CHINA'S ENVIRONMENTAL SECURITY POLICIES IN TIBET: IMPLICATIONS FOR INDIA, 2001-2013

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DECLARATION

I declare that the thesis entitled **"China's Environmental Security Policies in Tibet: Implications for India, 2001-2013"** submitted by me in partial fulfillment of the requirements for the award of the degree of **Doctor of Philosophy** of Jawaharlal Nehru University is my own work. The thesis has not been submitted for any other degree of this University or any other university.

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CERTIFICATE

I recommend that this thesis be placed before the examiners for evaluation.

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for all Environmentalists in Tibet

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Abbreviation

ASEAN	Association of Southeast Asian Nations
BCIM	Bangladesh-China-India-Myanmar
CCPCC	Chinese Communist Party Central Committee
CCICCD	China national Committee for the Implementaion of the UN Convention to Combact Desertification
CCP	Chinese Communist Party
CGS	China Geological Survey
CITES	Convention on International Trade in Endangered Species
CTA	Central Tibetan Administration
CAS	Chinese Academy of Sciences
CES	Compensation for Ecosystem Services
DIIR	Department of Information and International Relations
EIA	Environmental Impact Assessment
ENGO	Environmental Non-Governmental Organisation
EPBs	Environmental Protection Bureaus
EPOs	Environmental Protection Offices
EPL	Environmental Protection Law
ELM	Expert-Level Mechanism
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GW	GigaWatt
GLOF	Glacier Lake Outburst Flood
HDI	Human Development Index
HCRS	Household Contracted Responsibility System
ICT	International Campaign for Tibet
ICIMOD	International Centre for Integrated Mountain Development
IPCC	Intergovernmental Panel on Climate Change
IDSA	Institute Of Defence Studies and Analyses
IUCN	International Union for Conservation of Nature
LLOF	Landslide Lake Outburst Flood
MOU	Memorandums of Understanding
MEP	Ministry of Environmental Protection

NBS	National Bureau of Statistic of China
NDRC	National Development and Reform Commission
NEPA	National Environmental Protection Agency
NEPP	Natural Forest Protection Program
NPC	National People's Congress
NSB	National Bureau of Statistic
OECD	Organisation for Economic Co-operation and Development
PRC	People's Republic of China
RBO	River Basin Organisation
SEPA	State Environmental Protection Administration
SLCP	Sloping Land Conversion Program
TAR	Tibet Autonomous Region
TCHRD	Tibetan Center for Human Rights and Democracy
TEPB	Tibet Environment Protection Bureau
TIN	Tibet Information Network
UN	United Nations
UNEP	United Nations Environmental Program
UNFCCC	United Nations Framework Convention on Climate Change
WCED	World Commission on Environment and Development
WWF	World Wildlife Fund
WCD	World Commission on Dams

Glossary of Terms

Amdo	The Indigenously defined region of northeast Tibet, which is currently subdivided between Qinghai, Gansu and Sichuan.
Cholkha sum	Tibetan term to refer to the Tibetan Plateau; synonymous with the entity 'Tibet' and includes U-Tsang, Kham and Amdo. In other words, it includes the TAR and the Tibetan inhabited areas of Qinghai, Gansu, Sichuan and Yunnan.
Gaden Phodrang	Government of Tibet
Jinmu	Grazing Ban
Kham	The indigenously defined region of eastern Tibet, which is currently subdivided between the TAR, Sichuan, Yunnan and Qinghai.
Lunmu	Rotational Grazing
Ri-gya Dom-pa	Territorial Sealing
Ri-gya Lung-gya dom-pa	Sealing of the Hills and Valleys
Ri-lung Tsa-tsig	The Mountian Valley Edicts
TAC	Tibetan Autonomous County, the lower level of autonomous status, incorporated into prefectures. Other minority autonomous areas are similarly designated such as HAC for Hui Autonomous County, TMAP for Tibetan/ Mongolian Autonomous Prefectures, and so forth.
TAP	Tibetan Autonomous Prefecture, the higher level of autonomous status given to Tibetan (and other ethnic) areas outside the TAR and incorporated into the other four provinces containing Tibetan areas, namely Qinghai, Gansu, Sichuan and Yunnan.
TAR	Tibet Autonomous Region: China's translation of Xizang zizhiqu. TAR is largely the same area as U-Tsang, one of the three provinces of Tibet. The term is used in parentheses because it is only half the area and less than half the population of Tibet, and is not genuinely autonomous. Outside of TAR China classifies around 75 counties as Tibetan areas of "autonomous" governance, usually in Tibetan "Autonomous" Prefectures, or Zangzu Zizhizhou.
Tuimu huancao	Literally "retiring pasture to restore grassland." A current Chinese policy of compulsory grazing bans, destocking and exclusion of

	nomads from lands leased to them.
U-tsang	The indigenously defined region of Central Tibet. *U* is the area under Lhasa and Lhoka, the main seat of the Dalai Lama, whereas *Tsang* is the area around Shigatse, the main seat of the Panchen Lamas.
Xibu da Kaifa	Literally "Open up the Great West" or "Exploit the Great West". More often translated into English as the "Great Western Development" of "Go West". A Chinese policy announced in 1999 to accelerate development in the western half of China, in an attempt to narrow the widening inequality, and alleviate widespread poverty.
Xiumu	Grazing Restrictions
Xizang	Tibet

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CHAPTER ONE

Introduction

Background

Tibet has different connotations for Tibetans and Chinese. For Tibetans, the term 'Tibet' refers to the entire historical Tibetan area, known as *Cholkha sum* (U-Tsang, Kham and Amdo). It includes the present-day Chinese administrative areas of the Tibet Autonomous Region, parts of Qinghai Province, two Tibetan Autonomous Prefectures, and one Tibetan Autonomous County in Sichuan Province, one Tibetan Autonomous Prefecture and one Tibetan Autonomous County in Gansu Province and one Tibetan Autonomous Prefecture in Yunnan Province of China.

What China refers to, as Tibet is the Tibet Autonomous Region (TAR), which was created in 1965, the central plateau comprising U-Tsang and the western part of Kham, or roughly half the Tibetan Plateau. TAR is home to 3 million Tibetans covering an area of 1. 22 million square kilometres. It was the last autonomous region to be established in China, the others being Inner Mongolia (1947), Xinjiang (1955), Guangxi Zhuang (1958), and Ningxia (1958).

For this study, the term 'Tibetan Plateau' will be used to refer to all the Tibetan areas (Cholkha sum) in the PRC. The study will also use the term 'Tibet' to refer to *Cholkha sum* areas, where there does not seem to be a need to be specific about the geographical limits.

The Tibetan Plateau, commonly known as the "Roof of the World" is situated in the heart of Asia. It lies to the north of India, Nepal, Bhutan, Burma, and west of China. The Tibetan Plateau is the highest and largest plateau in the world with nearly 2.5 million square kilometres, close to two precent of the land surface of the planet, stretching for almost 3,000 kilometres from west to east and 1,500 kilometres from north to south at an average height of 4,500 meters above

sea level. The Plateau is surrounded by the Himalayas in the south, the Kunlun Mountains in the north, and the Hindu Kush and Pamir ranges in the west.

The Tibetan Plateau is also known as "The Third Pole" because it holds the largest perennial ice mass on the planet. After the two poles, it holds more fresh water than any other place on earth. While the water in the North and the South poles is locked up, water sources on the Tibetan Plateau continue to flow into Asia. The Plateau is the "Water Tower of Asia", the source of many of the Asia's principal rivers, including the Brahmaputra (Yarlung Tsangpo), the Indus (Senge Khabab), the Sutlej (Langchen Khabab), the Karnale (Macha Khabab), Arun (Phongchu), the Salween (Gyalmo Ngulchu), the Mekong (Zachu), the Yangtse (Drichu), the Huangho or Yellow River (Machu), and the Irrawaddy.

These rivers are indeed the lifeblood of the world's most populous nations, India and China and other countries including Pakistan, Nepal, Bhutan, Bangladesh, Burma, Thailand, Vietnam, Laos and Cambodia. Thus, it plays a triple hydro-role: Asia's main freshwater repository, its largest water supplier, and principal rainmaker (Chellaney 2011: 95), in addition to being the "starter" and "regulating area" of the climate of China and the Eastern Hemisphere as a whole (State Council 2013).

The Indus and Brahmaputra, the two principal rivers of South Asia, originate from the southern Tibetan belt, the Himalaya rim. This region also serves as the headwater to other several important rivers like the Karnale and the Kosi, which empty into the Ganges. The Sutlej, 1,550 kilometres long, also originates from this belt, the southern slopes of Mount Kailash finally draining into the Indus in Pakistan. The southeast and eastern part of the Tibetan Plateau is an equally significant source of water. The Salween's primary source is near the town of Nagchu in the TAR and the Mekong originates from the Thangla Mountains of Tibet's Amdo region, in Qinghai Province.

