

TIBET POLICY INSTITUTE

TIBETAN PERSPECTIVES ON TIBET'S ENVIRONMENT

A compilation of reports, papers and articles prepared by the Environment & Development Desk
2010-2020



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**ENVIRONMENT & DEVELOPMENT DESK
TIBET POLICY INSTITUTE
CENTRAL TIBETAN ADMINISTRATION**

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Preface

In the last few years, there has been an encouraging trend of increasing number of scientific reports, research papers and news articles being published on the current state of ecology of the Tibetan Plateau and its global implications. The trend clearly coincides with Tibet's environment gaining strong interest among international scientists, gradual recognition from governments and parliamentarians, and a widespread support from general public across the world.

It should be unequivocally acknowledged that the current success of Tibet's environmental awareness is a result of many years of planning, research and advocacy by various organizations and individuals. One particular organization which spearheaded the environment movement is the Environment & Development Desk (EDD), established under the Department of Information and International Relations of the Central Tibetan Administration in March 1990.

To galvanize support and awareness on Tibet's environmental issues, a year-long 'International Year of Environment and Human Rights for Tibet' was observed in 1992 by the Central Tibetan Administration. As a part of this initiative, the EDD brought out its first major report on Tibet's environment titled, 'Tibet: Environment and Development Issue' in the same year. The publication was launched ahead of the 1992 Rio Earth Summit in Brazil, where His Holiness the Dalai Lama was invited to speak by the Parliamentary Earth Summit. His Holiness's participation at the summit helped garner global attention to Tibet's ecological importance and its environmental situations. The report was a timely supplement for the newly gained interest on Tibet's environment. Thus, His Holiness's participation at the summit and the publication of the report helped lay the initial foundation for a sustained environmental campaign by the Central Tibetan Administration.

The environmental campaign led by Tibetans and Tibetan support groups have always been strengthened and inspired by His Holiness the Dalai Lama's long-standing concern for environmental conservation works as well as the deteriorating environmental situation in Tibet. The EDD has firmly and consistently carried forward His Holiness's vision for protection of Tibet's environment for the benefit of Tibetans in Tibet as well as for the welfare of millions of people in Asia, who are dependent on rivers originating from the Tibetan Plateau.

Despite limited international awareness on Tibet's ecological importance and Tibetan environmental activism being in its early stages during those initial years, EDD undertook numerous environmental activities, published reports, participated at number of UN and international environmental conferences, and organized major international environmental conferences on Tibet's Ecology in recent years. Its subsequent publications such as 'Tibet 2000: Environment & Development Issues', 'Tibet: A Human Development and Environment Report 2007', 'The Impact of Climate Changes on the Tibetan Plateau: A Synthesis of Recent Science and Tibetan Research 2009', 'The Dalai Lama on Environment:

Collected Statements 1987-2018’, and ‘Current State of Ecology on the Tibetan Plateau 2018’ laid strong foundations for providing documentation and scientific data on Tibet’s environment for the last many years.

Therefore, to bring a detailed chronicle of environmental issues developing from Tibet at different times, we are very happy to compile reports, papers and articles prepared and published by successive researchers at the Environment & Development Desk from 2010-2020. This book titled ‘Tibetan Perspectives on Tibet’s Environment’, aspires to give much needed understanding on Tibet’s past environmental issues, present environmental situations and future environmental risks from a Tibetan perspective. A perspective which is unquestionably driven by an enormous sense of responsibility and concern for Tibet’s future environmental sustainability and for the welfare of Tibetans in Tibet.

This volume gives readers a rare glimpse as well as a good understanding of emerging issues at that particular period in the last ten years as is evident from a series of reports and articles published in the last ten years. For example, issues such as deforestation, hunting, resource extractions, forceful removal of nomads, melting glaciers, thawing permafrost, degrading grasslands, damming of rivers, influx of mass tourism, establishment of nature reserves, mining on sacred mountains, lack of garbage management and increasing cases of natural disasters in Tibet were highlighted and discussed as a reflection of the importance of the issue at that particular point of time. As an environmentalist since 2011 and the head of the Environment & Development Desk since 2014, I am very happy that we are finally able to bring out this volume after years of work by many people, to whom EDD owe much gratitude for their contribution and support. We would like to thank Tibet House Trust for funding the publication and Mr. Tenzin Wangdak for assisting us in editing the book.

Finally, we would like to thank governments, organizations, scientists and environmentalists around the world for their work and support on protection of the Tibetan Plateau, which is the world’s highest and largest plateau as well as the head source of Asia’s largest rivers. As the Tibetan Plateau is increasingly considered as the solution to combat global climate change, its global ecological importance should be recognized by governments and the Tibetan Plateau should be part of any global climate change discussions.

Like previous publications by Environment & Development Desk, the ‘Tibetan Perspectives on Tibet’s Environment’ could surely become another important source for authentic and a detailed information on Tibet’s environment.

Tempa Gyaltzen Zamlha

Executive Head
Environment & Development Desk
Tibet Policy Institute
Central Tibetan Administration

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ENVIRONMENTAL CONCERNS AND IMPLEMENTATION OF UNSUSTAINABLE DEVELOPMENT POLICIES ON THE TIBETAN PLATEAU

Mining concerns

Uncontrolled mining on the Tibetan Plateau against the will of the local residents has been one of our greatest concerns. We are informed that these mining activities are carried out without any or very poor corporate commitments and responsibilities. We were told by a witness that at the drilling site/mining area, loud announcements are carried out in the streets everyday declaring that 'the central government needs to develop and needs these mineral ores. Anybody found revolting against mining would be considered as revolting against the state'. But even under such circumstances, in the past two years, we have witnessed several local oppositions against the mining activities - mostly gold and copper ores in the Tibetan areas as follows:

- March 2009, Bathang county, Kham Karze (Eastern Tibet).
- May 2009, Ser Ngul Lo, Lhara Village, Markham County, Chamdo (Eastern Tibet).
- June 2009, Meldro Gyama, Meldro Gungkar county near Lhasa.
- May 2010, Wu Yug Sogchen of Namling district in Shigatse (Central Tibet).

In most of the above cases, when local people took to the streets, it often involves when the concerned mining company directly disregards the aesthetic and social value of the local residents. Or when the higher authorities have turned a blind eye on their grievances against these companies. The recent mudslide/landslide incident at Drogchu (Ch: Zhouqu), in the south-east of Kanlho Tibetan Autonomous Prefecture, that took more than thousand innocent lives was also triggered by uncontrolled mining, logging and hydropower projects in that area for many years.

Implementation of Unsustainable Development Policies

For centuries, the Tibetan nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. In the name of modernization and conservation, (but also to maintain a tight grip over the nomadic community), the nomads have been removed from their ancestral pastoral grounds to concrete blocks.

The new policy, tuimu huancao in Chinese, meaning closing pastures to restore grasslands. Like most simple ideas, it is overly simple (Yeh, 2010). On practical

ground, this policy demands the herders to 'abandon their herds to restore grasslands'. It assumes that the only way to conserve China's upper watersheds is to remove animals and nomads. It took Chinese scientists 50 years to discover what the nomads have always known, and Chinese policy remains far behind the latest scientific knowledge. State power has relocated nomads into concrete block settlements on the edges of their former lands, with basic rations to ensure they do not die of starvation. Instantly, all their skills, risk management strategies, environmental services, carbon sequestration, traditional knowledge and biodiversity conservation are gone, redundant, as if they had never existed. As of today, we know that more than 700,000 nomads have been removed from their ancestral pastoral lands. Recent scientific findings tell a different and more technical view about the regeneration of the grasslands and the vital role of grazers in replenishing the degraded grasslands. According to these research papers, the carrying capacity of some grasslands were far exceeded partly due to inappropriate land management practices implemented in the 1950s.

Some Chinese researchers have blamed the degradation of these grasslands on many factors such as permafrost degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc.) and climate warming. More recent studies revealed that grazing actually helps in regenerating the grasslands by improving the soil Carbon/Nitrogen ratio and prolonging/extending the growing season (Clark, 2009).

Herders are being forcibly evicted to make rooms for large-scale projects, like dam and roads. Many are relocated to small concrete blocks and forced to slaughter their livestock. Furthermore, their lack of other skills prevents them from finding alternate means of making a living.

Tourism boom and waste management concerns

We are worried that many sanctified areas and urban centers inside Tibet as a result of mass tourism might turn into an open dumpsite to manage the inflow of waste generated by tourists, let alone for the loss of Tibetan cultural and social values. This will severely cripple the already dilapidated municipalities that are managing these solid wastes - attracting unwanted scavengers and spreading diseases.

The ongoing campaigns of boosting Tibet's economy by investing huge amounts in tourism and industries would not only impact the marginalized Tibetan community but also encourage the mass influx of Chinese migrant workers and their extended families. According to an official Chinese media, the Tibetan Plateau drew in 1.8 millions tourist for the first half year of 2010 (Consulate General of the People's Republic of China in Auckland, 2010). It is true that tourism has favoured a few

Tibetan families but the majority of the households are not able to react to the changes identically or on equal basis. Chinese researchers and academicians have also mentioned that the cash economy is rapidly replacing the traditional self-sufficient economy and exposing the farmers to more volatile market-oriented economic crops and activities, to which they have never coped with earlier.

The People's Republic of China's (PRC) National Development and Reform Commission plans to provide 682 billion Yuan (US\$100bn) as financial support for the western region over the next few years. The funds will be used for 23 new infrastructure projects, including railways, roads, airports, coalmines, nuclear power stations and power grids. Recently, China mentioned that it had completed the drawing up of a detailed "Action Plan for Building Lhasa into an International Tourist City in Five Years" (China.org.cn, 2009).

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*This article was published in August 2010 by EDD EU delegates



ENVIRONMENTAL ISSUES AND CONCERNS ON THE TIBETAN PLATEAU

Tibet referred to as ‘The Third Pole’ and ‘The Water Tower of Asia’ is currently facing a huge challenge to cope with climate change and its impacts. It is one of the earth’s most sensitive environments and a unique bio-geographical zone on our planet. Despite its cold environment, for thousands of years, the Tibetan people occupied this plateau and created cultural landscapes based on the principles of simplicity and non-violence that are in harmony with the environment.

Glacial Retreat and Rivers Originating from the Tibetan Plateau:

According to a study conducted by a NASA scientist¹, 20 percent of Tibetan glaciers have retreated in the past 40 years and if the current trend continues, more than 60 percent of the existing glaciers could be gone in the next 40 years. The same would cause widespread water crisis across Asia. The IPCC (Intergovernmental Panel on Climate Change) also warned that the continued melting at the current rate will result in massive flooding followed by severe droughts. Without these glaciers, the flow of rivers would become seasonal, leaving the livelihoods and lives of tens of millions of people swinging between flood and drought.

The snow covered mountain ranges and glaciers on the Tibetan Plateau are the sources of major rivers that flow into Asia. Mighty rivers such as the Yellow and Yangtze rivers, along with the Brahmaputra and Indus flow down from the glaciated peaks of the Tibetan Plateau. The Chinese dam building frenzy is creating huge discussions on whether these dams could be an initial step in enhancing its ambitious water transfer projects (Some experts believe that the current railway network linking Beijing and Lhasa would further enhance the needful transportation of technical staff and inventories to initiate this water diversion project). After many years of denial, the Chinese side finally accepted in building a HPP (Hydropower Plant; 500 megawatts) on the upper reaches of Yarlung Tsangpo at dZam (Ch: Zangmu), at Lhoka prefecture in Tibet. They have further plans to build five more HPP along the Yarlung Tsangpo. According to an April 2010 report in the South China Morning Post, ‘the duties of the armed police include dam-building and mining, particularly when these take place in strategically sensitive areas’.

The Tibetan Plateau also plays a huge role in influencing the Asian summer monsoon and its permafrost landscape acts like a sponge in conserving and

1. Jordan Camp, ‘Melting Glaciers of Tibet’, Climate Change Research at NASA-Goddard Space Flight Center, 2010.

managing the flow of the mighty rivers. Recent scientific journals have indicated that the climate warming over the Tibetan Plateau is also responsible for degrading these permafrost and frozen soils.

Endangering Pastoralism and Grasslands Stewardship in Tibet

Pastoralism on the Tibetan Plateau is an 'adaptation to a cold environment at elevations above the limit of cultivation'. For centuries, the Tibetan nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The Plateau itself is covered in almost 70 percent of these precious grasslands. The pasture lands are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts they have maintained the sustainable use of this area for many centuries. China's introduction of different grassland policies over the years threatened the sustainability of this delicate environmental balance. The new policies restricts the flexibility and mobility of the nomads (which is the main ingredient in the nomadic pastoral production) and blames their livestock for overgrazing the grasslands.

These days many researchers and rangeland specialist are arguing the applicability of these new policies and how much these have actually benefited or affected. Recent scientific findings give us more technical view about the regeneration of the grasslands and the vital role of grazers in replenishing the grasslands. Few researchers even cited that carrying capacity of the grasslands may not even exist in most of the Plateau's extremely variable (unpredictable) environments.

According to these research papers, the carrying capacity of some grasslands have far exceeded the natural limit partly due to inappropriate land-use and land management practices implemented in the 1950s. It was also mentioned that the major determinant for grassland productivity on the Tibetan Plateau is the rainfall rather than the past or the present livestock number. Some recent field studies also revealed that grazing actually helps in regenerating the grasslands by improving the soil Carbon/Nitrogen ratio and prolonging/extending the growing season. Even some Chinese researchers have blamed the degradation of these grasslands on many factors such as permafrost degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc.) and climate warming.

Despite all these valid arguments, in the name of modernization and conservation, the Tibetan nomads are forcibly removed from their ancestral pastoral lands, compelled to slaughter and sell their livestock. They now have to live on the state

rations and some of them sold their belongings to run small vendors. Furthermore, their lack of other skills prevents them from finding alternate means of making a living.

Development for Whom?

According to Professor Amartya Sen (1998 Nobel laureate), development is ‘not the mere accumulation of goods but the enhanced freedom to choose, to lead the kind of life one values’. The ongoing campaigns and activities of boosting Tibet’s economy (by investing huge amounts in tourism and industries) are encouraging mass influx of Chinese migrant workers and their extended families to settle in Tibet. It is true that tourism has favored a few Tibetan families but the majority of the households are not able to react to the changes on an equal basis. Chinese researchers and academicians have also mentioned that the cash economy is rapidly replacing the traditional self-sufficient economy and exposing the farmers to more volatile market-oriented economic crops and activities, to which they have never coped with earlier.

The Chinese authorities have long regarded tourism as one of Tibet’s pillar industries. According to a Chinese state run media, ‘Tibet Autonomous Region (TAR)’ alone is expected to receive 6 million tourists in 2010 alone in Lhasa,² Tibet’s holiest city. A place of spiritual power is now being replaced with resorts and hotels to boost tourism industry in Tibet. There are now internationally-branded luxury hotels being constructed in Lhasa including the 2000 room-property of Intercontinental Hotel and many more. With little regard and respect to the available local human resources, these development projects would attract many migrant and skilled workers from Mainland China. About 1.2 million rural Tibetans, nearly 40 percent of the region’s population, have been moved into new residences under a ‘comfortable housing’ program to make room for large-scale projects, like dams and roads. At present, in ‘TAR’ there are more than 140 star-rated hotels and over 1000 other hotels.

The People’s Republic of China’s (PRC) National Development and Reform Commission plans to provide 682 billion Yuan (US\$100bn) as financial support for the western region over the next few years. The funds will be used for 23 new infrastructure projects, including railways, roads, airports, coal mines, nuclear power stations and power grids. The central government invested \$3 billion in ‘TAR’ in 2009, a 31 percent increase over 2008. Recently, China mentioned that it had completed the drawing up of a detailed ‘Action Plan for Building Lhasa into an International Tourist City in Five Years’. Makeshift restaurants and houses run by ethnic Han businesspeople have sprung up even at a remote lake (Nam Tso) north of Lhasa (Wong, 2010). Wong further writes that the influx of money and people has brought new prosperity, but it has also deepened resentment against

2. TAR to receive 6 million tourists in 2010 (2010-Jun-17).

Chinese among many Tibetans. Migrant Han entrepreneurs elbow out Tibetan rivals, then return home for the winter after reaping profits. Large Han-owned companies dominate the main industries, from mining to construction to tourism. Chinese officials say Tibetans make up more than 95 percent of the region's 2.9 million people, but refuse to give estimates on Han migrants, who are not registered residents. In the cities of Lhasa and Shigatse, it is clear that Han neighborhoods are dwarfing Tibetan areas.

A 2009 study estimated, that with the current economic development and dramatic demographic change in the region, the total municipal solid waste (MSW) generation in 'TAR' would increase by 37 percent in 2020 as compared to the year 2006 (Huang, Sillanpää, Gjessing, & Vogt, 2009). Such increase in the MSW output would severely cripple the municipalities, - attracting unwanted scavengers and spreading diseases. With non-existing municipal waste treatment facilities, and the prevailing practice of discharging the waste into rivers and dumpsites near the settlements, it would seriously pollute the aquifers and rivers beyond human control. We are concerned that, in a few years' time, many sanctified areas might transform into dumpsites to manage the inflow of MSW generated by tourists and the migrant workers.

Apart from the waste and housing episode, Beijing's uncertainty and ever-changing policy has once again excluded skilled Tibetan tourist guides from the industry. According to the 'TAR' Tourism Bureau, each guide must possess a national or regional certification and an employee's card issued by 'TAR' tourism department. The same would be issued only after passing the examination conducted by 'TAR' Tourism Training Center. Why the need for such new requirements? According to some recent information received, many Tibetan tour guides have lost their jobs to Chinese counterparts due to this current requirements. Not only are these local Tibetans losing their jobs but it also creates deep resentment against the whole system.

Natural Resource Exploitation

It has regularly been mentioned that one main reason for Tibet's occupation by China lies in its unearthed treasure troves. China refers to Tibet as 'Xizang' which literally means the western treasure house. The Plateau's rich natural resources became more or less like a resource curse for the local residents and its ecosystem. Since late 60's, these resources have been exploited in various scales and mostly under very poor environmental norms and regulations. The potential for significant impacts is greater when mining occurs in remote, environmentally or socially sensitive areas. Besides destroying the ecologically/environmentally harmonious relationship, most of these mining projects create social tension and distrust when standard corporate policies are not followed or when the project undermines securing a corporate

commitment. The ever expanding railway networks across the Tibetan Plateau, the logistic issue of transporting mineral ores and accessing the drilling sites remains the least of concerns.

There are many areas in Tibet where the local residents are silenced by Chinese military forces against any mining protests. We were told by a witness that loud announcements are carried out in the streets everyday declaring that ‘the central government needs to develop and needs these mineral ores. Anybody found revolting against mining would be considered as revolting against the state’. But even under such circumstances, in the past two years, we have witnessed several local oppositions against the mining activities-mostly gold and copper ores in the Tibetan areas as follows;

- March 2009, Bathang county, Kham Karze (Eastern Tibet).
- May 2009, Ser Ngul Lo, Lhara Village, Markham county, Chamdo (Eastern Tibet).
- June 2009, Meldro Gyama, Meldro Gungkar county near Lhasa.
- May, 2010, Wu Yug Sogchen of Namling district in Shigatse (Central Tibet).
- August, 2010, Payul County, Kham (Eastern Tibet).

In all of the above cases, when local people took to the streets, it often involved the concerned mining company directly disregarding the aesthetic and social value of the residents. Or when the higher authorities have turned a blind eye on their grievances against these companies.

We strongly believe that the recent mudslide/landslide incident at Drogchu [(Ch: Zhouqu), in the south-east of Kanlho-Tibetan Autonomous Prefecture, that took more than ten thousand innocent lives] was also triggered by uncontrolled mining, logging and hydropower projects in that area for many years. Let us not stand still and wish the Constitution of PRC [Article 9 and 26 (under the general principles) and Article 27, 28, 45 & 66 of ‘Regional National Autonomy’] to prevail through the test of time. In 2010, the Canadian mining company run by Hunter Dickinson Inc. through its subsidiaries of Continental Minerals will be shifting large Caterpillar earth scrapers and wheel loaders for its Shethongmon copper mining project near Shigatse. Once officially in operation, the company is expected to have an annual production of 1.17 million ounces of silver, 116 million pounds of copper, and 190,000 ounces of gold. According to reports published in 2010, China Gold International, based in Vancouver, has entered into an agreement to acquire the Gyama copper polymetallic metal mining property located in Meldro Gungkar county. The development will include two pits plus an underground mine

that will be accessed from two shafts. It was estimated that the mining facility would excavate daily around 12,000 tonnes of ore for three decades. Production will consist of copper concentrate, molybdenum concentrate and lead concentrate. Gold and silver will be separated and smelted in downstream processing.

Looking forward

The knowledge and experience of Tibetan herders should be incorporated into rangeland management practices. The Tibetan herders should be directly involved in the decision making process or at the least their concerns should be respected before issuing policy decisions. Beijing should give the Tibetan herders the right and the power to take control of the restoration of degraded grassland rather than giving this responsibility to inexperienced Chinese officials. Central Tibetan Administration-Dharamsala welcomes development activities related to social and economic upbringing of Tibetan communities inside Tibet, but these developments besides being sustainable, should not outweigh the preservation of the unique Tibetan culture, language and its environment. These development projects should not spark off any social tension and unrest amongst the Tibetan communities. The development projects should first prioritize on training the local Tibetans in their daily life skills and the technical know-how. More attention should be given on improving the health and education sectors reaching down to the village levels.

Tibet matters, because not only are its glaciers melting fast but the Plateau is warming faster than other areas on earth, resulting in more extreme and unpredictable weather across Asia. And with the major Asian rivers originating from the Tibetan Plateau and also being a significant factor for influencing the Asian summer monsoon, the social security and well-being of billions of people are threatened. A healthy Tibetan Plateau would not only benefit the entire Asian continent but also helps in promoting peace and harmony in the region, especially between two major emerging powers (India and China). We request all TSGs to not only pass these messages to your local Parliamentarians but request/urge them to bring these issues to their governments with the request that these concerns are raised and discussed in any bilateral talks and discussions with their Chinese counterparts.

In brief, all development projects in Tibet should incorporate the following crosscutting guidelines (DIIR, CTA, 2004);

- Involve beneficiaries, from the identification of a project to formulation through the implementation cycle, by applying participatory tools and techniques such as participatory rural assessment (PRA) to ensure accountability and ownership.

- Always insist on small-scale interventions that suit the regions and populace rather than capital intensive ones;
- Foster self-reliance, and build local project management teams centered on community-based organizations (CBOs), through local capacity building;
- Conduct a feasibility study and environmental impact assessment;
- Rely on traditional local knowledge and wisdom, including resource management and survival techniques;
- Respect and promote the Tibetans' culture, traditions, knowledge and wisdom about their own landscape and risk management;
- Be subject to ongoing on-site monitoring by the development agencies to ensure that the intended target group actually benefits, and that those in power do not usurp the benefits meant for the poor and disadvantaged;
- Use Tibetan as the working language of the project;
- Neither provide incentives nor in any way facilitate direct or indirect migration and settlement of non-Tibetans in Tibetan regions;
- Neither provide incentives nor help facilitate the transfer of land and natural resources to non-Tibetans. For more details on the guidelines, please visit: <http://www.tibet.net/en/index.php?id=223&rmenuid=11>

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ENVIRONMENT: DENUDING, DEGRADING AND DEPOPULATING

Tibet and Climate Change: What's the Underlying Story

Why Tibet matters? Several scientists have realized the importance and Tibet's role in the planetary climate. However, the six million Tibetans are silenced and forbidden to form their own organizations, people think Tibet is small and unimportant on a global scale. Actually, it is an immense upland, with an area of ~2.5 million sq. km and averaging over 4500 meters in elevation. It is not just the largest and highest area in the world today (also referred to as 'the roof of the world'); it may be the largest and highest in all geologic history. It is also close to 2% of the land surface of the planet (Environment and Development Desk, 2000).

Scientists are increasingly calling the Tibet the planetary 'Third Pole', because it is home to around 46,000 glaciers, storing more freshwater than any other region except the North and South poles. These scientists also know that Tibet is warming at least twice as fast as the rest of the world resulting in more extreme and unpredictable weather across Asia. Tibet's glaciers will be gone within decades. These glaciers feed the rivers that are the lifeblood of Asia, providing water for more than one billion people in ten nations downstream of Tibet.

Global warming is not only causing extreme weather conditions and particularly affecting extreme elevation regions of the world. On the one hand, global warming could cause the submergence of low-lying islands and coastal lands, while on the other hand its effect on the Tibetan Plateau is higher than any part of the world. Tibet is virtually an island in the sky so vast it deeply affects wind circulation, draws the Asian monsoons deep inland, affecting even storm tracks of the north Pacific and Atlantic Oceans. The Alpine grasslands of the Tibetan Plateau play an important role, like the rainforest of Amazon, in absorbing Carbon dioxide and acting as a Carbon sink. Over one-third (37%) of the Plateau's grassland Soil Organic Carbon is stored in its permafrost regions (Wang Genxu, 2008).

The release of the carbon contained within the Plateau's grasslands (positive feedback) could also accelerate global warming. Like the vast Amazon rainforest, it is on the brink of being turned into a desert, which could in turn have catastrophic consequences on the world's climate.

As the climate change on Tibet's fragile mountain ecosystem continues or even accelerates, their effects will resonate far beyond the plateau, changing the water supply for billions of people and altering the atmospheric circulation over half the

planet. More than ever before, the need to save the Tibetan Plateau from ecological devastation is urgent because it is not a question of the survival of Tibetans, but also half of the humanity. The following sections addresses the major impacts of climate change on the Tibetan Plateau and its people especially the nomads. The prevailing global warming and the land use changes over the Plateau are leading to a series of interconnected environmental concerns including:

- Meltdown of glaciers
- Degradation of permafrost layers
- Changes in the river hydrology
- Drying up of wetlands and shrinking of lakes
- Degradation of grasslands and displacement of Tibetan nomads
- Resource extraction and deforestation
- Human-induced factors

Tibetan Plateau and Climate Change: An Overview

Today, climate change and its impact are a grave concern to the entire world and one that can no longer be ignored. Such a change is not an inexorable force of nature but in fact, has known human causes and available solutions to restore climatic stability. After Arctic and Antarctic, the Tibetan Plateau is Earth's largest store of ice and a hotspot of climate change. Due to its unique geographical location and high altitude, Tibetan Plateau faces rapid changes in its weather patterns and ecosystems in more extreme ways than other parts of the world. The Plateau has been warming three times as fast as the global average and its glaciers are shrinking more rapidly than anywhere else. Despite its cold environment, for thousands of years the Tibetan people inhabited this plateau and created cultural landscapes based on the principles of simplicity and non-violence, in harmony with the environment.

The significance of the Tibetan Plateau is clearly evident from different names being used by scientists such as, 'The Third Pole', 'The Water Tower of Asia', 'The Roof of the World' and 'The Barometer of Asia'. With an average elevation of 4,500 meters, the Plateau contains over 46,000 glaciers covering an area of 105,000 sq. km, and is the highest, largest, and coldest plateau on Earth (Environment and Development Desk, 2009). It is surrounded by the mighty Himalayas in the south, Kunlun Mountains in the north, and Hindu Kush and Pamir ranges in the west.

The glaciers, snowcapped mountains, permafrost soils and alpine wetlands of the Tibetan Plateau hold a large reserve of carbon. If not managed properly they could become a source of greenhouse gases. The rivers originating from Tibet have been the lifeblood of Asian civilization as ancient societies have developed their lifestyles around these great rivers. Today almost half of the world's population is dependent on the water coming from Tibet. As a result, Plateau's impact is not only regional, but also global. The plateau plays an important role in generating and regulating the Asian monsoon. It heats quickly in spring and summer, diverting the jet stream, establishing a steep pressure gradient that draws monsoon clouds deep inland into the heart of Eurasia. The Tibetan Plateau is a unique biodiversity zone with over 100,000 high altitude plant species, 12,000 species of vascular plants, 532 species of birds, 126 identified minerals etc (Environment and Development Desk, 2000).

The prevailing global warming and the land use changes over the Tibetan Plateau are leading to a series of interconnected environmental concerns like meltdown of glaciers, degradation of permafrost layers, changes in the river hydrology, drying up of wetlands, shrinking of lakes, and degradation of grasslands and displacement of Tibetan pastoral nomads. This multi-faceted environmental degradation further enhances warming process and adversely affect the Plateau's climate, its neighbors and the world at large.

Glacial Meltdown and Glacial Lake Outburst Floods

The Tibetan Plateau holds the Hindu-Kush Himalayan Ice Sheet, considered the largest ice mass outside the two poles (T P Barnett, 2005). Hence scientists and geologists are increasingly using the name 'Third Pole' to pronounce the global significance of Tibet's environment.

According to the Inter-governmental Panel on Climate Change (IPCC), glaciers in the Tibetan Plateau are receding fast, which will result in massive flooding followed by severe drought. Some reports suggest that Tibet's glaciers have shrunk by 6,600 sq. km in the past 40 years and 82% of the glaciers have already retreated in the past 50 years (Qiu, 2008). Furthermore, a major concern is the lack of any net accumulation of snow since 1950 over these mountains.

The scale of glacial melting can be viewed at Rongbuk Glacier, the northern slope of Mt. Everest (Tib: Jhomolangma). Between 1966 and 1997, the glacier receded by up to 270m in the middle, 170m at its eastern side, and 230m at its far-east side. Similarly, the Zepu glacier of southeast Tibet has thinned by more than 100m in the last three decades alone (YANG Xuchao, 2006). Mountain glaciers are experiencing less accumulation of snow and higher rates of melting. Without these glaciers the flow of rivers would become seasonal, leaving the livelihoods of hundreds of

millions of people affected by the extreme weather conditions.

Furthermore, melting of glaciers and the permafrost in recent years have destabilized hillsides and resulted in landslides. A massive landslide in Tibet blocked Pareechu, a tributary of the Sutlej in Tibet. In the year 2000 and 2005 this unstable rock-fall dam burst caused heavy destruction of livelihood, infrastructure, and socio-economic assets in Kinnaur and Shimla districts in Himachal Pradesh, India.

Due to the rapidly melting glaciers, there has been a rapid increase in the numbers of glacial lakes in the Himalayan regions resulting in Glacial Lake Outburst Floods (GLOF) particularly in Nepal, India and Bhutan. According to the International Centre for Integrated Mountain Development (ICIMOD), there are 8790 glacial lakes within a selected areas of Hindu-Kush Himalaya and more than 200 potentially dangerous glacial lakes, where rock walls created by retreating glaciers may suddenly collapse (Jack D. Ives, 2010).

Degradation of Frozen Earth Layers and Release of Green House Gases

The presence or absence of the permafrost layer necessitates major variations in the soil's physical structure mainly its moisture and nutrient content. The permafrost covers approximately 1.3 to 1.6 million sq. km. (Jin, Li, Cheng, Shaoling, & Li, 2000) These covers have thickness ranging from 1 to 130 m, depending on such local characteristics as slope and exposure, altitude, geological structure, soils, and soil water content. The alpine permafrost on the Plateau stores about 12,300 million tons of Carbon. (Wang Genxu, 2008) Significant amount of methane gas are also trapped in the permafrost, preventing its release into the atmosphere. The alpine permafrost on the Plateau is characterized by warm permafrost and rich ground ice, as a result they are sensitive to climate change and are particularly vulnerable to rising temperature.

Tibet serves as a major carbon sink with around 37% (12,300 million tons of Carbon) of the grassland Soil Organic Carbon (SOC) stored in the alpine permafrost of the Tibetan Plateau. Their degradation would lead to a huge amount of carbon entering the atmosphere, intensifying global warming. Recent studies have shown that glacial melting and thawing of permafrost on the Plateau will lead to a large-scale release of green-house gases into the atmosphere and could bring further changes in the already warming global climate.

With a significant measured increase in the mean cold season average temperature, the permafrost layers and seasonally frozen grounds are slowly degrading leading to increased microbial decomposition of previously frozen organic carbons. The degradation of permafrost, besides disturbing the carbon balance over the plateau,

will also lead to the lowering of the water table, loss of soil moisture content, drying of wetland, extinction of native plant species and desertification.

If the current trend of melting permafrost and loss of wetlands continue then the carbon deposits and methane would be released in the air, and it can speed up the Global Climate Change. The loss of carbon deposits will also degrade the grasslands directly hurting the biodiversity on the Tibetan Plateau. In addition, since the wetlands and permafrost work as sponges controlling the amount of water running into the rivers, there could be flash floods and ultimately water crisis in the most populous regions of the world.

Impact on River Hydrology and Sustenance of Lower Riparian Countries

Snow peaks and glaciers enable Tibet to be the source of major rivers that flow into Asia and meet its water demand. Rivers such as Machu (Yellow), Drichu (Yangtze), Zachu (Mekong), Gyalmo Ngulchu (Salween), Yarlung Tsangpo (Brahmaputra), Macha Khabab (Karnali), Langchen Khabab (Sutlej), Sengye Khabab (Indus), Bhumchu (Arun) and Lhodrak Sharchu (Manas) have their sources in the Tibetan Plateau.

According to some estimate, approximately 1.3 billion people in Asia are directly dependent on the watersheds of these major rivers. For instance, Yarlung Tsangpo originates from the glaciers of Mt. Kailash range in Tibet and drains an area of 651,335 sq. km connecting Tibet (50.5%), India (33.6%), Bangladesh (8.1%) and Bhutan (7.8%). Beyond the populations residing in the watersheds of these rivers are the additional hundreds of millions who depend on monsoon rains drawn inland by the Tibetan Plateau. Unfortunately, the flow regimes of the rivers in Tibet are changing due to climate change and human interventions. In 2007, the WWF (World Wide Fund For Nature) identified that four out of the world's top ten rivers, which are at greatest risk (from six important threats including dams and infrastructure, excessive water extraction, climate change, invasive species, over-fishing, and pollution), originate from the Tibetan Plateau. This includes Sengye Khabab affected by climate change, Drichu confronting a pollution crisis, Gyalmo Ngyulchu threatened by dam construction and Zachu threatened by overfishing (Wong, 2007).

According to the World Commission on Dams, the Chinese government increased the number of large dams from 22 in 1950 to 22,000 in 2000 (The World Commission on Dam, 2000). Although the plans to divert water from the Drichu and Yarlung Tsangpo rivers to the fast-drying Machu River will improve its flow through the most populated areas of China, it will deprive water to the millions of people in the lower riparian (downstream) regions.

| Tibetan Name | Common Name | Watershed Regions/ Countries | Outflow |
|---------------------|--------------------|--|-----------------|
| Machu | Yellow River | Tibet, China, Inner Mongolia | Yellow Sea |
| Drichu | Yangtze | Tibet and China | East China Sea |
| Zachu | Mekong | China, Vietnam, Laos, Cambodia, Thailand | South China Sea |
| Gyalmo Ngulchu | Salween | Tibet, China, Myanmar, Thailand | Andaman Sea |
| Yarlung Tsangpo | Brahmaputra | Tibet, India, Bangladesh | Bay of Bengal |
| Macha Khabab | Karnali | Tibet, Nepal, India | Bay of Bengal |
| Langchen Khabab | Sutlej | Tibet, India, Pakistan | Arabian Sea |
| Senge Khabab | Indus | Tibet, India, Pakistan | Arabian Sea |
| Bhumchu | Arun | Tibet, Nepal, India | Bay of Bengal |
| Lhodrak Sherchu | Manas | Tibet, Bhutan, India, Bangladesh | Bay of Bengal |

Grassland Degradation and Removal of Tibetan Nomads

Tibet's rangeland with an average altitude of 4500 meters, covers approximately 70% of Tibet's total area. The Alpine grassland at high altitude occupies over 60% of the total rangeland in Tibet (Environment and Development Desk, 2008).

Pastoralism on the Tibetan Plateau is an adaptation to a cold environment at elevations above the limit of cultivation. Consequently, pastoral nomads of Tibet have maintained a unique pastoral culture for more than 8000 years. Tibet's grasslands represent one of the last remaining agro-pastoral regions in the world. The pasturelands are made habitable through the co-existence of the Tibetan people and their yaks. According to recent archaeological fieldwork, the Tibetan Plateau has been used extensively by pastoral nomads, who developed deep understanding of grassland dynamics and veterinary knowledge for close to 9,000 years. According to one UNDP report (2007), Tibet's grasslands are turning into desert at the rate of

2,330 sq. km per year (Khoday, 2007). Apart from the natural climate warming and its feedback, various anthropogenic (human-induced) factors are also responsible for accelerating the process of grassland degradation.

China's introduction of different grassland policies over the years have threatened the sustainability of this fragile environmental balance. The overall plan during the periods of 'Collectivization and Household Responsibility' was to maximize the agricultural production from the grasslands. During that era, almost 20 million hectares of grassland in Tibet and Inner Mongolia were converted to croplands. Tibetan Plateau's alpine grasslands has been plowed and exposed to hazardous chemical fertilizers causing severe degradation of grasslands.

However, Chinese government has been accusing nomads, making them scapegoats for causing the grassland degradation and is planning to forcibly resettle all nomads in permanent structures by 2020, in order to protect their precious water tower! Chinese government's implementation of the policy to settle Tibetan nomads has led to increasing poverty, environmental degradation and social breakdown. Tibetan nomads, in reality, are the expert custodians of the alpine pastures and their mobile lifestyle prevents the grasslands from overgrazing. Recent researchers have also indicated that managed grazing on these grasslands could actually help to restore the degraded grasslands and maintain a wider biodiversity of indigenous species of grasses, forbs and medicinally useful plants.

Therefore, far from being 'selfish', 'stupid' or 'ignorant' of the consequences of grazing, as China supposes, Tibetan nomads has actually been the natural resource managers over millennia. If at all, the implementation of the current grassland law is necessary to protect the grasslands or the Chinese water tower, why the nomads are excluded, and their past experiences are not valued? They could play a key role in rehabilitating the degraded pastures.

Contraction of Wetlands and Drying Up of Lakes

Wetlands, often referred to as earth's kidney, has played a vital role in sustaining ecosystems that serves millions of lives. They act as an enormous sponge slowly releasing water into rivers all round year. The freshwater wetlands on the Tibetan Plateau are distributed in an area of around 1,33,000 sq. km (Jin, Li, Cheng, Shaoling, & Li, 2000). With their wealth of stored carbon, these wetlands provide a potential sink for the atmospheric carbon. It was also observed that the role of wetland as a carbon sink was closely related with the water table and the amount of precipitation.

The warming climate has resulted in the drying-up of thousands of lakes across the Tibetan Plateau. Most of them are considered sacred. These lakes have no

outlet and depend entirely on local streams and underground sources to maintain their water level. Already a large number of lakes have disappeared due to warming climate and human activities in the past few decades. This is now accelerating.

The subsequent release of Carbon dioxide, Methane and Nitrogen dioxide from these contracting wetlands further adds up to the yearly GHGs emission. Total Carbon dioxide emission from the Tibetan Plateau wetlands due to prolonged permafrost thawing season is estimated to be around 10 million tons, which is roughly equivalent to Carbon dioxide emitted by 10 million average automobiles in China for two months. The wetlands of Lhalu on the northwest edge of Lhasa, with its total area of 6.2 sq. km could absorb 78,800 tons of Carbon and produce 57,300 tons of oxygen annually. The contraction in the wetlands due to climate change led to reduced flows of the Driчу (Yangtze) and Machu (Yellow) rivers. The warming climate has resulted in the drying-up of thousands of lakes across the Tibetan Plateau over thousands of years. According to Chinese Academy of Sciences, the wetlands on the Tibetan Plateau have shrunk more than 10% overall in the past 40 years, with biggest shrinkage occurring at the source of the Driчу (Yangtze) and Machu (Yellow).

The surface area of lake Nam-Tso has decreased by 38.58 sq. km from 1970 to 1988 at a rate of 2.14 Sq. km per year (Jiahua Zhang, 2007). Similarly, the water level of Tso-Ngonpo has reportedly lowered by 3.62 meters and its water surface shrank by 342 sq. km between 1959 and 2005. The decline in the lake level of Tso-Ngonpo has led to many environmental problems in this watershed such as grassland degradation, deterioration of water quality, wind erosion and expansion of sandy land.

Resource Extraction and Deforestation

Tibet's elevation has produced a unique, resource-rich geology. The unchecked mining operations in Tibet have been a major cause for environmental degradation since 1960s. Extraction of mineral ores and natural resources (chromium, salt, copper, silver, coal, gold, lithium, lead, zinc, asbestos, oil, gas, magnesium, potash and uranium) has been vigorously carried out by the Chinese government to fuel its growing economy and to lessen its dependence on costly imports. Chinese Geological Survey in 2007 estimated that the Tibetan Plateau holds about 30-40 million tons of copper reserves, 40 million tons of zinc, and several billion tons of iron. Copper deposits included the Yulong copper find in the Tibetan Autonomous Region (TAR) which has a proven reserve of more than 7.8 million tons, making it the second largest copper mine in Asia (Environment and Development Desk, 2009). The mining operations are carried out without any consent, involvement

and, in some case, even the knowledge of the local Tibetans. This is a violation of their fundamental right to determine how their economic resources are utilized. The Chinese government has also been actively promoting resource extraction opportunities in Tibet to foreign firms who have both the capital and expertise needed to mine in Tibet's inaccessible and often hostile environment.

The opening of the Gormo-Lhasa Railway has allowed China to extract Tibet's resources more efficiently and at the faster rate. The railway has been deliberately routed through areas with rich mineral deposits, which confirms the suspicion that one of China's prime objectives for the railway is to transport vast quantities of Tibet's enormous mineral wealth out of Tibet, denying Tibetans any opportunity to benefit from it. Mining poses devastating social, economic and ecological consequences for the local Tibetan communities. Mine operations have an irreversibly destructive impact on environment, especially gold and copper mining, which use toxic chemicals usually cyanide or arsenic in the processing stage. Of particular concern is danger of water contamination from the waste discarded at mine sites, as most of the proposed mines are in close proximity to Tibet's main river systems, including the Yarlung Tsangpo.

Increased mining activities further reduce vegetation cover and thus increase the danger for severe landslides, massive soil erosion and loss of wildlife habitat. Mine operations destroy grazing lands, negatively impacting the livelihood of local residents located near mining sites. The heavy influx of Han Chinese migrant workers has also started to cause disastrous effect on the region and lead to potential conflicts with Tibetan residents. Over the past two years, they have been several protest made by the local residents against the mining companies all across the three traditional provinces of Tibet. China refers to Tibet as its 'Western Treasure House'. At the time of China's invasion in 1950, the Plateau was rich in timber resources, but decades of logging have resulted in large-scale deforestation and half of Tibet's forest-stock have been exported to China, leaving the region highly prone to erosion. It was only after the disastrous floods of the middle and lower Yangtze River in 1998, that China realized the consequences of stripping Tibet's forests. Even now logging does continue but at a smaller scale.

Anthropogenic (Human-Induced) Factors

Various anthropogenic factors on the Tibetan Plateau are also responsible for speeding up the environmental degradation and its associated problems. One of the major causes has been the Chinese government's policy to bring changes in land use, in particular, conversion of grassland into cropland to maximize agricultural production. The construction of Siling-Lhasa Highway (SLH) (Ch: Qinghai-Tibet

Highway) in 1959 led to severe degradation of the permafrost soil and the vegetation along the highway and adjoining areas (Environment and Development Desk, 2009). The damaged vegetative mat led to the loss of organic matter and carbon in the soil, and the melting of the warm permafrost layer under the topsoil. The degradation of the permafrost was further aggravated during the road width expansion and reconstruction of SLH between 1973 and 1984. Recent researchers have also indicated that the permafrost degradation on the Tibetan Plateau is mainly attributed to human interventions or the surface disturbances over the past several decades, while the global warming has played a secondary role in speeding up the degradation.

China has been constructing a series of dams on Tibet's major rivers, disregarding the implications on Tibet's fragile ecology. These dams have proved controversial as they involve massive relocation of people and their homes, and the environmental impact of altering landscape and ecosystems. Besides these immediate environmental and social problems, there are other issues that will threaten the dams and the peoples living in its shadow. Most of the Tibetan Plateau is an active seismic zone, where earthquakes are frequent and often severe. The weight of water stored in the dam has been found scientifically to be sufficient to trigger seismic events.

Furthermore, other human-induced factors that contributes to the environmental degradation in the Tibetan Plateau includes infrastructural development such as new townships for displaced nomads and railroad tracks, reclamation of communal land and pastures to allow commercial development, large-scale illegal harvesting of wild medicinal herbs on grasslands, and elimination of indigenous predators causing growth of pest species etc.

Quotes about Tibet's Environment

“These days the environment-the source of life for all beings in the world including Tibet, the Land of Snows-is undergoing extensive degeneration. At this time, it is extremely important that every human being, according to his or her ability, consistently puts effort into ensuring the conservation and protection of this planet's environment and its inhabitants.”-His Holiness the XIV Dalai Lama, the spiritual leader of Tibet

“Our understanding of global climate change would be incomplete without taking into consideration what's happening to the Tibetan plateau.”-Veerabhadran Ramanathan, an atmospheric scientist at the Scripps Institution of Oceanography in La Jolla, California.

“[...] While there is little doubt about the extent of the land degradation problem, the Special Rapporteur would note that herders should not, as a result of the measures adopted under the tuimu huancao (‘removing animals to grow grass’)

policy, be put in a situation where they have no other options than to sell their herd and resettle”. -Olivier De Schutter, the UN Special Rapporteur on the Right to Food, Preliminary observations and conclusions: Mission to the People’s Republic of China from Dec. 15 to 23, 2010.

“The Dalai Lama argued that the political agenda should be sidelined for five to ten years, and the international community should shift its focus to climate change on the Tibetan plateau. Melting glaciers, deforestation, and increasingly polluted water from mining projects were problems that cannot wait”. -Timothy Roemer, the US Ambassador to India stated in his cable to Washington about his meeting with His Holiness the Dalai Lama.

“The highest and largest plateau on earth. It shelters a wide array of unique species, including the Tibetan antelope, Tibetan gazelle, wild yak, blue sheep, snow leopard, brown bear, Bengal tiger and black-necked crane. The Tibetan Plateau is also the source of almost all of Asia’s major rivers: the Yellow River, the Yangtze, the Mekong, the Salween, the Indus, and the Yarlung Tsangpo, which downstream becomes the Brahmaputra. Because of its high elevation (ave. elev. 4000m), the ecosystem here is extremely fragile. Once damaged, it is extremely difficult to reverse”. -Ling Lin, Director of Tibetan Plateau Programme, World Wide Fund for Nature.

“Temperatures are rising four times faster than elsewhere in China, and the Tibetan glaciers are retreating at a higher speed than in any other part of the world. In the short term, this will cause lakes to expand and bring floods and mudflows. In the long run, the glaciers are vital lifelines for Asian rivers, including the Indus and the Ganges. Once they vanish, water supplies in those regions will be in peril”. -Qin Dahe, the former head of the China Meteorological Administration

Did you know?

- Tibetan Plateau or The Third Pole which contains more than 46,000 glaciers covering an area of 105,000 sq. km is the most glaciated region on earth.
- Around 1.3 billion people in Asia thrive on the watershed of the rivers originating from the Tibetan Plateau.
- United Nations has warned that Tibet’s glaciers could disappear within the next 100 years.
- The Tibetan Plateau plays a pivotal role in generating and regulating Asian monsoon.
- The melting of Tibetan glaciers had led to the formation of 8,790 identified glacial lakes, and 204 of these are considered potentially dangerous and may

lead to Lake Outburst and floods.

- The air temperature on the Tibetan Plateau is predicted to increase by 2.2°-2.6° C by 2030, which in turn will melt the region's glaciers and permafrost at an accelerating rate.
- According to WWF, four of the world's top ten rivers, which are at the greatest risk (from dams and infrastructure, excessive water extraction, climate change, invasive species, over-fishing, and pollution) originates from the Tibetan Plateau.
- According to one UNDP report (2007), Tibet's grasslands are turning into desert at the rate of 2,330 sq. km per year.
- Tibetan pastoral nomads are the best stewards of the grasslands and China's current grassland policy completely disregards their traditional knowledge and compels them to settle permanently without their livestock.

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THE STATE OF ENVIRONMENT ON THE TIBETAN PLATEAU AND ITS CONSEQUENCES FOR INDIA

With an average elevation of 4500 meters, the Tibetan Plateau is one of the most distinctive land-feature on this earth. For many generations, this Plateau has met the basic necessities to sustain life and flourish human civilizations beyond its vast border. The modern era now begins to realize the significance of its strategic location for developing peace and harmony within the region or the opposite. As referred by many scientist and intellectuals as the barometer of Asia, this vast plateau warms faster than the oceans, drawing moist air from the Indian Ocean and helps to generate and regulate the monsoon in India during the summer season. However, worrying factor for all of Asia is a documented shift in the annual summer monsoon season. Experts say that the monsoon is declining in intensity and has become more variable.

Tibet also referred to as ‘The Third Pole’ and ‘The Water Tower of Asia’ is the headwater of major rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Myanmar and Vietnam. The snow peaks and glaciers enable Tibet to be the source of major rivers that flow into Asia. As a result, approximately 47 percent of the world’s population live in the watersheds of the six major rivers that originate in Tibet.

With the major Asian rivers originating from its plateau, the total river basin area (as of 2003 data) is estimated above 5,477,700 sq km. That is 3% of the land surface of our planet. Beyond the populations residing in the watersheds of these rivers are the additional hundreds of millions or billions who depend on monsoon rains drawn inland by the Tibetan Plateau. The Plateau provides Asia’s fresh water resource from the deserts of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonlesap lake of Cambodia to the North China plain.

The Water Tower of Asia is currently facing a huge challenge to cope with the climate change and damming activities. In recent years, Tibet has seen a continuous rise in temperatures at the rate of 0.3 degree Celsius per decade, which is twice the global average temperature rise. Increased temperature has accelerated glacial shrinkage and has accelerated the degradation of permafrost regions. According to the Chinese Academy of Science, glaciers on the Tibetan Plateau are melting at a rate of 7 per cent annually and if the current rate continues, two-thirds of the glaciers on the plateau will be gone by 2050.

The International Centre for Integrated Mountain Development (ICIMOD) has revealed alarming details on the sustainability of the Himalayan ecology. According to their findings, the current trend of melting suggests that the Ganges, Indus,

Brahmaputra and other rivers across the northern India plains could most likely become seasonal rivers in the near future. The formation of glacial lakes as a result of the rapid melting of glaciers on the higher reaches of the mountain ranges continues to pose a serious threat to livelihood downstream. ICIMOD has identified some 8,790 glacial lakes in parts of the Hindu-Kush Himalayas out of which, the organization has confirmed 204 glacial lakes as 'likely to burst'. The sudden discharge of a large volume of water with debris would lead to massive floods known as the glacial lake outburst floods (GLOF).

Around 15 GLOFs have been recorded in the Tibet Autonomous Region alone between 1930 and 2002. Debris from nine of those GLOFs entered Nepal and India and caused serious loss of life and assets. For example, on April 9, 2000, a large landslide in the Bomi area in Kham formed a landslide dam on the Yidwong Tsangpo (Chinese: Yigong Zangpo)-a tributary of Yarlung Tsangpo (Brahmaputra).

On June 10, 2000, the dam breached, resulting in flash floods in five downstream districts of Arunachal Pradesh (Eastern India) and left 50,000 people homeless, and damaged more than 20 bridges. The total economic loss was estimated at more than 1 billion Rupees (22.9 million USD). Similarly, Pareechu, a tributary of the Sutlej was blocked by a massive landslide in Tibet, forming an unstable rock fall dam. In the years 2000 and 2005, the Pareechu Lake burst in Tibet, causing heavy destruction of livelihoods, infrastructure, and socio-economic assets downstream, particularly in Kinnaur and Shimla districts of Himachal Pradesh (Northern India). A grandiose diversion project revealed in a book by a retired officer of People's Liberation Army, Li Ling, aims to divert water from the Brahmaputra to the parched areas of northern China. Scientists have confirmed that this project, if implemented, could pose immeasurable challenges to both the environment and human population.

After much denial, Beijing finally disclosed the construction of Zangmu dam on Brahmaputra. A China Daily story in March 2009 acknowledged that the 'Zangmu Water Power Station' is on the main streams of the middle reaches of Brahmaputra. There are more dams planned in this section of the river, and construction has been going on since 2006. The installed capacity of 'Zangmu Water Power Station' will be 510 MW (85 MW x 6 turbines). The project is located in Lhokha (Shannan) Prefecture of Tibet Autonomous Region, about 140 km southeast from Lhasa, between Zangs-Ri (Sangri) and Gya-Tsha (Jiacha) Counties. Huaneng, China's top power company is backing the financing of the project and, Gezhouba, one of China's biggest dam construction companies, will build the project. Such news should be particularly alarming for people living in downstream countries of India and Bangladesh. China is likely to approve more dam projects on the Brahmaputra and its tributaries this year. There is repeated speculation about China planning to

build dam at the Great bend from where the Brahmaputra takes a sharp U-turn, forming the world's deepest gorge, an area reported to have hydropower potential of 38,000 Megawatt.

Chinas' frenzy of dam building can be observed from their record of dam building in the past fifty years. According to the World Commission on Dams, China had only 22 large dams in 1949 and by 2000 the number had increased to 22,000 dams. In 18,000 days China constructed about 20,000 dams and just recently the Chinese government announced that they were going ahead with their plans of building one dam equal to the Three Gorges dam each year for the next 10 years.

On March 5, premier Wen Jiabao presented his "government work report" during China's annual parliamentary session in Beijing, revealing the key goals of the country's 12th Five-Year Plan (FYP 2011-2015). Apart from other grand visions to cut energy and carbon intensity, China also aims to boost the proportion of non-fossil fuels in primary energy consumption to 11.4 per cent. After the Japanese nuclear tragedy and the subsequent freezing of further approvals of nuclear projects in China (at least for few years), this statement is in fact a green signal for the dam construction companies to invest more on the Tibetan rivers and to meet the energy target. World Wildlife Fund (WWF) named the Indus River as one of the ten rivers at risk. The Indus which was already facing an acute shortage of water in its flow due to climate change suffered more obstruction after Beijing built a dam on the dying river without informing the downstream countries-India and Pakistan. Pakistan, where the river mainly flows, has people using its water in far less quantity than the minimum requirement as recommended by the UN for human health and survival.

Infrastructure development in Tibet is of immense significance to India as it would impact Indian security concerns on its Northern and Eastern borders. The 1,142-km Gormo- Lhasa Railway line from Gormo to Lhasa became fully operational in July 2006. The railway line connects and integrates the Tibetan Plateau with the rest of China. The ultimate goal is to extend its railway to neighboring countries, so that they can extend a sphere of influence to south Asia. The line will not only ease the difficulty of supplying garrisons stationed along the frontier but also reduce military expenditure. This certainly poses a threat to the regional security balance. China has unveiled plans for extending Chinese national rail network to the Indian border. The planned railway included a line extending west from Lhasa to Shigatse which is scheduled to complete in 2013. According to Aditya Baral, the Nepalese premier's foreign affairs advisor, China has started to build a rail link between Tibet and Nepal; railway line from to Khasa, a town along the Nepal-China border.

A healthy Tibetan Plateau would not only benefit the entire Asian continent but also it helps in promoting peace and harmony within the region, especially between two major emerging powers (India and China).

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CONSEQUENCES OF CHINA'S POLICIES ON TIBETAN PASTORAL NOMADS

It was mobility that was the very essence of herding. Pastoral nomads in the Old-World Dry Belt, whether in the savannahs of Africa, the steppes of central Asia or the high-altitude pastures of the Qinghai-Tibetan Plateau, have always needed to move their animals regularly to make use of the spatial and temporal patchiness of grassland resources. Nomadism was therefore more than just an ecological adaptation or an adaptation to the political environment. It was a 'region-specific, temporally and spatially ubiquitous survival strategy, an independent socio-ecological mode of culture' which was based on subsistence and coexisted as an alternative to the sedentary cultures of agricultural and urban societies (Fred, 1995).

Nomadism is a strategy to optimize use of available natural resources and capitalise on socio-political conditions. While often ridiculed as primitive or even 'incomplete' by outsiders, it is in fact a highly sophisticated adaptation for exploiting energy captured in the grasslands of the region (R.Merkle, 2000).

The different approaches to grassland management reveal a tension that seems to be grounded in the different rationality of the 'modern' sedentary pastoral production system and the nomadic pastoral production system. Control is a central dividing component, as the nomadic pastoral practices are centred around mobility and flexibility, whereas the current semi-settled production system limits the herders' mobility, and grazing is sought to be better controlled. This diverging rationality seems to be largely causing a situation where the traditional practices are considered as insufficient to conserve and rehabilitate the grasslands. According to the Chinese grassland degradation discourse, the traditional production system is not sufficiently controlling, and it may therefore easily, and it has widely been a central factor in causing overgrazing. In the present situation, herders' level of decision-making in herding and grassland management appears to be decreasing, as the government is directing livestock numbers, pastoral practices, grazing systems, and grasslands are being set aside for rehabilitation (Breivik, *The Political Ecology of Grassland Conservation in Qinghai Province, China: Discourse, policies and the Herders*, 2007).

For centuries, the Tibetan pastoral nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasturelands and autumn to spring pasturelands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The Plateau itself is covered in almost 70 per cent of these precious grasslands (Badingquiyang, 2018). The pasturelands are made habitable through the co-existence of the herders and their livestock. Through their efforts they have maintained the sustainable use of

this area for many centuries. China's introduction of different policies over the years have not only punished these pastoral nomads and the herders but also threatened the sustainability of this delicate environmental balance. During the commune system (Columbia University), in the name of "democratic reform", the nomads were herded into communes, stripped of all possessions, reshaped into production brigades, and given rations according to their work points. No production meant no rations. From the outset, the new class of cadres in command saw the nomads not as stewards and curators of the landscape, but as ignorant, backward and irrational, utterly lacking in enthusiasm for class warfare. At the same time, under the commands of the new cadres, the herd size steadily grew to an unsustainable level and the chain of grassland degradation began.

Twenty years later, in the late 1970s, the communes collapsed, having failed except for one achievement: the number of animals, in all Chinese official statistics, had climbed steadily every year, to record levels: 30 million sheep and goats, six million yaks. In the early 1980s nomads were given their animals back, but not their land. As soon as they regained some control over their lives, they cut the number of sheep back to more sustainable levels.

Household Contract Responsibility System (HCRS) (Ptackova, 2011) or the Grassland law (CHINA.ORG.CN, 1985) was adopted in the year 1985. This law was adopted in order to protect the degrading grasslands and to modernize the animal husbandry. Some researchers argue that this law has been implemented in order to gain more control over the pastures and to stop the over-exploitation of the grasslands, which the government appears to consider the most important cause for grassland degradation. Long after the Chinese farmers had been given such guarantees of their land (land lease certificates) the nomads were at last (in the 1990s) given certificated guarantees of long-term leasehold to their land (30 to 50 years). This encouraged conservation of pastures, giving nomads a sense of ownership.

Along with the implementation of the grassland law, the state authority gradually implemented the so-called "Four-Way Programme" or 'Si Pei Tao', ordering region-wide fencing regimes and shelters for nomads and livestock (Breivik, 2007). According to the Animal Husbandry Bureau (one of the four actors of the programme) stated that this programme was meant to improve people's lives, and control livestock and grazing. On the ground, this program limited the mobility of the livestock and encouraged the herders to invest and spend more time in winter pastures leading to increased grazing pressure on a smaller land area. Thus, the Four Way Programme at some point intensified or at least in part, responsible for the problems for which the herders are now being blamed. But at the same time, other policies, driven by China's long-standing disdain for mobile people,

were also implemented. Limits on family size and herd size were gradually made compulsory. Gone was the annual cycle overwintering in lower plateau pastures and herding up into the alpine meadows in summer. Mobility was crucial, moving on before grazing pressure destroys plants, exposing the dying turf to the icy gales and blizzards of Tibet which can strip soil, leaving only bare rock. Nomadic knowledge of how, when and where to graze, and the nomadic willingness to live in portable woven yak hair tents, summer and winter, with their animals, kept the pasture free of invasive toxic weeds, erosion, shrub invasion, and infestations of pests. None of this was known in the 1980s, except to the nomads themselves, and no-one asked them how they dealt with the risks of living at the third pole. It is only in the 21st century that Chinese and global science have caught up with what the nomads have always known (Gabriel Laffite 2010).

In 1990s, even after implementing series of policies and measures, nothing much changed, and it became obvious that everything on the grasslands was going wrong. The living turf was dying, eroding and slumping, only to be torn away in wild weather, back to bare rock or ‘black beach’ as Chinese scientists called it. Burrowing rodent populations exploded, in plague proportions. Toxic invasive weeds multiplied. The rangelands were degrading, including the arid area of eastern Tibet where both of China’s great rivers, the Yangtze and Yellow, rise from glacier melt. Chinese scientists and administrators turned to just one explanation. The nomads were to blame. They were overstocking, beyond the carrying capacity of the pastures, and this was the cause of degradation. The compulsory overstocking during the commune system could not be discussed; it was and is off-limits. So only one cause was possible: to blame the nomads. But some recent research revealed that overgrazing and degradation of the grasslands is not entirely dependent on the grazing livestock. The herders even talked about weather changes, rodents and mining activities as important factors causing grassland changes.

In 2003, a grassland rehabilitation policy is implemented throughout the country and in pastoral areas this policy is referred to as the ‘Restore Grassland Policy’ or ‘tuimu huanco’ in Chinese, meaning “closing pasture to restore grasslands” (Yeh, 2010). In recent years, moving herders from the grasslands to state build housings is being largely intensified and has now become the central measure in protecting these grasslands. The land lease certificates guaranteeing nomads long term land tenure have been nullified by the new command. Instantly, all their skills, risk management strategies, environmental services, traditional knowledge and biodiversity conservation are gone, redundant, as if they had never existed.

For decades, the policies such as de-stocking and rodent poisoning were carried out that goes strictly against the religious sentiments of the herders. For instance,

it was made compulsory that one person from each family should join in the drive to poison the rodents (Tibetan pika) (Hogan, 2010). Over the past 40 years, the Chinese government has sponsored the systematic poisoning of pikas, most recently using grain laced with Botulin C strain toxin (*Clostridium botulinum*). Approximately 320,000 square kilometres were poisoned. However, some past and recent researchers have argued that these rodents are the keystone species of the grasslands and that large-scale killing of rodents may even be harmful for the grasslands and is almost certain to affect other wildlife and the broader environment.

Under the “new countryside” programme launched in 2006, the local Chinese government of Tibet Autonomous Region (TAR) had moved a total of about 300,000 families involving 1.43 million Tibetan nomads and farmers into new or fixed settlement homes. Another 185,500 families are expected to move into new homes by 2013. This new policy, ‘tuimu huancao’ like most simple ideas, it is overly simple (Yeh, 2010). It assumes the only way to conserve China’s upper watersheds is to remove animals and nomads. Yet China’s own scientists have now learned, through patient observation, that the grasslands of Tibet, when grazed moderately and intermittently, moving herds on well before the short summer growing season ends, actually maintains a higher biodiversity than on ungrazed pastures, where toxic weeds invade and biodiversity declines. It took Chinese scientists 50 years to discover what the nomads have always known, and Chinese policy remains far behind the latest scientific knowledge. Now climate change has arrived, explaining everything. No longer need China fear its past policy failures as the cause of degradation of Tibetan rangelands. Climate change explains all, especially in Tibet, where climate change is happening faster than in most parts of the planet. But the most immediate impact of climate change is the exclusion of nomads from their lands, labelling them officially as “ecological migrants”.

The compulsory “ecological migration” of the Tibetan nomads is grounded in ignorance, prejudice, a failure to listen and learn. China is far from alone in assuming its nomads are backward, and to blame for degrading land. But around the world, governments increasingly recognize that pastoral nomadic mobility holds the key to sustainability on the dry lands of the world. There are other solutions to the problems of degradation of Tibetan lands. Tuimu huacao, closing pastures to convert them to grassland, is not the only way. Nor is it helpful to assert climate change as the catch-all cause of all problems. UN Special Rapporteur on the Right to Food Mr. Olivier De Schutter has mentioned in his Preliminary Observations and concluding statement during his mission to PRC (15-23 December 2010) that, the herders should not, as a result of the measures adopted under the tuimu huancao policy, be put in a situation where they have no other options than to sell their herd and resettle (Schutter, 2010).

Grassland policies and consequences for herders in Yushu Prefecture (Breivik, 2007)

| Policies | Consequences |
|--------------------|--|
| Four Way Programme | Change of pastoral production system and changes in livelihoods. Discontent due to implementation process. Unintended consequences e.g, conflict, less co-operation among neighbour. More troublesome to change pastures. |
| De-stocking | Difficulties for herders' socio-economic situation. Structures affecting women negatively. Forcing herders to act in a way contrary to their religious beliefs' |
| Relocation | Urbanization causing unemployment and social problems. Insecurity among herders. Hindering local wildlife protection work |
| Rodent control | Forcing herders to act in a way contrary to their religious beliefs' |

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WHITE PAPER RESPONSE

Tibetans have sustained a harmonious balance between human beings and the natural environment. Such beliefs objectively contributed to the protection of the natural environment and ecological balance. In Tibetan history, protection of the environment was achieved by means of traditional customs, moral obligations, religious beliefs, and taboos. These unwritten routines of environmental protection were used to regulate people's behavior through conscious effort, social beliefs, and state policies. A well-known example of state policy regarding wildlife conservation was the "Mountain Valley Edict" (ri-lung tsatsik). This edict was issued by the government every year after the New Year/Monlam celebrations in Lhasa, and copies of it were distributed to every district throughout Tibet (Norbu, 2009).

In recent years, frequent changes in the size or land use of the protected areas (ecological conservation areas, national forest parks, geological parks, state-class scenic area and the nature reserves) are seen to make way for local economic development projects (Jian Peng, 2010). As for the nature reserves, the operating costs are paid by provincial or county governments making it one of the lowest ranking priorities as compared to the costs of education and health (MELICK, 2007). It was also seen that, under the current arrangements of nature reserve protection, the concerned staff takes their orders from local government rather than acting on behalf of the nation, making the reserves vulnerable for the encroachers to redraw the boundaries, or change the way the land is used. The local regulations and administrative rules as per published by the people's congress has to be implemented regardless of the offenders, whether it be an army officer shooting wildlife or a mining industry polluting water resources. Within the past two years, the international community has seen how ineffective these regulations are in practical terms. Especially in the case of mining industries, when the local residents of: [Wu Yug Sogchen of Namling district in Shigatse (Central Tibet) in May 2010 and Payul County, Kham (Eastern Tibet) in August 2010] raised their voices against these miners of polluting their water sources and grazing areas. Such incidents could be avoided should the regulations be effectively in order and operationally in place.

The latest report, 'The State of the Environment of China' citing about the clean air and water in Tibet is just another propaganda document circulated to win the hearts of the local residents and to draw in more investors (Ministry of Environmental Protection of the People's Republic of China, 2011). Some researchers have documented an elevated concentration of Pb, Zn, Mn, and Al in the surface water and streambed at the upper/middle part of the Gyama valley

due to mining activities (Huang X, 2010). The researchers have further mentioned of a great potential threat to the downstream water users due to the high content of heavy metals in the stream sediments as well as in a number of tailings with gangue and material from the ore processing sites. The recent case of polluted water entering the water supply system in Kumbum (Amdo) clearly shows how effective these regulations are when it comes to implementing them (See annex 1 for more details).

The increase in the state grant towards ecological and environmental protection is a positive note and might reflect the states (false) concerns to a commoner, but if we ponder a little, it clearly tells us how much the state has spent/willing to spend in restoring the natural habitat and environment that have been destroyed (within the span of five years 10th-11th five-year plan) in the name of economic development.

Today, monks from the Kumbum monastery and the local residents have filed a petition to the Chinese Central Political Office and other concerned authorities regarding the rampant mining of holy passes/mountains within the area. They also requested in their petition to stop the indiscriminate activities on the upstream rivers without any botheration for life and death of the downstream villagers, who depend solely on those rivers. The monks have also requested in their petition to cease the policy of economic development (exploitation of natural resources) at the cost of communal unrest and social welfare of local residents.

According to another information posted on the same website, on the 13 June 2011, the monks have also submitted their grievance to Mr. Wang Jiao En (a senior minister at the Chinese Central Ministry for Religious Affairs) when he and 20 other ministry staff visited the Kumbum monastery.

Though conservation policy is centered in the establishment of protected areas, traditional Tibetan culture already contains a conscious awareness of environmental protection. In Tibetan history, protection of the environment was achieved by means of traditional customs, moral obligations, religious beliefs, and taboos. These unwritten routines of environmental protection were used to regulate people's behavior through conscious effort, social beliefs, and state policies. A well-known example of state policy regarding wildlife conservation was the "Mountain Valley Edict" (ri-lung tsatsik). This edict was issued by the government every year after the New Year/Monlam celebrations in Lhasa, and copies of it were distributed to every district throughout Tibet. Buddhism like other faiths proposed that human beings were an integral part of the same system as other animals. Buddhists abided by the teachings from generation to generation, which prohibited killing and advocated protection of forests and living creatures. Tibetans have always lived with nature

and because of the low population density; Tibetans have sustained a harmonious balance between human beings and the natural environment. Such beliefs objectively contributed to the protection of the natural environment and ecological balance.

The natural environment has long been influenced by humans so environmental policy must address the needs of local people as well as conservation goals. Current conservation policy in China is hampered by unclear and fragmented policy regarding protected areas, lack of funding, and exclusion of local culture and knowledge in policy making decision.

Protected areas are funded by a variety of mechanisms. National reserves are funded by national ministries for infrastructure construction while provincial reserves receive funding more infrequently because they are only allocated small amounts for specific projects. Meanwhile, all reserves' operating costs are paid by provincial or county governments who usually must balance costs of education, health and other priorities with biodiversity conservation, making it often one of the lowest priorities. Due to the funding problem, Central and provincial governments encourage local governments to give priority to economic growth that rarely benefit local people rather than to sustainability and this prioritization has led to protected areas failing to meet conservation goals leads to environmental degradation (Peng et al. 2006, Xu, Jianchu, et.al, 2007).

A well-known example of this phenomenon is the dramatic environmental collapse in Maduo County (Qinghai Province) and its portion of the Three-River Headwaters (Sanjiangyuan) Nature Reserve, at the confluence of the Yellow, Changjiang, and Qiantangjiang Rivers. Prior to 1970, environmental conditions in this Tibetan county were regarded as excellent, with over 4,000 lakes and rich grasslands. In the 1980s, Maduo accrued wealth quickly through destructive gold mining and achieved the highest per capita income among all of China's animal-husbandry counties (Ren & Wang, 2004). By 2004, however, 90% of its lakes had dried up, in part due to overgrazing. This resulted in economic decline and Maduo becoming one of China's ten poorest counties, despite the fact that the county became part of the Three- River Headwaters (Sanjiangyuan) Nature Reserve in 2001. By 2007, most of the population had migrated out of the region as the area became increasingly unsuitable for human habitation due to ecological collapse (Wang, X. 2006).

Most of the nature reserves that are already established on the Tibetan Plateau are not well managed because, quite often, little is invested in facility construction and management and the workers are poorly trained. In Tibet, the lack of well-trained staff and the necessary framework to support them is a pressing issue. Handful of officials and staff that are in charge of conservation, few have received

adequate training and lack the basic knowledge to effectively carry out conservation work. Further, often staff allocated to remote nature reserves lives with poor working conditions and low pay, with very few opportunities to enrich themselves because of the remote location. As a result, conservation goals become even harder to meet. For an understaffed reserve, or a reserve with inadequately trained staff, poaching can be difficult to control, such as killing Tibetan antelopes in the Hoh Xil nature reserve. Tibetans are keenly aware that wildlife is not as abundant as it was one or two generations ago, largely due to indiscriminate hunting and poaching by non-Tibetans and are keen to help implement China's wildlife protection laws. This was vividly shown in the prize-winning movie *Kekekxili: Mountain Patrol*, in which underpaid and under resourced Tibetan rangers took extraordinary risks to protect endangered antelope from slaughter by non-Tibetan poachers, putting their lives on the line.

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Annex 1: Monks and local residents of Kumbum filed a petition for environmental safety. Kumbum, June 30, 2011:

Background: Over the past six years, within the vicinity of the Kumbum monastery, the local authorities have constructed an ore processing plant and many other mining facilities. Due to the excessive mining and resource extraction from the Lhamo Rhi, (a sacred mountain near the Kumbum monastery), the whole area has been spoiled, polluting the water source and turning it into a barren land. It was also reported that due to this mining activities, over the past six years more than one hundred Children's have died due to lead poisoning in the drinking water. The local residents

filed numerous complaints and other initiatives to alert the miners, even the Kumbum monastery have filed a petition against these irresponsible miners but all in vain.

According to the information posted on the website, despite the numerous petitions and complaints, the environmental situation near the Kumbum monastery has gone worse over the years. These days, the polluted water has entered the water supply system of the Kumbum monastery and eight neighboring towns. As a result, many people are hospitalized consuming this contaminated water. On the 22 June (Wednesday), monks from Kumbum monastery collected few water samples from the local water supply system and handed over the water samples to the local environmental office to check its quality. After one week, on the 29 of June, the monks were simply informed that this water is not safe for human consumption and is harmful, however they were not told about how deadly the cocktail was in terms of Chemicals, heavy metals and other pollutants.

*The Report was prepared by Environment & Development Desk, DIIR, CTA, as a response to the White Paper released by PRC on 11 July 2011.



CLIMATE CHANGE IN TIBET AND ASIA

The Significance of the Tibetan Plateau

Tibet referred to as ‘The Third Pole’ and ‘The Water Tower of Asia’ reflects the significance of its snowcapped mountains and its alpine grasslands. Since time immemorial, the plateau holds the Hindu Kush Himalayan Ice Sheet, considered as the largest ice mass outside the two poles. Its plateau contains more than 45,000 glaciers covering an area of 105,000 km². Encompassing an area of about 2.5 million square kilometers, or about one-third the area of the continental United States, the Tibetan Plateau is the largest and highest region on Earth. With an average elevation of 4,500 meters above sea level, the Tibetan Plateau stretches for almost 3,000 kilometers from west to east and 1,500 kilometers from south to north. The Plateau is ringed by high mountains—the Himalayas to the south, the Karakorum in the west and the Kunlun across the north. One can just learn by looking at its map to figure out how the Tibetan Plateau dominates the geography of Asia (D.J. Miller, 2009).

Glaciers and Rivers

Glacial runoff from these regions feed the largest rivers in Asia, including Yarlung Tsangpo (Brahmaputra), Driчу (Yangtze), Machu (Yellow), Zachu (Mekong), Macha Khabab (Ganges) and Sengye Khabab (Indus River) and more. Referred to as ‘The Water Tower of Asia’, the Tibetan Plateau is the head region to major rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Burma and Vietnam. For China alone, 30 percent of its fresh water supply is met from the rivers flowing from Tibet. For many generations, this Plateau has met the basic necessities to sustain life and flourish human civilizations beyond its vast border. From the arid plains of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonlesap lake of Cambodia to the North China plain, these rivers bring life and joy to millions of peoples (EDD, 2009).

There is little doubt that melting glaciers of the Tibetan Plateau provide a key source of water in the summer months; as much as 70 percent of the summer flow in the Ganges and 30–50 percent of the flow in other major rivers. The glacier-fed rivers originating from the Tibetan Plateau make up the largest river run-off from any single location in the world. Perhaps the most critical region in which the melting glaciers will negatively affect water supply (in the next few decades) will be China and parts of Asia, including India and Bangladesh.

Zachu or Mekong River, originating from Mount Thangla is the bloodline for the Mekong-region countries. This river flows from central Tibet through Yunnan Province in China and then flows through Laos, Thailand, Cambodia and finally ending its journey in Vietnam. This river directly supports approximately 70 million common people along its basin from fisherman to farmers.

Permafrost layers as carbon store

The presence or absence of the permafrost layer entails major variations in the soil's physical structure, determining, to a large extent, the hydrological and nutritional status of the soil, which in turn, is pivotal in determining the vegetative coverage, plant community structure and productivity. Unlike the ones that are widespread in the Arctic and boreal regions of Northern Hemisphere, the permafrost prevailing on the Tibetan Plateau (1.3 to 1.6 million km²) are alpine permafrost. This type of permafrost are featured by warm permafrost and rich ground ice and are among the most sensitive to climate change and are particularly vulnerable to warming temperature. The alpine permafrost on Tibetan Plateau stores about 12,300 Million tonnes of Carbon. A study conducted at the source region of the Yellow River indicated that a significant amount of methane is trapped in the permafrost layer of that region (EDD, 2009).

Alpine Grasslands and Meadows as carbon sink

Tibet's rangeland (Tib: Jhangthang), from the Northern Plateau of upper Tibet to the extreme eastern edge of the plateau, with an average altitude of 4,000 to 5,000 meters, covers approximately 70 percent of the total area of the Tibet's area. The types of rangeland vary from alpine meadows and mountain scrub to mountain sparse wood and mountain desert, which helps sustain domestic herds and nurture a wide variety of wildlife species. These rangelands and its cold alpine grassland soils are the major carbon sink and house a greater organic carbon pool. During the growing season, the alpine meadows appears to absorb 'or' take up CO₂ at the rate of (1840 – 3050) mg/m²/day. Studies showed that total Soil Organic Carbon storage (sampled from the top 1 meter soil) in the alpine grasslands of TP was estimated about 7,400 Million tonnes of Carbon. For many generations, pastoralism on these rangelands has been the best and the only option to live successfully. Over time, Tibetan pastoral nomads has skillfully introduced domestic herds and maintained an extraordinary biodiversity of grasses and sedges, enabling human life to flourish on the Third Pole.

Wetlands and wetland areas as carbon sequesters

Statistics of the natural wetlands (excluding lakes and floodplains) area by geographic regions in China revealed that Tibetan Highland holds over 51 percent

of total natural wetlands. These wetlands are dominated by Salt Marsh, Peat land and Freshwater Marsh. These wetlands tend to trap carbon-rich sediments from watershed sources. The Wetlands in Tibet play a major role in regulating the flow of rivers and also are the major carbon stores. They act like sponge, absorbing water during the summer when the water is in excess and releasing it in the winter when the runoff is short.

Climate Change impacts in Tibet and Asia

Critical components to Tibet's ecosystem are undergoing major transformations due to climate change. For instance, it has led to the receding of Tibet's glaciers, shrinking and disappearance of thousands of lakes, drying of wetlands, thawing of permafrost, and reduced flow regimes in many rivers. Abnormal weather conditions due to climate change such as non-sequential rainfall, delayed in milking season, reduced growth of calf, etc., has made subsistence farming and herding more unpredictable, thus impacting the livelihoods of a majority of Tibetans. These days, on the plateau, the spring thawing is earlier and the permafrost is melting away before the growing plants can access the water. This affects not only the crops but also the native vegetation of Tibet, especially in wetlands and other low lying areas. The loss of wetland in turn threatens the migratory birds used to Tibetan stopovers (EDD, 2009).

Julia Klein (Klein, Harte, & Zhao, 2007), mentioned in her studies that 'climate warming is an unusual environmental problem since the primary greenhouse gas emitters driving these changes can be far removed (due to the large spatial disconnect between drivers and recipients) from the most vulnerable recipients of the climate change effects'. This rise in temperature also leads to increase in the rate of evapo-transpiration from the rivers and watershed areas intensifying the desertification process. According to Immerzeel (Immerzeel, Stoorvogel, & Antle, 2008), 'Eco-payment' for the Tibetan farmers could become a viable solution in order to protect the downstream areas from possible water crisis. At present, the plateau is undergoing a multi-facet environmental degradation; the melting of glaciers, non-sequential thawing of permafrost, drying up of wetlands and vast desertification of grasslands leading to the failure to assimilate atmospheric carbon. These carbon pool would soon disintegrate in due time, resulting in further emissions of greenhouse gases and the vicious cycle continues further. The immediate recipients of the climate change impacts are those herders and farmers who did nothing to cause climate change. Chinese National Climate Change Assessment Report (2007) revealed that China's average annual temperature could increase between 1.3-2.1 degrees by 2020 and as much as 3.3 degrees by 2050. It is predicted that precipitation in three of the seven major rivers will drop by 30 percent in the second half of the century leading to a 37 percent decline in wheat, rice, and corn yields. Major cities in coastal areas will face serious challenges due to rising sea levels, and extreme weather patterns are likely to increase.

Glacial meltdown & permafrost degradation

According to Jane Qiu (Qiu, 2008), 82 percent of the Tibetan Glaciers have already retreated in the past half century. In the past 40 years, Tibet's glaciers have shrunk by 6,600 sq km (as of year 2006). It is estimated that they are currently melting at a rate of 7 percent per year. A separate study by a NASA scientist (2010) revealed that 20 percent of Tibetan glaciers have retreated in the past 40 years and if the current trend continues, more than 60 percent of the existing glaciers could be gone in the next 40 years.

The formation of glacial lakes as a result of the rapid melting of glaciers on the higher reaches of the mountain ranges continues to pose a serious threat to downstream countries, especially Nepal and Bhutan. International Centre for Integrated Mountain Development (ICIMOD) has identified some 8,790 glacial lakes in parts of the Hindu-Kush Himalayas out of which, the organization has confirmed 204 glacial lakes as 'likely to burst'. Greenpeace reported that Imja glacier in Nepal is retreating at nearly 10 meters per year. Other reports show that the average temperature in Nepal has increased by 1.5 Celsius since 1975. Scientists from Nepal's ICIMOD said the lake is growing by just under 50 meters per year and is in danger of bursting its banks—a 31 meter-high dam of rocks and stones—and flooding nearby villages and trekking routes. They predicted that more than 7,500 people would be affected by the floods, including tourists hiking along the popular Everest Base Camp route. A recent BBC news report mentioned that the ethnic community residing in Nepal's western province (Halji village) is threatened by a glacial lake on the mountain overlooking their village.

Studies have also shown that glacial melting and thawing of permafrost in the Tibetan Plateau will lead to a large scale release of greenhouse gases in the atmosphere and bringing further changes in the already warming climate. The permafrost layers and the seasonally frozen soils on the Tibetan Plateau are well preserved over a long time by low winter air temperatures. Its seasonal thawing and refreezing have also played a vital role in balancing the delicate alpine vegetation, until now. With the significant increase in the mean cold season average temperature, the permafrost layers and seasonally frozen grounds are slowly degrading leading to increased microbial decomposition of previously frozen organic carbon. Slope failures are often seen on the Tibetan Plateau due to permafrost degradation. Permafrost degradation has changed the regime of water retention and regulation by producing more runoff in areas of permafrost, leading to more evaporation. It has also prolonged the thawing period significantly leading to many interconnected ecological changes and technological worries. Locally, this degradation would result in the gradual desertification of grasslands, resulting to higher surface albedo and increased ground temperature.

Human interference is also largely responsible for the degradation of permafrost layer on the Tibetan Plateau. In a recent study (Jin, Yu, Wang, & Lü, 2007), researcher have found along the Siling Lhasa Highway (SLH) corridor that the heat accumulation under the asphalt road bases resulted in increased thaw depths too great to be frozen and, consequently, resulting in the transformation of vertically connected permafrost into disconnected phase. They indicated that the ground temperature at the shallow depths in transition and quasi-stable permafrost zone have been increasing noticeably, as a result leading to the shrinkage of permafrost boundaries. Some other researchers have pointed out that approximately 30 percent of the SLH has to be repaired every year due to damage cause by frost action. Recent studies showed that permafrost thawing in many regions of TP is influencing both hydrological regimes and vegetation, as well as engineered structures. Such thawing of permafrost leads to the formation of thaw slumps, slope failure and in the process will inject lots of trapped carbons in the atmosphere. The condition of permafrost degradation in some areas of the Tibetan Plateau was such that the active layers were oversaturated by water either from glacial runoff or rainfall during the thawing season.

Influence on Asian monsoon pattern

The plateau's seasonal heating during summer and spring plays a principal role in determining the large-scale air circulation in summer. Heating over the Tibetan Plateau tends to generate a surface cyclonic circulation and upper-atmosphere anti-cyclonic circulation which results in the appearance of a large air motion in the eastern side of the plateau. As long ago as 1884, An English meteorologist working in India had the inspired idea that the snows of Tibet and the Indian monsoon are causally connected. Henry Francis Blanford, in the pages of Proceedings of the Royal Society, in London, proposed that the greater the snow cover in the land of snows, the later the Indian monsoon wets the parched earth on India. Conversely, he suggested, the less the winter snows in Tibet, the earlier the snowmelt, and the earlier the monsoon. During summer, the Tibetan Plateau intensifies the pressure gradient between the south Asian landmass and the Indian Ocean leading to the flow of air and moisture from the sea (EDD, 2009).