On their southward course, the Salween and Mekong River run parallel through the Tibetan Plateau into Yunnan before separating, the former entering Burma and the latter, joined by the Ngomchu River, flows into Laos. The Yangtze (Asia's longest river) and the Yellow River also originate from the eastern part of the Tibetan Plateau. The Yellow River flows from the place which China designates as the "Yushu Tibetan Autonomous Prefecture" (Yushu, or "Jade Tree," is Chinese, the Tibetan name being Kyegudo). The Irrawaddy, Burma's major river, also originates from the Tibetan Plateau, being fed by three Tibetan streams in Zayul County, near the border of India. The Manas (Lhodrak Sharchu to Tibetans and Norbu Lakchu to Bhutanese) a river 376 kilometres long flowing through Bhutan and northeast India, is also originates from Tibet (Chellaney 2011:103).

The Tibetan Plateau is home to some of the rarest medicinal plants, and the tallest peaks including Mount Everest; the landscape ranges from tundra to tropical jungles. It is a matchless realm of bio-geographic formation and biological diversity with more than 12,000 species of vascular plants, 5,000 species of epiphytes, 210 species of mammals, and over 532 different species of birds (Zhang et al. 2002: 135). Tibet's forests spruce, fir, larch, juniper, oak, cypress, bamboo, and rhododendron cover over 25.2 million hectares with trees over 200 years old.

The Tibetan Plateau is also rich in precious metals and mineral resources like gold, chromite, copper, borax, iron, lead, petroleum, zinc, and magnetite. Thus, the Chinese name for the Tibet since the Qing Dynasty is *Xizang*, meaning "Western Treasure Land". Tibet is the world's number one lithium producer and has China's biggest reserves of ten different metals. It is the largest supplier of China's timber, cashmere and wool (Chellaney 2011: 95). Tibet has the world's largest deposit of uranium, with its largest uranium mine being Thewo, Khalho (Gannan) prefecture, Gansu Province. Uranium mines are also found in the Tsaidam Basin, Damshung and in the area of Yamdrok Tso.

In 2004, the People's Daily reported that the TAR is rich in mining resources, with an estimated value of about 650.5 billion Yuan (US $ 78.4 bn). It also has one hundred types of ores, of a world total of 173 types of ore. The newspaper further stated that a total of 1891 mine producing areas have been discovered in TAR of which 30 are energy resources mining areas, 34 are metallic ore areas and 39 are non-metallic ore areas.

The region is home to numerous rare and endangered wildlife species such as yak, Tibetan wild ass (kiang), the migratory Tibetan antelope (chiru), the Tibetan argali and the snow leopard. Conserving these animals and their habitat is an important priority for the global conservation community (Miller, 03 May 2009). The grasslands, forests, and wetlands of Tibet contain magnificent landscapes, and unique biodiversity. With the coming of Chinese into Tibet and controlling the region, the fragile Tibetan Plateau has been put in great danger due to destruction of the environment and challenges to the livelihood sustainability of the local population.

China has introduced various development programmes in Tibet in the name of so-called 'liberation' and 'modernisation' of the region. Beijing's strategy of large-scale development was officially implemented in 2001 through the 'Western Development Campaign' or 'Open Up the West' to strengthen the support for the 'modernisation' of Tibet. To uphold its rule, China believes that development is a necessary tool to consolidate the occupation or "national unity" of Tibet with the rest of China. However, 'development' for over the last half-century has remained inequitable and has had an increasingly negative impact on people and the environment.

Tibet also has experienced environmental transformation; thus, the Tibet issue is not only political, but much larger and more fundamental. It is about Asia's water, environmental security issues, and its ecological interests (Chellaney: 2011). It is also about access to natural resources and ecology, which could affect billions of people and securing – or destroying- Asia's future. The

fate of the ecology of the Tibetan plateau affects not only the Tibetans but also the billions of people living downstream. The Chinese government has introduced numerous policies, laws and regulations to protect the environment in Tibet, but the effectiveness of these policies still remain questionable. It is therefore necessary to understand the concept 'environmental security' to analyse China's environmental security policies in Tibet.

Environmental Security: Concept

There is no unifying definition of environmental security however; the concept is a new entrant to the field of security studies. The earliest versions of concern for environmental security date back to the mid-nineteenth century, when writers expressed concern over industrialisation and population growth for degrading the environment. Thomas Robert Malthus, a classical economist contended that if the human population grew faster than their agricultural output, which he regarded as a likely scenario, then there would be gaps between supply and demand, which would lead to famines, epidemics, and wars. John Stuart Mill (1806-1873) introduced the concept of the 'Stationary State' where both population and consumption were stabilised, but perhaps at some low level of human happiness. Such thinkers argued that there is a need of immediate stabilisation of population, reduction of aggregate consumption and more equitable worldwide distribution of wealth to improve the human condition.

Garret Hardin's *The Tragedy of the Commons* (1968) recognised the common property nature of environmental resources as the root cause of many economic externalities. According to Hardin, global commons like oceans and atmosphere belong to everyone, hence to no one, and they were freely exploitable. However, Aldo Leopold's *A Sand County Almanac* (1948), in which he argues for man's recognition of his place in the ecological chain and interdependence of man and nature, has become representative of the thinking of many environmentalists and natural philosophers. He argued that any notion of land ownership is abusive, and hence people abuse land because they regard it as a commodity belonging to

them. According to Neo-Marxism, the root cause of pollution is material growth, thus, such growth must eventually be restricted to prevent ecological disasters. Thus, to escape from ecological disaster, socialisation of the economy is required, including the end of private property, and participation of everyone in decision - making on what to produce, how to produce and how it is to be distributed (Meyer 1975).

The science of ecology was not popularised until 1962 with the American biologist Rachel Carson's (1962) book *Silent Spring*, first serialised in the New Yorker. The book contains the message that, "the natural environment was being poisoned by chemicals (DDT pesticides) and the people had done it themselves" (Carson 30 June 1962). Her book catalogued the environmental impact of the indiscriminate spraying of DDT in the US, which could cause cancer and was a threat to wildlife, especially birds. Public interest in environmental issues grew strongly, and new pressure groups like Greenpeace and Friends of the Earth were formed.

The UN was the first forum where development and environment began to be discussed. Environmental security was discussed during the UN Conference of Human Environment at Stockholm, Sweden, from June 5-16, 1972. It was the first UN conference on international environmental issues, marking a turning point in the development of international environmental politics, with a growing awareness on the severity of environmental problems like climate change, ozone depletion, and biodiversity loss after the conference (Gautam 2003: 2). The 1987 report of the World Commission on Environment and Development, *Our Common Future,* also known as the Brundtland report, was the first using the term 'environmental security'. The Vienna Convention in 1985-87 and the UN Conference on Environment and Development at Rio De Janeiro in 1992*,* formalised the relation between environment and development and the conference produced a comprehensive guide to sustainable development, 'Agenda 21'.

The new environment theory that emerged after the Second World War was sustainable development. Sustainable development is vague but prominent theory, which talks about the sustainability of the environment, as well as its social and economic aspects. The idea of sustainability as a new mandate was adopted first by International Union for Conservation of Nature (IUCN) in 1969. It was a key theme of the United Nations Conference on the Human Environment in Stockholm in 1972. The concept was coined explicitly to suggest that it was possible to achieve economic growth and industrialization without environmental damage. The most commonly cited definition of sustainable development is "economic development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). However, many scholars critique the definition of the concept sustainable development by saying that the term has come into common use but has no clear meaning as applied.

For China, sustainable development refers "to the harmonious development of economy, society, resources and environmental protection, which compose an inseparable system. We should achieve the goal of economic growth while protecting the natural resources and environment, including the atmosphere, freshwater, sea, land and forests, on which mankind relies for existence, ensuring that future generations may inherit sustained development, and live in peace and plenty" (State Council 2009). The concept of sustainable development is important because it emphasis the possibility of economic development without pressuring the natural resources and threatening the environment and people's livelihood.

Environmental degradation and its irreversible loss are threats to countries and their inhabitants. The major environmental- related stress factors are population growth, global warming and climate change, energy consumption, land degradation and crop land scarcity, desertification, fresh water scarcity, loss of biodiversity, degradation of coastal areas and marine environment, decline of fish

stock and degradation of mountain ecosystems like the Himalayas (Gautam 2003: 1).

The environment security deals with four essential features: environmental degradations could cause violent conflict over resource scarcities presents challenges for the state, environmental scarcity and degradation impacts on the well-being of communities, environmental degradations impacts on the economy, and environmental degradation can lead to regime change (Economy 2005: 281; Goh 2002; Dixon 1991). Therefore, environmental security involves issues of environmental degradation and scarcity lead to inter/intra state conflicts. Environmental degradation in fact leads to stress across borders as well as within the nation (McNeil and Max G. Manwaring 2002: 3).

Thus, environmental security refers to the political instability and conflicts caused by environmental scarcity or environmental degradation and its threat to human health and wellbeing. For the study purpose, the emphasis is on the environmental threat to the nation and how it impacts the wellbeing of the people and economy and poses challenges to the regime.

Literature Review

The Chinese government has released ample reports on policies and protection of the environment and which have been used extensively for the purpose of the research. To balance the research, the study has also referred to reports released by the international think tanks and the Central Tibetan Administration, Dharamsala. The literature survey is organised thematically and includes debates and discussions on three major themes: China's environmental protection and policies, ecological improvement and environmental protection work in Tibet by China, and the environmental degradation caused by China's policies in Tibet.

China's Environmental Protection and Policies

China's MEP publishes yearly reports on environment which have been analysed by many to understand the government's initiatives. The reports have been the major sources of the study. MEP's 2010 report has identified air and water pollution and desertification as its major environmental challenges and it further stated that these types of pollution are shifting to rural areas. The report further emphasises the positive results that have achieved in environmental planning and capacity building.

A joint report by the World Bank and the State Environmental Protection Agency (2007) analyses the health impact of air and water pollution and non-health impacts of water and air pollution. The report further states that the economic growth in China has had positive impact on the environment. However, Elizabeth Economy (2003) in her research argues that China's environment continues to degrade due to rapid economic development and increase in consumption. This argument is further supported by Pan Yue (2007), Yang Yi (2006), and Xiaofan Li (2006) who discuss the environmental cost of economic growth in China. However, there is a variation in the total percent of GDP for the environmental cost and the Chinese official's percent would be always lower than the other reports and studies.

Judith Shapiro's book *China's Environmental Challenges* (2012) gives a detailed study on the various environmental problems that exist in China and discusses China's environmental regulations and standards. Another two factors which pressure on environment and resources are population growth and urbanisation. Xiaofan Li and Yang Yi emphasise the impact of China's population and growing urbanisation on the environment.

Zhang Kunmin's (2007) article on "Environmental Policies in China: Envolvement, Features and Evaluation", notes five phases of China's policies in environment and development: from national basic state policy to sustainable

development strategy, focus changed from pollution control to combination of pollution control and ecological protection, method changed from end control to source control, moved from point source treatment to catchments and regional treatment, and management style change from administrative management-based method to legal and economic instruments-based method.

Wang Chunmei and Lin Zhaolan (2010) have published an extensive study "Environmental Policies in China over the Past 10 years: Progress and Prospects". Although China has introduced numerous environmental policies, regulations, and mechanisms, they still face challenges on the implementation level. Wang Chunmie and Lin Zhaolan have pointed to five limitations China encounters while implementing environmental policy instruments and mechanisms: a) top-down approach to environmental management, b) fragmented authority and budget allocation problems, c) lack of incentives for environmental protection to local leaders, d) backward and outdated technologies and techniques, and e) lack of space for environmental NGOs.

Ecological Improvement and Environmental Protection Work in Tibet by China

According to many Chinese scholars, the major problem that Tibet faces today is the environmental degradation caused by developmental projects. However, the Chinese government and many other scholars assert that the environmental management started only after 1949 with the China's introduction of the 'peaceful liberation of Tibet'. For instance, China's White Paper (2003), "Ecological Improvement and Environmental Protection in Tibet", states that the Tibetan ecological management and environmental protection started only after China's 'peaceful liberation of Tibet' with the modernisation of Tibet. The development level of its productive forces was extremely low in Tibet before the 1950s, being in a state of "passive adaptation of natural conditions and one-way exploitation of natural resources".

Jan-Erik Gustafsson (1993) shares a similar view. He discusses how China has brought changes in land and water management in Tibet from 'feudalship' to today's 'modernised' Tibet. According to him, pre-1951 Tibet's land was owned by 'manorial estates held by lay aristocrats, monasteries, and incarnated lamas' and by the government and its local officials. After the Chinese 'liberation of Tibet', China has taken numerous modernisation projects in Tibet and all these projects have, according to him, helped the Tibetans; therefore, the policy of promoting land and water improvement projects and rural modernisation will continue and the changes have been profound as compared to the 'Lamaist State' (Gustafsson 1993: 19). Such arguments fit the standard productivist ideology of global modernity, an argument for 'progress', even if there is inevitable cost to the environment. Progress is taken to be a naturalized concept, a self-evident good, measurable by income and material standards of living, in which environmental costs are 'externalities'. This leads to an unresolvable tension between economic good and environmental good, positioning them against each other, in a zero-sum logic.

Wang Jun (2009) talks about how China has promoted environmental protection in Tibet recently. According to him, Tibet began to formulate the Plan on Protection and Construction of the Ecological Security Screen in Tibet (2008-30). According to the plan, within 20 years, China will mobilise all the resources at its disposal to make Tibet a protective screen or regional ecological security. Wang says that Tibet has formed a systematic, local legal regime concerning environmental protection. It has issued the Regulations for Environmental Protection in the Tibet Autonomous Region, the Rules for the Implementation of Management Methods for the Tibet Autonomous Region for Protection of the Environment of Construction Projects and the Methods of the Tibet Autonomous Region for Collection of Sewage Charges. The region has also drafted the Regulations for Natural Protection in the Tibet Autonomous Region, and Methods of the Tibet Autonomous Region for Comprehensive Management of the Urban

Environment. Whether such regulations are enforced is a major concern of this research project.

A leading Chinese scholar of Tibet, Hao Shijuan, the director of Tibet Historical and Culture Research Centre of the Chinese Academy of Social Sciences states that although it is difficult to balance economic development and environmental protection, the government has always made environmental protection its top priority in promoting development in Tibet. He added, that the government has also been encouraging the development of environment-friendly industries such as tourism in the autonomous region. Therefore, according to Hao Shijuan, Tibet ranks as number one in terms of ecological indexes used to measure the quality of the environment across the country.

In 2006, China completed the building of the Lhasa-Gormo Railway project in Tibet and many scientists and scholars have critically raised the possibility of environmental damage that the railway could result in. However, Peng Changhui (2007) discusses the adoption of a "green policy" by the Chinese government while constructing the railway to protect soil, vegetation, animals, and water resources. He sets forth in great detail the key measures taken by the Chinese government on the railway project to minimise the negative impacts. On a contrary, Zheng Guoguang (2010), head of China Meteorological Administration, states, "In Tibet, the mercury has climbed an average 0.32 degree Celsius every decade since records began in 1961. This is much higher than the national average temperature rise of 0.05-0.08 degrees Celsius every 10 years" (China Tibet Online 2010). He stated that Tibet has felt some of the largest impacts of global warming.

Xuefeng Cui and Hans-F. Graf (2009) also discuss the recent warming trends on the Tibetan Plateau directly influencing the permafrost and snow melting. There are significant land cover changes on the Tibetan Plateau such as permafrost and grassland degradation, urbanisation, deforestation and desertification caused by human activities like socio-economic developement and

transport projects in Tibet. They further aruge that these changes not only impact on the local climate and environment, but also have significant hydrological implications for the rivers originating from the plateau.

Thus, there are differences of opinion among Chinese scholars on the Tibetan environment, with many claiming that the Chinese government is managing and protecting the Tibetan environment whereas others argue that the Tibetan Plateau is degrading due to human activities like developmental projects. Increasingly, Chinese researchers are highlighting the gap between statements of policy and realities on the ground in Tibet.

Environmental Degradation caused by China's Policies in Tibet

Tibet maintained its ecological sustainability before 1949 with the influence of its Buddhist philosophy but according to many scholars the Tibetan Plateau is facing gradual environmental degradation due to China's developmental policies in Tibet. The Department of Information and International Relations (DIIR) of the Tibetan government-in-exile (2009) and Buchung K. Tsering (2009) state that Tibet was ecologically stable before the Chinese occupation and environmental conservation was an essential component of daily life. This was much influenced by Buddhist beliefs including the concept of 'interdependence' of both living and non-living elements of the earth. Widespread environmental destruction in Tibet followed the invasion of Tibet by China in 1949, resulting in deforestation, overgrazing, uncontrolled mining, soil erosion, landslides and other perils. The transfer of large numbers of Han Chinese settlers into Tibet demonstrates the colonial nature of Chinese rule. Under such a system, Tibetans have been marginalised in the economic, educational, political and social spheres and Tibet's rich culture and traditions are rapidly disappearing.

Justin Lowe (1992) also argues that historically both Buddhist doctrine and the Tibetan government promoted environmental protection through religious teachings as well as by formal edicts called *Tsatsigs*. These directives forbade the

taking of animal life, the polluting water sources, and the unnecessary disruption of soil or the overcutting of forests. He further says that if the Chinese continue exploiting the Tibetan environment, the end result may be the irreversible impoverishment of Tibet's ecological and cultural diversity, causing the curtain to fall for the last time on yet another of the world's irreplaceable ecosystems and peoples.