According to many scientist and researchers the ground freezing and thawing of the Tibetan Plateau have a significant influence on the atmospheric circulation. The rise in the soil moisture content (due to active layer thawing) increases the level of heat exchange between the atmosphere and ground surface. For instance, the onset of summer precipitation in Southern China and in the middle and lower basin of the Driчу (Yangtze River) are influenced by the spring thaw timing over the Tibetan Plateau. In consistent to that, the significance of spring snow depth

over the Tibetan Plateau correlates with the amount of summer precipitation on the middle and lower basins of Driчу.

Shrinking lakes and wetlands

There used to be thousands of lakes in Tibet. Most of these lakes have no outlet, and depends entirely on local streams and underground sources to maintain their water level. These lake levels are mainly controlled by the warming climate and human activities. Already a large number of these lakes in Tibet have disappeared. As per Xinhua News Agency, wetlands on the Tibetan plateau have shrunk more than 10 percent the last four decades, with wetlands at the Yangtze's origin contracting an alarming 29 percent. The wetlands on the Tibetan Plateau are shrinking and drying resulting in the subsequent release of carbon dioxide, methane and nitrogen dioxide. As such, this further adds up to the yearly greenhouse gas emission. Methane emission from the wetlands during the thaw season were estimated to be (0.7– 1.05) Million tonnes per year and the annual NO₂ emission from the wetlands of Tibetan Plateau are estimated at 0.022 – 0.025 Million tonnes. Adding up the total GHG emission of CO₂ (316.02 g CO₂/m²), CH₄ and NO₂ from Tibetan Plateau wetlands in a year (irrespective of their atmospheric stability and in terms of CO₂ GWP), it sums up to 68 Million tonnes of CO₂.

Loss of carbon sinks from degraded grasslands, Endangering Pastoralism

Pastoralism on the Tibetan Plateau is an 'adaptation to a cold environment at elevations above the limit of cultivation'. For centuries, the Tibetan nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The Plateau itself is covered in almost 70 percent of these precious grasslands. The pasture lands are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts they have maintained the sustainable use of this area for many centuries. China's introduction of different grassland policies over the years threatened the sustainability of this delicate environmental balance. The new policies restricts the flexibility and mobility of the nomads (which is the main ingredient in the nomadic pastoral production) and blames their livestock for overgrazing the grasslands (EDD, 2009).

These days, many researchers and rangeland specialist are arguing the applicability of these new policies, and how much these have actually benefited or affected. Recent scientific findings (Julia et al, 2007; Lovell and Ward, 2009) give us more insight information about the regeneration of the grasslands and the vital role of grazers in replenishing the grasslands. In their studies, they revealed that grazing actually

helps in regenerating the grasslands by improving the soil Carbon/Nitrogen ratio and prolonging/extending the growing season. Even some Chinese researchers have blamed the degradation of these grasslands on many factors such as permafrost degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc.) and climate warming.

Water availability and management

The International Centre for Integrated Mountain Development (ICIMOD) has revealed alarming details on the sustainability of the Himalayan ecology. According to their findings, the current trend of melting glaciers suggests that the Ganges, Indus, Brahmaputra and other rivers across the northern India plains could most likely become seasonal rivers in the near future. The tension on water availability is further raised by the rate at which the PRC is commissioning damming projects on those rivers that flows from Tibet. The Chinese dam building frenzy is creating huge discussions on whether these dams could be an initial step in enhancing its ambitious water transfer projects. Some experts believe that the current railway network linking Beijing and Lhasa would further enhance the needful transportation of technical staff and inventories to initiate this water diversion project.

After many years of denial, the Chinese side finally accepted in building a HPP (Hydropower Plant; 510 megawatts) on the upper reaches of Yarlung Tsangpo at dZam (Ch: Zangmu), at Lhoka prefecture in Tibet. No doubt, the PRC was quick in responding that the current HPP is a run-of-the-river project. But that too requires some storing of water to fill the reservoir. But that is not the end, six more dams are on the drawing board along the Yarlung Tsangpo and no clear information is flowing out of Tibet as to how and when they will initiate the other projects. According to a report published by IDSA (2010), water demand in India will grow to almost 1.5 trillion m³ by 2030, principally driven by population growth and the domestic need for agriculture. And with no proportional increase in water availability and an ever increasing demand, a water crisis is imminent. Water-being international, indispensable, and emotional can serve as a cornerstone for confidence building and a potential entry point for peace. China has built over 87,000 hydro dams, more than any other country in the world. Besides performing various functions, the issue of dam safety has always been treated as a sensitive subject. Now, incidents at a number of dams and reservoirs have cast doubt on the quality of these projects, but they are rarely reported to the general public (Lu and Shen, 2011).

Zhang Boting, vice secretary of the China Society for Hydropower Engineering, told reporters that the 12th Five Year Plan called for hydropower development to be prioritized. For various reasons, two thirds of the hydropower projects detailed

in the 11th Five Year Plan had not been completed and would be revived in the 12th Five Year Plan (China Tibet news, 2011).

Box 1. Hydropower development on the Tibetan Plateau

[Behind the scenes, preparations for hydropower development on the Yarlung Tsangpo (Brahmaputra) have been constant. In a recent media interview, Zhi Xiaoqian, head of the Chengdu Surveying Institute, said that plans had been drawn up for all of Tibet's major rivers, including the middle reaches of the Yarlung Tsangpo. But a lack of clear policy direction has meant approval for those plans has been slow and the projects have not commenced. "Now the time and conditions are ripe. China's energy supply is becoming ever more pressured, and there's an urgent need to develop the rich hydropower resources of Tibet," Zhi said. Currently less than 0.6% of Tibet's hydropower resources have been developed. In comparison with the rest of China, this is virgin territory...]

[Several key power stations will be built in the Drichu (Yangtse), Zachu (Mekong), Gyalmo Ngulchu (Salween) during the period covered by the 12th Five-year Plan, with an overall installed capacity of more than 5,000 megawatts as the eventual goal. Moreover, additional objectives include enhancement of the operational capacity to more than 5,000 megawatts and a planned installed capacity of more than 10,000 megawatts by the end of 13th Five-year Plan. The goal of this project is to create an energy production base for the West-to-East Electricity Transmission Program. Further efforts will be made to expand electricity transmission capacity to more than 2,000 megawatts by 2020, 5,000-10,000 megawatts by 2025, and 18,000 megawatts with an overall installed capacity of 10,000 megawatts by 2030...]

Source: Chinadialogue.net

On March 5, premier Wen Jiabao presented his "government work report" during China's annual parliamentary session in Beijing, revealing the key goals of the country's 12th Five Year Plan (2011-2015). Apart from other grand visions to cut energy and carbon intensity, China also aims to boost the proportion of non-fossil fuels in primary energy consumption to 11.4 per cent. After the Japanese nuclear tragedy and the subsequent freezing of further approvals of nuclear projects in China (at least for few years), this statement is in fact a green signal for the dam construction companies to invest more on the Tibetan rivers and to meet its energy target (please refer to Box1. for more information).

Meng Si, the managing editor of Chinadialogue's Beijing office mentioned that, Chinese Environmental NGOs believes that hydropower projects could bring economic development, but not necessarily to the benefit of local people. They believe that today's insufficiently transparent policymaking mechanisms are maximizing the interests of hydropower industry, officials and a small number

of experts, while driving ecological destruction, affecting local livelihoods and increasing the risk of geological disasters. The damming activities along the upstream of Zachu/Mekong have significantly affected the flow volume of the river. So far, the PRC has in total 21 HPP either built, under construction, under active consideration in Tibet alone (Tashi, 2011). The users downstream are turning their frustration on the Chinese government whose damming projects on the upstream Mekong River has greatly affected their lifestyles. The livelihoods of the local fishermen and many other communities from Cambodia are threatened by the reduced flow of the river but their concerned voices are blanketed by the aids their government receives from PRC.

For China, Tibet's rivers are proving as rich resources for hydroelectric and geo-political power as its mineral wealth. But frenzied dam construction projected until 2020 means that a prehistoric irrigation system that dates back 30 to 40 million years is coming to an end (Huffington Post, August 2011). Growing industrialization, population growth, and increasing levels of consumption are placing heavy demands on water resources, which provide vital support for the subsistence livelihoods of millions of people. According to a report by the International Water Management Institute "the capacity of India and China to efficiently manage water resources, especially on a regional basis, is likely to be one of the key determinants of future global food security (Morton, 2008).

Conclusion & Recommendations

The Tibetan Plateau is the land bridge connecting South Asia with East Asia. If India maintains its habitual stance of viewing events in Tibet as if in some far place, it will fail to engage with the rapid changes outlined above, all of which directly impact on India and its long term sustainability. As Jane Qiu quoted an excerpt in her article from Veerabhadran Ramanathan (an atmospheric scientist), "Our understanding of global climate change would be incomplete without taking into consideration what's happening to the Tibetan plateau".

The very survival of almost 2 billion people depends on the water resources originating from the Tibetan Plateau. The impact on Tibet's landscape and its natural resources due to climate warming will threaten not only the future food security of many nations but also its developments. If Tibet's grasslands are maintained and improved, through a combination of nomadic work and state/donor finance, they will form a part of the solution to a global problem. This is a far better alternative than excluding nomads, and will enable grasslands to recapture carbon while also sustaining human livelihoods.

India can and should take a proactive role in mitigating the environmental impacts of China's development policies in Tibet, so as to preserve the amenity and environmental services which Tibet provides to India. While India has shown proper concern for the downstream impacts of dams on the river systems shared by both China and India, we need to recognize China now has plans for radical change which will impact well beyond security of water supply. Much effort is needed on the ground in Tibet to restore wetlands, adapt farm and pastureland, and preserve forests before the impacts of climate change makes it more difficult to save ecosystems. Through state and people working together, desertification may also be reversed. The fate of future developments and social security of the lower riparian countries relies on how well the resources are managed in TIBET.

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*The Report was prepared by Tenzin Norbu, Environment & Development Desk, DIIR, CTA, for the 'Tibet in the Aftermath of Devolution of Political Authority' seminar held at Vivekananda International Foundation (VIF), Delhi, on September 6-7, 2011.



THE SIGNIFICANCE OF THE TIBETAN PLATEAU

Abstract: A glance at a map shows how the Tibetan Plateau dominates the geography of Asia. With an average elevation of 4,500 meters above sea level, (Chin.org.cn, 2007) the Tibetan Plateau stretches for almost 3,000 kilometers from west to east and 1,500 kilometers from south to north. Since time immemorial, the plateau holds the Hindu Kush Himalayan Ice Sheet, considered as the largest ice mass outside the poles. The current trend of glacial melting and permafrost degradation on the Tibetan Plateau would threaten the flow of mighty rivers that feed billions of people downstream. Geographically, the Tibetan Plateau has a vast expanse of Permafrost (approximately 1.3-1.6 Million sq. km) and seasonally frozen grounds (Qingbai Wu, 2010). The permafrost on the Tibetan Plateau is sensitive to climate change and is particularly vulnerable to warming temperature. For centuries, these permafrost soils have acted like a sponge, conserving and managing the flow of these mighty rivers. They have also been the store house for Millions of tons of carbon.

Lying few meters above the permafrost soil is the Tibet's rangeland that covers approximately 70 percent of the total area of the Tibet's are (Camille Richard, 2004). These rangelands are the highest and coldest on Earth, made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts the pastoral nomads and the herders have maintained the sustainable use of this area for many centuries. Over the past few decades, human intervention and natural causes have critically affected these rangelands and is now affecting the permafrost soil threatening not only the diverse species and nomadic way of life but also the underground aquifers that recharge these mighty rivers.

This paper will discuss the different arguments and research findings about the permafrost cover on the Tibetan Plateau, and also its significance towards the major rivers that flow down the Indian peninsula and South-East Asia.

Introduction

Situated at the heart of Asia, with an average elevation of 4500 meters above the mean sea level (China.org.cn, 2007). The Plateau is ringed and crisscrossed by fourteen high mountain ranges from all the directions. For many generations these high peak mountains have served as a source of water and also acted as a barrier against any unwanted guests and in the preservation of its unique biodiversity. The Tibetan plateau even though very inhospitable to many species due to its high altitude and extreme climates holds one of the most diverse plant and animal species. There are many species (both plant and animals) that are only found on the Tibetan Plateau, for instance Wild Yak, Tibetan Antelope and medicinal plants

such as *Rheum palmatum* (Chumtsa), *Fritillaria* (Abhika) and about 400 species of *Rhododendron* (Hays, n.d.). The infinite grasslands and meadows are breathtakingly awesome and serene. In the summer time it would be filled with different varieties of flowering plants and in the winter with a thick blanket of snow. These grasslands not only serve as feeds to the wild ungulates, but recent scientific studies have revealed that these grasslands actually store more than 7,400 million tons of carbon and grazing herds in turn play an important role in maintaining these grasslands in many ways. These grasslands represent one of the last remaining agro-pastoral regions in the world covering a major part of the Tibet's total area. The types of rangeland vary from alpine meadows and mountain scrub to mountain sparse wood and mountain desert, which helps sustain domestic herds and nurture a wide variety of wildlife species.

These pasture lands are the highest and coldest on Earth and are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts the nomads and the herders have maintained the sustainable use of this area for many centuries. The freshwater wetlands on Tibetan plateau are distributed in an area covering approximately 1,33,000 sq. km besides acting as a potential sink for atmospheric carbon, they also recharge the underground aquifers which in turn feed the mighty rivers. The contractions in the wetlands due to climate change have led to reduced flows of the Driчу (Yangtze) and Machu (Yellow) Rivers. With the major Asian rivers originating from its plateau (See table1), the total river basin area (as of 2003 data) is estimated above 5,477,700 sq. km.

Permafrost and frozen grounds

Permafrost is defined as ground that remains at or below 0°C continuously for two or more years. It is widespread in high latitudes and in high-elevation regions. The permafrost cover on the Tibetan Plateau (1.3 to 1.6 million sq. km) is alpine permafrost best defined as warm permafrost and rich ground ice, usually not far from melting temperature (H. J. Jin, 2007). Tibetan permafrost comprises 74.5% of the Northern Hemisphere's mountain permafrost and is a direct consequence of land uplift on the order of 3000 m over the last 2 million years. Because the Plateau is geologically young and active, the geothermal gradient is steep (0.0514 °C/m), resulting in a thin, relatively warm permafrost layer containing many taliks.

This permafrost cover varies in its thickness from 1 to 130 m, depending on local characteristics and soil water content. Unlike the permafrost of other cold regions, the permafrost prevailing on the Tibetan Plateau is generally ice-poor as a consequence of the arid climate, high evaporation, and glacial history. Over the past several thousand years, these frozen soils have enclosed vast amounts of carbons and methane. Many researchers fear that once the permafrost starts to

degrade, the trapped gases will be released in the atmosphere leading to a positive feedback. Such feedbacks would lead to abrupt changes in the climate that would likely be irreversible. Researchers in 2008 estimated that these alpine permafrost stores about 12,300 Million tons of Carbon (Environment and Development Desk, DIIR, CTA, 2009). A separate study conducted at the source region of the Machu (Yellow River) indicated that significant amount of methane gases is trapped in the permafrost layer. If the current trend continues, it will result in continuous declining of permafrost table. As a result, those thawed layers of soils in warm season cannot refreeze completely in the freezing season. Such process is leading to a complete change in the local habitat and hydrology of the soil. The presence or absence of this permafrost layer necessitates major variations in the soil's physical structure mainly its moisture and nutrient content. On the Tibetan Plateau, the permafrost region goes through a high solar radiation load unlike other permafrost regions such as Siberia, making it highly sensitive to climate warming and surface disturbances.

Degrading Permafrost on the Third Pole

Over the past few decades, human intervention and climate warming have affected these permafrost regions and are now degrading and threatening not only the diverse species and nomadic way of life but also the underground aquifers that recharge wetlands and the mighty rivers. Field observations conducted by various scientists at different location on the Tibetan Plateau reveal that the ongoing permafrost degradation on the Tibetan Plateau has to be taken seriously and without any delay in implementing new effective policies or revising old policies that are in play. In late 1950's and the following few decades, the people liberation army- PLA, in order to maximize the agricultural production (winter crop) from the alpine grasslands have ploughed almost 20 million hectares of grassland in Tibet and Inner Mongolia. They were converted to croplands, by state owned farms, state-owned forestry operations, and other state-owned enterprises. During that era, they were all labeled as "Newly Claimed Virgin croplands" but later failed to reap any harvest. These grasslands are now severely degraded.

In 1954, the construction of Siling Lhasa Highway (Ch: Qinghai-Tibet Highway) from Lanzhou and Xining to Lhasa led to the severe degradation of the permafrost soil, its vegetative mat along the highway and its adjoining areas (Environment and Development Desk, 2009). Based on a scientific field survey in the year 1990, thaw settlement along the highway accounted for 83% of the road damage (Wang Shaoling, 2000). The initial highway re-construction using asphalt pavement that took place during 1973- 1984 led to further degradation of these frozen soils. According to some researchers, approximately 30% of this highway has to be repaired every year due to damage cause by frost action. Those areas covered by

asphalt road surface showed significantly higher Mean Annual Ground Temperature (MAGT) compared to the adjoining regions. In other words, the road construction/renovation has resulted in a faster degradation of the permafrost layer, compared to the natural state. The stretch of highway near the Kunlun Mountain revealed that the thickness of active seasonal melt/refreeze layer under the asphalt road surface was 5.2 m compared to only 2.8m under the normal state; and the surface temperature was warmer compared to the normal state (MAGT ranging from -1.0 to -0.2°C under the asphalt road and -2.5 to -3.5°C for the normal state). It was also found that the heat accumulation under the asphalt road bases resulted in increased thaw depths too great to be seasonally refrozen and, consequently, resulting in the transformation of vertically connected permafrost into disconnected phase.

In other excavations in the Kunlun Pass (35°40' N, 94°02' E; 4715 m) the researchers found that the oil pipeline that was built in 1973 along the highway to pump Tibetan oil from Gormo to Lhasa, has induced a summer thaw depth of much higher magnitude compared to the nearby areas. They have also noticed that, due to the thaw settlement, the bridges and water conduits have also been damaged considerably. At the highway near the Dhangla Ri-gyuth (Ch: Fenghuoshan Mountain), scientists found an arc shaped thaw slumping area measuring up to 73m wide and 103m long (in 2003) with the total volume of the failure about 10,000m³ caused by the repairing of the highway. Their survey results showed that the thaw slump has been active for more than 10 years compared to the general thaw slumping life year of 3-5 years and it will further remain active until the ice rich permafrost has disappeared altogether. The original sliding was caused by excavation of the slope toe in 1990 during the repairing of the Qinghai-Tibet Highway. After that, the excavation began to collapse in warm seasons and leave the ground ice exposed to the air.

Researchers have found that, the permafrost temperature at the source areas of Driчу (Yangtze River) and Machu (Yellow River) in the arid heart of the Tibetan Plateau has risen since 1980 resulting to the increase in the soil active layer (Environment and Development Desk, 2009). Under such conditions, the permafrost degradation is directly leading to the lowering of local water tables and lake water levels, and shrinking of wetlands and deterioration of marshy meadows. The diminishing marshy meadows allow for a greater depth of thaw thus further lowering of the water table. The same observations were also made by other researchers. Recently the researchers have noticed a shrinking of about 20% of the alpine meadows and the wetlands area in the vast Amdo area due to permafrost degradation. These changes in permafrost regions have resulted (over the years) in loss of soil moisture and the subsequent release of trapped carbon to the atmosphere. Such degradation has/ will in future cause large scale environmental deterioration, including changes in surface hydrology, accelerated desertification, and destabilization of human infrastructure.

Depicts some of the impacts of thawing ice-rich permafrost inducing retrogressive thermal slumping on the highway, slope failures on the alpine pastures and drying up of the head regions of the rivers.

In short, climate warming will degrade the upper permafrost as a result converting the alpine wetlands to alpine meadowlands, alpine meadows becoming grasslands, and grasslands becoming deep-rooted shrub lands. Such changes if subjected under climate warming over a long time can cause a further degradation of the permafrost and will finally lead to desertification. This is a succession of biomass productivity loss. The above findings reveal that the current permafrost degradation was mainly due to the surface disturbances while the global warming has played a secondary role in speeding up this degradation. It is also clear that infrastructure development undoubtedly exerted additional stresses on these sensitive permafrost environments.

How to restore the degrading permafrost?

Up until today, the modern science and technology has no solution to stop or reverse the degrading permafrost. Once the ground temperature starts to increase above zero degree, then there is no turning back, it further increases the depth of the active layer and thereby magnifies the thaw size in warmer months. But we can always delay and reduce its impacts by careful investigation and understanding the basic nature of the landscapes. Scientists have spent many harsh winters to actually read the basics of these grasslands that have preserved the frozen soil for the past several centuries. Modern science is now beginning to understand what was known to the pastoral nomads for many generations. These nomads have evolved along with the extreme climates and are the best stewards of the grasslands. Although they might not know the technical and scientific details about the frozen soils and its relationship to the alpine grasslands, but they were very sure that their ancestral cultures and their mobile lifestyle are successful in maintaining the grasslands healthy.

Does depopulating the grasslands actually help to restore the permafrost or the opposite is correct?

Pastoralism on the Tibetan Plateau is an ‘adaptation to a cold environment at elevations above the limit of cultivation’. For centuries, the Tibetan nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands, thereby not pushing the limits of the grassland so called ‘carrying capacity’. The alpine grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The Plateau itself is covered in almost 70 percent of these precious grasslands. The pasture lands are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts they have maintained

the sustainable use of this area for many centuries. China's introduction of different grassland policies over the years threatened the sustainability of this delicate environmental balance. The new policies restrict the flexibility and mobility of the Tibetan nomads. They are compelled to settle in concrete housings. Their livestock and their culture are held responsible for the degrading the grasslands, which in turn will dry-up the precious water tower of China. These days many researchers and rangeland specialists dispute the effectiveness of the grassland laws and related new policies which requires depopulating these alpine grasslands. According to the Chinese state media, under the "new countryside" program launched in 2006, (China Daily, 2006) the local Chinese government of Tibet Autonomous Region- 'TAR' had moved a total of about 300,000 families involving 1.43 million Tibetan nomads and farmers into new or fixed settlement homes. Another 185,500 families are expected to move into new homes by 2013.

Field observations conducted on these grasslands have revealed some positive connections between the grazing herds of the nomads and the grasslands. The researchers say that abandoning these grasslands will lead to the domination of the invasive species and do more harm for the grassland which in turn would affect the frozen soil. Recent field studies also revealed that skillfully managed grazing pressure actually helps in regenerating the grasslands by improving the Carbon/ Nitrogen ratio and prolonging/extending the growing season. These researchers say the degradation of these grasslands are due to many factors such as permafrost degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc.) and climate warming. They say a managed grazing could actually reverse the grassland degradation. The researchers went further to prove that global warming and grazing cancel each other and there was no significant effect on ANPP (Above Ground Net Primary Production), and those depopulated grasslands could in future have less ANPP. Their study indicated the following points.

- Grazing can alter the age structure of leaves and regenerate older plants It also helps to keep the expansion of invasive weeds under control.
- Species richness in grazed areas remains stable, whereas in the absence of grazing, there is faster decrease in the species richness, especially the medicinal plants.
- Grazing can increase the rangeland productivity and can reduce the negative effects of warming on both vegetation production and quality.

Some researchers even suggest that we cannot apply concepts such as 'carrying capacity' and 'stocking rates'. They are not applicable because most of the Plateau's environments are extremely variable and unpredictable. Some even mentioned that

the carrying capacities of some grassland were far exceeded partly due to inappropriate land-use and land management practices implemented in the 1950s. It was also mentioned that the major determinant for grassland productivity on the Tibetan Plateau is the rainfall rather than the past or the present livestock number.

Further human induced factors responsible for the degradation of the permafrost soil:

- Infrastructure development such as highways, new townships for settlers and railroad tracks.
- Growing rapeseed on low-lying pastures-particularly by Chinese settlers and military units - around the pastoral plains of Amdo's Tso Ngonpo (Lake Kokonor).
- Uncontrolled gold mining and illegal harvesting of wild medicinal herbs on grasslands with the connivance of local authorities.
- Chemical elimination of indigenous predators on the grasslands leading to the loss of natural checks on the population growth of pest species.
- The construction of the 1120-km, 159-mm diameter Gormo (Ch: Golmud) to Lhasa Oil Products Pipeline (GLOPP) that took five years (1972 till 1977).
- Increased grazing pressure on the grassland due to sudden increase of livestock number (especially the number of sheep) during the commune system and during the implementation of fencing policy.

Conclusion & Recommendations

The Tibetan Plateau is the land bridge connecting South Asia with East Asia. If the neighboring countries maintain their habitual stance of viewing events in Tibet as some far place, they will fail to engage with the rapid changes outlined above, all of which directly impact on Tibetan Plateau long term sustainability. As Jane Qiu quoted an excerpt in her article from Veerabhadran Ramanathan (an atmospheric scientist), "Our understanding of global climate change would be incomplete without taking into consideration what's happening to the Tibetan Plateau" (Qiu, 2008).

The very survival of almost 2 billion people depends on the monsoon dynamic and water resources originating from the Tibetan Plateau. The impact on Tibet's landscape, especially the frozen grounds due to human intervention of climate warming will threaten not only the future food security of many nations but also its developments. If Tibet's grasslands are maintained and improved, through a combination of nomadic work and state/donor finance, they will form a part of the

solution to a global problem. This is a far better alternative than excluding nomads and will enable grasslands to recapture carbon while also sustaining human livelihoods. Much effort is needed on the ground in Tibet to restore wetlands, adapt farm and pastureland, and preserve forests before the impacts of climate change makes it more difficult to save ecosystems. Through state and people working together, desertification may also be reversed. The fate of future developments and social security of the lower riparian countries relies on how well the resources are managed in Tibet.

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MOUNT KAILASH (GANG-RINPOCHE)

Mount Kailash (Tibetan: Gang-Tise or Gang-Rinpoche) is a 22,028 feet (6,714m) high peak in one of the highest and most inhospitable parts of the Himalayan mountains of western Tibet. Situated at 31.070704° N latitude and 81.314664° E longitude, it is one of the most significant mountain-geographically and spiritually (Tikkanen, Kailas Range). This great mass of black rock has a distinct diamond-like shape with four sheer facades matching the cardinal points of the compass and isolated location with no other mountains in the vicinity to obscure its grandeur.

It is the source of some of the prominent rivers in Asia including Yarlung-Tsangpo (Brahmaputra), Langchen-Khabab (Sutlej), Sengey-Khabab (Indus) and Macha-Khabab (Karnali, a major tributary of Ganges) which begin in the area surrounding Kailash (Environmental change and ecosystem services programme, 2010). The landscape around the mountain is rugged and dry, and on its south side are two freshwater lakes-Mansarowar and Rakshastal. Lake Mansarowar (Tib: Tso-Mapham) situated at an altitude of 14,950 feet is the highest body of fresh water in the world (Tikkanen, Lake Mapam).



Mount Kailash, close Up from The Kangnyi Chorten Tarboche area on Mount Kailash Outer Kora. Source: www.mountainsoftravelphotos.com

Mt. Kailash is certainly one of the world's most venerated holy places and regarded as the earthly manifestation of mythic Mount Meru (or Sumeru), the Axis Mundi, the spiritual center of the universe in Buddhist, Hindu and Jain cosmology. (Environmental change and ecosystem services programme, 2010) Tibetans call the mountain Gang-Rinpoche meaning 'Precious One of Glacial Snow' and regard it to be the abode of the tantric meditational deity Demchog and his consort, Dorjee Phagmo (Govinda, 1970). The three hills near Gang-Rinpoche are believed

to be the homes of the Bodhisattvas Manjushri, Vajrapani and Avalokiteshrava (Mount Kailash). Hindus revere it as the throne of the great Lord Shiva, one of the three prominent deities. To Jains, Kailash is the site at which Rishaba, first of the twenty-four Tirthankaras, received enlightenment. Additionally, Bon, Tibet's pre-Buddhist religion believe it to be the seat of the Sky Goddess Sipaimen and a site of spiritual battle that established Buddhism as the primary religion of Tibet.

A few thousand pilgrims make a difficult and sometimes treacherous journey to this place every year to complete a 52 km ritual circumambulation around Mt. Kailash. (Environmental change and ecosystem services programme, 2010). It usually takes three days of walk or months of full-body circumambulation to complete a holy 'kora' or circuit of the mountain. Preservationists argue that to protect Mt. Kailash from commercialization and destruction, it should be designated as a UNESCO World Heritage site (The Economic Times). Recently, campaigns were launched to gather support in this pursuit, but Chinese government has so far not requested nomination of Mount Kailash to UNESCO.

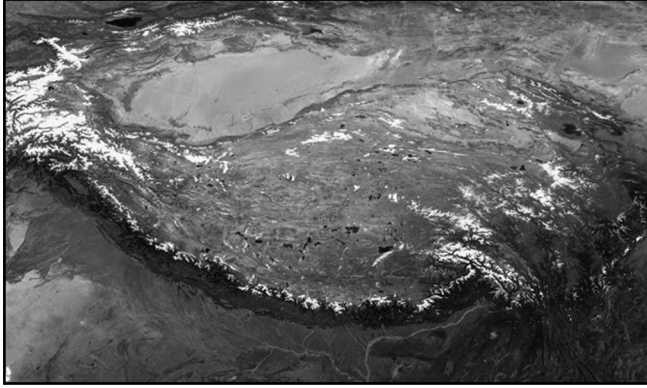
On 'International Mountain Day'*, we call upon the Chinese government and the UNESCO to nominate and recognize Mount Kailash for World Heritage Listing in order to protect this important, sacred and beautiful place.

*The United Nations General Assembly has designated 11 December, from 2003 onwards, as "International Mountain Day". Since then the day has been celebrated as a way to create awareness about the importance of mountains to life, to highlight the opportunities and constraints in mountain development and to build partnership that will bring positive change to the world's mountains and highlands. This year's International Mountain Day theme focuses on 'Mountains and Forests'.

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THE SIGNIFICANCE OF THE THIRD POLE: THE TIBETAN PLATEAU



A satellite's-eye-view of the Tibetan Plateau. Image from NASA's Terra satellite. Photo credit- NASA

Tibetan Plateau referred to as 'The Third Pole' and 'The Water Tower of Asia' reflects the significance of its snow capped mountains and its alpine grasslands. Since time memorial, the plateau holds the Hindu Kush Himalayan Ice Sheet, considered as the largest ice mass outside the two poles. Its plateau contains more than 45,000 glaciers

covering an area of 105,000 km² (Morton, 2011). Encompassing an area of about 2.5 million square kilometers, or about one-third the area of the continental United States, the Tibetan Plateau is the largest and highest region on Earth. (Miller, 2009) With an average elevation of 4,500 meters above sea level, the Tibetan Plateau stretches for almost 3,000 kilometers from west to east and 1,500 kilometers from south to north (Miller, 2009). The Plateau is ringed by high mountains—the Himalayas to the south, the Karakorum in the west and the Kunlun across the north. One can just learn by looking at its map to figure out how the Tibetan Plateau dominates the geography of Asia.

Glaciers & Rivers

Glacial runoff from these regions feeds the largest rivers in Asia, including Yarlung Tsangpo (Brahmaputra), Driчу (Yangtze), Machu (Yellow), Zachu (Mekong), Macha Khabab (Ganges) and Sengye Khabab (Indus River) and more (Circle of Blue, 2008). Referred to as 'The Water Tower of Asia', the Tibetan Plateau is the head region to major rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Burma and Vietnam. For China alone, 30 percent of its fresh water supply is met from the rivers flowing from Tibet (Ranade, 2010). For many generations, this Plateau has met the basic necessities to sustain life and flourish human civilizations beyond its vast border. From the arid plains of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonlesap lake of Cambodia to the North China plain, these rivers bring life and joy to millions of people. The glacier-fed rivers originating from the Tibetan Plateau make up the

largest river run-off from any single location in the world. Perhaps the most critical region in which the melting glaciers will negatively affect water supply (in the next few decades) will be China and parts of Asia, including India and Bangladesh. Zachu or Mekong River, originating from Mount Thangla is the bloodline for the Mekong-region countries. This river flows from the central Tibet through Yunnan Province in China and then flowing through Laos, Thailand, Cambodia and finally ending its journey in Vietnam. This river directly supports approximately 70 million common peoples along its basin from fisherman to farmers (Food and Agriculture Organization of the United Nation, 2011).

Permafrost: The frozen soils

The presence or absence of the permafrost layer entails major variations in the soil's physical structure, determining, to a large extent, the hydrological and nutritional status of the soil, which in turn, is pivotal in determining the vegetative coverage, plant community structure and productivity. Unlike the ones that are widespread in the Arctic and boreal regions of Northern Hemisphere, the permafrost prevailing on the Tibetan Plateau (1.3 to 1.6 million km²) are alpine permafrost. This type of permafrost are featured by warm permafrost and rich ground ice and are among the most sensitive to climate change and are particularly vulnerable to warming temperature. The alpine permafrost on Tibetan Plateau stores about 12,300 Million tonnes of Carbon (IANS, 2015).

Alpine Grasslands and Meadows

Tibet's rangeland (Tib: Jhangthang), from the Northern Plateau of upper Tibet to the extreme eastern edge of the plateau, with an average altitude of 4000 to 5000 meters, covers approximately 70 percent of the total area of the Tibet's area (Badingquiying, 2018). The types of rangeland vary from alpine meadows and mountain scrub to mountain sparse wood and mountain desert, which helps sustain domestic herds and nurture a wide variety of wildlife species.

These rangelands and its cold alpine grassland soils are the major carbon sink and house a greater organic carbon pool. During the growing season, the alpine meadows appears to absorb 'or' take up CO₂ at the rate of (1840–3050) mg/m²/day. Studies showed that total Soil Organic Carbon storage (sampled from the top 1 meter soil) in the alpine grasslands of TP was estimated about 7400 Million tonnes of Carbon (Shuli Liu, 2016). For many generations, pastoral nomadism on these rangelands has been the best and the only option to live successfully. Over the time, Tibetan pastoral nomads has skillfully introduced domestic herds and maintained an extraordinary biodiversity of grasses and sedges, enabling human life to flourish at the Third pole.

Wetlands and wetland areas as carbon sequesters

Statistics of the natural wetlands (excluding lakes and floodplains) area by geographic regions in China revealed that Tibetan Highland holds over 51 percent of total natural wetlands. These wetlands are dominated by Salt Marsh, Peat land and Freshwater Marsh. These wetlands tend to trap carbon-rich sediments from watershed sources. The Wetlands in Tibet play a major role in regulating the flow of rivers and also are the major carbon stores. They act like sponge, absorbing water during the summer when the water is in excess and releasing it in the winter when the runoff is short. Much effort is needed on the ground in Tibet to restore wetlands, adapt farm and pastureland, and preserve forests before the impacts of climate change makes it more difficult to save ecosystems. Through state and people working together, desertification may also be reversed (Yeh, 2009). The fate of future developments and social security of the lower riparian countries relies on how well the resources are managed in Tibet.

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TIBETAN RESISTANCE TO DESTRUCTIVE MINING IN TIBET?

Earlier this year, China announced that they would set up three major mineral bases in Tibet in the next five years following discoveries of critically important/rich reserves worth USD 100 billion in the Plateau. The bases would be set up in the Lhasa City, Lhokha and Chamdo Prefectures. But this is just one part of the menacing story of China's full-scale exploitation of Tibet. In 2005, Chinese geologists from the China Geological Survey Bureau boasted the success of the seven-year-long geological survey that looked for mineral resources prospecting and environmental investigation on the Tibetan Plateau. The survey is believed to have found 5,000 mineral deposits on the Plateau. It estimated 30 million tons could be extracted from copper reserves; 40 million tons from lead and zinc reserves, and 1 billion tons from iron ore reserves. More specifically, geologists have discovered 600 new sites of copper, iron, lead and zinc ore deposits along the route of the railway line. However, a decade ago, there has only been limited large-scale exploitation of the mineral deposits found in the Tibetan Plateau mainly due to factors such as inaccessibility, lack of infrastructure, lack of geological data etc. But things have changed swiftly and now the trend of large-scale mining in the Tibetan Plateau has intensified since the completion of the Gormo-Lhasa railway line and construction of several hydro-dams near mining sites to provide necessary energy especially to mines requiring processing of ores. With the necessary infrastructure in place and availability of such geological data, China plans to carry out mining on a larger scale in order to bring what they claim, "light to the darkness of Tibet." But, local Tibetans don't seem to be pleased with these mining activities as is evident from the frequent reports of mining protest led by local Tibetans in Tibet. There are several economic, social, political and environmental concerns among Tibetans that makes the aim of China's mining activities in Tibet questionable. The compiled list of recent mining protests and some of the issues that arise from these protests are also presented at the end.

Around the world, 'resource curse' has become a concept that identifies the paradox of wealth in resources, translating into poverty of the local people. Tibet is an extreme example of this paradox. Not only does Tibet's mineral wealth fail to enrich Tibetan lives, it marginalizes and impoverishes them, also ruining their land and rivers. Tibetans are powerless and have no say in the decision-making processes that affect them, be it their culture, economy or environment. This leads to the impoverishment of local communities and the enrichment of the distant elite.

Mr. Gabriel Lafitte, in his recent article 'Tibet's resource curse' explains, "China's plan is to rapidly increase lithium extraction, first from the Qinghai Tsaidam Basin

lakes, then from Drangyer Tsaka in the far west of Tibet Autonomous Region. In order to speed up industrialisation, Beijing has ordered companies to merge”. China plans to produce 30,000 tons of lithium a year from the Qinghai salt lakes. He warns that China’s plan to scale up lithium extraction to meet demand for electric cars and smart phones could cause irreparable environmental damage to the fragile Tibetan Plateau. Like in some other parts of the world, where impoverished and marginalized groups are underrepresented in any decision making process related to mining, Tibetans in Tibet are experiencing the same, if not the worse. They are excluded and silenced, their petitions and grievances are ignored, and their peaceful protests are brutally crushed. China’s policies in Tibet seem to have brought more darkness of hopelessness and discontentment rather than ‘light’.

List of Mining Protests Inside Tibet

U-Tsang: June 2009, Meldro Gyama, Meldro Gungkar county (water pollution & diversion, UNPO link, Phayul).

- May 2010, Wu Yug Sochen, Namling dzong (protest).
- November, 2010 Lingka Monastery, Tamo, Shetongmon district (15 People Jailed).
- April 2011 Phondo, Phenpo Lhundrup Dong (protest).
- May, 2011 Mining protest in Dzogang County, Chamdo (Beaten and detained) Tibetan Review.
- June, 2011 Mining protest in Bethong township, Dzogang County, Chamdo (detained).

Do-Toe: March 2009 Bathang county, Kham Karze (death of cattle).

- May 2009, SerNgul Lo, Lhara Village, Markham county, Eastern Tibet (road blocked) Phayul.
- 8 April, 2010 in Nyarong, Kham, Exploitation of Mineral Resources (Residents Protest).
- August 2010, Fatal shooting of Tibetan in mining site, Palyul county, Kardze, Kham (3 People killed) Phayul, Tibet Action, RFA, Phayul.

Do-Mey: 2010, Dakthar Dineth, Amdo Golog, 2010 (peaceful protest).

- May, 2010 Tibetan demonstrators against a highly pollutant local cement factory, Labrang, Sangchu County, Kanlho TAP, Gansu (open fired).
- April 2011, Rampant gold mining threatens human lives and ecology in Rebkong, Malho TAP (imprisonment).
- June 2011, Monks and local residents of Kumbum filed a petition for environmental safety. Kumbum, Amdo, (lead poisoning), ICT, RFA, Asian News
- June 2011, Golog, TsoNgon Shingchen, (peaceful protest- 400 students).
- September 2011, Chone (Ch: Zhuoni) Kanlho TAP, Gansu Concealed exploitation led to ecological damage.

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DENIAL OF TIBETAN PEOPLE'S RIGHTS ON THEIR NATIVE LAND

Overview: Being one of the earth's most environmentally sensitive and a unique bio-geographical zone, a healthy Tibetan Plateau benefits the entire Asian sub-continent. Over the past five decades, the landscapes on the Tibetan Plateau have experienced much environmental negligence and degradation, caused mainly by natural phenomenon (such as climate warming, earthquakes) and due to human interference (resource extraction, unskillful policy implementations and infrastructure developments). This article will look into the latter human-induced cause and examine how such degradations are actually affecting the daily lives of the local residents who have from ages been the natural guardians of these landscapes.

Resource Extraction:

China boastfully refers to Tibet as 'Xizang' which literally means the western treasure house. The Plateau's rich natural resources became a resource curse for the local residents and its ecosystem. Since late 60's, these resources have been exploited in various scales and mostly under very poor environmental norms and regulations. The mining not only undermines the sanctity of the local landscapes but also creates social tension and distrust when standard corporate policies are not followed. Wherever possible, the Tibetan communities try to put forward their grievances in numerous petitions to higher authorities against the miners: they are either ignored or harassed. After failing to respond adequately, the local residents then resort to street protests that are immediately suppressed by heavy armed forces. Unlike the protests related to environmental negligence and accidents in many parts of China, those that occur in Tibet are classified as political and the protestors are immediately clamped down. It also appears that the Administrative Litigation Law (ALL)¹ which has been successfully adopted in other parts of China remains invalid in Tibetan areas. In the frequent protests by Tibetan villagers, quite often their immediate concern has been the damages done by the miners to the local streams, rivers, landscapes and pasture land.

Over the past two years (2010-2011), there have been more than 12 protests against mining activities that Environment Desk of the Central Tibetan Administration has documented and many more remains unknown (Tibet: Environment and

1. Administrative Litigation Law was adopted in the year 1989, this law allows parties to bring suit when their 'legitimate rights and interests' are infringed by a specific administrative act of an administrative organ or its personnel. The APL has often been used by plaintiffs asserting that local governments have illegally taken land or imposed taxes.

Development, 2011). With the recent announcement of more than 3000 potential mining sites and many precious mineral deposits in Tibet, it is very likely that there will be more such protests in the future if the attitude of miner's and the local cadre remains unchanged. The state itself is fervently involved in tapping these resources, as it is evident from the budget in the 12 Five Year Plan for improving the resource extraction, economy, and infrastructures such as highways, railway lines, and hydropower plants (Harris, 2011). These infrastructures will facilitate smooth operation and transportation of mineral ores to various smelters located in distant mainland China in addition to the large-scale migration of Chinese workers.

So far, copper, chromium, gold and iron are the four minerals of primary interest to Chinese and other foreign miners. These are being mined to different extents at various locations throughout the Tibetan Plateau. A recent Chinese official media report claimed to have found more than 7.9 million tons of copper and 100,000 tons of Molybdenum deposits in Kyung-lung (Ch: Qulong) in Meldro Ghongkar county. The extractive industries are now mining from those sites that are considered holy and revered by the local residents. Such mindless activities are further fueling the flame of frustration and it sets a constant reminder to many youngsters that the land they have lived and worshipped for many generations could be destroyed within a few days by showing a piece of paper proclaiming mining rights. This is not the end; the mining activities leads to the destruction of the grazing pastures, pollution and diversion of the local water source, building of hydro powers plants to get energy and exodus of migrant workers who in their leisure engage in hunting the wildlife including some endangered species. As mentioned above it is truly a resource curse for the local residents in its worse form. There is no mentioning of any post mining activities being conducted in rehabilitating the mining sites as required by the standard norms, there could be only two possible answers; either the resource is boundless or they simply don't care. It is also true that such activities are happening right under the nose of those judicial personnel who are fully aware of the standard environmental norms and laws as stipulated in the PRC constitution and Law of Regional National Autonomy.

End to Pastoral Nomadism

For centuries, the Tibetan nomads (drogpas) and herders have lived successfully with their herds using only their centuries-old local knowledge and by keeping a mobile lifestyle. For some social scientists, nomadism, while often ridiculed as primitive or even 'incomplete' by outsiders, is in fact a highly sophisticated adaptation for harnessing energy captured in the grasslands of the region. The implementations of different grassland and land-use policies in the name of development have severely affected not only these grasslands but also the lives of the 'drogpas'.

The vital role played by the ‘drogpas’ in maintaining these pastures are acknowledged only in research articles, while the policy makers often fail to understand these intricate relations since they judge everything in black and white. The current grassland rehabilitation policy that is implemented throughout Tibet referred to as the ‘Restore Grassland Policy’ or ‘tuimu huanco’ in Chinese, (meaning closing pasture to restore grasslands) restricts the mobility of the nomads and blames their livestock for overgrazing these grasslands. In fact the actual degradation or overgrazing of these grasslands started during the commune system 50 years ago when all the herds were collectivized. In recent years, moving the nomads from the grasslands to state built housings is being largely intensified in all parts of Tibet and has now become the central measure in protecting these grasslands.

What Science says

Field observations conducted on these grasslands have revealed positive connections between the grazing herds of the nomads and the grasslands. The researchers say that abandoning and depopulating these grasslands will lead to the domination of the invasive species, diminution of biodiversity, and cause more harm to the grassland. China’s own scientists have now learned through patient observation that the grasslands of Tibet, when grazed moderately and intermittently actually maintain a higher biodiversity and healthier pastures (Isom, 2009) (Foggin, 2008).

According to the latest 2011 Qinghai Statistical Year Book, the area of Amdo region (Ch: Qinghai) affected by drought increased from 108 thousand hectares in 2007 to 158 thousand in 2010. Technically, it should be the other way round, which clearly shows that the current policy of removing the herds ‘to protect the grasslands’ is failing badly in terms of what was initially projected.

We have roughly found that total number of people being moved or lured to these concrete settlements under the different name tags (ecological migrants or comfortable housings projects) sums to approximately 3.2 million in whole of Tibet (including Amdo and Kham province). According to the Chinese state media - Xinhua (2011), another 185,500 families are expected to move into new homes by 2013. These figures in other words indicates the number of peoples whose life style are now directly under the control and mercy of the central command and nothing more.

Status quo

Joblessness and alcoholism amongst the youth are prevalent in those new settlements where the elders are often seen cherishing their past lives and reliving only in their memories. Whereas the younger ones are scavenging waste to earn little extra money (Perrement). From our recent interactions with ‘drogpas’ and herders who fled into

exile (India) and from those documented research papers conducted inside Tibet, we came to know that the current policy of forced ‘villagization’ is in fact a very strategic move (from the state) to have all the mobile pastoral wanderers in tight leash and to have open access to pastures for extractive industries without facing any resentment. It also favors the central state in boasting that they have invested such amounts in upbringing the lifestyles of local residents. For many anthropologists and scholars, the term development has nothing to do with external materialistic life, it is the freedom to choose and to lead the life one values and respects. Given the choice of livelihood, almost all the residents of these newly constructed concrete settlements would love to roll back to their previous lifestyle without a second thought, even if it meant to live without a two bedroom house.

Prof. Olivier De Schutter (the UN Special Rapporteur on the Right to Food) after his mission to the PRC between 15-23 December 2010 and having seen the conditions of the newly settled ‘drogpas’ and herders in the new concrete camps, noted strongly against the policy of settling the herders. Again on 6 March, 2012 at the UN Human Right Council in Geneva, he spoke about his concerns regarding those people living in the ‘new socialist’ villages (Tibet.net, 2011).

For the PRC, another aspect of development where more income could be generated from Tibet is the tourism industry, which is now further enhanced by the railway networks connecting different places in Tibet. According to the latest information, around 49 million travelled in the railway line linking Gormo to Lhasa since its opening in 2006. It is estimated that passengers on the railway have increased at 10.3 percent annually. It is indeed good news for the travel agencies, hotels and the street shops but sadly almost all of them are owned by Han Chinese and those who have good ‘Guanzi’ (the connection). This boom in tourism industry has adversely affected the local Tibetan guides, who are now required to sit for an exam to earn a new tour guide license from the tourism authority/department, the implication of which is very clear. Our Desk recently came across a sad documentary film and a short report about the ‘drogpas’ of Mogru town (south of Kokonor Lake), highlighting the impacts of tourism and how the state authorities are impounding lands owned by the ‘drogpas’ and local herders.

The Chinese tourists who visit Mogru town liked to be photographed with Tibetan children of the Mogru clan, who must dress as if they are timeless nomads, people without history, forever smiling. Perhaps not even knowing that the land of the clan was taken to build the tourist facilities, and the Mogru Tibetans have no source of income other than posing for happy tourist snaps. Attempts by the Mogru Tibetans to petition Beijing and seek justice have come to nothing.

Damming and Polluting Rivers:

Rivers originating from Tibet flows to more than ten countries and play a vital role in the environmental services and socioeconomic aspects of each country. These rivers enable the Tibetan Plateau to become a strategic platform in exercising its dominance over the lower riparian states.

So far China has dammed every major river and its tributaries in Tibet, and has unveiled plans to construct even more dams in the coming years. In its 12 Five Year Plan (2011-2015), hydropower projects are to be prioritized and those that are not completed during its previous five year plan are now scheduled.

Meng Si, the managing director of China Dialogue's Beijing Office mentioned that China's green NGOs believe hydropower projects could bring economic development, but not necessarily to the benefit of local people. They believe that today's insufficiently transparent policymaking mechanisms are maximizing the interests of hydropower industry, officials and a small number of experts, while driving ecological destruction, affecting local livelihoods and increasing the risk of geological disasters. According to an article in Huffington Post, Catriona Luke, a South Asia writer for newstatesman.com writes that for China, Tibet's rivers are proving as rich resources for hydroelectric and geo-political power as its mineral wealth. But frenzied dam construction projected until 2020 means that a prehistoric irrigation system that dates back 30 to 40 million years is coming to an end (Luke, 2011).

Not only are these rivers and tributaries dammed for generating energy but some are also polluted with chemicals and other toxins dangerous for human consumption. For instance, the tap water of Kumbum monastery in Amdo (Ch: Qinghai) detected high concentrations of lead (Pb) due to a mining activity in the upstream river (McKown, 2011). This is not an isolated episode; similar cases of chemicals from mining polluting the drinking water supply are common in watersheds where mining activities are prevalent.

Conclusion

Any development in Tibet should be based on the approach, 'listening to the land and listening to the people'. The land and its resources must be used within its capabilities and ecological limits; and any policy implementation and developmental activities must respect the cultural tradition of Tibetan, which is based on centuries-old practice of sustainable use. The local Tibetans should be the major stakeholder for any development activities and their grievances (if any) resulting from such development activities should not be suppressed, instead should be channeled to find ways to take care of their interests.

The experiences and intimate knowledge of pastoral nomads should be incorporated into rangeland management practices. There should be a principle of collaborative management attending to the needs of the pastoral nomads and herders alike. A healthy and sustainable Tibetan Plateau is important as it would benefit the entire Asian continent and would further enhance peace and harmony within the region, especially between two major super powers (India and China).

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THE IMPACTS ON THE PASTORAL NOMADS OF THE MELTING TIBETAN PLATEAU

Overview: With an average elevation of 4,500 meters, the Tibetan Plateau is one of the most distinctive land-features on this earth. For many generations, this Plateau has met the basic necessities to sustain life and flourish human civilizations beyond its vast border. The modern era now begins to acknowledge the significance of its strategic location for developing peace and harmony within the region or the opposite. The Tibetan Plateau, also referred as ‘The Water Tower of Asia,’ is the headwater of major rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Myanmar and Vietnam.

The snow peaks and glaciers enable Tibet to be the source of major rivers that flow into Asia. As a result, approximately 1.3 billion people are dependent on the health of ten major rivers that originate in Tibet. The total river basin area is estimated above 5.6 million square kilometers. The Plateau provides Asia’s freshwater resource from the deserts of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonle Sap lake of Cambodia to the North China plain. Critical components to Tibet’s ecosystem are undergoing major transformations due to climate change. For instance, it has led to the receding of Tibet’s glaciers, shrinking and disappearance of thousands of lakes, drying of wetlands, thawing of permafrost, and reduced flow regimes in many rivers. Abnormal weather conditions due to climate change has made subsistence farming and herding more unpredictable, thus impacting the livelihoods of a majority of Tibetans. These days, on the Plateau, the spring thawing is earlier and the permafrost is melting away before the growing plants can access the water. This affects not only the crops but also the native vegetation of Tibet, especially in wetlands and other low lying areas. The loss of wetland in turn threatens the migratory birds that are used to Tibetan stopovers during the mating season.

Endangering Pastoralism and Grasslands Stewardship in Tibet

It was mobility that was the very essence of herding. Pastoral nomads in the Old World Dry Belt, whether in the savannahs of Africa, the steppes of central Asia or the high altitude pastures of the Qinghai-Tibetan Plateau, have always needed to move their animals regularly to make use of the spatial and temporal patchiness of grassland resources. Nomadism was therefore more than just an ecological adaptation or an adaptation to the political environment. It was a ‘region-specific, temporally and spatially ubiquitous survival strategy, an independent socio-ecological mode of culture’ which was based on subsistence and coexisted as an alternative to the sedentary cultures of agricultural and urban societies (Scholz (1995).

Nomadism is a strategy to optimize use of available natural resources and capitalise on socio-political conditions. While often ridiculed as primitive or even ‘incomplete’ by outsiders, it is in fact a highly sophisticated adaptation for exploiting energy captured in the grasslands of the region (R. Merkle, 2000). The local economy, which draws almost exclusively on Han migrants to staff schools, hospitals and other government posts, offers few opportunities to the Tibetan families who have traded their community assets for an uncertain future (Matt Perrenson 2006).

The different approaches to grassland management reveal a tension that seems to be grounded in the different rationality of the ‘modern’ sedentary pastoral production system and the nomadic pastoral production system. Control is a central dividing component, as the nomadic pastoral practices are centered around mobility and flexibility, whereas the current semi-settled production system limits the herders’ mobility, and grazing is sought to be better controlled. In the present situation, herders’ level of decision-making in herding and grassland management appears to be decreasing, as the government is directing livestock numbers, pastoral practices, grazing systems, and grasslands are being set aside for rehabilitation” (Irene Breivik, 2007).

Mobility was crucial, moving on before grazing pressure destroys plants, exposing the dying turf to the icy gales and blizzards of Tibet which can strip soil, leaving only bare rock. Nomadic knowledge of how, when and where to graze, and the nomadic willingness to live in portable woven yak hair tents, summer and winter, with their animals, kept the pasture free of invasive toxic weeds, erosion, shrub invasion, and infestations of pests. None of this was known in the 1980s, except to the nomads themselves, and no-one asked them how they dealt with the risks of living at the third pole. It is only in the 21st century that Chinese and global science have caught up with what the nomads have always known (Gabriel Laffite, 2010).

Pastoralism on the Tibetan Plateau is an ‘adaptation to a cold environment at elevations above the limit of cultivation’. For centuries, the Tibetan nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The Plateau itself is covered in almost 70 percent of these precious grasslands. The pasture lands are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts they have maintained the sustainable use of this area for many centuries. China’s introduction of different grassland policies over the years threatened the sustainability of this delicate environmental balance. The new policies restricts the flexibility and mobility of the nomads (which is the main ingredient in the nomadic pastoral production) and blames their livestock for overgrazing the grassland.

Despite all these valid arguments, in the name of modernization and conservation, the Tibetan Nomads are forcibly removed from their ancestral pastoral lands, compelled to slaughter and sell their livestock. They now have to live on the state rations and some of them sold their belongings to small vendors. Furthermore, their lack of means of other skill prevents them from finding alternate of making a living. For centuries, the Tibetan pastoral nomads (Tibetan: Drogpa) and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The Plateau itself is covered in almost 70 percent of these precious grasslands. The pasture lands are made habitable through the co-existence of the herders and their livestock. Through their efforts they have maintained the sustainable use of this area for many centuries.

Implementation of failed policies

China's introduction of different policies over the years have not only punished these pastoral nomad and the herders but also threatened the sustainability of this delicate environmental balance. During the commune system, in the name of "democratic reform", the nomads were herded into the communes, stripped of all possessions, reshaped into production brigades, and given rations according to their work points. No production meant no rations. From the outset, the new class of cadres in command saw the nomads not as stewards and curators of the landscape, but as ignorant, backward and irrational, utterly lacking in enthusiasm for class warfare. At the same time, under the commands of the new cadres, the herd size steadily grew to an unsustainable levels and the chain of grassland degradation began.

Twenty years later, in the late 1970s, the communes collapsed, having failed except for one achievement: the number of animals, in all Chinese official statistics, had climbed steadily every year, to record levels: 30 million sheep and goats, six million yaks. In the early 1980s nomads were given their animals back, but not their land. As soon as they regained some control over their lives, they cut the number of sheep back to more sustainable levels. It is now widely known that the actual grassland degradation and the increased grazing pressure started from the commune system. The Chinese statistical year book also revealed a significant increase in the number of grazing animals by the end of the commune period (1979). Household Contract Responsibility System (HCRS) or the Grassland law was adopted in the year 1985. This law was adopted in order to protect the degrading grasslands and to modernize the animal husbandry. Some researchers argue that this law has been implemented in order to gain more control over the pastures and to stop the over-exploitation of the grasslands, which the government appears to consider the most important

cause for grassland degradation. Long after the Chinese farmers had been given such guarantees of their land (land lease certificates) the nomads were at last (in the 1990s) given certificated guarantees of long term leasehold to their land (30 to 50 years). This encouraged conservation of pastures, giving nomads a sense of ownership.

Along with the implementation of the grassland law, the state authority gradually implemented the so-called 'Four-Way Programme' or 'Si Pei Tao', ordering region-wide fencing regimes and shelters for nomads and livestock. According to the Animal Husbandry Bureau (one of the four actors of the programme) stated that this programme was meant to improve people's lives, and control livestock and grazing. On the ground, this program limited the mobility of the livestock and encouraged the herders to invest and spend more time in winter pastures leading to increased grazing pressure on a small land area. Thus the Four Way Programme at some point intensified or at least in part, responsible for the problems for which the herders are now being blamed. But at the same time, other policies, driven by China's long standing disdain for mobile people, were also implemented. Limits on family size and herd size were gradually made compulsory. Gone was the annual cycle of overwintering in lower plateau pastures and herding up into the alpine meadows in summer.

In 1990s, even after implementing series of policies and measures, nothing much changed and it became obvious that everything on the grasslands was going wrong. The living turf was dying, eroding and slumping, only to be torn away in wild weather, back to bare rock or 'black beach' as Chinese scientists called it. Burrowing rodent populations exploded, in plague proportions. Toxic invasive weeds multiplied. The rangelands were degrading, including the arid area of eastern Tibet where both of China's great rivers, the Yangtze and Yellow, rise from glacier melt. Chinese scientists and administrators turned to just one explanation. The nomads were to blame. They were overstocking beyond the carrying capacity of the pastures, and this was the cause of degradation. The compulsory overstocking during the commune system could not be discussed; it was and is off-limits. So only one cause was possible: to blame the nomads. But some recent research revealed that overgrazing and degradation of the grasslands is not entirely dependent on the grazing livestock. The herders even talked about weather changes, rodents and mining activities as important factors causing grassland changes.

In 2003, a grassland rehabilitation policy is implemented throughout the country and in pastoral areas this policy is referred to as the 'Restore Grassland Policy' or 'tuimu huanco' in Chinese, meaning "closing pasture to restore grasslands". In recent years, moving herders from the grasslands to state build housings is being largely intensified and has now become the central measure in protecting these grasslands.

The land lease certificates guaranteeing nomads long term land tenure have been nullified by the new command. Instantly, all their skills, risk management strategies, environmental services, traditional knowledge and biodiversity conservation are gone, redundant, as if they had never existed. The most hardline policies are enforced in Golok and Yushu prefectures, in the area China considers to be the source of its great rivers, where, in Chinese eyes, the downstream water supply is threatened by rangeland degradation which is caused by destructive nomads. In this large area, nomads are frequently ‘villagised’ in ‘line villages’ that are far from their customary grazing land, they are required to sell their livestock, and the new concrete settlements they are moved to are very far from their usual pasture.

For decades, the policies such as de-stocking and rodent poisoning were carried out that goes strictly against the religious sentiments of the herders. For instance, it was made compulsory that one person from each family should join in the drive to poison the rodents (Tibetan pika). Over the past 40 years, the Chinese government has sponsored the systematic poisoning of pikas, most recently using grain laced with Botulin C strain toxin (*Clostridium botulinum*). Approximately 320,000 square kilometers were poisoned! However some past and recent researchers have argued that these rodents are the keystone species of the grasslands and that large-scale killing of rodents may even be harmful for the grasslands, and is almost certain to affect other wildlife and the broader environment. This new policy, ‘tuimu huancao’ like most simple ideas, it is overly simple. It assumes the only way to conserve China’s upper watersheds is to remove animals and nomads. Yet China’s own scientists have now learned, through patient observation, that the grasslands of Tibet, when grazed moderately and intermittently, moving herds on well before the short summer growing season ends, actually maintains a higher biodiversity than on ungrazed pastures, where toxic weeds invade and biodiversity declines.

The compulsory ‘ecological migration’ of the Tibetan nomads is grounded in ignorance, prejudice, a failure to listen and learn. China is far from alone in assuming its nomads are backward, and to blame for degrading land. But around the world, governments increasingly recognize that pastoral nomadic mobility holds the key to sustainability on the dry lands of the world. There are other solutions to the problems of degradation of Tibetan lands. Tuimu huancao, closing pastures to convert them to grassland, is not the only way. Nor is it helpful to assert climate change as the catch- all cause of all problems.

Status quo

Joblessness and alcoholism amongst the youth are prevalent in those new settlements where the elders are often seen cherishing their past lives and reliving in their

memories and the younger ones are scavenging waste to earn little extra money. From our recent interactions with ‘drogpas’ and herders who fled into exile (India) and from those documented research papers conducted inside Tibet, we came to know that the current policy of forced ‘villagization’ is in fact a very strategic move (from the state) to have all the mobile pastoral wanderers in tight leash and to have open access to pastures for extractive industries without facing any resentment. It also favors the central state in boasting that they have invested such amounts in upbringing the lifestyles of local residents.

For many anthropologist and scholars, the term development has nothing to do with external materialistic life, it is the freedom to choose and to lead the life one values and respects. Given the choice of livelihood, almost all the residents of these newly constructed concrete settlements would love to roll back to their previous lifestyle without a second thought, even it if meant to live without a two bedroom house.

In his own words, Prof. Olivier De Schutter (the UN Special Rapporteur on the Right to Food) after his mission to the PRC (15-23 December 2010) and having seen the conditions of the newly settled ‘drogpas’ and herders in the new concrete camps. He has mentioned strongly against the policy of settling the herders. Again on 6 March, 2012 at the UN Human Right Council in Geneva, he spoke about his concerns regarding those people living in the “new socialist” villages.

For PRC, another aspect of development where more income could be generated from Tibet is the tourism industry, which is now further enhanced by the railway networks connecting different places in Tibet. According to the latest information, around 49 million travelled in the railway line linking Gormo to Lhasa since its opening in 2006. It is estimated that passengers on the railway have increased at 10.3 percent annually. It is indeed good news for the travel agencies, hotels and the street shops but sadly almost all of them are owned by Han Chinese and those who have good ‘Guanzi’ (the connection).

This boom in tourism industry is has adversely affected the local Tibetan guides, who are now required to sit for an exam to earn a new tour guide license from the tourism authority/department, the implication of which is very clear. Our Desk recently came across a sad documentary film and a short report about the ‘drogpas’ of Mogru town (south of Kokonor Lake), highlighting the impacts of tourism and how the state authorities are impounding lands owned by the ‘drogpas’ and local herders.

The Chinese tourists who visits Mogru town liked to be photographed with Tibetan children of the Mogru clan, who must dress as if they are timeless nomads, people without history, forever smiling. Perhaps not even knowing that the land of the clan was taken to build the tourist facilities, and the Mogru Tibetans have no source of

income other than posing for happy tourist snaps. Attempts by the Mogru Tibetans to petition Beijing and seek justice have come to nothing.

We have roughly found that total number of people being moved or lured to these concrete settlements under the different name tags (ecological migrants or comfortable housings projects) sums to approximately 3.2 million in whole of Tibet (including Amdo and Kham province). According to the Chinese state media (2011), another 185,500 families are expected to move into new homes by 2013. These figures in other words indicates the number of peoples whose life style are now directly under the control and mercy of the central command and nothing more.

What Science Says?

Grassland degradations: China's own scientists have now learned through patient observation that the grasslands of Tibet, when grazed moderately and intermittently actually maintain a higher biodiversity and healthier pastures. Many researchers have indicated in their findings that depopulating these grasslands and labeling the nomads as ecological migrants will not help to restore the pastures.

These days many researchers and rangeland specialist are arguing the applicability of these new policies. Recent scientific findings give us more technical view about the regeneration of the grasslands and the vital role of grazers in replenishing the grasslands. Few researchers even cited that carrying capacity of the grasslands may not even exist in most of the Plateau's extremely variable (unpredictable) environments.

According to these research papers, the carrying capacity of some grasslands were far exceeded partly due to inappropriate land-use and land management practices implemented in the 1950s. It was also mentioned that the major determinant for grassland productivity on the Tibetan Plateau is the rainfall rather than the past or the present livestock number. Some recent field studies also revealed that grazing actually helps in regenerating the grasslands by improving the soil Carbon/Nitrogen ratio and prolonging/extending the growing season. Even some Chinese researchers have blamed the degradation of these grasslands on many factors such as permafrost degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc.) and climate warming.

Field observations conducted on these grasslands have revealed positive connections between the grazing herds of the nomads and the grasslands. The researchers say that abandoning these grasslands will lead to the domination of the invasive species, reduce biodiversity, and do more harm for the grassland which in turn would affect the permafrost soil. These days, many researchers and rangeland specialist are arguing the applicability of these new policies, and how much these

have actually benefited or affected. Recent scientific findings give us more insight information about the regeneration of the grasslands and the vital role of grazers in replenishing the grasslands. The researchers revealed that grazing actually helps in regenerating the grasslands by improving the soil Carbon/Nitrogen ratio and prolonging/extending the growing season. Some other researchers have blamed the degradation of these grasslands on many factors such as permafrost degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc,) and climate warming.

Conclusion:

Any development in Tibet should be based on the approach, 'listening to the land and listening to the people'. The land and its resources must be used within its capabilities and ecological limits; and any policy implementation and developmental activities must respect the cultural tradition of Tibetan, which is based on centuries-old practice of sustainable use.

The experiences and intimate knowledge of pastoral nomads should be incorporated into rangeland management practices. There should be a principle of collaborative management attending to the needs of the pastoral nomads and herders alike.

A healthy and sustainable Tibetan Plateau is important as it would benefit the entire Asian continent and would further enhance peace and harmony within the region, especially between two major super powers (India and China).

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RIFTING OF THE TIBETAN PLATEAU

One of the prominent and distinguishable feature on the vast Tibetan Plateau is its spectacular rift valleys. Many scientists reckon that these rifts are formed due to the east-west extension of the crustal layer caused by active tectonic deformation. In this post, we will briefly discuss the formation of these rift valleys that adds to the grandeur of Tibet, the roof of the world.

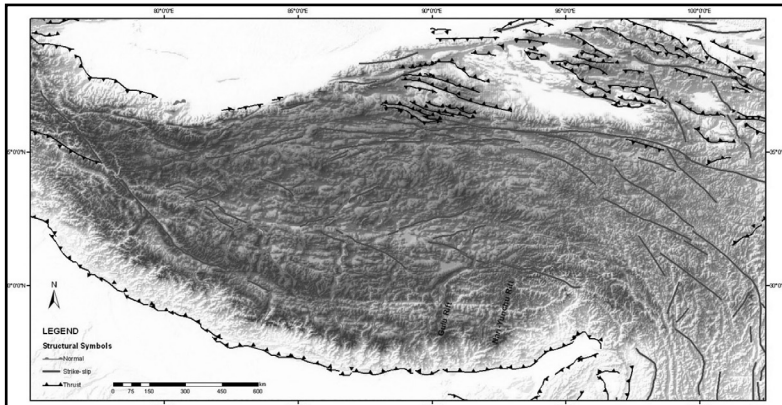


Fig. 1 Neo-tectonic map of the Tibetan Plateau showing active features. The north-south trending rifts are shown as green lines.

Around 50 to 55 million years ago, the Indian plate started colliding with the Eurasian plate, resulting in crustal shortening due to the northward movement of Indian plate relative to the stable Eurasia at a rate of 35-50 mm per year. The process led to the eventual construction of the Tibetan Plateau. In the past 10 million years, the plateau experienced widespread extension, which has been evident from Landsat imagery, fault-plane solutions of earthquakes, and field observations. This extension is expressed by a series of roughly north-south trending rifts, which are a notable feature of the Tibetan Plateau (Fig. 1). Many of the lakes have also been formed in the depression caused by the extension of crust.

Scientific knowledge about these structures has greatly improved since its initial recognition during late 1970s. The progress in knowledge about these structures can be credited to several detailed field investigations and improved quality of Landsat imagery, as well as availability of seismic reflection and refraction data.

Various studies have tried to constrain the timing of extension (east-west) in Tibet, e.g., the onset of east-west extension is constrained to be ~8 million years ago in Nyenchen Thangla region of southeast Tibet, while initiation of the Yadong-Gulu

rift is constrained at about ~12 million years ago. A north-south trending dike swarm which was dated to estimate the age of minor extension in southernmost Tibet near Shigatse is emplaced at ~18 million years ago. Unlike our knowledge about east-west extension in southern Tibet, the studies about the rifts in northern Tibet are based mainly on fault plane solutions of earthquakes and interpretations of Landsat images.

One of the foremost and common explanations of the Tibetan extension is gravitational spreading of the thick crust. More recently, the convective removal of the lower mantle lithosphere under the Tibetan plateau has been suggested as a mechanism to this extensional process. Other researchers argue that the formation of the Tibetan rifts is due to local boundary conditions such as oblique convergence or basal shear associated with subduction of the Indian plate under Tibet that led to the radial expansion and stretching along the Himalayan arc.

It is possible that anyone or some combination of these processes together contributes to crustal extension in the Tibetan plateau. However, data about the timing of onset and vertical extent of the extension is limited and largely disputed.

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TO DAM OR NOT TO DAM THE YARLUNG TSANGPO

Due to its rising power shortages coupled with increasing international pressure to reduce its carbon emissions, China has dammed all the major rivers originating from Tibet. The most recent case is the damming of the untapped upper reaches of the Yarlung Tsangpo (Brahmaputra).

A major hydropower project in Tibet at rZam (Tib: རྩམ་; Ch: Zangmu), which began in November 2010, is the first of at least 6 dams proposed on the Yarlung Tsangpo that have been approved (Krishnan, 2011). The most ambitious of their project is a 38,000 MW mega dam at Metog (Tib: མེ་རྟོག་; Ch: Motuo) on the great bend of the mighty Tsangpo, where the river descends ~2000 m before entering India (Fig. 1) (Defence Forum India, 2010). This mega project has the potential to generate output more than twice the capacity of the world's largest power station, the Three Gorges Dam.



Fig. 1 The location of dams under development, proposed and planned on Yarlung Tsangpo and its tributaries. Map source: www.meltdownintibet.com

However, is China's widespread dam building a correct response to reduce climate pollution and eradicate poverty, the two biggest challenges facing the country today?

Chinese government argues that damming rivers is a greener alternative to burning coal by the country, which is the world's biggest emitter of greenhouse gases. But several studies have shown that dams impact the aquatic ecosystem including water flows, water quality, fish habitats, wetlands, and livelihood of people relying on it. Dams also causes high evaporation and loss of water and are also a globally significant source of greenhouse gases such as methane. The rotting organic matter from the vegetation and soils, and detritus that flows in the reservoir contribute to

the greenhouse gas emission. According to an estimate, dams and reservoirs are responsible for almost a quarter of all human-caused methane emission (Ivan B. T. Lima, 2008). Some studies also indicate that dams cause bloom of blue algae (Agriculture and Food, 2020). Construction of widespread dams on Yarlung Tsangpo has been controversial—ecologically, socially and politically—as it involves environmental impact of altering landscape and ecosystems and threatens the livelihood of the lower riparian communities.

Will China’s ever increasing energy demand overwhelm Tibet’s environment?

In case of the Tibetan Plateau, the third pole, which has an extremely fragile ecology, the situation could even be worse. Due to climate change and environmental degradation, the plateau is warming at least twice as fast as the rest of the world, which is causing high rates of glacial melting which in turn leads to the formation of glacial lakes that eventually burst to cause glacial lake outburst floods. The significant and unpredictable changes in the hydrology of the glacier-fed Yarlung-Tsangpo could cause risk of dam failures and catastrophic flood releases. Any event of flash flood in the upper reaches could have a domino effect on the series of dams planned downstream of Tsangpo. Yarlung Tsangpo has the world’s deepest canyon, longer than the Grand Canyon. Largely due to its steep gradient, the river cuts deep gorges and rapidly erodes the bedrock at ~7mm every year (World Wide Science, n.d.). Tsangpo also transports an exceptionally heavy load of eroded sediments and provides nutrients down stream on which the river basin’s farmers and fish depend. The obstruction of sediment transport by dam or even tunnel could not only impact the livelihood of lower riparian communities but could cause siltation and landslides.

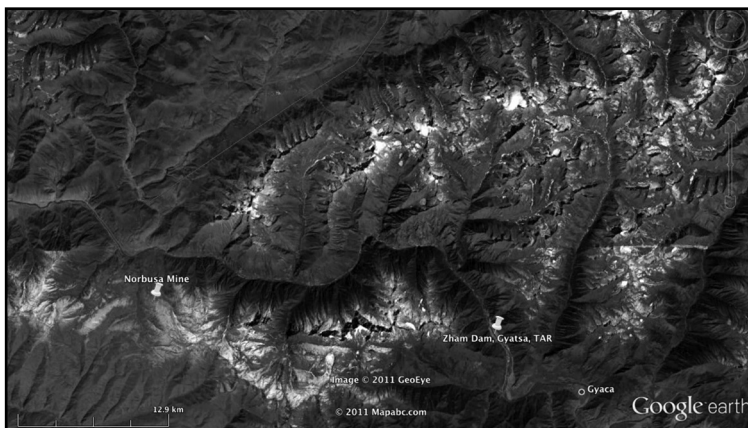


Fig. 2 Google earth image showing the location of rZam Dam in Gyatsa, 30 km east of the tectonically active Tsona-Chusum Rift (marked as red line).

The Tibetan Plateau due to its unique tectonic settings and active deformation, experiences high seismic activities that are frequent and often severe (Deng Qidong, 2014). Some of these dams on Tsangpo are built or planned close to major fault

lines e.g., dZam dam (Ch: Zangmu) is just 30 km east of the tectonically active Tsona-Chusum rift (Ch: Cona-Qusum; Fig. 2). Moreover, the whole stretch of the Indus-Yarlung Suture experiences strike-slip motion (different blocks of landmass sliding past each other) with high seismicity. The weight of water stored in the dam has been found scientifically to be sufficient to trigger seismic events, which could further aggravate landslides and heavy siltation, posing high risk to the dam as well as lower riparian communities. Thus, instead of simply perceiving Yarlung Tsangpo as a potential hydropower resource, China must take serious consideration to address the long-term environmental and social impacts of such a full-river development. The emission of greenhouse gases from the dams will grossly deteriorate the warming trend in the Tibetan Plateau. Therefore, China's endeavour to save 200m tons of carbon each year (by using hydropower instead of coal) might turn into another Three Gorges Dam, a model of disaster. The cumulative effect of dam construction on this tectonically, geographically and ecologically significant region could be detrimental.

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WATER SECURITY AND ENVIRONMENTAL MANAGEMENT ON THE TIBETAN PLATEAU

Climate Change in Tibet and impacts in Asia

With an average elevation of 4500 meters, the Tibetan Plateau is one of the most distinctive land-features on this earth. For many generations, this Plateau has met the basic necessities to sustain life and flourish human civilizations beyond its vast border. The modern era now begins to acknowledge the significance of its strategic location for developing peace and harmony within the region or the opposite. The Tibetan Plateau, also referred as ‘The Water Tower of Asia,’ is the headwater of major rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Myanmar and Vietnam. The snowpeaks and glaciers enable Tibet to be the source of major rivers that flow into Asia. As a result, approximately 1.3 billion people are dependent on the health of ten major rivers that originate in Tibet. The total river basin area (as of 2003 data) is estimated above 5,477,700 sq. km. The Plateau provides Asia’s freshwater resource from the deserts of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonle Sap lake of Cambodia to the North China plain (Environment and Development Desk, 2008).

Critical components to Tibet’s ecosystem are undergoing major transformations due to climate change. For instance, it has led to the receding of Tibet’s glaciers, shrinking and disappearance of thousands of lakes, drying of wetlands, thawing of permafrost, and reduced flow regimes in many rivers. Abnormal weather conditions due to climate change has made subsistence farming and herding more unpredictable, thus impacting the livelihoods of a majority of Tibetans. These days, on the Plateau, the spring thawing takes place earlier than usual and the permafrost is melting away before the growing plants can access the water. This affects not only the crops but also the native vegetation of Tibet, especially in wetlands and other low lying areas. The loss of wetland in turn threatens the migratory birds that are used to Tibetan stopovers during the mating season (Environment and Development Desk).

Temperature rise: This rise in temperature has also increased the rate of evapotranspiration from the rivers and watershed areas intensifying the desertification process. ‘Eco-compensation’ (payment or compensation for ecological services) for the Tibetan farmers could become a viable solution in order to protect the downstream areas from possible water crisis (Immerzeel, Stoorvogel, & Antle, 2008). The immediate recipients of the climate change impacts are those herders and farmers who did nothing to face these conditions. Chinese National Climate Change Assessment Report (Chinese National Climate Change Programme, 2007)

revealed that China's average annual temperature could increase between 1.3 to 2.1 degrees by 2020 and as much as 3.3 degrees by 2050. It is predicted that precipitation in three of the seven major rivers will drop by 30 percent in the second half of the century leading to a 37 percent decline in wheat, rice, and corn yields. Major cities in coastal areas will face serious challenges due to rising sea levels, and extreme weather patterns are likely to increase. In recent years, Tibet has seen a continuous rise in temperatures at the rate of 0.3 degree Celsius per decade, which is twice the global average temperature rise. Increased temperature has accelerated glacial shrinkage and has accelerated the degradation of permafrost¹ regions.

Glacier shrinkage, lake growth: According to other scientists (Qiu, 2008), 82 percent of the Tibetan Glaciers have already retreated in the past half century. In the past 40 years, Tibet's glaciers have shrunk by 6,600 sq km (as of year 2006). It is estimated that they are currently melting at a rate of 7 percent per year. A separate study by a NASA scientist in 2010 revealed that 20 percent of Tibetan glaciers have retreated in the past 40 years and if the current trend continues, more than 60 percent of the existing glaciers could be gone in the next 40 years. Even the Chinese national reports have mentioned that the area of glaciers and frozen earth is expected to decrease more rapidly and are estimated that glacier area in western China will decrease by 27.7 percent by the year 2050.

The formation of glacial lakes as a result of the rapid melting of glaciers on the higher reaches of the mountain ranges continues to pose a serious threat to downstream countries (lower riparian), especially Nepal and Bhutan. The International Centre for Integrated Mountain Development (ICIMOD) has identified some 8,790 glacial lakes in parts of the Hindu-Kush Himalayas, of which the organization has confirmed 204 glacial lakes as 'likely to burst,' causing floods that could be devastating to downstream communities.

Permafrost: The frozen soils and the seasonally frozen soils on the Tibetan Plateau are well preserved over a long time by low winter air temperatures. Its seasonal thawing and refreezing have also played a vital role in balancing the delicate alpine vegetations, until now. Slope failures are often seen on the Tibetan Plateau due to permafrost degradation². Locally, this degradation would result in the gradual desertification of grasslands and increased ground temperature.

1. In geology: permafrost soil is soil at or below the freezing point of water (0 °C or 32 °F) for two or more years.

2. Permafrost degradation has changed the regime of water retention and regulation by producing more runoff in areas of permafrost, leading to more evaporation. It has also prolonged the thawing period significantly leading to many interconnected ecological changes and technological worries.

Human interference is also responsible for the degradation of permafrost layer on the Tibetan Plateau. Some Chinese scientists in their study along the Siling Lhasa Highway (SLH) corridor have found that the heat accumulation under the asphalt road bases resulted in increased thaw depths too great to be frozen and, consequently, resulting in the degradation of permafrost. They indicated that the ground temperature has been increasing noticeably leading to permafrost degradations (Jin, Yu, Wang, & Lan-zhiLü, 2008).

Grasslands: Just above these great stretches of frozen soils lie the alpine grasslands and cold meadows that represent one of the last remaining agro-pastoral regions in the world. The Tibetan Plateau itself is covered in almost 70 percent of these precious grasslands. The pasture lands are made habitable through the co-existence of the Tibetan herders and their yaks. Through their efforts they have maintained the sustainable use of this area for many centuries. China's introduction of different grassland policies over the years threatened the sustainability of this delicate environmental balance. The new policies restrict the flexibility and mobility of the nomads (main factors in the nomadic pastoral production) and blame their livestock for overgrazing the grasslands (Environment and Development Desk).

For centuries, the Tibetan pastoral nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. For some social scientists, nomadism is a strategy to optimize use of available natural resources and capitalize on socio-political conditions. While often ridiculed as primitive or even 'incomplete' by outsiders, it is in fact a highly sophisticated adaptation for exploiting energy captured in the grasslands of the region (Merkle, 2002).

This new policy, 'tuimu huancao' (Annex 1) assumes the only way to conserve China's upper watersheds is to remove animals and nomads. Yet China's own scientists have now learned through patient observation that the grasslands of Tibet, when grazed moderately and intermittently, moving herds on well before the short summer growing season ends, actually maintains a higher biodiversity. It took Chinese scientists 50 years to discover what the nomads have always known. But the most immediate impact of climate change is the exclusion of nomads from their lands, labeling them officially as "ecological migrants". UN Special Rapporteur on the Right to Food, Mr. Olivier De Schutter has mentioned in his Preliminary Observations and concluding statement during his mission to the PRC (15 -23 December 2010) that, the herders should not, as a result of the measures adopted under the 'tuimu huancao' policy, be put in a situation where they have no other options than to sell their herd and resettle.

These days, many researchers and rangeland specialist are arguing the applicability of these new policies, and how much these have actually benefited or affected the herders. Recent scientific findings give us more insight information about the regeneration of the grasslands and the vital role of grazers in replenishing the m. In their studies, they revealed that grazing actually helps in regenerating the grasslands (Klein, Harte, & Zhao, 2007). Field observations conducted on these grasslands have revealed positive connections between the grazing herds of the nomads and the grasslands. The researchers say that abandoning these grasslands will lead to the domination of the invasive species and do more harm for the grassland which in turn would affect the frozen soil that recharges these mighty rivers. Some recent research revealed that underground aquifers are a major contributor to the flow of the mighty rivers originating from the Tibetan Plateau. These underground aquifers are in turn dependent on the health of the permafrost soils.

Tibetan Plateau and the Asian monsoon pattern

The Plateau's seasonal heating during summer and spring plays a principal role in determining the large-scale air circulation in summer. Heating over the Tibetan Plateau tends to generate a surface cyclonic circulation and upper-atmosphere anti-cyclonic circulation which results in the appearance of a large air motion in the eastern side of the Plateau. As long ago as 1884, an English meteorologist working in India had the inspired idea that the snows of Tibet and the Indian monsoon are causally connected. Henry Francis Blanford³ also suggested that the less it snows in winter in Tibet, the earlier the snowmelt, and the earlier the monsoon (Blanford, 1884). During summer, the Tibetan Plateau acts as an elevated heat source driving the Asian monsoon, with sensible and latent heat fluxes domination over the eastern and western Plateau respectively. The differential heating between land and sea intensifies the pressure gradient between the south Asian landmass and the Indian Ocean leading to the flow of air and moisture from the sea (Environment and Development Desk). In other words, the Tibetan Plateau acts as a heat pump in the summer drawing in the moisture rich water vapors from the Bay of Bengal. The seasonal monsoon wind shift and weather associated with the heating and cooling of the Tibetan Plateau is believed to be the strongest such monsoon on earth. The major rivers that flow from the Tibetan Plateau are further recharged by the monsoon as they reach the lower riparian countries.