Daniel J. Miller (1999) discusses the traditional sustainable management of rangeland by nomads on the Tibetan Plateau. Raising different kinds of animals, allocation and reallocation of pastures, seasonal migration of nomads is characterised as one of the key progressions in the evolution of human civilisation. Nomadic pastoralism is an "acculturation by humankind" to rangeland. Thus, he sees nomadic pastoralism as a sustainable way of living, protecting nature as well as protecting herds in a complex and fragile environment.

Gabriel Lafitte (2013) talks about China's project of forced relocation of 2.25 million Tibetan nomads and semi-nomads after the launch of the 'Western Development Campaign'. The issue of Tibetan nomads is that of a collective violation of human rights, the violation of social and economic rights of the entire people. Lafitte says that China's rationale for this policy is climate change and to protect China's river sources from erosion, degradation, and desertification. However, there has been no dialogue between the Chinese government and the nomads.

Claude Arpi, Hari Bansh Jha and Brahma Challeney (2011) discuss China's effort to control Tibet's water. According to them, China is increasingly exploiting the water resources of the Tibetan Plateau through mega-projects such as inter-basin and inter-river water transfer projects, dams, barrages, and diversion in southern and south-eastern Tibet. This will have a large impact on the downstream water and produce trans-boundary effects on its riparian neighbours. Arpi further argues that there are possible geopolitical implications including the

imminent threat of armed conflict that could arise due to water shortages in the region. Anand Kumar, the UNDP 2007 report on Tibet's environment and Xinhua News on 22 July 2007 talk about the hydrological and atmospheric impact of Tibet on its riparian countries and Asia.

The International Committee of Lawyers (1997) for Tibet group looks at Tibet's problems from the legal point of view. According to them, China's exploitation of Tibet's natural resources is denying the Tibetan people their right to economic self-determination. They further point out that Chinese efforts to increase crop and herd yields have depleted the soil and left large tracts of land unsuitable for further agriculture or grazing. This process is a short-term exploitation of natural wealth but is a long-term poisoning of an already fragile environment, constituting a grave violation of the Tibetan's right to self-determination.

P. K. Gautam (2010) deals with the climate change and environmental degradation in Tibet and its implications for environmental security in South Asia. According to him, ecology of Tibet is an issue of regional if not global implications. Therefore, dialogue on the political solution of the Tibet problem between the Chinese government and the Tibetan government-in-exile is essential. He further emphasises that a limited dialogue Sino-Tibetan dialogue will not solve the environmental problems of Tibet.

There are a few Tibetan scholars in Tibet who also write on the environmental issues. However, some of them have been imprisoned due to their open criticism of China's developmental policies, such as Rinchen Samdrup, Kunga Tsayang and Dolma Kyab. Rinchen Samdrup is an environmentalist who discusses how environmental protection has become integral to the Tibetan people. He says that environmental protection is a culture that has been formed throughout the historical development of the Tibetan people and it is pervasive and inseparable from it like blood flowing through the body.

Kunga Tsayang raises two very important environmental issues in his writings: the natural resource exploitation in Tibet and its impact on the Tibetan people and environmental protection. Kunga also discusses glacier melt and mining activities that have been carried out in Tibet since 1980s and how these activities instead of benefitting Tibetans, have degraded the Tibetan environment. Woeser is another Tibetan writer and blogger who constantly raise the issue of environmental destruction in Tibet. She states that Tibet has become "open for development" to all kinds of mines, dams and tourism projects. But these projects will cause irreparable damage to the Tibetan nation, culture, and way of life, the sacred mountains and lakes, and in turn, the ecology of the world.

The significant gap in the literature is that none of the scholars have dealt with a range of environmental problems but reflected only on one specific issue like nomads or water pollution in Tibet. Secondly, there is a huge gap on the studies of scientists and anthropologies and social sciences whereas, scientists tend to focus narrowly on the science of climate change and whereas they lack focus on human impact of environmental degradation. Thirdly, it is extremely difficult to research on environmental issues in China because some environmental issues like mining and dam constructions are considered sensitive, and many people got jailed for speaking up for the environmental issues in Tibet. Fourth, much of the research on Tibet, China and India is on the political aspect of them thus, not much attention has been received on Tibet's environmental degradation and its impact on India. Thus, the study sought to fill the gap by attempting to synthesis of both Chinese and Tibetan perspective on the subject. The following paragraph will provide the definition, rationale, and the scope of the study, the research questions, research methodology, and the hypothesis.

Definition, Rationale, and Scope of the Study

According to Jon Barnett, environmental security is "the process of peacefully reducing human vulnerability to human-induced environmental degradation by addressing the root courses of environmental degradation and human insecurity".

The United Nations Development Program, defines environmental security from the global level perspective, saying, "environmental threats countries are facing are a combination of the degradation of local ecosystems and that of the global systems. These comprise threats to environmental security." Thus, although there are different definitions of environmental security, it is a concept which refers to the adverse impact of developmental policies on the environment and human security due to environmental degradation.

This study analysed the Tibetan environment, environmental security in Tibet and its implications for India. The period of focus for the study is from 2001 to 2013. China launched its 'Western Development Campaign'- *xibu da kaifa* in 2001 to develop its western regions and started various developmental programmes and policies in Tibet. In January 2013, the State Council under a new energy development plan for 2015 approved three new hydropower dams on the middle reaches of the Brahmaputra River. These policies will have a huge impact on the society, culture and environment of the Tibetan Plateau as well as its neighbouring countries, especially India. India's rivers- the Indus, the Sutlej and the Brahmaputra originate from Tibet. As China has failed to include the local Tibetans in these developmental policies, Tibetans are silent witnesses to the destruction of their fragile ecology, which raises a major concern for the entire world.

The Tibetan Plateau is warming twice as fast as the rest of the world and the impact of the glaciers melting will be catastrophic, not only for the Tibetan and Chinese people, but also for hundreds of millions of people downstream. The Tibetan Plateau has hydrological and climatic impact on neighbouring countries, especially on India. Therefore, the impact of climate change and ecological depletion on the Tibetan Plateau is not only a regional but also a global issue.

The study focused on the environmental policies, problems, and limitations in implementing the policies in China and Tibet as well. Finally, the study discussed the implications of environmental degradation in Tibet to India.

The environmental issues affect not only to Tibet but also regions across Asia and poses threat to people's livelihood, which further poses threat to state security. However, the limitations of the study include access to Chinese language sources therefore; there will be an emphasis on secondary sources.

The study addressed the following questions: what are the major environmental challenges China faces? How do economy growth, population and urbanisation affect environment and what are the social impacts of environmental degradation? What are the institutional structures, environmental legal systems and China's environmental diplomacy? How does the existing environmental security concept relate to the Tibetan environmental problems? How did the Tibetans protect and manage the Tibetan environment in the pre-1949 period? What are China's developmental policies in Tibet since 2001 and its impact on the Tibetan Environment? What are the environmental problems in Tibet? What is the reaction of the Tibetans to the environmental degradation caused by China's policies? What are the Chinese government's environmental protection policies and how are these implemented? How does Tibetan environmental degradation in hydrological and atmospheric spheres impact on India?

In this study, we tested the following two hypotheses: a) China's policies in Tibet have contributed to the degradation of the environment, and secondly, the degradation of the Tibetan environment has an adverse effect on the hydrology and atmosphere of India because of the geographical proximity to India.

Research Methods

The methodology to be used in the study is an analytical and inductive method. Inductive method or reasoning moves from specific observations to broader generalizations and theories. Following this method, we investigated how environmental issues have arisen in Tibet and use this to draw broader generalizations about environmental degradation and their impact on India. Tibetan ecology is treated as the dependent variable while China's development

policies are an independent variable. Global and regional environmental effects are an intervening variable for the purposes of the study.

Both primary and secondary sources are used. Primary sources from the People's Republic of China (PRC), the Central Tibetan Administration and the Government of Indai's reports and documents were used. The PRC's documents concerning the Tenth-Five Year Plan and the Eleventh Five-Year Plan, China's White Papers on Tibet, policies of the Western Development Strategies, reports of Tibet Work Forum Meetings, reports of Ministry of Environmental Protection, Report on the State of Environment in China, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India were referred. Reports of various institutions like UNDP, UNEP, WWF, IPCC, ICIMOD, International Organisation of Migration, and International Commission on Large Dams. Online official web news were referred to, such as the People's Daily, Xinhua News, China Tibet Online, Gov.cn, and Tibet.net. Secondary sources like books by various authors, journal articles, online articles, and news articles were examined for the research.

Structure of the Thesis

Chapter two traced the evolution of China's environmental state, starting with how the 1972 UN Conference on Human Environment impacted the China's environmental movement. It analysed the positive development brought by these environmental policies and how individual policy makers' initiatives have contributed in China's environmental policy formation. However, China continues to face environmental challenges, thus, it is crucial to critically analyse the current environmental conditions in China, what are the major environmental problems in China and what are the social and environmental costs of environmental pollution in China. The second chapter focused on why China faces difficulties in implementing its environmental policies, regulations, and laws.

Chapter three examined the traditional environmental protection in Tibet, how Buddhism has helped the Tibetans to protect their land and how nomadic lifestyle has been sustainable for the Tibetan Plateau. With the coming of China in Tibet from early 1950s, China introduced various environmental policies in Tibet. Therefore, the chapter analysed the environmental policies from 1951-2013. The Western Development Campaign in 2001 introduced many environmental policies in Tibet, such as the Grain to Green Program, protection of biodiversity, construction of nature reserves, and the pasture to grassland policy. The chapter further emphasised on the social and economic changes and status of nomads after the introduction of above mention policies.

Chapter four studied the various environmental issues and problems that Tibet currently faces, such as grassland degradation, endangered wildlife, permafrost melt, water pollution, deforestation, and desertification. The chapter analysed the major environmental protests in Tibet and will further discuss detail on the anti-mining protests, anti-pollution protests, water pollution and self-immolations. Finally, it evaluated the importance of the Tibetan Plateau to South and Southeast Asian countries and what are the China's trans-boundary river policies.

Chapter five highlighted the significance of Tibet's ecology to its neighbouring countries. It specifically focused on the implications of Tibet's environmental degradation on India's hydrology and atmosphere with particular case study of the Brahmaputra dam construction in Tibet and how it will impact the downstream nations. Chapter six concluded the thesis and discussed the findings of the study.

CHAPTER TWO

China's Environmental Policies

"China has gone through industrialisation in the past twenty years that many developing countries needed one hundred years to complete"

: Pan Yue, 2006

Introduction

China as a developing country with the largest population of 22 percent of the world, has been ranked the second largest economy in the world. However, it faces enormous challenges with regard to environmental pollution and ecological degradation, which further impacts the national economy and people's health. Thus, China's environmental protection policies will be the most important task for its effort to sustain rapid economic development. An environmental concern in China only emerged in the early 1970s, but by then China's environment was already in serious conditions. China continues to formulate new regulations to protect its environment but continues to face severe pollution problems.

This chapter analyses the various environmental problems in China and review and critically analyse China's environmental institutions development, regulations and laws and the global environment governance. It also discusses the various positive developments in China's environmental laws, regulations and policies. Though China is successful in developing efficient and strong environmental laws, it still faces serious environmental problems like air and water pollution; therefore it is crucial to study the current environmental conditions in China and the social and economic costs of environmental pollution.

Finally, the study critically analyses the challenges of enforcement of environmental regulations, the structural shortcomings in the implementing of these policies, and why local leaders are not able to protect the environment according to the guidelines issued by the Central government.

China's Environmental Problems

China's current major environmental problems are water and air pollution, desertification, soil erosion, biodiversity losses, grassland degradation, and disappearing of wetlands. In 2010, China's Ministry of Environmental Protection (MEP) released a report that identified several critical environmental problems:

> Pollution of surface water in China remained serious. In general, the seven major water systems were under slight pollution. The air quality in urban areas across the country was good at large and better than that of last year, but some cities still suffer from relatively serious pollution. The acid rain distribution areas remained stable and acid rain pollution was still serious pollution. Current total area subject to water and soil erosion is 3.5692 million km^2, taking up 37.2 percent of total land area. Among them, 1.6122 million km^2 are subject to water erosion, accounting for 16.8 percent, 1.957 million km^2 subject to wind erosion, talking up 20.4 percent of total land area. At present, rural environmental problems are increasingly prominent and they pose severe challenges. It is mainly reflected by such facts as weak infrastructure for treating rural domestic pollution, worsening non-point pollution, prominent industrial and mining pollution, shift of pollution from cities to rural areas and no effective control of ecological degradation in rural areas (MEP 2010).

The report has identified water and air pollution, acid rain, and soil erosion as the major environmental challenges. Environmental problems are shifting towards rural areas are increasing due to weak infrastructure for treating domestic pollution, mining, and industrialisation. China has achieved rapid economic growth, urbanisation, and industrialisation in recent decades, however, the hidden cost of such growth raised grave concerns about the sustainability and its impact on water and air pollution (The World Bank and SEPA 2007).

Water Pollution

Water pollution is one of the most serious environmental threats in China. It poses a triple threat: "Supply is scarce in the populous north, flooding endangers lives and land in the south, and growing municipal and industrial pollution jeopardises regions through the country" (Wu et al. 1999: 251). China's extraordinary economic growth, urbanisation and industrialisation, along with inadequate investment in water supply and treatment have resulted in widespread water pollution. Water pollution became more serious in China in the 1970s as industries were expanded and the population

gradually increased. However, China made progress in wastewater treatment, and the nature of water pollution changed as the municipal wastewater increased and industrial wastewater dropped. Treatment of both municipal and industrial wastewater has increased markedly. Even so, in urban areas 80 percent of the surface water is still polluted, and 50 percent of China's potable water is polluted, threatening the health of the inhabitants in hundreds of cities (Edmonds in Czeslaw Tubilewicz (ed.) 2006: 122).

According to the MEP report (2003), the seven major water systems of China are under slight contamination, which led to water shortage. The seven major rivers are the Yangtze River, the Yellow River, the Songhua River, the Pearl River, the Haihe River, the Huaihe River, and the Liaohe River[1]. These rivers can be put into the following order in terms of the seriousness of pollution according to the comprehensive pollution index: the Haihe, the Huaihe, the Liaohe, the Yellow River, the Songhuajiang, the Yangtze River, and the Pearl River. The main pollutants were organic pollution: petroleum, BOD, ammonia nitrogen, volatile phenols, and mercury.

China's water shortage is estimated to be about 40 billion cubic metres, and it is likely to increase to 100 billion cubic metres (Yang and Teng Siow Song, 2007: 165). Elizabeth Economy (2003) states that about 60 million people find it difficult to get enough water for their daily needs. In 2006, nearly half of China's major cities

[1] The Yangtze River is the longest river in the Asia. It orginates from the glacial meltwaters of the Tanggula Mountains in Tibet and flows approximately 3,915 miles until it empties in the East China Sea near the city of Shaighai. The river flows through 10 provinces (Qinghai, Sichuan, Yunnan, Chongqing, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, and Shanghai).
2. The Yellow River also originates in Tibet and is the second longest river in China. It flows for 3,400 miles through Qinghai, Gansu, Ningxia, Inner Mongolia and the border of Shaanxi and Shanxi, Henan and Shandong before it empties into Bo Hai Gulf in the Yellow River (see Hays 2009).
3. The Pearl River is also known as Zhujiang in Chinese. The Pearl River is the third longest river with 1,500 miles and drains the majority of Guangdon and Guangxi provinces as well as parts of Yunnan, Guizhou, Hunan and Jiangxi. It also drains into northern parts of Vietnam's Northeast Cao Bang and Lang Son province.
4. The Songhua River is the largest tributary of the Heilong River and runs about 1,897 km. The source of the river is a crater lake called Heavenly Lake, which borders North Korea in China's Jilin Province.
5. The Huaihe River flows from west to east, with the Huanghe in the north and Yangtze River in the South (see china.org.cn).
6. The Haihe River the largest water system in north China is formed by five large rivers - the North Canal, the Yongding, the Daqing, the Ziya and the South Canal. The Haihe basin covers Beijing, Tianjin, the greater part of Hebei, and parts of Shandong, Shanxi, Henan, and Inner Mongolia (see http://www.china.org.cn/english/travel/40457.htm).

did not meet provincial drinking-water quality standards (China Water Risk 2010:1). China's water shortage problem could become more serious due to poor water management, uneven water distribution, pollution from industrial waste-paper mills, printing and dyeing factories, chemical plants, domestic sewage, and leakage from outdated waste treatment systems and runoff from agricultural fertilisers (Zhuoqiong 2007).

The water pollution is further triggered by heavy rainfall, floods, or drought. The lack of proper management of water quality poses serious threats to human health and impact on the economy. "In 2007, China's total annual discharge of municipal and industrial wastewater reached 55.6 billion tonnes, of which only 56 percent had some form of treatment" (China Water Risk 2010: 7). The economic cost of disease and death associated with incidence of diarrhea and cancer in rural China is around RMB 66.2 billion, based on 2003 data (Ibid: 8).

Air Pollution

The MEP (2010) report stated that the air quality in urban areas was good but some cities still suffer from relatively severe pollution. China's increasing reliance on coal has made its air quality among the worst in the world (Economy 2003). Within China, the northern cities are more polluted than south, due to industrial activity and geographic and meteorological conditions. Similarly, the most severely polluted river basins are also located in northern China (the Lio, Huai, Hai and Songhua rivers) (World Bank and SEPA 2007).

Almost 68 percent of its energy comes from coal, which has led to continuously high levels of SO_2 and particulate air pollution (Ibid: 2). The acid rain pollution is a serious problem in China resulting from sulphur dioxide emissions from coal-burning and affects around one-fourth of China's land, damaging crop and fisheries. According to the World Bank, 16 of the world's 20 most polluted cities are in China. Almost one-third of the country is affected by acid rain. Whereas 2 percent of the cities suffered from highly acid rain in 2000, this had increased to 10 percent in 2004 (ibid).