Water availability and management in China

According to survey data analyzed by the Joint Monitoring Program for Water and Sanitation of WHO and UNICEF, about 100 million Chinese still did not have

3. The Proceedings of the Royal Society in London, proposed that the greater the snow cover in the land of snows, the later the Indian monsoon wets the parched earth on India

access to an improved water source in 2008, and about 460 million did not have access to improved sanitation. Progress in rural areas appears to lag behind what has been achieved in urban areas. Water scarcity threatens the ability of China's farmers to irrigate their crops, impacting food security as well as social stability, especially in northern China. Water shortages cost the country an estimated 40-60 billion RMB⁴ in lost economic output per year. Continued scarcity and uncertainty will affect the willingness of foreign and domestic companies to invest in China, further lowering the production of existing facilities, and ultimately affecting the job market (Hu).

The recent supply of water and the sewerage pricing in China with relation to its water scarcity is still very low and are not well balanced to meet the supply and demand level for long-term sustainability. For instance, in Chongqing⁵, more public funds are spent on bottled water than on metered water due to the low quality of the water and the poor people have no alternative than to consume the inferior quality water (Xie, 2008).

The authorities have so far failed to combat the main reason behind the inefficient water usage-the substantial under-pricing of the water. And the main reason for this failure lies in the ever-present sense of insecurity amongst the Communist party if the farmers and the factory owners protest against the proper pricing of water (Forbes, 2011).

According to China's Ministry of Environmental Protection, one quarter of China's surface water is contaminated, and more than a quarter cannot be used for drinking, swimming, or fishing. Such conditions have a significant effect on the Chinese economy (Report to the US-China Economic and Security Review Commission, 2010). In the 12th Five Year Plan, China has made strict rules for pollution control, particularly so as to govern the wastewater discharge. It aims to cut the release of major industrial pollutants such as COD (chemical-oxygen demand), and others by 1.5 percent per year to 2015.

The current situation necessitates a change in the Chinese government approach toward the development of water infrastructure. China needs to step away from a protectionist stance and move toward a more global perspective which involves understanding that increasing foreign involvement will be a necessary part of strengthening China's national water security (Hu).

The sheer struggle to combat the water management and to achieve those wishful targets reflected in the 12th Five Year Plan requires a massive build-up of trust in

4. Equals to (6.3 - 9.5 Billion USD)

5. Major city in Southwest China and one of the five national central cities of China.

common people and most of all, a huge upfront investment for new infrastructures and upgrading of the existing water treatment plants to function more efficiently. The same could be achieved by working hand-in-hand with the developed nations, in the case of water management, especially in the agricultural sector, the PRC could invest (as it has in state TV and its military budget) in the emerging technologies in desalination and highly-efficient drip irrigation, and in water re-uses⁶. According to Yusha Hu (Hu), China can achieve foreign investment in China's water infrastructure if it changes its current complex set of requirements⁷ that are designed to limit foreign control while maximizing technology transfer to local firms. After all, even if it tries, the bureaucratic infighting and a lack of coordination among ministries, commissions, and state-owned companies have led to severe challenges in creating and implementing policies (Report to the US-China Economic and Security Review Commission, 2010).

Often the implementation of water and pollution governance fails due to bureaucracy, lack of clear guidance and corruption causing major environmental accidents and negligence as demonstrated by the case of the chemical leakage at a copper mine in Fujian Province (Bloomberg News, 2010) and the negligence of authorities at Kumbum monastery in Amdo (Ch: Qinghai), when the tap water detected high lead (Pb)⁸ concentrations due to a mining activity (High Peaks Pure Earth, 2011).

According to Article 34 of China's 2002 Water Law, it is illegal to construct waste outlets in protected drinking water sources. In Tibet, most of the water related problems are connected with mining activities. Since late 1960s, mining firms have exploited Tibet in various scales and mostly under very poor environmental norms and regulations. Besides destroying the ecology and polluting the water sources, most of these mining projects create social tension and distrust when standard corporate policies are not followed. According to an interview conducted by our office with newcomers from Tibet (in the year 2010) we were told that loud announcements were made in the streets that the central government needs to develop these mineral ores. Anybody found revolting against mining would be considered as revolting against the State. But even under such circumstances, in the past two years (2010-2011) there have been several protests by local residents related to mining activities, mostly when the local water supply is diverted and

6. In doing so, PRC should also protect the intellectual property rights

7. They include build-operate-transfer agreements (BOT), public-private-partnerships (PPP), and an array of joint venture structures (JV) that typically require majority ownership to be Chinese.

8. Lead interferes with a variety of body processes and is toxic to many organs and tissues including the heart, bones, intestines, kidneys, and reproductive and nervous systems. It interferes with the development of the nervous system and is therefore particularly toxic to children, causing potentially permanent learning and behavior disorders. Routes of exposure to lead include contaminated air, water, soil, food, and consumer products

polluted for mining activities. Unlike the environmental protests in many parts of China, such protests in Tibet are suppressed by armed forces and in many cases the locals are silenced by firearms. If the concerned water authorities seriously want to curb the water pollution to manage this precious resource, it should start from the head regions of these rivers, rather than taking strict measures to clean the already polluted water. On a larger scale, Ma Jun⁹ writes that ‘Environmental protection policies are subordinate to the broader economic picture. Environmental impact assessments can be breached if they are a barrier to investment. Once a crackdown has ended, polluting industries can pick up where they left off—as long as it will benefit GDP growth. Faced with the choice between economic growth and protecting water resources, local governments favor the economy.’

Regional competition for water: Chinese dams

Tibet is strategically important to China due to its centrality in Asia’s hydrological cycle: Tibet’s glaciers, underground springs, lakes and high altitude makes it the freshwater repository, water supplier and rainmaker of China, Southeast Asia and South Asia. Brahma Chellaney (a professor of strategic studies at the independent Center for Policy Research in New Delhi) writes, in his latest book (Chellaney, 2011), “Control over the ‘blue gold’ wealth of the Tibetan Plateau makes China a potential water power in the way Saudi Arabia is an oil power”.

According to a report published by Institute of Defense Studies and Analyses (IDSA) in 2010, “water demand in India will grow from its current water supply of approximately 740 billion m³ (current level) to almost 1.5 trillion m³ by 2030, principally driven by population growth and the domestic need for agriculture. With no proportional increase in water availability and an ever increasing demand, a water crisis is imminent. Water being international, indispensable, and emotional can serve as a cornerstone for confidence building and a potential entry point for peace” (Institute for Defence Studies and Analyses, 2010).

Loh Su Hsing¹⁰ writes in JakartaGlobe, “The big issue in Asia, apart from climate change, is whether China will exploit its control of the Tibetan Plateau to increasingly siphon off for its own use the waters of the international rivers that are the lifeblood of the countries located in a contiguous arc from Vietnam to Afghanistan. China is not only building mega dams on the international rivers running out of the Tibetan Plateau but is also damming the trans-boundary streams in its north and west that

9. Ma Jun is a Chinese environmentalist, journalist; he set up the influential NGO, IPE (Institute of Public and Environmental Affairs) in China. Time magazine named him as one of the world’s 100 most influential people in the year 2006

10. Loh Su Hsing is an associate fellow of the Asia Program at Chatham House.

flow to Russia and Kazakhstan. China has dammed almost every major river on the Tibetan Plateau, including the Mekong, the Salween, the Brahmaputra, the Yangtze, the Yellow, the Indus, the Sutlej, the Shweli¹¹ and the Karnali¹². China has unveiled plans to dam the rivers that still remain free flowing, such as the Arun¹³ and the Subansiri¹⁴. In the wake of climate change issues, the International Centre for Integrated Mountain Development (ICIMOD) has revealed alarming details on the sustainability of the Himalayan glaciers. According to their findings, the current trend of melting glaciers suggests that the Ganges, Indus, Brahmaputra and other rivers across the northern India plains could most likely become seasonal rivers in the near future.

The Chinese dam building frenzy is creating huge discussions on whether these dams could be an initial step in enhancing its ambitious water transfer projects. Some experts believe that the current railway network linking Beijing and Lhasa would further enhance the needful transportation of technical staff and inventories to initiate this water diversion project. After many years of denial, when the Indian satellite images confirmed the plans for China dam on Yarlung Tsangpo (Indian Express, 2009), the Chinese finally confirmed building a HPP (Hydropower Plant; 510 megawatts) on the upper reaches of Yarlung Tsangpo at dZam (Ch: Zangmu), at Lhoka prefecture in Tibet. No doubt, the PRC was quick in responding that the current HPP is a run-of-the-river project. But that too requires some storing of water to fill the reservoir. But that is not the end, five more dams are on the drawing board along the Yarlung Tsangpo and no clear information is available as to how and when they will initiate the other projects. World Wide Fund (WWF) for nature, formerly known as World Wildlife Fund, named the Indus River as one of the world's ten rivers at risk. The Indus which was already facing an acute shortage of water in its flow due to climate change suffered more obstruction after Beijing built a dam on the dying river without informing the downstream countries-India and Pakistan.

The Zachu or Mekong River, originating from the central Tibet through Yunnan Province in China and then flowing through Laos, Thailand, Cambodia and finally ending its journey in Vietnam is the lifeline for the Mekong region countries. This river directly supports approximately 70 million people along its basin from fisherman to farmers. The damming activities along the upstream of Zachu/Mekong have significantly affected the flow volume of the river. So far, the PRC has in total 21 HPP either built, under construction, under active consideration in

11. Shweli River is a river in Myanmar (Burma). It forms part of the boundary between Burma and China

12. Karnali is the major tributary that flows from Tibet forms river Ganga

13. Arun flows from Tibet as Bhumchu to Nepal and India

14. The Subansiri River is a tributary of the Brahmaputra River flowing from Tibet to the Indian states of Assam and Arunachal Pradesh

Tibet alone. The users downstream are turning their frustration on the Chinese government whose damming projects on the upstream Mekong River has greatly affected their lifestyles. Fishing boats are seen stranded on the shores of dried Mekong River in Mukdahan Province and at Nakhon Panam in Thailand. The livelihoods of the local fishermen and many other communities from Cambodia are threatened by the reduced flow of the river but their concerned voices are blanketed by the aid their government receives from China. According to Kate Lazarus¹⁵, the single largest activity affecting water use, management and productivity in the Mekong region today is development of rivers for hydropower. With the total count of over 140 hydropower plants that are either built, under construction or planned, it will put around \$3 billion US worth of fisheries at risk. The aggregate demand for electricity in Greater Mekong Sub-region is projected to rise from 108,850 GWh in 1995 to 600,000 GWh in 2020. Virtually every study of the impact of dams on the Mekong System predicts substantial environmental and social cost as a consequence of their development (Lazarus, 2011).

China has built over 87,000 hydro dams, more than any other country in the world. Besides performing various functions, the issue of dam safety has always been treated as a sensitive subject. Now, incidents at a number of dams and reservoirs have cast doubt on the quality of these projects, but they are rarely reported to the general public (Zongshu & Nianzu, 2011). Zhang Boting, Vice Secretary of China Society for Hydropower Engineering, told reporters that the 12th Five Year Plan called for hydropower development to be prioritized. For various reasons, two thirds of the hydropower projects detailed in the 11th Five Year Plan had not been completed and would be revived in the 12th Five Year Plan.

On March 5, 2011, premier Wen Jiabao presented his ‘government work report’ during China’s annual parliamentary session in Beijing, revealing the key goals of the country’s 12th Five Year Plan (2011-2015). Apart from other grand visions to cut energy and carbon intensity¹⁶, China also aims to boost the proportion of non fossil fuels in primary energy consumption to 11.4 percent. After the Japanese nuclear tragedy and the subsequent freezing of further approvals of nuclear projects in China (at least for a few years), this is in fact a green signal for the dam construction companies to invest more on the Tibetan rivers and to meet its energy target.

In a recent media interview, according to China dialogue, Zhi Xiaoqian¹⁷ said that “plans had been drawn up for all of Tibet’s major rivers, including the middle reaches of the YarlungTsangpo. But a lack of clear policy direction has meant

15. MSP Coordinator/Specialist, CPFW-Mekong Water Governance, M-POWER

16. Carbon intensity is defined as carbon dioxide emitted per unit of GDP (i.e., the ratio of one ton of carbon dioxide to \$1,000 of GDP)

17. Head of the Chengdu Surveying Institute

approval for those plans has been slow and the projects have not commenced. Now the time and conditions are ripe. China's energy supply is becoming ever more pressured, and there's an urgent need to develop the rich hydropower resources of Tibet," Zhi said. "Currently less than 0.6% of Tibet's hydropower resources have been developed. In comparison with the rest of China, this is virgin territory" (Yannan & Haining, 2011). Meng Si¹⁸ mentioned that, China's green NGOs believe hydropower projects could bring economic development, but not necessarily to the benefit of local people. They believe that today's insufficiently transparent policy making mechanisms are maximizing the interests of hydropower industry, officials and a small number of experts, while driving ecological destruction, affecting local livelihoods and increasing the risk of geological disasters. According to an article in Huffington Post, Catriona Luke, a South Asia writer for newstatesman.com writes that for China, Tibet's rivers are proving as rich resources for hydroelectric and geo-political power as its mineral wealth. But frenzied dam construction projected until 2020 means that a prehistoric irrigation system that dates back 30 to 40 million years is coming to an end (Luke, 2011).

Growing industrialization, population growth, and increasing levels of consumption are placing heavy demands on water resources, which provide vital support for the subsistence livelihood to millions of people. Currently, there exists is no regional framework for South and East Asian nations to discuss or negotiate over water resources, other than the Mekong River Commission, whose members are Cambodia, Laos, Vietnam and Thailand. China is not party to any bilateral or multilateral agreement on water with downstream nations, other than as a 'dialogue partner' to the Mekong River Commission.

Recommendations

The Tibetan Plateau is the land bridge connecting South Asia with East Asia. The very survival of almost 1.3 billion people depends on the water resources originating from the Tibetan Plateau. The impact on Tibet's landscape and its natural resources due to climate warming and human intervention will threaten not only the future food security of many nations but also their development. The United States can help address the problems of warming on the Tibetan Plateau and its consequences by providing political, financial and institutional support. To this end, we offer the following recommendations to U.S. policy-makers:

Recommendations 1: Monitoring

The U.S. government, in collaboration with private and academic institutions, should partner with Chinese and international scientific institutions to monitor

18. Meng Si is the managing editor of Chinadialogue's Beijing office

glacial retreat, temperature rise and carbon levels on the Tibetan Plateau, with a goal of creating better models to understand warming trends and the resultant impacts on permafrost, river flows, grasslands and desertification, and the monsoon cycle.

Recommendation 2: Mitigation

The U.S. should engage with the Chinese government and NGOs to encourage a systematic re-thinking of policies related to grassland management and nomad resettlement. Changes in the ecosystem of the Tibetan Plateau will require sound mitigation policies and on-the-ground stewardship, which must include the integral participation of Tibetan stakeholders, primarily the nomads and their indigenous experience in managing this land for centuries.

Recommendation 3: Regional Framework

The U.S. should promote creation of a regional framework on water security. Such a structure would facilitate cooperative agreements among all riparian neighbors that would promote transparency, sharing of information, pollution regulation, and arrangements on impounding and diversion of river water. The U.S., which is already involved in a similar role with the Lower Mekong Initiative, could cite this initiative as a model or a starting point for further regional cooperation.

Annex 1: ‘Restore Grassland Policy’ or ‘tuimu huanco’ 2003

In 2003, a grassland rehabilitation policy is implemented throughout the country and in pastoral areas this policy is referred to as the ‘Restore Grassland Policy’ or ‘tuimu huanco’ in Chinese, meaning ‘closing pasture to restore grasslands’. In recent years, moving herders from the grasslands to state build housings is being largely intensified and has now become the central measure in protecting these grasslands. The land lease certificates guaranteeing nomads long term land tenure have been nullified by the new command. Instantly, all their skills, risk management strategies, environmental services, traditional knowledge and biodiversity conservation are gone, redundant, as if they had never existed. The compulsory ‘ecological migration’ of the Tibetan nomads is grounded in ignorance, prejudice, a failure to listen and learn. China is far from alone in assuming its nomads are backward, and to blame for degrading land. But around the world, governments increasingly recognize that pastoral nomadic mobility holds the key to sustainability on the dry lands of the world.

In 1990s, even after implementing series of policies and measures, nothing much changed and it became obvious that everything on the grasslands was going wrong. The rangelands were degrading, including the arid area of eastern Tibet where both of China’s great rivers, the Yangtze and Yellow, rise from glacier melt. Chinese

scientists and administrators turned to just one explanation. The nomads were to blame. They were overstocking, beyond the carrying capacity of the pastures, and this was the cause of degradation. The compulsory overstocking during the commune system could not be discussed; it was and is off-limits. So only one cause was possible: to blame the nomads. Irene Breivik who conducted field research in Tibet stated in his final research paper that Control is a central dividing component, as the nomadic pastoral practices are centered around mobility and flexibility, whereas the current semi-settled production system limits the herders' mobility, and grazing is sought to be better controlled. This diverging rationality seems to be largely causing a situation where the traditional practices are considered as insufficient to conserve and rehabilitate the grasslands.

But some recent research revealed that overgrazing and degradation of the grasslands is not entirely dependent on the grazing livestock. The herders even talked about weather changes, rodents and mining activities as important factors causing grassland changes.

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DEGRADING WETLANDS OF THE TIBETAN PLATEAU

Every year on February 2nd, World Wetlands Day is celebrated internationally which marks the anniversary of the signing of the Convention on Wetlands of International Importance (Ramsar Convention) in Ramsar, Iran, on 2 February, 1971. The international theme for World Wetlands Day 2012 is ‘Wetlands and Tourism’.

Presently the parties of the Ramsar Convention have 160 contracting members including China who joined the Convention in 1992. The list of Wetlands of International Importance includes 1994 wetlands, with a total area of about 192 million hectares. Out of this 41 sites are located in China, covering an area of 3,709,853 hectares (Ramsar, 2011).

The wetland is known as the ‘kidney of the earth’ and is one of the three major ecosystems along with forest and ocean. The wetland plays a key role in flood control, water conservation, pollution control, environment regulation and so on. It is deemed as a warehouse with water and food for humans as well as a habitat for rare wildlife to overwinter and reproduce.

Wetlands of the Tibetan Plateau

Known as ‘the third pole’ and ‘the water tower of Asia’, Tibetan Plateau has 1,33,000 sq. km of alpine freshwater wetland, which functions as a source of major rivers of Asia, biological species gene pool, oxygen supply, a potential carbon sink, and a critical factor maintaining the stability of water table and the balance of diverse alpine ecosystems in the Tibetan Plateau.

The wetlands on the Tibetan Plateau are distributed mainly in three kinds of areas including:

- Source region of rivers that provide life-giving waters to over a billion people and flow into sea directly or indirectly, e.g., lake Wetland, river wetland and swamp wetland distributed in the source area of Driчу (Yangtse River) and Machu (Yellow river).
- The hinterland of the Tibetan plateau with very high altitude or inland water in basins among mountains, e.g., inland river or lake wetlands in the Northern Tibet’s Jhangthang Plateau, A-chen Gang-gyal (Kekexili) and Tso-ngon (Qinghai Lake).
- Flat and lower elevation areas such as Dzoge (Ruegai), Tsaidam (chaidamud) and permafrost. Besides, backwater areas adjacent to alpine glacier and snow cover, and swampy wetlands exist extensively in these flat regions of the Tibetan Plateau.

Three-river Source Region (Tib: ལྷ་ལྷོ་རྩ་གསུམ།), which is located in the south of Tsongon (Qinghai Province), is the source of Machu (Yellow River), Drichu (Yangtze) and Zachu (Lancangjiang). Plateau wetland ecosystem in Three-river Source Region is the largest with the highest altitude above sea level in the world, the total area of which is 7.33×10^6 ha. It supplies an estimated 25%, 49% and 15% of Drichu, Machu and Zachu's total water volume, respectively.

Another important wetlands distribution area in the Plateau is Ruergai with altitude ranging from 3400 to 3900 m, where the wetland is the largest Plateau peat swamp remaining in China with a total area of 1.6×10^6 ha. Ruergai wetland ecosystem is a critical water conservation of Yellow River and is the concentrated distribution area of plateau swamp vegetation and main breeding habitat of *Grus nigricollis* (black-necked Crane) and its common plant species are *Carex muliensis* and *Clinelymus nutans*.

Lhalu Wetland located in the north of the city of Lhasa, covers an area of 12.2 sq. km. With an average elevation of 3545 meters, it is highest altitude wetland in the world. It had been reported that the wetland has 52 geneses of 30 plant families, 43 species of terrestrial wildlife, 152 species of aquatic wildlife and 101 species of insect. Black-necked cranes, Bearded vultures and Himalayan Griffon are some of the important species found in this wetland.

The most notable feature in this image of the Lhasa city (Tibet) is the Lhalu Wetland Nature Reserve on the northern side of the city. The reserve is a red brown landscape with black smudges where water darkens the surface. The natural wetland influences Lhasa's climate, adding humidity to the city. The plants are also an important source of oxygen to a city with a thin, high-altitude atmosphere. The Lhalu Wetland Nature Reserve provides habitat for a wide range of birds.

Degradation of the Alpine Wetlands of the Tibetan Plateau

Diverse wetland ecosystems in the Tibetan Plateau have been playing an important role in maintaining the healthy performance of other kinds of ecosystem and regulating water resources. These wetlands are also home to many species of birds, mammals, and fish, as well as being critical grazing areas for Tibet's traditional nomadic livestock herders.

However, the Tibetan Plateau's wetlands are now seriously threatened by human intervention and global climate change. Due to various natural and human factors, typical alpine wetland has degraded extensively with its area shrinking an estimated 10% in the Tibetan Plateau. The ecosystem shifting in the western and northern part of Three-river Source Region, which involves water ecosystem shifting to bottomland ecosystem and wetland shifting to grassland, occurred during 1975

to 2004, resulting in the shrinking of the aerial extend of the water and wetland over the years. The greatest such degradation occurred in the Source Region of Drichu where swampy wetland shrank by 29% and nearly 17.5% of lakes had dried up (Wang Genxu, 2007). Similarly, 38.9% of total lake dried up from 1985 to 2000 in Dzoge Region, at a rate of around 56.13 ha per year (Pan Xubin, 2011). Degradation of plateau wetlands led to alteration of their hydrological functions. In the source region of the Drichu and the Dzoge region, where the wetlands declined more severely, the frequency of the perennial low water runoff decreased while the rare larger runoff increased. Besides, water regulation capacity of all the wetlands was declined.

Climate change has been an important cause of wetland degradation in the Tibetan Plateau. Due to the increased irregularity of annual precipitation, the prolonged duration of sunshine, and the rising air and soil temperature, there has been adverse effects of water loses and the degradation of plateau wetlands.

Furthermore, another driving force for wetland degradation has been the small-scale changes of the temporal and spatial distribution of key climatic factors and alteration of local climate characteristics. Meanwhile, human activity plays an important role as amplifiers and accelerators in wetland degradation processes.

Protection of the wetlands of the Tibetan Plateau

China's efforts to portray itself as the protector of its biodiversity and ecology is evident from the lengthy white paper about its 'Policies and Actions for Addressing Climate Change' and series of Xinhua reports bragging its 'initiatives' and 'achievements'.

Xinhua, the official mouthpiece of China recently quoted a spokesperson of its State Forestry Administration who boasted that they, 'carried out 42 wetland protection projects, increased 330,000 hectares of protected wetland areas, added four wetlands of international importance and 68 national wetland parks' (ChinaDaily, 2012). These 'initiatives' and 'achievements' may be a step towards the right direction but addressing the critical problem of wetland degradation, which threatens the sustenance of over a billion people, entails urgent and sincere efforts from peoples of all sectors. To protect and restore wetlands in the Tibetan Plateau, a vital and immediate step that the Chinese government must take is to reduce and restrict negative effects of human activities in wetland areas caused by the construction of railways and roadways, deforestation, desertification, and mining.

At the same time, putting ecological compensation into practice may boost the positive effect of human activities on the protection of plateau wetland ecosystems. Additionally, further research on wetland science in the Tibetan Plateau is urgently needed to ensure that conservation of the Tibetan Plateau's Wetlands is seriously considered as a priority rather than just an empty rhetoric that are usually based on some questionable figures.

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THE GEOLOGICAL EVOLUTION AND SEISMICITY OF THE TIBETAN PLATEAU

The Geological Evolution of the Tibetan Plateau

The Tibetan Plateau is undoubtedly the most prominent and distinguishable feature on the face of the globe, rightly known as the 'Roof of the World'. With an average elevation of around 4,500 meters (14,763 ft.) and covering an approximate 2.5 million sq. km of area, it is the largest and highest plateau in earth's entire geological history (Kang, 2010). It is surrounded by the Himalaya-Karakoram complex in the south and west that contains 14 major peaks of over 8,000 meters including Mount Everest. To the north, the plateau is bounded by the deserts of the Tarim Basin and Tsaidam while a series of alternating deep forested valleys and high mountain ranges marks its eastern periphery.

The geological evolution of the plateau and the ensuing tectonic changes has been a matter of interest, debate, and deliberation among the scientific community. The general notion about the onset of its development, even familiar to many school children, has been the collision of Indian plate with the Eurasian plate at around 50 to 55 million years ago. This high-speed collision due to the northward movement of Indian plate relative to the stable Eurasia at a rate of 35-50 mm per year resulted in crustal shortening of the plateau. The resultant high rate of uplift (up to 10 mm per year) led to the eventual construction of the highly elevated Tibetan Plateau. Tibet has a thick continental crust of about 65 km twice the average thickness of earth's crust. During the past 10 million years, the plateau experienced widespread extension (east and west) that are expressed by a series of roughly north-south trending rifts, which are a notable feature of the Tibetan Plateau (L. T. White, 2011).

Since the collision began, there have been a lot of tectonic changes especially in the upper crust of the plateau leaving it as a collage of continental fragments (called terranes) that were added successively to the Eurasian plate during the Paleozoic and Mesozoic eras. The sutures (joints) zones between these microplates consist of ophiolitic materials (volcanic rocks) formed during the accretion of these crustal blocks. The main Tibetan crustal blocks, from north to south, are the Kunlun Terrane, Songban-Karze Terrane, Jangthang Terrane and Lhasa Terrane.

Ideas behind the formation of the vast, elevated plateau?

There have been various theories proposed to explain the formation of this immense thickness with micro-scale variation upon them. An initial idea was the concept of 'distributed shortening', of the Plateau by folding and thrusting of its

rocks. The faulting and subsequent movement of large masses of rock stacked one on top of other leads to the thickening of the crust. Later, it was proposed that the under thrusting of the Indian continental plate beneath the Tibetan Plateau leads to its subsequent uplift, a theory known as ‘continental subduction’. This process is similar to pushing one block of ice slab beneath another slab, causing it to rise upwards.

A more recent proposal, lower crustal flow, involves the introduction of Indian crust beneath Tibet as melted rock, called magma. Granitic melts derived from the subducting Indian crust rise into the overlying Eurasian and transfer heat into the base of the Tibetan Plateau making it buoyant to rise higher.

Active structures and seismicity of the Tibetan Plateau

A series of tectonic deformation at varying scale in the plateau results in various types of active structures including anticlines, synclines, folds, left-slip faults, right-slip faults, strike-slip faults, thrust faults and sutures that are all zones of seismic activities of varying degree. Thrust faulting are formed at plate boundaries due to collision of plates; normal faulting occurs in the middle of the Tibetan plateau due to east-west extension; and strike-slip faulting are a common phenomena at the eastward and south-eastward movement of different fragmented blocks.



Fig.1 Active structures of the Tibetan Plateau (based on Taylor 2009)
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The data of focal mechanism, ground acceleration, GPS vectors and earthquake catalogue suggests that due to the ongoing active deformation across the plateau, there have been a swarm of seismic events in the recorded history that are frequent and often severe. However, only few events have been fatal such as the 1950, Assam earthquake (Indo-Tibetan border) of 8.6 magnitude, which claimed at least 1526 lives (although the casualties were lesser on the Tibetan side) while a more recent

event of 6.9 magnitude struck Kyegudo (Yushul) area of western Tibet, claiming over 2,698 lives and injuring 12,135. Otherwise, the death toll during other events has been minimal due to very low population density over the plateau.

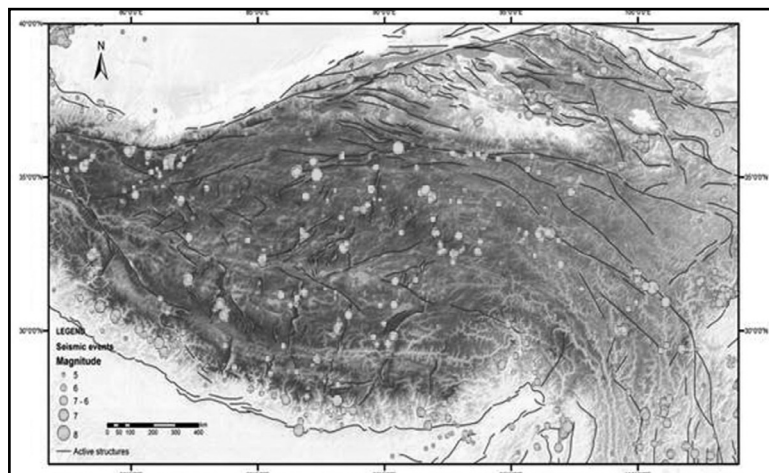


Fig. 2 The distribution of seismic events (over 5 magnitude) across the Tibetan Plateau between 1973 and 2012. Copyright: EDD, CTA

The understanding of the geology and seismicity of the Tibetan Plateau is important as it is closely related to the resources and development in Tibet. The location of mineral deposits and prospects can be identified from geological information while seismic data aids in recognizing hazards posed to development projects such as construction of dams, railways, resettlement housings etc. For example, the series of dams under construction on the Yarlung Tsangpo falls on the seismically active Gyatsa Canyon which experiences strike-slip motion and is also located close to an active rift system in Woga, thus posing a greater threat to the safety of the dam and people living in the downstream regions. As millions of Tibetan nomads are pushed out of their ancestral rangelands into urban ghettos, their vulnerability to earthquake hazard is greatly increased if these concrete housing complexes are located close to seismically active zones of the Tibetan Plateau.

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THE LAST OF THE MOGRU NOMADIC CLAN

(A DOCUMENTARY REVIEW)

The tourism boom in Mogru town of Tso Ngon region (Ch: Qinghai) has brought in new asphalt laden roads for the nomads so that they could ride faster on their horses to the nearest town! It even brought new faces from far across the mainland China along with their waste to litter at this holy lake of Tso Ngon. If not for these development activities that attracts regular visitors and tourists, the Mogru clans cannot afford in their natural lifetime to visit China to meet and see those peoples wearing flashy clothes with headphones.

Tourism industry has literally uprooted the once happy nomadic clan of Mogru in Tso Ngon region (Ch: Qinghai). The whole nomadic community (from elders to infant) is shown as if they are rehearsing every day for a never-ending play. A women, after finishing her daily chores hurried back to dress her five-year-old daughter in traditional costumes, so that she can earn few extra money from the tourists, after posing a photo with them. It is true that, at her age, this young girl should be attending school rather than running behind tourist. But the ground reality tells another story; her daily earnings meant more to support her family than what she could perhaps learn from school. Her family is neither a herder nor an urban dweller with a day job. And from that little earning, almost half of the amount goes to the tourism office for letting her enter the barricade that separates the tourists from the local residents. In other words, she was taxed for being herself truly in front of the camera!

Some local elders have seen everything from day one (back in early 50's), how the first Chinese migrants have faced hardships of mere surviving on these alpine pastures by robbing bird nests. Later after few years, the red army poured in with heavy artillery turning everything upside down and bulldozing all the prairies to make way for a secret military experimental base.

The locals, even though have official documents issued by the provincial authority guaranteeing their right to own this holy place but their out pouring grievances against the tourism agency often put them behind bars. The little money they have earned by selling their ancestral herds have been invested in erecting some concrete three storey building for the community, but the construction was judged illegal, now they have nothing left, no herds, no money, except for the half finished three storey building, which too will be bulldozed in due time. They are now living in their worst nightmares and do not see any way out of it.

For the visitors and tourists (mostly from China), this place provides everything that one's needs to show back home, from a fancy Yak ride at the lake shore to postcard pictures taken with nomads in their traditional costumes. Do they (the tourists) know that these displaced nomads have no other sources of income, they neither own any of the road side shops nor do they get any incentives from the tourism agency, instead they have to pay back to the provincial authority to renew their stay order on their own ancestral grounds.

As per orders given from higher authority, the local administration of Tso Ngon displaced twenty-five family members of Mogru town from to make way for development projects to attract more tourists. An order has been issued for another sixty-five nomad families to abandon their pastures latest by March 2012. The local residents tried their best to put forward their concerns and grievances in various offices. They even traveled as far as Beijing to meet higher authorities but all in vain. The local authority has even declared (in future) to acquire all the lands around Tso Ngon (Kokonor lake), undoubtedly, to build new tourist centers and still more barricades that will prevent the local residents to pay their homage to the holy lake.

Even under such tense state of mind and emotions, the local residents of Mogru town still enjoy the yearly horse race as if nothing has ever changed over the years. May be, it is the only moment when they truly feel they are more connected to their culture, their pastures and to their ancestors. Nobody can read their minds, except for the momentary smiles that are captured in this one-hour documentary.

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THE TIBETAN PLATEAU AND CLIMATE CHANGE: AN OVERVIEW

Today, climate change and its impact are a grave concern for the entire world and one that can no longer be ignored. Such a change is not an inexorable force of nature but in fact, has known human causes and available solutions to restore climatic stability. After Arctic and Antarctic, the Tibetan Plateau is Earth's largest store of ice and a hotspot of climate change. Due to its unique geographical location and high altitude, Tibetan Plateau faces rapid changes in its weather patterns and ecosystems in more extreme ways than other parts of the world. The Plateau has been warming three times as fast as the global average and its glaciers are shrinking more rapidly than anywhere else.

Despite its cold environment, for thousands of years the Tibetan people inhabited this plateau and created cultural landscapes based on the principles of simplicity and non-violence, in harmony with the environment.

The significance of the Tibetan Plateau is clearly evident from different names being used by scientists such as, 'The Third Pole', 'The Water Tower of Asia', 'The Roof of the World' and 'The Barometer of Asia'.

With an average elevation of 4,500 meters, the Plateau contains over 46,000 glaciers covering an area of 105,000 sq. km, and is the highest, largest, and coldest plateau on Earth (shichang, 2010). It is surrounded by the mighty Himalayas in the south, Kunlun Mountains in the north, and Hindu Kush and Pamir ranges in the west.

The glaciers, snow-capped mountains, permafrost soils and alpine wetlands of the Tibetan Plateau hold a large reserve of carbon. If not managed properly they could become a source of greenhouse gases.

The rivers originating from Tibet have been the lifeblood of Asian civilization as ancient societies have developed their lifestyles around these great rivers. Today almost half of the world's population is dependent on the water originating from Tibet. As a result, Plateau's impact is not only regional, but also global.

The plateau plays an important role in generating and regulating the Asian monsoon. It heats quickly in spring and summer, diverting the jet stream, establishing a steep pressure gradient that draws monsoon clouds deep inland into the heart of Eurasia.

The Tibetan Plateau is a unique biodiversity zone with over 100,000 high altitude plant species, 12,000 species of vascular plants, 532 species of birds, 132 identified minerals etc (Environment & Development Desk, DIIR, 2000).

The prevailing global warming and the land use changes over the Tibetan Plateau are leading to a series of interconnected environmental concerns like meltdown of glaciers, degradation of permafrost layers, changes in the river hydrology, drying up of wetlands, shrinking of lakes, and degradation of grasslands and displacement of Tibetan pastoral nomads.

This multi-faceted environmental degradation further enhances warming process and adversely affects the Plateau's climate, its neighbors, and the world at large.

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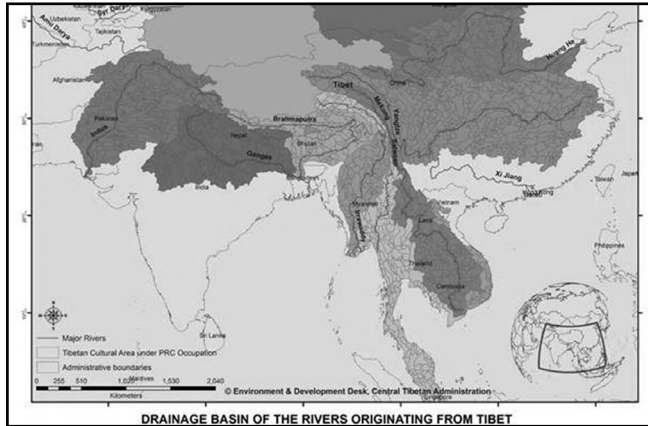
GLACIAL MELTDOWN AND GLACIAL LAKE OUTBURST FLOODS

The Tibetan Plateau holds the Hindu-Kush Himalayan Ice Sheet, considered the largest ice mass outside the two poles. Hence scientists and geologists are increasingly using the name 'Third Pole' to pronounce the global significance of Tibet's environment. According to the Inter-governmental Panel on Climate Change (IPCC), glaciers in the Tibetan Plateau are receding fast, which will result in massive flooding followed by severe drought. Some reports suggest that Tibet's glaciers have shrunk by 6,600 sq. km in the past 40 years and 82% of the glaciers have already retreated in the past 50 years (Qiu, 2008). Furthermore, a major concern is the lack of any net accumulation of snow since 1950 over these mountains (Natalie M. Kehrwald, 2008). The scale of glacial melting can be viewed at Rongbuk Glacier, the northern slope of Mt. Everest (Tib: Jhomolangma). Between 1966 and 1997, the glacier receded by up to 270m in the middle, 170m at its eastern side, and 230m at its far-east side. Similarly, the Zepu glacier of southeast Tibet has thinned by more than 100m in the last three decades alone. Mountain glaciers are experiencing less accumulation of snow and higher rates of melting. Without these glaciers the flow of rivers would become seasonal, leaving the livelihoods of hundreds of millions of people affected by the extreme weather conditions. Furthermore, melting of glaciers and the permafrost in recent years have destabilized hillsides and resulted in landslides. A massive landslide in Tibet blocked Pareechu, a tributary of the Sutlej in Tibet. In the year 2000 and 20005 this unstable rock-fall dam burst caused heavy destruction of livelihood, infrastructure, and socio-economic assets in Kinnaur and Shimla districts in Himachal Pradesh, India. Due to the rapidly melting glaciers, there has been a rapid increase in the numbers of glacial lakes in the Himalayan regions resulting in Glacial Lake Outburst Floods (GLOF) particularly in Nepal, India, and Bhutan. According to the International Centre for Integrated Mountain Development (ICIMOD), there are 8790 glacial lakes within a selected area of Hindu-Kush Himalaya and more than 200 potentially dangerous glacial lakes, where rock walls created by retreating glaciers may suddenly collapse (ICIMOD, 2010).

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IMPACT ON RIVER HYDROLOGY IN TIBET AND SUSTENANCE OF LOWER RIPARIAN COUNTRIES



Snow peaks and glaciers enable Tibet to be the source of major rivers that flow into Asia and meet its water demand. Rivers such as Machu (Yellow), Dri Chu (Yangtze), Zachu (Mekong), Gyalmo Nyulchu (Salween), Yarlung Tsangpo (Brahmaputra), Macha Khabab (Karnali), Langchen Khabab (Sutlej),

Sengye Khabab (Indus), Bhumchu (Arun) and Lhodrak Sharchu (Manas) have their sources in the Tibetan Plateau. According to some estimate, approximately 1.3 billion people in Asia are directly or indirectly depend on the watersheds of these major rivers (Walter Immerzeel, 2015). For instance, Yarlung Tsangpo originates from the glaciers of Mt. Kailash range in Tibet and drains an area of 651,335 sq. km connecting Tibet (50.5%), India (33.6%), Bangladesh (8.1%) and Bhutan (7.8%) ((EDD), 2009). Beyond the populations residing in the watersheds of these rivers are the additional hundreds of millions who depend on monsoon rains drawn inland by the Tibetan Plateau.

Unfortunately, the flow regimes of the rivers in Tibet are changing due to climate change and human interventions. In 2007, the WWF (World Wide Fund For Nature) identified that four out of the world's top ten rivers, which are at greatest risk (from six important threats including dams and infrastructure, excessive water extraction, climate change, invasive species, over-fishing, and pollution), originate from the Tibetan Plateau (Wong, 2007). This includes Sengye Khabab affected by climate change, Dri Chu confronting a pollution crisis, Gyalmo Ngyulchu threatened by dam construction and Zachu threatened by overfishing.

According to the World Commission on Dams, the Chinese government increased the number of large dams from 22 in 1950 to 22,000 in 2000 (The World Commission on Dams, 2000). Although the plans to divert water from the Dri Chu and Yarlung Tsangpo rivers to the fast-drying Machu River will improve its flow through the most populated areas of China, it will deprive water to the millions of people in the lower riparian (downstream) regions.

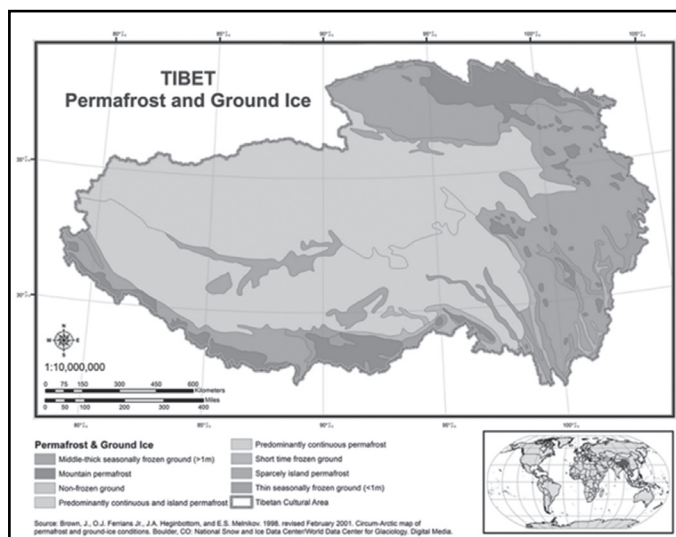
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DEGRADATION OF FROZEN EARTH LAYERS AND RELEASE OF GREEN GASES ON THE TIBETAN PLATEAU



The permafrost and ground ice in Tibet. Image copyright EDD (CTA)

The presence or absence of the permafrost layer necessitates major variations in the soil's physical structure mainly its moisture and nutrient content. The permafrost covers approximately 1.3 to 1.6 million sq. km (Huijun Jin, 2007). These covers have thickness ranging from 1 to 130 m, depending on such local characteristics as slope and exposure, altitude, geological structure, soils, and soil water content.

The alpine permafrost on the Tibetan Plateau stores about 12,300 million tons of Carbon (Khoday, 2007). Significant amount of methane gas is also trapped in the permafrost, preventing its release into the atmosphere. The alpine permafrost on the Plateau is characterized by warm permafrost and rich ground ice, as a result they are sensitive to climate change and are particularly vulnerable to rising temperature.

Tibet serves as a major carbon sink with around 37% (12,300 million tons of Carbon) of its grassland Soil Organic Carbon (SOC) stored in the alpine permafrost of the Tibetan Plateau. Their degradation would lead to a huge amount of carbon entering the atmosphere, intensifying global warming. Recent studies have shown that glacial melting and thawing of permafrost on the Plateau will lead to a large-scale release of green-house gases into the atmosphere and could bring further changes in the already warming global climate. With a significant measured increase in the mean cold season average temperature, the permafrost layers and seasonally frozen grounds are slowly degrading leading to increased microbial decomposition of previously frozen organic carbons. The degradation of permafrost, besides disturbing the carbon balance over the plateau, will also lead to the lowering of the water table, loss of soil moisture content, drying of wetland, extinction of native plant species and desertification.

If the current trend of melting permafrost and loss of wetlands continue then the carbon deposits and methane would be released in the air, and it can speed up the Global Climate Change. The loss of carbon deposits will also degrade the grasslands directly hurting the biodiversity on the Tibetan Plateau. In addition, since the wetlands and permafrost work as sponges controlling the amount of water running into the rivers, there could be flash floods and ultimately water crisis in the most populous regions of the world.

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GRASSLAND DEGRADATION AND REMOVAL OF TIBETAN PASTORALIST (DROGPAS)

Tibet's rangeland with an average altitude of 4,500 meters, covers approximately 70% of Tibet's total area. The Alpine grassland at high altitude occupies over 60% of the total rangeland in Tibet (Environment and Development Desk, 2009). Pastoralism on the Tibetan Plateau is an adaptation to a cold environment at elevations above the limit of cultivation. Consequently, pastoral nomads of Tibet have maintained a unique pastoral culture for more than 8,000 years. Tibet's grasslands represent one of the last remaining agro-Pastoral regions in the world. The pasturelands are made habitable through the co-existence of the Tibetan people and their yaks. According to recent archaeological fieldwork, the Tibetan Plateau has been used extensively by pastoral nomads, who developed deep understanding of grassland dynamics and veterinary knowledge for close to 9,000 years.

According to one UNDP report (Kishan Khoday, 2007), Tibet's grasslands are turning into deserts at the rate of 2,330 sq. km per year. Apart from the natural climate warming and its feedback, various anthropogenic (human-induced) factors are also responsible for accelerating the process of grassland degradation. China's introduction of different grassland policies over the years has threatened the sustainability of this fragile environmental balance. The overall plan during the periods of 'Collectivization and Household Responsibility' was to maximize the agricultural production from the grasslands. During that era, almost 20 million hectares of grassland in Tibet and Inner Mongolia were converted to croplands. Tibetan Plateau's alpine grasslands has been plowed and exposed to hazardous chemical fertilizers causing severe degradation of grasslands.

However, the Chinese government has been accusing drogpas, making them scapegoats for causing the grassland degradation and is planning to forcibly resettle all nomads in permanent structures in order to protect their precious water tower! Chinese government's implementation of the policy to settle Tibetan nomads has led to increasing poverty, environmental degradation, and social breakdown. Tibetan nomads, in reality, are the expert custodians of the alpine pastures and their mobile lifestyle prevents the grasslands from overgrazing. Recent researchers have also indicated that managed grazing on these grasslands could actually help to restore the degraded grasslands and maintain a wider biodiversity of indigenous species of grasses, forbs, and medicinally useful plants.

With the latest policy of restoring the grasslands (2003), these pastures are now being depopulated in huge scales, making them accessible and more prone to extractive

industries and small-scale miners. According to the latest statistics, 1.43 million pastoralists have been removed from their ancestral grounds and are being put in concrete blocks. Their lifestyle has been totally changed from once independent, self-sufficient pasture dwellers to those who now depend on state rations for their daily sustenance. It is high time that the PRC policy makers should work on the principle of collaborative management attending to the needs of these pastoralists.

Therefore, far from being ‘selfish’, ‘stupid’ or ‘ignorant’ of the consequences of grazing, as China supposes, Tibetan nomads has actually been the natural resource managers over millennia. If at all, the implementation of the current grassland law is necessary to protect the grasslands or the Chinese water tower, why the nomads are excluded, and their past experiences are not valued? They could play a key role in rehabilitating the degraded pastures.

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CONTRACTION OF WETLANDS AND DRYING UP OF LAKES

Wetlands, often referred to as earth's kidney, have played a vital role in sustaining ecosystems that serves millions of lives. They act as an enormous sponge slowly releasing water into rivers all round year. The fresh water wetlands on the Tibetan Plateau are distributed in an area of around 1,33,000 sq. km. With their wealth of stored carbon, these wetlands provide a potential sink for the atmospheric carbon. It was also observed that the role of wetland as a carbon sink was closely related with the water table and the amount of precipitation. The warming climate has resulted in the drying-up of thousands of lakes across the Tibetan Plateau. Most of them are considered sacred. These lakes have no outlet and depend entirely on local streams and underground sources to maintain their water level. Already a large number of lakes have disappeared due to warming climate and human activities in the past few decades. This is now accelerating. Dagze Tso is one of many inland lakes in Tibet. In glacial times, the region was considerably wetter, and lakes were correspondingly much larger, as evidenced by the numerous fossil shorelines that circle the lake and attest to the presence of a previously larger, deeper lake. Over millennia changes in climate have resulted in greater aridity of the Tibetan Plateau. The subsequent release of Carbon dioxide, Methane and Nitrogen dioxide from these contracting wetlands further adds up to the yearly GHGs emission. Total Carbon dioxide emission from the Tibetan Plateau wetlands due to prolonged permafrost thawing season is estimated to be around 10 million tons, which is roughly equivalent to Carbon dioxide emitted by 10 million average automobiles in China for two months. The wetlands of Lhalu on the northwest edge of Lhasa, with its total area of 6.2 sq. km could absorb 78,800 tons of Carbon and produce 57,300 tons of oxygen annually. The contraction in the wetlands due to climate change led to reduced flows of the Driчу (Yangtze) and Machu (Yellow) rivers. The warming climate has resulted in the drying-up of thousands of lakes across the Tibetan Plateau over thousands of years. According to Chinese Academy of Sciences, the wetlands on the Tibetan Plateau have shrunk more than 10% overall in the past 40 years (Yu Zhang, 2011), with biggest shrinkage occurring at the source of the Driчу (Yangtze) and Machu (Yellow). The surface area of lake Nam-Tso has decreased by 38.58 sq. km from 1970 to 1988 at a rate of 2.14 Sq. km per year. Similarly, the water level of Tso-Ngonpo has reportedly lowered by 3.62 meters and its water surface shrank by 342 sq. km between 1959 and 2005. The decline in the lake level of Tso-Ngonpo has led to many environmental problems in this watershed such as grassland degradation, deterioration of water quality, wind erosion and expansion of sandy land.

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TIBET: THE THIRD POLE

Introduction: Transboundary Commons

With an average elevation of 4,500 meters above mean sea level, the Tibetan Plateau physically dominates the geographical map of the world. The whole plateau stretches for almost 3,000 kilometers from west to east and 1,500 kilometers from south to north. (Environment and Development Desk, 2009) Since time immemorial, the plateau held the Hindu-Kush Himalayan Ice Sheet, considered as the largest ice mass and reservoir of fresh water outside the two poles, hence the name 'Third Pole' (the third pole, n.d.). The Tibetan plateau even though very inhospitable to many species due to its high altitude and extreme climates holds one of the most diverse plant and animal species, some of which are unique to the Tibetan Plateau for instance Wild Yak, Tibetan Antelope and medicinal plants such as *Rheum palmatum* (Chumtsa), *Frittilaria* (Abhika) and about 400 species of *Rhododendron*.

The Tibetan plateau is also known as 'The Water Tower of Asia' as major rivers of Asia have their source inside Tibet. (Immerzeel, 2008) Glacial runoff from these snow peak mountains and the underground aquifers feeds these rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Burma, Cambodia and Vietnam. For China alone, 30 percent of its fresh water supply is met from the rivers flowing from Tibet. These rivers give hope to and sustain life of millions of people downstream, from the arid plains of Pakistan and India to the rice paddies of Southeast Asian countries. It is estimated that 1.3 billion peoples live in the watersheds of these major rivers (Circle of Blue, 2008). Beyond the populations residing in the watersheds of these rivers are the additional millions who depend on monsoon rains drawn inland by the Tibetan Plateau. It was also indicated that this Southeast Asian monsoon that recharges most of the rivers downstream varies in intensity according to the snow cover on the Tibetan Plateau.

Unlike any other country, almost the entire plateau of Tibet lies on the permafrost soil and seasonally frozen grounds. For centuries, these permafrost soils have acted like a sponge, conserving and managing the flow of these mighty rivers. They have also been the store house for millions of tons of carbon. Lying few meters above these frozen soils are the Tibet's rangelands, from the Northern Plateau of upper Tibet to the extreme eastern edge of the plateau dominating almost 70 percent of its total landscape (Yan Zhaoli, 2005). These rangelands represent one of the last remaining agro-pastoral regions in the world. The types of rangeland vary from alpine meadows and mountain scrub to mountain sparse wood and mountain desert, which helps sustain domestic herds and nurture a wide variety of wildlife species.

These alpine grasslands not only serve as feed to the wild ungulates, but recent scientific studies have revealed that they actually store more than 7,400 million tons of carbon. These inhospitable and cold pasture lands are made habitable through the co-existence of the Tibetan herders and their yaks. Through their efforts they have maintained the sustainable use of this area for many centuries. Tibetan Highland holds over 51 percent of total natural wetlands (excluding lakes and floodplains) in China. These wetlands are dominated by Salt Marsh, Peat land and Freshwater Marsh. The Wetlands in Tibet play a major role in regulating the flow of rivers by absorbing the excess water during the summer and releasing it in the winter when the run-off is short.

Prevailing Environment Situations

Being one of the earth's most sensitive environments and a unique bio-geographical zone, a healthy Tibetan Plateau benefits the entire Asian sub-continent. Over the past five decades, the landscapes on the Tibetan Plateau have experienced much environmental negligence and degradation. Some degradation is by natural phenomenon such as climate warming, earthquakes and others due to human interference such as resource extraction, unskillful policy implementations and infrastructure developments. In recent years on the Tibetan Plateau, there has been a continuous rise in temperatures, almost twice the global average. This rise in temperature not only accelerates glacial meltdown but also accelerates many natural processes such as desertification, evaporation, shrinking and disappearance of lakes, drying of wetlands, thawing of permafrost, and reduction of flow regimes in many rivers.

Glacial Retreat

According to the Chinese Academy of Science, Glaciers on the Tibetan Plateau are melting at a rate of 7 percent annually and if the current rate continues, two-thirds of the glaciers on the plateau will be gone by 2050 (The Guardian , 2006). A separate study by NASA revealed that 20 percent of Tibetan glaciers have retreated in the past 40 years and more than 60 percent of the existing glaciers could be gone in the next 40 years (Pink, 2016). Some recent studies have also indicated that the black soot depositions on these glaciers are also responsible for accelerating the rate of meltdown due to reduced surface reflection and more heat accumulation.

Permafrost degradation

Up until now, the low winter temperatures have well preserved the permafrost soil and the seasonally frozen grounds on the Tibetan Plateau. The increase in the winter temperatures as a result of climate warming slowly degrades or melts the frozen earth. As such the soil loses moisture in spring before the growing plants

can access the water. This affects not only the crops but also the native vegetation of Tibet, especially in wetlands and other low-lying areas. Apart from climate warming, human activities are also responsible for destroying the permafrost cover as indicated in some research works conducted on the Tibetan Plateau. The researchers cited examples of much higher heat accumulations under the asphalt paved road compared to the natural surroundings. They also indicated that the ground temperature has been increasing noticeably leading to permafrost degradation.

End to Pastoral Nomadism and Grassland degradations

The implementations of different grassland and land-use policies have severely affected these grasslands. For centuries, the Tibetan nomads and herders have lived successfully with their herds using only their local knowledge and by keeping a mobile lifestyle. For some social scientists, nomadism, while often ridiculed as primitive or even ‘incomplete’ by outsiders, is in fact a highly sophisticated adaptation for exploiting energy captured in the grasslands of the region.

The vital role played by the Tibetan pastoral nomads in maintaining these pastures are acknowledged only in research articles, and the policy makers often fail to understand these intricate relations since they judge everything in black and white. The current grassland rehabilitation policy that is implemented throughout Tibet referred to as the ‘Restore Grassland Policy’ or ‘tuimu huanco’ in Chinese, (meaning closing pasture to restore grasslands) is restricting the mobility of the nomads and blames their livestock for overgrazing the grasslands (Yeh, 2010). In fact the actual degradation or overgrazing of these grasslands started during the commune system 50 years ago when all the herds were collectivized for one main reason: more meat production (refer to Box 1 for more detail). In recent years, moving the nomads from the grasslands to state-built housings is being largely intensified and has now become the central measure in protecting these grasslands.

China’s own scientists have now learned through patient observation that the grasslands of Tibet, when grazed moderately and intermittently actually maintain a higher biodiversity and healthier pastures. Many researchers have indicated in their findings that depopulating these grasslands and labeling the nomads as ecological migrants will not help to restore the pastures. Field observations conducted on these grasslands have revealed positive connections between the grazing herds of the nomads and the grasslands. The researchers say that abandoning these grasslands will lead to the domination of the invasive species, reduce biodiversity, and do more harm for the grassland which in turn would affect the permafrost soil.

Box1. Grassland degradations

- 1958-1976: Mao Zedong's land reform policy 'Collectivism' and The Great Leap Forward campaign resulted in extensive destruction/conversion of forest and grasslands to croplands. All the nomadic herds were collectivized; renovation of Xiling-Lhasa Highway led to vast degradation of grasslands and permafrost soils.
- 1976-1999: Deng reintroduced 'Household Responsibility' which in turn led to more aggressive farming and conversion of more Tibetan Plateau grasslands to croplands.
- The Chinese government has sponsored the systematic poisoning of pikas (rodents) over an area of 320,000 square kilometers. These rodents are the keystone species of the grasslands, and such large-scale killing of rodents is harmful for the grasslands, and is almost certain to affect other wildlife.
- 2001 onwards: (grain to green, fencing of the grasslands) the unproductive croplands are converted back into grasslands and nomads are blamed for the destruction/overgrazing of grasslands.
- 2003 onwards: Restore Grassland Policy or 'tuimu huanco' in Chinese, (meaning closing pasture to restore Grasslands) is restricting the mobility of the nomads and encourages them to sell their herds and settle.

According to Chinese state media, about 300,000 families involving 1.43 million Tibetan nomads and farmers have been removed from their ancestral pastures into new permanent settlements. Another 185,500 families are expected to move into new homes by 2013. According to the latest 2011 Qinghai statistical yearbook, the area of Amdo region (Ch: Qinghai) affected by drought increased from 108 thousand hectares in 2007 to 158 thousand in 2010 (Hong, 2011). This clearly shows that the current policy of removing nomads from the pastures to protect its water tower is failing badly in terms of what was initially intended.

UN Special Rapporteur on the Right to Food, Prof. Olivier De Schutter said during his mission to the PRC (15-23 December 2010) that, the herders should not, as a result of the measures adopted under the 'tuimu huanco' policy, be put in a situation where they have no other options than to sell their herd and resettle. On 6 March, 2012 at the UN Human Right Council in Geneva, Prof. Olivier De Schutter spoke about his concerns regarding those people living in the 'new socialist' villages. He further added that, so far this policy of resettling the herders and nomads among the Chinese has resulted to self-immolation of many members from the newly resettled herding community (Schutter, 2010).

Tourism Industry Endangering the Lives of Mogru Nomadic Clan

At China's 'atomic city' on the shores of the greatest lake in Tibet, where China once tested nuclear weapons for submarines, patriotic red tourists now come to see China's military triumphs. They also come to see the native Tibetans, who must dress as if they are timeless nomads, people without history, forever smiling. Chinese tourists like to be photographed with Tibetan children of the Mogru clan, perhaps not even knowing that the land of the clan was taken to build the tourist facilities, and the Mogru Tibetans have no source of income other than posing for happy tourist snaps. Attempts by the Mogru Tibetans to petition Beijing and seek justice has come to nothing.

Resource Extraction

China refers to Tibet as 'Xizang' which literally means the western treasure house. The Plateau's rich natural resources became a resource curse for the local residents and its ecosystem. Since late 60's, these resources have been exploited in various scales and mostly under very poor environmental norms and regulations. The mining not only undermines the sanctity of the local landscapes but also creates social tension and distrust when standard corporate policies are not followed.

Tibetan communities try to put forward their grievances in numerous petitions to higher authorities against the miners: they are either ignored or harassed. After failing to respond adequately, the local residents then resort to street protest and are immediately suppressed by heavy armed forces. Unlike those protest related to environmental negligence and accidents in many parts of China, those that occur in Tibet are classified as political and the protestors are severely suppressed. In the frequent protests by Tibetan villagers, quite often their immediate concern has been the damages done by the miners to the local streams, rivers, landscapes and pastureland.

Over the past two years (2010-2011), there have been more than 12 protests against mining activities that Environment Desk has documented and many more remains unknown. With the recent announcement of more than 3000 potential mining sites and many precious mineral deposits in Tibet, it is very likely that there will be more such protests in the future if the miner's and the local cadre attitude remain unchanged. The state itself is doing everything in tapping these resources, as it is evident from the budget in the 12th FYP for improving the resource extraction economy infrastructures such as highways, railway lines, and hydropower plants (China's National People's Congress, 2011). All these are essential to the smooth operation and transportation of mineral ores to various smelters located in distant mainland China.

So far, copper, chromium, gold and iron are the four minerals of greatest interest to Chinese and other foreign miners. These are being mined to different extents

at various locations throughout the Tibetan Plateau. Over the past few years, the Chinese state government has shown more interest and has invested in the extraction of lithium ores (lithium carbonate) on the Tibetan Plateau. According to China Chemical Reporter (2009), China's demand for lithium salt has grown rapidly, and lithium salt output capacity was expected to increase to 60,000 ton/yr in 2010 (China Chemical Reporter, 2009). Most of the salt lakes containing lithium resources (80% of the total reserves) are located in the western part of the country. Drangyer Tsaga (Ch: Lake Zabuye) is a landlocked salt lake located at an elevation of 4,400 metres in the Drongpa county of Shigatse (Ch: Rikaze) district. In 2008, the salt mine at this lake was regarded as the major source of lithium in China (Lithiummine, n.d.). Zabuye Lithium High-Tech Co. Ltd. planned to expand its lithium salt output capacity by 20,000 ton/ yr from 7,500 ton/yr (Lithiummine, n.d.).

These days' rare earth elements (REEs) are considered as one of the most important natural resource for the modern world to make high-tech goods such as iPhones, fiber-optic cables and missile guidance systems. The global demand for these seventeen REEs is booming, tripling over the past decade from 40,000 to 120,000 tons. By 2014 its global demand is expected to hit 200,000 tons a year. At present, China provides 97 per cent of the global supplies of rare earth elements, but for several years China has been steadily reducing the amount of material it makes available for export. According to a recent news article, United States, European Union and Japan jointly accused Beijing of breaking trade rules and lodged a complaint with the World Trade Organization that China is monopolizing global supply of REEs.

Most of the Chinas REEs are coming from a single mine in Inner Mongolia (Baotou Cho) and few years back an article published in Environmental Geology mentioned that the concentration of REEs at the southern part of Nam-Tso Lake basin (Ch: Namco basin) in central Tibet is much higher than the average values in the whole of China and the world. But so far there has been no clear information whether REEs are actually being extracted at Nam-Tso basin (Chaoliu Li, 2008).

Such rich reserves of minerals resources attract miners of various scales who plan to make quick money and not bothering about the standard environmental norms and laws stipulated in the PRC constitution and Law of Regional National Autonomy. Many Canadian companies are also attracted towards the resource rich Tibetan Plateau (Table1). We fully hope these companies will not follow the practices of Chinese miners by undermining the sanctity of the holy landscapes and depriving the local Tibetans their right to self-determination and equal opportunities.

Table1. Canadian Mining and Exploration Companies on the Tibetan Plateau

| No | Name | Property in Tibet | Company website |
|----|------------------------------------|---|---|
| 1 | China Gold International Resources | Gyama Mine, TAR | http://www.chinagoldintl.com/s/Home.asp |
| 2 | Eldorado Gold | Tanjianshan Mine, Qinghai | http://www.eldoradogold.com/s/Home.asp |
| 3 | Inter-Citic | Dachang Gold Project, Qinghai | http://www.inter-citic.com/ |
| 4 | Lara Exploration* | Huangnan Project, Qinghai | http://www.laraexploration.com/ |
| 5 | Silvercorp Metals** | Nabao Project, Qinghai | http://www.silvercorp.ca/ |
| 6 | Sterling Group Ventures | Danxiangcuo Salt Lake, TAR | http://www.sterlinggroupventures.com/index.html |
| 7 | Tri-River Ventures | Lianlong Project, Sichuan; Kunteyi Salt Lake, Qinghai | http://www.tririver-venture.com/index.php |

*The company stated (privately) that they'd like to get out of China but their partner, the Western Mining Group, has failed to keep their agreement regarding transferring an interest in the property. Lara invested \$500,000 in the project but never received the shares they were promised.

** Have sold 2/3 of the Nabao project but still retain 1/3 which they hope to sell.

Tibetan water resources and Chinese dams

Rivers originating from Tibet flows to more than ten countries and play a vital role in the environmental services and socio-economic of each country. These rivers (Table2) enable the Tibetan Plateau to become a strategic platform in exercising its dominance over the lower riparian states.

Table 2. Major rivers flowing from Tibet.

| No | Tibetan name | Common name | Watershed Regions/ Countries |
|----|--------------|--------------|---|
| 1 | Machu | Yellow River | Tibet, China, Inner Mongolia |
| 2 | Drichu | Yangtze | Tibet and China |
| 3 | Zachu | Mekong | Tibet, China, Vietnam, Laos, Cambodia, Thailand |

| | | | |
|----|-----------------|---------------|----------------------------------|
| 4 | Gyalmo Ngulchu | Salween | Tibet, China, Burma, Thailand |
| 5 | Yarlung Tsangpo | Brahmaputra | Tibet, India, Bangladesh |
| 6 | Macha Khabab | Karnali Ganga | Tibet, Nepal, India |
| 7 | Langchen Khabab | Sutlej | Tibet, India, Pakistan |
| 8 | Senge Khabab | Indus | Tibet, India, Pakistan |
| 9 | Bhumchu | Arun | Tibet, Nepal, India |
| 10 | Lhodrak Sharchu | Manas | Tibet, Bhutan, India, Bangladesh |

Source: DIIR, 2007

The International Centre for Integrated Mountain Development (ICIMOD) has revealed alarming details on the sustainability of the Himalayan glaciers in the time of climate change. According to their findings, the current trend of melting glaciers suggests that the Ganges, Indus, Brahmaputra and other rivers across the northern India plains could most likely become seasonal rivers in the near future, flowing only in monsoon season (ICIMOD, n.d.). World Wide Fund (WWF) for Nature, formerly known as World Wildlife Fund, named the Indus River as one of the world's ten rivers most at risk (Wong, 2007). The Indus which already faces an acute shortage of water flow due to climate change suffered more obstruction after China built a dam on the dying river (in Ngari, Western Tibet) without informing the downstream countries-India and Pakistan. So far China has dammed every major rivers and its tributaries in Tibet and has unveiled plans to construct even more dams in the coming years. In its 12th Five Year Plan (2011-2015), hydropower projects are to be prioritized and those that are not completed during its previous five-year plan are now scheduled (China's National People's Congress, 2011).

The Chinese dam building boom and its water transfer projects are creating additional worries to the lower riparian states, especially in India where it was estimated that by 2030 the water demand will be higher by 50 percent from the current demand of 740 billion cubic meters. The Zachu or Mekong River, originating from central Tibet through Yunnan Province in China and then flowing through Laos, Thailand, Cambodia and finally ending its journey in Vietnam is the lifeline for the Mekong-region countries. This river directly supports approximately 70 million people along its basin from fishermen to farmers. The damming activities along the upstream of Zachu/Mekong have significantly affected the flow volume of the river. So far, the China has in total 21 Hydro Power Projects on Zachu either

built, under construction and under active consideration in Tibet alone. Water user community downstream are turning their frustration on the Chinese government whose damming projects on the upstream Mekong River has greatly affected their lifestyles. Fishing boats are seen stranded on the shores of dried Mekong River in Mukdahan Province and at Nakhon Panam in Thailand. The livelihoods of the local fishermen and many other communities from Cambodia are threatened by the reduced flow of the river but their concerned voices are muffled by the aid their government receives from China.

Green NGOs in China believe hydropower projects could bring economic development, but not necessarily to the benefit of local people (Si, 2011). They believe that today's insufficiently transparent policymaking mechanisms are maximizing the interests of hydropower industry, officials and a small number of experts, while driving ecological destruction, affecting local livelihoods and increasing the risk of geological disasters. Chinese government policy is that the hydropower is the cheapest source of electricity. Not only are these rivers and tributaries dammed for generating electricity, but some are also polluted with chemicals and other toxins dangerous for human consumption. For instance, the tap water of Kumbum monastery in Amdo detected high concentrations of lead (Pb) due to a mining activity. This is not an isolated episode, similar cases of mining chemicals polluting the natural water supply are common wherever mining activities are prevalent. Growing industrialization, population growth, and increasing levels of consumption are placing heavy demands on water resources, which provide vital support for the subsistence livelihood to millions of people. Currently, there exists no regional framework or forum for South and East Asian nations to discuss or negotiate over water resources, other than the Mekong River Commission, which does not include China.

Looking Forward & Recommendations

Tibetan nomads are the expert custodians of the alpine pastures, and their knowledge and experience should be incorporated into rangeland management practices. The Tibetan herders should be directly involved in the decision-making process or there should be at least a principle of collaborative management attending to the needs of the pastoral nomads and herders alike. Central Tibetan Administration (Dharamsala) welcomes development activities related to social and economic upbringing of Tibetan communities inside Tibet, but these developments besides being sustainable, should not outweigh the preservation of the unique Tibetan culture, language and the environment. These development projects should not spark off any social tension and unrest amongst the Tibetan communities. The development projects should first prioritize training the local Tibetans in their daily life skills and technical know-how to participate in new economic activity and add

value to their customary economy. A healthy and sustainable Tibetan Plateau would not only benefit the entire Asian continent but also it helps in promoting peace and harmony within the region, especially between two major emerging powers (India and China). This is an important geostrategic factor. The Tibetan Plateau is the land bridge connecting South Asia with East Asia. The very survival of almost 1.3 billion people depends on the water resources originating from the Tibetan Plateau. The impact on Tibet's landscape and its natural resources due to climate warming and human intervention will threaten not only the future food security of many nations but also their development. Parliamentarians can help address the problems related to climate warming and human interventions on the Tibetan Plateau and its consequences by raising the issue in their own parliament and provide political, financial and institutional support. To this end, we offer the following recommendations to all the parliamentarians who are attending this conference in Ottawa:

Monitoring: Your country, in collaboration with private and academic institutions, should partner with Chinese and international scientific institutions to monitor glacial retreat, temperature rise and carbon levels on the Tibetan Plateau, with a goal of creating better models to understand warming trends and the resultant impacts on permafrost, river flows, grasslands and desertification, and the monsoon cycle.

Mitigation: Your government should engage with the Chinese government and NGOs to encourage a systematic re-thinking of policies related to grassland management and nomad resettlement. Changes in the ecosystem of the Tibetan Plateau will require sound mitigation policies and on-the-ground stewardship, which must include the integral participation of Tibetan stakeholders, primarily the nomads and their indigenous experience in managing this land for centuries.

Regional Framework: Your government should promote creation of a regional framework on water security. Such a structure would facilitate cooperative agreements among all riparian neighbours that would promote transparency, sharing of information, pollution regulation, and arrangements on impounding and diversion of river water.

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A CULTURE ENDANGERED: DEPOPULATING THE GRASSLANDS OF THE TIBETAN PLATEAU

Overview: Melting Tibetan Plateau

With an average elevation of 4,500 meters, the Tibetan Plateau is one of the most distinctive land-features on earth. It occupies an area of 2.5 million square kilometers—more than one quarter of the size of China and is the world's highest and largest plateau in the world. For many generations, this Plateau has provided the basic necessities to sustain life, allowing human civilization to flourish beyond its vast border. The modern era now begun to acknowledge the significance of its strategic location for both developing peace and harmony within the region.

The Tibetan Plateau, also referred as 'The Water Tower of Asia,' is the headwaters of major rivers that flow into India, Bangladesh, China, Nepal, Pakistan, Thailand, Myanmar, and Vietnam. Approximately 1.3 billion people are directly dependent on the health of ten major rivers that originate in Tibet. The total river basin area is estimated to be greater than 5.6 million square kilometers. With its snow peaks and glaciers, the Plateau provides freshwater resource to a wide swatch of Asia, in areas ranging from the deserts of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonle Sap lake in Cambodia to the North China Plain.

In recent years, critical components of Tibet's ecosystem are undergoing major transformations due to climate change. For instance, climate change has led to receding glaciers, shrinking and disappearance of thousands of lakes, drying of wetlands, thawing of permafrost, and reduced flow regimes in many rivers. Abnormal weather conditions due to climate change have made subsistence farming and herding more unpredictable, thus impacting the livelihoods of a majority of Tibetans. These days, on the Plateau, the spring thawing is earlier and the permafrost is melting away before the growing plants can access the water. These changes affect not only the crops but also the native vegetation of Tibet, especially in wetlands and other low lying areas. The loss of wetland in turn threatens the migratory birds that are used to making Tibetan stopovers during the mating season.

Endangering Pastoralism and Grasslands Stewardship in Tibet

- It was mobility that was the very essence of herding. Pastoral nomads in the Old World Dry Belt, whether in the savannahs of Africa, the steppes of central Asia or the high altitude pastures of the Qinghai-Tibetan Plateau, have always needed to move their animals regularly to make use of the spatial and temporal patchiness of grassland resources. Nomadism was therefore more than just an ecological

adaptation or an adaptation to the political environment. It was a 'region-specific, temporally and spatially ubiquitous survival strategy an alternative to the sedentary cultures of agricultural and urban societies (Scholz, 1995, p. 300).

- While often ridiculed as primitive or even 'incomplete' by outsiders, [nomadism] is in fact a highly sophisticated adaptation for exploiting energy captured in the grasslands of the region (Merkle, 2000).
- Mobility was crucial, moving on before grazing pressure destroys plants, exposing the dying turf to the icy gales and blizzards of Tibet which can strip soil, leaving only bare rock. Nomadic knowledge of how, when and where to graze, and the nomadic willingness to live in portable woven yak hair tents, summer and winter, with their animals, kept the pasture free of invasive toxic weeds, erosion, shrub invasion, and infestations of pests. None of this was known in the 1980s, except to the nomads themselves.... It is only in the 21st century that Chinese and global science have caught up with what the nomads have always known (Gabriel Lafitte in a personal communications with the author, 2010).



Map of Tibetan Nomadic Pastoral Area @D.J Miller

Pastoralism on the Tibetan Plateau is an adaptation to a cold environment at elevations above the limit of cultivation. For centuries, the Tibetan nomads, drogpas (in Tibetan) and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and from autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. Almost 70 percent of the Plateau itself is covered in these precious

grasslands. The pasture lands are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts, they have maintained sustainable use of this area for many centuries. China's grassland policies over the past several decades, however, threaten the sustainability of this delicate environmental balance. The policies have reduced the flexibility and mobility of the nomads, which are the key components of nomadic pastoral production. At the same time, the livestock has been blamed for overgrazing the grasslands.

Implementation of Failed Policies

In the name of modernization and conservation, Chinese authorities forcibly removed the Tibetan nomads from their ancestral pastoral lands and compelled them to slaughter and sell their livestock. The nomads have been made to live on state rations; some of them sold their belongings to become small vendors. And their lack of other skills prevents them from finding alternative means of making a living. During the era of the commune system, 1958-1979, the nomads were herded into communes, stripped of all their possessions, turned into production brigades, and given rations according to their work points. No production meant no rations. From the outset, the new class of cadres in command saw the nomads not as stewards and curators of the landscape, but as ignorant, backward, and irrational people, utterly lacking in enthusiasm for class struggle. At the same time, under the control of the new cadres, the herd size steadily grew to unsustainable levels and the chain of grassland degradation began. Twenty years later, in the late 1970s, the communes collapsed, having failed except for one achievement: the number of animals, in all Chinese official statistics, had climbed steadily every year.

Table1. Numbers of grazing animals, in millions, in Tibet Autonomous Region, as reported by Tibet Statistical Yearbook

| Year | Yaks | Sheep | Goats |
|------|------|-------|-------|
| 1965 | 4.27 | 7.99 | 4.3 |
| 1980 | 4.99 | 10.86 | 5.4 |
| 1990 | 5.06 | 11.13 | 5.68 |
| 2000 | 5.26 | 10.74 | 5.9 |
| 2010 | 6.54 | 9.97 | 6.02 |

In the early 1980s, nomads were given their animals back, but not their land. As soon as they regained some control over their lives, the nomads cut the number of sheep back to more sustainable levels. It is now widely known that grassland degradation and the increased grazing pressure actually started with the commune system. The Household Contract Responsibility System (HCRS) or the ‘Grassland Law’ was adopted in 1985, ostensibly to protect the degrading grasslands and to modernize animal husbandry. But some researchers argue that, in fact, the law was implemented to enable the government to gain more control over the pastures and to stop the over-exploitation of the grasslands, which the government apparently viewed as the most important cause of grassland degradation. In the 1980s, Tibetan nomadic herders, like China’s peasant farmers, were officially promised long term

land tenure, to encourage them to see their allotted grazing land as theirs, and be motivated to care for it. Long after the Chinese farmers had been given such guarantees of land use in the form of land lease certificates, the nomads were at last given the same guarantees, in the 1990s—long-term leaseholds to their land that ranged from 30 to 50 years. This encouraged conservation of pastures and gave the nomads a sense of ownership. Along with the Grassland Law, state authorities gradually implemented the so-called Four-Way Program or ‘Si Pei Tao’ ordering region-wide fencing regimes and the construction of shelters for nomads and livestock. The Animal Husbandry Bureau, the implementing agency of the program, stated that this program was meant to improve people’s lives and control livestock and grazing. In practice, the program limited the mobility of the livestock and encouraged the herders to invest and spend more time in winter pastures, resulting in increased grazing pressure on a smaller land area. Thus, the program in fact intensified, or, at least in part, caused, the problems for which the herders are now being blamed. At the same time, other policies, driven by China’s long standing disdain for mobile people, were also implemented. Limits on family size and herd size were gradually made compulsory. Gone was the annual cycle of overwintering in lower plateau pastures and herding up into the alpine meadows in summer. Mobility was compromised and curtailed.

In the 1990s, after the implementation of series of policies and measures, it became obvious that everything on the grasslands was going wrong. The living turf was dying, eroding, and slumping, only to be torn away by wild weather, reduced to bare rock or ‘black beach,’ as Chinese scientists called it. Burrowing rodent populations exploded, in plague proportions. Toxic invasive weeds multiplied. The rangelands were degrading, including the arid area of northeastern Tibet where both of China’s great rivers, the Yangtze and Yellow River, rise from glacier melt. Chinese scientists and administrators offered only one explanation: the nomads were overstocking beyond the carrying capacity of the pastures. The compulsory overstocking during the commune system was not mentioned; the subject was and is still off-limit. But recent research has revealed that overgrazing and degradation of the grasslands are not the result of grazing livestock alone. Herders point to weather changes, rodents, and mining activities as important factors causing grassland changes.

In 2003, a grassland rehabilitation policy was implemented throughout China’s grasslands and in pastoral areas. In Chinese, the Restore Grassland Policy is called *tuimu huancuo*, which means ‘closing pastures to restore grasslands’. The key measure of this policy is the relocation of herders from the grasslands to state-built housing, a measure that has been intensified in recent years. The land lease certificates guaranteeing nomads long term land tenure have been nullified. Instantly, all of the herders’ skills, risk management strategies, environmental services, traditional

knowledge, and biodiversity conservation practices were made superfluous. The harshest measures have been enforced in Golok and Yushu prefectures, in the area China considers to be the source of its great rivers. There, in Chinese view, the downstream water supply is threatened by rangeland degradation caused by destructive nomads. In this large area, nomads are frequently ‘villagized’ in new concrete settlements called ‘line villages’ that are far from their customary grazing land, and they are required to sell their livestock.

For decades, other policies such as de-stocking and rodent poisoning were enforced against the religious sentiments of the herders. For instance, one person from each family is required to join in the drive to poison the rodents, the Tibetan pikas. Tibetans find it deeply distressing to have to poison the animals whose habitat they share. They also dislike having to sell so many animals, both because raising animals for slaughter is against Buddhist ethics, but also because, in a land with no social safety net, herd size is the only wealth, security, insurance, capital, collateral against loans, and dowry. Over the past 40 years, the Chinese government has sponsored the systematic poisoning of pikas, most recently using grain laced with Botulin C strain toxin (*Clostridium botulinum*). Approximately 320,000 square kilometers grasslands were poisoned! But researchers have argued that these rodents are the keystone species of the grasslands, and that their large-scale killing may even be harmful for the grasslands and is almost certain to affect other wildlife and the broader environment. China’s own scientists have now learned, through patient observation that the grasslands of Tibet, when grazed moderately and intermittently, with herds being moved on well before the short summer growing season ends, actually maintain a higher biodiversity than ungrazed pastures, where toxic weeds pervade and biodiversity declines.

What Science Says about Grassland Degradation

Many researchers have found that depopulating these grasslands and labeling the nomads as ecological migrants will not help to restore the pastures. Although the stated objective of tuimu huancao is to grow grass and thus conserve watersheds, careful scientific observation shows that when all grazing is removed, the biodiversity of grasses diminishes, medicinal herbs are driven out by toxic weeds, and woody shrubs make the land unusable. Research has shown that the carrying capacity of some grasslands has been far exceeded partly due to the inappropriate land-use and land management practices of the 1950s. Researchers also cite rainfall—rather than livestock numbers, past or present—as the major determinant of grassland productivity on the Tibetan Plateau. Some recent field studies also revealed that grazing actually helps regenerate the grasslands by improving the soil carbon-nitrogen ratio and extending the growing season. Even some Chinese researchers have attributed the degradation of these grasslands to factors such as permafrost

degradation, irrational human disturbance (mining, road construction, conversion of grassland to cropland, gold mining, overgrazing etc.), and climate warming. Field observations conducted on these grasslands indicate positive connections between the grazing herds of the nomads and the grasslands. Researchers say that abandoning these grasslands will lead to the domination by invasive species and reduced biodiversity. Damage to the grasslands would in turn affect the permafrost soil.

Status Quo

Joblessness and alcoholism amongst the youth are prevalent in the new settlements—where the elders are often seen reminiscing their past lives and reliving them in their memories, and the younger ones are scavenging to earn a little extra money. From our recent interactions with drogpas and herders who fled into exile in India, and from research conducted inside Tibet, we came to know that the current policy of forced ‘villagization’ is in fact a very strategic move on the part of the state to keep all the mobile pastoral wanderers in tight leash and to have open access to pastures for extractive industries without facing any resentment. The policy also enables the central government to boast that it has made sizable investments in elevating the lifestyles of local residents. But, as many anthropologist and scholars recognize, development has less to do with external materialistic life than with the freedom to choose and to lead the life that one values and respects. Given the choice of livelihood, we believe that almost all the residents of these newly constructed concrete settlements would prefer to go back to their previous lifestyle without a second thought, even if it meant leaving a two-bedroom house.

A documentary, ‘The Last Of The Mogru Nomadic Clan,’ has captured the plight of the displaced drogpas in Mogru, in Qinghai. Chinese tourists who visit Mogru town like to be photographed with Tibetan children of the Mogru clan, who are made to dress as if they are timeless nomads, people without history, forever smiling. Perhaps the tourists do not know that the land of the clan was taken to build the Atomic City tourist facilities, and the Mogru Tibetans have no source of income other than posing for happy tourist snapshots. Attempts by the Mogru Tibetans to petition Beijing and seek justice have come to nothing. We have found that the people being moved or lured to these concrete settlements in the names of different programs euphemistically named ecological migration or comfortable housings projects number approximately 3.2 million in whole of Tibet, including Amdo and Kham province. According to Chinese state media in 2011, another 185,500 families are expected to move into new homes by 2013. These figures reflect the number of people whose lifestyle is now directly under the control of the central government and nothing more.

Following his mission to China in December 2010 where he saw the conditions of the newly settled droppas and herders in the concrete camps, Prof. Olivier De Schutter, the UN Special Rapporteur on the Right to Food, publicly opposed the resettlement policy. More recently, on March 6, 2012, at the UN Human Right Council in Geneva, he again expressed concerns about the displaced people living in the ‘new socialist-villages’.

Conclusion

The compulsory ecological migration of the Tibetan nomads is grounded in ignorance, prejudice, and a failure to listen and learn. China is far from alone in assuming its nomads are backward and responsible for degrading land. But around the world, governments now increasingly recognize that pastoral nomadic mobility holds the key to sustainability on the dry lands of the world.

Any development in Tibet should be based on the approach of listening to the land and listening to the people. The land and its resources must be used within its capabilities and ecological limits; and any policy implementation and developmental activities must respect the cultural tradition of Tibetans, which is based on centuries-old practice of sustainable use. The experiences and intimate knowledge of pastoral nomads should be incorporated into rangeland management practices. There should be a principle of collaborative management attending to the needs of the pastoral nomads and herders alike.

A healthy and sustainable Tibetan Plateau is important because it would benefit the entire Asian continent and would further enhance peace and harmony within the region, especially between two major super powers, India and China.

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ENVIRONMENTAL DESTRUCTION: TIBETAN NOMADS AND ENDING THEIR WAY OF LIFE

In the spring of 1956, Zhu De, Commander-in-Chief of the People's Liberation Army (PLA) and the Vice-Chairman of the Communist Party, ordered that 'all nomadic herdsmen [in Tibet] should settle in order to facilitate socialist transformation and socialist construction'. This was during the height of enforcing 'democratic reform' in eastern and north-eastern Tibet, where the majority of the agricultural sector was 'collectivised.' Massive propaganda was disseminated to promote the policy of 'mutual aid and co-operation' in the pastoral areas. However, the principal objective of this campaign was not to improve the lives of nomads and farmers or to bring about a positive social transformation. Rather, it was to enforce control, to manage and to implement the 'democratic reform' across Tibetan society. This was apparent from the official document Outline of the Propaganda for CCP Tibetan Working Committee Concerning the Policy of Not Implementing Democratic Reforms in Tibet Within Six Years, which states that "to be able to live happily, the Tibetan people must take the road of socialism; and to enforce democratic reform is the unavoidable path the Tibetan people have to follow". To force the nomads to settle in permanent homes and to prevent them from pasturing their herds of yaks across vast distances, depending on where the grass was greener, was done so that the Chinese communist authorities could better control this population of nomads.

Xie Zhanru, first secretary, CCP Committee, Gannan Tibetan Autonomous Zhou in present Gansu stated that by 15 September, 1958, '46,000 Tibetan herdsmen, who only a short time ago still basically lived in a feudalistic society, have now, on the basis of having scored victories in the suppression of counter-revolutionaries and carried out a social reform, ... singing and dancing, have reached heaven in one stride, taking them into People's Communes in which are carried the seeds of communism' (Bskal-Bzan-Tshe, 1998, pp. 161-163). Xie added that "the culture of the pastoral people is quite backward, and their level of science and technology even lower," and claimed that (Bskal-Bzan-Tshe, 1998, pp. 161 -163) after a few years of socialist ideological education by the Party, they abolished their superstitions, liberated their thoughts, promoted their class consciousness, determined to follow the socialist road (Bskal-Bzan-Tshe, 1998, pp. 161 - 163).

In reality, however, the dark side of the revolution imposed in the pastoral areas was 'a very violent class-struggle of life and death' (Bskal-Bzan-Tshe, 1998, p. 10). Just as the coming of the Chinese communists had destroyed the way of life of the Tibetan nomads, who traditionally pastured their herds with the change of seasons and lived in harmony with the natural environment, so too, the commune

system imposed by the Chinese presented a totally alien concept. In these new circumstances, these fiercely independent nomads found it difficult to operate in a system where everything was imposed from top down. 'In the people's commune,' Tibetans said to one another, 'every person only has three personal belongings, a set of clothes, a set of bedclothes, and a bowl with a pair of chopsticks' (Bskal-Bzan-Tshe, 1998, p. 110).

Since ancient times, Tibetan nomads and farmers engaged in barter systems in which nomads gave salt, butter, meat, dried cheese and wool in exchange for barley, clothes and other items of daily use. By the end of 1950s, this way of life had been replaced by the commune system, which allowed the authorities to operate a more efficient system of taxation. The taxes included, as stated elsewhere in this report, the Patriotic Grain Tax, State Grain Reserve, War Preparation Reserve, etc (Tibet Under Chinese Communist Rule: A Compilation of Refugee Statements 1958-1975, 1976, pp. 119-122). It was a system that resulted in massive grain shortage, forcing the people to slaughter and eat much of their livestock. The late Panchen Lama writes in his Petition that "most of the households were ransacked, and almost all of the residents' own stores of grains, meat and butter were taken away ... many of the residents were short of grain; some ran out of grain, and were very short of meat, butter, oil and so on; there was not even any lamp oil. Even firewood could not be bought" (Bskal-Bzan-Tshe, 1998, p. 30).

Like other Tibetans, the nomads suffered greatly through the next three decades, as one political campaign followed another, culminating in the Cultural Revolution. However, the biggest threat to their way of life is permanent resettlement, a policy that the Chinese authorities vigorously pushes forward today. These permanent settlements of Tibetan nomads that seriously began in the 1990s is associated with the 'Western Development' campaign. Claiming environmental protection as the reason to fence off pastureland and to impose the sedentarization of nomads, the Chinese government carried out policies such as 'convert farmland to forest' (Human Rights Watch, 2007, p.17) and 'revert pasture to grassland' (Human Rights Watch, 2007). The Chinese authorities, claiming to reverse the supposed degradation in pastoral regions, imposed bans on grazing, and issued an official policy that blames the supposed crisis in the grassland on the 'primitive' and 'unscientific' way of life of the Tibetan nomads (Northern Tibet Grassland Takes on a New Look, 2009).

An estimated 2.25 million nomads live on the Tibetan Plateau. Through the ages, Tibetan nomads skillfully managed their livestock and sustained the land while adapting to the realities of Tibet's fragile ecological system (Julia, 1997). The current crisis in the pastoral regions has nothing to do with the nomads' traditional way of life. It grows out of Beijing's policies of the past 50 years, such as compulsory

collectivization, imposition of production quotas, and collectivised herding which directly led to famine, degradation of grasslands and destruction of the traditional sustainable methods of pasture management.

In June 2007, the New York-based Human Rights Watch issued a report on the permanent re-settlement of the nomads in Tibet titled *No One Has the Liberty to Refuse*. This report describes China's nomadic resettlement project, "Since 2002, the Chinese government has been implementing resettlement, land confiscation, and fencing policies in pastoral areas inhabited primarily by Tibetans, drastically curtailing their livelihood. The policies have been especially radical many Tibetan herders have been required to slaughter most of their livestock and move into newly-built housing colonies in or near towns, abandoning their traditional way of life" (Human Rights Watch, 2007, p.3).

"These requirements are part of a broader policy associated with the 'Western Development' campaign. Since this campaign got underway in 1999, many Tibetan agricultural communities have had their land confiscated, with minimal compensation, or have been evicted to make way for mining, infrastructure projects, or urban development" (Human Rights Watch, 2007, p.3).

The Human Rights Watch report quotes a Tibetan who assesses the impact of this scheme on the nomadic way of life. He says, "They are destroying our Tibetan (herding) communities by not letting us live in our area and thus wiping out our livelihood completely, making it difficult for us to survive in this world, as we have been (herders) for generations. The Chinese are not letting us carry on our occupation and forcing us to live in Chinese-built towns, which will leave with no livestock and won't be able to do any other work" (Human Rights Watch, 2007, p.3).

In 2003 a total ban was imposed on grazing in Golok in north-eastern Tibet and nomads were forced to move into government-built houses. A case in point that illustrates the compulsory change in land use is Tang Karma project in Amdo (Ch. Qinghai) province, where nomads have been forced to resettle at a disused prison site, where there is no drinking water and electricity (Human Rights Watch, 2007, p. 27). The site of this project is a mixed farming settlement where nomads, who have no experience in cultivating fields and growing crops, are newly expected to engage in farming with no water. A Tibetan interviewed by Human Rights Watch noted that the order came directly from the central government, not something made up [at lower levels] and that 'not a single household can stay behind' (Human Rights Watch, 2007, p.35).

Removal and relocations are also taking place to make way for large-scale infrastructural projects such as dams, mining and undertakings like Lhasa-Xining highway and railway line. According to the research paper *Constructing A Green*

Railway on the Tibet Plateau: Evaluating the Effectiveness of Mitigation Measures by Zhou Jinxing of the Chinese Academy of Forestry Sciences, Yang Jun of the Department of Landscape, Architecture and Horticulture, Temple University in Philadelphia and Peng Gong of Beijing Normal University, the construction of the Lhasa-Xining Highway was done ‘without an environmental impact assessment or any environment protection plan’ (Jinxing, 2008). It resulted in ‘the destruction of the vegetative mat on the route of the highway, the adjacent vegetative mats were damaged as the soil was scraped up to build the road’ (Jinxing, 2008). The researchers add that ‘the damaged vegetation has led to the loss of organic matter in the soil and the melting of the permafrost layer under the top soil’ (Jinxing, 2008).

These development plans and infrastructural projects are urban-centric and finance is channelled in such a way that “Tibetans find it hard to compete with Chinese migrants”. Andre Fischer, a development economist who specialises on Tibet, writes that “this situation arises precisely because of who controls the subsidies and investments and where the money is spent” (Wang & Bai, 1991).

Fencing off of pastures, limit imposed on herds and relocation in permanent settlements have forced the nomads to seek other sources of income for which they either do not have enough skills or lack opportunities (Wang & Bai, 1991). The relocation of the nomads in permanent settlements has severed their intimate connection with their animals, and rendered their knowledge of animal and grassland management, inherited from one generation to another, useless.

The officially-stated reason for the permanent settlement of the nomads, from the time Zhu De ordered that “all nomadic herdsmen should settle” in 1956 to the total ban on grazing in Golok and resettlement of nomads in Tibet today, is to transform the ‘backward’ nomads and to bring them ‘scientific development’ (Chi).

This assertion of bringing ‘scientific development’ to the nomads is particularly odd given the fact that Tibet possess a long history of environmental protection and respect for the land, animals and natural resources (Chi).

According to Katherine Morton, a China specialist at Australia National University, over 700,000 nomads have been settled since 2000 (Chi). The official Chinese media mention that 226,302 houses were built for Tibetan herders and farmers since early 2006 and that by the end of 2009 over 80 percent of herdsmen and farmers will live in houses; the projected figure for 2009 is about 1.32 million people, or 220,000 households. Often, resettled nomads have been given a one-time payment for their livestock, and houses with no job prospect and no steady source of income. As a result, they resort to collecting and selling yartsa gunbu or caterpillar fungus, a medicinal root that has high demand and very high market value. During the

summer, almost the entire population in nomadic areas scour the grasslands for this plant. In some areas, local leaders issue passbooks that allow people to collect the root and then officials act as middlemen in selling it to make huge profits. Some officials organize video nights in the mountains for root collectors during which adult films are shown and cheap alcohol is sold. There also have been cases of violent and often fatal conflicts over trading and scarcity, as Jonathan Watts reports in 17 June, 2010 issue of *The Guardian* that “in July 2007 eight people were shot to death and 50 wounded in one such conflict”.

Another assault on nomads’ traditional values and religious sentiments is the building of series of slaughter houses in pastoral areas by the Chinese government and setting quotas for each household to provide animals to these houses. Punishments are meted out by local officials if herders fail to comply with the order to slaughter animals. In Sersbul county in Karze in eastern Tibet, people petitioned the local authorities against the slaughter house built in the locality. When the petition was rejected some monks of Bumnyak Monastery and local people wrote an appeal saying that “there is no greater harm to Buddhist religion than this. Even if we don’t protect living creatures, slaughtering them without mercy is against Buddhism. This is the heartfelt wish of the people.” The official response was to arrest the three people, who had gone to submit the appeal.

Summary solutions like arrests, imprisonment and coercions are compounded by large-scale resource extractions and rampant commercialisation of livestock such as yak sperm banks (Leckie, 1994) to breed bigger yaks at a shorter time. Yaks are restricted in barbed-wire fences and herders in state-built houses (Hessler, 1991). The fundamental problem is the failure to acknowledge and understand the wisdom and sophistication of Tibetans’ traditional livestock management, which has allowed nomads to thrive for centuries.

Wu Ning, a rangeland expert at the Chengdu Institute of Biology, writes that “simply focusing on pasture or livestock development fundamentally ignores the tight linkages between culture and the land” (Ning, 1995). In this current policy from Beijing, nomads are at the receiving end. Chinese government has little or no experience, in pastoral production beyond a simplistic and risky policy of reliance on overstocking, and in more recent years, on accelerated slaughter.

Traditionally in Tibet the nomads were regarded as the naturally well off. They, like most Tibetans, fervently engaged in religious activities by inviting monks and lamas to the environs, and were generous in their offerings to the monasteries. However, as the resettlement has driven them into poverty and desperation, social linkages are broken down and traditional values abandoned for immediate and urgent needs to survive.

Beijing accuses that “their [Tibetan nomads] way of life is threatening the environment” and that they live a ‘primitive’ life’ bound by traditional concept’ of self-sufficiency and “did not know how to make money by selling their domestic animals” (Department of International Relations and Information, 2001). What is actually being threatened and driven into extinction is the nomads’ way of life, their culture, their religion and their existence as people who have successfully survived on the Tibetan Plateau for thousands of years.

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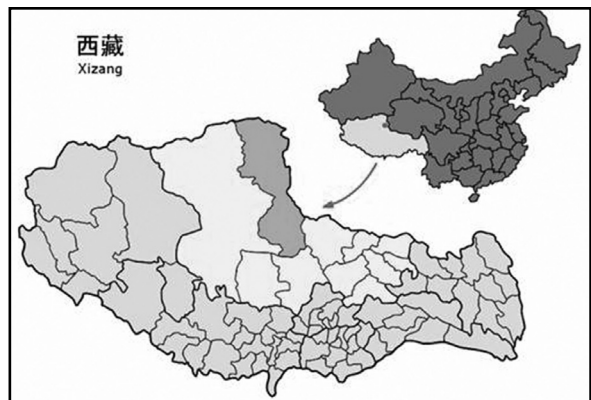
WHAT DOES IT MEAN TO MAKE MORE INVESTMENT AND COUNTY UPGRADE IN THE WESTERN TIBET?

On 25 January 2013, two major announcements were made by China's official news media: the plan to invest over 3.5 billion Yuan to protect environment and creation of a new county in Nagchu Prefecture in the so-called Tibet Autonomous Region (comprising the western half of historical Tibet). China Daily reported (Wang Ghuahzong, 2013) that according to the draft budget of 2013 submitted by the finance department of the so-called Tibet Autonomous Region (TAR), 'the region plans to invest 3.5 billion Yuan (USD 563 million) in 2013 [...] in environmental protection'. The report further stated that most of the investment (3.23 billion) will be used for 'major forestation projects and for compensating and rewarding locals who protect grass and forests, and conserve wetlands, lakes and water resources'. Besides, 'over 50 million Yuan will be allocated to support environment improvement projects and preserve resources'. The investment will also 'support the building of an ecological safety screen on the plateau'. Although any investment in environment protection in Tibet is welcoming but it remains to be seen whether these ventures, especially forestation, can help heal the ecological damage caused by decades of failed policies and mismanagement in Tibet. In the recent years, scientists and conservation groups have voiced concerns about the long-term viability of significant aspects of China's reforestation efforts. Of greatest concern is the planting of large swaths of non-native tree species, many of which perish because their water needs are too great for the arid regions in which they are planted. China also is cultivating large monoculture plantations that harbor little biodiversity. After an extensive analysis of one such 'afforestation' efforts, by a group of scientists, they found that, over time, as many as 85 percent of the plantings fail due to the introduction of non-native or maladapted species (Shixiong Cao, 2011). Jianchu Xu, senior scientist at the World Agroforestry Centre and a professor at the Kunming Institute of Botany, Chinese Academy of Science, pointed out that plantation forests tend to be driven by commercial considerations aspiring to get economic benefit in the form of saw timber, fiber for the pulp and paper industry, rubber, and even food in the form of fruit (Xu, 2012).

Chinese government must understand that merely carrying out big reforestation program is far from enough. The non-native species over years or decades deplete the soil moisture on the surface and at depth, leading to lowering of the water table and high rates of tree mortality when tree roots can no longer reach deep soil water. Therefore, only native species which function in equilibrium with the resources available to it should be restored and promoted during such programs

with no commercial considerations, whatsoever. On the same day, it was reported (China Daily, 2013) the formation of a new county in Nagchu Prefecture (ནག་ལུ་རྫོང་) of the so-called Tibet Autonomous Region. After approval by the State Council, the present Shuanghu Special district (མཚོ་བཞི་མ་དོན་གཅོད་ཁུལ) whose administrative affairs were previously managed by departments in nearby Nyima County (300km away), will be ‘upgraded to become the World’s highest county’, report said. The Shuanghu Special District (Shuanghu for short) originates from the previous Shuanghu office which was established in 1976 ‘to develop and construct the depopulated zone in North Tibet by sending 5,000 herdsmen along with half a million livestock’.

With an average altitude of 5,000 meters and an average temperature of minus 13 degrees Celsius, the 116,000 sq. km area of Shuanghu comprises seven villages with a total population of over 12,000. The Shuanghu region covers two-thirds of Hoh Xil nature reserve. With long winter, harsh climate, poor road, and high risk of natural disasters, Shuanghu is labeled as ‘human life limit laboratory’. It needs to be seen if Tibetans will get any benefit in terms of their right to self-determination after Shuanghu becomes a full functioning county. Needless to say, any infrastructural development in the region should be in accordance with the wishes of Tibetans and sustainability of environment.



Location of Shuanghu Special District (in red) within Nagchu Prefecture of the so-called Tibet Autonomous Region. Source: wikipedia

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DAMMING TIBETAN AND HIMALAYAN RIVERS

‘More than 60% of the world’s 227 largest rivers have been fragmented by infrastructures such as dams and diversions. Rivers are turned on and off instead of flowing by natural rhythms. Many rivers are thus but shadows of their former selves and the blue lines on the map are often tokens of faded glories’ - UNESCO-IHP.

Rivers originating from the Himalayan ranges and other regions in Tibet drain approximately 6 million sq. km or more. These snow peaks and glaciers enable these regions to be the source of major rivers that flow into Asia, approximately sustaining 1.3 billion people. One could easily observe the Chinese dam building frenzy from their past records, as per the World Commission on Dams, China had only 22 large dams in 1949 and today there are more than 87,000 dams in China. It even plans to dam the rivers that still remain free flowing, such as the Arun (Arun flows from Tibet as Bhumchu to Nepal and India) and the Subansiri (Subansiri River is a tributary of the Brahmaputra River flowing from Tibet to the Indian states of Assam and Arunachal Pradesh) before flowing into India. According to South China Morning Post, on the 23 of January 2013, the state council has released an energy-sector blue print for 2011-2015 in which they have decided to construct at least 54 hydro power stations with total capacity of 120 GW on the upper reaches of Yangtze, Mekong, and Salween. It clearly disregards the geological risks, global biodiversity, resettlement and impacts on downstream communities. This plan also includes the reopening of previously shelved damming projects on Salween River due to environmental concerns.

According to International Rivers, many of these damming projects have forced over 23 million people from their homes and land, many of whom are still suffering the impacts of displacement and dislocation. Yet despite serious impacts of dam construction in China, the Chinese government has ambitious plans to expand hydropower generation. Not only are these rivers subjected to hydropower projects but also these free flowing rivers and its power attracts major extractive industries from distant mainland. Now, with a strong policy backing from Beijing towards the mining sector, designating them as one of Beijing’s “Four Pillar” industries in Central Tibet, these transboundary rivers will obviously face more toxic pollutions and barriers along its path. The western rivers such as Yarlung Tsangpo (Brahmaputra) and its major tributaries in Tibet (Kyichu, Nyangchu, Tongchu, Nyang Trib Chu, Drakchu, Wolga Chu, Chllong Chu, Yiwong Chu, Parlung Chu) are now being increasingly interrupted by medium sized dams. Such activities paint a bleak picture as they would definitely impede the downstream flow of water and alluvial sediment to the floodplains of India and Bangladesh. The information has it that, two new

additional dams (Bayu and Daigu) are being planned along the mainstream of Yarlung Tsangpo along with the full swing construction of 510 megawatt project at rzam/Zangmu. The official narration from China towards these damming is, as usual, same except a small change in the date. ‘The Chinese side always takes a responsible attitude towards the exploitation of cross-border rivers and every new project will be planned and reasoned in a scientific way-before being started’ was the response by Hong Lei, the foreign ministry during a daily press briefing. China is (indeed) the central (poker) player in many of the controversies surrounding shared water resources in Asia with more damming plans for its upstream reserves that will have dramatic impacts on the lower riparian countries. On this side of the political border, the hydropower potential for the remaining Himalayan countries also remains very attractive for the power companies. K.Pomeranz, estimated that for Pakistan, India, Bhutan and Nepal, the hydropower potential could be jaw dropping 192,000 megawatts with almost half of it on the Indian side.

According to Pandit and Grumbine, the hydropower potentials within the Indian Himalayan Rivers (Brahmaputra, Ganges and Indus) are enormous (50,000 MW) and the Government of India is keen to invest on these water resources. The authors also

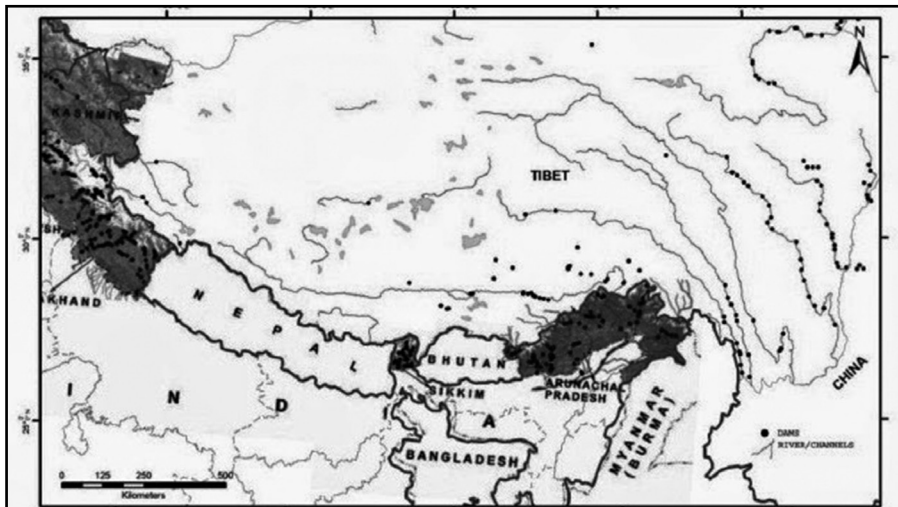


Fig.1. Distribution of dams under various planning stages on the rivers flowing from Tibet and on The Indian Himalayan regions; Adapted from Zoomer & Tashi (2013) and Pandit and Grumbine, 2012.

mentioned that this region could be the highest dam density in the world and would also cause huge loss and extinction of terrestrial species and change in land cover should all the 292 Dams (under construction and proposed-Fig. 1) are constructed as planned. A separate article published by Hindustan Times-Darjeeling discusses about

the grand master plan as envisioned by the Central government of India in identifying the North-Eastern region as ‘India’s future powerhouse’ by building about 160 or more dams. It also quoted a statement from a former West Bengal State Planning Board member that the earthquake that struck Sikkim on September, 2011 could have been induced or accelerated by the multiple dams on Teesta River.

A UNESCO-IHP report mentioned that both water and culture are strongly interrelated and their perfect blending is crucial for flourishing of human culture. But, by looking at the current pace of damming activities and its various impacts, it appears that we have moved too far for a complete U-turn to a point close to ‘A’, but still, timely enough to admit our past errors in understanding the true value of these resources to sustain our ancestral culture and tradition. The geological nature of the Tibetan plateau and the Himalayan belt indicates that the whole region in its entirety is still rising higher and often jolted with strong and weak earthquakes. The dams constructed on the seismic prone zones and near active fault lines could be a perfect recipe for an unfolded future disaster. In most cases, the locals were poorly informed or not consulted during this maddening spree of damming and traversing the natural rhythm of rivers in the name of developments.

In China, dam safety has always been treated as a sensitive subject. Now, incidents at a number of dams and reservoirs have cast doubt on the quality of these projects, but they are rarely reported to the general public. In 2012, a study conducted by ‘Probe International’ mentioned that more than 99.7 percent of large dams in western China (in Tibet) are located in zones of moderate to very high seismic hazard (as defined by UN Global Seismic Hazard Assessment Program).

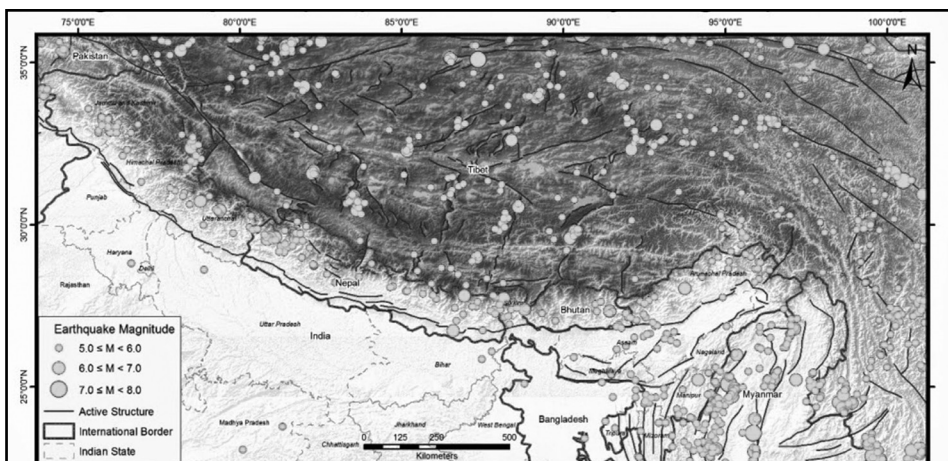
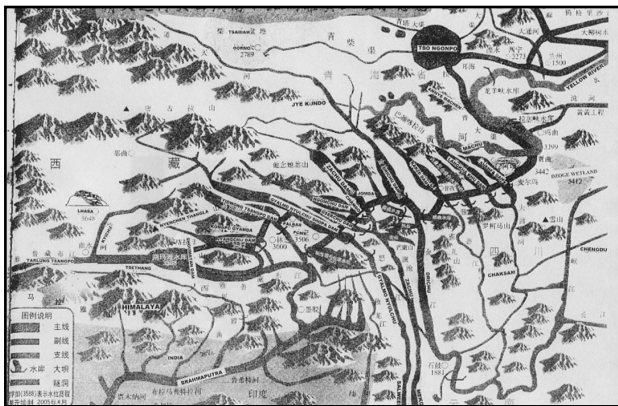


Fig2. Seismic events (magnitude ≥ 5) that occurred between 1973 and 2013, and active structures within the Himalayan Regions. Source: EDD/ DIIR 2013.

Figure 2 explains the seismic prone areas within the Himalayan belt and warns us about the imminent threat posed by those 200 or more dams that are built or under construction throughout the Himalayan regions.

Is Brahmaputra China's next target for dam building spree?

After much media speculations, the 510 MW dam of Zangmu (Tib: rZam) on Brahmaputra in Tibet went on construction in 2010 leaving India and its neighboring country Bangladesh dumbfounded. Once again the media takes China's state council approval of three dams-Dagu, Jiacha and Jiexu on Brahmaputra with immense surprise although it was already circulating in the news for over a year except for Dagu dam (Patranobis, 2013). The Times of India reported last year about the six dams Lengda, Zhongda, Langzhen, Jiexu, Jiacha, and Zangmu that China is planning to build on Brahmaputra in Tibet (Bagchi, 2011). Amidst denial of the diversification of Yarlung Tsangpo (the Tibetan name for Brahmaputra) by Chinese government, reports of dam construction on Yarlung Tsangpo (Tibetan name for Brahmaputra) and its tributaries have been surfacing frequently.



Source: Adapted from Li ling's Xizang zhi shui jiu Zhongguo: da Xi xian "zai zao Zhongguo" zhan lue nei mu xiang lu (Save China through water from Tibet). Zhongguo Chang'an chu ban she.

through Water from Tibet). According to the proposed project (shown in figure above), the first dam in Tibet would be at Suma Tan near Tsethang for the diversion. And the second dam would be Nyangchu dam that lies just below Kongpo Gyamda on the Brahmaputra diversion sketch map in the book. Both Tsethang and Kongpo Gyamda are in Lhoka prefecture and Nyingtri prefecture respectively.

If we analyze the ongoing and planned location of dams, there are reasons to believe that the speculation of water diversion could be carried out in near future.

But India and Bangladesh may have bigger and more challenging issues to face in future. There have been speculations among some Indian academic quarters about a possible diversion of water from Yarlung Tsangpo. This is based on the proposals by Gao Kai and Li Ling (PLA retired armies), who wrote a grand project of the Tsangpo diversion in their book called Xizang Zhi Shui Jiu Zhongguo (Save China

For example, Zangmu (Tib: rZam), Jiacha (Tib: Gyatsa), Lengda (Tib: gLing-mDa) are in Lhoka Prefecture where the first planned dam of the diversion project would be. Out of the five planned dams, two including Zhongda (Tib: sGrom-mDa), and Langzhen (sNang Dzong) are located in Nyingtri Prefecture where Li Ling proposed his second dams.

Another possibility to tap Tsangpo's water in huge volume is through construction of a mega dam on the river. Zhang Boting, Deputy Secretary of China's Society for Hydropower Engineering argued that a massive dam of 38 GW on the Great Bend where the river makes a sharp U-turn would 'benefit the world'(Guardian, 24 May 2010). He also told the Guardian that a research was being carried out on the project. The project if implemented would surpass the Three Gorges dam in scale (Watts, J., 2010). Unfortunately, such a massive project will also have unprecedented social and environmental impact in Tibet as well as regions downstream.

Given the fact that most of the speculation regarding China's plans to harness Tibetan rivers are actually being implemented, and hence it is high time for the government of India and Bangladesh to jointly pressure China for higher level of cooperation in order to secure the water and livelihood of its citizens.

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THE (DEGRADING) THIRD POLE

Situated at the heart of Asia, with an average elevation of 4,500 meters above the mean sea level, Tibet stretches for almost 3,000 kilometers from West to East and 1,500 kilometers from South to North. The plateau is ringed by fourteen high mountain ranges from the southern end, the mighty Himalaya, Khawakarpo and Minyak Gankar mountain range. The glacier-fed rivers originating from these mountains make up the largest river run-off from any single location in the world. Despite its cold environment, for thousands of years the Tibetan people have occupied this plateau and created cultural landscapes based on the principles of simplicity and non-violence that are in harmony with the environment. One only needs to look at its map to figure out how the Tibetan Plateau dominates the geography of Asia. It is one of the most environmentally strategic and sensitive regions in the world.

Tibet referred to as ‘The Third Pole’ and ‘The Water Tower of Asia’ reflects the significance of its snowcapped mountains, its water resources and its alpine grasslands. Since time immemorial, the plateau holds the Hindu Kush Himalayan Ice Sheet, considered as the largest ice mass outside the two poles. Its plateau contains more than 45,000 glaciers covering an area of 105,000 km². The plateau is also the fountainhead for many rivers that flow into Asia (India, Inner Mongolia, Bhutan, Nepal, Bangladesh, China, Pakistan, Thailand, Laos, Myanmar, Cambodia and Vietnam). As a result, approximately 1.3 billion people directly depend on the health of these major rivers. The total river basin area is estimated at above six million square kilometers. In recent years, due to climate warming and human interventions, these majestic landscapes, ancestral pastoral cultures and river systems are silently degrading before our own eyes.

Over the last few decades, global warming is taking its toll on glaciers, permafrost, frozen soils, lakes, grasslands and the whole biotic community in Tibet. On a micro level, its future implications are far more threatening; the ongoing flow of rivers that drains its vast basin could become seasonal and the change in the rainfall pattern will affect the livelihood of tens of millions of people, creating more regional tension. It is estimated that the glaciers in Tibet are currently melting at a rate of 7% annually. Similarly, a separate study by a NASA scientist (Camp, 2010) revealed that 20% of Tibet’s glaciers have retreated in the past 40 years and, if the current trend continues, more than 60% of the existing glaciers could be gone in the next 40 years.

Even China’s National Climate Change Program report (China.org.cn, 2007) has mentioned that the area of glaciers and frozen earth is expected to decrease more

rapidly and it is estimated that the glacier area in western China will decrease by 27% by the year 2050. The same concerns have been shared by the IPCC (Intergovernmental Panel on Climate Change) in one of its reports, warning that such meltdown will result in massive flooding followed by severe droughts.

Rivers originating from Tibet flow to more than ten countries and play a vital role in the environmental services and social economy of each country. These rivers (Table 1) not only enable Tibet to become a strategic platform in exercising its dominance over the lower riparian states but also attract many secondary and primary industries from mainland China. This is due to the fact that nearly half the GDP (45%) and (51%) of the industrial output of China is from water scarce provinces and municipalities. Moreover, these water scarce regions of China house 38% of the installed power capacity and 47% of the coal fired power plants. According to the 2009 China Statistical Yearbook (China Statistics Press, 2009), Tibet scored the highest value of water availability with 139,659 m³/person/ year compared to Beijing and Tianjin, both averaging only 127 m³/person/ year.

Currently, all the major rivers and their tributaries that flow from Tibet are dammed and this dam building frenzy in western Tibet is creating huge controversy and doubt about these projects acting as a stepping stone in expanding China's ambitious water transfer projects beyond the initial plan. The current expansion of the railway network connecting Beijing with the rest of Tibet paves the way for logistical support and transportation of damming inventories, if required, in due time. So far, China has built over 87,000 hydro dams, but the issue of safety has always been treated as a sensitive subject. The numerous incidents at a number of dams and reservoirs have cast doubt on the quality of these projects, but they are rarely reported to the general public.

According to the South China Morning Post (Jing, 2013), the Chinese state council has released an energy sector blueprint for 2011-2015 in which they have decided to construct at least 54 hydro power stations with a total capacity of 120 GW on the upper reaches of Driчу (Yangtze), Zachu (Mekong) and Gyalmo Ngulchu (Salween). It clearly disregards the geological risks, global biodiversity, resettlement and impacts on downstream communities. This plan also includes the reopening of previously shelved dam projects on the Salween River due to environmental concerns.

Table 1 Major Rivers Flowing From Tibet

| Tibetan Name | Common Name | Watershed Regions/Countries |
|-----------------|---------------|---|
| Machu | Yellow River | Tibet, China, Inner Mongolia |
| Drichu | Yangtze | Tibet, China |
| Zachu | Mekong | Tibet, China, Vietnam, Laos, Cambodia, Thailand |
| Gyalmo Ngulchu | Salween | Tibet, China, Burma, Thailand |
| Yarlung Tsangpo | Brahmaputra | Tibet, India, Bangladesh |
| Macha Khabab | Karnali/Ganga | Tibet, Nepal, Pakistan |
| Langchen Khabab | Sutlej | Tibet, India, Pakistan |
| Senge Khabab | Indus | Tibet, India, Pakistan |
| Bhumchu | Arun | Tibet, Nepal, India |
| Lhodrak Sharchu | Manas | Tibet, Bhutan, India, Bangladesh |

By just overlaying the UN seismic hazard zone map and the locations of these dams on the western rivers of Tibet, clearly sends an inevitable signal that those living in the shadow of these dams are at the mercy of nature. According to the report published by Probe International (2012), more than 90% of dams that are built, under construction or proposed for the rivers that flow from Tibet are located in zones of very high or moderate seismic hazards.

In her latest book, *China's Environmental Challenges* (Shapiro, 2012), Judith Shapiro, a renowned Chinese scholar writes, "Severe environmental problems are occurring in ethnic minority communities on the periphery of the country, where grab for resources is thinly disguised as development program". She further adds, "When we take a closer look at these regions inhabited by ethnic minorities, we suspect that the government attempts to develop infrastructure are often no more than strategies to extract natural resources at the expense of a minority, marginalized people".

Deforestation: The plateau once possessed one of the oldest forest reserves in Central Asia and a wealth of over 5000 species of higher plants; these forests were indiscriminately cut down and transported to China. It was not until the disastrous Drichu (Yangtze) flood in 1998 that China realized it was paying the price of stripping Tibet's forest. That flooding killed over 10,000 people and left 240 million affected by its waters and destroyed over a million hectare of farmland and homes in China. Only after the forest had been entirely stripped did the large scale logging

finally stop in the name of water conservation. Despite the unconditional logging ban announced by the government in September 1998 on an area of 4.6 million hectares along the Driчу (Yangtze) basin in Tibet, commercial felling of trees still continues. Even though the Chinese government claims to have invested a huge amount in various reforestation projects (White Paper, 2011), most of these new tree plantation are of exotic tree species (fruit trees, rubber, and eucalyptus) rather than the indigenous varieties. Some of the standing forests, is seriously compromising the ecological services provided by forest ecosystems.

Conversion of grassland to croplands: The overall plan during the periods of Collectivization and House-hold Responsibility System was to maximize the agricultural production from the grasslands. During that era, almost 20 million hectares (0.2 million sq. km) of grassland in Tibet and Inner Mongolia were converted to croplands by state owned farms, state owned forestry operations, and other state owned enterprises. They were all labelled ‘Newly Claimed Virgin Croplands’ in the 1950s and the trend continued for another few decades. These grasslands are now severely degraded. China’s grassland policies over the past several decades have not only destroyed these grasslands but also undermined the age-old ancestral grassland stewardship provided by the drogpas. These policies have not only reduced the mobility of the nomads and their herds, but are also responsible for overgrazing some parts of the grasslands.

Resource extraction: Tibet’s rich mineral deposits have become a resource curse for the local residents and ecosystem. Since the late ‘60s, these mineral deposits have been exploited to various degrees, mostly under poor environmental norms and regulations. Among the minerals extracted, copper, chromium, gold, lead, iron, and zinc are of greatest interest to Chinese and other foreign miners operating on the Tibetan Plateau. These are being mined to different extents at various locations throughout the Tibetan Plateau. Over the past few years, the Chinese state government has shown more interest in and has invested in the extraction of lithium ores (lithium carbonate) on the Tibetan Plateau. The locals residing in and around the mining sites have no reason to celebrate since they know such projects often pollute the local water source, grab their grazing lands and with very little or no compensation. The mining companies pay little respect to the local culture and the sanctity of the landscapes. They have been known to extract minerals and other resources from holy lakes and sacred mountains which local Tibetans have revered for generations. Such negligence and disrespect creates strong social tension, distrust, anger, desperation and fear among the local residence. The 78th self-immolation of Tsering Dhondup (tibet.net, 2012) that took place at the entrance of a mining site in Amchok, Labrang in the northeast part of Tibet, clearly sends a strong signal of a ‘non-harmonized society’. Whenever the Tibetan communities

attempt to put forward their grievances in petitions to higher authorities against the miners, they are either ignored, harassed or even fired upon by the police. In the frequent protests by Tibetan villagers, their immediate concern has often been the damage done by miners to the local streams, rivers, holy mountains and pasture land. Without any concern or hesitation, miners dump the mine tailing and chemical effluents in the local river with no special attention given to and action from the local authorities. For instance, in the Kumbum monastery in Amdo (Ch: Qinghai) in 2011, the local tap water detected high lead (Pb) concentrations due to mining activity near the local water source.

According to German scholar Fred Scholz (Scholz, 1995), nomadism is a natural response to a generally inhospitable physical environment, where pastoral nomads have had to develop a complex system of using rangeland resources and maintaining grazing capacity of these barren lands. As such, the mobility was the very essence of herding, where herders or the nomads are needed to move their animals regularly to make use of the spatial and temporal patchiness of grassland resources. Pastoralism on the Tibetan Plateau is an adaptation to a cold environment at elevations above the limit of cultivation. For centuries, Tibetan pastoral nomads or drogpas have successfully maintained a sustainable lifestyle, travelling from winter to summer pasture lands and from autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining high altitude agro-pastoral regions in the world.

In response to the degrading grasslands, Chinese policymakers have offered only one explanation: the nomads were overstocking beyond the carrying capacity of the pastures, but they shy away from accepting responsibility for the compulsory overstocking, fencing etc. during the commune system. For decades, other policies such as de-stocking and rodent poisoning were enforced against the religious sentiments of the herders. For these pastoralists, their herd size is the only wealth, security, insurance, capital and collateral against loans.

Other researchers also cite rainfall rather than livestock numbers, past or present as the major determinant of the conditions of the grassland in Tibet. Many researchers have indicated in their field study reports that removing the livestock from these grasslands and labelling nomads as 'ecological migrants' will not help restore these degraded pastures. They have indicated positive connections between the grazing herds of the nomads and the grasslands in terms of the soil carbon-nitrogen ratio. Although the stated objective of tuimu huancao is to grow grass and thus conserve watersheds, careful scientific observation shows that when all grazing is removed, the biodiversity of grasses diminishes, medicinal herbs are driven out by toxic weeds, and woody shrubs make the land unusable. The herders point to weather changes, rodents, and mining activities as important factors causing grassland changes.

A survey conducted in 2011 by Gallup (Pugliese, 2012) in China revealed that most of the adult Chinese prioritize environment over economy. The only question remaining unanswered is whether or not the new Chinese leaders will act accordingly. The Tibetan Plateau is the land bridge connecting South Asia with East Asia. The very survival of almost 1.3 billion people depends on the water resources originating from the Tibetan Plateau. Downstream users of water originating in Tibet should establish a regional forum to create policies on transboundary issues that effectively safeguard access and quality of water, at a time of accelerating glacier melt and damming activities. The impacts on Tibet's landscape and its natural resources due to natural causes, land use policies and large scale development will threaten the future food security of many nations and their relations to China. A healthy and sustainable Tibetan Plateau will not only benefit the entire Asian continent but also help in promoting peace and harmony within the region.

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SCARRING THE LAND, SCRAPING THE WOUNDS

The number of Tibetans setting themselves ablaze is increasing at an alarming rate. So far, over 100 Tibetans have self-immolated since 2009, constituting one of the biggest waves of self-immolation as political protest in the history of mankind. Most of them called for the freedom of Tibet and the return of His Holiness the Dalai Lama from exile. In addition to several political, social, religious, and economic factors, the impact of mining and environmental pollution has been one of the major causes that drive fiery protests across Tibet.

On Tuesday 20 November 2012, a Tibetan in his mid-30s got up early in his hometown in Amchok (eastern Tibet), walked up the hill to the entrance of gold mining site in Gyagar Thang, poured kerosene over his body and set himself on fire (Voice of America, 2012). He died at the scene of the protest. Tsering Dhundup was the 78th Tibetan to self-immolate inside Tibet since the fiery protest first began in 2009. He is survived by his parents, wife and three children aged sixteen, fifteen and eight. He was an agro-pastoralist from Sangchu county (Ch: Xiahe), in eastern Tibet. According to Dharamshala-based Tibetan Centre for Human Rights and Democracy, through his burning protest Dhundup ‘wanted to highlight the hardship and suffering of the local Tibetans harmed by mining activities’. Six days later, on 26 November 2012, a teenager followed his trails up to the mining site and set himself ablaze near the same spot as Dhundup’s in a protest against the mining activities in the region (Phayul.com, 2012). He died on the same day from severe burn injuries. Eighteen-year-old Kunchok Tsering was the 84th Tibetan to carry out self-immolation. He is survived by his wife, parents, and elder brother (tibet.net, 2012).

Earlier in the same month, twenty-six-year-old Chakmo Kyi from Khagya village called for ‘racial equality and freedom to protect environment’ before setting herself on fire in Dolma Square near Rongwo Monastery in Rebgong county in Eastern Tibet (Voice of America, 2012). Kyi, who died on the same day, was a mother of two and the 75th self-immolator on the Tibetan Plateau. Since 2009, close to 100 Tibetans, including monks, nuns, farmers, nomads, intellectuals, and businessmen have set themselves on fire (tibet.net, 2012). Judging from the circumstances and calls made by these brave Tibetans, it is evident that the flaring up of burning protests raging across Tibet is a direct result of six decades of deep-seated resentment caused by China’s political repression, cultural assimilation, social discrimination, economic marginalization, and environmental destruction. Over eighty-eight self-immolators died expressing outright rejection of the counter-productive policies pursued and expanded by the Chinese government that continue to destroy the natural environment of Tibet and cultural traditions of its people. Among others,

the unbridled exploitation of natural resources and its impacts has been a cause of major concern for Tibetans in several terms – ecological, economical, social, and spiritual.

Historically, ordinary Tibetans have both religious and economic objections to the exploitation of natural resources. The conscious awareness about environmental protection has been deeply rooted in Tibetan religious beliefs, customs, moral obligations, and taboos. The idea of protecting nature dates back as early as 8th century BC, when Tibetans followed the indigenous Bön religion. According to Bön, everything in the world—mountains, water, trees, animals among others – has its own deity, who can protect and punish human beings based on their behavior towards nature. Later in the 7th century AD when Buddhism was introduced into Tibet, Buddhist principles of interdependence made the people an integral part of the whole system, holding life in all its forms sacred. Tibetans prohibited killing and advocated protection of forests and living beings. In his book *The People of Tibet*, Charles Bell, who was British India's ambassador to Tibet, wrote, 'In Tibet, there is an old-established objection to mining on religious grounds.' There was almost no mining as it was also believed to impact the fertility of the soil.

As early as 1642, an environment protection law called Ri-rlung Tsa-tsig or Mountain Valley Edicts existed in Tibet that prohibited felling, hunting, mining and so on. The edict was issued every year by the government of Tibet after the Tibetan New year and served as an important and useful ecological guideline to protect wildlife and the environment (forests, grasslands, lakes, and streams). This was one of the reasons that helped maintain Tibet's pristine highland with its diverse flora and fauna for centuries. But China's occupation of Tibet in the 1950s opened the door to systematic exploitation of Tibet's rich minerals. Due to its tectonic formation and settings, Tibet has 132 different types of mineral resources. Big mining companies in Tibet have shown great interest in copper, gold, coal, crude oil, natural gas, chromite, arsenic, asbestos, aluminum, iron ore, boron, potassium, lead, zinc, and lithium. According to the Article 9 of the Constitution of the People's Republic of China, Tibet's resources are state assets available to be exploited to meet the needs of national development.

Over the past sixty years, however, mineral exploitation has evolved from a marginal endeavour to a major phenomenon in China's economic growth driven by industrialization and urbanization. The large-scale and capital-intensive exploitation of resources in Tibet has also been aided by the advancement in geological information (in 2005, China Geological Survey compiled geological map on the scale of 1:250,000 and first map of metal and nonmetal deposits on the scale of 1:1.5 million) and rapid infrastructural development (including the world's highest Gormo-Lhasa Railway completed in 2006) under the 'Great Western Development' (GWD) strategy adopted by Beijing in 1999.

With plans to further advance the GWD strategy in its 12th five-year plan (2011-2015), a new network of railway lines is in the pipeline, including an extension of the ongoing Lhasa-Shigatse further east to Eastern Turkestan (Ch: Xinjiang), extension of Lhasa-Nyingtri train to Chengdu and Dali, and Gormo-Chengdu line linking the two major economic centres. These development plans will further intensify the exploitation of natural resources as the pattern of the proposed railway networks mirrors the location of major mineral reserves and strategic interests in Tibet. Additionally, construction of a number of new hydro-dams across major rivers in Tibet will provide the much-needed power to boost mining operations. For instance, the Jinhe power station on Jinhe river (a tributary of Zachu or Mekong) is being built to power development of Yulong copper mine in Chamdo (Ch: Qamdo) prefecture. The new urban centres and roadways will bring more Chinese migrant workers into Tibet to thrive in the mining industry, already dominated by the Chinese – particularly in skilled and managerial sectors. According to China's official news agency (China Daily, 2011) Zhang Qingli – the then Communist party secretary of the so-called Tibet Autonomous Region (TAR) Regional Committee – reportedly told Xinhua's Economy and Nation Weekly that Tibet has abundant mine reserves, but little exploration has been done so far. Zhang pledged to increase investment in exploration of mineral resources in TAR in the coming five years (2011-2015). Recently, nine special zones for the mineral industry have been marked in Tibet and the mineral industry is expected to contribute 30-50 per cent of TAR's GDP by 2020.

Mining is an important sector of growth for any country but the rampant mining in Tibet, with few environmental guidelines, has caused enormous problems with little or no benefit to Tibetans. It has led to the destruction of sacred sites and world heritage sites. Environmental pollution and land degradation have caused great harm to livestock and wildlife, including biodiversity. The influx of Chinese migrants has resulted in lack of employment opportunity and benefits to Tibetans, with pasture and arable land being expropriated to facilitate mining operations. All this has aggravated the already brewing resentment among Tibetans leading to protests, direct action, and other drastic measures, including self-immolations.

Khawa Karpo (Meili Snow Mountain) is one of the most sacred mountains and a major pilgrimage site in Tibet. It is located in Three Parallel Rivers, designated a UNESCO World Heritage site in 2003. Since 2004, iron ore mining has been taking place on river slopes disregarding the spiritual and cultural sentiments of the people. In 2011, a small gold mining operation in the western side of the region provoked direct action from villagers, who threw the mining equipment into Gyalmo Ngulchu River (Salween). The tension continued after the resumption of mining, leading to the arrest of a village leader in early 2012. This led to a

confrontation with security forces during which villagers were seriously injured. In late 2012, hundreds of villagers from the surrounding areas have joined in the protest. Millions of Tibetan nomads and farmers have been forcibly evicted (Human Rights Watch, 2013) or compelled to abandon their centuries-old lifestyle to make way for extractive industries and hydropower projects. In the last decade, the Chinese government has aggressively implemented the policy to remove nomads from their ancestral pastures and force them into concrete camps resulting in increasing poverty, environmental degradation, and social breakdown. Once the nomads are removed in the name of ‘environmental protection’, the mining companies inevitably move in and start operations with no resistance. Radio Free Asia (13 January 2013) reported that Tibetan herders were forced to move away from traditional grazing areas by mining operations located near Dun village in Khartse township of Lhundrup (Ch: Linzhou) county in 2005.

Most of the protests related to mining and environmental pollution occurred after repeated complaints and petitions made by Tibetans to protect the environment were ignored by the authorities or construed as recalcitrance or silenced using force. A positive response at this stage seems unlikely, as it will be at odds with the self-interests of many officials who make quasi-legal financial gains by protecting mining enterprises. With no room for legal and administrative procedures, Tibetans have resorted to demonstration and sometimes direct action to disrupt mining activities. Over nineteen protests related to mining activities and environmental pollution have been reported across Tibet since 2009. Three took place in 2012. Radio Free Asia reported on 26 August 2010 that three Tibetans were killed and thirty others severely injured when Chinese security forces opened fire on a group of Tibetan petitioners who had gathered outside a government building in Palyul County (Sichuan province) to protest against the environmental damage caused by the expansion of a gold mine in the area.

The large-scale mining activities have been causing significant damage to Tibet’s fragile ecosystem, including land degradation, pollution, harm to livestock and wildlife biodiversity. Huang and her associates (2010) conducted research on the environmental impact of mining activities on the quality of surface water in Gyama town near Lhasa and found that the ‘high content of heavy metals in the stream sediments as well as in a number of tailings with gangue and material from the ore processing, poses a great potential threat to the downstream water users.’ Similar reports of environmental pollution leading to water contamination, illness of local Tibetans and loss of animals are common. A case in point is the lead poisoning of the water supply around Kumbum Monastery due to pollution from the Ganhetan industrial district in Rushar (Ch: Huangzhong) county in Amdo (Ch: Qinghai) province. The poisoning led to over 100 children falling ill in 2006. Such

events clearly demonstrate the lack of environmental governance among mining operations in Tibet, most of which are incidentally carried out by China's state-owned enterprises (SOEs).

The environmental impact of mining in Tibet is an issue of global consequences. The Tibetan plateau, also known as The Third Pole, is home to around 46,000 glaciers, storing more freshwater than any other region except the North and South Poles. As the rivers originating from Tibet have been the lifeblood of Asian civilization, any impact on this high plateau upstream environment will affect the livelihood of at least 1.3 billion people living downstream. The glaciers, snow capped mountains, permafrost soils and alpine wetlands of the Tibetan plateau hold a large reserve of carbon. If left unchecked they will become a source of greenhouse gases that would further accelerate the global warming crisis.

Any development in Tibet can be useful and sustainable only if its resources are used within its capabilities and ecological limits. Tibetans should be guaranteed the fundamental rights to the environment and involved in all decision-making processes. Mineral development in Tibet must ensure prior investigation of the social, environmental, and cultural impacts. Any transfer of the ownership of Tibetan land and resources to non-Tibetans large-scale capital-intensive and commercial projects should be forbidden. However, the present top-down approach to development in Tibet puts Tibetans on the fringe and threatens not only their livelihoods, land, and resources, but also their very survival. Such dire circumstances have forced them to take extreme measures.

Thus far the Chinese government has responded to the escalating incidents of fiery protests with greater restriction and relentless crackdown in Tibet. Instead of seriously addressing the real cause of self-immolation, Beijing blames 'the exile forces for instigation' and has criminalized this act of sacrifice. Recently, some families and friends of brave immolators have been charged with 'intentional homicide' and handed down severe sentences, including death and lengthy jail terms. It is time that the Chinese government acknowledges that the burning protests are a direct result of its destructive policies. Criminalization of the protest and failure to address the grievances of the people will only aggravate the already volatile situation in Tibet.

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*The Report was prepared by Tsering Dhundup, Environment & Development Desk, DIIR, CTA, in April 2013.



LANDSLIDE IN GYAMA MINE: NATURAL OR MAN-MADE?

On Friday, 30 March 2013, China's official media reported (People's Daily, 2013) that 83 miners including two Tibetans have been buried after a major landslide hit a part of the Gyama (Ch: Jiama) Copper Polymetallic Mine. So far, the rescue efforts have failed to find any survivors and the chances of survival for those buried are getting slim. This is a sad and unfortunate incident that resulted in large number of casualties that could be higher than reported. Environment and Development Desk (EDD) fear that this tragic incident could be a result of the aggressive expansion and large-scale exploitation of mineral in the Gyama Valley—a man-made phenomenon rather than just a 'natural disaster'. Gyama mine is located in Medrogungkar (Ch: Maizhokunggar) County of the so-called Tibet Autonomous Region, about 68 km from Lhasa. It is a large-scale polymetallic deposit consisting of copper, molybdenum, gold, silver, lead and zinc with the potential to become the China's biggest copper producer in 10 years. The Gyama Mine has been selected as a 'pilot of the national green mines project' by Ministry of Land and Resources (PRC) in 2012 and also a 'Model enterprises of national unity and progress'. As a requirement, Gyama mine must meet higher standard of technology oriented and corporate responsibility-oriented laws with adherence to policies of 'people first' and 'safe production', promote 'harmony between the mine and the community and shoulder the responsibility of social welfare'.

However, in the past decade, Gyama mine has been a major failure in terms of the social harmony and environmental protection in the area. Before it was consolidated under a one umbrella in 2007, the Gyama Mine consisted of four small mines which has been causing pollution, land degradation, harm to livestock etc. After the consolidation, large-scale and heavy mechanized operations accelerated the ongoing environmental and social problems. There has been rapid expansion of the mining operation which covers a total of 145.50 sq. km including mining area of 76.19 sq. km and exploration covering an area of 66.41 sq. km. In order to acquire maximum profit in the shortest period of time, whole swaths of land have been excavated in several sites and in some cases the whole face of a mountain has been ripped using high explosives and blasting agents in the process of exploration, water diversion, mining, and road construction. Such a large scale and aggressive expansion out of the mine could have caused the recent event of landslide.

Due to the massive influx of Chinese migrants, Tibetans are left with very few employment opportunities and other benefits. The fact that only two of those trapped are Tibetan and the rest are Han Chinese migrant workers from neighboring provinces of Yunnan, Guizhou and Sichuan is a clear indicator. Many Tibetan

farmers and nomads have been forced to move away from their ancestral pastures and arable lands which have been expropriated by government to make way for the expansion of mining operations in Gyama. Reports of environmental pollution leading to water contamination, illness of local Tibetans and loss of animals are common in the Gyama Valley. The impacts of rampant mining activities have led to social unrest and related issues. In 2008, Chinese mining company carried out a water-diversion project in the upper Gyama region leading to forceful confiscation of agricultural lands. The mining, which has been going on in the upper hills of Gyama for nearly two decades have led to toxic wastes being dumped into Gyama Shingchu river resulting in the death of a large number of cattle. Villagers in the valley depend on Gyama Shingchu for their drinking water supply and irrigation. In the same year, local Tibetan residents from Gyama Township reportedly petitioned the local government to put an immediate halt to the mining project in the area. The local government responded by putting the whole region under heavy military surveillance, with imposition of severe restrictions on communication to outside world and people visiting the region. A positive response seems unlikely, as it will be at odds with the self-interests of many officials who make quasi-legal financial gains by protecting mining enterprises. On 20 June 2009, angry villagers took to streets and clashed with Chinese miners and the scuffle between Tibetans and miners were followed by police crackdown leaving 3 Tibetans wounded.

As opposed to being a model for ‘green mine’ or ‘progress’, Gyama Mine is a model of the issues relating to over 200 mining sites across Tibetan plateau which faces similar or even worse socio-economic and environmental problems, requiring urgent attention. EDD hope that Chinese government will put sincere efforts to figure out the real cause of the landslide in the mine operated by Huatailong Mining Development Co. Ltd, (a subsidiary of the State-owned China National Gold Group Corporation) and take appropriate measures. EDD also call on Chinese government to ensure active participation of Tibetan people in all decision making process in Tibet; social, environmental (Environmental Impact Assessment) and cultural impacts are fully investigated; natural resources are not depleted; migration and settlement of non-Tibetans into Tibet are not facilitated; ownership of Tibetan land and resources are not transferred to non-Tibetans; and large-scale, capital-intensive and commercial projects are not facilitated inside Tibet.

References

People’s Daily. (2013, March 30). No survivors, bodies found after Tibet landslide. Retrieved from People’s Daily: <http://en.people.cn/90882/8189158.html>

*The Report was prepared by Environment & Development Desk, DIIR, CTA, on 1st April 2013.

ASSESSMENT REPORT

THE RECENT LANDSLIDE EVENT IN THE GYAMA VALLEY: IT'S POSSIBLE CAUSE AND IMPACTS

Introduction

On Friday, 29 March 2013, Chinese state media reported that 83 miners including two Tibetans have been buried after a major landslide hit part of the Gyama (Ch: Jiama) Copper Polymetallic Mine at 6.00AM local time. As of 4 April, 66 miners have been confirmed dead and 17 are reported missing or believed dead. The workers were reportedly asleep in their tents when they were buried by a mass of mud, rocks and debris, three kilometres wide and 30 metres deep. The landslide occurred in the Pulang Valley in Siphug Village of Tashi Gang Town of Central Tibet. Tibet's rich mineral deposits have become a resource curse for the local residents and ecosystem. Since the late '60s, these mineral deposits have been exploited in various scales, mostly under poor environmental norms and regulations. As for the minerals extracted, copper, chromium, gold, lead, iron and zinc are the minerals of greatest interest to Chinese and other foreign miners operating in Tibet. These are being mined to different extents at various locations throughout the Tibetan Plateau. Now with a strong policy backing from Beijing designating mining in Tibet as one of Beijing's 'Four Pillar' industries, Tibet's holy landscapes, lakes and the pristine rivers will face more destruction, pollution and most of all the local residents will have no option but to silently witness the ecocide of the Tibetan Plateau.

In a show of concern, President Xi Jinping, Premier Li Keqiang and Vice Premier Zhang Gaoli have instructed officials to 'spare no efforts' to rescue workers. This is indeed a very sad and unfortunate incident. However, Chinese government must also "spare no efforts" to figure out the real cause of this tragedy, through sincere and transparent investigation by putting aside political and social sensitivity of the issue. The Environment and Development Desk (DIIR) of Central Tibetan Administration suspects that this tragic incident could be a result of the aggressive expansion and large-scale exploitation of mineral in the Gyama Valley—a man-made phenomenon rather than merely a 'natural disaster'.

Location Setting

Gyama mine is in Medrogungkar (Ch: Maizhokunggar) County of the so-called Tibet Autonomous Region (TAR), located within the Gangdise Porphyry Copper Metallogeny Belt in central Tibet, about 68 km from Lhasa (Figures 1a & 1b). It is currently owned and operated by Tibet Huatailong Mining Development Company Limited, a subsidiary of China National Gold Group. It is a large scale polymetallic

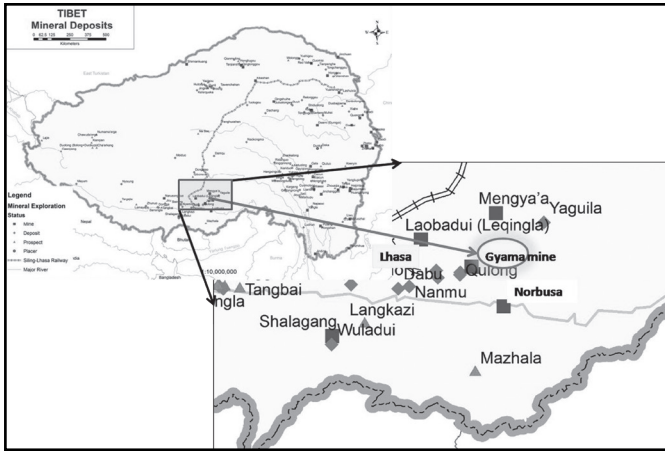


Figure 1a: Gyama Mine Location (DIIR 2013)

deposit consisting of copper, molybdenum, gold, silver, lead and zinc with the potential to become China's biggest copper producer in 10 years. Gyama valley (Ch.: Jiama gou) situated south of the Lhasa River, is the historical birth place of Songtsen Gampo, one of the greatest Dharma king of Tibet. The valley is also home to many

sacred historical temples like Gyelpo Khangkar, containing image of Songtsen Gampo and his two foreign queens, Dumburi (a 12century monastery), Rinchen Gong monastery which was built in year 1181. Thousands of Tibetans throng to the valley every year for pilgrimage. The valley is a semi-agriculture area with nomadic animal husbandry. The upper part of the valley is dominated by pastures while the lower reaches of valley are covered by farmland. Major crops are barley, wheat, rapeseeds, peas and potatoes, along with husbandry of yak, sheep, cow and horses. The valley has three villages: Lungda, Trikhang and Tserong with a population of around 3500 (Huang, 2010).



Figure 1b. Gyama Mine Site

Historical development of the mine

As early as 1951, geological work was conducted and before 1991, an area of 3,600m long copper-lead-zinc mineralization zone had been delineated. Between 1991 and 1999, number 6 Geological Brigade (Brigade 6) of Tibet Geology and Mineral Resource Bureau conducted a detailed exploration work. Based on this work, 4 mining licenses were issued to;

- Gyama Township (began operation in 2004)
- Lhasa Mining Company (began operation in 1995)
- Brigade 6 (began operation in 2003)
- Tibet Huatailong Mining Development (began operation in 2005) (Deng, 2010)

However, in April 2007, mining activities by the previous operators in the four mining license areas were stopped by the ‘TAR’ government. In accordance with an agreement between the ‘TAR’ government and China National Gold Group Corporation, the four mining licenses as well as the exploration licenses in the surrounding areas were consolidated under the Chinese government’s consolidation policy for mining properties (China Gold International Resources Corp. Ltd, 2012).

Gyama Copper Polymetallic Mine has been selected as a ‘pilot of the National Green Mines Project’ by Ministry of Land and Resources (PRC) in 2012 and also a ‘Model enterprises of national unity and progress’. As a requirement, Gyama mine should meet higher standard of

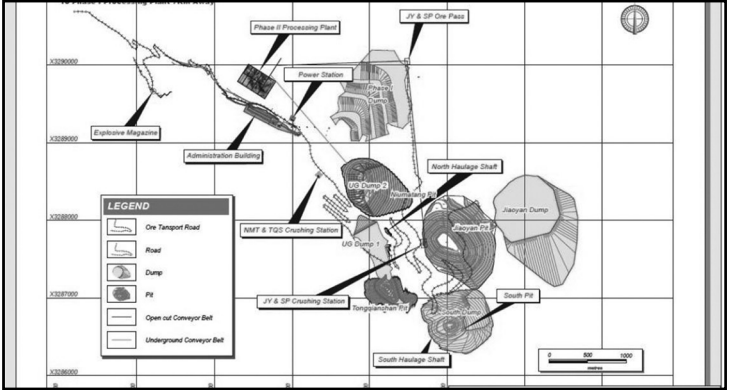


Figure 2: Map from the technical report showing location of pits, Source: MMC Pre-Feasibility study for the phase II expansion of the Jiama (Gyama) Project

technology oriented and corporate responsibility-oriented laws with adherence to policies of ‘people first’ and ‘safe production’ and promote ‘harmony between the mine and the community and shoulder the responsibility of social welfare’ (China Gold International Resources Corp., 2013).

There has been rapid expansion of the mining operation which now covers a total of 145.50 km² including mining area of 76.19 km² and exploration covering an area of 66.41 km² at an altitude between 4,000 to 5,407m. According to the company’s assessment report, Gyama Copper Polymetallic Mine will have a total of 4 open pit mines and two underground mining areas (Figure 2). Open pit mines includes, Niumatang (Depth: 610m, life: 8 years, Status: operational), Tongqianshan (Depth: 290m, life: 3 years, Status: operational), South Pit (Depth: 539m, life: 8 years, Status: Started in 2013) and Jiaoyan (Depth: 495m, life: 21 years, status: starting in 2020). Production has been carried out since 2010 at a rate of 1.8 Mtpa ROM (run of mine) ore at two open cut pits: Tongqianshan and Niumatang. The two underground mines are North areas (life: 29 yrs) and South areas (life: 21 yrs and starting in 2023).

Mining company is expected to get an average net cash flow of \$120 million every year for the 31 years of LOM (Life of Mine). The key minerals produced are copper (Cu), gold (Au), silver (Ag), molybdenum (Mo), lead (Pb) and zinc (Zn).

The contributions of these mineral ores to gross revenues are 75%, 11%, 7% and 6%. The mine is expected to get an annual production of 176 million pounds of copper, 35 thousand ounces of gold, 2.7 million ounces of silver and 2.3 thousand tons of molybdenum. Last year, a Chinese state magazine carried an article under the title, ‘A Mining Miracle’ which highly commended the efforts of Huatailong mining company to help, “restore a Tibetan region after private sector abuses”. It described the present state of the mining activity as having, ‘a panorama of lush green trees and grasslands, new roads and infrastructure, and cleaner mining facilities, giving the local people a better life’ (Jun, 2012) . China Daily reported last year that the Gyama mine had hired 191 locals. It said non-Han employees made up 35% of the mine operator’s staff, ‘the highest percentage among mining companies in China’ (Juan, 2012).

Cause of Landslide: Chinese Government

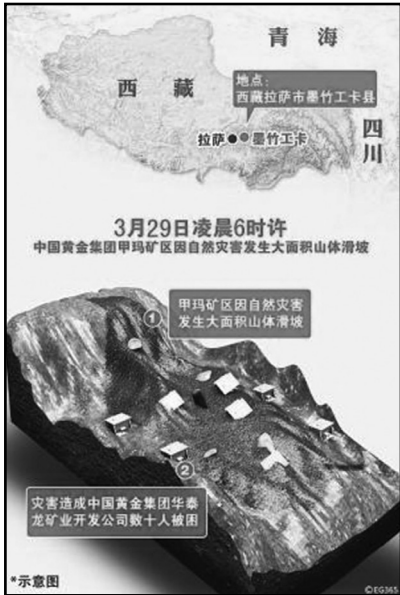


Figure 3. Chinese Drawing showing the landslide from teh mountain, Source: <http://image.baidu.com/>

But all these claims of eco-friendly and mining safety were put to test on 29 March 2013 by a massive landslide. A day after the landslide, Chinese state media and Tibet Regional Propaganda Office were quick to portray the accident as a ‘natural disaster’, without giving any specifics. On 2 April, more details emerged through the Chinese state media. Dorje, an academic with the Chinese Academy of Engineering was quoted to have stated, “The area from which the landslide originated was previously covered by large glaciers. Rocks hidden under the glaciers broke into smaller, loose rocks over a long period of time due to thermal expansion and contraction stress, as well as rainy and snowy weather.” He further stressed, “The smaller rocks near the source of the landslide collected together and snowballed into a massive landslide that was incredibly destructive” (Figure 2) (Hui, 2013).

Three days later, a six-member expert team led by Cen Jiafa, a researcher from the Ministry of Land and Resources presented their investigation report which reiterated and corroborated the previous argument. It was reported that the steepness of the slope, disintegrating rock and water from snowmelt combined to cause the landslide (2013). The report added, “The Mountain where the landslide

occurred has a slope of up to 45 degrees and the drop along the 1,980-meter-long landslide is 824 meters high’.

However, several fundamental questions still remain unanswered.

- If rocks were disintegrated due to snowmelt and thermal dynamics, one should see similar cases of landslide in other regions covered with snow and glaciers across Tibet. So why did the landslide occur only at the site of mining and not anywhere else? Is this another ‘Mining Miracle’?
- According to the company’s website, Gyama mine will ‘adhere to policies of people first and safe production’. Two-days before the landslide, China Gold’s chief executive Song Xin reportedly told that Gyama mine adhered to high standards of occupational health, safety and environmental protection (South China Morning Post, 2013). If so, then why were the worker’s camped so close to such a ‘natural geological hazard’ and why was the ‘risk-emergency plan’ launched only after the tragedy had struck (Mining Weekly, 2013)?
- Gyama mine has been hailed by Beijing as a flagship project. Several survey and supervisions have been carried out during the plan process of the mine. Why was the danger of loose rock not identified during the final technical feasibility study by the company as recommended by Minacro Mine Consult (MMC) (China Gold International Resources Corp. Ltd, 2012)? Is it just a coincidence that most of the rocks in the landslide were of similar looking shapes and sizes?
- Above all, why are officials trying to underreport the event by not allowing Chinese media to report freely let alone giving access to foreign media? What is the government trying to hide? Real cause, rights violation against Tibetans or corruption?

Possible cause(s) of Landslide in Gyama Mine

In order to acquire the maximum profit in the shortest period possible, mining in Gyama has been pursued aggressively. Whole swaths of land have been excavated in several sites and in some cases the whole face of a mountain has been ripped in the process of exploration, water diversion, mining and road construction. It was just a matter of time that such a large scale and aggressive expansion out of the mine was going to cause a big disaster.

The Environment and Development Desk (EDD) of Department of Information and International Relations (Central Tibetan Administration) believes that the landslide in Gyama is a man-made phenomenon rather than a natural disaster. However, we agree with aspects of the process suggested by the Chinese investigation team. The steepness of the slope and disintegration of rock have

been the key players in causing this landslide. However, rock has been disintegrated into smaller pieces as part of the mining process and not due to glacial dynamics that Chinese official are trying to make us believe. EDD has enough evidence to suggest that loose rock that turned into a landslide came from the surface mining at the top of the mountain which has been dumped on the eastern flank from where the landslide occurred (GE Figures 4 and 5).

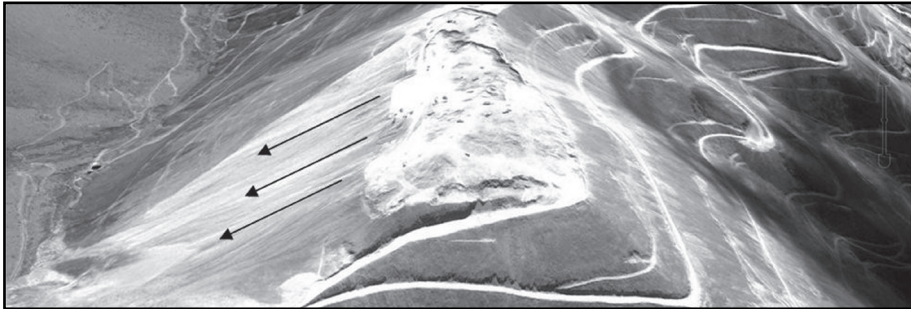
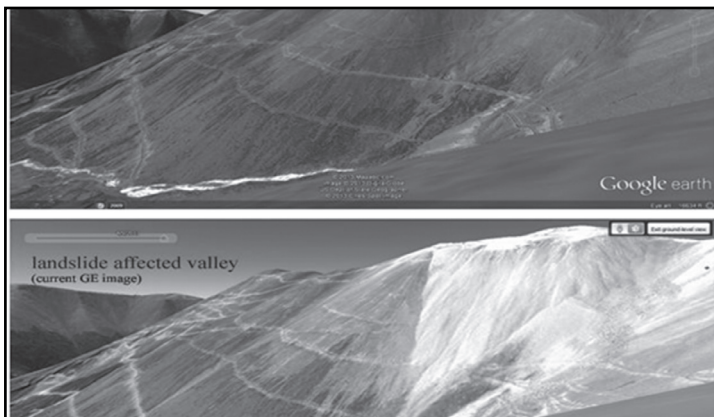


Figure 4 The black lines indicating the debris flow-direction from the excavation has been dumped on its eastern flank down the Tashi Gang valley; Image source:GE

First, we need to understand the amount of materials being extracted and the resultant amount of debris which was dumped as waste in the process. Phase one of the mining began in the second-half of 2010 with an annual mining and processing capacity of 6,000 tons a day. If 6000 tons per day is processed, it would amount to approx. 2.19 million tons per annum, which will add up to approx. 3.5 million tons for the 20 months from mid-2010 till March 2013. Since late 2012 or early 2013, it is evident that surface mining has been carried out at the top of a prominent mountain and an estimated 420 meter long and 250 meters wide area has been flattened. This is clearly evident from the Google Earth (GE) Image which shows some kind of mining



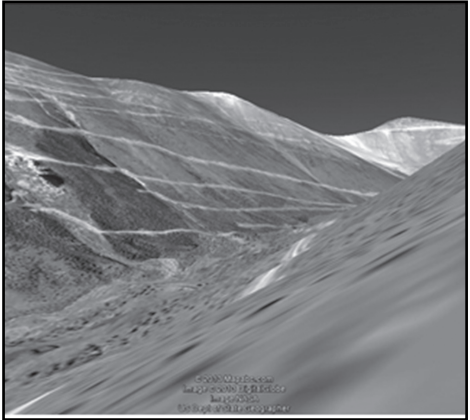
activity on top of the mountain (coordinates 29042'13.00"N lat. and 21045'50.21"E long). within the Gyama Copper Polymetallic Mining area. One can clearly compare the latest image with the previous ones (using timeline option) to get a sense of the

Figure 5a & 5b (comparative GE images of the the mining site)

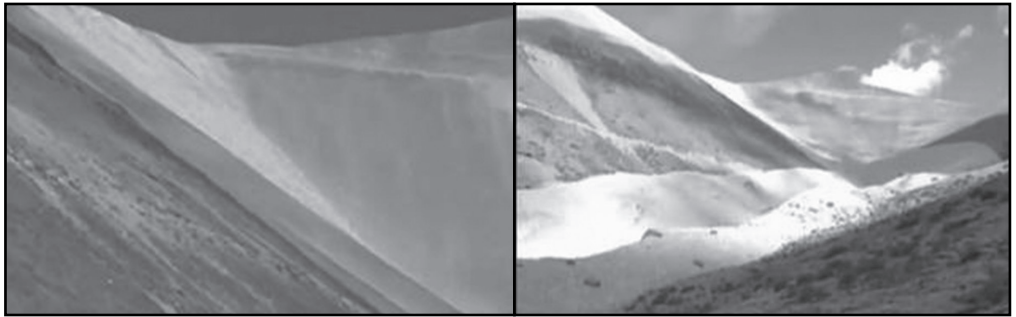
extent of excavation and also calculate the volume of material removed from the mountain. We also compared various, GE images, landslide images and video clips that were widely circulated in the Chinese media, and even invited a local resident who virtually took us to ground zero with the help of Google Earth software. After painstakingly comparing various images and ruling out the maximum possibility, we came to this conclusion that the area of landslide that we have extracted from GE images matches exactly with the images circulated in the Chinese media. Even though, those Chinese images only captured the tongue of the landslide (Figures 6a), one could clearly make out from its background that those GE images shown in figures 6b, 4 and 5 speaks of the same location. In addition to the above images, we captured some more screen shots from a recent Chinese clip (Figures 7a&7b) on the landslide incident and they too in a way confirms the geographical location of our argument (Figure 8).



Figures 6a: Rescue workers in action
Image:Xinhua



Figures 6b: current GE image
confirming the location



Figures 7a& 7b Screen grabs confirming the location Source: www.voanews.com/english

Our rough calculation yielded an estimated 1.89 million cubic meters of material obliterated from the mountaintop after it was reduced to a flat ridge-like structure. The explosives used in mining could surely cause instability in the debris pile. The debris from the excavation has been dumped on its eastern flank down the valley (newly formed light patch on the slope seen in all the images). According to the Chinese State media, the amount of material in the landslide is approximately 2 million cubic meters and it sort of perfectly matches with our calculation of the missing material from the mountaintop. The steepness of the mountain is around 45 degrees as is suggested by Chinese investigators. In the valley, GE image shows blue-roofed camps, possibly camps for worker which may be the one's swept and buried by the landslide.

The debris of the landslide are of similar size and shape suggesting that they are not fragmented by any geological processes like thermal dynamics of glaciers but rather crushed into particular sizes for processing. According to the technical report of the company, excavated rocks will be crushed into sizes smaller than 300 mm (China Gold International Resources Corp. Ltd, 2012). A natural landslide will cause rocks to disintegrate in varying size while a mechanized crushing could only yield rocks of defined sizes. EDD believes that due to excessive dumping of these rock waste and tailings in the steep slopes of the mountain, the stability of the slope is disturbed and increased its vulnerability to fail.

This factor is aided by high explosives and blasting agents used during the exploration carried out in the adjoining areas. At a point, when the slope could no longer hold the weight of several million tons of debris, the whole pile which has low cohesion plummeted down the valley and the ensuing force pushed it 3 km away. This situation resembles the process of 'debris avalanche' or 'waste avalanche', which is a type of landslide characterized by the chaotic movement of rocks soil and debris mixed with water or ice. Debris avalanches can also travel well past the foot of the slope due to their tremendous speed. Due to its swift slide, the miners in the camp possibly did not get any chance. The picture of the landslide looks similar to a debris avalanche.

- Possibly a surface excavation on top of the mountain
- The waste ore/ mine tailing from the excavation is dumped on the eastern flank of the mountain (indicated by the blue arrow)
- The brown shade indicates the valley that has been hit by the landslide; caused by the increase weight of the stockpile and possibly aided by use of explosive for exploration drilling in the adjoining areas.

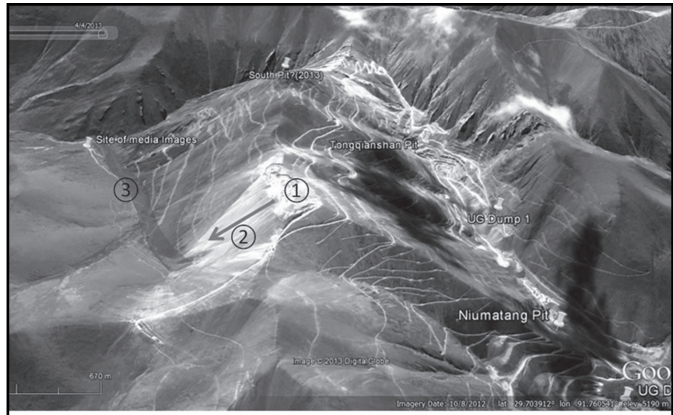


Figure 8: EDD's theory about the landslide , Image Source: GE

Media Restrictions and Reaction of Netizens in China

From the outset, all reports about the landslide has been reported and supplied by Chinese state media. Foreign media has already been barred in Tibet since 2008 and the Chinese media personnel were given strict instructions not to diverge from the official position and cautioned from divulging any independent findings. An instruction, thought to be leaked from the Chinese Central Propaganda Department, ordered media outlets to ‘use Xinhua wire copy and information issued by authorities departments as the standard’. It specified: ‘No journalist to be sent to the region for reporting or interviewing’ (Henochowicz, 2013).

The disaster has drawn angry reactions against the authority and strong sympathy for the Tibetans among the netizens in China. Many Internet users in China suggested that the landslide was likely caused by the devastation of the area’s environment by uncontrolled and widespread mining activity. Beijing based writer Tsering Woesser, who has written about environmental problems in Tibet expressed, “This was not a natural but a man-made disaster”. She further stressed, “For locals, it says loud and clear how crazy the mining has become there” (Wong, 2013). Another blogger wrote that travelling along the Sichuan-Tibet freeway, there were countless mines, large and small. The road had been badly damaged by the hundreds of huge 80 tonnes trucks carrying mineral ore out of the region each day.

Television director Zhang Ronggui said he was “strongly opposed to the development of heavy industry and mineral resources in Tibet” in a widely forwarded post on Sina Weibo (Chinese Twitter equivalent). “It is the world’s highest and purest holy

land, and I hope the government can leave a blue sky, clean water and white clouds for the next generation,” he wrote. Well-known author Zhang Yihe, in a message to her 339,000 fans, said: “I don’t understand why we have to dig up gold in areas that are above 4,000 metres. Why must we also build dams on rivers, including the Yarlung Zangbo? Why don’t we leave something for the next generation?” (The Hindu, 2013).

Recommendations of the Technical Report

Several Technical reports have been produced for the mining company in Gyama including update report (Deng, 2010) prepared by Behre Dolbear Asia, Inc. Denver, Colorado in March 2012 and pre-feasibility study technical report for the phase II expansion of the Jiama project (China Gold International Resources Corp. Ltd, 2012) prepared by Minacro Mine Consult (MMC), Brisbane, Queensland, Australia, in November 2012. MMC has noted five additional detailed mine planning studies that are required to be conducted prior to operation. Those mentioned below are we thought that the client must have ignored:

1. Confirm, optimize and improve pit designs, scheduling and equipment selection for South Pit and Jiaoyan (this will require further geotechnical work but this work has potential to improve project economics).
2. Confirm final design parameters for South Pit and Jiaoyan, particularly those relating to the overall pit slope angle of 43 degrees, which are considered conservative.
3. Confirm final design parameters used for the underground mine (this will require further geotechnical work).

MMC have mentioned in their technical report that further geotechnical studies should be undertaken to better understand the rock mechanics related to the Jiaoyan Pit, South Pit and the underground mine, as to date only qualitative descriptions regarding the stress distribution characteristics of rock mass in the rock mechanics and general estimations regarding the ground surface caving have been able to be completed to date. MMC further recommends the following additional geotechnical work such as rock stress testing, research on rock mass strain properties and ground pressure observation and analysis.

Corruption: Interplay of politics and wealth

In accordance with an agreement between the ‘TAR’ government and China National Gold Group Corporation, the four mining licenses in the Gyama valley as well as the exploration licenses in the surrounding areas were consolidated by the reorganized Huatailong in late 2007, with China Gold Group (Hong Kong) as the primary shareholder (Deng, 2010). However, the process of transferring

ownership was not so simple. Several holding companies got involved in the deal including PRC based 'Jia Ertong', Cayman Island Company 'Skyland Mining' and British Virgin Island Company 'Rapid Results Investment'. The present owner, China Gold International Resources Corp. Ltd. (CGIR) came into picture after it signed purchase agreement on 30 August 2010 and agreed to pay over \$700,000,000 worth of shares and about \$50,000,000 in cash for the Gyama mine. As the 49% owner, Rapid Result Investment (RRI) received about USD 375,000,000 in addition to USD 216,000,000 that it already received from PRC State Owned Enterprise China National Gold Group from the sale of its 51% share in the mine. Thus RRI received a total of about USD 590,000,000 in this whole transaction.

Rapid Result Investment is an investment holding company incorporated in British Virgin Islands (BVI) on September 22, 2006. BVI along with other offshore areas such as Cayman Islands, Samoa Islands etc. are used by many Chinese business owners and officials to conceal illegal conduct such as tax evasion and fraud by establishing offshore holding companies. Recently, on 4 April 2013, the International Consortium of Investigative Journalists (ICIJ) began leaking the details of 2 million emails and other documents and Journalists investigating British Virgin Islands data found that those setting up offshore entities were mostly from Chinese mainland, HK and Taiwan (South China Morning Post, 2013). It could be possible that the RRI owned by various individuals and family trust most likely connected with the CCP in TAR and Beijing, who amassed huge wealth through the transfer of ownership of Gyama mine, could also be exposed.

Socio-economic and Environmental Impacts

In the past decade, the Gyama mine has been a major failure in terms of the social harmony and environmental protection in the area. Before it was consolidated under one umbrella in 2007, the Gyama Mine consisted of four small mines which has been causing pollution, land degradation, harm to livestock etc. After the consolidation, large-scale and heavy mechanized operations accelerated the ongoing environmental and social problems. Gyama valley has been considered sacred and many Tibetans visit the valley for pilgrimage every year. But due to the rapid expansion, many monasteries, hermitage and centuries-old paintings have been affected. The lack of empathy by Chinese government towards Tibetan Culture and sentiment is expressed by Tsering Woenser who wrote, "It is true that I mention Songtsen Gampo often, always in the hope that those greedy cadres and companies would show some mercy. In Han Chinese culture, the birthplace of all former dynasties' emperors is considered to be the treasured place of 'fengshui', referred to as 'dragon's pulse [...] Gyama, with its many sacred and beautiful places, is where the 'dragon's pulse' exists in Tibet and it should never have to endure such disemboweling hardship as it does today'.