Desertification

Desertification in China is caused primarily by excessive land reclamation and increasing livestock numbers in affected areas, devastating sandstorms, and over-cultivation of cropland (Johnson 2009; Economy 2003). More than one-quarter of China's land is now desert, advancing roughly 900 sq. miles annually. China's deserts account for a total land area of 712,900 km2, 13.36 percent of China's total land area (Ci and Xiaohui Yang 2010: 29).[2]

However, the Chinese government acknowledges the environmental problems and has taken various initiatives and measures to resolve the environmental problems, achieving a few positive results in several areas:

1. The environmental system took the combat against financial crisis as a good opportunity to transform the pattern of economic development, restructure the economy and develop environmental cause.
2. Pollution reduction has achieved notable result and some indexes for environmental quality continued to improve. COD discharge and SO_2 emission went down by 3.27 percent and 4.60 percent respectively compared with that of the last year and down by 9.66 percent and 13.14 percent against the 2005 level. The target of SO_2 reduction set in the Eleventh Five-Year Plan was accomplished a year ahead of schedule.
3. Environmental protection in rural areas and conservation of nature and ecology continued to improve.
4. The three basic strategic projects for pollution reduction produced abundant results and the early work of the 12^{th} Five-Year Plan was progressing smoothly.
5. Overall advance has been made in environmental policy and legislation, environmental monitoring, and international cooperation.
6. Positive results have been achieved in environmental planning and capacity building (MEP 2010).

The environmental protection in rural areas is improving and positive results have been achieved in environmental planning and capacity building. However, these achievements have not yet resolved the environmental problems in China, where the greatest challenge for environmental protection is the rapid economic growth.

[2] The major deserts and sand lands are mainly located in Xinjiang, Inner Mongolia, Gansu and Ningxia. The largest among them is the Taklimakan Desert, located in the Tarim Basin of southern Xinjiang, covering an area of 337,600 km2 (see Ci and Xiaohui Yang 2010: 29).

Rapid Economic Growth and Environmental Problems

In recent years, China has achieved rapid economic growth with an increase in GDP of 8 to 9 percent (The World Bank 2007:1). However, economic growth has carried a significant environmental cost even though the Chinese government has made great efforts to protect its environment (Pan 2007; Wang 2006; Chen 2010; Li 2006). Thus, the report released by the World Bank and State Environmental Protection Agency (SEPA) of China (2007) claimed that China's economic growth over the last 20-25 years has had positive impacts on the environment. Nevertheless, according to several scholars, China's environment continues to degrade due to rapid industrialisation and increasing rates of per capita consumption (Pong (ed.) 2009: 525; Economy 2003).

With China's opening-up and Deng Xiaoping's market reforms, rapid economic growth has been the policy of China since the 1980s, and the country has quickly passed through the development stages that have taken the developed countries a century. "China has gone through industrialisation in the past twenty years that many developing countries needed one hundred years to complete," said Pan Yue, the Deputy Director of China's SEPA. However, China is experiencing the same growing pains as any other industrialized nations (Zissis and Jayshree Bajoria, 2008; Huang et al. 2010: 221). In fact, the Chinese government has acknowledged the same problem and pointed to "a lot of environmental problems that have haunted developed countries in different phases of their 100-year-long industrialisation are appearing at the same time in China" (State Council 2006).

China's economic growth has followed the traditional development model, which depends on high material consumption. China's GDP accounted for only 4 percent of the world total in 2003, the share of key material consumption was much higher than other countries: coal 31 percent, steel 27 percent, cement 40 percent, aluminium oxide 25 percent, and petroleum 7.4 percent. The energy consumption per unit industrial product in China is 30 percent higher than that in developed countries (Wang 2006: 282). Therefore, China's economic growth comes at the cost of resource depletion and high-energy consumption.

Another critical issue is the economic impact of environmental problems in China. In 1997, The World Bank study estimated environmental costs of China's GDP to be 8 percent, with 93 percent attributable to air pollution and 7 percent water pollution. In September 2006, the SEPA and the National Bureau of Statistic (NBS) jointly released the first green GDP report. The report indicated that environmental pollution had cost China 511.8 billion Yuan (US $64 bn) in economic losses, accounting for 3.05 percent of the country's GDP in 2004. The economic cost of environment pollution was lower than the international report but it shocked government officials.

There is widespread agreement among environmental economists that the total cost to the Chinese economy of environmental degradation and resource scarcity is 8 to 12 percent of GDP annually which is well above the 0.8 to 1.0 percent standard recommended by the United Nations Environmental Program (UNEP). The greatest cost is in health and productivity losses associated with urban air pollution, which the World Bank estimates at more than $20 billion. Water scarcity in Chinese cities costs about $14 billion in lost industrial output (when factories are forced to shut down); in rural areas, water scarcity and pollution contribute to crop loss to the value of roughly $24 billion annually (Economy 2005: 6).

Getting more out of that investment motivates China's current goal to strengthen and reform environment management. However, China is still one of the world's largest contributors to ozone depletion, biodiversity loss and climate change. Moreover, China ranked 121st out of 163 countries on the list of 2010 Environmental Performance Index report released by Yale University and Columbia University (Huang et al. 2010: 222).

Population/Urbanisation and Environment

The thrust for rapid development and a large population also place enormous pressure on China's environment (Li 2006; Wang 2006). China has the world largest population of 1.3 billion people. This massive population poses an enormous challenge to China even after it placed population growth under control policies like One Child Policy. The massive population is the cause of considerable pressure on resources and the environment. Increase in per capita income is accompanied by an

inevitably growing per capita consumption of water, heating, electricity, air conditioning, and transportation, adversely affecting China's environment.

Moreover, China's urban population is increasing each year, causing a concentration of pollution in cities. In 1978, China had 172 million urban population and it increased by 43 percent in 2005 with 562 million urban population. From 2000 to 2005, the urban population is increased by 103 million (World Bank and SEPA 2007: 9) (see table: 2.1). In many of these urban populations live in areas that suffer from severe water and air pollution.

(Table: 2.1) China's Urbanisation and Industrialisation

Year	**Total Population**	**Urban Population (million)**	**Percent Urban Population**
1978	963	172	18
1985	1,059	251	24
1990	1,143	302	26
1995	1,211	352	29
2000	1.267	459	36
2004	1,300	543	42
2005	1,308	562	43

(Source: World Bank and SEPA 2007: 9)

Social Impact of Environmental Problems

China bears several social costs from its environmental pollution: environmental migration and social unrest.

Environmental Migration

Environmental migrants are "persons or groups of persons who, for compelling reasons of sudden or progressive change in the environment that adversely affects their lives or living conditions, are obliged to leave their habitual homes, or choose to

do so, either temporarily or permanently, and who move either within their country or abroad" (IOM 2011).

Environmental migration has been a major issue for China in recent years. Displacement due to natural disasters impacted happened big cities (Randall 2013) with millions of people moving into the cities to escape environmental problems. In 1994, the World Bank Report stated:

> Since the founding of the People's Republic, more than 10 million people have undergone involuntary resettlement. This experience has not been entirely successful. It is estimated that 25 percent of resettlers are better off than before, 25 percent are at the same level as before and 50 percent are not better off than before. This less than satisfactory situation is the result of inadequacies in regulations, planning, execution, and funding. The need to improve the situation is slowly being recognized (Woort 1994: 69).

According to the report, 10 million people had undergone involuntary resettlement in China, and 50 percent of the people were not better off than before. Zhang Shaoshan, an official of the Office of Resettlement of the Ministry of Water Resources, slightly downplays the above problems by saying that from the total number of resettlers, one-third are well settled, one-third are marginally settled, and one-third are poorly settled. The area of land allocated to them after the relocation is much smaller than the land that they owned before. Therefore, the land's productivity is also much lower. Another problem is that the public facilities in some areas are incomplete. So, they face problems accessing transportation, education and so on.

These migrants place significant additional stress on cities already facing shortage of water, employment, housing etc. Forced migration or resettlement, as a result of large-scale projects like river diversions or dams is a source of unrest. For example, the Three Gorges Dam[3] resettlement has caused demonstrations involving hundreds of farmers. A large numbers of reports have highlighted corruption during the resettlement. China continues to build dams and carry out water megaprojects

[3] "The Three Gorges Dam is the world's largest hydropower project and most notorious dam. The massive project sets records for number of people displaced (more than 1.2 million), number of cities and towns flooded (13 cities, 140 towns, 1350 villages), and length of reservoir (more than 600 kilometers). The project has been plagued by corruption, spiraling costs, environmental impacts, human rights violations and resettlement difficulties" (International Rivers).

which cause further deterioration to the environment, threatening people's livelihood and creating environmental migrants. China owns and operates more than 80,000 dams, about 22,000 of which are large dams and mostly built after the Communist takeover in 1949. Millions of people have been displaced due to dam constructions in China.