Due to the massive influx of Chinese migrants, Tibetans are left with very few employment opportunities and other benefits. The fact that only two of those trapped are Tibetan and the rest are Han Chinese migrant workers from neighboring provinces of Yunnan, Guizhou and Sichuan is a clear indicator. Many Tibetan farmers and nomads have been forced to move away from their ancestral pastures and arable lands which have been expropriated by government to make way for the expansion of mining operations in Gyama.

Reports of environmental pollution leading to water contamination, illness of local Tibetans and loss of animals are common in the Gyama Valley. Huang and her associates (2010) conducted researches on the environmental impact of mining activities on the surface water quality in the Gyama town near Lhasa and found out that “high content of heavy metals in the stream sediments as well as in a number of tailings with gangue and material from the ore processing, poses a great potential threat to the downstream water users” (Huang, 2010). The mining, which has been going on in the upper hills of Gyama for nearly two decades have led to toxic wastes being dumped into Gyama Shingchu river resulting in the death of a large number of cattle. Villagers in the valley depend on Gyama Shingchu for their drinking water supply and irrigation. Tsering Woesser who went to Gyama in 2005, later wrote, “I heard that the elderly man who guards the temple already passed away. Because of the pollution caused by mining activities, many villagers have fallen ill.”

The impacts of rampant mining activities have led to social unrest and related issues. In 2008, a Chinese mining company carried out a water-diversion project in the upper Gyama region leading to forceful confiscation of agricultural lands. In the same year, local Tibetan residents from Gyama Township reportedly petitioned the local government to put an immediate halt to the mining project in the area. The local government responded by putting the whole region under heavy military surveillance, with imposition of severe restrictions on communication to the outside world and people visiting the region (Phayul, 2013). A positive response seems unlikely, as it will be at odds with the self-interests of many officials who make quasi-legal financial gains by protecting mining enterprises. On 20 June, 2009, angry villagers took to streets and clashed with Chinese miners and the scuffle between Tibetans and miners were followed by police crackdown leaving 3 Tibetans wounded.

Mining Accidents as a Norm in China

The mining and quarrying industry in China has a dreadful safety record and the list of mining-related accidents is long. On the same day when this massive landslide swept through a part of the Gyama mine, there were reports of explosions in two coal mines located in Jilin and Guizhou resulting in the death of 29 workers. The

authorities put Babao coal mine in Jilin ‘under investigation’, but just three days later Babao witnessed another gas explosion, killing six more workers while 11 remain missing (Xinhua, 2013). According to the data compiled by United States Mine Rescue Association (USMRA), 19 incidents of mining-related accidents have been reported in China since the beginning of 2013, resulting in the death of at least 167 with 95 workers still missing (United States Mine Rescue Association, 2013). According to the official figures, at least 1,384 people died due to mining-related accidents in China in 2012 only. The figure in 2011 was higher at 1,973 and the State Administration of Work Safety (SAWS) claims ‘major progress’ in reducing deaths. However, due to widespread practice of concealing or underreporting the full extent of mine disasters, the actual death tolls could be higher. The lack of a free press, independent trade unions, citizen watchdog groups and other checks on official power have enabled government officials to have higher success rate in concealing a tragedy than preventing it (Lafraniere, 2009).

In a rather similar case as Gyama in the mainland China in Shanxi province, a landslide toppled a waste dump of the mine and buried Sigou Village of Loufan County claiming 45 lives on 1 August, 2009. Chinese authorities later confirmed and accepted that poor mining management was the cause of the Sigou Village landslide in China (China Daily, 2009). However, a landslide in a minority region such as those inhabited by Tibetans, Uyghurs and Mongolians provoke a different response from the authorities as it is viewed as politically and socially sensitive. On 31 July 2012, a landslide occurred in Araltobe, Xinyuan County in Kazak Autonomous Prefecture of Ili, in Xinjiang Uygur Autonomous Region and buried a building occupied by 28 people. After an ‘official investigation’, the local land resources authorities found that the disaster was a result of heavy rainfall (Xinhua, 2012).

Conclusion

Millions are suppressed from expressing their voices, limited information flows out of Tibet, heavy internet and media censorship, yet the truth prevails. Resource extraction is prevalent in more than 200 different sites in the whole of Tibet. Since 2009, there have been over 18 different cases of public protest related to mining sector in all the three provinces of Tibet. These mining companies pay little respect to the local culture and the sanctity of the landscapes. They have been known to extract minerals and other resources from holy lakes and sacred mountains which local Tibetans have revered for generations. Such negligence and disrespect creates strong social tensions, distrust, anger, desperation and fear among the local residence.

Whenever the Tibetan communities attempt to put forward their grievances in petitions to higher authorities against the miners, they are ignored, politicized and

harassed or even fired upon by the police. In the frequent protests by Tibetan villagers, their immediate concern has often been the damage done by miners to the local streams, rivers, holy mountains and pasture land. Without any concern or hesitation, miners dump the mine tailing and chemical effluents in the local river with no special attention and action from the local authorities.

Towards this end, we demand a full investigation from an independent party to investigate and report the real cause of this landslide. More importantly, we call on Chinese government to ensure active participation of Tibetan people in all decision making process in Tibet; social, environmental (Environmental Impact Assessment) and cultural impacts are fully investigated; natural resources are not depleted; migration and settlement of non-Tibetans into Tibet are not facilitated; ownership of Tibetan land and resources are not transferred to non-Tibetans; and large-scale, capital-intensive and commercial projects are not facilitated inside Tibet.

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WATER AVAILABILITY AND MANAGEMENT

Growing industrialization, population growth, and increasing levels of consumption are placing heavy demands on water resources, which provide vital support for the subsistence livelihoods of millions of people. Figure 1 explains in brief the baseline water stress regions in Asia. The tension on water availability is further raised by the rate at which

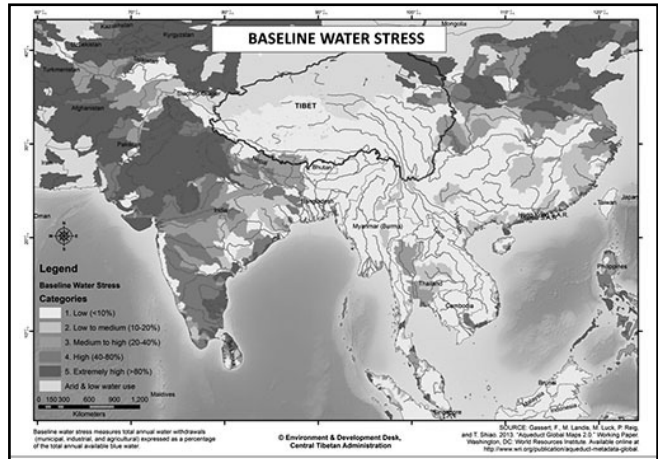


Figure1. Baseline Water Stress Regions in Asia Map © EDD/ DIIR

Chinese are commissioning damming projects on those trans-boundary rivers. With no foreseeable increase in the water availability and no water sharing treaty in action, all the riparian states from Pakistan till Vietnam are at the mercy of these massive reservoirs within Tibet and China. As for India, its water demand will double by 2030 reaching 1.5 trillion cubic meters, principally driven by population growth and the domestic need for agriculture (IDSA Task Force, 2010).

According to recent report released on Himalayan Glaciers, the combined river basin of Indus, Ganga/Brahmaputra benefits/supports more than 744 million people living within the contiguous arc from Afghanistan to Bangladesh. The use of water in the agricultural sector has increased over the past few decades. It is estimated as per 2000 data that the irrigation area for Indus (15 MHA), Ganga/Brahmaputra basin (29 MHA)-million hectares and will continue to increase further (National Academic Press, 2012).

Fig 2. Fraction of the land equipped for irrigation in the HKH region. Irrigation is widespread in both the Indus and Ganges/Brahmaputra basins. A relatively large amount of irrigated water consumption in the Indus basin is for cotton production. In the Brahmaputra basin, by comparison, irrigation water use is dominated by rice production, while in the Ganges basin, irrigated water is used primarily for wheat production.



Source: National Academy of Science (2012)
<http://www.nasonline.org/>

Looking towards China, a survey data analyzed by the Joint Monitoring Program for Water and Sanitation of WHO and UNICEF mentioned that about 100 million Chinese still did not have access to an improved water source in 2008, and about 460 million did not have access to improved sanitation. Water scarcity threatens the ability of China's farmers to irrigate their crops, impacting food security as well as social stability, especially in northern China. A case in point is

the impact in Yunnan province which is facing a severe drought and government is responding by proposing huge reservoirs and dams on the already stressed rivers flowing from the province (Fangyi & Jiading, 2020). Every year, water shortages cost the country an estimated 40-60 billion RMB in lost economic output. Continued scarcity and uncertainty will affect the willingness of foreign and domestic companies to invest in China, further lowering the production of existing facilities, and ultimately affecting its job market (Yusha, 2010).

For China, Tibet's rivers are proving as rich resources for hydro electric and geopolitical power as its mineral wealth. Chinese 12th Five Year Plan (2011-2015) has prioritized the development of Hydro power projects, it also plans to revive two third of those unfinished hydro power projects detailed in the 11th Five Year Plan. According to South China Morning Post (Jing, 2013), the Chinese state council has released an energy sector blueprint for 2011-2015 in which they have decided to construct at least 54 hydro power stations with a total capacity of 120 GW on the upper reaches of Driчу (Yangtze), Zachu (Mekong) and Salween. It clearly disregards the geological risks, global biodiversity, resettlement and impacts on downstream communities. This plan also includes the reopening of previously shelved dam projects on the Salween River due to environmental concerns. On a macro level, China is planning to install 1.2 TW (1200 GW) of water-reliant power capacity by 2030 and 277 GW of coal fired power plant by 2015. As for the latter case, the majority of the coal reserves in China are in water scarce regions of Shanxi and Inner Mongolia and it is a well-known that coal mining requires heavy water use (China Water Risk, 2012).

Managing and securing the water resource in Tibet could be the biggest and most important challenge for the new Chinese leaders. Downstream users of water originating in Tibet should establish a regional forum to create policies on trans boundary issues that effectively safeguard access and quality of water, at a time of accelerating glacier melt and damming activities.

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CLIMATE CHANGE IMPACTS ON THE TIBETAN PLATEAU AND ITS IMPLICATIONS ON ASIAN WATER RESOURCES.

Tibetan Plateau: The roof of the world

Tibetan Plateau, rising majestically at an average elevation of 4500 meters above the mean sea level is situated at the heart of Asia, ringed by fourteen high snow-capped mountain ranges and six biggest Asian rivers. This beautiful land is fondly called Land of Snow by Tibetans and Roof of the World by outsiders.

This vast plateau stretches for almost 3,000 kilometers from west to east and 1,500 kilometers from south to north. The glacier-fed rivers originating from these peaks and the subsequent recharge from the underground aquifer makes up Tibet the largest river run-off from any single location in the world. Despite its cold environment and intricately complex natural systems, the Tibetan people have occupied this plateau for thousands of years. They have created a cultural landscape based on the principles of simplicity and non-violence that are in harmony with the environment. It is in fact one of the most environmentally strategic and sensitive regions in the world and quite often referred to as ‘The Third Pole’ and ‘The Water Tower of Asia’. These synonyms reflect the significance of its snowcapped mountains, the river systems and its alpine grasslands. Since time immemorial, the plateau holds the Hindu Kush Himalayan Ice Sheet, considered as the largest ice mass outside the two poles. Tibet also acts as the fountainhead for many rivers that flow into Asia (India, Inner Mongolia, Nepal, Bhutan, Bangladesh, China, Pakistan, Thailand, Laos, Burma, Cambodia and Vietnam) creating a vast river basin area of more than 6 million sq. km. During the last few decades, due to climate warming and human actions, the natural systems of this unique landscape are silently degrading away and threatening the survival of millions who rely on its natural ecosystem services.

Tibetan Plateau: The Third Pole

Tibetan Plateau holds the Hindu-Kush Himalayan Ice Sheet, considered the largest ice mass outside the two poles. Hence Scientist and geologists are increasingly using the name ‘Third Pole’ to pronounce the global significance of Tibet’s environment. The Plateau contains over 46,000 glaciers covering an area of 105,000 sq. km, and is the highest, largest, and coldest plateau on Earth. This region contains the largest reservoir of fresh water besides the two poles and practically holds more accessible fresh water reserves if compared to the poles.

Tibetan Plateau: Water Tower of Asia and Significance of Tibetan rivers

Tibetan rivers are distinguished by their high silt loads resulting from the largely desert landscape from which they originate. The six major rivers are Machu (Yellow River), Drichu (Yangtze), Zachu (Mekong), Gyalmo Ngulchu (Salween), Yarlung Tsangpo (Brahmaputra) and Senge Khabab (Indus). These rivers flow into nine most populous nations on earth from Pakistan in the west to Vietnam and Cambodia in the east, supporting every form of social and economic livelihood in these riparian regions. In fact, beside the six major river mentions above, there are many rivers and smaller streams that originate from Tibet and flows into neighboring states to form bigger rivers. In whole, the entire Tibetan Plateau serves as the Water Tower of Asia, providing water for irrigation, fishing, electricity, transportation, industrialization and consumption to more than 1.3 billion peoples, both poor and rich. These rivers (Table1) not only enable Tibet to become a strategic platform in exercising its dominance over the lower riparian states but also attract many secondary and primary industries from mainland China. This is due to the fact that, nearly half of the GDP 45% and 51% of the industrial output of China are from water scarce provinces and municipalities. Moreover, these water scarce regions of China house 38% of the installed power capacity and 47% of the coal fired power plant. No wonder these industries would be attracted to water abundant regions in Tibet where per capita water availability records 139,659 m³ compared to only 127 m³ /person/year in Beijing and Tianjin.

| Major Rivers flowing from Tibet | | | |
|---------------------------------|-----------------|---------------------|---|
| No. | Tibetan Name | Common Name | Watershed Regions/Countries |
| 1 | Drichu | Yangtze River | Tibet, China |
| 2 | Machu | Yellow River | Tibet, Inner Mongolia, China |
| 3 | Zachu | Mekong River | Tibet, China, Vietnam, Laos, Cambodia, Thailand |
| 4 | Gyalmo Ngulchu | Salween River | Tibet, China, Burma, Thailand |
| 5 | Yarlung Tsangpo | Brahmaputra | Tibet, India, Bangladesh |
| 6 | Senge Khabab | Indus River | Tibet, India, Pakistan |
| 7 | Nyakchu | Yalong River | Tibet, China |
| 8 | Lhodrak Sharchu | Manas River | Tibet, Bhutan, India, Bangladesh |
| 9 | Bhumchu | Arun River | Tibet, Nepal, India |
| 10 | Macha Khabab | Karnali/Ganga River | Tibet, Nepal, India |
| 11 | Langchen Khabab | Sutlej River | Tibet, India, Pakistan |

Source: EDD/DIIR

Six Major Asian River Systems

Drichu/Yangtze River is the longest in Asia and one third of China's population live in the Yangtze River valley. Yangtze River basin also accounts for 40% of China's freshwater resources, more than 70% China's rice production, 50% of its grain production and more than 70% of fishery production.

Machu/Yellow River which flows through 9 provinces in China is the second longest in China and sixth longest in world. It directly supports over 500 million people and two third of China's cropland.

Zachu/Mekong River which originates from Tibetan plateau and flows through China, Burma, Laos, Thailand, Cambodia and Vietnam is the 7th longest in Asia and 10th longest in the world. Mekong River provides food, water and transportation to about 60 million people in Cambodia, Laos, Thailand and Vietnam. The Mekong in Thai roughly translates as 'mother of the waters'.

Gyalmo Ngulchu/Salween River which flows from Tibetan plateau through China, Burma and Thailand is one of the longest free-flowing rivers in the world and its home to 7 million people. Extensive logging in the late 20th century has damaged the river's ecology. China has proposed to build 13 cascade dams on the mainstream river through Yunnan. As of today, no major dams exist except for two small hydropower stations at Takrir (Ch: Chalong) and Driru (Ch: Jiquan) in Tibet.

Yarlung Tsangpo/Brahmaputra River which flows from south west Tibet into India (Arunachal Pradesh and Assam) and Bangladesh is an important river for irrigation and transportation. It provides irrigation for 128 million people in Bangladesh and is one of the highest major rivers of the world. The ongoing hydro power projects on the mainstream river in Tibet are creating a political tension for the riparian states.

Senge Tsangpo/Indus River flows from Tibet to India and Pakistan; it provides the key water resources for the economy of Pakistan. It's the longest and the most important river in Pakistan and main source for irrigation.

The Four Famous Khababs

The famous four 'Khababs' (meaning rivers running from different Mouths); Senge Khabab (Lion's mouth), Macha Khabab (Peacock's mouth), Langchen Khabab (Elephant's mouth) and Tamchok Khabab (Horse's mouth), all originate around Mt. Kailash, also known as the Gang Rinpoche, 'the Holy Mountain'.

Tamchok Khabab (Brahmaputra) originating from the east of Mt. Kailash and flows through the most densely populated central Tibetan region of Yarlung where

the name changes into Yarlung Tsangpo and it irrigates most of the agricultural land in the historical Yarlung valley of Tibet. The river then flows through the once forested Kongpo region before turning abruptly near Mt. Namchak Barwa to the south, cutting straight through the Himalayan divide to flow into India as Brahmaputra and then to Bangladesh as their lifeline.

Senge Khabab (Indus) originates from the north of Kailash, flows west into India (Ladakh and Kashmir) and then into Pakistan where it's well known as Indus River, running right in the central of Pakistan cutting from north to south providing fishing, irrigation, transportation and fresh water to most of the Pakistan.

Langchen Khabab (Sutlej) begins from the west of Mt. Kailash, crossing the Himalayas into Himachal Pradesh in northwest India as Sutlej River, passing through the Punjab region before joining the Indus in Pakistan.

Macha Khabab (Karnali) originates from the southern part of Mt. Kailash, crossing the Himalayas into western Nepal as Karnali river and then into India where it becomes one of the major tributary of the River Ganges (Environment & Development Desk, 2000).

According to recent report published on Himalayan Glaciers, the combined river basin of Indus, Ganga/ Brahmaputra benefits/supports more than 744 million people living within the contiguous arc from Afghanistan to Bangladesh. The use of water in the agricultural sector has increased over the past few decades. It is estimated as per 2000 data that the irrigation area for Indus (15 MHA), Ganga\ Brahmaputra basin (29 MHA)-million hectares and will continue to increase further (National Research Council of The National Academies, 2012). Growing industrialization, population growth, and increasing levels of consumption are placing heavy demands on water resources, which provide vital support for the subsistence livelihoods of millions of people.

The tension on water availability is further raised by the rate at which Chinese are commissioning damming projects on those trans-boundary rivers. With no foreseeable increase in the water availability and no water sharing treaty in action, all the riparian states from Pakistan till Vietnam are at the mercy of these dam builders. The IDSA or (Institute for Defence Studies and Analyses, 2010), quotes 'The McKinsey Report' that 'water demand in India will grow from its current water supply of approximately 740 billion m³ to almost 1.5 trillion m³ by 2030, principally driven by population growth and the domestic need for agriculture'.

Climate Change Impacts: Diminishing Water Reserves

It is a well-documented fact that the rate of climate warming or increase in the air temperature on the Tibetan Plateau is twice the global average. This rise in air temperature, on a regional scale have accelerated the melting of glaciers, increased evaporation rate resulting to drying up the head regions of major rivers and wetlands, loss of biodiversity (medical plants and other sensitive species), & permafrost degradation leading to degradation of grasslands, underground aquifers and lowering of water tables. Such changes would signal an unavoidable and a gloomy future roadmap for those neighboring countries, which has benefited from the ecosystem services provided by the Tibetan Plateau.

For instance, it is now feared that the Himalayan glaciers are rapidly retreating because of climate change. Since the mid-1970s, the average air temperature rose by 1°C in the Himalayan region, i.e., almost twice as fast as the global average warming of 0.6 °C reported by the IPCC, this trend being most pronounced at high altitude sites. And almost 67% of the glaciers in the Himalayan and Tianshan mountain ranges have retreated in the past decade—by as much as 30 m per year for the Gangotri glacier (Collette, 2007).

Permafrost Degradation

The major rivers (Yangtze, Yellow, Mekong, Salween, Yalong Jiang) have their source around large permafrost region of northern Tibet; these rivers are seasonally replenished by melting and refreezing in different season thus maintaining a constant flow. Permafrost is defined as ground that remains at or below 0°C continuously for two or more years. It is widespread in high latitudes and in high-elevation regions. The permafrost cover on the Tibetan Plateau (1.3 to 1.6 million sq. km) is alpine permafrost best defined as warm permafrost and rich ground ice, usually not far from melting temperature. Tibetan permafrost comprises 74.5% of the Northern Hemisphere's mountain permafrost and is a direct consequence of land uplift since last 2 million years.

This permafrost cover varies in its thickness from 1 to 130 m, depending on local characteristics and soil water content. Unlike the permafrost of other cold regions, the permafrost prevailing on the Tibetan Plateau is generally ice-poor as a consequence of the arid climate, high evaporation, and glacial history. The increase in the winter temperatures as a result of climate warming slowly degrades or melts the frozen earth. As such the soil loses moisture in spring before the growing plants can access the water. This affects not only the crops and the native vegetation of Tibet (especially in wetlands and other low-lying areas) but also leads to the fall in the water table resulting to the drying up of underground aquifers. Apart from climate warming, human activities (road constructions, mining, underground

pipeline networks) are also responsible for destroying the permafrost soil. Researchers have found that, the permafrost temperature at the source areas of Driчу (Yangtze River) and Machu (Yellow River) in the arid heart of the Tibetan Plateau has risen since 1980 resulting to the increase in the soil active layer. Under such conditions, the permafrost degradation is directly leading to the lowering of local water tables and lake water levels and shrinking of wetlands and deterioration of marshy meadows. The diminishing marshy meadows allow for a greater depth of thaw thus further lowering of the water table. The same observations were also made by other researchers. Recently some researchers have noticed a shrinking of about 20% of the alpine meadows and the wetlands area in the vast Amdo area due to permafrost degradation (Environment & Development Desk, 2009).

These changes in permafrost regions have resulted (over the years) in loss of soil moisture and the subsequent release of trapped carbon to the atmosphere. Such degradation will cause large scale environmental deterioration, including changes in surface hydrology, accelerated desertification, and destabilization of human infrastructure.

Glacial Retreat

A glacier is a large persistent body of ice that forms where the accumulation of snow exceeds its ablation (melting and sublimation) over many years, often centuries. Glaciers slowly deform and flow due to stresses induced by their weight, creating crevasses, seracs and other distinguishing features. They also abrade rock and debris from their substrate to create landforms such as cirques and moraines. Glaciers form only on land and are distinct from the much thinner sea ice and lake ice. Most of the Asian rivers originating from south western part of Tibetan Plateau are glacier fed rivers.

The rise in temperature would also increase the rate of evapo-transpiration from the rivers and watershed areas intensifying the desertification process. About 82 percent of the Tibetan Glaciers in the Himalayas have already retreated in the past half century (Qiu, 2008). In the past 40 years, Tibet's glaciers have shrunk by 6,600 sq km (as of year 2006). It is estimated that they are currently melting at a rate of 7 percent per year. A separate study by a NASA scientist (2010) revealed that 20 percent of these glaciers have retreated in the past 40 years and if the current trend continues, more than 60 percent of the existing glaciers could be gone in the next 40 years. Glaciers in the Indian Himalayas are losing one meter of ice every year and the main contributor towards this melting is from the black carbon resulting from forest fires and burning of agricultural waste. It was also reported that the loss in mass of glaciers in Indian Himalayas has significantly gone up 1998 onwards (Sharma, 2012). It was also reported that the fastest retreating glacier in the Himalayas is the Imja Glacier.

Even (National Development and Reform Commission (NDRC), 2007) has mentioned that the area of glaciers and frozen earth is expected to decrease more rapidly, and it is estimated that the glacier area in western China will decrease by 27% by the year 2050. The same concerns have been shared by the IPCC (Intergovernmental Panel on Climate Change) in one of its reports, warning that such meltdown will result in massive flooding followed by severe droughts.

The International Centre for Integrated Mountain Development (ICIMOD) has revealed alarming details on the sustainability of the Himalayan glaciers. According to their findings, the current trend of melting glaciers suggests that the Ganges, Indus, Brahmaputra and other rivers across the northern India plains could most likely become seasonal rivers in the near future. Increased temperature has accelerated glacial shrinkage and has accelerated the degradation of permafrost regions further reducing the river flow.

Weakening of Indian Monsoon

The present atmospheric circulation patterns over the Tibetan Plateau and surrounding are characterized by the Indian monsoon in summer and the Westerlies in the winter. Some recent research has indicated the weakening of Indian monsoon and strengthening of the Westerlies also leading to less accumulation of snow or less precipitation on the Himalayan ranges. Most of the rivers that flow from Tibet to the south Asian regions are recharged heavily by the summer Monsoon. The intensity of the summer monsoon or the Indian monsoon is highly dependent on the heating rate of Tibetan plateau. Plateau's seasonal heating during summer and spring plays a principal role in determining the large-scale air circulation in summer. Technically, this heating over the Tibetan Plateau tends to generate a surface cyclonic circulation and upper-atmosphere anti-cyclonic circulation which results in the appearance of a large air motion in the eastern side of the Plateau.

As long ago as 1884, an English meteorologist (Blanford, 1984) working in India had the inspired idea that the snows of Tibet and the Indian monsoon are causally connected. Henry Francis Blanford also suggested that the less it snows in winter in Tibet, the earlier the snowmelt, and the earlier the monsoon (Blanford, 1984). In other words, the Tibetan Plateau acts as a heat pump in the summer drawing in the moisture rich water vapors from the Bay of Bengal¹. Some researchers have even identified and related their findings to the thickness of spring snow on the plateau

1. During summer, the Tibetan Plateau acts as an elevated heat source driving the Asian monsoon, with sensible and latent heat fluxes domination over the eastern and western Plateau respectively. The differential heating between land and sea intensifies the pressure gradient between the south Asian landmass and the Indian Ocean leading to the flow of air and moisture from the sea.

to the overall heat exchange that could affect the timing and the intensity of the East Asian Summer Monsoon. Previous studies have also speculated the seasonal snow cover on the Tibetan Plateau as an important factor in regulating the Asian Monsoon (Zhaoxia Pu, 2008).

Other factors exacerbating the climate change impacts: Wrong policies and human interventions

Dams and Diversions The Chinese dam building frenzy could be easily observed from their record in the past fifty years. According to the World Commission on Dams, China had only 22 large dams in 1949 and by 2000 the number had increased to 22,000 dams. Loh Su Hsing has mentioned in *Jakarta Globe* (2011) that, “China has dammed every major river on the Tibetan Plateau-including the Mekong, the Salween, the Brahmaputra, the Yangtze, the Yellow, the Indus, the Sutlej, the Shweli² and the Karnali³. China has unveiled plans to dam the rivers that still remain free flowing, such as the Arun⁴ and the Subansiri⁵.”

The World-Wide Fund (WWF) for nature named the Indus River as one of the world’s ten rivers at risk. The Indus which was already facing an acute shortage of water in its flow due to climate change suffered more obstruction after Beijing built a dam on the river at Gar in Ngari (Ch: Ali) without informing India and Pakistan. For China, Tibet’s rivers are proving as rich resources for hydroelectric and geopolitical power as its mineral wealth. But frenzied dam construction projected until 2020 means that a prehistoric irrigation system that dates back 30 to 40 million years is coming to an end (Luke, 2011). Chinese 12th Five Year Plan (2011-2015) has prioritized the development of Hydropower projects, it also plans to revive two third of those unfinished hydropower projects detailed in the 11th Five Year Plan.

According to an energy sector blueprint released by the Chinese state council for 2011-2015, they have decided to construct at least 54 hydro power stations with a total capacity of 120 GW on the upper reaches of Drichu (Yangtze), Zachu (Mekong) and Gyalmo Ngulchu (Salween) (Jing, 2013). It clearly disregards the geological risks, global biodiversity, resettlement and impacts on downstream communities. This plan also includes the reopening of previously shelved dam projects on the Salween River due to environmental concerns.

2. Shweli River is a river in Myanmar (Burma). It forms part of the boundary between Burma and China.

3. Karnali is the major tributary that flows from Tibet that forms river Ganga.

4. Arun flows from Tibet as Bhumchu to Nepal and India

5. Subansiri River is a tributary of the Brahmaputra River flowing from Tibet to the Indian states of Assam and Arunachal Pradesh.

The mainstream Yarlung Tsangpo and its major tributaries in Tibet (Kyichu, Nyangchu, Tongchu, Nyang Trib Chu, Drakchu, Wolga Chu, Chllong Chu, Yiwong Chu, Parlung Chu) is becoming increasingly interrupted by medium sized dams in Tibet and may one day host the biggest dam in the world. If this scheme were implemented it would impede the downstream flow of the primary resources -water and alluvial sediment, that India and Bangladesh depend on. While the construction of 510-megawatt project is already underway, two new additional dams (Bayu and Daigu) are being planned along the mainstream of Yarlung Tsangpo and no clear information is available as to how and when they will initiate these projects along with those that are already being planned.

Deforestation and soil erosion China refers to Tibet as its —Western Treasure House. At the time of China’s invasion in 1950, the Plateau was rich in timber resources, but decades of logging have resulted in large-scale deforestation and half of Tibet’s forest-stock have been exported to China, leaving the region highly prone to erosion. It was only after the disastrous floods of the middle and lower Yangtze River in 1998, that China realized the consequences of stripping Tibet’s forests. Even now logging does continue but at a smaller scale. Shrinking forest cover lessens the landscape’s capacity to intercept, retain and transpire precipitation. Instead of trapping precipitation, which then percolates to groundwater systems, deforested areas become sources of surface water runoff, which moves much faster than subsurface flows. That quicker transport of surface water can translate into flash flooding and more localized floods than would occur with the forest cover. Deforestation also contributes to decreased evapo-transpiration, which lessens atmospheric moisture which in some cases affects precipitation levels downwind from the deforested area, as water is not recycled to downwind forests, but is lost in runoff and returns directly to the oceans.

Resource Extractions: Mining In her latest book *China’s Environmental Challenges* (Shapiro, 2012), Judith Shapiro writes, “Severe environmental problems are occurring in ethnic minority communities on the periphery of the country, where grab for resources is thinly disguised as development program”.

Tibet’s elevation has produced a unique, resource-rich geology. The unchecked mining operations in Tibet have been a major cause for environmental degradation since 1960s. Extraction of mineral ores and natural resources (chromium, salt, copper, silver, coal, gold, lithium, lead, zinc, asbestos, oil, gas, magnesium, potash and uranium) has been vigorously carried out by the Chinese government to fuel its growing economy and to lessen its dependence on costly imports. Chinese Geological Survey in 2007 estimated that the Tibetan Plateau holds about 30-40 million tons of copper reserves, 40 million tons of zinc, and several billion tons of iron. Copper deposits included the Yulong copper field in the Tibetan Autonomous

Region (TAR) which has a proven reserve of more than 7.8 million tons, making it the second largest copper mine in Asia. Mining poses devastating social, economic and ecological consequences for the local Tibetan communities. Mine operations have an irreversibly destructive impact on environment, especially gold and copper mining, which use toxic chemicals usually cyanide or arsenic in the processing stage. Of particular concern is water contamination from the waste discarded at mine sites, as most of the proposed mines are in close proximity to Tibet 's main river systems, including the Yarlung Tsangpo.

Excessive and unsustainable development Over the past few decades, human interventions and climate warming have affected these permafrost regions and are now degrading and threatening not only the diverse species and nomadic way of life but also the underground aquifers that recharge wetlands and the mighty rivers. Field observations conducted by various scientists at different location on the Tibetan Plateau reveal that the ongoing permafrost degradation on the Tibetan Plateau has to be taken seriously and without any delay in implementing new effective policies or revising old policies that are in play. In late 1950's and the following few decades, the People Liberation Army-PLA, in order to maximize the agricultural production (winter crop) from the alpine grasslands have ploughed almost 20 million hectares of grassland in Tibet and Inner Mongolia. They were converted to croplands, by state owned farms, state-owned forestry operations, and other state-owned enterprises. During that era, they were all labeled as —Newly Claimed Virgin croplands but later failed to reap any harvest). These grasslands are now severely degraded (Environment & Development Desk, 2009).

In 1954, the construction of Siling-Lhasa Highway (Ch: Qinghai–Tibet Highway) from Lanzhou and Xining to Lhasa led to the severe degradation of the permafrost soil, its vegetative mat along the highway and its adjoining areas. Based on a scientific field survey in the year 1990, thaw settlement along the highway accounted for 83% of the road damage. The initial highway reconstruction using asphalt pavement that took place during 1973-1984 led to further degradation of these frozen soils. The stretch of highway near the Kunlun Mountain revealed that the thickness of active seasonal melt/refreeze layer under the asphalt road surface was 5.2m compared to only 2.8m under the normal state; and the surface temperature was warmer compared to the normal state. It was also found that the heat accumulation under the asphalt road bases resulted in increased thaw depths too great to be seasonally refrozen and, consequently, resulting in the transformation of vertically connected permafrost into disconnected phase (Huijun Jin, 2000), meaning the permafrost is slowly degrading. The above findings reveal that the current permafrost degradation was mainly due to the surface disturbances while the global warming has played a secondary role in speeding up this degradation. It is also clear that infrastructure development undoubtedly exerted additional stresses on these sensitive permafrost environments.

Forced resettlement of Traditional Pastoral Nomads Many researchers have found that depopulating these grasslands and labeling the nomads as ecological migrants will not help to restore the pastures. Although the stated objective of tuimu huancao is to grow grass and thus conserve watersheds, careful scientific observation shows that when all grazing is removed, the biodiversity of grasses diminishes, medicinal herbs are driven out by toxic weeds, and woody shrubs make the land unusable. Various field observations and research conducted on grasslands indicate a positive connection between the grazing herds of the nomads and the grasslands (Julia A. Klein, 2004). Researchers say that abandoning these grasslands will lead to the domination by invasive species and reduced biodiversity.

For centuries, the Tibetan nomads and herders have successfully maintained a sustainable and mobile lifestyle, traveling from winter to summer pasture lands and autumn to spring pasture lands. The grasslands on the Tibetan Plateau represent one of the last remaining agro-pastoral regions in the world. The pasture lands are made habitable through the co-existence of the Tibetan people and their yaks. Through their efforts they have maintained the sustainable use of this area for many centuries. China's introduction of different grassland policies over the years threatened the sustainability of this delicate environmental balance. The new policies restrict the flexibility and mobility of the nomads (which is the main ingredient in the nomadic pastoral production) and blames their livestock for overgrazing the grasslands. We have found that the people being moved or lured to these concrete settlements in the names of different programs-ecological migration or comfortable housings projects - number approximately 3.2 million in whole of Tibet, including those ethnic Tibetans residing in Amdo and Kham province. According to a study (Y. Feng, 2008) the problem is caused by changes in land use of grassland during the different time periods throughout the past 30 years. As far as Tibetan pastoral nomads are concerned, changes are already occurring. The warmer and drier climate has degraded their usual pastures, so more and more herders are left with no option but to take their herds to higher and harsher grasslands. According to the latest report published by Human Rights Watch, over two million Tibetan herders and nomads have been 'resettled' by the Chinese government over the past seven years (Human Rights Watch, 2013).

Joblessness and alcoholism amongst the youth are prevalent in the new settlements—where the elders are often seen reminiscing their past lives and reliving in their memories and the younger ones are scavenging to earn a little extra money. From our recent interactions with drogpas and herders who fled into exile in India, and from research conducted inside Tibet, we came to know that the current policy of forced —villagization is in fact a very strategic move on the part of the state to keep all the mobile pastoral wanderers in tight leash and to have open access to pastures

for extractive industries without facing any resentment. The policy also enables the central government to boast that it has made sizable investments in elevating the lifestyles of local residents (Norbu, 2012).

Conclusions & Recommendations

The very survival of almost 1.3 billion people depends on the water resources originating from the Tibetan Plateau. Downstream users of water originating in Tibet should establish a regional forum to create policies on trans-boundary issues that effectively safeguard access and quality of water, at a time of accelerating glacier melt and damming activities. China's grassland policies over the past several decades have not only destroyed these grasslands which in turn lead to permafrost degradation, resulting in lost water source for major Asian rivers. But have also undermined the age-old ancestral grassland stewardship provided by the drogpas. The impacts on Tibet's landscape and its natural resources due to natural causes, land-use policies and large-scale development will threaten the future food security of many nations and their relations to China. A healthy and sustainable Tibetan Plateau would not only benefit the entire Asian continent but also it helps in promoting peace and harmony within the region. To preserve the continuous flow of Asian rivers, we need to protect the fragile ecosystem of the Tibetan Plateau or the Water Tower of Asia.

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TIBET: THE THIRD POLE AND THE HIMALAYAS

The world has one roof. It is the Tibetan Plateau, defined simply by Tibetans as the land surrounded by mountains, or the land of snows. Situated at the heart of Asia, Tibet is ringed by fourteen high mountain ranges; the whole plateau is uplifted to an average height of 4,500 meters. This vast plateau stretches for almost 3,000 kilometers from west to east and 1,500 kilometers from south to north. The glacier-fed rivers originating from these peaks and the subsequent recharge from the underground aquifer makes up Tibet the largest river run-off from any single location in the world. Despite its cold environment and intricately complex natural systems, the Tibetan people have occupied this plateau for thousands of years. They have created a cultural landscape based on the principles of simplicity and non-violence that are in harmony with the environment. It is in fact one of the most environmentally strategic and sensitive regions in the world and quite often referred to as ‘The Third Pole’ and ‘The Water Tower of Asia’. These synonyms reflect the significance of its snow-capped mountains, the river systems and its alpine grasslands. Since time immemorial, the plateau holds the Hindu Kush Himalayan Ice Sheet, considered as the largest ice mass outside the two poles. Tibet also acts as the fountain-head for many rivers that flow into Asia (India, Inner Mongolia, Nepal, Bhutan, Bangladesh, China, Pakistan, Thailand, Laos, Burma, Cambodia and Vietnam) creating a vast river basin area of more than 6 million sq. kilometers. During the last few decades, due to climate warming and human actions, the natural systems of this unique landscape are silently degrading away and threatening the survival of millions who rely on its natural ecosystem services.

Rilung Tsatsig: The Mountain Valley Decree

Tibetans have always lived with nature, seeking to learn and understand its nuances and rhythms. Buddhism, which was introduced to Tibet in the second or third century, has played an important role in this respect. A general taboo against exploiting the environment was a direct result of Buddhist knowledge and belief about the inter-relationship between all plants, animals, as well as the non-living elements of nature such as sunshine sky, mountains, valleys, lakes and rivers. The close relationship between religion and nature meant that the simple yet effective principles which maintained balance in the natural world became a part of life. After ages of living like this, it is in fact difficult for a Tibetan to differentiate between the practice of religion and concern for the environment.

Looking back in time, in the Horse Water Year of 1642 His Holiness the Great Fifth Dalai Lama (Ngawang Lobsang Gyatso, the spiritual and political leader of

Tibet) issued a royal decree in the tenth lunar month to protect the animals and the environment. This royal decree was widely known as Rilung Tsatsig or the 'Mountain Valley Decree'. In the absence of the Dalai Lama, this decree was issued by the regent. One such decree issued by the Regent Tagdra in 1940 reads, for this Iron-Dragon year, the Tibetan Government has decreed that in each and every village and town in Tibet, on 8th, 15th, 30th day of each lunar month and on the 4th, 6th, and 22nd day of the 9th lunar month and the 25th day of the 10th lunar month, nobody is allowed to kill domestic animal for the purpose of selling it or for personal consumption (Environment and Development Desk, 1992).

Hundreds of copies of this decree were drafted by the clerks in the private office of His Holiness and were then distributed to various regions and villages in the whole of Tibet to be read out by the district head or the magistrate to the people in order to promote peace and prosperity, to remind the words of Lord Buddha and to refrain them from committing sinful acts. It also reiterates the legal rule and also regarded by the locals as a blessing from His Holiness (French, 1995).

On special occasions and on the advice from the state oracle (Nechung) a special Tsatsig would also be issued. For instance, Regent Tagdra issued a special Tsatsig in the seventh month of 1944 (wood monkey year). In short the decree reads, except for the predatory animals such as wolves, all the other animals, aquatic, boreal, or amphibians as long as they are endowed with the gift of life must be protected and should not be harmed. Clear directions were also given for the implementation of the Tsatsig to all the governors and the local officials (Atisha, 1990).

Similar Tsatsig or decree were also issued from the local high priest or lamas, this tradition is prevalent throughout Tibet, these Tsatsigs were considered the most effective ways to preserve the religion, life, happiness and health for all the sentient beings. In some western parts of Tibet, in Ngari region, periodic or territorial decree or Kabdhus Tsatsig was issued and the local authorities should employ some rangers or guards to protect the animals from hunters and poachers. For example, decree issued during the spring season of the third and fourth lunar month that coincides with the birthing period of Tibetan antelope and the migration of fish. In some cases, the local authorities should employ special corps during the mating season of the wild ducks, their duties were to protect the eggs till the young hatchlings could swim freely with their mothers (Tsering Choephel, 2003).

From all these above accounts, one could clearly make out that these decrees or Tsatsigs had a deep connection and reverence towards Buddhist philosophy of nature conservation and protection. These decrees were not only considered as a direct command but also referred to as a blessing from the Dalai Lama or the high

priest. Rebecca Redwood French, mentioned in her book, *The Golden Yoke-The legal cosmology of Buddhist Tibet* how this royal decree looks and the reaction of the local Tibetans, she writes: “The decrees that were issued from His Holiness private office bear the full name of His Holiness the Thirteenth Dalai Lama, the Tibetan year and date. The decree was always written on the finest paper, unrolled to almost a yard in width and two yards in length. The writing was exquisite; even those who could not read would marvel at the elegant shapes of the finest government duktsa script. At the top was a large red seal of the Dalai Lama’s Office; it was followed by exactly forty five lines of even script, all perfectly spaced. The villagers went up to receive the blessing of the even larger red seal of His Holiness at the bottom, which was placed near his many-worded full name” (French, 1995).

Evidence of the successful implementation of this approach can be found in the records of various western travelers, explorers and naturalist who visited Tibet before the Chinese invasion. They mentioned about various bird festivals and also certain areas being designated as bird sanctuaries for migrating birds, specific shrines were named in protecting the birds, for instance, Yarlung Jha-sa Lhakang (meaning, the resting-place-of-birds temple). Yet another temple was at the north shore of the lake Namtso known as the Jha-do gompa, or ‘bird confluence monastery’.

According to Jamyang Norbu, “Jha-sa Temple in Yarlung, Reting monastery, and the Jha-do monastery by Namtso Lake form an almost straight line on the migration path of birds flying to the Changtang from Mon, or the Arunachal Pradesh area. So it is conceivable that these festivals were a way of aiding and supporting these exhausted migrating birds on the way to their breeding grounds in the north, and also of making the local public aware of this important event”(Norbu, 2009).

Since the occupation of Tibet, the Chinese government has not only restricted the practice of traditional Buddhist traditions involved in environmental preservation but also embarked upon unsustainable development schemes in many parts of Tibet, adversely impacting most of its river systems, biodiversity and the pristine landscape that benefits the entire Himalayan nations and beyond.

The Himal Parivar

Those mountains that attract the snow extend beyond the political boundaries of today’s Tibet, which, in China’s definition, covers less than half the Plateau. To the north and east of ‘Tibet Autonomous Region’ (TAR) are the historic Tibetan provinces of Amdo and Kham, today fragmented into China’s Qinghai, Gansu, Sichuan and Yunnan. To the south of TAR are the Himalayan communities of Arunachal, Kashmir and Sikkim in India, Bhutan and upland Nepal. Taken together, they constitute a Tibetanised world, a coherent cultural, religious and linguistic

bloc with deep ties and connections over many centuries. This Himal parivar long predates the interventions of great powers—the British Raj, China and modern India. As a Trans-Himalayan cultural family, it will outlive the ridgeline mapping imposed on the region by imperial powers. In no way is this claim to a ‘Greater Tibet’ or for political change to existing boundaries. It remains a cultural reality that the Himalayas, for those living in them, are not at all an absolute barrier, but a porous life way that has long brought down from the plateau water, wool, salt, pilgrims, lamas and religion; while carrying up from the lowlands and through the mountains cotton, pilgrims, modernity and the clouds of the monsoon. This rich history of two-way traffic, of goods and ideas, commodities and mind training instruction, brought the Himalayan peoples closer together, overcoming all hardships of a steep terrain. The peoples of the Himalayas know how extraordinary their land is. Their orientation was to the north, to Lhasa and the great sources of the Buddhist teachings that made mountain life meaningful. The hill tribes of the Himalayas looked north to Tibet, to trade, to go on pilgrimage, to seek a teacher for the village, to rebuild a monastery, to find an artist to repaint murals, to seek authentic connections to a lineage of mediators.

The Water Tower of Asia: Himalayan Rivers

Tibetan rivers are distinguished by their high silt loads resulting from the largely desert landscape from which they originate. The five major rivers are Machu (Yellow River), Driчу (Yangtze), Zachu (Mekong), Gyalmo Ngulchu (Salween) and Yarlung Tsangpo (Brahmaputra). Rivers originating from Tibet flows to more than ten countries and play a vital role in all the spheres of life form and socio-economic of each country. These rivers enable Tibet to become the Water Tower of Asia.

From the western part of Tibet, four rivers originate around Mt. Kailash, also known as the Gang Rinpoche, the Holy Mountain. From the east of Mt. Kailash through the most densely populated region of Tibet, The Yarlung Tsangpo (Brahmaputra River) irrigates most of the agricultural land in the historical Yarlung valley of Tibet (hence the name Yarlung, and Tsangpo meaning river in Tibetan). Then it passes through Shigatse City and, flowing south of Lhasa, it drains the Kyichu River. The river then flows through the once forested Kongpo region before turning abruptly near Mt. Namchak Barwa to the south, cutting straight through the Himalayan divide to flow into India as Brahmaputra and then to Bangladesh. The Senge Khabab or Indus River originates from the north of Kailash. It then flows west into India (Ladakh and Kashmir) and continues to become Pakistans principal river. The Langchen Khabab (River Sutlej) begins from the west of Mt. Kailash, crossing the Himalayas into Himachal Pradesh in northwest India, passing through the Punjab region before joining the Indus in Pakistan. The Macha Khabab

(Karnali) originates from the southern part of Mt. Kailash, crossing the Himalayas into western Nepal and then into India where it becomes one of the major tributary of the River Ganges (Environment and Development Desk, DIIR,CTA, 2000).

Melting Himalayas and the State of its Rivers

It is now feared that the Himalayan glaciers are rapidly retreating because of climate change. Since the mid-1970s, the average air temperature rose by 1°C in the Himalayan region, i.e. almost twice as fast as the global average warming of 0.6 °C reported by the IPCC, this trend being most pronounced at high altitude sites. And almost 67% of the glaciers in the Himalayan and Tienshan mountain ranges have retreated in the past decade 6 – by as much as 30 m per year for the Gangotri glacier (UNESCO, 2007).

According to Jane Qiu (2008) (Qiu, 2008), 82 percent of the Tibetan Glaciers in the Himalayas have already retreated in the past half century. In the past 40 years, Tibet's glaciers have shrunk by 6,600 sq. km (as of year 2006). It is estimated that they are currently melting at a rate of 7 percent per year. A separate study by a NASA scientist (2010) revealed that 20 percent of these glaciers have retreated in the past 40 years and if the current trend continues, more than 60 percent of the existing glaciers could be gone in the next 40 years. Glaciers in the Indian Himalayas are losing one metre of ice every year and the main contributor towards this melting is from the black carbon - resulting from forest fires and burning of agricultural waste. It was also reported that the loss in mass of glaciers in Indian Himalayas has significantly gone up 1998 onwards (Sharma, 2012). It was also reported that the fastest retreating glacier in the Himalayas is the Imja Glacier.

The International Centre for Integrated Mountain Development (ICIMOD) has revealed alarming details on the sustainability of the Himalayan glaciers. According to their findings, the current trend of melting glaciers suggests that the Ganges, Indus, Brahmaputra and other rivers across the northern India plains could most likely become seasonal rivers in the near future. Increased temperature has accelerated glacial shrinkage and has accelerated the degradation of permafrost regions further reducing the river flow. Himalayan glaciers in the eastern Nepal near the Dudh Koshi region are retreating at rates ranging from 10 to 60 m per annum, and many glaciers smaller than 0.2 km² have already disappeared.

Glacier melting leads to the formation of glacial lakes. The banks of such lakes are made of moraines (accumulated earth and stones deposited by the glacier) that may collapse when the lakes fill up—leading to sudden and violent flooding in the downstream valleys. Any flood of this sort can have disastrous consequences for the population and biodiversity of the entire region downstream of the lakes. The formation of glacial lakes as a result of the rapid melting of glaciers on the higher

reaches of the mountain ranges continues to pose a serious threat to downstream countries, especially Nepal and Bhutan.

A study recorded about more than 1,600 glacial lakes in Nepal, of which about a half dozen are considered very dangerous. In the Bhote Koshi /Sun Koshi basin alone, 139 glacial lakes and nine lakes have been identified as potentially dangerous. Twenty-four GLOF events have been reported so far out of which ten occurred in the Tibetan catchments of river. The 1981 GLOF event that swept away 41 houses, two highway bridges, and many water mills has cost Nepal a loss of USD 750,000. Recent research in time series analysis indicated that the number, area, and ice reserves of glaciers in this basin are declining leading to increase in the number of glacial lakes. The study even warns the likelihood of other GLOFs in the near future with double the magnitude experienced in 1981, affecting nearly 900 households as they are living within the GLOF hazard zone or their properties are within the hazard zone (Bajracharya, 2013).

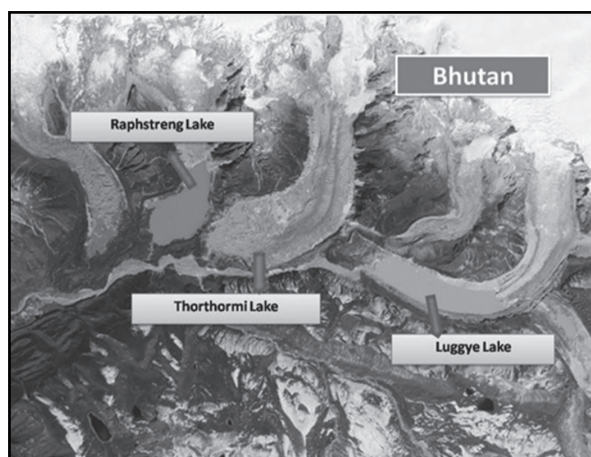


Fig1. Glacial lakes in Bhutan; Source: Y. Penjor

In 2002, the Greenpeace reported in its briefing that, the proglacial (Imja Lake) lake was born in the 1960s and continues to grow, filling the area left as the glacier front retreats, currently at the rate of nearly 10 metres per year (Greenpeace, 2002). Other scientists from Nepal's reported that the Imja lake is growing by just under 50 meters per year and is in danger of bursting its banks – a 31 meter-high dam of rocks

and stones – and flooding nearby villages and trekking routes. They predicted that more than 7,500 people would be affected by the floods, including tourists hiking along the popular Everest Base Camp route. It was also mentioned that the ethnic community residing in Nepal's western province (Halji village) is threatened by a glacial lake on the mountain overlooking their village (Khadia, 2011). Such outbursts can kill, and they almost always invariably destroy infrastructure and land, burying fields in several metres of rubble. Similarly, the formation of various glacial lakes such as Raphstreng Lake, Thorthormi Lake and Luggye Lake in Bhutan are all clear indication of the rising temperature on the Himalayan ranges (Fig1).

Glacial lake was also reported at the snout of South Lhonak glacier at the height of 7000 meters in Sikkim, the study further revealed that this lake was bounded only by loose soil and debris and could cause havoc downstream if it ruptures. Such climate of fear and change in the weather patterns are also affecting the daily lives of the local residents and the native species.

Unpredictability of South Asian Summer Monsoon

The seasonal monsoon wind shift and weather associated with the heating and cooling of the Tibetan Plateau is believed to be the strongest such monsoon on earth. The Plateau's seasonal heating during summer and spring plays a principal role in determining the large-scale air circulation in summer. Heating over the Tibetan Plateau tends to generate a surface cyclonic circulation and upper-atmosphere anti-cyclonic circulation which results in the appearance of a large air motion in the eastern side of the Plateau. As long ago as 1884, an English meteorologist working in India had the inspired idea that the snows of Tibet and the Indian monsoon are causally connected. Henry Francis Blanford also suggested that the less it snows in winter in Tibet, the earlier the snowmelt, and the earlier the monsoon (Blanford, 1884). In other words, the Tibetan Plateau acts as a heat pump in the summer drawing in the moisture rich water vapors from the Bay of Bengal.

Many researchers have identified that the rate at which the Tibetan Plateau is heated and the thickness of summer snow on the plateau determines the timing and the intensity of the Indian monsoon. In a recent report published by ICIMOD (Bajracharya, 2013), on flash flood risk and management in the Himalayas, they have mentioned that these flashfloods and other natural hazards are triggered by the intense seasonal precipitation in the central and eastern Himalayas during the summer monsoon (June–September) and in the western Himalayas during winter. In future, any change or erratic behavior in the weather system especially the Himalayan region could be very devastating. For instance the series cloud bursts event that occurred in Pakistan and in India at Leh, Ladakh, on August 5, 2010 (The Hindu, 2010) (AccuWeather, 2012).

Damming Himalayan Rivers

The greatest threat to any river ecosystem is undoubtedly the manipulation of its natural flow to meet our demands. We do either by damming or diverting its flow. 'More than 60% of the world's 227 largest rivers have been fragmented by infrastructures such as dams and diversions. Rivers are turned on and off instead of flowing by natural rhythms. Many rivers are thus but shadows of their former selves and the blue lines on the map are often tokens of faded glories' (Johnston, 2012). In her written Testimony before the U.S.-China Economic and Security Review Commission on 26 January, 2012, Dr. Elizabeth Economy mentioned that "Several of Asia's longest and most important rivers begin in the Himalayas and the Tibetan

Plateau, and China is a central player in many of the controversies surrounding shared water resources in Central, South, and Southeast Asia. China develops plans for its upstream reserves that will have dramatic impacts on the lower reaches. China is one of only three countries, along with Burundi and Turkey, not to sign onto the 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourses. It rejects the idea of national integrity, which asserts that states have the right not to be adversely affected in their development potential by activities of the upstream riparian countries” (Economy, 2012).

According to South China Morning Post, on the 23 of January 2013, the state council has released an energy-sector blueprint for 2011-2015 in which they have decided to construct at least 54 hydro power stations with total capacity of 120 GW on the upper reaches of Yangtze, Mekong and Salween (Jing, 2013). It clearly disregards the geological risks, global biodiversity, resettlement and impacts on downstream communities. This plan also includes the reopening of previously shelved damming projects on Salween River due to environmental concerns. Kenneth Pomeranz mentioned in one of her article that even by excluding China, hydropower potential for the remaining Himalayan countries (Pakistan, India, Bhutan and Nepal) is a 192,000 megawatts with almost half of it in India. She further writes, “Current models predict that this will happen much faster in the western than the eastern Himalayas; the situation for Pakistan and northwest India is thus particularly grim, with an initial windfall period of increased flows to be followed by a devastating loss of water in the already declining Indus, Sutlej and other rivers” (Pomeranz, 2009).

The Chinese dam building frenzy could be easily observed from their record in the past fifty years. According to the World Commission on Dams, China had only 22 large dams in 1949 and by 2000 the number had increased to 22,000 dams. The mainstream Yarlung Tsangpo and its major tributaries in Tibet (Kyichu, Nyangchu, Tongchu, Nyang Trib Chu, Drakchu, Wolga Chu, Chllong Chu, Yiwong Chu, Parlung Chu) is becoming increasingly interrupted by medium sized dams in Tibet and may one day host the biggest dam in the world. If this scheme were implemented it would impede the downstream flow of the primary resources -water and alluvial sediment, that India and Bangladesh depend on. While the construction of 510 megawatt project is already underway, two new additional dams (Bayu and Daigu) are being planned along the mainstream of Yarlung Tsangpo and no clear information is available as to how and when they will initiate these projects along with those that are already being planned. Hong Lei, the foreign ministry was quick to clarify on a press briefing that “The Chinese side always takes a responsible attitude towards the exploitation of cross border rivers and every new project will be planned and reasoned in a scientific way - before being started” (Walker, 2013).

Loh Su Hsing has mentioned in *Jakarta Globe* (2011) that, “China has dammed every major river on the Tibetan Plateau - including the Mekong, the Salween, the Brahmaputra, the Yangtze, the Yellow, the Indus, the Sutlej, the Shweli and the Karnali. China has unveiled plans to dam the rivers that still remain free flowing, such as the Arun and the Subansiri” (Lu Zongshue, 2011).

The World Wide Fund (WWF) for nature named the Indus River as one of the worlds ten rivers at risk. The Indus which was already facing an acute shortage of water in its flow due to climate change suffered more obstruction after Beijing built a dam on the river at Gar in Ngari (Ch: Ali) without informing India and Pakistan. Not only are these rivers subjected to hydropower projects but also these free flowing rivers lures the major extractive industries from distant mainland. Now, with a strong policy backing from Beijing (mining sector designated as one of Beijings ‘Four Pillar’ industries in Central Tibet), these rivers will face more pollution from toxic wastes. If these pollutions are not addressed immediately, it could be too late when these toxic spills wander beyond the boundaries of administrative jurisdiction causing social unease.

Dam safety and Social Impacts

In China, dam safety has always been treated as a sensitive subject. Now, incidents at a number of dams and reservoirs have cast doubt on the quality of these projects, but they are rarely reported to the general public (Lu Zongshue, 2011). In 2012, a study conducted by the Probe International, mentioned that more than 90 percent of dams that are built, under construction or proposed for the rivers that flow from Tibet are located in zones of very high or moderate seismic hazards. In a simpler way, one can just overlay the UN seismic hazard zone map and the locations of these dams in Tibet to realize and understand the imminent threat posed by these dams.

By just overlaying the UN seismic hazard zone map and the locations of these dams on the western rivers of Tibet clearly sends an inevitable signal that those living in the shadow of these dams are at the mercy of nature (Fig 2).

According to a recent report published by UNESCO-IHP (2012) it reads, Water shapes culture and culture shapes water and it is crucial for the flourishing of cultures. Managing and securing the water resource in Tibet could be the biggest and most important challenge for the new Chinese leaders. Downstream users of water originating in Tibet should establish a regional forum to create policies on transboundary issues that effectively safeguard access and quality of water, at a time of accelerating glacier melt and damming activities.

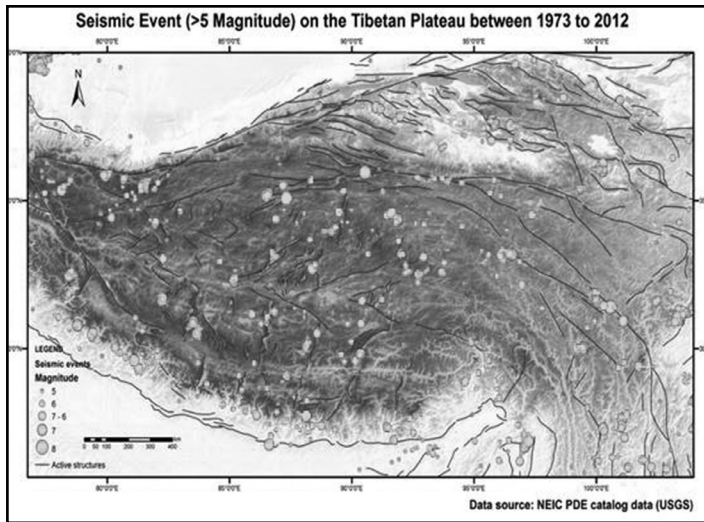


Fig 2 Seismic events (>5 magnitude) between 1973 to 2012 on the Tibetan Plateau, Map© EDD/ DIIR

According to recent report released on Himalayan Glaciers, the combined river basin of Indus, Ganga/ Brahmaputra benefits/supports more than 744 million people living within the contiguous arc from Afghanistan to Bangladesh (Fig 3). The use of water in the agricultural sector has increased over the past few decades. It is estimated as per 2000 data that the irrigation area for Indus (15 MHA), Ganga/Brahmaputra basin (29 MHA)-million hectares and will continue to increase further (Himalayan Glaciers: Climate Change, Water Resources, and Water Security, 2012).

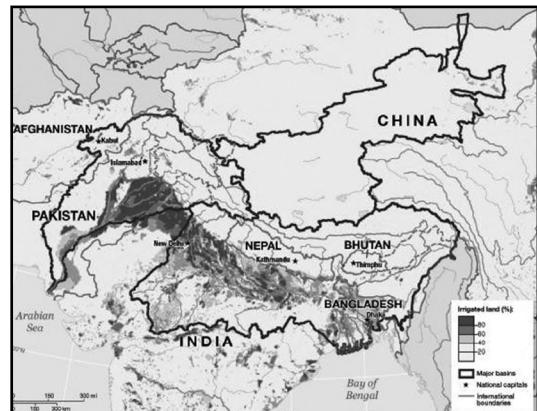


Fig3. Fraction of the land equipped for irrigation in the HKH region. Irrigation is widespread in both the Indus and Ganges/ Brahmaputra basins. A relatively large amount of irrigated water consumption in the Indus basin is for cotton production.

Climate warming impacts on Daily lives & culture

On the high alpine pastures of Tibet, climate warming has not only resulted to various landscape changes but also resulted to the final eviction of nomads from their ancestral pastures. The current Chinese policy of settling the nomads in low land permanent settlements are based on the overgrazing of pastures by their livestock. In reality, it could be the climate warming is slowly heating up the surface and slowly degrading the permafrost soil that in turn could affects the vegetation mat leading to

the desertification of grasslands. These nomads are termed as ‘ecological migrants’ and are involuntarily settled permanently in concrete blocks. This forceful sedentarization has led to abandon or sell their livestock which are their only security or investments. The pastoral lifestyle on the Tibetan plateau has evolved over thousands of years of careful studying and knowing the climate extremes.

According to D. Miller, The area used by nomads includes the high-elevation regions of Bhutan, Nepal and India in the south and extends north across the Tibetan Plateau to the Kunlun and Qilian Mountains in northern Tibet, Qinghai and Gansu Provinces of China. In the east, it begins in the highlands of western Sichuan Province and extends west to the boundary of the Tibetan Autonomous Region of China, also extending into the Ladakh region of northwestern India (Fig4) (Miller, 2007).



Fig. 4. The pastoral nomadic area of Tibet, Source: D.J Miller

In the hilly areas of Nepal and Bhutan, beekeeping is an important component of mountain farming systems and a source of income, nutrition, and medicine for mountain communities. In addition to direct income from bee products such as honey and beeswax, honeybees also support agricultural production and biodiversity through pollination services, thus contributing to the livelihoods of poor mountain communities. Challenges arising from climate change are affecting bee populations and the flowering of crops and other plants that provide nectar and pollen for colony development and honey production (Farooq Ahmad, 2004).

Recommendations

The Tibetan Plateau is the land bridge connecting South Asia with East Asia. The very survival of almost 1.3 billion people depends on the water resources originating from the Tibetan Plateau. The impact on Tibet's landscape and its natural resources due to climate warming and human intervention will threaten

not only the future food security of many nations but also their development. A healthy¹ Tibetan Plateau would not only benefit the entire Asian continent but also it helps in promoting peace and harmony within the region, especially between two major emerging super powers (India and China). Downstream users of water originating in Tibet should establish a regional forum to create policies on transboundary issues that effectively safeguard access and quality of water, at a time of accelerating glacier melt. A special priority for such a regional forum should be long term planning for the time when the current enhanced flows due to glacier melt will greatly diminish, once the un-recharged glaciers are exhausted.

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POISONING TIBETAN RIVERS: WHY IS IT NOT SO NATURAL

'In the past, our rivers were crisp and clean, the mountains and valleys were known for their natural beauty. But now the rivers are polluted with poisonous waste from the mines' (Radio Free Asia, 2014), is what a local resident said to Radio Free Asia hoping that letting the news out to the world would at least raise pressure on local authorities to act as the people's government, rather than of the mining companies. Such grievances are numerous and wide spread among the Tibetan population in recent years due to the desecration of their mountains and poisoning of their rivers by destructive mining practices followed in Tibetan areas under Chinese occupation. On September 23, 2014, more than 1000 local Tibetans of Dokar and Zibuk villages near Tibetan capital city Lhasa protested against poisoning of their rivers by Gyama Copper Poly-metallic mine (Radio Free Asia, 2014). The mine is located close to a stream that locals use for drinking, irrigation and animal feeding. But as always, the local officials conveniently declared that the water pollution in the rivers was caused by natural factors and not by the mine.

A similar official statement (China Daily, 2013) was issued back in 2013, when 83 mine workers of the same mine were killed in a mine induced landslide due to mismanagement of mine waste or over-piling of mine waste rocks on a steep V-shaped valley. The official statement was obediently published by China Daily and Xinhua News without the slightest hint of journalistic objectivity despite the loss of so many lives. This systematic approach without any legal transparency and with no sense of compunction by the local Chinese government in Tibetan areas has become a dangerous trend and bizarre scenario. The Gyama Mine is operated by Huatailong Mining Development, a subsidy of the China National Gold Group Corporation, and ironically is praised as eco-friendly and a model mine by China. If the standard and qualification for a model mine is of such, then the plight of the people and state of the environment is seriously in danger. The deliberate and systematic falsification of causes behind the Gyama mine landslide and river water poisoning by Chinese local government could only be explained by themselves.

But according to a research paper 'Environmental impact of mining activity on the surface water quality in Tibet: Gyama valley' (Xiang Huang, 2010), it firmly ascertains that "a localized severe heavy metal contamination is documented in the stream water of Gyamaxung-chu (chu means river) and wastewater treatment facilities in the Gyama valley". It also states that "the environmental risk at the Gyamaxung-chu source area, where the measured contents correspond mainly to geochemical background was zero. However, there was a very high risk at the upper and middle parts of the stream and it appears to be both natural and accelerated by

the extensive mining activities. The levels of metals (such as lead, copper, cadmium and zinc) represent the high risk for the environment, including local human populations and their livestock'. The article further goes on to say that 'the great environmental concern are the many mining and processing deposits in the valley, containing large amount of heavy metals, such as lead, copper, zinc and manganese etc. These deposits are prone to leak its contaminants through seepage water and erosion of particulates, and pose therefore a future risk for the local environment and a potential threat to the downstream water quality'. Gyamaxung-chu is a mountain spring fed by groundwater, rain and melting snow with continuous flow throughout the year providing life for the many villages situated on its path before draining into the Lhasa river and finally into the Yarlung Tsangpo or Brahmaputra. A similar report titled 'Assessment Report of the Recent Landslide Event in the Gyama Valley: It's Possible Cause and Impact' (Environment & Development Desk, 2013) by the Central Tibetan Administration after the Gyama mine landslide clearly produced strong evidence to link the landslide with the mismanagement of mine waste.



Figure 1 Dolkar Vilage and its beautiful environment- where the polluted river flows by

Considering the evidences, why do the relevant authorities refuse to see the truth and deny justice for its own people? Who granted mining companies so much power that they could get away with killing its own workers and poisoning Community Rivers? The only conclusion according to the local Tibetans is that there is an absolute cozy camaraderie between mining companies and local officials. The power of this nexus overrides everything else: ethnic cultural rights, local community interests, mineral resource extraction procedures and environmental laws. They could even manipulate official media and experts to validate outright crimes against its own people and the environment.

The recent protest against river water poisoning is a desperate attempt after almost five years of continuous pleas to the Chinese authorities in Lhasa. The so called people's government threatens and intimidates its own people for raising such issues of public interest. The people are left with no choice but to seek help from the outside world by appealing to international media, hoping Beijing would take notice and the central government would come to their rescue. I am sure Beijing cares about the welfare of its people. According to a report in China Daily, the central

urban areas of Beijing city alone have 300 water quality monitoring stations (Xin, 2013). How many such stations are there in the Tibetan areas and why are the people of Gyama valley denied of such rights? The poisoning of Tibetan rivers will have catastrophic consequences to both China and the world, as Tibet is home to the largest store of accessible fresh water and source of Asia's six greatest rivers (Yangtze, Yellow, Mekong,



Figure 2: Dolkar Village with cut-off mountain top seen on the background where the Gyama mine located

Salween, Indus and Brahmaputra), feeding some of the world's most populated nations like Pakistan, India, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam and China. Tibetans take great pride in the purity of their rivers and causing river water pollution is simply against their way of life. In the 11th century when Indian Buddhist scholar, Atisha Dipamkara visited Tibet, he was overjoyed by the freshness and purity of Tibetan rivers so much that he recommended the waters of Tibet be served as the greatest offering to Lord Buddha. Since then the unmistakable Tibetan culture of water offering is prominently visible in every home and monastery. But what will the people of Gyama valley would offer to the Gods, when the very basic necessity of drinking water for the community is poisoned?

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CHINA'S NEW ENVIRONMENTAL PROTECTION LAW, NOT FOR TIBET

The toxic smog engulfing Beijing and other Chinese cities has forced the Communist government to amend its development model and bring in a new environmental protection law (People's Republic of China, 2014) in a bid to calm ever growing public anger. Unfortunately, as in the past, the new environment law may prefer to stay within China proper rather than extend into Tibet and other regions currently under the occupation of the PRC. Ever since the former President Hu Jintao's scientific development concept slogan in 2003, there has been loud government rhetoric on environment protection (People's Republic of China, 2012), but the lack of genuine efforts was evident from Chai Jing's 'Under the Dome' documentary film (Jing, 2015). The film reveals that the giant state-owned companies continue to flout environmental laws and still pride themselves as patriots.

So, how might the new environmental protection law be enforced is a question which needs analysis. The swift approval of the new law and the appointment of Chen Jining as the minister to enforce the law is a step forward. This is a welcome indication that President Xi Jinping is serious about environmental protection. But the commercial interests of the giant state-owned companies are deeply intertwined with the wealth of the Chinese central and provincial officials. So any moves directly affecting this lucrative business would mean serious internal friction.

Therefore the Chinese government may take an approach that aims to appease both the officials and urban citizens. Beijing would enforce the new environmental law as strictly as possible in China proper to calm growing public dissent, while leaving the law ambiguously enforced in the ethnic regions like Inner Mongolia, East Turkestan and Tibet (as it often does in the ethnic regions where constitutional rights are misinterpreted and curbed in the name of development and stability). Such an approach would thus enable the Chinese companies to continue making money far away from Beijing; in places where the laws are interpreted and manipulated as it suits the interests of the central and local officials, or where environment protests are ruthlessly suppressed as they are deemed 'anti-national' or 'influenced by the Dalai clique'.

The more than 20 large-scale mining protests in Tibetan areas brutally suppressed by the Chinese government in the past 5 years¹ is a dreadful reminder of the ambiguity of such laws. The Gyama (near Lhasa) mine landslide in March 2013 which killed 83 mine workers was clearly induced by mismanagement of the mine

1. Environment & Development Desk of DIIR, CTA, has recorded more the 20 large scale mining protest in Tibet between 2009-2013.

(Environment & Development Desk, 2013), but the company was not punished. The same mine was blamed for the poisoning of a stream flowing through Dokar village in September 2014, but the officials again sided with the mining company. The stream is a tributary of Lhasa Kyichu River which joins the Yarlung Tsangpo or the Brahmaputra. On August 2013, the locals of Zatoe in Kham (north-eastern Tibet) protested against mining in the Sanjyangyun (Source region of Machu, Drichu and Zachu River) Nature Reserve. The officials fired tear gas and detained the locals instead of enforcing the nature reserve protection laws.

Mining has been declared the pillar industry in the Tibetan areas, despite being the biggest threat to the fragile ecosystem of the world's highest plateau, thus hurting both the land and the people of this ancient civilization. So the terrifying visible outcome is that the Tibetan plateau is being plundered and poisoned, and gradually being turned into another toxic Chinese province. Environmental protection means not repeating past errors, but Beijing seems completely indifferent when it comes to the need of protecting the environment of the ethnic regions.

This indifference is apparent if we take a careful assessment of President Xi Jinping's commitment (Landler, 2014) to peak carbon emissions by 2030. This surely is a way forward, but it means drastically reducing coal consumption. So as Grace Mang of International Rivers put it so aptly in her article 'No need to sacrifice rivers for power (Mang, 2015)', that the devil is in the details, and how will Beijing plan to quench the ever rising energy thirst of the world's second largest economy?

Unfortunately, the Chinese government is set to dam and divert water from Tibetan rivers to light cities and factories in China. Like the removal of Tibetan nomads from grasslands to bring in mining, the fragile ecosystem of the Tibetan plateau is now being put at risk to reduce smog in coastal cities of China. The risk from 510 megawatt Zammu hydropower dam on Yarlung Tsangpo in Gyatsa county of Southern Tibet and the 295 meter high Lianghekou dam on Nyakchu River in the Nyarong area of the eastern Tibet is simply too great. The impact on the region's wildlife habitat and reduced river flow into the downstream areas are apparent, but the most dreadful threat would be from (RIS) Reservoir-Induced Seismic activity like the horrifying Wenchuan and Ludian earthquakes. Some experts (Xiao, 2012) have voiced the possibility of 2008 Wenchuan earthquake, which killed 80,000 people, might have been induced by the nearby Zipingpu Dam and the 2014 Ludian earthquake in Yunnan, which was similarly induced by the Xiluodu dam.

Sadly, China has planned more such mega dams on Tibetan rivers and destructive mining on the mountains, a rapidly surging threat on the fragile plateau.

The call for the rule of law in China by President Xi Jinping is a glimmer of hope that the laws would be enforced and the unruly state-owned companies would be disciplined. But the question is, will the new environmental protection law be equally and fairly enforced and extended into Tibet?

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THE TIBETAN PLATEAU: WHY IT MATTERS

The Global Significance of the Tibetan Plateau

The ecological role and global significance of the Tibetan Plateau is evident from the various names being used by scientist to describe the Tibetan Plateau as the ‘Roof of the World’, the ‘Third Pole’, the ‘Water Tower of Asia’ and the ‘Rain Maker’.

Tibet: The Roof of the World

The Tibetan Plateau, at an average elevation of more than 4000 meters above sea level with an area of 2.5 million square kilometers, almost 2% of earth’s land surface, is the world’s highest (Kang Sichang, 2010) and largest plateau on earth. Hence it’s called the Roof of the World. The Plateau is made up of 14 great mountain ranges and hundreds of the earth’s highest peaks like Chomolangma (Mt Everest). The 14 great mountain ranges are; Great Himalayan Range, Karakoram Range, Nganglon Range, Thangla Range, Nyenchen Thanglha Range, Kunlun Range, Altyn Tagh Range, Serthen Range, Gangkar Chogley Namgyal Range, Amyne Machen Range, Yara Tagtse Range, Dege Trola Range Minyak Gangkar Range and Khawa Karpo Range.

Tibet: The Third Pole

The Tibetan Plateau is also known as the Third Pole because its home to 46,000 glaciers, covering an area of 105,000 km. Which makes the Plateau the third largest store of ice after North and South Pole. And also the largest source of accessible fresh water on this planet. The term ‘Third Pole’ was first used by the famous Swiss explorer Marcel Kurz, who had talked of the Himalayan regions of the Tibetan plateau as the ‘Globe’s Third Pole’ in an article in 1933. The same term was borrowed by his friend G. O. Dyhrenfurth in a publication titled ‘To the Third Pole: The History of the High Himalaya’ in 1955. In recent years, Chinese scientist have been prominently referring to the Tibetan Plateau as the Third Pole (Kang Sichang, 2010). For Tibetans, the Plateau, their home; is fondly called the Snow-land Paradise. A paradise surrounded by mighty snow clad mountains like Himalaya in the south, Karakoram in the West, Altyn Tagh and Gangkar Chogley Namgyal in the North, Kharwakarpo and Minyak Gongkar range in the East.

Tibet: The Water Tower of Asia

The Tibetan Plateau is rightly called as the Water Tower of Asia as its the head source of Asia’s six largest and most important rivers such as (English/Tibetan): Yangtze/Drichu, Yellow/Machu, Mekong/Zachu, Salween/Gyalmo Ngulchu, Indus/Senge Khabab and Brahmaputra/Yarlung Tsangpo. Flowing and supporting

life in some of the most-densely populated nations in the world like Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam, and China. The melt water from the 12,000 km³ of glaciers of the Third Pole ensures permanent flow of Asia's Major rivers. Thus greatly influencing the social and economic development of a fifth of the world's population with more than 1.5 billion people living downstream in the river basins of the region (Political Brief, 2011). Any major damage to the Tibetan rivers could affect 40 per cent of the world's population (Foggin, 2008) some way or the other.

Tibet: The Rain Maker

The vast area of about 2.5 million sq. km at an average elevation of more than 4000 meters above sea level, makes the Tibetan Plateau home to both extremely cold weather in winter and intense sun shine in the summer. As the land surface absorbs more sunlight than the atmosphere, the plateau creates a vast area of surface warmer than the air at that elevation, thereby increasing the land-ocean pressure gradient and intensifying the monsoon. Some 130 years ago, Sir H.F. Blanford, Chief Reporter of the newly-established India Meteorological Department (IMD), noticed that more Himalayan snow cover during the preceding winter presaged a poor monsoon. On that basis, IMD began issuing the first monsoon forecasts from 1882.

The Tibetan Plateau exerts a huge influence on regional and global climate through thermal and mechanical forcing mechanisms (Kang Sichang, 2010). Thus the timing and intensity of the Indian monsoon and the East Asian monsoons are greatly influenced by climate change on the Tibetan Plateau. Even the worsening heat waves in Europe and north-east Asia are linked to thinning snow cover on the Tibetan Plateau (Wu Zhiwei, 2015).

The Impact of Climate Change on the Tibetan Plateau

V. Ramanathan, an atmospheric scientist (Scripps Institution of Oceanography in La Jolla, California) said that our understanding of global climate change would be incomplete without taking into consideration what's happening to the Tibetan plateau. Thus clearly indicating the major global climatic role to the Tibetan Plateau.

The proximate cause of the changes now being felt on the plateau is a rise in temperature of up to 0.3°C a decade that has been going on for fifty years (Qiu, 2008)-twice more than global temperature rise, resulting in rapid glacier retreat and permafrost degradation. Such drastic change is having a serious impact on the landscape of the Tibetan Plateau and wellbeing of the millions living on the banks of Tibetan rivers in Asia. According to a paper (published by a group of Chinese and western scientist on June 2006); the Indian summer monsoon is intensified and

the East China summer monsoon is weakened due to human-induced land cover change on the Tibetan Plateau.

Glacial Retreat: There has been no net accumulation of ice on the Tibetan Plateau since 1950s (Sichang, 2015) with warming in excess of 10°C on the Tibetan side of the Himalayas (Institute for Governance and Sustainable Development, 2010) has contributed to retreat of more than 82 per cent of the glaciers on the Tibetan Plateau (Qiu, 2008). The melting seasons on the plateau now begin earlier and last longer, says Xu Baiqing of the Institute of Tibetan Plateau Research. According to Yao Tandong (2007), director of the Institute of Tibetan Plateau Research, 2/3 of the glaciers on the Tibetan Plateau would be gone by 2050 if the current rate continues.

Glacial retreat on the Tibetan Plateau and surrounding regions is characteristic since the 1960s and has intensified in the past 10 yr. The magnitude of glacial retreat is relatively small in the interior of the Tibetan Plateau and increases to the margins of the plateau, with the greatest retreat around the edges. Glacial retreat in this region is impacting the hydrological processes in the Tibetan Plateau and surrounding regions. The glacial retreat has caused an increase of more than 5.5% in river runoff from the plateau (Yao Tandong, 2007).

Since many of the south Asian rivers such as Brahmaputra, Indus, Karnali, Sutlej, Arun, Manas etc have their source around many of the glaciers on the Plateau, So such a scenario of rapid glacial retreat would cause sudden increase in river volume resulting in devastating floods in the downstream regions. These are some of the densely populated and mostly agricultural dependent regions in the world. The water flowing out from the rapidly melting glaciers form unstable lakes or glacial lakes on the foot of a peak or in a small mountain valley, ready to burst out anytime. According to ICMOD, there are more than 8000 glacial lakes on the Himalayan regions, of which 200 are potentially dangerous.

Permafrost Degradation and Grassland Desertification: Another big impact of climate change and the warming weather on the Tibetan Plateau is the rapid degradation of permafrost, leading to extensive grassland desertification on the north and north eastern regions of the plateau. A large-scale thaw of permafrost would result in the loss of its water content and trigger an ecological catastrophe”, says Hua Ouyang, deputy director of the Institute of Geographical Sciences and Natural Resources Research in Beijing. As permafrost stores one-third of the world’s soil carbon, vegetation loss would lead to a huge amount of carbon entering the atmosphere, exacerbating global warming.

More than 70% of the plateau is covered by various forms of permafrost and more than 50% grassland. But there has been a rapid degradation of more than 10

per cent of the Plateau's permafrost in the past decade and a large scale grassland desertification at a rate of 2,330 square kilometers per year (UNDP 2007). Which also has resulted in shrinking of more than 10 per cent wetlands on the Tibetan Plateau from where Asia's major rivers like Yangtze, Yellow, Mekong and Salween originate. Therefore, the dangerous rate of grassland desertification would not only cause a serious ecological and economic hardship to the locals, but would also have a catastrophic effect on the millions thriving on the banks of Tibetan rivers in Burma, Thailand, Laos, Cambodia, Vietnam and China.

Current Environment Situation in Tibet

Damming Tibetan Rivers: There has been unprecedented construction of dams on the Tibetan rivers since 1950s, in recent years there has been a new trend of building large dams despite the Plateau been highly seismic prone zone. Scientist believe mega dams are both the trigger and the victim of Earth Quakes. Cascade dams are likely to cause chain reactions and expand the impact of any earthquake. There are Chinese experts who claim the 2008 Wenchuan earthquake (which killed 80,000 people) could have be induced by the nearby Zipingpu Dam and the 2014 Ludian earthquake by the Xiluodu dam.

The 510 megawatt Zammu hydropower dam on the Yarlung Tsangpo (Brahmaputra) and the highest embankment dam Lianghekou on Nyakchu River in Nyarong region of Tibet (incorporated in Chinese province of Sichuan) could cause immense damage to the ecology of the Plateau and wellbeing of downstream areas.China has dammed every major river and their tributaries in Tibet. In their 12th Five-Year Plan, Beijing announced plans to construct 50 more large scale hydropower plants on Tibetan rivers.

Removal of Tibetan Nomads: Tibet's rangeland covers approximately 70% of its total area. The Alpine grassland at high altitude covers, in turn, 60% of the total Tibetan rangeland. Pastoralism on the Tibetan Plateau involves an adaptation to a cold environment at elevations above the limit of cultivation. According to archaeological fieldwork, the Tibetan Plateau has been extensively used by pastoral Nomads, who have developed a deep understanding of grassland dynamics and veterinary knowledge while maintaining a unique pastoral culture for more than 8,000 years.

Tibetan nomads live a very happy, ecofriendly and self-sufficient life spread on the vast grassland of the plateau. But the Chinese government has removed more than two million nomads from their land and into large-scale settlements, with no medical, educational and business opportunities to thrive a dignified life and retain their identity.

Mining Menace in Tibet: There has been more than 20 large protests against mining in Tibetan areas, especially on sacred mountains since 2009 due to poor

environmental norms and regulations regarding mining. The consent and involvement of local communities are rarely sought, overlooking the actual need of the people and benefits for the local community from the mining. The rapid expansion of mines with poor regulation from the governments in Tibetan areas destroying mountains and polluting rivers.

On March 29, 2013, a massive landslide due to rapid expansion and mismanagement of Gyama mine in Tibet killed 83 workers. On September 2014, Dokar village's plea against dumping of mine waste in their river by the same Gyama mine, causing death of many cattle was ignored by the government.

On August 16, 2013, more than 4500 local Tibetans of Zatoe nomadic community protested against mining companies marching towards their sacred mountain Mt. Garwa Choejad, Mt. Shuela Ngoephu and Mt Tongpon Dorje Rabsel.