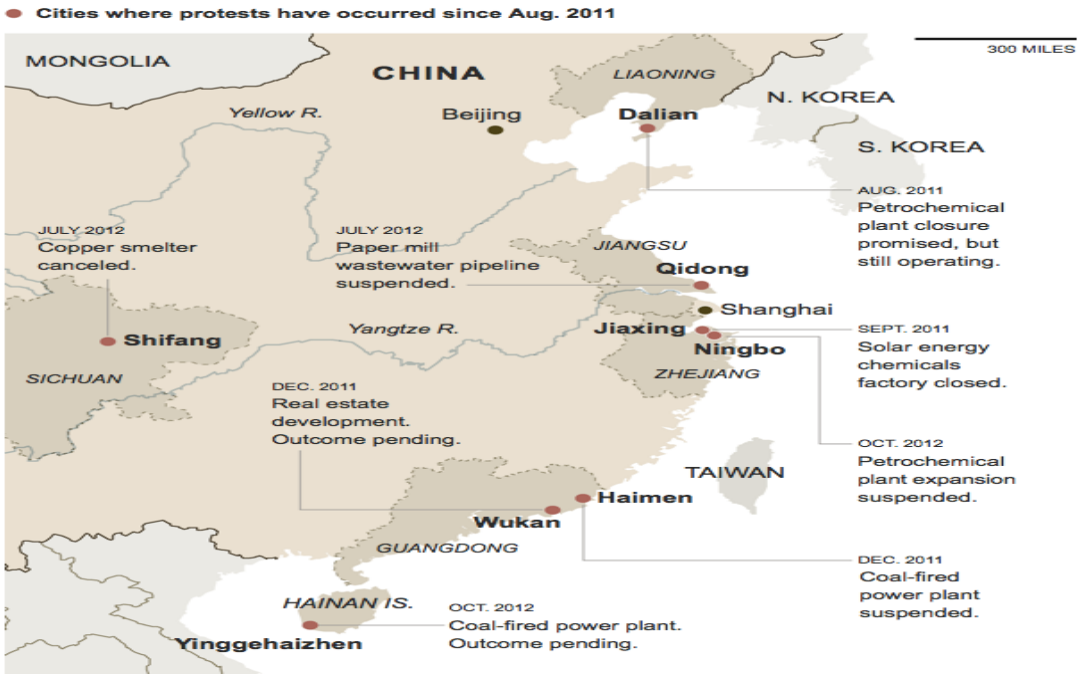
Environmental Protests

Disputes over forests, grasslands, and mineral resources, as well as water pollution caused by factories are often the cause of social unrest in China. According to SEPA 2004, the number of environment-related proposals raised by delegates to the People's Congresses doubled from 6177 in 1996 to 12,523 in 2004. Zhou Shengxian, China's top environmental official announced that there were around 51,000 pollution related protests in 2005, rising to 180,000 public environmental protests in 2010. Citizens' complaints to local officials increase at a rate of 30 percent a year.

Major cities that complain about pollution since 2011 were Shifang in Sichuan Province, Beijing, Dalian in Liaoning Province, Qidong in Jiangsu Province, Jiaxing and Ningbo in Zhejiang province, Haimen and Wukan from Guangdong Province, and Hainan in Yinggehaizhen province. Most of the complaints were related to a coal fire power plant, paper mill waste pipeline, and petrochemical plant expansions (see Map: 2.1).

These environmental protests create social unrest in the country, further challenging the stability of the government and damaging China's international image. Therefore, it is essential for the government to address these issues and introduce policies and regulations to address people's discontent.

(Map: 2.1) Cities Where Protests have occurred since August 2011



(Source: New York Times 2012)

Continued internal dissatisfaction with the government's efforts at managing environmental policy led the leadership to designate the Environmental Protection Bureau one of the five new "major bureaus" created by the Eleventh NPC (2008) under a new "major bureau system". The question is whether the bureau will have authority over other traditionally more influential interests, such as energy and agriculture. From 2002 and 2007, China has promulgated a series of environmental laws, regulations, practices and standards such as the provisional decision on penalties that can be imposed not only for violation of the letter of the law but also for behaviour that is deemed contrary to the intent of national policy, guidelines for public participation in environmental impact assessments and so on (Ibid: 531).[4]

[4] China suffers from a series of wider 'governance deficits', including a lack of official accountability, public participation, and transparency and weak rule of law. These factors impede the effective enforcement of environmental legislation. It is widely acknowledge that environmental public participation and information disclosure is insufficient. As a result, the public is limited in the extent to which it can hold local officials to account (See Johnson 2009: 10).

Institutional Structures of Environmental Protection in China

The Communist Party of China is the unitary governing party with the General Secretary, the most prominent leader, and a Politburo of 24 members, among which the Standing Committee of 7 members is the most powerful. Alongside the Party, are the state government institutions, with the nearly 3,000 members of National People's Congress (NPC) being the legislative body that approves laws and the general direction of the country through five-year plans negotiated in advance.

The State Council of the People's Republic of China is the chief administrative authority in the country, chaired by the Premier. The 27 ministries and commissions under the State Council include several with overlapping jurisdiction over environmental matters, including the MEP, the Ministry of Water Resources, the Ministry of Agriculture, the Ministry of Housing and Urban-Rural Development (formerly Ministry of Construction), the Ministry of Science and Technology, and the Ministry of Land and Resources (Shapiro 2012: 62).

The top-down, multilayer power structure prevents effective implementation of environmental rules and regulations when local party bosses are not incentivized to push forward the green causes (Chen 2009). The legislature (Congress), the cabinet (State Council), and the Chinese Communist Party (CCP) play a dominant role in all decision-making processes. Although the three systems (the Party, the administration, and the legislature) are all led by party members, there is still an implicit dimension of power play in daily political life. Party secretaries of CCP committees at all governmental levels (central, provincial, municipal, county, township) have a dominant say in all political affairs, while the administrative chiefs at various levels are responsible for daily routine and administrative work but have to listen to the party committee's orders during decision-making on important matters.

The system of People's Congress at all levels is the least powerful branch among the three. The National People's Congress (NPC) also referred to as "rubber stamp" by western media, is spite of being regarded by the Constitution as the nation's highest legislative body, passing both basic environmental and special laws. In practice, the State Council (administration) drafts proposed laws and refers them to the NPC and its Standing Committee because it sits at the top of a vast bureaucracy

including all ministries, commissions, and other administrative agencies. The People's Congress at all levels holds plenary sessions once a year, but delegates have very limited power in supervising the implementation of laws (Chen 2009: 17-18).

The global environmental awareness increased dramatically after the United Nations Conference on the Human Environment (Stockholm Conference) of 1972, which also encouraged China to strive towards the environmental conscious state. Therefore, the institutional framework slowly grew in China. In 1974, the State Council Leading Group Office for Environmental Protection was established; the office was reorganised into an Environmental Protection Bureau (EPB) in 1982. In 1984, the Bureau was renamed the National Environmental Protection Agency (NEPA) and promoted in 1987 to an independent agency at deputy ministerial level directly under the State Council. NEPA was again renamed the State Environmental Protection Administration (SEPA), with ministerial equivalence in 1998. In March 2008, SEPA was elevated to cabinet-level Ministry of Environmental Protection (MEP)[5] with its sub-branches established at provincial, municipal, county and even township level under EPBs or EPOs (Environmental Protection Offices) (see table: 2.2).

Unlike the powerful Ministry of Foreign Affairs or the National Development and Reform Commission, the ministerial-level SEPA is an organisation directly under the State Council and receives most of its funding from the State Council. Moreover, there is a fragmented and complicated division of work, the pollution control functions being scattered among several ministries including water resources, construction, agriculture, oceanic, and forestry administration. The Ministry of Foreign Affairs is in charge of talks on international environmental treaties, and the National Development and Reform Commission is responsible for the environmental protection of industry, energy efficiency, and climate change, and carbon emission cutting issues. The protection of water resources is managed by the Ministry of Water

[5] Current MEP leaders are Li Ganjie, Secretary of the Leading Party Members' Group, and Minister, of the MEP; Zhou Ying, a member of the Leading Party Member's Group of the MEP; Zhai Qing, Vice Minister of the MEP; Zhao Yingmin, Vice Minister of the MEP; Liu Hua, Vice-Minister of the MEP and Administrator of the National Nuclear Safety Administration; and Wu Haiying, Head of Discipline Inspection at the MEP (see MEPa).

Resources, while the Bureau of Forestry takes care of ecological protection of the forests. The Oceanic Administration, the Ministry of Agriculture, and the Ministry of Construction are in charge of the environmental protection of ocean, rural soil and water, garbage treatment, and urban water (Gang 2009: 22).