The irony was the fact that despite the above areas being clearly listed as part of Sanjiangyuan National Nature Reserve (SNNR), provincial government nonetheless issued mining license and violated the very law the Chinese government proclaimed in year 2000 to expel Tibetan Nomads from the same areas in the name of environment protection and nature reservoir law.

Such policies are clear case of discrimination and double standard to suit wherever vested interest of the Chinese officials lay. It has strengthened the long held fear that the very reason behind the Chinese government's policy to remove Tibetan nomads from the vast grassland is to make space for Chinese mining companies. China announced more than 3000 mining sites in Tibetan areas.

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LICHU RIVER POISONED: CASE OF MINYAK LHAGANG LITHIUM MINE PROTEST

On 4 May 2016, a sudden mass death of fish in the Lichu River in Minyak Lhagang, Dartsedo County in Karze Prefecture brought hundreds of local Tibetans out on the street, protesting against a lithium mining company (Ronda Lithium Co Ltd) that released mine waste into the Lichu River, a tributary of Nakchu/Yalong river, the biggest river that merges with Yangtze downstream (Free Tibet, 2016).

Yet another case of contaminated mine waste released into Tibetan rivers by a Chinese mining company clearly contradicts Beijing's call for Green Development in their 13th Five Year plan. In recent years, there have been an increase in the number of cases of environmental degradation caused by Chinese mining companies in Tibet, resulting in more than 20 large scale mining-related protests since 2009.

The source of lithium at Minyak Lhagang in Dartsedo is pegmatite, economically most profitable lithium minerals from hard rock. Minyak Lhagang lithium mining site may have the same high concentration of lithium as the adjacent Jiajika lithium mine, which is considered as the China's largest pegmatite type lithium deposit.

The extraction of lithium has significant environmental impact, resulting in water and soil pollution. Unfortunately, extraction and processing of lithium does not involve clean and green technology as advertised in lithium-based products such as electric and hybrid cars. Many parts of China still carry out traditional lithium mining in both brine and hard rock lithium. Traditional lithium mining for hard rock involves roasting and calcination process at high temperature followed by water leaching. Water leaching is a process in which lithium is treated with high concentration of acids such as hydrochloric acid or sulphuric acid in water for high lithium recovery. Higher the concentration of acid used in the water leaching process, higher is the lithium recovery rate.

Local Tibetans believe that the death of hundreds of fish is caused by the poisoned water from the mining site and suspect leakage from the water leaching site. The highly concentrated acid stored for water leaching process might have leaked and drained into the Lichu River, which in turn may have led to the contamination of water, causing death of hundreds of fish.

The optimum pH level of majority of the aquatic animals lies between pH 6.5 to 9 (Fondriest Environmental Learning Center). Any further change in the optimum pH causes strain on animal physiology, reduces hatching and survival rate. Aquatic animals are more sensitive towards acids than alkalis. A change in pH with 0.5 towards

acid from pure water (pH 7) causes aquatic animals in an abnormal environment and cannot survive when the pH level is lower than 3. Highly concentrated acids in the local river due to leakage of water leaching site may have altered the level of pH to as low as 3 causing death of fish and damage to the entire local river ecosystem.



Lithium mine site

During summer, aquatic animals usually have difficulty carrying out full life cycle as the concentration of dissolved oxygen fluctuates seasonally and is lowest during the months of May and June. Dissolved oxygen is the amount of oxygen contained in water, one of the indicators of the water's ability to support life and is found to be lower at higher altitude. The water leaching site might contain organic wastes (dead plants and animals) since the

mining site was closed for a few years, the organic wastes drained into river water are decomposed by aerobic bacteria. Decomposition of the organic wastes is a major function of aerobic bacteria to provide nutrient to aquatic animals and requires oxygen which in turn cause depletion in oxygen level to other aquatic animals. High concentration of nitrates and phosphate if present in the contaminated water can be a factor lowering dissolved oxygen and causing high mortality rate of fish.

The People's Republic of China (PRC) has passed Environment Impact Assessment law, effective from September 2003 (National People's Congress Standing Committee, 2002). According to Article 5 of the EIA law of PRC, it states: 'The state shall encourage all relevant units, experts and the public to participate in the Environment Impact Assessment (EIA) in proper ways'. The authorities at various levels should make local Tibetans well-informed and well-aware about the EIA law. The public or the residents near the mining sites are the chief stakeholders of social as well as environment impact assessment.

The local Tibetans earlier in October 2013 protested against the same lithium mining company when hundreds of fish were poisoned to death due to contaminated mining wastes drained into the Lichu River (International Campaign for Tibet, 2016). If the authorities had treated all the stakeholders equally, environmentalists, NGOs and the local Tibetans might have rejected the proposed mining project from the very beginning due to clear negative environmental and social impact in future. It is evident that the local Tibetans were neither given equal participation while carrying out environment impact assessment nor clear instruction on the proposed project and its possible impact on the environment or EIA wasn't carried out at all.

Is temporary halt to operation at the mining site the heaviest penalty for the mining company which caused huge damage to river ecosystem? Will the government re-examine the mining project and the company in accordance with Article 27 of EIA law of PRC which states: 'In case of any inconsistency with EIA documents during project construction and operation, the construction unit shall organize a post-assessment of the environmental impacts, adopt improvement measures, and report to the original EIA document approval department and original project approval department for documentation? The original EIA document approval department may also request the construction unit to perform a post-assessment of the environmental impacts and adopt improvement measures' (National People's Congress Standing Committee, 2002).

Similarly, Article 85 in the Law of PRC on Prevention and Control of Water Pollution states: 'The party whose rights and interests are damaged by a water pollution accident is entitled to ask the party discharging pollutants to eliminate the damage and make compensation for their losses'. If the law was to be implemented accordingly, the mining company in question should compensate for damaging river ecosystem to the local Tibetans who are dependent on the river for their daily livelihood or should take voluntary action in depolluting the Lichu River and the local environment.

China's move towards Green Development as stated in China's 13th Five Year Plan (Central Committee of the Communist Party of China, 2016-2020), a sustainable development with low carbon output and its claim of heading towards energy revolution will see promotion of 'green cars'. Huge demand for electric and hybrid cars across the world has tripled the price of lithium, "the white petroleum" over the years. Chinese Government's huge subsidy of electric and hybrid cars up to 60,000 Yuan per car has accelerated the demand for electric vehicles in China and is the leading consumer of electric cars and lithium in the world. According to China's Ministry of Land and Resource (MOLAR), the discovery rate of hard rock lithium in 2014 is 36.6% from 5.37 million tons resource whereas brine lithium is 18.8% from 92.491 million tons resource. Most of the brine lithium China has discovered in Amdo (Qinghai Province) provides low-cost transportation to lithium manufacturing companies because of their relatively closer proximity to Beijing. However, the rise in demand for lithium will see more mining projects initiated on the Tibetan Plateau. This will in turn cut the cost and reduce China's dependence on other countries for lithium and will aid China's continued influence on lithium price in the global market.

Lithium based batteries have higher capacity to store power, are lighter in weight and cheaper than nickel metal hydride, form of batteries earlier used in electric and hybrid cars. This led to the steep rise in demand for lithium in the past few years. How will the government's huge subsidy of electric vehicles and steadily growing lithium price will meet the demand of China's huge appetite for lithium from other countries in the future? The only solution is to mine the Tibetan Plateau.

The recent reopening of the lithium mining site in Minyak Lhangang in eastern Tibet is to satisfy China's current lithium demand. China's demand for lithium has crossed threshold where it is compelled to reopen a lithium mining site which was earlier closed in 2013, following huge environmental degradation and death of hundreds of fish in Minyak Lhangang. The local Tibetans' protest against the mining site resulted in closing of the mining site but the mining company was never penalized for the damage it caused to the environment.

Minerals are rich in fault lines and Tibetan Plateau lies on the junction of Eurasian and Gondwana continental plates, world's key ore forming region. China's growing demand for minerals put the Tibetan Plateau at the forefront of its policies to profit from potential mining sites. Tibet has more than 90% of China's lithium reserves (Piesse, 2019). The present small lithium mining projects in China will never meet the growing demand for lithium, hence large lithium mining projects in Tibet will serve a lucrative proposition.

Minyak Lhangang mining site, a considerably small lithium mining site, caused huge environmental damage, polluting rivers and death of hundreds of fish. Larger mining projects in Tibet will see remarkably higher damage to the environment and the local communities. Tibet's rivers are the source of fresh water and livelihood for the lower riparian South East Asia and South Asian countries. If mining projects in Tibet are not regulated, the toxins released from mining wastes may also cause huge number of fish mortality affecting fish industry in the downstream countries.

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DAMMING THE THREE PARALLEL RIVERS OF TIBET

The Three Parallel Rivers

The Tibetan plateau is also known, as the ‘Water Tower of Asia’. is the origin of major Asian rivers. Most of the riparian countries are dependent on rivers flowing from Tibet. Previously, rivers in Tibet were considered pristine, well preserved, and unaffected by human activity. However, this all changed under China’s occupation and its abuse of natural resources. The World Wildlife Fund classifies the Three Parallel Rivers as one of the top ten endangered rivers of the world. The Driчу (internationally known as the Yangtze), the Gyalmo Ngulchu (Salween), and the Zachu (Mekong) together form the ‘Three Parallel Rivers’ World Heritage Site (TPRWHS). The three are regarded as one of the most biologically rich and temperate regions of the world due to their topography and geographical location. These rivers run virtually parallel to each other from north to south.

While the potential for power generation from three parallel rivers is large, so too is the potential for adverse ecological effects as the gorges of these rivers are still young, active, and the prone to geological formation. The Yangtze River is the longest river in Tibet and the third-longest river in the world next to Amazon and Nile. The Yangtze runs for 6380 kilometers whereas the Mekong and Salween are 4500 kilometers and 2736 kilometers respectively (Environment and Development Desk, 2000). The source of the Yangtze lies deep within the Thangla Mountain of Amdo, northeastern Tibet. This river is fed by a multitude of tributaries along its course towards the southern section of the Tibetan plateau, where it subsequently flows into China and finally runs into the East China Sea. Its importance is rooted in the historical and socio-economic development of China, and supports over millions dependent on its fishery and shoreline agriculture.

Similarly, the Mekong is the twelfth longest river in the world, also originating from a remote sector of Thangla Mountain. The Mekong is one of the largest trans-boundary rivers on Earth, running across six countries: China, Myanmar, Laos, Thailand, Cambodia, and Vietnam, and eventually disperses into the South China Sea. Much like the Yangtze, the Mekong possesses great economic value as the river houses the largest population of freshwater fish. The hydro projects on the Lancang (upper Mekong) can greatly impact water flow, fisheries, and agriculture, ultimately affecting people across South East Asia who are dependent on these rivers.

Finally, the Salween, unlike the Yangtze and Mekong, is sourced from Nagchu, located in the northern region of the Tibet Autonomous Region (TAR). Its current drifts through southwest China, Myanmar, and Thailand and ultimately reaches its

delta at the Andaman Sea of the Indian Ocean. The Salween is the last free-flowing river in South East Asia (International Rivers, n.d.). Realizing its potential gain, the Chinese government had proposed sequential construction of mega-dams on the Salween that would generate more power than the Three Gorges Dam, which is currently the world's largest hydropower station. However, in 2005, the UNESCO World Heritage Committee issued a warning against damming in the region, consequently halting government construction plans (UNESCO, 2005).

However, According to South China Morning Post, on 23 of January 2013, the State Council has released an energy sector blueprint for 2011-2015 in which it decided to construct at least 54 hydropower station with a total capacity of 120 GW on the upper reaches of Yangtze, Mekong, and Salween (Jing, 2013). It disregards the geological risk, biodiversity, resettlement, and impact on the downstream nation. This plan also includes the reopening of previously shelved damming projects on the Salween River due to environmental concerns (Jing, 2013).

Chinese Construction of Dams on the Three Parallel Rivers

The preservation of these rivers is important, yet China continues damming on rivers on the Tibetan plateau. The Chinese Government earmarked \$ 3 billion for the construction of the first of twelve planned hydropower megabases in Tibet. The Suwalong hydropower plant is projected to generate more power with a design capacity of 1.2 million kilowatts), when completed in 2021 (China Daily, 2016) . On its completion, the Suwalong will become the largest hydropower plant in the fragile Tibetan ecosystem, at a staggering 112 meters high and with double the capacity of Zangmu Dam, which is on Yarlung Tsangpo (Brahmaputra River). At present, the Zangmu is the largest functioning dam in Tibet, demonstrating the sheer enormity of the Suwalong, which will provide electricity from the junction of Markham and Batang in eastern Tibet to economically well-off regions in East China for rapid industrialization and mining purposes.

China's plan to build the successive dam is clearly a strategic maneuver. As Tibet is the source of most of these international rivers, China being the upper riparian of these rivers and has access to these rivers first. Being in this position, China has the ability to control downstream nations for political and economic gain. China's hydro-behavior with other neighbors may serve as a key to understand its approach. Moreover, China has largely met its ambitious goals for hydropower development set out in its twelfth five-year plan (2011–15 China's National People's Congress , 2011).

A profusion of dams is to be built on the upper reaches of the Yangtze, Salween, and Mekong, with sites already allocated for more dams. Disturbingly, these projects could be completed within two decades and fulfill China's objective to

triple hydropower capacity by 2020. This is all despite evidence condemning the construction and existence of dams due to adverse problems pertaining to landslides, flooding, and pollution.

Previously, Chinese authorities announced the construction of thirteen dams on the upper reaches of the Salween in 2003. (Living River Siam Association, 2013) Advocates of the dam claimed that once built, this cascade of dams would generate more electricity than the Three Gorges Dam and it will bring modernization and poverty alleviation to some of China's poorest region (Magee, 2006) However, for unknown reasons, recently hydroelectric work on tributaries of the Nu River (upper reaches of Salween River) was halted and to be replaced by the construction of a national park in its place. With this latest announcement of halting construction (Leavenworth, 2016), will China cease plans to the dam on the Salween?

Effects of Damming Tibetan Rivers

In 1949, China had only 22 large dams but over the last six decades, it has constructed more than 80,000 dams. (Leavenworth, 2016) Collectively, they generate 300 gigawatts of power, which is roughly three times that of US production levels. The government claims that dams have the potential to save locals from floods and provide a cleaner alternative to coal. However, some hydrologists counter these claims, declaring that there is a huge environmental price to pay. For instance, sediment and a shifting gravel floor will obstruct turbines and build-up of sediments on the reservoir floor, creating more floods and destroying the baseline for ecological security.

Additionally, the disruption of water flow in the lower regions due to damming on the upper reaches may cause and/or amplify the effects of drought. Furthermore, Chinese geologists Xu Daoyi and Sun Wenpeng warn that the effects of tectonic activity in the region have heightened the occurrence, frequency, and impact of natural disasters, such as earthquakes and mudslides (Jianqiang, 2011).

Despite the successful construction of large dams by the Chinese government, no fixed steel and concrete dam can withstand the sheer ferocity of nature, nor can anyone or anything prevent a mountainside collapse, landslides, earthquakes, and mudslides. In May 2016, a 5.5 magnitude earthquake near the Three Parallel Rivers demonstrates the fragility of the land and how the construction of mega dams in these locations could magnify the effects of a natural disaster (The Weather Channel, 2016).

In 2012, a study conducted by Probe International mentioned that “more than 99.7 percent of large dams in western China (in Tibet) are located in zones of moderate to very high seismic hazard (as defined by UN global seismic hazard

assessment program)” (Jackson, 2012) Failure of one dam could cause a negative chain reaction in dams downstream. With hundreds of millions of liters of water along with rock, the mud would rush downstream, potentially crossing over into other countries creating floods.

The area is also home to 7000 plant species and eighty rare/endangered animals. The construction of mega-dams will moreover cause the displacement of tens of millions of people. Twelve years after the construction of the Three Gorges Dam, thousands of relocated people continue to petition the government. They claim that they were forced to leave their farms and businesses, cheated out of promised housing and compensation, with some now living in destitution. (Leavenworth, 2016) But the Chinese government always maintained consistency in its response to such accusations: Denial; promise to consult; and, carry on regardless.

The worst Yangtze floods in China of August 1998 resulted in an economic loss of US\$ 37.5 billion and the death of 3656 people. (Environment and Development Desk, 2000) At a rally on 28 September of that year, held in Beijing by the communist party to declare “victory” over the disastrous summer floods, President Jiang Zemin admitted in a significant ideological departure that communist governments had too often tried to impose its will on nature. It was important now, he said, “to understand the law of nature, correctly manage it and learn how to follow it to facilitate our economic development and other social undertakings”. (Lawrence, 1998) Now is China following what was once said by its leader?

What should be done?

The Three Parallel Rivers have their source in Tibet. These three parallel rivers are recognized by UNESCO as the Natural World Heritage Site because these rivers are one of the top ten endangered rivers of the world. Despite these challenges, by the end of last year China’s top scientific body CAS (Chinese Academy of Sciences) revealed that large areas of the Tibetan plateau are suffering from desertification and the situation will only get worse, potentially reducing future water flow to the rest of China and South Asia (Walker, 2016).

So, These River should be well respected by all the countries and should be treated as a natural platform to promote peace and harmony by converting the plateau into a zone of peace, as proposed by His Holiness the Dalai Lama in his Five-Point Peace Plan of 1987. Only when the international community comes together to make a joint effort to stop China from continuing damming of Tibetan plateau, China will cease construction plans. Ethically, morally and for the survival of Asia’s million, there is a clear need to save Tibetan rivers from ecological devastation.

Therefore, China should allow civil society and downstream nations to have a say in the planning and implementation of Chinese damming projects. Before China moves forward with any further projects on upper parts of Trans Boundary Rivers, the government should actively engage with the scientist and experts and riparian countries. A regional forum like (Mekong River Commission and other Regional Organizations) should take a more active role in safeguarding and ensuring that people downstream have full access to freshwater.

If these issues are not addressed in the near future, the scarcity of water will become the biggest challenge to overcome. It is predicted that seventy-five percent of the world's population will face freshwater scarcity by 2050. People across the world need to come together and actively promote the protection of Tibetan rivers.

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NATURAL DISASTERS IN TIBET: IS IT THE NEW NORMAL?

World's highest plateau witness three different natural disasters in a month

A 600 million cubic meters of glacial slide onto the Aru summer pasture of Ruthok County on 17 July 2016, killing nine people, burying more than 110 yaks and 350 sheep. Ruthok is one of the seven counties of Ngari prefecture of the (so called) Tibet Autonomous Regions (TAR), located in the north-western edge of Tibet, bordering Xinjiang in the north and Ladakh (India) in the west.

Far away from Ruthok, in the north-eastern edge of the Tibetan Plateau, mud floods and landslides killed two Tibetans and injured more than 30 people on the 9th day of the same month. The unusual mud flood also killed dozens of wild animals and livestock in the four counties of Tsolho Tibetan Autonomous prefecture of Qinghai Province. Around the same time, a rare drought hit Chumarleb and Matoe counties¹ leaving behind a dried river bed with hundreds of dead fishes. Ironically, local residents had to drink from lakes and muddy rivers despite Tibet being the 'Water Tower of Asia'.

A glacial avalanche, mud floods and a drought within the month of July is a natural disaster too many too quickly. Local Tibetans are worried of the new trend of frequent natural disasters. A trend which might be, unfortunately, becoming the 'New Normal in Tibet'.

Now, what is the cause behind the increasing number of natural disasters in Tibet in recent months or years?

“Climate change and human development are jeopardizing the plateau’s fragile environment (Qiu, 2014)” reports nature, precisely answering the causes behind the worrying natural trend. Tibet is the world’s largest and highest plateau²; from where earth’s majestic peaks rise in to the sky and mighty rivers gush through most of Asia, feeding billion plus lives in the riparian states and influencing the weather patterns as far as Europe. But with a temperature rise of 0.30°C per decade, which is twice more than the global average (Xingxing Kuang, 2016), the plateau is experience rapid melting of its 46,000 glaciers. The rapid melting of glacier could cause floods and landslides in short-term and possible drying up of some of the stream in long run as the glacier on the river’s head source gradually melts off.

1. Located in the central-north of Tibet as part of Qinghai Province, the counties are considered water source of Asia’s major rivers like Yellow, Yangtze and Mekong.

2. The Tibetan Plateau with an area of 2.5 million sq.km and at an average elevation of 4500 meter above sea level, makes it the highest and largest plateau

Despite the Tibetan Plateau facing the severest impact from climate change, there is an absolute lack of public education and awareness program on how to mitigate and adapt to the climate change. Much of China's environment related policies framed in recent years are aimed at solving urban coastal pollution problems rather than protecting the fragile ethnic regions of Tibet and Xinjiang.

The local residents of Tsolho blamed the recent mud-flood in the region to excessive mining and tunneling of a mountains. The impact of climate change has been exacerbated by the increasing scale of resource extractions and dam constructions in the Tibetan areas. Mining has become the biggest concern for both the land and people of Tibet, causing landslide, grassland degradation and water pollution. According to the Environment & Development Desk of the Tibet Policy Institute, there has been more than 30 known environment related protests in Tibet since 2009.

The dire implication of excessive mining in Tibet has been echoed by Chinese scientist as well. As per an assessment report by Chinese Academy of Science, Tibetan mines produced 100 million tonnes of wastewater in 2007 and 18.8 million tonnes of solid waste in 2009. The report also stated that as most of the mines were open pits and had limited environmental oversight, air, water and soil pollution was particularly serious in the region (Qiu, Double Threat for Tibet, 2014).

A similar horrendous scenario was reported first hand by the author of a 2009 travel guide 'Tibet Handbook', in which he writes "the hills around Chumarleb have heavily eroded by the itinerant 70,000 or 80,000 Chinese gold miners who come here during the summer months. The lawlessness of these prospectors is encouraged by the paucity of the police force assigned to monitor them (Dorje, 2009)". This is the same site where a recent drought has been reported and desertification is a serious issue. Despite a clear warning of increasing natural disasters in Tibet such as landslides, torrential floods and snow disasters in an Environment Assessment Report (Deliang Chen, 2015) published by the Institute of Tibetan Plateau, the Chinese government continue to expand and expedite mining and damming in Tibet. Thus, increasing the likelihood of more natural disasters as well as exacerbating the impact of any natural disaster. The flood in Tashigang Township of Lhatse County in central Tibet on 3 August is one of the most recent disasters (Xinhua News, 2016). Fortunately, it was a breach of river embankment and not a dam burst as hurriedly reported by Xinhua.

Nevertheless, rising river levels due to increasing rainfall and fast melting of glaciers could burst dams and cause catastrophic disasters to Tibet, China and Asia. Tibet is home to probably the largest number of dams in the world and Chinese government has been investing heavily on building mega dams. The Suwalong

hydropower project on the Yangtze River with a design capacity of 1.2 gigawatts is in the latest list of mega dams on this seismically active plateau.

A sudden rise in temperature and increase in natural disasters has been strongly felt by the local Tibetans in recent years. But the lack of information and infrastructure to mitigate the impact and adapt to the new pattern of global weather system has left Tibetans unprepared and unprotected. Meanwhile, the Chinese government continue to build railways and dams to accelerate the exploitation of more than 3,000 proven mineral reserves found in Tibet (Chinadaily, 2010).

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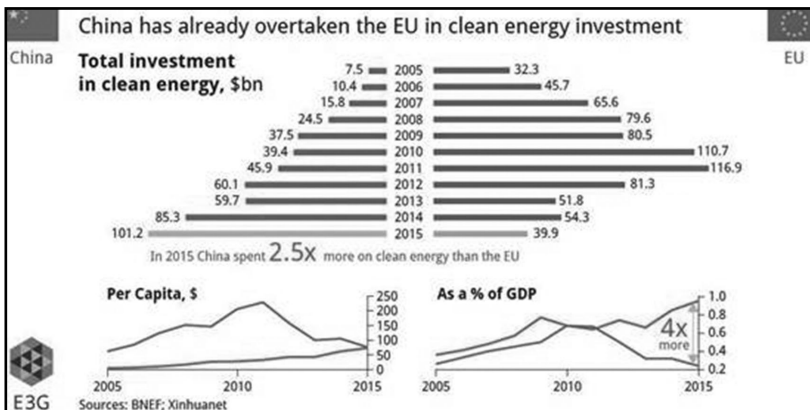
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CHINA'S DAMMING OF THE RIVER: A POLICY IN DISGUISE

China's control over 'blue gold' wealth on Tibetan plateau has armed China with tremendous leverage and made them a potential water power in a way Saudi Arabia is an oil power (Chellaney, 2011). Moreover, the country which has the largest number of dams in the world with two-third of it located on the Tibetan plateau is still in the process of developing more dams to satiate its industrial sector's growing power demand. As of now, China has more than 87,000 dams and in the last decade, the country has installed more hydropower capacity than the rest of the world combined (Internationa Rivers, n.d.). This means that China continues to play a leading role in global hydropower development.

Furthermore, Chinese companies and Chinese banks now fund the largest dam projects in the world. By August 2012, Chinese companies and banks were involved in almost 308 dam projects in 70 different countries (Mongabay, 2012). As of now, Chinese state-owned Sinohydro Corporation is the largest hydropower company in the world and the China Export-Import Bank (China Exim Bank) has emerged as the biggest funder of large dams.



China is developing at what cost?

On the ongoing debate over the ecological impact of large dams, Mark Tercek, CEO of Nature Conservancy said: 'Environmentalists generally hate dams, even though they're clean energy' (Wockner, 2014). Unfortunately, the dams are not "Clean Energy" as Tercek has described. In fact, dams are one of the major factors causing Climate change. According to Ivan Lima and other experts from Brazil's National Institute for Space Research (INPE), the world's large dams emit 104 million metric tons of methane annually, which implies that methane emission

from dams is responsible for at least 4% of total global warming caused by human activities (Lima, 2008). Taking into consideration the case of the Mekong River, Chinese officials' claim that the dam which was built on the upper reaches of the Mekong River would have a positive environmental impact. They assert that during the wet season, the dam will help control flood and riverbank soil erosion and above all provide clean energy. Conversely, releasing water during summer will help ease water shortage during the dry season (Jory Hecht, 2014).

A river can be dammed in an environmentally considerate manner. But what China is doing is over-damming of rivers. However, they fail to acknowledge that hydropower development alters the hydrology of the river by forcing variation in water flow such as reducing and delaying wet season flow and increasing dry season flow. This affects the ecosystem and livelihood of people who are dependent on the natural flow of rivers. Also, these water fluctuations are made considering the rise and fall in electricity demand. Moreover, controlling the flow of floodwater has another adverse effect. The seasonal flooding is key to productive farms and the health of fisheries as the floodwater inundates land with valuable nutrients and sediments. These nutrients stimulate the food web and enrich the soil and thereby promoting farming and fisheries. However, with the damming on the Mekong River, it has created a huge net loss to the people dependent on the river for livelihood.

Furthermore, the dams built on the upper reaches of the Mekong River are located in highly seismic area. Although, Chinese regulations stipulate that dams are designed to withstand seismic activity. In case, big dams built on the upper reaches of the Mekong River fail due to natural catastrophe, it will create a 'domino effect', triggering a cascading sequel collapse of dams further downstream. A 2012 Probe International report noted that '98.6% of all of these dams, and 99.7% of western China's electricity generating capacity will be located in zones with a moderate to very a high level of seismic hazard' (Jackson, 2012).

Adrian Moon, a geologist who has been monitoring earthquake activity on the Tibetan plateau, southeast Tibet and west of Sichuan since 2009 contends that 'In an area like South-Eastern Tibet, with such complex geology and fault lines, just because nothing's happened in the past doesn't mean nothing will happen in the future' (Chen, 2014). China has turned a blind eye to the warnings and continues its frenetic dam building on the plateau including six large hydropower dams on the Lancang (Mekong) river and The Rumei (or Rongmei in Tibetan) hydropower project, which once completed will be the second-highest in the world at 315 meters.

More Dams in the Tibetan Plateau and Other Parts of the World.

In March this year, China set out its development plan for the next five years. According to its 13th Five Year Plan, China has successfully taken over European Union in clean energy investment in the last five years, and they further intend to dominate the clean technology market both at home and abroad for the next five years (Shin Wei Ng, 2016). So, the question arises, will hydropower be considered as clean energy as described in the 13th Five Year Plan? If so, then there will be a further escalation in dam building on the Tibetan plateau and other parts of the world.

The Impacts of China's Dams on the Lower Riparian Countries

China's control over Tibet brings a special privilege of being the upper riparian country of most of Asia's major rivers, Beijing is using this vantage point in the game of water diplomacy. Since late 2015, countries along the Lancang-Mekong River have suffered from severe drought and the Chinese government blames it on the El Nino phenomenon as they always turn their blame away from its dams. So, in order to show their leverage over riparian countries, China announced the release of emergency water supply from Jinghong Hydropower Station from March 15 till April 10, 2016, to help overcome drought in Mekong Delta. From this, we can observe that Beijing had already highlighted its dominance over the Mekong River and the downstream countries are dependent on China's goodwill and charity of this life-sustaining resources (Jie, 2016).

Likewise, Geostrategist Brahma Chellaney had also described how China could use its leverage to deter downstream countries from challenging its broader regional interests, citing that "smaller downstream countries in Southeast and Central Asia now use only coded language to express their concerns over Chinese dam building. For example, calling for transparency has become a way of referring obliquely to China, which smaller states are wary of mentioning by the name" (Chellaney, China's dam boom stokes concerns in Asia, 2016).

One of the most recent examples of arm twisting by China using its vantage point as an upper riparian country is the stalled multi-billion-dollar Myitsone dam project on the Irrawaddy River backed by China. Once completed, China will import 90% of the electricity generated leaving hardly any profit to the people of Myanmar despite the fact that Myanmar suffers daily power shortages. With the new government in power, the decision of resuming the project rests with the senior leadership, particularly Aung San Suu Kyi. If she decides to resume the project, it will seriously tarnish her claim of moral and political leadership and may even prompt protests in the country. China continues to put pressure on Myanmar giving them three options regarding the future of the dam. According to China, Myanmar can cancel

the dam project and be liable to pay \$800 million in compensation or resume work on the project and earn \$500 million a year in revenue when it is completed or do nothing and pay \$50 million in interest for as long as it remains suspended (Myint, 2016). Moreover, most of Myanmar's rivers have its source on the Tibetan plateau and China may use this as a tool to pressurize the new government. Beijing, with its diplomatic and economic clout, has put the National League for Democracy (NLD) government in a deep dilemma. On one hand, they have their own people who protest against the dam project, and on the other, they have the Chinese government pressurizing them to resume the dam project.

In addition, neighboring countries like India and Nepal are concerned about an increased natural disaster in Tibet such as glacial avalanche, mud flood, landslide, dammed river bursting, and earthquake. When asked about the flooding from Tibet, officials from Central Water Commission of India says that they have concerns about flooding from Tibet too, but they're focused on dams building on Tibetan rivers 'If waters from them are released in a larger quantity, they may become floods and if we have no storage in the Indian portion, that may create havoc', the commission's chairman Ghanashyam Jha told the BBC (Khadka, 2016).

Considering the impact of China's dam-building spree on the Tibetan plateau and in the neighboring countries, this article is an attempt to highlight the importance of the need for South Asian countries to come together to seek sustainable ecological and cost-effective solutions instead of continuing dam-building through collaborative efforts. There is no right without responsibility, so China to represent as a responsible Asian power and upstream state on the international river, has a duty to allow independent, comprehensive, and expert assessment of risks involved in the extension of dam projects in and around Tibet. Findings of the experts should be made available to the affected people and the countries.

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WHY IS CHINA PLANNING TO TURN WHOLE OF THE TIBETAN PLATEAU INTO A PARK?

According to a recent report (Chen, 2017), the Chinese government is planning to turn whole of the Tibetan Plateau into a mega national park. National parks are created to preserve ecology as well as its cultural heritage. China's plan of converting whole of the Tibetan Plateau into a national park is an arduous task but not impossible as large parts of Tibet, such as, the Qinghai Golmud Kunlun Mountain National Park, Jomolangma National Park, Namtso Nyenchen tanglha National Park, Guge National Park etc have already been declared national parks.

The Chinese government designates a particular site as national park aiming for ecological sustainability. Provincial and local governments are given responsibilities to operate national parks with no further direction. However, local governments do not have sufficient funds for construction and operation of national park and hence it encourages private sectors to engage in initial infrastructure development and permitting them to operate park for a time period. Private sectors profit from the ticket sales for park entry and other recreational activities in the park. They develop sites within the national park at scenic spots by building hotels, resorts, and restaurants. This defeats the objectives to preserve nature and to protect biodiversity and its ecosystem.

Chinese scholars and environmentalists have often critiqued the concept of national park, and many argue whether they are for conservation or are aimed at commercialization. China has followed the United States' method of monitoring its national park without understanding the unified system of governance in United States against the fragmented and often overlapping environmental governance in China. China's plan of national parks in some of the areas in mainland China encouraged large number of tourists, but a severe loss in biodiversity and its plan to convert Tibetan Plateau into "The Last Piece of Pure Earth" can be considered as the first call to bring tourism to the whole of Tibet. China gained such confidence from success in tourism industry in certain Tibetan cities (Lhasa, Nyingtri and Gyalthang). China's need to construct huge area of national park in recent times is mainly because of emerging middle class with growing interests in outdoor recreational activities and this demand for public recreational sites and hugely profitable tourism sector attract state to build a greater number of national parks. The impact of tourism is evident in Lhasa where the majority of tourists are Chinese, and they have their plans tailored to benefit Chinese businesses providing accommodation and food.

China's plan of converting the whole of Tibet to a national park not necessarily mean a positive effort towards nature conservation. In August 2013, there were reports (Voice of America, 2013) of mining on a sacred mountain in Zatoe region of north-eastern Tibet. The area is under the jurisdiction of Sangjiangyuan National Nature Reserve. The local Tibetans of Zatoe County protested against the mining company but were violently suppressed by Chinese armed forces. In the year 2003, Sanjiangyuan Nature Reserve, (head source of three rivers) was declared as a national-level nature reserve. Nature reserves are highly protected areas where development projects like mining and tourism are strictly prohibited, and national parks are built keeping in mind the economic and social development. When local authorities mismanage a national-level reserve for their economic benefit as evident in Zatoe, there is a clear picture of what Tibet will turn into once it is designated as the third pole national park.

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GARBAGE RAMPAGE IN TIBET

Why rampant littering on the world's highest Plateau concerns us all

Tibet, once the mystical Shangri-La to the western world, is still one of the most beautiful places and sought after destination for travelers. In 2016 alone, a whopping 23 million tourist flocked to the plateau (Xinhua, 2017).

But the question is: Is Tibet ready to accommodate such massive number of tourists?

According to Chinese government sources, the so called Tibet Autonomous Region is all set to welcome 25 million tourist this year and 30 million by 2020 (Palden Nyima, 2017), ensuring an increase of 1.5 million tourists every year. To realize the 2020 target, the Chinese government has been making huge investments in infrastructural set-up: building roads, railways, airports and cities in the Tibetan areas. With increased access to Tibet, the government is able to mint, billions in tourism revenue.

But the Chinese government has conveniently neglected the imperativeness of the very basic measures and mechanisms needed to cope with increasing human activities in the fragile ecology. That is, garbage management and garbage treatment facilities. The massive number of visitors to the region leaves behind proportional volume of garbage. The lack of institutional measures and adept governance in waste management has encouraged rampant littering on the mountains and massive waste dumping in the rivers. Declaring more and more nature reserves or proposing to declare whole of Tibet into a National Park is absurd without providing the very basic infrastructure to deal with the everyday waste.

“Tibet is no longer the same, there are garbage everywhere”, said Tashi who has returned from a recent visit to his home in Karze region (an eastern Tibetan region incorporated into Sichuan Province of China). With a sense of frustration, he further added that “the rivers are flooded with garbage and there are no waste management facilities provided by the Chinese government in the rural areas”.

The frustration over rampant littering fueled by Government's apathy is no longer an isolated case in Karze region but is pertinent across Tibet. This is reflected in the numerous local conservation effort of the local Tibetans in recent years. On 24th of the same month, a management group for sacred mountain Tsari in Nyingtri region of the 'Tibet Autonomous Region' made an appeal to the visitors not to litter on the holy mountain. Until two decades, garbage was never an issue in Tibet. Domestic wastes were ingeniously managed and processed into manures for use in the farms.

But now with global warming and rising temperatures on the roof of the world, increasing human activities and abundance of food products packaged in plastics, the plateau is inundated with unregulated garbage disposal by tourists, pilgrims and construction workers. The traditional ways of waste management no longer remain a viable solution. Such formidable scenarios, demands a forward-looking leadership to provide the necessary infrastructure, redressal mechanisms and sustainable measures. But the leadership in Beijing has utterly failed on two fronts in surmounting the pressing challenges: First it failed to make general public aware of the health hazards and the environmental impact of garbage, Second it failed to meet the governance and basic infrastructure needs for waste management.

Much of the government investment is concentrated in few selected tourist centers and cities housing government officials. As soon as one travels outer-skirt of towns and cities, littering is rampant and governance on waste management almost non-existent. Such situation has compelled the local communities to step up efforts: voluntary environmental groups are formed and tasked to collect truckloads of garbage from surrounding mountains infested with wastes. In the absence of infrastructural provisions to deal with the garbage, the locals take recourse to burning the wastes, thus unintentionally causing greater environmental hazards.

With an area of 2.5 million km² and at an average elevation of more than 4000 meters above sea level, Tibet is the largest and highest plateau on earth. The plateau is not only home to world's highest mountains, storing 46,000 glaciers (third largest store of ice on earth beyond north and south pole) but it's also the head-source of Asia's largest rivers, such as Brahmaputra, Indus, Yellow, Yangtze, Mekong and Salween. Supporting more than 1.5 billion people (UNESCO, SCOPE, UNEP, 211) in the eleven downstream nations¹. Any damage to the fragile ecosystem of the Tibetan Plateau would have adverse global repercussions.

Millions of tourists flocking to Tibet are predominantly Chinese, rushing to escape from the toxic smog that engulf much of China. If the current trend of rampant littering continue in Tibet, the 30 million tourists expected to touchdown in Tibet would further aggravate the situation. A situation that might tragically transform the world's highest plateau into a yet another toxic Chinese province. In a bid to avert such an impending threat, the Chinese government must take prudent measures to address the lapses and ensure that any future investment in the region would result in creating a healthy and sustainable environment; - an environment that millions of tourists and generations of Tibetans could continue to enjoy.

1. Pakistan, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam, China

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CHINA'S PLOY IN THE RIPARIAN COUNTRIES

China, a country known for its smoggy sky and hazardous environmental conditions, has become a prospective global leader on climate change. The environment is already a massive and potentially explosive issue in China and there is huge domestic pressure on framing and implementation of better environmental policies. With Premier Li Keqiang's pledge during the National People's Congress in March 2017, to "Make the sky blue again", (BBC, 2017). China understands its severe environmental problems and the need to find a solution as soon as possible.

China's 13th five-year plan for energy development, covering the period from 2016 to 2020, was officially published in early January 2017 (National Development and Reform Commission(NDRC), 2016). It outlines a strategy to reduce reliance on coal and to achieve a minimum share of 15 percent of non-fossil energy sources. Specific targets include an additional 60 GW of hydropower. China having dammed most of its rivers are now looking to explore Tibetan rivers as potential sources of energy.

The Tibetan Plateau has the largest reserve of freshwater outside the two poles, making it a source of major international rivers running across Asia. China, now in a position of control over these water resources, makes the riparian countries more dependent on incoming water from Tibet. Moreover, China voted against the UN Convention on The Law of Non-Navigational Use of International Watercourses which was adopted in 1997. It is not bound by the law, and this allows Beijing to use the water without hindrance. And China is using this power by engaging in dam-building and river diversion plans and other activities along international rivers without consultation with the riparian states.

It is justified that many of the South Asian countries have not ratified the UN convention as China (upstream) is not a member of the convention with whom they are dependent on water. Yarlung Tsangpo (Brahmaputra) is one such river that is causing friction amongst all three recipient countries, especially between India and China. The Zangmu Dam, the largest dam on the Yarlung Tsangpo is the cause of serious concern to the downstream countries. Although China's claim that the dam built on the Yarlung Tsangpo wouldn't impact the flow of the river but the general public who are directly dependent on the river have serious doubts about China's intention. But the government of India is assuaged by China's assurance that the dam built on the Yarlung Tsangpo isn't intended to regulate water.

In January 2013, China's State Council gave a go-ahead for three more hydropower dams on the Yarlung Tsangpo, which are Dagu, Jiacha, and Jiexu in Lhoka in south Tibet. (Krishnan, China's gives go-ahead for three new Brahmaputra dams, 2013)

Besides this, China has planned to construct seven more dams on the mainstream of Yarlung Tsangpo. When will the downstream countries raise this issue with China is still an unanswered question? Will it be after the completion of damming the river?

With China isn't having any water-sharing agreement with India and Bangladesh, it is not bound to any treaty and doesn't need to consider the concerns of downstream countries. In recent years the idea is floated that hydropower is a source of clean energy (Office of Energy Efficiency and Renewable Energy).

However, this idea falls within the realms of debate (Bridget R. Deemer, 2016). The claim that hydropower is a source of clean energy is being used by Beijing to push dam-building projects in the region. Damming of rivers might seem to some as a source of clean energy, while to others is damaging to the ecology. More ominously experts are aware that many of these dams being built are located in a highly seismic prone area. In an event of an earthquake, ineffective water management and deforestation in this region make the region vulnerable to flood or drought. These dams can wreak havoc accidentally or can be used to choreograph such incidents in times of conflict and war.

A dam breach in May 2000 in Tibet led to a massive flood in Arunachal Pradesh and it caused an extensive loss of life and destruction of key infrastructure (Arpi, 2008). The Indian government accused the Beijing counterpart of not sharing vital and timely information about the water level of the Brahmaputra which triggered a flood to Arunachal Pradesh. This necessitated the 2002 agreement (Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation), in which China agreed to supply river flow data to India during the flood season. But China refused to talk about its proposed dam building plan. So, to avoid any political disputes with India, China shows its cooperative face for a short term when pressure arose and when pressure abates, China returns to its actual plan.

Moreover, the flood remains a concern for the downstream countries and may worsen in the long run with the continued melting of Tibetan glaciers as a result of global warming. Yao Tandong, a leading Chinese glaciologist, reports that the glaciers on the Tibetan plateau are now melting at an accelerating rate. He believes that two-thirds of these glaciers could be gone by 2060 if the melting continues at the same rate (Brown, 2006).

The Yarlung Tsangpo has its water source from these glaciers. If the glaciers continue to retreat at such a rate, then in the future there will be a severe water crisis in Asia. China continues with dam building on international rivers without consulting downstream countries. When the riparian countries voice their concerns, China always maintains consistency in its response to such accusations, which

is invariably a complete denial, and then a promise to consult. After this China continues its dam-building activities regardless. In 2010, there was a widespread drought in Southeast Asia because of China's construction of a hydropower dam on the upper reaches of the Mekong which originates from Tibet. This drought compelled many of Southeast Asia to lodge their collective and strong protest to Beijing (International Union for Conservation of Nature, 2010).

In order to prevent India and Bangladesh from lodging any strong protest, China announced its construction of the Zangmu hydropower station (Krishnan, China begins damming Brahmaputra river for hydropower project, 2010). Beijing also explained that the construction of this dam on the Brahmaputra would not reduce its volume of water to the downstream countries. Until now, India and Bangladesh have been reactive rather than proactive to show their concern about China upstream dam building. A tripartite agreement between them is imperative. It is therefore time for the governments of India and Bangladesh to come together and start initiating talks before it is too late.

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PIKA: A MISUNDERSTOOD VICTIM OF GRASSLAND DEGRADATION

Humans emerged as the most dominant species in the world, influencing both the survival and extinction of many species. Modern civilization, with development in many aspects, has made people more educated, civilized and ironically more ruthless. We hunt wild animal for their skins, organs, and worst kill them for being pests. Unfortunately, pika (abra in Tibetan), small and furry wild animal, scurrying on the Tibetan plateau was the target of a large-scale eradication since 1962, as pikas were considered pest causing immense damage to the local ecosystem.

Extensive research on the role of pika on the rangeland of the Tibetan plateau has given rise to two contradictory result: while some consider them as a keystone species of Tibet's rangeland (Andrew T. Smith, 1999), others blame them as a factor for declining alpine meadow condition (Lie, 2006). Finding the actual role of pika on Tibet's rangeland might be too late and the species could soon be on the threatened red list of the International Union for Conservation of Nature (IUCN).

Human footprint is the main cause of Tibetan plateau's degrading rangeland. As George Schaller stated in his book, *Tibet's wild*, "pika are not the cause of degraded grassland but the indicator of the overgrazed and degraded land (Schaller, 2012)". Mass poisoning of pika began in 1962 as a pest competing with livestock for forage and causing soil erosion but with grassland degradation still occurring, who should be blamed next? As Andrew Smith and J. Marc Foggin wrote in their paper, instead of spending huge resources on killing them, pika should be considered as an alternative method to save Tibet's rangelands. Pikas are considered keystone species with immense benefit to the rangeland ecosystem in Tibet (Andrew T. Smith, 1999), Such as:

- Pika burrows are used by different type of birds as breeding ground.
- Pika faces provide nutrient to the soil.
- Pika help in loosening the soil layer making it more suitable for water storage.
- Pika help in prevention of soil erosion.
- They are the food sources for many predators like foxes, wolves, snow leopards and brown bears (keeping pikas population in control).
- More importantly, pikas feed on herbs and other poisonous plant species harmful and unpalatable to livestock.

The extermination of pika population has been justified for their presence on a degraded land and their competition with livestock for food. The antipathy towards pika from local community primarily arises from pika burrowing habitat which deface surface area and cause accidents when travelling through such places (Schaller, 2012). The above reason is found to be true to some extent as food scarcity make pika forage on plants preferred by livestock. The mass eradication of pika because of their home location seems very brutal and unfair. The alpine rangeland problems are, in fact, caused by unsustainable use of land by humans without proper and realistic measures. The Chinese government should solve such problem with logical solutions instead of blaming the pika.

The extermination of pika in 1962 was done by using pesticide sodium fluoroacetate (compound 1080), which is toxic to both human and animals. Later in the mid-1980s, it was replaced with toxin botulinum type C which affect animals only and kill them by effecting their neuron system. Both toxin is targeted for the pika and other pests in the region, however it has also affected livestock and other wild animal passing through the affected area (Schaller, 2012). The world would be a sad place, if the once freely roaming, small furry animal largely mistaken for rodents are to be completely exterminated from the alpine rangeland. Everything in this world has both good and bad sides to it. The pika might be harmful to the rangeland of Tibet on the bases of their habitat, competition with livestock for food but their positive effects on Tibet's rangeland are far greater than their negative impacts on the complex ecosystem of Tibet.

In conclusion, pike should be used for restoring the degrading rangeland instead of blaming them for the current situation.

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FLOODED TIBET: STRUGGLING TO ADAPT TO THE NEW REALITY

On 30 August 2017, a massive landslide buried nine people in Golok Machen region of north eastern Tibet. The horrifying disaster occurred in the early hours of the day (4:30am) while residents were still in bed. The day could have been, otherwise, a beautiful summer morning with nomadic melodies echoing across the valley as residents carry on their daily chores. But life on the Tibetan plateau is no longer the same as climate change now seeming affecting the once stable regions of the Tibetan Plateau (University, 2016). The impact of climate change is evident with unprecedented number of natural disasters across the plateau since 2016, mostly floods and landslides due to torrential rainfall (Zamlha, 2016).

As such in 2016, an unusual glacial avalanche in (Aru) Ruthok County of Ngari (Nasa, 2016) killed nine people and buried more than 110 yaks. Mud floods and landslide in Labrang, Sangchu, Tsolho and other regions of Amdo injured more than 30 people and caused huge damage (Zamlha, 2016). Thus clearly signals drastic shift in the climatic pattern on the Tibetan Plateau. The shift was apparent as 2017 saw simultaneous floods in many parts of parts of Kham in Tibet. There is growing worry on the increasing cases of natural disasters and their imminent threat to life of millions. This writer published an article titled 'Natural disasters in Tibet: Is it the new normal' on 8 August 2016, asking the People's Republic of China (PRC) to make necessary arrangements to minimize the impact of increasing natural disasters (Zamlha, 2016). The PRC should be applauded for the massive drive to plant trees across Tibet which would have an immense benefit in the future.

But the recent flood damages in Golok, Dege, Jomda, Sokzong and Rongdrak could have been avoided had the Chinese government proactively pursued a policy of safety first in any infrastructure development in Tibetan areas. The government has been forewarned of increasing natural disasters including landslides, torrential floods, snow disasters and forest fires in a 2015 Scientific Assessment Report by the Institute of Tibetan Plateau Research under Chinese Academy of Science in Beijing (Sun Honglie, Qin Dahe, Zheng Du, Wu Guoxiong, Zhou Xiuji, 2015). The question is, has the relevant governments taken any measures or framed any policy guidelines to face the new challenges. Who should be accountable for the loss of life and damage to property?

The plateau is witnessing a rapid rise in both temperature and precipitation in recent years. This inevitable change caused by climate change cannot be avoided but damages could be easily reduced if impact of climate change is taken into

consideration while framing any development policies. To frame any such policy, a thorough study should be done to understand the factors or the causes behind recent natural disasters in Tibet. So following are the few possible causes as per the understanding of this writer.

Climate Change: Climate change is certainly the primary cause for increasing natural disasters in Tibet. The plateau has been witnessing consecutive rise in both temperature and precipitation, especially in recent years (Sun Honglie, Qin Dahe, Zheng Du, Wu Guoxiong, Zhou Xiuji, 2015). At 0.3–0.4°C per decade, the temperature rise on the Tibetan plateau is twice the global average (Kang Shichang, 2010). This has led to massive permafrost degradation in northern regions of Tibet, resulting in increased water flow as frozen grounds quickly melts and degrades into desert. According to Inter-governmental Panel on Climate Change (IPCC), the temperature rise has also caused 82% of glacial on the Tibetan plateau to retreat in the past 50 years (Qiu, 2008). In many parts of Kham and Amdo, glacial are drastically retreating and mountain slopes are dangerously thawing. As mountain slopes thaw and frozen ground loosen, villages and towns located on hillsides and in narrow valleys are in constant danger from impending landslides. The situation is further exacerbated by the increased rainfall, especially in the eastern regions of Tibet. This is evident from the 2016 Tibet Summer Climate Report, which stated that Tibet experienced higher than average temperature and highest record of monthly total precipitation in the same historical period (China Tibet Online, 2016).

Rapid Urbanization: Rapid urbanization has led to land grab as most of the towns and cities in Tibet are located in narrow valleys with little space to extend in either direction. This has led to over congestion and construction of high rise buildings along the narrow river valley. According to a Chinese government report (Chinese Embassy in Iraq, 2015), the number of towns and cities in Tibet increased from 31 to 140 between the years 1990 to 2013. China has set target of reaching 60% urbanization by 2020 from its 56.1% in 2015. The so-called Tibet Autonomous Region plans to reach its urbanization rate at 30% by 2020 from its 25.7% in 2014. This is 0.4% faster than overall target rate pursued by the Chinese government. The rush for urbanization is apparent with cluster of buildings coming up in every Tibetan towns and cities. Chamdo, Shigatse, and Nyingtri were declared prefecture level cities. Soon all of the 18 prefecture headquarters across Tibet would be upgraded into prefecture level cities. There are around 150 county level towns that could also grow into mid-size cities in the coming years.

Poor construction: From the recent floods in Jomda and other Tibetan areas clearly demonstrated poor construction standard. Collapse of many of the buildings could have been avoided had they been built with better standard to withstand floods and earth quakes.

Location or Topography: Most of the towns and cities in Tibet are located in narrow valleys along major rivers, such location are highly prone to floods and landslides. As these towns grow in size, homes cram up on the steep slopes or encroach into the river banks, thus exacerbating the situation to a point where even a small natural event could cause massive damage.

Lack of Adaptation: Lack of adaptation is apparent as both the government and the communities were unprepared when disasters struck. There has been no climate change impact awareness program as both the government officials and general public are unaware of the socio-environmental impact of climate change. Hence natural disasters are taken as local events.

Conclusion

The summers are the best time of the year for Tibetans. People celebrate summer with festivals and picnics. Such a joyful occasion could turn into a nightmare if natural disasters continue to strike. Climate change is a global phenomenon but impacts vary from place to place. The magnitude of climate change related damages depend on how individual governments proactively pursue policies and take measures. Adaption and Mitigation are the two universally accepted principal solutions in facing the new climatic reality. Lack of awareness weakens any effort in dealing with climate change; hence both the government official and general public should be educated on the possible impacts of climate change.

The increased number of natural disasters occurred in the last two years were primarily due to climate change, but it was also partly due to rampant mining, rapid urbanization and irresponsible development works. Necessary mechanism to deal with natural disasters should be put in place for quick response. A thorough post disaster assessment should be carried out to both understand the causes and to hold those responsible accountable.

For any future development policies in Tibet, impact of climate change and local socio-ecological conditions should be taken into consideration.

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UN CLIMATE CHANGE SUMMITS: WITH OR WITHOUT TIBET

The 23rd Conference of Parties (COP23) or the UN Climate Summits will be organized by the government of Fiji. But due to logistic issues to accommodate tens of thousands of delegates from 197 member states, the conference will be held in Bonn, Germany from 6-17 November 2017. This mega event is the world's biggest climate conference attended by heads of states, government delegates, climate scientists, environment researchers and activists from across the globe.

Fiji, which is home to over 870,000 people, is frequently hit by cyclones and floods as a result of climate change. Rapid sea-level rise has threatened the island nation and forced villages to move to higher grounds. Located far away from the Pacific island nation of Fiji, the Tibetan Plateau is another region that is facing the brutal brunt of climate change. A small team of Tibetan delegates, though unrecognized as a sovereign member delegates, have been faithfully attending the UN climate summits since 1992 to voice its plight (Chicago Tribune, 1992). His Holiness the Dalai Lama was the first ever Tibetan to speak at such summits on Tibet's environment (Environment & Development Desk, CTA, 2018).

Why Tibet need to be at the UN Climate Change Summits

Tibet, known as the 'Roof of the World', is an environmentally strategic area and critical to the health of the planet. As the world focuses on climate action at COP23 and beyond, Tibet must be central to any progress made on climate change.

The Tibetan Plateau, with an average elevation of more than 4,000 meters above sea level and covering an area of 2.5 million square kilometers, is the highest and largest plateau on earth (Shichang Kang, 2010). Tibet is also the head source of Asia's greatest rivers¹ supporting livelihood in 10 most densely populated nations in the world, such as Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam and China. After the Arctic and Antarctic, the Tibetan Plateau with 46,000 glaciers, is home to the third largest concentration of ice on earth. Hence is rightly referred to as the planet's 'Third Pole' (Tandong Yao L.G., 2012) and any drastic land-cover-change on the third pole will resonate across Asia and beyond.

But due to its vast surface area at an extreme elevation, the temperature rise on the Tibetan Plateau is twice more the global average. This has led to rapid glacial

1. Driчу/ Yangtze, Machu/ Yellow, Zachu/ Mekong, Gyalmo Ngulchu/ Salween, Senge Tsangpo/ Indus, Yarlung Tsangpo/ Brhamaputra

retreat and permafrost degradation. According to an Intergovernmental Panel on Climate Change (IPCC) report, 82% of glaciers on the Tibetan Plateau have retreated in the last fifty years (Qiu, 2008). If the current rate continues, then 2/3 of all glaciers on the plateau would be gone by 2050 (Tandong Yao). The fast thawing of permafrost on the plateau would result in the release of vast quantity of carbon into the atmosphere. This could further exacerbate the rising temperature and cause extreme climatic conditions across the world. The plateau not only influences the timing and intensity of Asian monsoons but the increasing heat waves in Europe are also linked to the decreasing glaciers on the Tibetan plateau.

The rapid melting of glaciers would cause sudden surge in river flows in the next few years, causing floods and landslides. But the river volume could reach peak by 2030 and then would start to decline, causing unimaginable difficulties across Asia.

History of Tibetan Participation at the UN Climate Change Summits

The Dalai Lama was the first ever Tibetan participants at UN climate summits when His Holiness was invited (Chicago Tribune, 1992) at the 1992 Earth Summit in Rio de Janeiro (Government of Canada, 1992). His Holiness spoke on the issue of the Tibetan Plateau and its environmental significance (Environment & Development Desk, 2018). Around the same time the Environment & Development Desk (EDD) of the Central Tibetan Administration also came into existence. Since then, EDD has been working on Tibet's environmental issues to understand the environmental conditions in Tibet, to highlight the global significance of the plateau and work for the protection its environment.

After His Holiness's presence at the Earth Summit, the second batch of Tibetan delegates to attend such summit was in 2009 when a strong team of Tibetan delegates led by EDD attended the COP15 in Copenhagen (Tibet.net, 2009). The successful Tibetan presence at Copenhagen resulted in the continued participation of Tibetans at the subsequent UN climate conferences. The Tibetan participants, despite without negotiating rights, sincerely devoted their presence at UN climate conferences on environmental issues in whatever little possible way they could.

After 10 years of His Holiness's presence at the Rio Earth Summit, a lone Tibetan participant at 2012 Rio+20 Earth Summit was a memorable experience for this writer (tibet.net, 2012). The experience instilled sense of hope and desire to do whatever little one can in protecting Tibet's environment and contributing to the success of UN climate negotiations.

The 2015 participation at the COP21 UN climate summit in Paris was probably the biggest and most successful Tibetan participation. Seminars and side events were

held, Tibet Climate Action slogans resonated across the globe. His Holiness the Dalai Lama delivered a powerful and passionate video messages for the world ahead of the COP21 (The Guardian, 2015). In the message, His Holiness highlighted that the blue planet in which we live is our only home and that Tibet is like its roof. Therefore, the world need to fix the leaking roof instead of playing politics on non-political issues like environment.

Possible Partners: Tibet, China and the World

Environment is an issue that concerns us all. It knows no political boundary as His Holiness the Dalai Lama rightly said in his COP21 message. His Holiness also emphasized that the environmental issues of Tibet is something that concerns not only the Tibetans but over a billion human lives in China, India, Pakistan, Bangladesh and other southern regions of Himalaya. Tibetans have always lived in harmony with nature and protected the environment in which they lived, as they have great love and respect for nature.

Tibet witnessed unprecedented number of natural disasters across the plateau (Zamlha, 2016) with glacial avalanches, droughts and mud floods in 2016. This signaled a drastic climatic shift and a new weather pattern on the plateau. This year the situation got worse with simultaneous floods across much of the South-eastern regions of Tibet (Zamlha, Flooded Tibet: struggling to adapt to the new reality, 2017), clearly indicating urgent need for action. Fortunately, there has been some progress on the global stage with in recent years and months as the world took a united approach to sign the Paris Agreement in 2015. There has also been encouraging signs from China as President Xi Jinping gave great importance to environment in his opening speech at the recently concluded 19th National People's Congress (Chinadaily, 2017). There seem to be a common desire among all, the Tibetan people, the Chinese government and the international community to collectively work for a greener and more sustainable future. This is absolutely possible and necessary.

It's time the Chinese government and the world live up to their pledges and promises in combating global warming and protecting the environment. For a genuine effort in combating global climate, the protection of the Tibetan plateau is paramount. According to V Ramanathan, an atmospheric scientist, 'our understanding of global climate change would be incomplete without taking into consideration what's happening to the Tibetan plateau (Qiu J., 2008)'.

Environment should be considered an apolitical issue that Tibetan people and the Chinese government can work together. We must respect and consult each other on any environmental issues that concerns the Tibetan plateau.

The United Nations Framework Conventions on Climate Change (UNFCCC) should

- Launch a scientific research studies to better understand both the impact of climate change on the Tibetan Plateau and the Plateau's critical role in reversing the effects of global climate change. Such studies would inform and enable Tibetans, the Chinese government and the international community to protect, mitigate and adapt to climate change on the Tibetan Plateau.
- Recognize the global significance of the Tibetan Plateau and world leaders gathering in Bonn must make Tibet central to global climate change discussions.

To avoid a socio-environmental catastrophe, the world need to set political games aside and act now to protect the Tibetan Plateau's fragile ecosystem. For which, the Tibetan participation at such climate summits are important and Tibetan voices at climate debates are necessary.

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BRAHMAPUTRA RIVER: AN ETERNAL CONFLICT BETWEEN INDIA AND CHINA

The problem of water scarcity in the region

China having more than 20% of the world's population has less than 7% of global freshwater resources at its disposal. Moreover, the available water is unequally distributed, with Tibet having more water than northern China. To relieve the enormous pressure on water resources in China's north, the leadership in 2003 launched a gigantic South-to-North Water Transfer Project (International Rivers, n.d.). To satisfy its insatiable demand for electricity and as a part of its shift away from coal, China went on a dam building spree. However, the Chinese projects on Tibet's transboundary river have a negative impact on the downstream countries. One such issue is the Brahmaputra River. The Brahmaputra River is also known as the Yarlung Tsangpo and has its source in Chemayungdung glacier in Tibet. The river flows into three densely populated nations of the world-China, India, and Bangladesh. India, which is the middle riparian of the Brahmaputra River, has sour relations with China which controls the source of this river in Tibet.

For India, the Brahmaputra River is of great importance for two reasons: first, The River, accounts for 29% of the total run-off of India's rivers, is key to India's river linking project; second, The Brahmaputra basin possesses about 44% of India's total hydropower potential (Varis, 2009). But with the Chinese construction of dams and water diversion projects, it threatens the downstream countries. In the meantime, there is a need for Beijing to maintain relatively stable relations with neighboring countries in order to provide conditions for China's peaceful rise (Bijian, 2005).

Desecuritizing the water issue

To meet its surging energy demand, China itself seeks to utilize its huge hydropower potential of the Brahmaputra but on the other hand, China has to maintain stable relations with India and Bangladesh. Therefore, China follows the desecuritization policy to deal with water-sharing conflicts.

Desecuritization refers to the process of moving issues off the security agenda and back into the realm of political discourse and normal political dispute and accommodation. Desecuritization is therefore about 'turning threats into challenges and security into politics' (Williams, 2003).

China's desecuritization moves have primarily been of a reactive and short-term nature (Waever, 1995). Whenever there are concerns raised about the Chinese

activities on the upstream of the river, Beijing resorts to a volley of rhetorical comments. The main tool used by the Chinese is the signing of Memorandum of Understanding (MoU) regarding sharing hydrological data with India and Bangladesh, not leaving any space for downstream to point finger to a China for being uncooperative upper riparian country. But, whenever the circumstances arise, China uses Tibet's river to achieve its foreign policy goal. During the Doklam conflict, the issue of Brahmaputra also came into play, this is because of the lack of cooperation or agreement between the two countries. Since there is no water-sharing agreement or any dispute settling mechanism between the two countries, the issue of water is often mixed with border conflicts.

The existing apparatus between the countries on the water is mostly a series of MoU on hydrological data sharing and a body of the experts-level mechanism. However, these MoUs are non-binding and there is no overseeing organizational body that can ensure fair implementation of the agreement. With the recent Chinese policy of not sharing hydrological data with India, China has actually violated the bilateral MoUs. According to the MoUs, China is obliged to share hydrological data from three upstream monitoring stations of the Brahmaputra River in Tibet during the monsoon season from May 15 to October 15, and India on the other side has to pay for the hydrological data. While China sells hydrological data to downstream countries, India provides such data without charging fees to both of its downstream neighbors-Pakistan and Bangladesh.

Mr. Raveesh Kumar, an Indian foreign ministry spokesperson during a regular briefing said that “for this year, we have not received the hydrological data from the Chinese side” (Khadka, 2017).

Will the existing MoUs and the expert level mechanism between the two countries ensure future cooperation? Will there be any war between the two countries as predicted in case of any physical change in the flow of the river?

Until now, the existing MoU and the expert level mechanism worked for both countries. Beijing assured continuous flow of river despite damming of the river and the Indian government on the other hand also maintain a cordial relation with China over water issues, while simultaneously raising Brahmaputra River as an issue of concern with Chinese leaders.

Water Conflict

Due to rising demand, extensive use and climate change have all aggravated water security problems in the region. According to a McKinsey report it suggests that by 2030, water demand in India will grow by almost 1.5 trillion m³, against this

demand, India's current water supply is approximately 740 billion m³. As a result, most of India's river basin could face severe deficit by 2030, unless concerted action is taken (Report, 2010).

For whatever reason, either because of the Doklam conflict or because of some technical reasons as China claimed, Beijing didn't provide the hydrological data to India for this year. This hydrological data is of great importance to the Indian side to predict or prepare for a flood and to mitigate flood damage.

With the usual China desecuritization moves over water conflicts, Chinese foreign ministry spokesman Geng Shuang told media in Beijing that "for a long time we have cooperated on the river data with the Indian side. But to upgrade and renovate the relevant station on the Chinese side, we do not have the conditions now to collect the relevant statistics of the river". But the question of upgrading and reconstruction comes to light when Bangladesh, downstream to India received the same hydrological data from China about the same river. Bangladesh's water resources minister, Anisul Islam Mohammad confirmed to the BBC that his country was receiving hydrological data from China (Khadka, 2017).

Although, Beijing claimed the alleged paucity in data sharing is because of renovation, but Chinese observers have pointed to the escalating tensions in Doklam. Hu Zhiyong, a research fellow at the Institute of International Relations of the Shanghai Academy of Social Sciences said that "Although China is a responsible country, we can't fulfill our obligations to India when it shows no respect to our sovereignty". He further added that China will not agree to carry out normal cooperation on hydrological data with India unless it agrees to withdraw troops from Doklam (Yusha, 2017).

So, from this, it clearly indicates that Beijing is using the Brahmaputra as leverage against India to achieve its political goal. Since the problem of border conflict is unlikely to be solved in the near future, so does the problem of the Brahmaputra River. If China continues with the lack of transparency over its project, and does not adhere to the MoUs, the mistrust between the countries will continue to increase and it could lead to conflicts in the future.

Therefore, it is necessary for both countries to set up a joint institutional mechanism to encourage further cooperation on disaster management, climate change, and environmental protection. If the current situation remains the same, then this is likely to lead to war over water as predicted by some of the experts.

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THE BLACK BRAHMAPUTRA: LOOKING AT POSSIBLE CAUSES

The issue of Brahmaputra river pollution comes at a time of deteriorating ties between India and China. Following a tense border standoff between the two countries over the Doklam trijunction, there comes news that China has stopped sharing hydrological data of the Brahmaputra River with India which China agreed to share (Khadka, 2017). Before the situation is settled, the South China Morning Post published a report about the possible diversion of the Brahmaputra to Xinjiang through a 1000km tunnel (Chen, 2017). This further increases misunderstanding between the two countries. Then came the more worrisome news of Brahmaputra River that rises in Tibet turning unnaturally black and murky for more than two months (Karmakar, 2017). With all these changes in the river, China is still silent or denying the factors affecting the international river. On the other hand, India is always afraid of China using the river as a strategic tool against itself.

With the unsettled disputes between India and China on the Tibet-India border, the Brahmaputra River has also become one of the major sources of concern between the two countries. The recent standoff between the two countries started with China's road-laying effort in the Doklam plateau and India's support for Bhutan which has sovereignty over the area and to halt China's motorable road construction in the region. The dispute that began on 16 June 2017 and the standoff ended in August. Both sides gave contradictory statements for the border disengagement (Outlook Web Bureau, 2017).

Meanwhile, during the confrontation, China stopped sharing hydrological data of the Brahmaputra River, which could have helped India to mitigate the impacts of this year's flood in Assam. China shared data with Bangladesh while claiming the renovation work (data collection stations) as a reason for not giving data to India. The Doklam standoff between the two countries could be the reason for China's denial to share hydrological data with India.

The situation became tense when the news of water diversion to Xinjiang came up in the Chinese media. According to a report from the Hong Kong-based South China Morning Post, Chinese engineers were testing technologies that could be used to build the water-diversion tunnel (Chen, 2017). Though Beijing rejected these media reports as 'false and untrue', but the water diversion news continues to haunt India (Outlook Web Bureau, 2017). China's lack of transparency over the Brahmaputra River and India's suspicion of China using Brahmaputra water as a leverage against India will lead to further escalation of tensions between the two countries.

With the water of the Brahmaputra River turning unusual muddy, people who live along the river basin believe that it has been caused by Chinese activities on the upper part of the river. Ninong Ering, a member of parliament of the Indian National Congress from Arunachal Pradesh, wrote to the Indian Prime Minister, Narendra Modi, and raised concerns about the issue of the Brahmaputra River turning black, and requested the Prime Minister to take up the matter with the Chinese government. He further opined that the changes in water quality, which is unusual during the winter season, could be due to a possible diversion of the river in Tibet (PTI, 2017). With the water sample collected on 27 November 2017, the East Siang Public Health Engineering (PHE) Department has found that the waters of the Brahmaputra River are high in iron content. Bimal Welly, executive engineer, in a report states that the Nephelometric Turbidity Unit (NTU) of the Brahmaputra River is 425 NTU. Whereas the permissible range is 0-5 NTU. The report further states that the NTU of the Brahmaputra River ‘is very high and if exposed for a long period of time, may affect aquatic lives’ (The Economic Times, 2017).

The source of this pollution could be natural or due to man-made factors. Some river pollutions occur naturally, originating from earthquakes, volcanoes, dust storms, and forest and grassland fire. Human activities, such as construction, burning of fossil fuels, power plants, and various industrial processes also generate a significant number of particulates. With so much of construction works going on in both India and Tibet, the contamination of water may have emanated from these construction sites. The surface water runoff and the groundwater close to any construction sites become polluted with the various material used in the construction work such as diesel, oil, and other toxic material and cement. So, some speculate that the reason could well be local construction of roads while others say that it might be from the Chinese construction of the Lhasa-Nyingtri railway line, extending its railway track all along the Yarlung Tsangpo.

According to Tage Rupa, a geomorphologist at Itanagar’s Rajiv Gandhi University “Arunachal is seeing hectic construction, so maybe it’s just that”. She further added that “A lot of construction is close to the river, so it’s possible it’s just run-off from construction sites” (Saikia, 2017).

Zamlha Tempa Gyaltzen, a research fellow at the Tibet Policy Institute states that “If the Brahmaputra River running black from the entry point of the river into India at the Indo-Tibet border as reported, then the source of the river pollution has to be from Tibet. If that is so, then there are a few possibilities as already reported, such as an earthquake or dam construction. But I think there is one more possibility that hasn’t been raised yet, that is the construction of railway tunnels or stations along the Yarlung Tsangpo or Brahmaputra River in Tibet, most probably

the construction of a huge railway station near Nyingtri city”.

He further added “The Lhasa-Nyingtri section of the railway line crosses the Yarlung Tsangpo 16 times, piercing through the mountains with 21 tunnels and 34 train stations. Nyingtri city is located close to the confluence of the Yarlung Tsangpo and Nyang Tsangpo. Therefore, any construction of a major railway station near the city could seriously muddy the river. With the lowering of river volume as well as fewer tourists traveling to the region during the winter, it’s an ideal time for any major construction”. Meanwhile, responding to the report on the muddy Siang River (the Brahmaputra), The Global Times attributed a statement of Hu Zhiyong, a research fellow at the Shanghai Academy of Social Sciences’ Institute of International Relations. He stated that “India should not point its finger at China on hydrological issues to incite anti-China sentiment, which cannot help repair the ties of the two countries” (Jie, 2017).

“This time India has made a mountain out of a molehill challenging China by citing slag. India should look for problems on their own side, otherwise, Sino-Indian ties can hardly improve”, he added.

There is not enough information yet to ascertain the reason behind such phenomena. Beijing’s denial and silence on the issue creates an unhealthy misunderstanding between the two countries. If the source of pollution is from the Chinese side, then it would be bad for China’s reputation. It is Beijing’s responsibility to protect the source of the river on which millions of people are dependent on for their livelihood. So, it is pertinent for both the countries to find the source of the pollution and rectify it rather than arguing over who is causing the pollution.

Beijing’s silence on the issue makes it difficult to find the actual source of the pollution and if the river remains polluted for a longer period it would affect the ecosystem, putting at risk the flora and fauna of the region as well as the health of human beings. India can’t ignore the fact that the water pollution from the source in Tibet could ruin the whole water system of the Brahmaputra River. So, India must raise the issue with China and take a pragmatic approach towards preserving the sources of the major Asian rivers.

Beijing needs to improve its transparency over the shared river to fulfill the great Chinese dream of peaceful development and to be a responsible stakeholder in the international arena in the new era of China’s peaceful rise. This will further help China to enhance trust and reduce the risk of dangerous miscalculations.

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THE VIOLATION OF SOCIO-ENVIRONMENTAL RIGHTS OF THE TIBETAN PEOPLE UNDER PEOPLE'S REPUBLIC OF CHINA'S OCCUPATION

The socio-environmental rights of the Tibetan people are severely violated in many ways by various means under the Chinese occupation. Millions of Tibetan nomads have been forced to abandon their traditional way of life and live in poorly planned resettlement camps with no job opportunities to sustain a dignified life. The lack of sincere environmental conservation efforts by the Chinese government has encouraged rampant mining across Tibet, causing severe destruction to its environment and distress to its people.

The Tibetan culture and way of life is greatly influenced by the climatic condition of the land. Tibetans have always strived to protect and respect the environment in which they reside. They have not only adapted successfully to the ever-changing climatic condition of the plateau but have also prospered as a powerful civilization. Tibetan peoples' knowledge of the ecosystem in which they live has been immensely enriched by the experience of existing on the plateau for thousands of years. The Tibetan people's deep-rooted respect for nature and the belief in the presence of god in the mountains and lakes greatly helped in the conservation of the fragile plateau for thousands of years. As a strong advocate of environmental conservation, His Holiness the Dalai Lama has constantly stressed that the environmental protection is a non-political issue which we all need to work together. But the Chinese government's disrespect for the cultural rights of the people and the lack of consideration for environmental condition of the land have gravely violated the Tibetan people's right for a happy and dignified life.

The primary focus of this paper is the current socio-environmental conditions in Tibet under the Chinese occupation corroborated by actual case studies. To give the international community with a holistic understanding of the Tibetan plateau and why it matters to the world, this paper briefly highlights the global significance of the Tibetan Plateau and the impact of climate change in Tibet.

The Global Significance of the Tibetan Plateau

The Tibetan Plateau is popularly known as 'the Roof of the World'. The plateau at an average elevation of more than 4000 meters above sea level with an area of 2.5 million square kilometers, is almost 2% of earth's land surface, which makes it the world's highest (Kang Shichang, 2010) and largest plateau. The presence of 46,000 glaciers, covering an area of 105,000 km., makes the plateau the largest source of accessible fresh water on the planet and the third largest reservoir of

ice after the North and South Poles. Hence scientists have referred to the Tibetan Plateau as 'the Third pole'. The plateau is the head source of Asia's six largest rivers: the Driчу/Yangtze, Machu/Yellow, Zachu/Mekong, Gyalmo Ngulchu/Salween, Senge Khabab/Indus and Yarlung Tsangpo/Brahmaputra. These rivers from the Tibetan Plateau or 'the Water Tower of Asia' feed millions of lives in some of the most-densely populated nations in the world including Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam, and China. The melt water from the 12,000 km³ of glaciers in Tibet ensures a constant flow of Asia's major rivers, thus greatly influencing the social and economic development of a fifth of the world's population (UNESCO-SCOPE UNEP, 2011).

The timing and intensity of the Indian monsoon and the East Asian monsoon are greatly influenced by climate change on the Tibetan Plateau. Even the worsening heat waves in Europe and northeast Asia are linked to the receding snow cover on the Tibetan Plateau (Zhiwei Wu, 2015). According to a paper by Cui Xuefeng, the Indian summer monsoon is intensified and the East China summer monsoon is weakened due to human-induced land cover change on the Tibetan Plateau (Xuefeng Cui, 2006). Therefore the plateau is 'the Rain Maker of Asia'.

The ecological health of the Tibetan Plateau is absolutely vital for the stable social, economic and environmental well-being of Tibet, China and Asia.

The Socio-environmental Impact of Climate Change in Tibet

The impact of climate change on the Tibetan Plateau has been extreme, causing unprecedented natural disasters due to rapid glacial retreat, permafrost degradation and extensive desertification. A temperature rise of up to 0.3°C per decade has been recorded in Tibet since the 1950s. This is twice the average rise in the global temperature. Such an increase has not only resulted in the melting of more than 82 percent of the glaciers (Qiu, 2008) but has also heated the plateau to the extent that there has been no net accumulation of ice on since the 1950s (Sichang Kang, 2015). It has also been observed by Xu Baiqing of the Institute of Tibetan Plateau Research that the summers come faster, forcing the melting seasons on the plateau to begin earlier and last longer. Yao Tangdon, a Chinese scientist has warned in 2007 that if the current rate of melting continues, then 2/3 of the glaciers on the Tibetan Plateau would be depleted by 2050.

The rising temperature is also melting the vast permafrost coverage of the Tibetan Plateau. Around 70% of the plateau is covered by various type of permafrost, mostly alpine permafrost due to its high altitude (Environment & Development Desk, 2009). The increased rate of permafrost degradation in recent years has led to faster desertification of grassland in many parts of north and northeastern Tibet.

The Chinese government has realized the threat and taken a few steps to tackle the problems, but it has failed repeatedly to make a significant impact or effective plans. They refuse to consult and incorporate the ecological wisdom of local Tibetan communities while framing the policies. And in most cases, the policies are framed and imposed without fully informing the local Tibetan communities about why they are needed or what they mean.

Another threat from rapid permafrost degradation is the release of carbon into the atmosphere. About one third of the world's soil carbon is stored in permafrost regions. It is estimated that the alpine permafrost on the Tibetan Plateau stores about 12,300 million tons of carbon (Environment & Development Desk, 2009). Any degradation would lead to a huge amount of carbon entering the atmosphere, which would further intensify the rising temperature across the globe. The year 2016 saw an unprecedented number of natural disasters in a short span of time.¹ Tibet suffered even more extreme natural disasters in 2017. Local Tibetans are worried about the new trend of frequent natural disasters. It is a trend that scientists, researchers (Zamlha, 2016) and the general public in Tibet fear might become the 'New Normal in Tibet'.

The Current Socio-environmental Conditions in Tibet under the Chinese Occupation

The environment of the Tibetan Plateau is severely threatened by global warming. The situation is further exacerbated by destructive mining, irresponsible damming, forceful removal of Tibetan nomads, rampant littering, poor tourism regulations and mistreatment of environmental conservation groups across Tibet. The close nexus between mining companies and government officials has undermined public confidence as they ignore local interests.

Forceful Resettlement of Tibetan nomads

Tibet's rangeland covers approximately 70% of its total area. The alpine grassland at high altitude covers, in turn, 60% of the total Tibetan rangeland. Pastoralism on the Tibetan Plateau involves adaptation to a cold environment at elevations

1. 2016 - Mud floods and landslides on 9 July in Tsolho in northeastern Tibet killed two people and injured more than thirty. Drought in Chumarleb and Matoe on 10 July in central-north Tibet left behind dry rivers with hundreds of dead fishes. A glacial avalanche on 17 July in Ruthok County of Ngari in western Tibet killed nine people and buried 110 yaks and 350 sheep. A flood in Labrang and Sangchu on 22 August in northeastern Tibet destroyed significant amounts of property.

2017-More than 6,000 homes were flooded, affecting 30,000 people in Rongdrak on 15 June. Four homes were damaged by floods in Sokzong on 16 June; many homes were damaged by floods in Dege on 6 July; and three people lost their lives and many homes were damaged by floods in Jomda in eastern Tibet in the month of July.

above the limit of cultivation. According to archaeological fieldwork, the Tibetan Plateau has been extensively used by pastoral nomads, who have developed a deep understanding of grassland dynamics and veterinary knowledge while maintaining a unique pastoral culture for more than 8,000 years. Tibetan nomads live an ecofriendly and self-sufficient life spread out on the vast grassland of the plateau. But the Chinese government has removed more than two million (Human Rights Watch, 2013). Tibetans from their land and pushed them into large-scale settlements with no medical, educational and business opportunities to support a dignified life and retain their identity.

The Chinese government continues to talk about restoring grassland by prohibiting grazing under the incorrect presumption that grazing is the only cause of grassland degradation. There are many scientists, including Chinese, who have written extensively about the need for moderate grazing to maintain the ecosystem's health. The forceful removal of Tibetan nomads who have preserved the fragile grassland has in fact accelerated the degradation of the grassland. The forced resettlement of Tibetan nomads is a clear case of irresponsible governing on the part of China; first the nomads were blamed for degrading grasslands without sufficient evidence, then forcibly alienated from their traditional way of life, and finally transferred into poorly planned settlements in the middle of nowhere. There they have no farms, no livestock and few jobs to sustain them (Du, 2012). Schools, hospitals and jobs promised to the forcibly evicted nomads have yet to materialize. Tibetan nomads, who once lived healthy and self-sufficient lives, were suddenly thrust into poverty. This has been nothing more than a state-engineered destruction of a culture and way of life. Tibetans have long feared that the actual reason for resettlement of Tibetan nomads from their pasture land is to create space for large scale mining across Tibet.

Destructive Mining Undermines Socio-cultural rights of Tibetans

The rate of environmental degradation in Tibet accelerated following the Chinese occupation of Tibet in 1950s. The mode of development has been destructive and irresponsible, ignoring the actual social, environmental and economic needs of the Tibetan people. The declaration of mining and tourism as pillar industries across Tibet clearly contradicts the claim of following a 'sustainable path compatible with the harmonious co-existence of economy, society and ecological environment' in a White Paper published by the Chinese government (The State Council Information Office, People's Republic of China, 2015). The numerous cases of mining on Tibet's sacred mountains are the most blatant acts of disrespect for the cultural sentiments of the people as well as of disregard for the mountains' environmental conditions. Scientific research on the ground has discovered that the Tibetan people's beliefs in the sanctity of sacred sites has greatly contributed to the environmental protection of key ecologically sensitive areas (Danica M. Anderson, 2015).

Tibet has deposits of about 132 different minerals, accounting for a significant share of the world's reserves of resources. The Chinese Geological Survey in 2007 estimated that the Tibetan Plateau holds about 30-40 million tons of copper reserves, 40 million tons of zinc, and several billion tons of iron. The proven reserve of more than 7.8 million tons of copper at the Yulong Copper Mine makes it the largest in China and the second largest in Asia. As tallied in 2010, Tibet has more than 3,000 proven mineral reserves containing 102 varieties of resources in the Tibet Autonomous Region (TAR) alone (Xinhua, 2010).

The destructive and unethical form of China's mining practices has led to protests and disharmony across Tibet. There have been more than 30 known large-scale, mine-related protests in Tibet since 2009. Among the numerous cases of violation of socio-environmental rights in Tibet, four case studies are cited here to illustrate the socio-environmental situation in Tibet under Chinese occupation:

Case No. 1

Mining inside a Nature Reserve in Zatoe: Violation of Environmental Rights

On 16 August 2013, more than 4,500 local Tibetans from Zachen, Atod and China nomadic communities of Zatoe (Central North) in Tibet protested against mining on their sacred mountain located inside the Sanjiangyuan National Nature Reserve (SNNR) (tibet.net, 2013). "I felt sense of helplessness, as there was no one we could go for justice," said Sokpo Choedup. One of the local protesters who stabbed himself in desperation as around 500 Chinese Para-military forces brutally fired tear gas and rubber bullets on the peaceful protestors. A similar case of helplessness express in other cases as well (see case no.4).

The SNNR was established in 2000 to protect the three rivers (Yangtze, Yellow and Mekong) source region, a vast grassland on which a large Tibetan nomadic community thrived for centuries. But many were forcibly removed as part of the nature reserve protection regulations. Strangely, the Qinghai Provincial government issued a mining license for inside the reserve and violated the very law the Chinese government proclaimed 13 years earlier despite the Atod and Zachen areas being clearly listed as part of the SNNR (Tibetan Centre for Human Rights and Democracy, 2013). This is a clear case of discrimination and double standards on part of the Chinese government. It strengthened the long-held fear that the very reason behind the Chinese government's policy to remove Tibetan nomads from the vast grassland is to make space for Chinese mining companies. The declaration of more and more nature reserves in recent years is a welcome gesture, but the apparent lack of sincere effort by the Chinese government to protect those nature reserves is startling.

Case No. 2

Landslide at Gyama Mine site: Violation of Rights to Accurate Information

On 29 March 2013, 83 workers at the Gyama mine were killed by a landslide at the mining site. Chinese officials hurriedly concluded that the landslide was caused by natural factors (People's Daily, 2013). Xinhua News, as always, dutifully published the official statement without any journalistic investigation despite the loss of so many lives. But according to an Assessment Report (Environment & Development Desk, 2013) published by the Central Tibetan Administration on 9 April 2013—the actual cause of the Gyama mine landslide was due to mismanagement of the mine. The report declared 'in order to acquire maximum profit in the shortest possible time, mining in Gyama has been pursued aggressively. Whole swathes of land have been excavated in several sites and in some cases the whole face of a mountain has been stripped off in the process of exploration, water diversion, mining and road construction. It was just a matter of time that such large scale and aggressive expansion of mining was going to cause a large-scale disaster'. The report further stated that 'the landslide in Gyama is a man-made phenomenon rather than a natural disaster. The rocks were disintegrated into smaller pieces as part of the mining process and not due to glacial dynamics as Chinese officials are trying to make us believe. EDD has enough evidence to suggest that loose rock that turned into a landslide came from the surface mining at the top of the mountain which had been dumped on the eastern flank where the landslide originated (Environment & Development Desk, 2013).

Case No. 3

River Pollution in Minyak Lhagang: Violation of Rights of Access to Clean Drinking Water

On 4 May 2016, a sudden mass death of fish at Lichu River brought hundreds of local Tibetans of Minyak Lhagang in Karze out on the street, protesting against a Lithium mining company called Ronda Lithium Co Ltd (Voice of America, 2016). The company released mine waste (possibly lithium waste storage) into the local river, a tributary of Nakchu/Yalong River (Choesang, 2016). This is not the first time or an isolated case of river water pollution. Back in 2013, the same river had been polluted with lithium mine waste, causing deaths of marine life and threatening local drinking water. Minyak Lhagang is a Tibetan area incorporated into the Chinese province of Sichuan (Karze Tibetan Autonomous Prefecture).

In a similar case on 23 September 2014, more than 1,000 local Tibetans of Dokar and Zibuk villages (Lhundrup County, Shigatse Prefecture) near Lhasa, the Tibetan capital city, protested against the poisoning of their rivers by the Gyama Copper

Poly-metallic Mine. The mine is located close to a stream that locals use for drinking water, irrigation and feeding animals. But as always, the local officials declared that the water pollution in the river was conveniently caused by natural factors and not by the mine. But a 2010 article titled 'Environmental impact of mining activity on the surface water quality in Tibet: Gyama valley' by Xiang firmly states that, "the great environmental concerns are the many mining and processing deposits in the valley, containing large amount of heavy metals, such as lead, copper, zinc and manganese etc. These deposits are prone to leak its contaminants through seepage water and erosion of particulates, and therefore pose a future risk for the local environment and a potential threat to the downstream water quality (Xiang Huang, 2010)". A local resident of the village told Radio Free Asia, "In the past, our rivers were crisp and clean, the mountains and valleys were known for their natural beauty. But now the rivers are polluted with poisonous waste from the mines (Radio Free Asia, 2014)", clearly describing the rapid destruction of the local environment.

Case No. 4

Mining on a Sacred Mountain in Amchok: Violation of Cultural Rights

On 31 May 2016, around 2,000 local Tibetans in Amchok gathered to protest mining activities on their sacred Mt. Gong-nyong Lari. The mountain is considered highly sacred by eight different local communities, and mining on the same mountain brazenly disregarded those local communities and their beliefs. Amchok is in the Labrang region of Amdo, a Tibetan area incorporated into the Chinese province of Gansu (Sangchu County, Kanlho Tibetan Autonomous Prefecture). At the protest, many were seriously injured, and six Tibetans were detained as the Chinese government brutally suppressed the peaceful gathering. The protestors were calling for "protection of environment, protection of the sacred mountain and protection of people's safety". The disregard for locals' concerns was further evidenced by three separate self-immolations in the region. The unbearable agony caused by the mining on their sacred mountain and the attitude of the government towards people's grievances led Tsering Dhondup (20 November 2012) and Konchok Tsering (26 November 2012) to set themselves on fire at the mine site. The third self-immolator, Tsultrim Gyamtso (19 December 2013), also cited immense agony caused by the mining on their sacred mountain as a reason for his sacrifice.

Article 10 of the Mineral Resources Law of the People's Republic of China states: 'In mining mineral resources in national autonomous areas, the state should give consideration to the interests of those areas and make arrangements favorable to the areas' economic development and to the production and well-being of the local minority'. But increasing cases of environmental destruction caused by mining in

recent years and the suppression of peaceful environmental protests shows no indication of local interest being either protected or respected. With growing frustration among Tibetans towards the policies of the Chinese government, it seems that the Chinese government either doesn't understand Tibet's environment, culture and people, or they do not wish to understand.

Conclusion

The Chinese government must respect and protect the rights of the Tibetan peoples' cultural beliefs in the sanctity of the sacred mountains, lakes and rivers of the Tibetan Plateau. The Chinese government must set firm, uncompromising and transparent license procedures for mining permits in Tibet. The issuing of such permits should be based on competitive and reliable Environmental Impact Assessments and Social Impact Assessment reports. The Chinese government should also strictly monitor and prohibit mining companies from dumping hazardous mine waste into the surrounding areas and rivers.

Tibetan pastoral nomads are expert custodians of the alpine pastures and their knowledge and experience must be incorporated into climate mitigation and adaptation practices. Decision-making mechanisms should be transparent and inclusive of all regional stakeholders, especially Tibetan nomads. There should be an immediate halt to the forceful removal of Tibetan nomads from their lands and those already re-settled should be allowed to return to their pastures if they so wish. The Chinese government must also promptly address the poorly planned resettlement programs of Tibetan nomads. Having lost their traditional, self-reliant ways of life, the Chinese Government must provide the newly-resettled nomads with jobs, education, healthcare services, and business opportunities so as to restore their dignity. On the positive side, the Chinese government has been declaring more national parks and nature reserves across Tibet in recent years. For the formulation of any such laws and policies, the Tibetan cultural sentiments and local knowledge should be considered. The lives of millions of Tibetans who live in the areas declared nature reserves should not be undermined. People's voices and needs should be listened to and respected.

The rapid expansion of towns and cities places a severe ecological burden on Tibet's fragile ecosystem. Clear urban planning guidelines must be established and rigorously adhered to by the Chinese government officials. The mistakes made by the Chinese government in rapidly urbanizing Chinese town into cities must not be repeated in Tibet. The Chinese government must involve the local Tibetan population in decision-making processes for any major development projects in Tibet. Urban planning should also take into consideration the impact of climate

change. There has been increasing number of natural disasters in Tibet since 2016 with loss of life and damage to property. The situation was exacerbated by unregulated and poorly planned urbanization. The influx of millions of tourists into Tibet must be regulated with a clear guidelines to protect Tibet's environment and to respect the cultural sentiments of the Tibetan people. Chinese government must create an environment which is conducive for the local Tibetans to become the primary beneficiary of tourism income.

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TIBET TO XINJIANG WATER DIVERSION PLAN

The 2017 revival: Plans to divert a major river from Tibet to Xinjiang

The latest version of the plan includes a 750-kilometre tunnel traversing the Qinghai-Tibetan Plateau, from the river's Great Bend to Golmud; and a number of tributary tunnels to bring in water from the Parlung Tsangpo; the Nu and the Tongtian Rivers. It claims water will flow naturally towards Golmud, but the altitude at the start of the tunnel is less than 2,000 metres – and Golmud is at 2,700 metres. It is unclear how water will flow uphill.

The mountain valleys of south-western Tibet are prone to earthquakes and rock and mudslides. This is particularly the case at the Great Bend, where history records numerous strong earthquakes and landslides damning the river and causing flooding. The environmental and economic costs of such a huge project here are hard to imagine.

Rivers need a certain amount of water to supply their ecosystems and the needs of sustainable development for local societies – it is generally thought that no more than 30-40% of a river's natural flow should be exploited. These schemes would see unreasonable quantities of water diverted from the rivers – 83.3% to 91.5% in the Shuotian Canal proposal. The more recent proposal does not give a specific figure but says 'most' or 'all' water from the Source Rivers will be taken.

The rivers involved all flow across international borders. In 1972 the Declaration of the United Nations Conference on the Human Environment stated that: "States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction".

The 1992 Rio Declaration on Environment and Development reaffirmed that principle and stressed that development, particularly joint development, is important. The architects of these plans show nothing but ignorance and arrogance regarding the concept of international rivers.

Both plans repeatedly use water shortages in northern China as a justification, but this is a mistake. Some parts of the north are semi-humid, and even in some arid and semi-arid areas glacier melt creates fertile zones, such as the Hexi corridor and Xinjiang. Many water shortages are due to environmental damage, often arising from inappropriate human activity or misuse of water resources.

It is also the case that ecosystems form according to the resources available; demand arises according to supply. To increase supply to meet demand is a mistake. We cannot steal from one place to make up a shortage elsewhere, nor can we reallocate natural resources and change the natural environment at will. We will fail to achieve our goals and ultimately pay a huge price.

These schemes claim they will remake China and turn deserts into farmland. But the scientific foundation and the authors' understanding of nature show they are using imagination in place of facts and fantasy in place of science. We must ask ourselves: Why do so many people seem to regard these schemes as feasible.

EDD analysis

A detailed proposal to divert the Brahmaputra from Tibet into Xinjiang was posted online by Dr. Liu Yuanyuan. This proposal of water diversion is different from the earlier proposal of 1,000 km tunnel which was published in the South China Morning Post last year (Chen, 2017).

But Fan Xia, chief engineer of the Sichuan Geology and Mineral Bureau, has said that even if environmental and social costs are ignored, the construction and maintenance costs alone mean that this scheme is not feasible. (Xiao, 2018)

A planned diversion map of the Brahmaputra River toward Xinjiang

The proposal suggests the construction of a 750 km tunnel to take water from the great bend of Yarlung Tsangpo (the Brahmaputra River) to Golmud in Amdo and from Golmud to Lop Nor of Xinjiang. This large tunnel will be subdivided, and inclined shafts are inserted in the middle to build a side slope tunnel that vertically reaches a long tunnel. This long tunnel has a total of seven entry points with an average gap of 90 kilometer per entry section. This seven tunnel will bring water from the Parlung Tsangpo (a tributary of Brahmaputra River), Gyalmo Ngulchu (Salween River), Tongtian River (Drichu), thereby channeling the water flow directly into the main tunnel.

To support this project, a series of big dams and big tunnels need to be built on the Tibetan Plateau, which is geologically unstable. There were a record number of earthquakes and landslides are common in the great bend and diverting the water from great bend, expert says, is not feasible. Water shortages as the justification for this plan to divert the water from the Brahmaputra to Xinjiang, and turning the Xinjiang into California, expert says, is not feasible. As we can see the impact of the already completed eastern and central route of the South-North Water Transfer Project has led to the mass relocation of hundreds of thousands of people and

exacerbate the water pollution problem. Therefore, this proposal of diverting Tibet's river water to Xinjiang could lead to the social, economic, and environmentally catastrophic. Instead of diverting the water, the Chinese government should encourage scientists and engineers to come up with a more viable solution such as rainwater harvesting and recycle more wastewater than water diversion.

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ARTIFICIAL RAIN ON THE TIBETAN PLATEAU FOR MORE WATER IN CHINA

Due to water scarcity in major Chinese cities, Chinese scientists are coming up with different techniques to acquire more water to satisfy their growing demand. According to a recent news report published on 22 March 2018 in South China Morning Post (Chen, 2018), ‘China needs more water. So, it’s building a rain-making network three times the size of Spain’, China is testing a weather modification system developed by the state-owned China Aerospace Science and Technology Corporation. The scientists have designed and constructed chambers using cutting-edge military rocket engine technology to develop this system. This is a cloud seeding method to bring more rain on the Tibetan plateau. Tibet is the home of the largest store of accessible freshwater outside the North Pole and the South Pole, it is also the source of the six most important rivers of Asia. Since Tibet is self-sufficient in water, there is no need for the Tibetan plateau to induce such an artificial rain-making system. These burners are set up by Chinese on the Tibetan plateau to increase rainfall to feed the Drichu (Yangtze) and Machu (Yellow), which are the lifeline of Chinese people.

So far, according to the news, China has built over 500 burners on the Tibetan mountains. Furthermore, they are planning to build tens of thousands of more such burners. Cloud-seeding is a method used by scientists to alter rainfall patterns. Water in clouds needs to form into heavy droplets to precipitate. But often, the droplets in the clouds are just too small to precipitate. This technique involves an enormous network of fuel-burning chambers which burn solid fuel to produce silver iodide, a cloud-seeding agent with a crystalline structure, much like that of ice. These chambers are installed high on the Tibetan mountain ridges facing the moist monsoon from South-Asia. As wind hits the mountains, it produces an upward draft and sweeps the particles into the cloud to induce rain and snowfall. This practice is not new, and it is used in many countries. Even Beijing famously used it during the Olympics in 2008 (Coonan, 2018). But the matter to be concerned about is that the Chinese government is considering setting up what would be the world’s largest cloud-seeding operation and keep these chambers operating in a near-vacuum condition for months, or even years, without requiring maintenance on the Tibetan plateau.

Other cloud-seeding methods such as using planes, cannons, and drones to blast silver iodide into the atmosphere won’t have much environmental impact as the process of ‘blast’ is for a short duration and induce rain only when it is required. But the type of chambers built on the Tibetan plateau that operates for months and years might have more impact over other methods. This cloud-seeding technique

sounds good in theory, but the question is, does the technique work, and what would be the long-term effects on the Tibetan plateau? Whether cloud-seeding is a sustainable method is a controversial subject. A study in 2016 by the Wyoming Weather Modification Pilot Programme found that, although the technique can increase precipitation if wind and other conditions are ideal, it cannot do so reliably over a long period or on a large scale (ROY, 2018). Much of the literature on this substantiates that not only does cloud-seeding fail to achieve the desired effect, it also could yield harmful consequences. Some of these consequences include rain suppression, flood, tornado, and silver iodide toxicity (International Programme on Chemical Safety, 1977).

In Australia, scientists consider three or five years to be the bare minimum period required to obtain reliable data from the area of seeding trial. However, Australia has stopped cloud-seeding due to environmental reasons. The Tibetan plateau is very fragile, and any weather modification could be fraught with unintended consequences. Before tens of thousands of chambers are to be built at select locations across the Tibetan plateau, the Chinese government should wait for at least three to five years to get reliable data from these 500 burners which have already been set up. They also should carry out a thorough scientific study of its use and conduct an Environmental Impact Assessment (EIA) before giving the green light to such a project.

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NOMADS OF KHAM LHATOK FORCED TO MAKE WAY FOR MINING

The Chinese authorities in Tibet's Chamdo prefecture have forced more than 400 nomadic families in Lhato move out for expansion of Yulong Copper Mine. The authorities have warned locals not to go onto the newly fenced off area to collect caterpillar fungus (Radio Free Asia, 2018). Caterpillar or Yartsagunbu as its known in Tibetan is possibility only real source of income for the Tibetans in the region.

The Yulong Copper Mine site is primarily located in the Lhatok in traditional Kham. The area is currently part of Jomda County of Chamdo Prefecture in eastern Tibet. Some areas of the mine extends into other counties as well. Yulong Copper Mine is reported to be the largest copper mine in China and the second largest mine in Asia (Embassy of China, India, 2005). The mine has a proven deposit of 6.5 million tons of copper in ore form and another 10 million tons of prospective reserves. According to a report in the People's Daily (2008), the company eventually hopes to expand the production capacity to 100,000 tons a year (People's Daily, 2008).

Yulong copper mine is predominantly owned by Zijin Mining Group and Western Mining, both of which are China's major mining and development companies. The Western Mining holds a 58 percent stake in the mine and a unit of Goldman Sachs owns just over 8 percent of Western Mining (Reuters, 2008). Western Mining Co is China's seventh-largest copper miner. According to a Bloomberg report, the Tibet Yulong Copper Joint Stock Limited owns and operates Yulong copper mine that contains copper reserves. As per the transaction announced on 9 August 2007, Tibet Yulong Copper Joint Stock Limited operates as a subsidiary of Western Mining Co. Ltd. The Tibet Yulong Copper Joint Stock Limited was founded in 2005 and is based in China.

Despite the huge copper deposit, the mine has not been in full production due to lack of necessary infrastructure. According to a statement from the company, the operation of the mine has been delayed since the 1990s due to the remoteness of the place and its weak supporting infrastructures for the mining industry. But in recent years, the scale of both expansion and extraction of the mine has greatly increased as infrastructure in the region rapidly improves. Guoduo Hydropower Station, the second largest hydropower station in the so-called Tibet Autonomous Region was built to provide power for the Yulong Copper Mine (China Tibet Online, 2009).

Even the proposed Lhasa-Nyingtri-Chengdu railway line takes an unusual turn by making a long detour off the most direct route between its namesake cities to reach the Yulong mining site (Choedon, 2016). The planned railway line, otherwise

touches only important county towns and prefecture cities on its route but the track deliberately touches Yulong before it moves to Chamdo city. There has been a welcome sign of increased concern for the environment ever since Xi Jinping came into power in China. Chinese local officials in Tibet are trying to echo their President without any real commitment for environmental conservation. Grand proposals were declared to create nature reserves that devoid of any actual protection on the ground, instead thousands of nomads were forced to move out from their traditional homes.

According to a press conference held in Beijing on 10 March 2017, on the sidelines of the National People's Congress, Lobsang Gyaltzen, former chairman of Tibet and current Chairman of the Standing Committee of the Tibet People's Congress said that "No mining project have been approved throughout the period under two leaderships in Tibet (China Tibet Online, 2017)".

So what is happening in Chamdo could be summarized as a dual strategy – a strategy of not permitting new companies and shutting down insignificant polluting companies while allowing mega companies to both expand and increase production from the existing mine sites. Such a strategy would first help reduce further environmental destruction in the region to some extent and also will give the local government much needed claim of protecting the environment. Second, such a strategy would relieve prefecture governments' fear of losing their bulk of income from mining.

Central Tibetan Administration needs to raise such issue of contradictions and also need to point out the lack of any benefit for the local Tibetan communities from the multi-billion worth of natural resources been extracted from Tibet.

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THE REAL CAUSE BEHIND TIBET'S GARBAGE CRISIS

Twenty years ago, garbage was never a prevalent issue in Tibet. Domestic waste was ingeniously managed and processed into manure for farm use. But in recent years, the rampant littering on the Tibetan Plateau has become an obnoxious reality and a rapidly evolving crisis.

The crisis: The waste crisis left an indelible impression on Tashi, whose 2016 visit to Tibet completely changed his childhood memory of the beautiful and garbage-free village that he grew up in. Frustrated, he lamented that Tibet is no longer the same, and there is garbage everywhere. Tashi also found that garbage had been dumped into the rivers due to the lack of basic waste-management facilities in rural areas. The situation further presented itself as numerous writings and photos of the garbage began to emerge from Tibet. The photos highlighted construction leftovers, pilgrimage leftovers, tourist leftovers, festival leftovers and domestic dumping, contributing to the rampant littering on the mountains and in the rivers. The extent and severity of the problem has compelled different local communities in Tibet to look for solutions. Some environmental groups were formed to collect plastic waste from their surroundings.

Observing such a rapidly evolving crisis, this author was impelled to write an article titled 'Garbage Rampage in Tibet' in 2017, highlighting the urgent need of governance on basic waste management infrastructure and the importance of educating the general public about the health hazards of littering (Zamlha, 2017). The situation was similarly echoed in a recent article 'The Litter Collecting Monk of Tibet' (Hao, 2018), in which Feng Hao wrote that plastics were found in the stomachs of livestock died inexplicably.

Garbage problems in other mountainous regions

Littering has been a serious problem in many mountainous regions. Even beautiful Bhutan is facing grave concerns from growing volume of garbage. The situation is utterly out of control in Nepal and many mountainous regions of northern India. The enormity of the garbage problem has made various efforts in these regions seem futile. According to a report by Science Advances (19 July 2017), humans have created 6,300 million tons of plastic waste as of 2015, and if the trend continues, there will be roughly 12,000 million tons of plastic waste in the natural environment by 2050 (Roland Geyer, 2017).

With rapid urbanization and a massive influx of tourists in the region, Tibet stands at a critical junction in waste management. Unless the Chinese government takes a bold and effective course of action, the world's highest plateau could plunge into the same fate as other developing countries. There is a high possibility of the garbage problem quickly spiraling out of control.

The primary causes To address the impending crisis, a clear understanding of the factors that encourage littering is essential. Feng's article seems to insinuate that the local communities are the primary contributors to the garbage problem. Whereas, my article (Zamlha, 2017), I have clearly cited three alternative primary factors that lie at the root of the problem: the lack of governance and basic infrastructure needs for waste management, the lack of public awareness programs to highlight the health hazards and environmental impact of garbage, and the lack of firm tourist regulations, which allows millions of tourists in Tibet to leave behind proportional volume of waste. In our respective articles, both Feng and myself have tried to highlight a problem that could either explode out of control or could be tackled if the right measures are immediately taken. Upon a careful analysis of the two articles, a discernable parallel could be noticed. So could it have been my article posted last summer (2017) that prompted Feng to travel to Tibet this summer (2018) to investigate the facts?

Governance on Waste Management The absolute absence of governance on waste management in rural areas in Tibet has compelled local communities to dump or burn their domestic waste. Even the garbage collected by Environmental Groups cleaning up nearby mountains ends up being burnt. This is due to the state's utter failure to provide very basic infrastructure to its citizens. Tsering Tsomo, who recently returned from a visit to Tibet, said there are simply no government waste-collection trucks in rural areas, and the problem is left to deteriorate.

The absence of waste management is similarly highlighted by Feng in his article by quoting Sangay, the founder of the Ganjia Environmental Volunteers Association. Sangay states that a little more money and labour from the government to build waste sorting points in villages would make greater impacts in rural areas.

Surprisingly, Feng tries to portray the government's inability to provide very basic waste management facilities as an ordinary issue. Quoting Peng Kui, a conservation expert with the Global Environmental Institute, Feng highlights that the lack of governance on waste management is not only restricted to rural areas, but also widely prevalent in cities and county-level towns. He states that there is simply no spare funding for waste management in townships and villages.

This is absurd as China is the world's second largest economy which continues to grow rapidly. The Chinese government has deployed hundreds of thousands of security personals across Tibet and funds the world most expensive network of roads, known as the "Belt and Road Initiative." Since the garbage problem in Tibet is in an early stage, only a fraction of that cost and manpower could fix it.

Conclusion

Feng's interest in the waste issue in Tibet is seemingly stimulated by my earlier article. But much of his writing is presumably influenced by the tight surveillance he might have encountered while travelling in Tibet. Despite the apparent difficulty of investigating the real causes of the garbage problem in Tibet, such articles will likely alarm the Chinese government into action to protect Tibet from garbage inundation. The vast Tibetan Plateau, standing at an average elevation of more than 4,000 meters above sea level, is not only the world's highest plateau but is also the source of Asia's largest rivers. Any damage done to this majestic plateau will have catastrophic repercussions for Tibet, China and the world. Currently there is a massive public effort on rural waste cleaning underway in Tibet, but a feasible solution is not possible without strong government support.

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A MINING PROTEST IN DRIRU COUNTY

Driru in northwest of Kham is currently administered as a county under Nagchu prefecture of the so-called Tibet Autonomous Region (TAR). The prefecture is rich deposit mineral ores, such as gold, silver, copper, antimony, lead, zinc, borax, petroleum, salt etc. These ores found in the region are large in reserve, high in grade, and easy for exploitation. The local Chinese government has started building roads at the foothills of Mount Sebtra Zagyen (སེབ་ཁྲུ་རྒྱལ་) to pave way for mining activities in the region. They forced the residents of three villages in Markor, Wathang and Gochu to sign a document that allows the local authorities to conduct mining activities at Sebtra Zagyen (Tibetan Centre for Human Rights and Democracy, 2018). Karma, the head of the Markor village was detained by Chinese official for challenging the official order in February. When the news of his detention reached outside Tibet, local authorities immediately called a meeting during which 30 Tibetans were detained of suspected involvement in leaking the information.

Earlier history of mining in Driru County

This is not the first case of mining activities on sacred mountains in Driru County, there has been similar cases in 2010 as well. Some of the Chinese companies, on the pretext of a hydroelectric construction project, started mining on Mt. Naglha Dzamba Mountain, an important sacred mountain in the region. This led to a series of local protests which forced Chinese local Chinese government to halt it temporarily. But three years later, in May 2013, another mining company arrived and started mining activities on the sacred Mount Naglha Dzamba (Tibet.net, 2018). Such a blatant disregard for local cultural beliefs and sentiments led to a massive protest on 24 May 2013. More than 5,400 Tibetans from four major areas in the region-Pekar, Nagshoe Phudha and Tsala gathered in Dathang town to protest against the growing Chinese mining activities in the county (The Tibet Post International, 2013). As the protest was gaining strength with more Tibetans begun to converge from different areas and also appearing in international news, the Chinese government was once again forced to halt the mining to subside both local and international attention.

Impact of the mining

The continued exploitation of mineral resources in the region is causing immense social, cultural and environmental distress. Sacred mountains have great cultural and environmental importance for local Tibetan communities across the plateau. The Mount Sebtra Zagyen is considered one of the 'three sacred, supreme places' (གསང་བ་གསུམ་གྱི་གནས་མཚོན་ག) representing the place of mind (Tibet Times, 2018).

The mountain is also home to many endangered animals such as Tsoe (Tibetan antelope), Nah (Blue Sheep) and Gowa (Tibetan gazelle).

The world largest free-flowing river, Gyalmo Ngulchu, known as Salween outside of Tibet, runs through the foothills of the Mount Sebtra Zagyen where the mining activity is happening. Mining close to a river is not only illegal but also poses serious water pollution. Salween River originates from Tibet and runs through three different countries—China, Thailand and Myanmar and sustains over 7 million people. Locals Tibetan in the region were also worried that the mining activities on Sebtra Zagyen will trigger landslides, which could possibly block the river or it can damage the river ecology. So, mining on the sacred mountain not only hurts the sentiments of Tibetans but threatens the millions of people who are depended on the rivers.

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CHINA'S GOLD MINING IN TIBET IS A STRATEGIC MOVE AGAINST INDIA

A recent article in South China Morning Post about rapidly expanding Chinese gold mining activities in Tibet (Chen, 2018), close to India's border, reverberated the Sino-India border tension. The Post deliberately titled the article 'How Chinese mining in the Himalayas may create a new military flashpoint with India' to stir the volatile relation between the two neighbors. The highly competitive Indian media quickly picked up the news with bits of its own exaggeration, which helps SCMP to achieve its long term commercial goal of expanding readership across the Indian subcontinent.

In between such political games and commercial interest, the views of the local communities are often overlooked and the importance of the places in case are constantly misunderstood. Lhuntse, from where the Chinese mining activity was reported, is only about 150 km from Tawang in Arunachal Pradesh. It is one of the 12 counties of Lhokha prefecture under the so-called Tibet Autonomous Region (TAR) presently under Chinese occupation.

So why is Lhuntse suddenly in the news?

It's unlikely the Chinese government would have allowed large scale mining in a faraway, restricted area, where the People's Liberation Army (PLA) has stationed heavy military bases, unless there is a strategic plan. The most probable reason for the sudden surge in mining activities in Lhuntze could have been for two important issues – strategic and historical.

Strategic Move against India

The strategic plan is to heavily populate the region with Chinese migrants to outnumber local Tibetans and create a strong base to counter Indian influence across the border in Arunachal Pradesh. Mining would be an ideal excuse to attract thousands of Chinese migrants in the scarcely populated area to build a new Chinese town in the region. Such an atmosphere could facilitate a strong migrant Chinese support for PLA in the region. The strategic plan is further evident from what Professor Zheng Youye of China University of Geosciences in Beijing told the SCMP, that the new mining activities would lead to a rapid and significant Chinese population increase in the Himalayas, which would provide stable, long-term support for any diplomatic or military operations aimed at gradually driving Indian forces out of territory claimed by China.

The SCMP also writes that Chinese migrant workers have poured into the area so fast that even the local government officials could not provide a precise count for the current population. As per 2010 Chinese census, Lhuntse County has a population of 35248, with more than 99% being Tibetans. But the demography could quickly change as expansion of mining activities in the region would attract thousands of Chinese migrant workers, accompanied by cluster of Chinese shops, restaurants and night clubs. The area also has a heavy military presence whose numbers were not included in the local population census.

The gradual outnumbering of local population by migrant Chinese could also reduce the strong influence the Dalai Lama has in the region. The Tibetan peoples' deep faith in the Dalai Lama has created a favorable attitude towards India as it is the current home to the Dalai Lama and the Central Tibetans Administration.

Historical Importance for Tibetans

The Chinese could also be planning to change the demographic outlook of the place to reduce Tibetan cultural influence and wipe out historical memories. The place has been an important political and military base in different periods of Tibetan history. The most recent was in the 1950s. On 17 March 1959, the Dalai Lama was forced to flee with his ministers from Lhasa as PLA threatened to bombard the Dalai Lama's palace (Shakabpa, 1976). On 29 March 1959, after reaching Lhuntze, the Dalai Lama declared it as the temporary seat for the Tibetan Government (Shakabpa, 1976). Lhuntse is also an important military base for Tibetan resistance guerrilla fighters, the Chushi Gangdruk. The military organization successfully secured route for the Dalai Lama to escape into India as well as countered Chinese offensive military attacks.

Huayu Mine and its location

In its official website, the Huayu Mining Company says that the company is the largest ore manufacturer in Tibet (Huayu Mining Company). The mine site is located near Tashigang, about 45 km from the county headquarter or the Lhuntze town. An official website of the Chinese government states that the county is rich in gold, iron, medeleivium, lead, zinc, antimony, copper etc. The Huayu Mining that owns the mine in Lhuntze proudly declared that its Zhexikang (Tashigang) mine has 600,000 tons of lead, zinc and antimony, and also conservative value proved and forecasted at 8 billion yuan (Huayu Mining Company).

The mine is right next to the provincial highway S202, which makes transportation of mineral ores very convenient. The S202 is an extremely important road for both civilian and military purpose in the region. The highway starts from Tsethang, the

prefecture city of Lhoka, after passing through Lhuntze and Tsona, it ends close to the border opposite Tawang in Arunachal Pradesh. The S202 is also connected with Shigatse and Lhasa with other provincial highways for faster movement of goods, people and military.

Environmental Implications

Huayu claims that the company has been honored by the local government for its work safety, but such honors lack any credibility in the region. For example, despite the Gyama (Ch: Jiama) Copper Gold Mine, (one of the largest active mines in Tibet) been awarded a similar honor, it saw the biggest, man-made mine tragedy in Tibetan history with death of 83 workers in a massive landslide in 2013 (Environment & Development Desk, 2013).

A report in TAR official website (September 1, 2017) states that the government has been able to reduce soil erosion and decrease desertification along the Lhuntze valley (Khando, 2017). But the Tashigang mine could cause soil erosion and water pollution as it sits right on the bank of Nangme Chu river, a tributary of Nyelchu river that flows through the Lhuntze valley. The river becomes Subansiri River as it enters into Arunachal Pradesh. Any water pollution by the mine could quickly flow into India as it happened back in November 2017 when Brahmaputra began to turn black for months due to (unconfirmed) activities on the Tibetan side of the border.

There is another big mine to the north of Lhuntze, the Norbusa Mine. Norbusa meaning ‘Land of Gems’ in Tibetan, is the biggest chromite mine in Tibet.

Conclusion

On 29 October 2017, Xi Jinping wrote (the much reported) letter to Dolkar and Yangzom sisters of remote Yulmey Township in Lhuntze (China Daily, 2017). The presidential gesture, though made to look like meant for the two sisters, in fact was a message for India. It was a strategic move to illustrate people’s love for the state and the government presence in the border region. Only Beijing would know if the sisters ever sent a letter to which the Chairman replied.

The letter to the family and now the sudden surge in mining activities in the region comes after an embarrassing end to the Doklam standoff for China. The unexpected tough resistance from India could have spurred China to seek new strategy—a demographic shift with Chinese characteristics on the Indo-Tibet border. Such a move could assist the PLA’s expansion across the border with a fervent Chinese migrant support, which the Chinese military on the border obviously lacks.

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THE DELIBERATE OVER-REPORTING ON THE REMOVAL OF NOMADS FROM CHANGTANG NATURE RESERVE

According to a recent report in a Chinese state news media (Xinhua, 2018), the so-called Tibet Autonomous Region (TAR) removed around 1100 villagers (nomads) from the Changtang National Nature Reserve in Nagchu region and were relocated at an area of 27 kilometers from Lhasa. The Deputy Head of the Regional Forestry Bureau of TAR cited low oxygen, poor public facilities, lower than the region's average life expectancy and the need for reduction of human activities that might harm the fragile environment in the nature reserve. The above news seems like any other news from China in which the state making great efforts in modernizing and improving rural lives and environment. But for a researcher, an unusual element of excessive reporting about the nature reserve by various Chinese news media in the last one year could be clearly noticed. Which finally culminating into the removal of Tibetan nomads from their ancestral homes in recent days.

There are three distinct characters subtly and consistently displayed in the Chinese news reports about the nature reserve and removal of nomads from the area. First, the government news outlets consistently and excessively reporting on the nature reserve and the relocation. Second, calling 1100 nomads as villagers and the deliberate usage of certain terms to describe the local socio-environmental conditions. Third, the official news outlets trying to create a positive narrative about the nature reserve and the relocation of nomads to counter exile narrative.

Its apparent that Beijing has deliberately and systematically released selected news about the conditions of the nature reserve and the nomads living in the vicinity of the reserve. Following are few examples of the systematic over-reporting on the same issue.

- China banned (6 May 2017) visitors from passing through Changtang National Nature Reserve (CNNR). The circular warned tourists, adventurers and tour agencies to comply with the reserve's laws and regulations (Global Times, 2017).
- The State Council (12 July 2017) has announced 17 new national nature reserves across China, including in Tibetan areas. Proclaiming that the nature reserves are an important vehicle to promote ecological protection and enhance and protect China's stunning natural scenery (State Council, PRC, 2017).
- The Qinghai provincial government (2 May 2018) revoked 59 mining licenses both within and peripheral of nature reserves in the province (People's Daily, 2018).

- The Qinghai province (6 June 2018) also has banned travel in various national nature reserves in the province (China Tibet Online, 2018).
- The Tibet Autonomous Region government (16 June 2018) has started dismantling pasture fences in Nyima county of Nagchu, which is part of the CNNR. Stating that with relocation of the local residents to Lhasa, the fences were no longer necessary (Xinhua, 2018).
- The relocation of nomads (20 June 2018) has changed lives for better (Xinhua, 2018).

First, the Chinese government clearly understands the importance of presenting a narrative in which the removal of Tibetan nomads from the nature reserves are made to seem like necessary and urgent, on both social and environmentally accounts. For such a narrative to emerge, Beijing tasked its news outlets to report about the nature reserve and the nomad relocations before any foreign media or exile Tibetans could. Thus, becoming the source of the information which shapes the public perception and influences the direction of the story.

Second, reports were guided by careful and clever usage of terms. For example, 1100 nomads were deliberately termed as villagers in the Chinese news reports. Usage of such term greatly changes the meaning and magnitude of the event. Relocation of nomads have been more controversial than relocation of villagers. Relocation of nomads brought abrupt change to their way of life where as relocated villagers often continue the same profession of life. Relocations of villagers have been for betterment of the villagers whereas the relocation of nomads were for resource extractions or creation of nature reserves.

Third, the Chinese government tries to present itself as Champion of environmental conservation by constant release of selected news about improvements in the nature reserve, increase in wildlife population, declaration of more nature reserves and firmer enforcement of nature reserve regulations. Simultaneously, the Chinese government also tried to portray Tibetan nomadic life in the area as harsh, poor, unhealthy and backward. Trying to create such a narrative in which the readers are made to believe that the relocation of the nomads a necessary step for betterment of their life.

Conclusion

The Changtang National Nature Reserve covers six counties of the Nagchu with an area of 298,000 square km and has an average altitude of 5,000 meters. It was established in 1993 as a regional nature reserve and was upgraded to a national nature reserve in year 2000. This makes it the biggest and highest nature reserve within People's Republic of China (PRC).

Nomads were initially given options to move out or stay back, hoping that subsidies and incentives would attract most of them to the new locations. But due to numerous instances of not implementing promises and the poor conditions of resettled nomads, the residents of Changtang grassland were not lured by the false promises of schools, hospitals, homes and jobs. With fewer than expected nomads willing to move out, the Chinese local governments started making lives on the grassland difficult by introducing new laws and threatening to imprison those refusing to comply. Therefore, either by force or by tricks, the nomads were compelled to move out into new locations with very little opportunity to thrive a progressive life.

A strong call for better treatment of the resettled nomads are both urgent and necessary. The social, economic and educational conditions of the resettled nomads are in extreme conditions. Lack of jobs and business opportunities have forced man into alcoholism, women into prostitution, and children into petty crimes. A whole generation of Tibetan nomads are forced into absolute desperation. The extreme conditions of millions of resettled nomads need to be highlighted at various global stages, and the Chinese government must be questioned on the implementation of promises of homes, hospitals, schools and jobs.

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CHINA'S WHITE PAPER ON TIBET'S ECOLOGY: TOO MANY LIES AND CONTRADICTIONS

China's latest white paper 'Ecological Progress on the Qinghai-Tibetan Plateau' begins with a brazen lie that "the Communist Party of China (CPC) and the Chinese government have always valued ecological progress (The State Council, PRC, 2018). In fact, the infamous slogan 'Man must conquer nature' was declared by the founding father of the CPC Mao Zedong. In his opening speech at the National Conference of the CPC on 21 March 1955, Mao stated that "there is a way of conquering even Nature as an enemy". He further stated that "even the high mountains must bow, and even the rivers must yield". Such attitude towards nature by CPC and its call to develop at all cost has plunged China into as one of the most polluted regions on earth.

Too Many Lies and Factual Errors

The report would have been a wonderful reading for someone with very little knowledge about Tibet, but for a regular observer, there are too many lies and factual errors. A statement in the report which claims that the Qinghai-Tibetan Plateau is one of the regions with strictest water resource management and water environment protection in China is simple not true on the ground. There has been many instances of various factories and mining companies left unpunished despite serious cases of polluting local water bodies. The case of waste from lithium mines been flushed into the Lichu river in Minyak Lhagong (Karze region of Tibet) by the Ronda Lithium Co Limited is one such example. The toxic waste polluted source of local drinking water and caused mass death of fish on 4 May 2016 (Palden, 2016).

In a similar case on 23 September, 2014, more than 1,000 local Tibetans of Dokar and Zibuk villages near Lhasa protested against the poisoning of their river by the Gyama Copper Poly-metallic mine. The mine was located close to a river that local community used for drinking, irrigation and feeding their livestock. Another example of lack of proper water management is the rampant dumping of rural and urban wastes into nearby rivers. The paper states that RMB 6.3 billion was spent on domestic sewage and waste disposal projects but in reality, the garbage collection and management facilities are almost non-existent across Tibet, especially in rural areas.

In an effort to justify its claim that the Siling-Lhasa railway was an example of green development, it writes that even Science Magazine (April 27, 2007) found that the railway will "ultimately promote the sustainable ecological, social, and economic development of western China". But according to the actual article (Changhui Peng, 2007), in the Science Magazine titled 'Building a Green Railway in China',

the sentence begins by stating that “If carefully managed (emphasis added), the Qinghai-Tibet railway will ultimately promote the sustainable ecological, social and economic development of the western China”. To support its argument, the paper disregards intellectual integrity by selectively quoting or misquoting an incomplete sentences from Science Magazine to alter the actual context.

Contradictions between Policies and Implementations

There are far too many contradictions between policies for environmental protection and actual ground implementation. The paper claims that ‘the relevant provinces and autonomous regions have taken active measure to increase public awareness of eco-conservation, such as strengthening public campaigns on environmental protection’. But an official circular issued by the Tibet Public Security Department of the so-called Tibet Autonomous Region on 7 February 2018 has made environmental protection activities in Tibet an illegal act, thereby contradicting the claims made above.

The disregard to the pleas of Tibetans in Amchok against mining is yet another contradiction. On 31 May 2016, around 2,000 local Tibetans of Amchok in north-eastern Tibet gathered to protest against mining on their sacred mount Gong-nyong Lari (Voice of America, 2016). But the Chinese government brutally suppressed the protesters by seriously injuring many and detaining six local Tibetans. They were calling for ‘protection of environment, protection of the sacred mountain and protection of people’s safety’.

Some Important Issues are Ignored

The paper makes no mention of natural disasters despite Tibetan areas facing devastating floods, landslides and mudslides in recent years. The mountainous Tibetan Plateau faces the severest impact of climate change due to its high elevation at low latitude. The situation is further exacerbated by unregulated constructions and mining activities in the region. The plateau has seen unprecedented number of natural disaster across Tibet recent years (Zamlha, 2016). There are numerous floods and landslides occurring in North-eastern and Central regions of Tibet as we write. Unfortunately, the paper does not mention about natural disasters or efforts taken by the Chinese government to mitigate the impact.

This is apparently due to lack of real understanding of the current socio-environmental situation in Tibet by the Chinese government. The Chinese government has done very little to address climate change as well as put forth preventive measures to mitigate the impact of increasing incidents of natural disasters. As is often the case, it has been the Tibetan monasteries who have rushed

to the scene of natural disasters to help the public. While claiming massive progress in the creation of nature reserves, the plight of millions of resettled nomads are conveniently brushed aside. The lack of jobs and educational opportunities in the resettled areas have pushed the nomadic population into the margins of the society. The difficult life in the resettlement camps have compelled men into alcoholism, women into prostitution and children into petty crimes. A whole generation of Tibetans are impoverished and forced into destitution. The paper also gives very little information about Ngawa and Karze regions of eastern Tibet. A regions that has often faced repressive policies as its home to numerous protests against mining and natural disasters.

Conclusion

Environmental conservation efforts in Tibetan areas are arrogantly forced upon them by the state without informing or taking local communities into confidence. Such colonial approaches have often led to confrontation between the people and the government. In reality, it's the Tibetans who have preserved the fragile plateau for thousands of years. They have acquired enormous indigenous knowledge of the land and its climatic patterns, but they are rarely consulted for formation of any climate or environmental policies in the area.

The lack of mitigation efforts to face the new environmental situation and climatic conditions is a major failure. Tibetans should not be left to face natural disaster in the coming years as it has been in the last three years. The formulation of stricter regulations on protection of nature reserves is a welcome effort, a similar policy is also urgently required to strictly regulate the influx of millions of tourists into the plateau as it could leave massive carbon footprint on the fragile ecosystem of Tibet. The millions of resettled nomads should be provided with jobs, education and medical facilities to restore their dignity and livelihood.

Ever since Xi Jinping became the president of PRC, there has been positive efforts on environmental protection across China and in Tibet. But the lack of environmental knowledge, respect for environment and sincere desire for environmental protection among Chinese officials have led to various contradictions and confrontations. As a result, environmental conservation projects by various local Chinese governments in Tibet often end up further damaging the local environment and destroying people's livelihood.

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CHINESE FORCED WATER DIVERSION PROJECT IN AMDO

According to a report published on 20 July 2018 by the Tibetan Centre for Human Rights and Democracy (TCHRD) (Tibetan Centre for Human Rights and Democracy, 2018), in Bayen Dzong of Tsoshar, Amdo, Chinese authorities are forcefully implementing a river diversion project of Chakchu (also known as Drampa) river. The predominantly farming communities in Traseng, Dro, Gonpo Gyu, Achok and Adhey villages that are dependent on the river are concerned that such project would cause water scarcity resulting in poor yield and no adequate water supply for their livestock and overall bring negative impacts on the local environment. This water diversion project also causes a destruction of farmland by making a series of canal where local authorities have failed to compensate.

Since the local people do not know where and why the river has been diverted, it is speculated that the river is either being diverted towards the dominant Hui (Chinese Muslim) community or to other development projects such as mines or dams. Therefore, there is a possibility of continued protests or water disputes between Tibetan and Hui people. So, to avoid such conflict, it is the responsibility of the Chinese government to provide information, engage in inter-jurisdictional cooperation and take local concern into consideration before implementing such project.

Although, there is no reliable data on the number of inter-jurisdictional water disputes in this region, but the incidents seem to be continually increasing. On June 1, 2017, a similar incident of water diversion happened in the very county where the Yitsa Zachu River flowing within the Shitsa village was diverted to Tharga Village, the resident of which are mostly Hui Muslim. This led to clash between villagers and police, leaving 20 Tibetan and 10 police injured and arrest of more than 40 Tibetans.

Two Possible Reasons for the Diversion

Domestic hydro-politics: Due to China's unique combination of both centralized and decentralized political systems Chinese officials are often caught in institutional matrix known as *tiao-kuai* (Mertha, 2005). This matrix is intended to ensure that sub-national officials pursue priorities set by the central government, but also to provide them with the flexibility to implement these policies according to local circumstances. Beijing effectively controls the issues of strategic importance, whereas less important matters are dealt by sub-national actors (Moore, 2018).

In practical terms, this flexibility result in different application of specific policies, including those concerning water resources. Since most of the key government

and party position in this area are held by the dominant Hui population in Bayen Dzung, there is a possibility of unfair preferential practices of diverting the water flowing inside Tibetan villages to Hui villages.

Qinghai Water Resources Management Plan (2008-2030): As per the report published by TCHRD, the water diversion project in Bayen Dzung was linked with the Qinghai Water Resources Management Plan (Tibetan Centre for Human Rights and Democracy, 2018). If that is the case, such incidents compel us to ponder the question about the viability of such project. This kind of projects often lead to the land acquisition and resettlement, so it is necessary for local people to be aware of such possibilities.

A brief on Qinghai Rural Water Resources Management Project

The Qinghai Rural Water Resources Management Project covers three State-identified poverty counties of Yadzi Dzung, Bayen Dzung and Chentsa Dzon (Asian Development Bank, 2014). These three counties in Amdo province have agriculture as the major basic industry, but due to limited rainfall, agriculture relies mainly on the irrigation system. The present system relies on lift irrigation through pumping stations. Either because of defection in the water-lifting system or overburdened electricity bills, farmers' yield a very poor crop or significant parts of the irrigable land remain unirrigated despite abundant water resource in the Yellow River. In order to resolve the problem, the Lijiaxia and Gongboxia irrigation schemes have been included into the Qinghai Provincial 11th Five-Year Water Resources Project Portfolio as key water conservancy projects (The Qinghai provincial government for the Asian Development Bank., 2011).

The Lijiaxia irrigation scheme lies on northern and southern banks of the Yellow River mainstream, which flows through the territories of Bayen Dzung and Chentsa Dzung in Amdo Province. The Gongboxia irrigation scheme is located on either bank of the Yellow River, which flows through the territories of Yadzi Dzung and Bayen Dzung. Both the schemes take advantage of the high storage water levels of the two existing dams (Lijiaxia and Gongboxia Reservoirs) and the diverted water from the south and north agricultural irrigation channels from the dam to provide water resources for the agricultural development in the region, converting current lift irrigation into gravity irrigation.

Percentage of Tibetan Population under this project

The Gongboxia North Canal Irrigation Scheme will include a population of 32,615, consisting mainly of ethnic minorities (91.6%), including 12,878 Hui people (39.5%), 13,829 Salar people (42.4%), 3,145 Tibetans (9.6%) and 2,763 Han people (8.4%) (The Qinghai Provincial Government for the Asian Development

Bank, 2010). The Liji Xia North Canal Irrigation Scheme involves 42 administrative villages in the two towns and one administrative committee, and will include a population of 36,834, consisting mainly of Hui people (93.45%), in which Tibetans account for 5.98%.

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DEVASTATING NATURAL DISASTERS IN TIBET CONTINUE INTO 2018

The impact of climate change on the Tibetan plateau is apparent with unusual scale of torrential rainfall reported across Tibet. The drastic climatic shift has resulted in high frequency of floods and landslides occurring simultaneously in various part of Tibet as we write. The scale and frequency of natural disasters in year 2018 (see the list below) has been as severe as it has been in the last two years. Waterlogged homes and flooded summer pastures in different parts of Amdo is a particularly worrying sight and an alarming trend. Following are the list of ongoing floods in Tibet:

- July 10, 2018—More than 19 townships, 101 villages and 9,122 families were affected by floods in Drukchu Dzong (kanlho Prefecture, Gansu) in eastern Amdo due to heavy rainfall.
- July 10, 2018—Flood like situations continue in different parts of Central Tibet. Massive landslides in Ringpu Dzong blocked Highway 318, surging river in Sakya Dzong threatened the ancient Sakya monastery, and the Lhasa Kyichu has risen at a dangerous level.
- July 11, 2018 – Landslides and mudslides in Powo Dzong blocked Chengdu-Lhasa highway.
- July 12, 2018 – An unusual scene of water-logging were seen inside homes in Tongkor Dzong near Siling City due to heavy rainfall.
- July 14, 2018 – A threat from surging river, due to heavy rainfall, is reported from Rabgya area of Machen County in Amdo.
- July 14, 2018 – Monks from Zoige Taktsa Gompa and Muge Gompa were seen helping locals with rescue efforts during the floods in the region.
- July 15, 2018 – Landslides were reported due to heavy rainfall in Zamthang Dzong in Ngawa region of Tibet.
- July 15, 2018 – A brave Tibetan policeman rescued a local resident who was washed away by the surging Nyung River in Shigatse.
- July 17, 2018 – An unusual heavy snowfall in the summer was reported in the Gormo region of northern Tibet.
- A rare case of floods over a vast area of a summer pasture site has put Tibetan nomads and their tents inundated in many regions of Ngawa in Amdo.

Tibet has seen unprecedented number of floods, landslides, and mudslides since 2016, primarily due to rising temperature and increasing rainfall (Zamlha, 2016). The same year witnessed a new trend of simultaneous landslides, mudslides and floods were reported from different parts of Amdo. The extent of natural disasters has been much more severe in the following year with massive floods in many parts of Kham (Zamlha, 2017).

The once cold and arid plateau is undergoing a massive climatic shift with warming rate of 0.3°C per decade (Kang Shichang, 2010), which is twice more than the global average. According to a scientific paper on the climatic shift in Tibet from 1961-2015, published on 25 April 2017, by a group of Chinese scientists, the Tibetan Plateau has seen continuous rise in both temperature and precipitation for the last 50 years (Wan Guoning, 2017). The paper also stated that the years 1962-1985 and 1991-1998 were dry periods, while the years 1985-1991 and 1998-2000 were periods of more rainfall. The research was based on data from hundreds of meteorological stations spread across the plateau. The researchers found that places like Dartsedo, Nyarong, Lithang, Tsethang, Delingkha and Dulan experienced maximum increase in precipitation, while Sershul, Chigdril and Shigatse recorded the largest decrease in rainfall.

As per the understanding of this writer (Zamlha, *Flooded Tibet: struggling to adapt to the new reality*, 2017), following are the six primary causes of increasing natural disasters in Tibet- climate change and rising temperature, rapid urbanization and excessive construction works, topographic features and location of towns and villages, poor construction materials or traditional homes not suitable for the new climatic reality, lack of climate change awareness and awareness programs, inability to swiftly adapt to the new climatic pattern and mitigate possible impacts of climate change. We have been focusing on these issues by highlighting the situation through talks, articles and short video films in hope of making the Chinese government aware of the dire situation and to take necessary measures to mitigate the impact. We also launched a six-minute video on the subject recently to assist Tibetans both in exile and in Tibet, to understand the causes of the increasing natural disasters in Tibet.

The change is inevitable, hence we have to adapt to the rapidly changing climatic pattern on the Tibetan Plateau and must take necessary measures to mitigate the impact of the new climatic reality. Beyond the numerous threats, the rising temperature and increased rainfall on the (once) arid plateau also has positive benefits that we must harness. An extensive tree plantation drive across Tibet is urgently needed to prevent further floods, landslides, desertification and rising temperature. Such initiative is ideal at the moment as the increased precipitation on the plateau will support growth of trees where previously not possible.

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SACRED MOUNTAINS OF TIBET

How it's been understood from a Tibetan Perspective and its significance in environmental conservation

Tibet is home to thousands of peaks, of which many are considered abode of certain deities who protect the fertility of the land and prosperity of the people. This exceptionally rich and unique relationship between worldly gods, nature and humans has helped the Tibetan plateau survive for thousands of years despite its fragile ecosystem and historically dense population. Recent studies have also demonstrated that sacred areas often play a major role in environmental conservation. Scientists have found greater biodiversity and richer vegetation in sacred mountains such as the Mt. Khawa Karpo in eastern Tibet than elsewhere. According to the Bon religion's beliefs, the Yarlha Shampo deity or Mount Yarlha Shampo is one of the Nine Earthly protector deities came into existence with the Tibetan plateau's formation as protectors of the land. These powerful mountain deities have numerous children, siblings and ministers in the form of nearby sacred peaks and valleys, to protect the land and its inhabitants from drought, disease, famine and war. But in recent years, lack of Tibetan perspective in development models of current Tibet under Chinese rule, the threat to sacred mountains have never been greater.

Key words: Sacred Mountains, environment conservation, mountain deities, mining, Tibetan plateau.

Introduction

The Tibetan Plateau with an (Norbu, 2011) area of 2.5 million sq. km at an average elevation over 4,500 meters above sea level, covers close to 2% of the land surface of the planet, thus making it the highest and largest plateau on earth. For the Tibetans it has been a known fact ever since ancient times that they lived on a vast snow-covered mountainous plateau they fondly called Tibet the-Upland (སྐང་པ་བོད།) or the snow-land (ཁྲ་མ་ཅན།). But in recent years, scientists are increasingly calling the Tibetan Plateau by various names like (Environment & Development Desk, 2009) Roof of the World, Water Tower of Asia, the Third Pole and the Rain Maker to indicate its global social, environmental and geographical significance.

- Roof of the world; the highest and largest plateau on earth at an average elevation of 4500 m above sea level.
- The Third Pole; home to largest store of fresh water on earth beyond two poles with presence of around 46,000 glaciers.

- The Water Tower of Asia; source region of Asia's six greatest rivers such as Driчу (Yangtze), Machu (Yellow River), Zachu (Mekong), Gyalmo Ngulchu (Salween), Yarlung Tsangpo (Brahmaputra) and Senge Khabab (Indus) running into some of the world's most populous nations like China, Burma, Thailand, Vietnam, Laos, Cambodia, India, Bangladesh and Pakistan.
- The Rain Maker; plays an important role in generating and regulating Asian Monsoon. It heats quickly in spring and summer, diverting the jet stream, establishing a steep pressure gradient that draws monsoon clouds deep inland into the heart of Eurasia. According to various recent scientific researches, this vast plateau was formed around 50 million years ago when Indian subcontinent collided with Eurasia. This collision created tides of mountain range rolled throughout the Plateau, of which fourteen great mountain ranges are; Great Himalayan Range, Karakoram range, Nganglon range, Thangla range, Nyenchen Thanglha, Kunlun range, Altyn Tagh range, Sertheng range, Gangkar Chogley Namgyal range, Amnye Machen range, Yagra Tagtse range, Dege Trola range, Minyak Gongkar range and Khawa Karpo range. For Tibetans these giant mountain ranges and heavenly peaks like Mt Everest, Mt Namchak Barwa, Mt Khawa Karpo, Mt Kailash etc are abode of the earthly Gods or mountain deities and are respected as sacred mountains. The Tibetan civilization has had a very rich and complex relationship between nature, earthly gods and humans to co-exist in harmony and share a culture of interdependence and mutual respect. This cultural belief in sacred mountains emerged from ancient Tibetan civilization which has been greatly influence by early Bon religion and later elaborated by Buddhism. Hence (Puri, 2006) no understanding of the environment is adequate without a grasp of the religious life that constitutes the human societies that saturate the natural environment. There are numerous legends and folklores about human relationship with sacred mountains deities in Tibet, Such legends about (Danica M. Anderson, 2005) sacred places have long and diverse histories in human cultures and demonstrate ancient links between peoples and their environments. The culture of belief in Sacred places are a universal human phenomenon not associated with any specific religion or worldview (Engel 1985), but they have strong religious context and are influenced by traditional local beliefs, as well as (Jan Salick, 2007) historical geo phenomenal and cultural significance, storing rare and extraordinary flora and fauna. In many regions of the world, sacred sites have been shown to have a major effect on conservation, ecology and environment due to the special precautions and restrictions associated with them. The cultural belief in sacred mountains is as ancient as the Tibetan civilization itself, the land was ruled by various kings and people's faith shifted from one religion to another, but

the cultural reverence towards sacred mountains continue to exist and flourish. This belief in sacredness of nature was so embedded in Tibetan culture that the presence of deities in the mountains and its relevance to the people's life were never questioned until recent decades. After Chinese occupation of Tibet in 1959, the policy of development at all cost was ferociously enforced and the consequence of its environmental destruction belatedly realized in recent years in many part of China. But powerful Chinese state owned mining companies refused to learn from history and respect the cultural beliefs, instead call the belief as backward and irrelevant in this age of science. There has been many wonderful research articles, books and commentaries by Chinese and western scholars on the cultural importance of the sacred mountains for Tibetans and its scientific relevance in environment conservation. But still there is a clear lack of in-depth humanly understanding of Tibetan sacred mountains, as Gabriel Lafitte in his book *Spoiling Tibet* (2013) aptly puts it that "Tibet should be seen from Tibetan eyes..." also adds "in the absence of Tibetan perspectives, the plateau is readily dissected, categorized into useful and useless, farmland and waste land, alpine meadow and alpine desert". To understand the magnitude of sacred mountain belief in Tibetan culture from a Tibetan perspective, one need to understand the origin of when and how sacred mountains came prominence.

The Origin of Sacred Mountain belief on Tibetan Plateau

The early Bon religion of Tibet influenced and provided ancient Tibetan civilization with every aspect of human society with a profound and complex culture. A culture; which showed deep understanding of nature and immense respect for the environment in which humans thrive. The present concept of sacred mountain originates from Early Bon religious belief and later converted into Buddhist deities by Guru Padma sambhava, a powerful Buddhist Tantric practitioner from India.

The 37th king of Tibetan Empire Trisung Detsun begun to actively patronize Buddhism in the 8th century, this angered Bon sacred deities of Tibet who repeatedly destroyed in newly built Buddhist temples and caused natural calamities. Hence Indian Buddhist scholar Shanta Rakshita asked the King to invite Guru Padma Sambhava to (Tseten Phuntsok, 1989) subdue the earthly deities like Nyenchen Thanglha and Yarlha Shampo, who later vowed to continue protecting the land and the new religion. Therefore it is clear that (Yangkyi, 2013) the origin of sacred mountain belief in Tibet could have come from Ancient Bon religion and later elaborated by Buddhist as an adaptation to the complex culture of the land.

The greatest curiosity for a researcher is to find the origin of sacred mountains; when and how the cultural belief in sacred mountains came into prominence. Some

Tibetans argue that deities were once a military commander, a powerful minister, a yogi who all lived in the area and became deities after death to protect the same region (Yangkyi, 2013). Others argue that when a popular King, a Minister or a military commander die, the locals named peaks of the area after them to show respect, gratitude and remember than for generations, and a third hypothesis is that sacred sites were originally selected for designation as sacred because of unique biological attributes (Jan Salick, 2007).

An Ariel view of this mighty plateau would give one an astonishingly beautiful sight, snow covered mountain peaks towering above clouds and waves of mountain ranges rolled in unison, vast grassland in the north, beautiful lakes in the west, great rivers in the east and dense virgin forest in the south. This beautiful land has hundreds of sacred mountains, valleys, lakes, river sources and wetlands, which are accordingly named and differentiated. The complexity of Tibetan cultural belief in sacred sites are beyond someone who hasn't grown up in a Tibetan cultural society, because not all mountains are sacred and not all sacred mountains are respected.

Types of Sacred Mountains on Tibetan Plateau

Tibetan Plateau is a land of numerous sacred mountains, Sacred Mountain can be defined into three types according to Tibetan belief; local Deities (Yul-lha), Mountain Deities (Shi-dag) and Holy Mountains (Neri) (Yangkyi, 2013).

Yul-lha or Local Deities According to village folklores the Yul-lha were once a powerful person of the same village whose spirit continue to protect the village even after his death in the form of local deity. Such deities are numerous and mostly found within village area or very close by, and paintings show them dressed in the same village customs. Villagers strictly forbid people from cutting trees, digging earth and kill animals on such sites believed to be the abode of the yul-lha (Woodhouse, 2012). If someone conduct misdemeanors such as making fires, shouting, urinating and fighting near such sites, it would anger the deity and could cause misfortune for the individual as well as the whole village.

Shi-dag or Mountain Deities the Tibetan name for Mountain Deities could be translated as owner of the land or mountains. The clear separation between a Yul-lha and a Shi-dag is not possible, a Yul-lha can also be a Shi-dag or a Shi-dag vice versa. But their sphere of influence and reverence greatly differ; Yul-lhas are feared and revered for their power only by the same village or people of the same region, Whereas Shi-dag are believed to reside in mighty peaks or deep valleys as owner of that area. They are feared and revered by anyone passing through such mountains and valleys.

Neri or Holy Mountains Gang Rimpoche, Khawa Karpo and Tsari are some to the most revered sacred mountains where thousands of people come for pilgrimage each year. Such Neris are often mountains on which great Bon, Buddhist or Hindu scholars and Yogis attained nirvana or enlightenment. Another type of Neri is mountains like Yarlha Shampo, Amnye Machen and Nyenchen Thanglha, these ancient mountains are abode of deities who existed ever since Tibetan civilization.

The sacred sites could be a single peak or the entire mountain range, whole valley or only the source site of a stream running from the valley, a giant rock amid village or strangely shaped hilltop. The power and influence of a deity could be understood from the choice of its abode, minor spirits reside in giant rocks amid village or small hilltops, the most powerful deities reside on the highest peak of a giant mountain range, Some are feared as evil spirited deities and others revered as heavenly protectors of the land. Many of the sacred sites on the Menri of Khawa Karpo mountain ranges are found between 1900 and 4000 m, closer to villages, Anderson and co-field researchers in the area found it both rational and practical for local people to identify areas as sacred that are close to inhabited areas (Danica M. Anderson, 2005). The same researchers also found that the most sacred regions of the Menri landscape are found in both unusually low and unusually high elevations. There are thousands of peaks and hundreds of lakes in Tibet, many of the lakes are considered consorts of certain mountains. For example; Mt Nangchen Thanglha and lake Namtso Chumo, Mount Kailash and Lake Manasarovar, Mount Nadshing Gangsang and lake Yamdrok Yumtso, etc. Among hundreds of sacred mountains, there is eight most important Neri or holy mountains for pilgrimage and Nine Earthly Protector deities of Tibetan Plateau. According to the Dongkar Encyclopedia of Tibet, the Nine Earthly Protector Deities of Tibetan Plateau came into existence with the formation of Tibetan plateau to protect the land.

The Nine Earthly Protector deities of Tibetan Plateau are; Mt. Lhachen Wodhe Gungyal, Mt. Yarlha Shampo, Mt. Nyanchen Thanglha, Mt. Gatok Jowo Gurchen, Mt. Machen Pomra, Mt. Jowo Yulgyal, Mt. Kyishod Sholha Chukpo, Mt. Shelkar Jowo Thaged, Mt. Tsang Nadshing Gangwa.

Popular Mountain Deities and their association with Tibetan Civilization

Mt. Yarlha Shampo Mt Yarlha Shampo is located in the source region of Yarlung Tsangpo in the present Lhoka area of south western Tibet, the area formerly known as Yarlung. The Yarlung region is the site where king Nyentri Tsenpo built the first palace and established the Yarlung kingdom, which later ruled whole of Tibetan Plateau in the 7th century. Historical text and folklore legends stated that the Yarlha Shampo was the deity of this Yarlung Clan and it continues to be deity

of Lhasa royal families until recent decades. According some historical text and folklore legends; Yarlha Shampo is said to be a White yark who occasionally comes in the form of a beautiful man dressed in pure white, Some wall Painting of Yarlha Shampo in Lhasa portrays him as a deity dressed in pure white. There were various stories of deities pregnant locals who later gave birth to unusually powerful young man. One such story historically recorded occurred sometime in 1st century AD when the 7th King Drigung Tsenpo was killed by a minister in a coup and ruled the kingdom (Sakya, 1300-1400). The queen of the slain king was made to herd horses by the new king, at one occasion she dreamt of mating with a beautiful man dressed in pure white in a brief nap and found a white yak walking away from her the moment she woke up. Later she gave birth to an unusually strong and powerful man named Rulekye, who avenged the coup and restored Yarlung Kingdom. He was the first of Seven Noble Minister in the history of great Tibetan Empire.

Mt. Nyanchen Thanglha Mount Nyanchen Thanglha is believed to be the chief of 360 sacred peaks on the thanglha range, it is located near lake Namtso in the north-western part of Tibet or Nagchu area of present Tibet. The deity Nyanchen Thanglha is prominently mentioned in the great Ling-Gesar Epic, in this epic Nyangchen Thanglha, unlike the nine other deities, is considered one of the most powerful mountain deities of Tibetan Plateau.

Dongkar Encyclopaedia of Tibet Earthly Mountains deities of Tibet, Nyangchen Thanglha's influence and power extends and recognizable almost in whole of Tibetan Plateau, mentioned in many of the ritual prayer scriptures.

Mt Amnye Machen or Machen Pomra Mt Amnye machen is located in the Golok area of present Tibet; one of the most important sacred mountains of Amdo region, prominently mentioned in Hor-Ling battle of Ling-Gesar Epic and other folklore legends of the area. Amnye Machen has 18 offspring in the form different sacred peaks on the Machen range, one legend says that Machen Pomra was sent by Gang Rinpoche or Mt Kailash to protect the North-eastern part of Tibet (Editor, 2013).

Mt Khawa Karpo: Mount Khawa Karpo is one of the highest and most sacred peaks in southeastern part of Tibet or Dechen Tibetan area of Yunnan Province. The deity was said to be an evil warrior god later subdued by Guru Padmasambava and vowed to become a good deity. The Third Karmapa Rangshug Dorje visited the sacred mountain in 14th century and performed consecration rituals, since then is has been an important pilgrimage sites for Kargyupa lineage. Pilgrims from all over Tibet visit this sacred mountain every year as its among the eight most revered and important Neri or pilgrimage mountains in Tibet, particularly in years when the astrological signs for the element water and animal sheep coincide(most recently in 2003).

Gang Rimpoche or the Mount Kailash: Gang Rimpoche is located in the Ngari area of western Tibet, has been the central of Bon religious culture and history. Thousands of Hindu, Jain, Bon and Buddhist pilgrims visit this one of the most holy sacred mountains on earth. Unlike other sacred sites of Tibet, Gang Rimpoche is not considered a deity but a sacred holy site; Hindus believe it as the abode of Lord Shiva and center of earth by Bon religion. Pilgrims from various countries visit it every year.

Sacred Mountains and Resource Extraction

Historical text, folklore legends and recent researches clearly indicate ancient Tibetan civilization possessed great skill in metal work and knowledge about the presence of immense natural hidden treasure on the plateau.

There were other highly advanced and prosperous kingdoms like Zhang Zhung, Sumpa, Azha and Menyak in Tibet before the emergence of Yarlung kingdom in central Tibet, it was sometime around 1st AD the people of Yarlung (Sakya, 1300-1400) discovered mineral ores from which Iron, Copper and Silver were extracted. The word gTeror mineral treasure has been constantly mentioned in Tibetan historical manuscript. Battle amulet's gifted to neighbouring kings were of master craft metal work and numerous Thokchaks found in Tibetan areas are of unexplainable skill (John Belleza), of Yarlung Kingdom, Early Bon folklore legend and Buddhist religious text of ancient Tibet. The great battles fought in King-Gesar epic (sometime in 13th century) to conquer eighteen other kingdoms of Tibetan plateau were to extract minerals, the mineral extraction from the mountains were minimum and only necessary articles were removed, deities of ordered to protect the remaining minerals in the mountain for the prosperity of humanity in future. After the collapse of great Tibet Empire and during the disintegration period, there was rush of Tibetan scholars visiting Indian Buddhist centers to revive Buddhism in Tibet in the 10th century AD.

There seem to be a deliberate attempt as early as during the Zhang Zhung civilization to forbid mineral extraction from the mountains, this could have been caused by some sort of sudden change in climatic conditions causing droughts in the vast prosperous Zhang Zhung kingdom or the Ngari region of present Tibet. This sudden drastic climate change and continues drought and desertification could have awakened people of Zhang Zhung to seek to understand the science of natural environment in which human thrive, thus giving birth to a new cultural aspect of early Bon religion which propagate the presence of earthly gods in the mountains and lakes. This belief in sacred mountains though has been elaborated beyond scientific explanation in the last thousands of years but the core of this belief could have been a deeper science of understanding the nature in its totality.

Historical evidence suggest, despite Tibetan peoples clear knowledge about the presence of abundance natural resources on the plateau and the technical skills in its extraction at some point in early history, minimum extraction was done in early periods and almost no extraction in later periods of Tibetan history until a small scale mining during the rule of 13th Dalai Lama. The cultural belief in sacred mountains has thus protected the fragile ecosystem and continues to do so, but the Chinese occupation has suddenly caused an unprecedented destructive threat to very existence of sacred mountains and the cultural belief. This is due to the fact that the land is suddenly ruled by an outsider, with no faith in the prevailing cultural beliefs and an official slogan calling for development at all cost until recent years.

China under Mao caused some of the greatest destruction to the environment trees were treated as a raw material for industry, and consequently, it is estimated that forest cover decreased in Western Sichuan from 30% in the 1950s to 14% in the 1980s (Woodhouse, 2012). Local Tibetan believe that the (Woodhouse, 2012) destruction of natural surrounding during cultural revolution (1966-1976) was so severe that even the gods had to escaped with Tibetan refugees across the Himalayas to India and returned when religious practice was allowed to revive in 1980s. As for Tibetan, they believe that if humans regularly give offerings to the deities and do not commit transgressions against the natural world, then the spirits and deities will help them gain material benefits, such as fertility, productive harvests, monetary success, or good health (Denison, 2006).

According to some of the recent studies (Miller, 2003) there has been an unprecedented loss of habitat and biodiversity in the rangelands of Tibet in the last 40 years, a considerable reduction in the number, variety, and range of wild animals. Despite new environment policies been introduced and upgraded by the Chinese government, there has been open destruction of Tibetan mountains in the name of development, environment norms and Policies rarely apply when a state owned mining company march into Tibetan areas. According to Environment & Development Desk of Tibet Policy Institute, the majority of the big investors in the Chinese mining companies are central and provincial official holding important post in various government offices, thus making the mining companies extremely powerful and arrogant. Any resistances from locals were easily suppressed and official were paid off to bend the environment norms, leading to sign of helplessness among local Tibetans. There has been more than 20 known large scale mining related protest since 2009; some of the most recent mining protest are Zatoe Mining protest on 16th August to protect sacred Mt Zachen Radri Garwa Choejed, and Driru mining protest on 24th May 2013 to protect sacred Mt Naglha Zamba. Unfortunetely, with mining and tourism declared as pillar industries in Tibetan areas; China might continue to disrespect Tibetan religious beliefs, cultural sentiments and environmental concerns.

According to the (article 10) of Mineral Resource Policies of China (Tashi); During resource extraction in ethnic minority areas, (1) the benefit the ethnic region should be looked after, (2) the resource extraction should be carried such a way that it improves the economy of the ethnic autonomous areas. It is very important to note that there are many large-scale active mining sites in various Tibetan areas without any protest or resistance from Tibetans despite no visible economic benefits to the locals. Tibetan has protested only when the mining occurs close to a village, near a river, on a grazing pasture or most importantly when it's done on a sacred mountain.

Sacred Mountains and Environment Conservation

Tibetans regard natural space as a trinity combining nature, the deities and human beings (Derong, 2007). This is the organic unification theory of the cosmic view and ecological protection in Tibetan tradition prevailing from the 9th Century B.C. to the 9th Century A.D. Such traditional customs have helped in ecological protection of the vast Tibetan plateau for thousands of years and recent scientific field researches carried out in Tibetan areas confirm it continue to do so.

According to Tibetan scholar Derong Cering Denzhub (Derong, 2007), the Tibetan ancestors' inability to understand and prevent natural calamities caused an instinctive fear toward nature. Consequently, they never dared to capture birds and beasts, damage plants, chop down forests, or exploit the mountains and lakes; this objectively resulted in protection of ecosystem. The strong influence of Buddhist teaching in Tibetan culture has greatly contributed for a healthy ecology where minimum exploitation of nature is been fervently observed. Some of the most often recited prayers read as 'Whatever living beings there be, feeble or strong, tall, stout or medium, short, small or large, without exception; seen or unseen, those dwelling far or near, those who are born or those who are to be born, may all beings be happy (Puri, 2006)'.

Tibetan habitually forbid oneself from shouting or screaming aloud when crossing Sacred Mountains, steep cliffs and dense forest, so as not disturb or anger deities which might lead to thunder storm, avalanche, blizzard or lightening (Yangkyi, 2013). Similarly hunting and cutting trees from or near a sacred mountain is strictly forbid by cultural belief and is rarely done. Traditional Tibetan culture contains a conscious awareness of environmental protection. It advocates balance between human beings and the natural environment, protection of the ecosystem, treasuring resources, and consideration of the benefits that should be left for future generations. In Tibetan history, the goal of environmental protection was achieved by means of traditional customs, moral obligations, religious beliefs and taboos, associated with unwritten routines of environmental protection to regulate people's behavior

through self-conscious effort. There have been many recent field researches on the role of sacred mountains on environmental conservation in Tibetan areas and most of the findings conclude positive role of sacred mountains in environmental conservations. Following are excerpt from different findings from various field researches carried on Tibetan sacred mountains; Sacred Sites are located at lower elevations, and closer to villages, than randomly selected, non-sacred sites, and have overall species richness (Danica M. Anderson, 2005).

The diversity of the forested region in the southeastern Tibetan plateau is particularly impressive, with about 12,000 plant species, which is a little less than half of the total for all of China (Miller, 2003). Of these, about 3,500 species (29%) and at least 29 genera are endemic Species, including about 100 endemic ferns. More than a quarter of the world's Rhododendron species in the Hengduan Mountains of western Sichuan, some 230 Species, many of which are endemic.

Religious beliefs may affect the ecology of these sacred areas (Danica M. Anderson, 2005). Resulting in unique ecological characteristic of importance to conservation; recent studies have demonstrated that sacred areas can often play a major role in conservation.

Local laws and customs often limit human activity in these areas; hunting, grazing, and logging may be prohibited or restricted, and villagers take care not to damage the natural surroundings (Danica M. Anderson, 2005).

Local Tibetan Doctors claim that many of the sacred sites in the Menri region serve to protect useful plant species, particularly medicinal plants. The result of vegetation analysis in the Menri region demonstrates that Tibetan sacred sites and landscapes may indeed play a significant role in the ecological makeup of the Mount khawa Karpo and the surrounding areas. In Tibet, the sacred tree groves extend well beyond the western limit of other forests, suggesting that sanctity and grazing restrictions may have played a role in preserving forests on the western Tibetan Plateau (Jan Salick, 2007).

The fact that sacred sites shelter significantly larger trees and greater tree cover suggest that sacred sites are effective in conserving old growth trees and forests (Jan Salick, 2007). Local customs prohibit timber extraction from sacred areas, protecting their old growth trees and forests. In Samdo local lha in the landscape can be benevolent or malevolent, and frequently unpredictable (Woodhouse, 2012). Material concerns regarding the weather, fertility and disease can all be dictated by these lha requiring attention to every-day actions and regular propitiation.

Conservationists have suggested that sacred sites represent a form of informal institution for natural resource management which may incorporate not only non-extractive norms but active protection by local communities in the form of monitoring, social sanctions and management (Woodhouse, 2012).

For generations, indigenous people have lived in natural ecosystems in which they have developed and practiced life-styles and belief systems that draw upon their deep knowledge about local plants, wildlife, and ecology (Jianchu xu, 2006). Nevertheless, the local people with this knowledge are often unable to use it in modern world in which state policy overrides local management. Increasingly, however, scientists and development planners are recognizing the importance of indigenous knowledge to biological resource management and the maintenance of biodiversity. It is increasingly clear that social context plays a major role in the success of conservation ventures; therefore, consideration of traditional stewardship and indigenous belief system is crucial (Danica M. Anderson, 2005).

Our results indicated that the sacred sites are found in more specious and diverse habitats than randomly selected non-sacred sites (Jan Salick, 2007). Our study supported the hypothesis that -in addition to their religious significance- there is a biological reason for conserving sacred sites, based on their location within habitats of ecological and ethno-botanical importance. Despite this seeming disjunction between scientific and spiritual outlooks on the Tibetan landscape, the role of sanctity in environmental conservation is clear. Sacred site conservation has guided local environmental stewardship for millennia, it is this continued stewardship that will ultimately determine the future of this biodiversity hotspot.

Conclusion

The Tibetan view on nature is a highly complex and profound; it reflects historical, cultural, religious and philosophical beliefs that requires more than just academic and field research, it requires a humanly approach to understand how Tibetans perceive their surroundings. And this belief in sacred mountains should not be viewed as dichotomies of 'modernity' and 'tradition', instead it should be appreciated as an ancient cultural practice that has immensely contributed in environment conservation and sustainable way of life for the last thousands of years. This tradition if respected and understood could continue to protect the fragile ecosystem of the world's largest plateau, which is home to world's greatest rivers, highest peaks and largest glaciers.

One of the biggest causes for large-scale protest in Tibetan areas in recent years has been mining on sacred mountains. For Tibetans, this is an absolute disregard for ethnic sentiments and disrespect for cultural rights and values. According to

Tibetan Autonomous Region's 2007 official release there are 300 mining company listed but actual number is more than 600, number of mining company in Lhasa is almost same as number of cloth shops (Tashi).

Therefore Chinese government need to put ethnic Tibetan official in charge of issuing Mining license to Tibetan areas, most importantly local Tibetan should be consulted prior to issuing mining permits without threats and intimidation, a thorough scientific assessment need to be conducted by scientists with no financial links to any mining companies. Chinese government in recent years have taken many welcome steps in declaring more and more nature reserves, such efforts could be strengthened further if Tibetan cultural beliefs are respected and incorporated into policies. For example; Tibetans have been able to successfully forbid natural exploitation flora and fauna on the sacred mountains because each individual felt as part of the whole nature. But new nature reserves require stern enforcement and constant vigil which is lacking, there are instance of nature reserve policies been altered in places like Sanjiangyuan nature reserve where the Zatoe Mining protest occurred on august 2013. According to the Land Resource management rules of China if mining or resource extraction needs to be done on a grazing land, than the permission or consent from the land owner or land user must be obtained accordingly (Tashi). Concern authorities in China need to make constant surveillance on mining companies and local governments to see if such rules are observed. This would help gain trust of the local Tibetan who have long felt helplessness in protecting their land from powerful mining companies in collaboration with local government officials.

As the 14th Dalai Lama of Tibet emphasis that with thorough understanding of one's existence among all, the avoidance of cruelty to other living creatures, no exploitation of nature beyond the limit of one's survival, and with right aspiration and conduct-most environmental problems of today can be solved (Puri, 2006).

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THE WORLD'S THIRD POLE IS MELTING

How can Asian countries survive without Tibetan glaciers and water?

The Tibetan plateau, which holds the Hindu Kush Himalaya (HKH) ice sheet, is known as the world's 'Third Pole'. It holds the largest number of glaciers and snow after the Arctic and Antarctic. The Tibetan plateau has more than 46,000 glaciers, 14.5 percent of the world's total. These glaciers give birth to Asia's major river systems—the Indus, Sutlej, Brahmaputra, Irrawaddy, Salween, Mekong, Yangtze, and Yellow Rivers that provide lifelines to many countries and support a population of around 2 billion people. But due to climate change, the Tibetan plateau's glaciers are depleting faster than anywhere else on earth. The loss of Tibetan glaciers means the loss of livelihood for the people who are dependent on these rivers — over a quarter of the world's total population.

Under the International Center for Integrated Mountain Development (ICIMOD), experts from different regions have come together to develop the first Hindu Kush Himalayan assessment report, which was released on January 5, 2019 (Philippus Wester, 2019). The report corroborates a 2014 report by the International Panel on Climate Change (IPCC) showing that as temperatures rise with climate change, at least one-third of the Hindu Kush Himalayan glaciers will be depleted by 2100, even if global warming is held at 1.5 degrees Celsius. This report has received much media attention due to its alarming scientific findings of glaciers melting on the Hindu Kush Himalayan region, which would, in turn, would impact the overall water, energy, and food security in the region.

Impact of Glacier Retreat on Water Resources

Glaciers on the Tibetan plateau play a key role in supplying perennial water for many countries. But there is a growing concern about the impact of glaciers melting on the Tibetan plateau and the availability of water in the region.

The Tibetan plateau has seen an increase in temperature of approximately 0.3 degrees Celsius every 10 years. This means that over the past 50 years the temperature has increased by 1.3 degrees Celsius, which is three times the global average. If this current trend continues, many Chinese scientists believe that 40 percent of the plateau's glaciers could disappear by 2050. Scientists from the Chinese Academy of Sciences (CAS) also predict that temperature on the plateau will increase by up to 4.6 degrees Celsius by the end of the century (Chinese Academy of Sciences, 2015). Professor Liu Shiyin, who led a survey on these glaciers, said that retreating glaciers will release meltwater and create lakes, and ultimately it will lead to disaster

(K, 2015). As a unique and high plateau, the Tibetan plateau is highly sensitive and vulnerable to global climate change. In the past few years, the Tibetan plateau has seen a record number of floods, landslides, and mudslides as well as increases in lake volume in different parts of Tibet.

The impact of natural disasters on the Tibetan plateau is not only restricted to the plateau, but it has consequences far beyond it — for example, in a downstream country like India. The entirety of agriculture in northern India is highly dependent on rivers originating in Tibet and any changes in the flow of these rivers will have significant consequences. Then there are also extreme events such as glacier lake outburst floods (GLOF) that could pose an immense danger for many countries. In October 2018, debris blocked the flow of Yarlung Tsangpo River in Tibet, which threatened downstream India and Bangladesh with flooding.

The melting of glaciers will initially cause more floods in the region until they melt completely, providing more water in the short term. But in the long run, with depleted glacial ice, a runoff will be dramatically reduced. Many scientists predict that the quantity of runoff water from melting glaciers is likely to increase at least until 2050, and then it will decrease. The Voice of America (VOA) quoted a former researcher of the Chinese Academy of Science who wanted to remain anonymous (Dorje, 2015). In the interview, he said, “Diminished glacial runoff had already reduced water levels on the Yangtze and Yellow river”.

An average of 247 square kilometers of glacial ice has disappeared every year since the 1950s (Chinese Academy of Sciences, 2015). Continued shrinking of glaciers will affect runoff and water resources downstream, then it will induce water scarcity.

Moreover, in addition to climate change, the unregulated construction of Chinese dams and canals might further exacerbate the impact of climate change and increase the problem of water scarcity. With China’s ambition to reduce carbon emissions by developing clean energy, China is likely to build more dams along transboundary rivers. Geostrategist Brahma Chellaney writes: “China, by building increasing control over cross-border water resources through hydroengineering structures, is dragging its riparian neighbors into high-stakes games of geopolitical poker over water-related issues” (Chellaney, 2017). Hence, Tibet’s water resources have become an increasingly crucial strategic, political, and cultural element that the Chinese are intent on managing and controlling.

With a large proportion of the region’s population already living in poverty and dependent on natural resources for food and livelihood, limiting access to fresh water will push the entire region deeper into vulnerability.

Conflict and Water Scarcity

China has control over Tibet, ‘the Water Tower of Asia’, and thus the future of Asia’s water lies in China’s hands. China, a water scarce country due to uneven distribution of water resources, is facing considerable pressure on water resources to meet its own industrial growth, urbanization, and population growth.

China is expected to face a 25 percent supply gap on projected water demand by 2030, with two-thirds of its cities already facing difficulty in accessing water. In 2006, a World Bank working paper on water scarcity claimed that ‘China will soon become the most water-stressed country in East and Southeast Asia’.

Moreover, China is facing domestic water conflicts, mainly on issues like inter-jurisdictional water pollution and hydropower dam construction. These domestic water conflicts and water scarcity could provoke civil unrest. Therefore, these concerns might compel China to utilize transboundary rivers to meet its water scarcity challenge. The development of water infrastructure projects on Tibet’s transboundary rivers has already infuriated many downstream countries and triggered international criticism. For example, China’s construction of hydroelectric dams along the Brahmaputra River has become a source of friction between China and India. China has also dammed the upper Mekong River, which has become a major source of conflict between China and Southeast Asian countries.

There is no formal agreement between China and downstream countries over the use of shared river systems. By 2025, water scarcity is predicted to affect 1.8 billion people, particularly in Asia. Therefore, any alteration to the flow stemming from Tibet could have dire consequences for all. These reports add another concern and challenges to the region. As the volume of water decreases, the likelihood of conflicts between China and downstream countries is likely to increase. Chellaney predicted in 2011 that these rivers are destined to become ‘Asia’s new battleground’ (Chellaney, *Water: Asia’s new Battleground*, 2011).

Many scholars and experts have warned about possible future “water wars” between China and India, and the same dynamics could play out in Southeast Asia. The key to mitigating transboundary water conflicts and advancing water cooperation in Asia is largely in the hands of China. It is a time to recognize Tibet’s importance to regional security. The ICIMOD assessment report is one of many reports confirming the melting of glaciers on the Tibetan plateau, which could cause significant disruptions to future water scarcity (Philippus Wester, 2019). To effectively address the impacts of climate change on the Tibetan plateau and transboundary water conflict, there is a need for a regionally integrated approach to water resources management.

If unsustainable practices and mismanagement of water resources are not addressed, fresh water will become a precious commodity, the control of which could spark conflicts in Asia. Mistrust over shared rivers remains high between China and its neighbors. If China and the rest of the continent want to turn potential water conflict into constructive engagement, then a water dialogue is necessary.

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CHINA'S 60 YEARS OF ENVIRONMENTAL DESTRUCTION IN TIBET

The Tibetan Plateau with an area spread of 2.5 million square kilometers, was perceived as 'one great zoological garden' by early explorers to the region, such as Francis Kingdon - Ward, a British botanist and explorer, who conducted several surveys in Tibet before the First World War. The cultural way of life in Tibet, which was greatly influenced by both Bon and Buddhist traditions, strictly forbade the general public from commercial hunting. Successive rulers in Tibet issued strict edicts to ban hunting at several ecological sites during various periods of its history. Prior to Chinese occupation in 1950s, there were numerous accounts of seeing large herds of wild animals by early western explorers, Tibetan merchants and pilgrims travelling through the vast northern grasslands of Tibet. Captain C. G Rawling wrote (Rawling, 1905) that he saw herds of thousands upon thousands of Tibetan Antelope with their young as far as his eyes could reach, possibly not less than 15,000-20,000 visible at one time. Leonard Clark, an American adventurer in the forties reported that he spotted a bear, a wolf, herd of musk deer, Kiang (wild ass), gazelles, big horned sheep or foxes. Describing the sighting as 'one of the last unspoiled big game paradises' (Clark, 1954).

Environmental conservation efforts were carried out on a large scale as early as during the pre - imperial period (7th to 9th Century) in the Shangshung region, where the Bon belief in the presence of deities in the mountains and lakes came into practice. The conservation efforts were further strengthened by Songtsen Gampo, the 33rd emperor of the Tibetan empire, in the 7th century. The emperor issued edicts forbidding his subjects from harming and killing animals. The founder of the Phagmodrupa Dynasty in Tibet, Tai Situ Changchub Gyaltsen (1302-1364), enforced an ingenious policy of planting 200,000 trees annually and appointed a forest officer to protect the newly planted trees. Similarly, successive rulers in Tibet like the 5th Dalai Lama and the 13th Dalai Lama issued strict prohibitions on hunting and felling of trees at important ecological sites.

But, as the People's Liberation Army (PLA) marched into Tibet from three separate Sino-Tibet border fronts in 1950s, Tibet began to witness unprecedented environmental destruction across the plateau and a sudden disruption in its age-old tradition of causing minimum harm to the natural environment and its wildlife inhabitants. This particular section will focus on five environmental issues in Tibet in order to give a quick glimpse into 60 years of China's environmental destruction in Tibet.

Reality in Tibet and China's Lack of Understanding

China's White Paper 'Democratic Reform in Tibet—Sixty Years On' (The State Council Information Office of the People's Republic of China, 2019), was released on 27 March 2019 to mark the 60th year of Chinese occupation of the Tibetan plateau and suppression of the Tibetan people.

A brief chapter on Tibet's ecology in the Chinese White Paper on Tibet once again highlights Beijing's absolute lack of understanding of Tibet's history and its unwillingness to go beyond official government documents that remains dubious and manipulative of ground reality. With a blatant display of colonial arrogance, the paper states: "In old Tibet, with an extremely underdeveloped economy, people could only adapt to the natural environment—they used whatever they could to exploit from nature." Such narrative out rightly undermines Tibet's glorious history and overlooks Tibetan people's environmental conservation efforts of thousands of years. In reality, it was Tibetan people's belief in the sacredness of its natural environment coupled with their profound wisdom and skill to co-exist harmoniously with its surrounding environment that has helped in the conservation of the world's highest plateau until the Chinese occupation in 1950s. Historically, Tibetans have not only protected and respected their environment, but also have successfully adapted to the ever-changing climatic conditions of the plateau, thus enabling them to prosper on the world's highest plateau as a successful civilization, powerful empire and complex society.

Numerous scientific studies in recent years have affirmed the positive role of Tibetan people's cultural beliefs (Danica M. Anderson, 2005) in preserving the sacredness of important ecological sites (Jan Salick, 2007), as the environment for the most part was left undisturbed. Persistent efforts were made to further strengthen the culture of environmental protection by the then local and national rulers. Religious leaders and institutions played a major role in propagating the importance of ecological well-being for a healthy and prosperous community.

China's Invasion and the Sudden Decrease in Tibet's Wildlife

Many elderly Tibetans, who fled Tibet during the invasion in 1950s, had seen herds of wild animals slaughtered by People's Liberation Army (PLA) as the Chinese soldiers rained bullets on the animals from their machine guns. Such a large scale hunting practice of wild animals was utterly alien to the people of Tibet. Unfortunately, PLA soldiers stationed in Tibet, in order to sustain themselves on the Tibetan plateau continued to engage in similar large-scale mass hunting. According to eyewitness accounts, despite strong objection from local Tibetan communities, some Chinese officials used dynamites in rivers and lakes to instantaneously kill hundreds of fish.

Such practice deeply hurt the Buddhist sentiments of the Tibetans and drastically polluted local drinking water. Chinese government authorities in Tibet issued in 2006 and 2011, licenses for the commercial hunting of rare animals (Si, 2011) and many officials engaged in hunting for leisure. Such government attitude encouraged large - scale illegal poaching across Tibet in 1980s and early 1990s. Some emboldened poachers even killed Sonam Dhargye in 1994, a prominent wildlife conservationist, seeding fear and anger among the local community (Kyap, 2011).

In a brazen case of hypocrisy and insincerity, the Chinese government opposed His Holiness the Dalai Lama's call for Tibetans to abandon the tradition of wearing animal skins and fur decorated dresses in 2006. The increasing popularity of the dress is said to have led to a huge trafficking of animal skin products into Tibet from the Indian Subcontinent. Like many Tibetan scholars who have long opposed this practice, some environmentalists in India, such as Belinda Wright, the Executive Director of Wildlife Protection Society of India (WPSI) also voiced concern over this issue (Wildlife Protection Society of India, 2005). Fortunately, the H.H. the Dalai Lama's call, which was made during the Kalachakra in Amravati 2006, received instant mass reaction from Tibet despite the immense popularity of the dress in the region. Tibetans en masse burnt their expensive dresses (Spencer, 2006) and vowed to end the tradition of wearing dresses decorated by animal skins and furs. The popular movement was considered to be one of the greatest contributions to wildlife protection in Tibet post Chinese occupation. But the Chinese government, in contrary, encouraged and enforced government officials (Gaphel, 2015) and local community to continue with the practice of wearing animal fur-decorated dresses, especially at public functions and government meetings, punishing those who refused to follow the order.

China's State-logging Enterprises and Excessive Deforestation in Tibet

Until 1949, Tibet's forest cover, predominantly found in eastern Amdo, south-eastern Kham and Kongpo region of southern Tibet, was one of the oldest reserves in all of Central Asia. Some scientists have compared Tibetan Plateau's known biodiversity to that of the Amazon Rainforest (Environment & Development, 2000, pp. 1-18). But the invasion of Tibet opened-up the region to ambitious Chinese state-logging enterprises. China has been one of the largest consumers of timber in the world and it inflicted an unprecedented scale of deforestation across the region. Tibet's forest cover was reduced to 13.57 million hectares from 25.2 million hectares; about 46% reduction between 1950 and 1985 (Environment & Development Desk, 1992). The alarming scale of logging in many parts of south-eastern and north-eastern part of Tibet was one of the factors that led to the 1998 Yangtze flood and the 2010 Drukchu flood (Zong Yongqiang, 2000).

1998 Yangtze Flood The 1998 Yangtze flood in China was one of the worst floods in 44 years at the time. According to China's official estimate, the flood killed more than 3,000 people, displaced 15 million and affected 223 million – almost one-fifth of China's population at the time (UN office for the Coordination of Humanitarian Affairs, 1998). A post-disaster study by Chinese scientists put excessive logging in the Yangtze valley, particularly in the Tibetan areas, as one of the primary causes of the massive flood.

According to a report published by the United Nations Disaster Assessment and Coordination Team in 1998: the cause of the disaster is excessive rainfall, which, according to Chinese meteorologists was ascribed to the worldwide El Niño phenomenon followed by La Niña; the melting of lasting and deep snow accumulated in the Qinghai-Tibet plateau in the south-west of China; a weak Asian monsoon; unusual sub-tropical high pressure systems on the West Pacific Ocean; and a decrease in the number of typhoons. According to Chinese government officials, the disaster was also due, in part, to rampant deforestation, causing serious soil erosion, and, in turn, silting (UN office for the Coordination of Humanitarian Affairs, 1998).

Some 70 state - logging enterprises have cut a total of 120 million cubic metres of wood from the forest of eastern Kham, generated over 2 billion Yuan (US \$241 million) in taxes and profits between 1949 and 1998 (Environment & Development Desk, 2000, pp. 53-57). The extensive and unsustainable industrial logging continued until the disastrous 1998 Yangtze flood, but large-scale deforestation still continues in many parts of Kongpo. This might have led to some of the recent floods and landslides in the region in recent years (2014, 2016, and 2018). Tree logging was a major source of employment in Tibet. For instance, in the Kongpo region alone, over 20,000 Chinese soldiers and Tibetan prisoners were involved in tree felling and transportation (Environment & Development Desk, DIIR, 1992, pp. 47-50). The scale of logging in Tibet was also highlighted by ICIMOD in their latest report 'The Hindu Kush Himalaya Assessment' (Philippus Wester, 2019). The report states that the warm-temperate coniferous forest has nearly disappeared from the south-east Tibetan Plateau, mostly due to commercial logging before the end of 1990s. The consumption of timber in China increased by nearly 18% to 192.5 million cubic meters between 2013 and 2017 as per a report by Market Watch (Market Watch, 2019).

Drukchu Flood in 2010 On 8 August, 2010, landslides and mud-rock flow brought about by heavy rains, occurred in the Drukchu area of Amdo in north-eastern Tibet. As per Chinese official reports (China.org, 2010), the mud-rock flow leveled a region spanning 5 km in length, 300 meters in width and 5 meters in depth in the county seat with more than 2 million cubic meters of mud and rocks flowing down the valley. This severely damaged the power, telecommunication and water supply

in the region. The mudslides destroyed more than 300 homes and damaged another 700 (China Daily, 2010).

Local residents have blamed regional Chinese government for excessive logging in the valley as the primary cause for the massive flood. The forest was being cleared to build 156 hydropower stations along the river valley as part of a new policy issued in 2005 to exploit the Drukchu River (Environment & Development Desk, 2016). Similar conclusion were also echoed in a paper published by the Journal of Geophysical Research (Diandong, 2014). The paper stated that the massive Drukchu landslide of August 2010 was caused by extreme precipitation, magnified by the Wenchuan earthquake of May 2008 and the severe loss of vegetation cover in the Drukchu region.

Sudden Disruption of Nomadic Lifestyle

Tibet's rangeland covers approximately 70 percent of its total area. The alpine grassland at high altitude in turn covers 60 percent of the total Tibetan rangeland. Pastoralism on the Tibetan Plateau involves adaptation to a cold environment at elevations not suitable to cultivation. According to archaeological fieldwork, pastoral nomads have developed a deep understanding of grassland dynamics and veterinary knowledge while maintaining a unique pastoral culture for more than 8,000 years (Miller, 2008). However, according to a report by the Human Rights Watch in 2013, more than 2 million (Human Rights Watch, 2013), mostly nomads, were forcibly removed from their traditional grassland habitat between 1995 and 2015 and fenced into poorly planned re-settlement villages. The Chinese government blamed pastoral nomads for grassland degradation and desertification in the north-eastern regions of Tibet. With the sudden disruption of their age-old self-reliant nomadic way of life, the nomads were left completely destitute.

The Chinese government's policy of erecting fences to bar nomads from entering into their pasture areas has led to further degradation of the grasslands. The Chinese government's motive all along has been to seize land and use it for their own exploitation. With the rate that China is tampering with the fertile grasslands for mining, the consequential harm being caused to the ecosystem is immense.

The Chinese claim of engineering social wellbeing and economic development for the nomads by creating new resettlement villages are contrary to the reality faced by the resettled nomads (Gongbo Tashi, 2012). Resettled nomads have no access to medical, educational, or business opportunities to support themselves. Looking back at Tibetan history, nomads were integral to the upkeep of Tibetan grasslands; they had a prospering co-dependent relationship with the ecosystem.

The lack of jobs and educational opportunities in the resettled areas have pushed the nomadic population into the margins of the society where they are compelled into alcoholism with their children engaging in petty crimes (Tibetan Centre for Human Rights and Democracy, 2015).

Mega-dams on Tibetan Rivers and Increasing Risks

The claim in the Chinese White Paper (2019) that ‘currently all the major rivers and lakes in Tibet remain in their natural state’ stands in stark contrast to the reality on the ground. According to ‘The Last Report’, on all major Tibetan rivers, the Chinese government has either constructed, are actively constructing or have proposed plans to construct cascades of dams (Li Bo, 2014). Mega-dams are being built in Tibetan areas to power Chinese cities and accelerate large-scale resource extraction across Tibet. Damming of rivers have huge consequences on the ecosystem, people and the nations downstream. Mega-dams have great capacity to harm the environment and the ecosystems that support life on the Tibetan Plateau. Dams interrupt the flow of silt and the migration and breeding of fish as well as kill plants and trees, cause floods and landslides and reduce biodiversity.

There have been cases of Reservoir-Induced Seismic (RIS) activities caused by dams in China. According to a Probe International Report authored by Fan Xiao, a Chinese geologist, the 2008 Wenchuan Earthquake and the 2014 Ludian earthquake were induced by two nearby dams, the Zipinpu Dam and Xiluadu Dam. The report states (Xiao, 2012): the epicenter of the Wenchuan earthquake, which estimated to have killed more than 85,000 people and left 5 million without homes, was mere 3.5 miles away from the Zipingpu Dam. The Dam – a 510-foot-high wall with a reservoir holding 315 million tons of water – was built on top of a major seismic fault zone. The weight of the reservoir could have produced the earthquake or exasperated a smaller earthquake.

However, Chinese officials refuted the probability of the two occurring co-dependently. Unfortunately, dams being constructed in the Tibetan areas are located in moderate to very high seismic hazard zones as the Plateau is highly prone to seismic activities (Deng Qi-Dong, 2014). Despite making amendments to strengthen China’s Environmental Impact Assessment Law¹ in 2003, dams are being built rapidly without proper environmental impact assessment (EIA) and consultation with the local community. For instance, the construction of the Lianghekous dam, on the Yalong River in the Nyakchu area of southeastern Tibet,

1. Adopted at the 30th Meeting of the Standing Committee of the Ninth National People’s Congress on October 28, 2002, promulgated by Order No. 77 of the President of the People’s Republic of China on October 28, 2002, and effective on September 1, 2003.

will lead to the displacement of about 6,000 Tibetans in the area. According to reports, the massive project, said to become the third tallest dam in the world once completed in 2023, will submerge ancestral homes, Buddhist monasteries, fertile crops and sacred mountains as far as 100 kilometers upstream from the dam site (France-Presse, 2017).

River Water Pollution from Toxic Mine Waste

Some of China's greatest cultures, histories and economies flourished on the banks of the Yellow and Yangtze Rivers, which originate from the melting glaciers and permafrost of Tibet and continue to feed millions in China as they flow parallel to each other across almost all of China's provinces. It's clear that the ecological health of the Tibetan plateau is vital for a stable social, economic and environmental well-being of China. But as per a Chinese official report, over 40 percent of China's rivers are seriously polluted and about 20 percent of rivers are so excessively polluted that their water quality has been rated too toxic even to come into contact (Jian, 2012). Three-quarters of its lakes and reservoirs are unsuitable for human consumption and fishing (China Water Risk, 2010).

Systematic and large-scale mining in Tibet began in the 1960s with the expansion of Chinese presence in Tibet. China began surveying for mineral deposits in Tibet from the very onset of its occupation. Most of China's infrastructure development in Tibet is aimed at speeding up of large-scale resource extraction. The destructive and unethical methods of China's mining practices have led to protests and disharmony across Tibet. Since 2009, there have been more than 30 known large-scale public protests against mining in Tibet as Chinese mining companies continue to destroy grassland and pollute rivers.

Minyak Lhagang Water Pollution

A lithium mining company called Ronda Lithium Co Ltd released toxic mine waste into a local river called Lichu in Minyak Lhagang in eastern Tibet, causing serious water pollution and mass death of fish (Palden, 2016). This brought hundreds of local Tibetans out on the street on May 4, 2016 in protest against the mining company (Denyer, 2016). The local government informed the protestors that it had temporarily halted the mining activities, but local Tibetans soon realized that the government had lied to them as operation continued at the mining site. This was not the first or an isolated case of river water pollution (Voice of America , 2016). The same river had been polluted with lithium mine waste back in 2013, causing death of aquatic animals and threatening local drinking water.

Dolkar Village Water pollution

In a similar case on September 23, 2014, in Dolkar and Zibuk villages of Lhundrup County near Lhasa, more than 1,000 local Tibetans protested against the poisoning of their river by the Gyama Copper Poly-metallic mine (Radio Free Asia, 2014). The mine is located close to a river that locals use for drinking water, irrigation and feeding animals. Predictably, local officials declared that the water pollution in the river was caused by natural factors and not by the mining company. But according to an article published in 2010 by Xiang, a Chinese scientist firmly stated that many mining and processing sites in the valley pose a great environmental concern as the deposits contain large amount of heavy metals, such as lead, copper, zinc and manganese etc. The article further stated that the deposits are prone to leak its contaminants through seepage water and erosion of particulates, posing future risk to the local environment and to the downstream water quality (Xiang Huang, 2010).

A local resident of the village told Radio Free Asia in September 2014 that, “In the past, our rivers were crisp and clean, the mountains and valleys were known for their natural beauty”. But “now the rivers are polluted with poisonous waste from the mines” (Radio Free Asia, 2014). This is a clear indication of the scale of environmental damages infused by mining activities across Tibet.

China Earning Billions from Mining in Tibet

China claims that they are spending millions on environmental conservation projects in recent years, but they have earned billions more from mining and other resource extraction activities in Tibet. According to China Gold International’s 2018-2019 Year-End Report (China Gold International Resource Corp, 2019), the copper production from the Jiama (Gyama) Mine increased from 35,844 tons (approximately 79.0 million pounds) to 55,025 tons (approximately 121.3 million pounds), exhibiting an increase of about 54% in production from 2017 to 2018. Gold production increased to 70,262 ounces compared to 47,710 ounces in the same period. The report also stated that the revenue increased by 22% to US 163.0 million from US\$133.3 million.

The Chinese Geological Survey in 2007 estimated that the Tibetan Plateau holds about 30-40 million tons of copper reserves, 40 million tons of zinc, and several billion tons of iron (China Daily, 2007). The proven reserve of more than 7.8 million tons of copper at the Yulong Copper Mine makes it the largest in China and the second largest in Asia.

Conclusion

The primary goal of China's development projects in Tibet, as shown during its 60 years of occupation, is to facilitate resource extraction, mass migration and fuel China's economic development. The Chinese governments has been heavily investing in the Nyingtri Prefecture in Southern Tibet, resulting in massive construction activities along the Yarlung Tsangpo/Brahmaputra River valley. Even though China claims to opening-up of the isolated region to development, the real motive behind the billion dollar investment is to facilitate the eventual mass migration of Chinese into the Nyingtri region of Tibet. Nyingtri, a sparsely populated and resource-rich region that enjoys a temperate climate with immense forest cover, could be seen as an ideal place for Chinese migrants but possibly leading to both the destruction of its natural environment and further marginalization of the local Tibetan population.

While the Chinese state-owned companies continue to make billions from mining, damming, logging and tourism activities across Tibet, the scale of environmental destruction on the Tibetan plateau in the past 60 years has been unprecedented in its long history.

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THE TIBETAN PLATEAU: ITS'S CURRENT ENVIRONMENTAL SITUATION

The Tibetan culture and way of life are greatly influenced by the climatic condition of the land. Tibetans have always strived to protect and respect the environment in which they reside. They have not only adapted successfully to the ever-changing climatic condition of the plateau but have also prospered as a powerful civilization. Tibetan people's engrained knowledge of their ecosystem is a treasure overlooked by the international community. The ancient Bon culture of Tibet, which believed in the presence of deities in the mountains and lakes, gave rise to belief in the sacredness of the ecosystem and the subsequent conservation of the fragile plateau for thousands of years. During his reign in the 7th century, Songtsen Gampo, the 33rd emperor of Tibet, issued edicts that reprimanded his subjects for harming and killing of animals. The founder of the Phagmodrupa Dynasty in Tibet, Tai Situ Changchub Gyaltsen (1302-1364), issued similar edicts that prohibited hunting on various occasions and enforced ingenious policies of large scale tree plantation in central Tibet. Forest officers were appointed to protect the 200,000 trees planted annually. Environmental conservation efforts were further strengthened during the Gaden Phodrang rule (1642-1959) in Tibet. Both the 5th Dalai Lama and the 13th Dalai Lama issued strict prohibitions on hunting and the felling of trees at important ecological sites. Protection of the environment has also been a lifelong commitment of His Holiness the 14th Dalai Lama, a strong advocate of environmental conservation.

Until 1949, Tibet's forest cover were one of the oldest reserves in all central Asia, predominantly found in eastern Amdo, south-eastern Kham and Kongpo region of southern Tibet. But the invasion of Tibet opened up the region to hungry Chinese state-logging enterprises. China has been one of the largest consumers of timber in the world, it inflicted unprecedented scale of deforestation across the region. Tibet's forest cover was reduced to 13.57 million hectares from 25.2 million hectares, about 46% reduction between 1950 and 1985. The horrifying scale of logging in some part of Tibet lead to the 1998 Yangtze flood in China and the 2010 Drukchu flood in Tibet. The Tibetan Plateau was perceived as 'one great zoological garden' by early explorers to the region. Some scientists have compared its known biodiversity to that of Amazon Rainforest. The cultural way of life in Tibet, which was greatly influenced by both Bon and Buddhist traditions, as mentioned above, strictly forbid general public from commercial hunting. Successive rulers in Tibet issued strict edicts to ban hunting at several ecological sites during various periods of its history. Prior to 1950s, there were innumerable accounts of Tibetan merchants and pilgrims

travelling through vast grasslands of the northern plains, seeing large herds of wild animals. But with the Chinese occupation, Tibet witnessed sudden disruption in its age-old tradition of causing minimum harm to the natural environment and its wild life inhabitants. Many elderly Tibetans in exile have been eye-witness to People's Liberation Army (PLA) engaging in hunting practices employing machine-guns to hunt herds of wild animals during the invasion. Some PLA soldiers stationed in Tibet after the occupation often use dynamite in rivers and lakes to instantly catch hundreds of fish, a practice that Chinese officials followed even in 1990s despite strong objection from local Tibetan communities.

The Global Ecological Role of the Tibetan Plateau

The ecological role and global significance of the Tibetan Plateau is evident from the various names used by scientists to describe the Tibetan Plateau: the 'Roof of the World', the 'Third Pole', the 'Water Tower of Asia' and the 'Rain Maker'. The plateau at an average elevation of more than 4,000 meters above sea level with an area of 2.5 million square kilometers, is almost 2% of earth's land surface, which makes it the world's highest (Shichang Kang, 2010) and largest plateau. Thus it is popularly known as 'the Roof of the World'.

The Tibetan Plateau, with 46,000 glaciers, covering an area of 105,000 km, is also referred to as the 'Third Pole'. It is the largest source of accessible fresh water on the planet and the third largest reservoir of ice after the North and South Poles. The plateau is the head source of Asia's six largest rivers: the Driчу/Yangtze, Machu/Yellow, Zachu/Mekong, Gyalmo Ngulchu/Salween, Senge Khabab/Indus and Yarlung Tsangpo/Brahmaputra. These rivers from the Tibetan Plateau or 'the Water Tower of Asia' feed millions of lives in some of the most-densely populated nations in the world including Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam, and China. The melt water from the 12,000 km³ of glaciers in Tibet ensures a constant flow of Asia's major rivers, thus greatly influencing the social and economic development of a fifth of the world's population (UNESCO-SCOPE-UNEP, 2011).

The timing and intensity of the Indian monsoon and the East Asian monsoon are greatly influenced by climate change on the Tibetan Plateau. Even the worsening heat waves in Europe and northeast Asia are linked to the receding snow cover on the Tibetan Plateau (Zhiwei Wu, 2016). According to a paper by Cui Xuefeng, the Indian summer monsoon is intensified and the East China summer monsoon is weakened due to human-induced land cover change on the Tibetan Plateau (Xuefeng Cui, 2006). Therefore the plateau is 'the Rain Maker of Asia'. The ecological health of the Tibetan Plateau is absolutely vital for a stable social,

economic and environmental well-being of China. Some of the greatest aspects of Chinese culture, history and economy flourished on the banks of Yellow and Yangtze Rivers, which originate from the melting glaciers and permafrost of Tibet. The two rivers continue to feed millions in China as they flow parallel to each other across most of China's provinces.

Climate Change and the Tibetan Plateau

The unprecedented pace of global temperature rise has brought in extreme climatic conditions across the world. The impact has been much more extreme on the Tibetan plateau, causing unprecedented natural disasters due to rapid glacial retreat, permafrost degradation and extensive desertification.

Rapid Glacial Retreat

The Tibetan Plateau is home to 46,000 glaciers, making it the largest concentration of ice beyond the two poles. But the Third Pole is melting at an alarming rate, primarily due to rapid temperature rise. A temperature rise of up to 0.3°C per decade has been recorded in Tibet since the 1950s. This is twice the average rise in the global temperature. Such an increase has not only resulted in the melting of more than 82 percent of the glaciers (Qiu, 2008) but has also heated the plateau to the extent that there has been no net accumulation of ice since the 1950s (Kang, 2015). It has also been observed by Xu Baiqing of the Institute of Tibetan Plateau Research that the summers come faster, forcing the melting seasons on the plateau to begin earlier and last longer. Scientists have warned that if the current rate of melting continues, Yao Tandong, director of Tibetan Plateau Research, had warned in 2007 that 2/3 of the remaining glaciers on the Tibetan Plateau would be depleted by 2050 (Gardner, 2009).

Extensive Permafrost Degradation

The rising temperature is also melting the vast permafrost coverage of the Tibetan Plateau. Around 70% of the plateau is covered by various type of permafrost, mostly alpine permafrost due to its high altitude (Environment and Development Desk, 2009). The permafrost, when it melts moderately during the summer months, nurtures the growth of vegetation on the rain-scarce Tibetan Plateau. This process has sustained life on the vast grassland across much of north and north-eastern regions of Tibet. But there has been rapid permafrost degradation and large-scale grassland desertification and mudslides. Recent landslides in Machen (30 August 2017) and mudslides in Zatoe (7 September 2017) are a clear indication of the severity of the rate of permafrost thawing. As frozen grounds quickly thaw across Tibet due to rising temperature on the plateau, it releases a large quantity of

melt-water into the surface soil, which results in the loosening of the ground and causes mudslides. The Chinese government has yet to put forth adequate policies to prevent such disasters recurring in future. Another threat from rapid permafrost degradation is the release of carbon into the atmosphere. About one third of the world's soil carbon is stored in permafrost regions. It is estimated that the alpine permafrost on the Tibetan Plateau stores about 12,300 million tons of carbon (Desk, 2009). The permafrost on the Tibetan plateau is warm-permafrost, which is sensitive to climate change and particularly vulnerable to warming temperatures. Any degradation would lead to a huge amount of carbon entering the atmosphere, which would further intensify the rising temperature across the globe.

Tibet experiences increasing number of Natural Disasters

The year 2016 saw an unprecedented number of natural disasters in a short span of time. Mud floods and landslides on 9 July in Tsolho in northeastern Tibet killed two people and injured more than thirty. Drought in Chumarleb and Matoe on 10 July in central-north Tibet left behind dry rivers with hundreds of dead fishes. A glacial avalanche on 17 July in Ruthok County of Ngari in western Tibet killed nine people and buried 110 yaks and 350 sheep (Nasa Earth Observatory, 2016) (NASA visible earth, 2016). A flood in Labrang and Sangchu on 22 August in northeastern Tibet destroyed significant amounts of property. Tibet suffered even more extreme natural disasters during July 2017. More than 6,000 homes were flooded, affecting 30,000 people in Rongdrak on 15 June. Four homes were damaged by floods in Sokzong on 16 June; many homes were damaged by floods in Dege on 6 July; and three people lost their lives and many homes were damaged by floods in Jomda in eastern Tibet in the month of July. Local Tibetans are worried about the new trend of frequent natural disasters. It is a trend that scientists, researchers (Zamlha, 2016) and the general public in Tibet fear might become the 'New Normal in Tibet'.

In 2018, extreme climatic pattern continued with floods and landslides reported in many parts of Tibet, particularly in Shigatse areas (Shigatse, Sakya, Rinpung, Ngamring) of Central Tibet and different parts of Amdo region of Tibet in the months of July and August 2018. In a horrifying video (July 2018) from Tibet, nomadic homes were seen flooded as large portion of their summer pasture in Amdo were inundated due to heavy rainfall. The lack of rescue support from the Chinese government forced the nomads in the area to make extremely risky efforts. For example, in the same video, a man on a horse is seen pulling a woman and her baby, both wrapped in a plastic bag, through the flooded field to safety.

A twin landslide (October 11, 2018, November 3, 2018), close to each other, occurred in Jomda and Palyul area of eastern Tibet. Initially blocking the Drichu

(Yangtze River) for days, submerging much of Bolo Township and displacing thousands of residents, later flooded many Tibetan counties along the river. The beginning of year 2019 in Tibet witnessed extreme winter weather. Blizzard in many parts of northern regions of Tibet killed thousands of both domestic and wild animals. Unfortunately, the Chinese government has done very little to combat these disasters. The loss of life and damage to property from the floods and landslides could have been greatly reduced had the Chinese government taken more proactive actions and put in proper policies. The government was warned of increasing natural disasters including landslides, torrential floods, snow disasters and forest fires in a 2015 report by Chinese Academy of Science (Chinese Academy of Science, 2015). But they have not taken necessary measures or framed effective policy guidelines to face the new challenges. The local residents of Tsolho blamed the recent mud flood in the region on excessive mining and tunneling of mountains in the region. The impact of climate change has been aggravated by the increasing scale of resource extraction and dam construction across Tibet. Mining has become the biggest concern for both the land and people of Tibet, causing landslides, grassland degradation and water pollution.

The Current Environmental Situation in Tibet

The environment of the Tibetan Plateau is severely threatened by global warming. The situation is further exacerbated by destructive mining, irresponsible damming, and forceful removal of Tibetan nomads, rampant littering, poor tourism regulations and mistreatment of environmental conservation groups across Tibet. The close nexus between mining companies and government officials has undermined public confidence as they ignore local interests.

Destructive Mining Practices

Environmental degradation in Tibet has been devastating in many ways since the Chinese occupation of Tibet in 1950s. The mode of development has been destructive and irresponsible, ignoring the actual social, environmental and economic needs of the Tibetan people. The declaration of mining and tourism as pillar industries across Tibet clearly contradicts the claim of following a 'sustainable path compatible with the harmonious co-existence of economy, society and ecological environment (Xinhua, 2015)'. The lack of proper social and environmental impact assessments, lack of strict mining regulations, and lack of sincere environmental protection efforts by the Chinese government is evident from the numerous protests staged across Tibet over the years.

Tibet has deposits of about 132 different mineral types, accounting for a significant share of the world's reserves of resources (chromium, salt, copper, silver, coal, gold,

lithium, lead, zinc, asbestos, oil, gas, magnesium, potash and uranium). Extraction of mineral ores and natural resources has been vigorously carried out by the Chinese government to fuel its growing economy and to lessen its dependence on costly imports. The Chinese Geological Survey in 2007 estimated that the Tibetan Plateau holds about 30-40 million tons of copper reserves, 40 million tons of zinc, and several billion tons of iron. The proven reserve of more than 7.8 million tons of copper at the Yulong Copper Mine makes it the largest in China and the second largest in Asia. As tallied in 2010, Tibet has more than 3,000 proven mineral reserves containing 102 varieties of resources in the Tibet Autonomous Region (TAR) alone (China Daily, 2010).

The destructive and unethical form of China's mining practices has led to protests and disharmony across Tibet as mining causes destruction of sacred mountains and pollution of rivers. There have been more than 30 known large-scale, mine-related protests in Tibet since 2009.

Mining inside a Nature Reserve in Zatoe

On 16 August 2013, more than 4,500 local Tibetans from Zachen, Atod and Chiza nomadic communities of Zatoe (northeastern region) in Tibet protested against mining on their sacred mountain located inside the Sanjiangyuan National Nature Reserve (SNNR). As around 500 Chinese para-military forces brutally fired tear gas and rubber bullets on the peaceful protestors, a local protestor named Sokpo Choedup stabbed himself in desperation, saying "I felt a sense of helplessness, as there was no one we could go for justice." A similar case of extreme helplessness is expressed in other instances as well (Self-immolation in Amchok).

The SNNR was established in the year 2000 by the Chinese government to protect the head source of Yangtze (Drichu), Yellow (Machu) and Mekong (Zachu) rivers. The nature reserve covers a vast grassland where one of the largest Tibetan nomadic community has been living, and with the declaration of the region as a nature reserve, many nomads were forced to move out from the area. But ironically, in year 2013 the Qinghai government issued mining licenses for resource extractions in Atod and Zachen, areas which were clearly listed as a part of the SNNR, there by violating the very law the Chinese government proclaimed thirteen years earlier. This action strengthened the long-held fear that the Chinese government's policy to remove Tibetan nomads from the vast grassland was motivated by their plans to make space for Chinese mining companies. The declaration of more and more nature reserves in recent years is a welcome gesture, but the apparent lack of sincere effort by the Chinese government to protect those nature reserves is startling.

Landslide at Gyama mine Kills 83 workers

On 29 March 2013, 83 miners were killed by a landslide at the Gyama mine site. Chinese officials hurriedly concluded that the landslide was caused by natural factors. Despite the loss of so many lives, the Xinhua News as expectedly, published the official statement without conducting a journalistic investigation. But according to an Assessment Report published by the Environment and Development Desk (EDD) of the Central Tibetan Administration on 9 April 2013, the actual cause of the Gyama mine landslide was due to mismanagement of the mine.

In order to acquire maximum profit in the shortest possible time, mining in Gyama has been pursued aggressively. Whole swathes of land have been excavated in several sites and in some cases the whole face of a mountain has been stripped off in the process of exploration, water diversion, mining and road construction. It was just a matter of time that such large scale and aggressive expansion of mining was going to cause a large-scale disaster.

The report further stated that, The landslide in Gyama is a man-made phenomenon rather than a natural disaster. The rocks were disintegrated into smaller pieces as part of the mining process and not due to glacial dynamics as Chinese officials are trying to make us believe. EDD has enough evidence to suggest that loose rocks that turned into a landslide came from the surface mining at the top of the mountain which had been dumped on the eastern flank where the landslide originated (Environment & Development Desk, 2013).

River Water Pollution from Toxic Mine Waste

A. Minyak Lhagang lithium waste A lithium mining company called Ronda Lithium Co Ltd released toxic mine waste into a local river called Lichu in Minyak Lhagang in eastern Tibet (Choesang, 2016), causing serious water pollution and mass death of fish. This brought hundreds of local Tibetans out on the street on May 4, 2016, protesting against the mining company (Dorje, 2016). The local government informed the protestors that it had temporarily halted the mining activities, but locals Tibetans soon realized that the government has lied to them as continued operation at the mine were reported. This was not the first time or an isolated case of river water pollution. In 2013, the same river had been polluted with lithium mine waste, causing death of aquatic animals and threatening local drinking water.

Dolkar Village river pollution In a similar case on September 23, 2014, in Dokar and Zibuk villages of Lhundrup County near Lhasa, the Tibet's capital city, more than 1,000 local Tibetans protested against the poisoning of their river by the Gyama Copper Poly-metallic mine. The mine is located close to a river that locals

use for drinking water, irrigation and feeding animals. Predictably, local officials declared that the water pollution in the river was caused by natural factors and not by the mining activity. But according to an article ‘Environmental impact of mining activity on the surface water quality in Tibet: Gyama valley’, Xiang, a Chinese scientist firmly stated that many mining and processing sites in the valley pose a great environmental concerns as the deposits contain large amount of heavy metals, such as lead, copper, zinc and manganese etc. Further stating that the deposits are prone to leak its contaminants through seepage water and erosion of particulates, and therefore posing a future risk for the local environment and a potential threat to the downstream water quality.

A local resident of the village said “In the past, our rivers were crisp and clean, the mountains and valleys were known for their natural beauty. But now the rivers are polluted with poisonous waste from the mines” to an interview with Radio Free Asia (September 2014). Clearly describing the rapid destruction of the local environment.

Mining on Tibetan sacred mountains: There have been arbitrary arrests and brutal suppression of more than 30 peaceful environmental protests since 2009. Such activities undermine the importance of environmental conservation in Tibet. The numerous cases of mining on Tibet’s sacred mountains are the most blatant acts of disrespect for the cultural sentiments of the people and disregard for the ecological condition of the local environment. Scientific research on the ground has discovered that the Tibetan people’s beliefs in the sanctity of sacred sites has greatly contributed to the environmental protection of key ecologically sensitive areas. (Canica M. Anderson, 2005). On 31 May 2016, around 2,000 local Tibetans in Amchok gathered to protest mining activities on their sacred Mt. Gong-nyong Lari. The mountain is considered highly sacred by eight different local communities, and mining on the same mountain brazenly disregarded those local communities and their beliefs.

Amchok is in the Labrang region of Amdo, a Tibetan area incorporated into the Chinese province of Gansu (Sangchu County, Kanlho Tibetan Autonomous Prefecture). At the protest, many were seriously injured, and six Tibetans were detained as the Chinese government brutally suppressed the peaceful gathering. The protestors were calling for ‘protection of environment, protection of the sacred mountain and protection of people’s safety’. The disregard for locals’ concerns was further evidenced by three separate self-immolations in the region. The unbearable agony caused by the mining on their sacred mountain and the attitude of the government towards people’s grievances led Tsering Dhondup (20 November 2012) and Konchok Tsering (26 November 2012) to set themselves on fire at the mine site.

The third self-immolator, Tsultrim Gyamtso (19 December 2013), also cited immense agony caused by the mining on their sacred mountain as a reason for his sacrifice. Article 10 of the Mineral Resources Law of the People's Republic of China states: 'In mining mineral resources in national autonomous areas, the state should give consideration to the interests of those areas and make arrangements favorable to the areas' economic development and to the production and well-being of the local minority'. But in recent years, an increasing cases of environmental destruction caused by mining and the suppression of peaceful environmental protests further highlights Chinese government's lack of understanding or concern for Tibet's environment, culture and people.

New mega dams in Tibet and its implications

Tibet has seen unceasing construction of dams on its rivers since 1950s, but a new trend of building mega dams is posing a serious threat to the world's highest plateau. The plateau is highly prone to seismic activities (Deng Qi Dong, 2014) and a cluster of competing mega dams on its rivers could further aggravate the situation. Probe International warned in April 2012 that 98.6 percent of the dams being constructed in western China are located in moderate to very high seismic hazard zones (Probe International, 2012). There was a series of earthquakes in the month of November 2017 in the Nyingtri region (Xinhua, 2017), where many of the mega dams on Yarlung Tsangpo are being built. The impact of mega dams on the region's wildlife habitat and river flow is apparent, but the most dreadful threat is from (RIS) Reservoir-Induced Seismic activities like the Wenchuan and Ludian earthquakes. Scientists believe mega dams can be both the trigger and the victim of earthquakes—damage to any mega dams from an earthquake is likely to cause a chain reaction that expands the impact of the earthquakes. According to Fan Xiao¹, the 2008 Wenchuan earthquake that killed 80,000 people and the 2014 Ludian earthquake in Yunnan were both induced by nearby mega dams including the Zipingpu Dam and the Xiluodu Dam (Qiu J. , 2014).

Despite the known risk and clear warning from scientists, the Chinese government continues to build mega dams on the highly seismic-prone regions of Tibet. For example: A 510-megawatt Zammu hydropower dam built on the Yarlung Tsangpo, The 295-meter-high Lianghekou Dam is under construction on Nyakchu River and a massive 1.2 million kilowatt Suwalong hydropower station is planned on the Yangtze River. Tibet is a sparsely populated region with hundreds of large rivers; people's energy needs could be easily met by efficient small hydropower stations or by harnessing the vast solar energy potential. However, the PRC feels the need to build these dams to support the rapid expansion of mining and urbanization.

1. Chief Engineer, Regional Geological Survey Team, Sichuan Geology and Mineral Bureau, Chengdu

For example, at a ceremony held on 28 November 2009 for the construction of the Guoduo Hydropower Station (the second largest hydropower station in the Tibet Autonomous Region at the time) in Chamdo region, then vice-chairman of the Tibet Autonomous Region, Pema Tsewang, stated that the station will ensure the availability of power for the Yulong Copper Mine (China Tibet Online, 2009). Yulong is the largest copper deposit in China. Even the proposed Lhasa-Nyingtri-Chengdu railway line takes an unusual turn by making a long detour off the most direct route between its namesake cities to reach the Yulong mining site (Choedon, 2016). The motive behind the dam frenzy is also to support the mass migration of Han Chinese into certain parts of Tibet, such as Nyingtri in southern Tibet. The resource-rich region of Nyingtri is considered ideal for the mass immigration of Han Chinese as it enjoys a temperate climate with immense forest cover. Hence, the Chinese government has made a huge investment in the rapid construction of highways, railways, airports and mega dams to facilitate the eventual mass migration of Chinese into the Tibetan region.

Forceful removal of Tibetan nomads

Tibet's rangeland covers approximately 70% of its total area. The alpine grassland at high altitude covers, in turn, 60% of the total Tibetan rangeland. Pastoralism on the Tibetan Plateau involves adaptation to a cold environment at elevations above the limit of cultivation. According to archaeological fieldwork, the Tibetan Plateau has been extensively used by pastoral nomads, who have developed a deep understanding of grassland dynamics and veterinary knowledge while maintaining a unique pastoral culture for more than 8,000 years. Tibetan nomads live an ecofriendly and self-sufficient life spread out on the vast grassland of the plateau. But the Chinese government has removed more than two million (Human Rights Watch, 2013). Tibetans from their land and pushed them into large-scale settlements with no medical, educational and business opportunities to support a dignified life and retain their identity.

The Chinese government continues to talk about restoring grassland by prohibiting grazing under the incorrect presumption that grazing is the only cause of grassland degradation. There are many scientists, including Chinese, who have written extensively about the need for moderate grazing to maintain the ecosystem's health. The forceful removal of Tibetan nomads who have preserved the fragile grassland has in fact accelerated the degradation of the grassland. The forced resettlement of Tibetan nomads is a clear case of irresponsible governing on the part of China; first the nomads were blamed for degrading grasslands without sufficient evidence, then forcibly alienated from their traditional way of life, and finally transferred into poorly planned settlements in the middle of nowhere. There they have no farms, no livestock and few jobs to sustain them (Du, 2012). Schools, hospitals and jobs promised to the forcibly evicted nomads have yet to materialize. Tibetan nomads,

who once lived healthy and self-sufficient lives, were suddenly thrust into poverty. This has been nothing more than a state-engineered destruction of a culture and way of life.

Garbage pollution and lack of treatment facilities

With the increase in human activity and abundance of food products packaged in plastics, the plateau is inundated with unregulated garbage disposal by tourists, pilgrims and construction workers. The traditional ways of waste management—a natural process of waste decomposition due to the presence of a cold and dry climate—is no longer a viable solution. Much of the government investment in waste management is concentrated in a few select tourist centers and cities that house government officials, such as Gyalthang, Dartsedo, Lhasa, Shigatse, Kyegudo and Zitsadegu. As soon as one travels outside of these towns and cities, littering is rampant and waste management almost non-existent. The situation has compelled local communities to step up their own efforts: voluntary environmental groups have formed to collect truckloads of garbage from surrounding mountains. In the absence of infrastructural provisions to deal with garbage, locals burn the waste, unintentionally causing greater environmental hazards. Local Tibetans have voiced their helplessness as the government has failed to provide them with necessary facilities, such as sending garbage trucks to rural areas to collect waste or building garbage treatment sites in the area. Such a formidable scenario demands forward-looking leadership to provide sufficient and sustainable infrastructure and redressal mechanisms. But the leadership in Beijing has utterly failed on two fronts in surmounting the pressing challenges: First, they have failed to make the general public and government officials aware of the health hazards and the environmental impact of garbage; and second, they have failed to provide the required governance and basic infrastructure necessary for waste management in rural areas.

Conclusion

The Chinese government must respect and protect the rights of the Tibetan peoples' cultural beliefs in the sanctity of the sacred mountains, lakes and rivers of the Tibetan Plateau. The Chinese government must set firm, uncompromising and transparent license procedures for mining permits in Tibet. The issuing of such permits should be based on competitive and reliable Environmental Impact Assessments and Social Impact Assessment reports. The Chinese government should also strictly monitor and prohibit mining companies from dumping hazardous mine waste into the surrounding areas and rivers. Tibetan pastoral nomads been expert custodians of the alpine pastures, their knowledge and experience must be incorporated into climate mitigation and adaptation practices. Decision-making mechanisms should be transparent and inclusive of all regional stakeholders, especially Tibetan nomads. There

should be an immediate halt to the forceful removal of Tibetan nomads from their lands and those already re-settled should be allowed to return to their pastures if they so wish. The Chinese government must also promptly address the poorly planned resettlement programs of Tibetan nomads. Having lost their traditional, self-reliant ways of life, the Chinese Government must provide the newly-resettled nomads with jobs, education, healthcare services, and business opportunities so as to restore their dignity.

The rapid expansion of towns and cities places a severe ecological burden on Tibet's fragile ecosystem. Clear urban planning guidelines must be established and rigorously adhered to by the Chinese government. The mistakes made by the Chinese government in urbanizing mainland China must not be repeated on the Tibetan Plateau. The Chinese government must involve the local Tibetan population in decision-making processes for any major development projects in Tibet. Urban planning should also take into consideration the impact of climate change. There has been increasing number of natural disasters in Tibet since 2016 with loss of life and damage to property. The situation was exacerbated by unregulated and poorly planned urbanization. The influx of tourists into Tibet must be regulated with clear guidelines to protect the Plateau's fragile ecosystem. As climate change accelerates, the effects will resonate far beyond the Tibetan Plateau, changing the water supply for billions of people and altering the atmospheric circulation over half the planet. The world needs to take a firm stand and work for protection of the world's highest plateau from further ecological degradation. The international community must recognize the Global significance of the Tibetan Plateau and form a special scientific team to understanding the role of the Tibetan Plateau in influencing global climate change or vice versa. As V.Ramanathan has rightly said that the global climate change cannot be understood without taking into consideration what is happening on the Tibetan plateau, Tibet should be central to any discussion on global climate change conferences.

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WHY TIBETANS ARE EMBRACING GLOBAL CLIMATE STRIKE

The weeklong Global Climate Strikes¹ being observed across 150 countries has received a strong support from the Tibetans in exile- considered one of the most organized refugee communities in the world. The Tibetan diaspora, with presence in at least 40 countries, actively participated in the protests to highlight the severe impact of climate change in their homeland. The impact of climate change on the Tibetan Plateau, one of the most glaciated regions on earth, has been extreme. The plateau has seen unprecedented number of natural disasters occurring simultaneously across the region since 2016, primarily due to rising temperature and increased rainfall (Zamlha, 2016). The temperature rise on the plateau is 0.47°C per decade (Lanhui Li, 2019), three times faster than the global average of 0.12°C per decade. This has led to fast melting of glaciers in the east, rapid thawing of permafrost (frozen soil) in the northwest and drastic expansion of deserts beginning from the north. Tibetans are concerned that the new climatic pattern emerging on the world's highest plateau is changing too quickly for the inhabitants to adapt. The climate strike initiated by Greta Thunberg, an inspirational teenage environmentalist, got strong support from the Dalai Lama of Tibet, one of the most respected global figures. In a letter to the teenage icon, the Dalai Lama wrote, "It is encouraging to see how you have opened the eyes of the world to the urgency to protect our planet, our only home. At the same time, you have inspired so many young brothers and sisters to join this movement (Office of the Dalai Lama, 2019)".

The Dalai Lama is an ardent supporter of environmental protection, whose efforts to address the issue began as early as the 1950s, when he was a teenager himself. He is probably one of the most consistent environmentalists. The Tibetan Plateau, where the Dalai Lama was born in 1935, is a vast mountainous region with an area of 2.5 million sq. km., which is nearly 2% of the earth's land surface. The region as perceived as 'one great zoological garden' (Francis Kingdon-Ward) by early explorers to the plateau. Some scientists have compared its known biodiversity to that of Amazon Rainforest (Environment & Development, 2000, pp. 1-18).

Unfortunately, Tibet's forest, which was one of the oldest reserves in all central Asia until Chinese occupation in 1949, was reduced to 13.57 million hectares from 25.2 million hectares, about 46% reduction between 1950 and 1985, with an estimate market value of \$54 billion (Environment & Development Desk, 2000, pp. 53-69).

1. Global Climate Strikes -A series of weeklong international strikes and protests from 20-27 September 2019, calling for action to address climate change.

The alarming scale of logging in some parts of Tibet led to the 1998 Yangtze flood (UN office for the Coordination of Humanitarian Affairs, 1998) and the 2010 Drukchu (Zhouqu) flood, killing thousands and displacing millions in China (Diandong, 2014). The once rain-scarce mountainous terrain of Tibet has witness consecutive increased torrential rainfall for last the 4 years, causing simultaneous floods and landslides in many parts of Tibet. A twin landslide (October 11 2018 and November 3, 2018) in Palyul county in Eastern Tibet blocked the Yangtze River – the longest river in Asia and third longest in the world. Eleven days of blockage completely inundated the nearby Bolu Township in Tibet and the horror of a sudden collapse of the artificial barrier caused massive panic in the low lying regions of China through where the river flows.

The Tibetan participants at the climate strike have called for the protection of the 'Earth's Third Pole', as the Tibetan Plateau is popularly referred to by scientists. The presence of 46,000 glaciers, covering an area of 105,000 sq. km., makes the plateau the largest source of accessible fresh water on the planet and the third largest reservoir of ice, after the North and South Poles. With the constant temperature rise in Tibet, the once permanently snow-capped mountains are quickly receding at an alarming rate. In 2015, Professor Kang at the Institute of Tibetan Plateau Research found out that there had been no net accumulation of ice in the region since 1950s, clearly indicating a regular loss of glaciers. Another scientist, Professor Yao Tandong of Chinese Academy of Science, even warned that 2/3rd of all glaciers on the plateau could be gone by 2050 if the current rate of glacier retreat continues.

The Tibetan Plateau has a global ecological importance. Standing at an average elevation of more than 4,000 meters above sea level, it influences the timing and intensity of the Indian and the East Asian monsoons. Scientific studies have even linked the worsening heat waves in Europe and northeast Asia to the plateau's receding snow cover. The Tibetan participants at the on-going climate strike have also called for respect for Tibetan cultural way of life and its role in environmental protection. The cultural way of life in Tibet, which was greatly influenced by Bon and Buddhist traditions, both of which strictly forbid hunting of wild animals. For example, successive rulers in Tibet issued stringent edicts to ban hunting at several ecological sites during various periods of its history.

However, with the Chinese occupation, Tibet witnessed a sudden disruption in its age-old tradition of causing minimum harm to the natural environment and its wild life inhabitants. Many elderly Tibetans, who had to flee Tibet during the Chinese invasion in the 1950s, had seen herds of wild animals slaughtered by the People's Liberation Army (PLA) with their machine-guns. Such hunting practice with a horrifying scale of wild animals been killed instantly was utterly alien to the

land and people of Tibet. The occupation of Tibet also gave China control over the world's greatest water resources. Asia's largest rivers, i.e. Indus, Brahmaputra, Salween, Mekong, Yangtze and Yellow river, all come from Tibet. According to the United Nations Environment Programme (UNEP), rivers originating from the Tibetan Plateau feed 1.5 billion people in Asia (UNESCO-Division of Ecological and Earth Sciences, 2011).

The ecological health of the Tibetan Plateau is crucial for a stable social, economic and environmental well-being of many countries. Any further degradation of the land will exacerbate the dire situation and could bring catastrophic consequences for Tibet, China and the world. Therefore, just as Tibetans have joined hands with the international community at the global climate strike, the world too must support Tibetans in protecting their plateau from any further degradation.

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BEIJING PLAYS KINGMAKER: ASIA AND ITS INTERNATIONAL WATER RESOURCES

The people of the Mekong region countries have seen the Mekong water level drop to their lowest points in more than 100 years due to the severe drought in 2019, coupled by China's hydropower dams blocking the remaining water coming from the Tibetan plateau. Water flowing from upstream China contributes about 70% of downstream water in the dry season but the building of a series of dams on the upper part of the river by China manipulates the natural flow of the river (Beech, 2020). China's agreement to release water from its dams on the Mekong River has painted China's action in a much more benevolent light (Patpicha Tanakasempipat, 2020). In contrast, the recent report by research and consulting company Eyes on Earth Inc., notes the exact opposite of what China claims. The study shows that the 11 upstream Chinese dams on the Mekong have directly caused record low water levels in the lower Mekong countries (Alan Basist, 2020).

Incidentally, China has denied that their cascade of dams had any impact and shifted the blame on the lack of rainfall and climate change. China and its neighbors are in dire need of more water in the future, while the present situation is that they all have increasingly less water at their disposal. In February 2020, Chinese foreign minister Wang Yi said his country has also suffered from the arid condition. "China has overcome various difficulties to increase the water discharge of the Lancang River and help Mekong countries alleviate the impact of the drought," Wang told a meeting of the Lancang Mekong Cooperation group. China's refusal to share vital data regarding its water management decisions with the downstream countries makes the issue one of great concern (Ministry of Foreign Affairs of the People's Republic of China, 2020). What has happened in the Mekong region countries could be the future of all the other riparian countries that derives its water from the Tibetan plateau.

China control over the Water Tower of Asia

Many of Asia's largest Rivers originate in the glaciers of Tibet. Tibet, "The Water Tower of Asia" serves as a source of numerous major Asian river systems: The Yellow, Yangtze, Mekong, Brahmaputra, Salween, Sutlej, Irrawaddy, and Indus River. These rivers provide water to 1.5 billion people (Policy Brief, 2011). From the mountains in Tibet, they flow into Bangladesh, China, India, Pakistan, Nepal, Bhutan, Laos, Thailand, Myanmar, Cambodia, and Vietnam, etc. China, through its presence in Tibet, can control both the quality and quantity of water that reaches its downstream neighbors. Since the start of the 21st Century, China's dam-building activities have shifted from dam-saturated internal rivers to international rivers

flowing out of the Tibetan plateau (Chellaney, 2013). Both at the 12th Five-Year-Plan (2011-2015) (China's National People's Congress, 2011) and 13th Five Year Plan (2016-2020) (China's National People's Congress, 2016), China's state council energy plan has approved an array of new dams on all of the major Asian rivers, which originate on the Tibetan plateau and flow to South Asia and Southeast Asia. Even the upcoming 14th Five-Year Plan (Xin, 2020) vigorously push forward the hydropower project on the seismically active Tibetan plateau. Xie Kechang, a senior fellow at the Chinese Academy of Engineering, notes that non-fossil fuels energy generation will be the main focus of demand growth over the next FYP period (2021-2025), as the country aims for non-fossil to provide for about 20% of total energy consumption by 2030 (Tom Baxter, 2019). Much of that non-fossil generation will originate from hydropower and nuclear energy sources.

Some 80 percent of China's hydropower potential lies along the high-flow, glacier-fed rivers of the Tibetan plateau (Davis, 2017). Such a dam-building spree disrupts Tibetan communities through displacement and submergence of sacred sites. Dams there bring minimal local benefits because most of the power goes to smog-choked cities in the east. Besides it also has a huge impact on the downstream countries. Hydropower dams will have an immense impact on downstream fisheries, river ecologies, and agricultural systems that depend on the natural, sediment-filled flood pulse of the river.

A Lesson for the other Riparian Countries

China has not signed any water-sharing agreement with any of the neighboring countries and also been one of three countries that have voted against the UN watercourse convention. Instead, Beijing claims that the upstream nation has the right to assert absolute territorial sovereignty over the water on its side of the international boundary or divert as much water as it wishes for its needs- irrespective of effects it has on the downstream countries.

The Mekong, which is known as Zachu in Tibet, has its source in the Zatoe, Northeastern part of Tibet. From its source in Tibet, this river flows into six countries- China, Laos, Thailand, Cambodia, Myanmar, and Vietnam. Around 60 million people lives are dependent on the river and derive an income from it in the Lower Mekong Basin countries (Steve W.Lyon, 2017). It is also amongst the most bio-diverse rivers in the world. The drought situation of the Mekong because of Chinese dams is a great example of China's misappropriation of international rivers in the name of national sovereignty. It deprives the rights of the people living in the downstream countries. Until recently, there was no evidence of the impact of China's use of the river on the downstream countries but the latest reports by Eyes on Earth (Alan Basist, 2020), a water resources monitor, has produced

numerous statistics as well as satellite imagery which highlights the adverse impacts China's dams have had on these countries. Furthermore, the report reveals that China's Mekong River dams held back large amounts of water during a damaging drought in downstream countries last year despite China having higher-than-average water levels upstream. Overall, from the satellite data from 1992 to 2019 (28 years) and daily river height gauge from Chiang Sean, Mr. Basist and his colleague who compiled the report, calculated that dams in China had held back more than 410 feet of river height. China began building the first series of dams on the Mekong River in 1986. Since then, Chinese dams have lowered water levels, disrupted sediment flows, and damaged the health of fisheries in Myanmar, Thailand, Laos, Cambodia, and Vietnam. In Thailand, fishermen along the border with Laos have reported that the river has become unpredictable since China began upstream dam construction.

Based on such reports, there is a strong argument to be made that the fluctuation in river levels is not seasonal but rather dependent on China's activities upstream. China has long planned to build 19 of the world's tallest dams on its upstream portion of the Mekong, 11 of them are now complete (Eyler, 2019), the most recent being the 990 MW Wunonglong Dam on Diqing Prefecture, Yunnan province. If combined, the completed dams could generate 21,310 MW of electricity. Seven of the remaining planned dams are in Tibet and will store runoff of melting Himalayan glaciers into the next decades. Hydropower development on the Mekong River is not sustainable, as it contributes to social injustice and does not take into consideration the real social and environmental impacts of such projects.

Future of Downstream Countries

China's hunger for energy and control over its rivers to establish itself as a regional hegemon has sparked a new wave of plans for a dozen mega-dams along the mainstream of these transboundary rivers. Besides its impact on the environment, these plans enable it to subdue its neighbors and increase its presence in the region's political and geographical sphere.

Beijing's lack of transparency about its dam-building project and disinterest in formally cooperating or engaging with its lower riparian states in multilateral forums could lead to droughts and water fluctuation in the downstream countries, as the recent past has shown. This could be a new normal for the countries that get its water from the Tibetan plateau. Another great river that begins in the icy reaches of the Tibetan plateau, like the Brahmaputra, have also been dammed by China. Apart from the environmental consequences, there is an emerging strategic component of the dams, one that has reduced Southeast Asian nations' leverage vis-à-vis China and supplements its wider design for the neighboring region.

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RONGDRAK IN TIBET FACES YET ANOTHER MASSIVE FLOOD

A massive flood on 17 June 2020 due to torrential rainfall in the last few days has affected many parts of Rongdrak County in eastern Tibet (མི་དམངས་བླ་བུ།, 2020). The flood caused landslides as rivers gushed through the region, destroying homes, schools, and monasteries located along the extremely narrow valley. There have been similar floods back (16 June) in 2017, coincidentally almost on the same day as the recent one (ཁམས་བའི་གསར་འགྱུར་དྲ་ཚིགས།, 2017). Rongdrak County is currently administered as part of the 'Karze Tibetan Autonomous Prefecture'. The Karze Tibetan Autonomous Prefecture was, in fact, formed and incorporated as part of the Sichuan Province in 1955 after the Chinese occupation of the region.

Recently, many parts of southern China have faced severe floods due to heavy downpour and it took about a week for the impact of the heavy rainfall to reach south-eastern areas of Tibet. As per independent as well as Chinese official news reports, the floods have unfortunately left two people missing and displaced 20,000 people with the devastation spreading to ten separate areas within the county. It is also reported that the houses of two villages were completely destroyed by the flood. The flood has posed a significant risk to the nearby county of Tsenglha Dzong in 'Ngawa Tibetan Autonomous Prefecture' as well. Tibet has seen an unprecedented number of natural disasters occurring simultaneously across the region since 2016, primarily due to rising temperatures and increased rainfall. Furthermore, the situation has been exacerbated by a number of other factors such as excessive construction activities, a destructive mode of lithium mining, a cascade of dams along the river, and state-sanctioned felling of trees in some areas of the valley. A series of articles have been published by the Environment Desk of the Tibet Policy Institute in the last five years that both highlights as well as forewarns the Chinese government and the Tibetan people of the increased risk of repeated floods in Tibet in the coming years.

The first article, 'Natural Disasters in Tibet-Is it the New Normal (Zamlha, 2016)' which was published on 8 August 2016 (Tibet Policy Institute website) clearly warned the Chinese government to the looming risk of floods across Tibet as the plateau enters into a new pattern of climatic condition. The paper states, Despite the Tibetan Plateau facing the severest impact of climate change, there is an absolute lack of public education and awareness programs on how to mitigate and adapt to climate change.

The second paper, 'Flooded Tibet: Struggling to Adapt to the New Reality (Zamlha, 2017)', published the following year, on 4 September 2017, urged the Chinese

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DALAI LAMA, AN ENVIRONMENTALIST: A COMMITMENT OF 70 YEARS

“I was born in a small village called Taktser, in the northeast of Tibet, on the fifth day of the fifth month of the Wood Hog year of the Tibetan calendar, that is, in 1935,” writes the Dalai Lama in his first ever biography *My Land and My People*, published in 1962. (Dalai Lama, 1962). Eighty-five years since then, on 6 July 2020, people across the world will be celebrating his birthday and his life’s work of promoting universal peace and compassion. As commendation of the Dalai Lama’s immense global contribution to world peace and religious harmony, he has being hailed as one of the world’s most respected, admired and influential living figures (Gallup, 2019).

The focus of the Dalai Lama’s colossal endeavours extends from the cause of the Tibetan freedom struggle to universal ethics to bridging the gap between science and religion. Yet another vital aspect of his professed goals towards which he has consistently worked for has been calling for wildlife conservation and environmental protection ever since he took political responsibility of Tibet in 1950. From ordering measures for forest protection, banning hunting during the period of independent Tibet, ending poultry farming, supporting vegetarianism in the exiled Tibetan community in India, calling for tree plantation and wildlife protection in Tibet, highlighting ecological importance of the Tibetan Plateau, and urging for global cooperation on climate change—the Dalai Lama has consistently worked for environmental conservation for the last seven decades.

An Environmentalist: A Core Principle

Environmental conservation has been a core principle of the Dalai Lama. This principle has been clearly represented in the Three Main Commitments that he laid out in 2011. After the devolution of all political responsibility to a democratically elected leader of the Tibetan people in 2011, the Dalai Lama evocatively stated that he would continue to devote his life to three main commitments the promotion of human values, the promotion of religious harmony, the preservation of Tibet’s spiritual heritage and protection of its environment. The last commitment reaffirmed his lifelong objective of striving for environmental conservation. Such a significant pledge from the Dalai Lama, who is both the most revered person in Tibet as well as a deeply admired global figure, immensely strengthen the cause of environmental conservation. Furthermore, the Dalai Lama has been a strong supporter of global cooperation on climate change and global warming. His statement, during the 1992 address to the Parliamentary Earth Summit at the Rio Earth Summit, reads:

“I believe that to meet the challenge of our times, human beings will have to develop a greater sense of universal responsibility. Each of us must learn to work not for his or herself, family, or nation, but for the benefit of all mankind (Dalai Lama on Environment: Collected statement 1987-2018)”.

In a video message to the delegates of Paris Climate Summit in 2015, Dalai Lama rightly noted that human beings are responsible for the current climate crisis and that it is not a question of one nation or two nations, but a question of humanity affecting the whole world (Tibet.Net, 2015).

In a similar manner, the Dalai Lama sent another written message, delivered by hand by this author (Tibet.Net, 2018), to the Conference of Parties or the COP 24 and its delegates on 20 November 2018, the message states:

“I extend my greetings and prayers to my dear brothers and sisters, delegates to the 24th Conference of Parties (COP24) to the United Nations Framework Convention on Climate Change. I would sincerely like to thank all of you who have selflessly and tirelessly put effort into creating a better environment for the world so that future generation will be able to live a healthy, happy life (Dalai Lama, 2018)”.

An Environmentalist: Being One in Practice

Proposal for Tibet as zone of peace for men and nature in Five Point Peace Plan-1987: With an increasingly interdependent world and a rapidly degrading ecological situation in Tibet, the Dalai Lama put forth the famous Five Point Peace Plan during an address to the US Congressional Human Right’s Caucus in 1987. Proposing for a transformation of the whole of Tibet into a zone of peace, he stated:

“It is my sincere desire, as well as that of the Tibetan people, to restore to Tibet her invaluable role, by converting the entire country – comprising the three provinces of U-Tsang, Kham and Amdo – once more into a place of stability, peace and harmony (Dalailama, 1987)”.

The proposal further adds, “In the best of Buddhist tradition, Tibet would extend its services and hospitality to all who further the cause of world peace and the well-being of mankind and the natural environment we share.” Concerned of the grave implications from a poor environmental situation in Tibet, the Dalai Lama called for ‘Restoration and Protection of Tibet’s Natural Environment’ in the Five Point Peace Plan, emphatically voicing against the production of nuclear weapons and the dumping of nuclear waste on the plateau.

He further stated that the Tibetan people's inherent respect for all forms of life is enhanced by the Buddhist faith, which prohibits the harming of all sentient beings, whether human or animal. The proposal to transform Tibet as a Zone of Peace stems from his strong desire for a peaceful co-existence among different nations, and a lasting solution for the ongoing conflict between India and China on Tibet's border would only result from the fruition of this proposal.

It would also protect the world's highest plateau from further degradation and destruction, which ultimately would result in the conservation of the source of Asia's most important rivers such as Senge Tsangpo/Indus, Yarlung Tsangpo/Brahmaputra, Machu/Yellow River, Zachu/Mekong River, Drichu/Yangtze River and Gyalmo Nyulchu/Salween River, which directly supports more than 1.8 billion people in Asia and indirectly a fifth of the world's population.

Opposing and Ending the Tradition of Wearing Animal Fur Dress in Tibet

Tibetan traditional clothes with a layer of tiger or leopard or otter skin was an extremely popular attire across Tibet, particularly in eastern Tibet. Therefore, an abrupt end to this tradition was an unimaginable scenario until it happened soon after a strong objection from the Dalai Lama in 2006 during the Kalachakra Puja in Amravati, South India. At the Kalachakra Puja on 9 January, the Dalai Lama strongly spoke out against this practice, stating that:

“Some insensitive Tibetans in Tibet wear outfits adorned with tiger, leopard, and otter skins. Such behaviors, indeed, makes every one of us feel embarrassed. I have emphasised this so many times before. I once again emphasise to all of you, particularly those from Tibet, the flaunting clothes trimmed with animal skins is nothing but an act of stupidity — a source of embarrassment to you and your fellow Tibetans (Environment & Development Desk, 2018)”.

Such a strong objection resulted in scores of Tibetans in Tibet enthusiastically burning (Dalailama.com, 2006), in large numbers, their much loved and expensive animal fur or skin dresses and pledging never to use them again. Such scenes of putting an end to the practice emerged from all parts of Tibet.

This fundamental change has had immense positive effects towards saving hundreds of tigers and leopards in Asia, particularly in India. It was beyond anyone's speculation that the Dalai Lama's statement would receive such a prompt and decisive reaction from Tibet. As an environmentalist myself, this author has long considered it as one of the greatest environmental contributions by the Dalai Lama or anyone else.

First Nobel Laureate to be recognized for His Environmental Conservation Effort

The Dalai Lama was awarded the Nobel Peace Prize in 1989 for his decades' long commitment to a peaceful struggle, even in the face of extreme aggression for the restoration of freedom in Tibet. However, he also became the first Nobel Laureate to be recognised for his motivation and concern towards global environmental problems as well. In a press release, dated 5 November 1989, on their decision to award the Nobel Peace Prize to the Dalai Lama, the Norwegian Nobel Committee wrote:

“The Dalai Lama has developed his philosophy of peace from a great reverence for all things living and upon the concept of universal responsibility embracing all mankind as well as nature. In the opinion of the Committee, the Dalai Lama has come forward with constructive and forward-looking proposals for the solution of international conflicts, human rights issues, and global environmental problems”.

This recognition was a significant milestone in the Dalai Lama's endeavours for environmental conservation, one that has been supplemented and strengthened by a global acknowledgement of his efforts as an environmentalist.

A Continuing Quest for the Environmental Conservaton

As the Dalai Lama turns 85 this year, his dedication towards the environment has not dimmed in the slightest but continues to grow stronger. The strength behind such dedication stems from the core principle of environmental conservation that is one of the foundational pillars of his belief while he increasingly advocates for a more compassionate human society and a positive relationship with the global environment. His three commitments to the world have seen him transcend the perception of being a Buddhist or a Tibetan leader to a global figure that is respected and revered across borders, religions, cultures, and politics. As a consequence of such recognition, the Dalai Lama has been able to highlight the importance of environmental conservation, achieve long lasting results and become not just a beacon for compassion and universal ethics, but also as one of the most important ambassadors for environmentalists all over the world.

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BRAHMAPUTRA DAMS: A CHINA-INDIAN POLITICAL QUAGMIRE

China's dam-building threatens to close off the flow of one of India's most important rivers

The Brahmaputra River runs from its origin in western Tibet through India before flowing into the sea in Bangladesh. Both the 12th (China's National People's Congress, 2011) and 13th Five-Year Plans (China's National People's Congress, 2016) adopted by the Chinese State Council have called for large-scale expansion of hydropower projects in the southwest, including all three provinces of Tibet. The Yarlung Tsangpo (Brahmaputra River) is one of the main international rivers identified for hydropower expansion in Tibet.

Jiacha Dam to begin operation next month

This is the second large hydropower dam after the Zangmu to be built on the mainstream of the Yarlung Tsangpo. According to the China Society for Hydropower Engineering, Tibet's Jiacha Hydropower Station was successfully gated to store water this month. It has also been reported that the Jiacha station will put into operation the first of its scheduled three units in August. At present, the installation and commissioning of the generator are reportedly in place and fully functioning. The dam has three units, and their cumulative installed capacity will reach 360 megawatts. It is expected that the annual power generation will be 1.704 billion kilowatt-hours. The Jiacha (Gacha) Hydropower Station is located in Gyatsa county of the Tibet Autonomous Region on the middle reaches on the Yarlung Tsangpo.

Construction of Jiacha Dam was begun in December 2015 by Huaneng Tibet Power Generation Company Ltd (HTPG), a subsidiary of the state-owned China Huaneng Group. This 100-meter-level gravity dam has successfully closed the gates to store water, marking the completion of the main project of the dam (China Society for Hydropower Engineering, 2020). It is reported that once the dam is put into operation in August, the project will transmit its power jointly with the Zangmu Hydropower Station, which will supposedly solve the problem of power shortages in Tibet (Xinhua, 2012).

Impact of Brahmaputra dams

The Brahmaputra River flows for more than 3,000 kilometers through Tibet, India and Bangladesh on its journey from the Himalayas to the Bay of Bengal. It is

of great importance to India for three reasons. First, in terms of its ecological significance for India, its basin is shared by Arunachal Pradesh (41.9%), Assam (36.3%), Meghalaya (6.1%), Nagaland (5.6%), Sikkim (3.8%) and West Bengal (6.3%). The Brahmaputra basin belongs to the Indo-Burma biodiversity hotspot, one of the 12 hotspots of mega biodiversity on Earth recognized by the World Conservation Union (IUCN) (National Council of Science Museums).

Its unique physiographic and climatic provide unique habitats for a variety of flora and fauna, including many endangered species. The basin is reported to have about 7,233 animal species that include 195 species of mammals, 607 of birds, 115 of reptiles, 54 of amphibians, 267 of fish, and 4,953 insect species. The plant resources of this region are enormous and represent the rich floristic wealth of India.

Second, the river is of great importance for the socio-economic life of the people in Arunachal Pradesh and Assam. The river valley is home to many tribal communities that are dependent on the river for their livelihoods. The Adi tribe in Arunachal Pradesh reveres the river as Aane, or “Mother.” The Brahmaputra Valley, known as Siang in Arunachal Pradesh, is considered the rice bowl of the state and several villages are directly dependent on the river. Likewise in Assam, people and communities in 22 of its districts use the river to sustain their livelihoods in the raising of cattle, fishing, and cultivation of different types of crops, irrigation, and riverine transport. Approximately 59%, 18%, 13%, and 4% of the surveyed households depend on the river for agriculture, fishing, transportation of men and material, and log collection respectively (Nayak).

Finally, the damming of the Yarlung Tsangpo is not only a question of environmental and socio-economic issues but also of politics. The river is of great importance in the present-day geopolitical context since it is also linked to Sino-Indian border disputes. The two countries have contested claims in disputed areas called South Tibet in China and Arunachal Pradesh in India, which now controls the area. The disputed area occupies about an area of 90,000 square kilometers and has a population of more than 1 million (Zhang, 2016).

Now with the second dam being built on the Brahmaputra, India, which recently had a deadly conflict with China in Galwan Valley, has to face a choice: either to oppose or block the construction of this dam through militarily intervention or to allow China to continue its dam-building, which threatens to choke off the flow of one of India’s most important rivers. Therefore, the consequences of the direction the future of the Brahmaputra River moves toward will reverberate in the political, social, and environmental corridors of India’s and China’s foreign policies.

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CHINA IS USING TIBET'S WATERS AGAINST INDIA | ANALYSIS

The timing of the announcement to build a “super dam” on the lower reaches of the Yarlung Zangbo River close to the LAC can be linked to the ongoing border tensions, which is rooted in China’s refusal to acknowledge the McMahon Line. Last week, China announced plans to build a “super dam” on the lower reaches of the Yarlung Zangbo River close to the Line of Actual Control (LAC) in Tibet. Originating in the so-called Tibet Autonomous Region (TAR), the trans-border river flows into Arunachal Pradesh where it is called Siang, and then to Assam as Brahmaputra before flowing into Bangladesh and draining into the Bay of Bengal.

The timing of the announcement can be linked to the ongoing border tensions, which is rooted in China’s refusal to acknowledge the McMahon Line. Instead, Beijing claims 90,000 square kilometres in India’s Arunachal Pradesh as Southern Tibet (Nan Zang). China’s aggression has been increasing in the Ladakh and Sikkim sectors. Now, the building of a dam so close to LAC in Arunachal Pradesh also underlines China’s strategic intent: To question India’s territorial integrity.

Last month, Global Times, the government’s mouthpiece, reported that the proposed dam would be constructed in Metok (Medog), the last county of TAR (Xiaoyi 2020). According to the plan, the dam will be constructed 30 kilometres from the Indian border. The decision follows announcements made in the 14th Five Year Plan, which sets the government’s agenda till 2025. The plan states that China will “implement hydropower development in the lower reaches of the Yarlung Tsangpo River”. This dam is one of the three dams that have been proposed for the region.

According to Jiandao, which comprises media professionals, analysts and technical experts: “The Motok hydropower station will use the 50 km straight section of the river bend to build a giant tunnel to divert water, and then lay out 6 large hydropower stations each with an installed capacity of 10 million kilowatts. There is a 400-meter drop between each power station, with a total drop of up to 2,400 meters” (Jiandao 2020).

The new dam’s ability to generate hydropower could be three times that of the Three Gorges Dam, which has the largest installed hydropower capacity in the world. Yan Zhiyong, chairman of PowerChina, said recently that the dam could provide 300 billion kWh of zero-carbon electricity annually (Xiaoyi 2020).

India, the lower riparian country, has every reason to be alarmed

The Brahmaputra is an important river for the country. In the past, many incidents over the river inside the Indian boundary have been attributed to China's designs against India. These include the increase in turbidity and blackening of waters in Siang, temporary stoppage of data sharing by China over the high season flows as per the China-India memorandum of understanding during the Doklam standoff (2017), and news of a series of check dams being constructed along the Tibetan boundary (Yusha 2017).

Experts have also warned India about China's designs

“For India, the one domain in which China's status as the ‘upper riparian’ provides an almost insurmountable challenge is in ensuring shared access to transboundary rivers. And as the recent clashes on the Sino-Indian border have made clear, India needs to assess how China might “weaponise” its advantage over those countries downstream. Control over these rivers effectively gives China a chokehold on India's economy,” a Lowy Institute report said in July (Tembey 2020).

In *Water Wars: The Brahmaputra River and Sino Indian Relations*, Mark Christopher warns: “China's commitment to construct ever-larger upriver dams reflects a zero-sum mentality on water use that has the potential to bring it directly into conflict with India. Further downstream, the actions of both countries affect Bangladesh” (Christopher 2013). The management of the river is critical because it touches on a host of crucial and complicated issues, including territorial integrity, food security, international law, the intersection of domestic and foreign policy, and the asymmetric power of neighbouring states with huge populations and great aspirations.

The super hydropower station is being planned with one aim: To equip China with strategic leverage over India. Such huge water storage capacity could be used as a tool for consolidating supremacy in the disputed territories. India should be aware that the Yarlung Zangbo-Brahmaputra dam issue is not just about resource management; China is using Tibet's waters to further its territorial ambitions.

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CHINA'S "SUPER DAM": A THREAT TO INDIA'S SECURITY

Every infrastructure development along the Indo-Tibet border would bring a new degree of threat to India's border security. But the construction of a 'super dam' in Metok means the threat expands all the way to Arunachal Pradesh and Assam. The close proximity of the location to India's border means any sudden release of water from the dam could quickly reach India with very little time for evacuation.'

Yarlung Tsangpo is one of the most important rivers in south-western Tibet, supporting life along its fertile shore as the river runs through Kongpo (Nyingtri Prefecture) valleys in southern Tibet. The river is fondly called Brahmaputra as it enters India and Bangladesh, where it supports millions of people for their daily livelihood. This mighty river faces a huge threat from a 'super dam'.

According to a Global Times report on November 29, 2020, the Chinese government plans to construct a 'super hydropower dam' on the Yarlung Tsangpo in its 14th Five-Year Plan (2021-25). The report claimed that the hydropower dam would be "meaningful for the environment, national security, living standards and international cooperation (Shan Jie, 2020),"

In reality, the ongoing excessive damming on the Yarlung Tsangpo is neither eco-friendly nor is it beneficial for the local community. It is part of a state-engineered, long-term preparation for a mass influx of Chinese migrants into the Kongpo region for permanent settlement. Such an eventuality could cause irreversible damage to the local ecology, diminish local Tibetan identity and greatly destabilise the hydrological balance across northeastern India.

Unlike in the 1960s, the large hydropower dams are no longer considered eco-friendly and sustainable. According to a BBC report on 5 November 2018, more than 90 per cent of the dams which have been built since the 1930s around the world were "more expensive than anticipated", and that these dams have "damaged river ecology, displaced millions of people (McGrath, 2018)."

The Nature Magazine in its April 2018 publication, has stated that the demolition of Yacla de Yeltes Dam in Spain was hailed by ecologists as a milestone for river-restoration efforts in Europe (Schiermeier, 2018). In a similar case, the United States also removed 90 dams in 2019 alone for river restoration efforts (American Rivers, 2020). But in Tibet, the Chinese government is on a dam-building spree along the 1,600-km stretch of Yarlung Tsangpo in Lhokha and Nyingtri. Nyingtri, traditionally known as Kongpo, is home to one of the world's oldest forests and a safe habitat for primitive species. In fact, a group of Chinese scientists in 2015

discovered an extremely rare and primitive macaque monkey in the forest of Metok in Kongpo, a county where the ‘super dam’ is proposed to be built. One of the Chinese scientists even described Kongpo as “an ancient museum of nature (China Daily, 2015)”. China has long planned 11 hydel dams on the river with Zangmu and Gyatsa already completed, Dagu and Jeixu under construction, Lengda recently receiving permission and more to begin soon as part of the 14th Five-Year Plan. Large dams inevitably inundate vast area of land around it for water storage, leading to massive loss of vegetation and wildlife habitat.

Dams also induce seismic activity, landslides, sudden change in the local ecosystem, and emit greenhouse gases into the atmosphere. The dam construction is only one part of a state-engineered, infrastructure development plan in the Kongpo region of Southern Tibet to facilitate eventual mass migration from China to this scarcely populated region of Tibet. The region has seen rapid upgrading of the 5,476-km-long National Highway-318, which connects Chinese cities as far as Shanghai and Chengdu to Nyingtri city. The much-reported Chengdu-Nyingtri-Lhasa railway line (1,629 km), once completed, would be a direct passage for mass migration into the region.

The lack of trees and a harsh climate were the primary reasons for the Chinese migrants’ inability to permanently settle in some parts of the interior Tibet despite Beijing’s generous incentives. This makes Kongpo (Nyingytri Prefecture) in Tibet an ideal spot for mass migration as the region has pleasant mild weather with extensive forest and vegetation cover. So for Tibetans in the region, the ongoing excessive infrastructure development is a colonial trap to marginalise the Tibetans in their own land. Every infrastructure development along the Indo-Tibet border would bring a new degree of threat to India’s border security. But the construction of a ‘super dam’ in Metok means the threat expands all the way to Arunachal Pradesh and Assam. The close proximity of the location to India’s border means any sudden release of water from the dam could quickly and forcefully reach India with very little time for evacuation.

India would inevitably face a twin disaster in the future — water shortage in the winter as the ‘super dam’ could swallow much of the flow during dry season, and flash floods in the summer as excess water from the dam would be released during the monsoon season. As highlighted by this author in 2018, infrastructure development in the region is a means to bring more Chinese migrants into the region for permanent settlement to counter the Indian border challenges. The objective is becoming clearer by the unusual importance the Chinese leadership has given to the region in recent years by making successive visits and fast-tracking infrastructure development works (Zamlha, 2018).

Dams are known to alter the natural characteristics of a river system and also disrupt the lives of millions of people living along the river basin. The ‘super dam’ planned on the Great-Bend of Yarlung Tsangpo (Brahmaputra) Grand Canyon in Metok, if it gets the go-ahead from Beijing, would have a catastrophic impact on the lives of millions in India and Bangladesh.

Therefore, the huge investment on a massive infrastructure development drive in the region is part of a state-engineered, long-term plan to facilitate mass migration of Chinese into the Kongpo (Nyingtri Prefecture) region, which shares a long border with India. Such a strategic plan is aimed at countering both domestic Tibetan resistance as well as border challenges from India. A Chinese-dominated population in the region could give the People’s Liberation Army stationed in the region much-needed popular support from the local community, which it obviously lacks.

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