(Table: 2.2) Institution Structure of Environmental Protection

Year	Institutional Development
1974	The State Council Leading Group for Environmental Protection was established
1982	Ministry of Urban and Rural Development and Environment Protection was established, as one of the internal departments of which was Environmental Protection Bureau.
1984	The Environmental Protection Commission was established The Environmental Protection Bureau under the Ministry of URDE was reshuffled into National Environmental Protection Agency, which was still under the office of Environmental Protection Commission of the State Council
1988	National Environmental Protection Agency (a sub-ministerial level agency) was founded
1998	National Environmental Protection Agency was upgraded to State Environmental Protection Administration (Ministerial level). The Environmental Protection Commission of the State Council was revoked
2008	The State Environmental Protection Administration was upgraded to Ministry of Environmental Protection as an integral department of the State Council

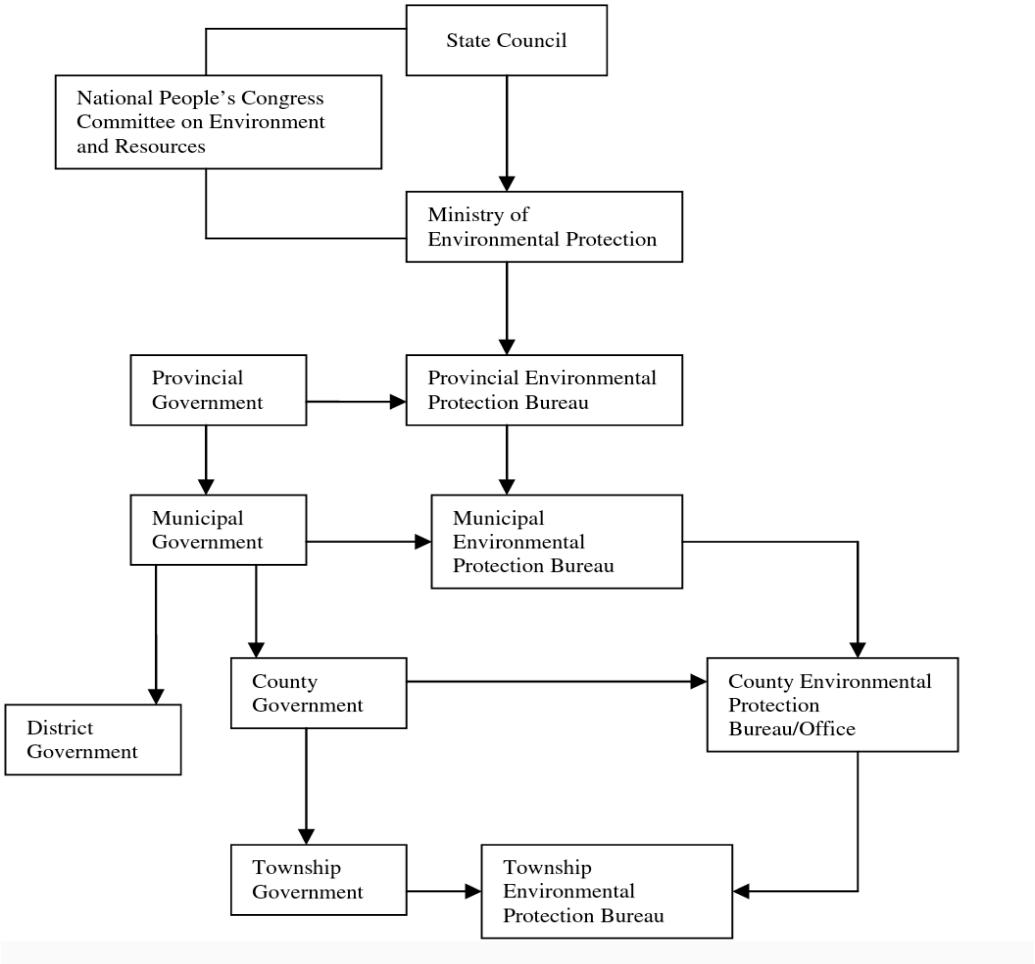
(Source: MEP)

In other words, though SEPA is responsible for addressing environmental issues, a number of ministries as well as agencies of the State Council are involved in environmental management and protection, such as the Ministry of Land and Resources, the Ministry of Water Management, the Ministry of Forestry, the Ministry of Agriculture, the Ministry of Health, the Ministry of Construction, the Ministry of Supervision and the Ministry of Communications.

Institutionally, the national regulatory framework is implemented through a four-tier management system, i.e., national, provincial, municipal and county levels. Local authorities govern the latter three levels in terms of financial and personal management. SEPA is responsible only for their substantial operation. SEPA and EPBs use various instruments to address the environmental problems, such as

command and control approaches, economic instruments, voluntary action and public participation. The regulatory and administrative framework for pollution control is extensive and has been continuously expanded to improve effectiveness to cover various emerging issues.

(Figure: 2.1) China's Environmental Protection Apparatus



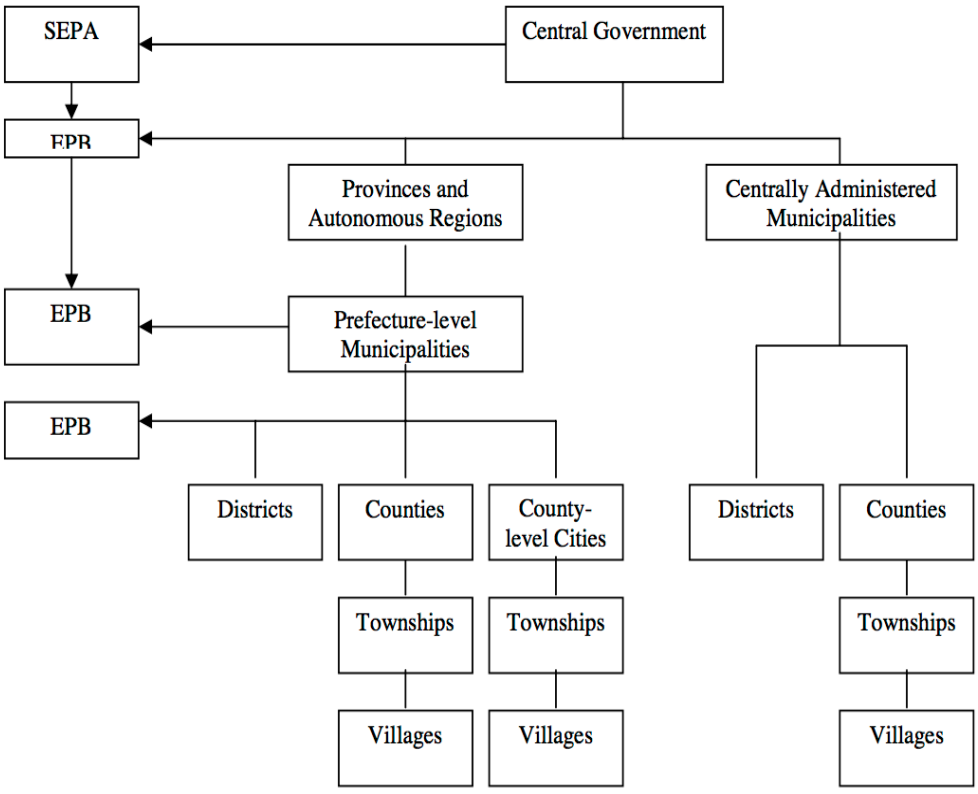
(Source: Gang 2009)

Notes: Advisory Relationship

Leadership Relationships

At the sub-national level, there are around 2000 EBPs who are responsible for implementing environmental policy at the sub-national (local) level[6]: at the provincial, prefecture/municipal, district/counties, and township administration levels (see figure: 2.1). EPBs are responsible for "overseeing EIA and other procedures for new development projects, monitoring pollution releases from industries, assessing fees for pollution discharges, initiating legal action against firms that fail to meet environmental requirements, and environmental reporting, environmental education and awareness raising activities" (OECD 2006).

(Figure: 2.2) The Sub-National Institutional Structure for Implementing Environmental Policies



(Source: OECD 2006: 17)

Other administrative units of local government that are involved in environmental policy implementations are Environmental Protection Committees of

[6] As opposed to the common meaning of "local level" in westerns, the term "at the local level" refer to China's environmental agencies at the provincial, municical and county levels.

Local People's Congresses, Environmental Protection Commissions of local governments, Mayor's offices, Planning Commissions, Industrial Bureaus and Finance Bureaus. The Environmental Protection Committees of local People's Congresses promote local environmental regulations, coordinate EPBs' work with that of other government organs, take decisions on large investment projects, review the environmental protection plans of EPBs, and manage city revenues and expenditures.

However, EPBs face several structural challenges at the local level. First, EPBs receive guidance from the SEPA but financially and institutionally they are dependent on provincial and local government. These local governments, however, tend to favour economic development over environmental protection. Secondly, the performance of local government leaders focuses on GDP growth rather than environmental issues. The State Council has included environmental performance in the evaluation and reward system of government officials, but the implementation remains difficult. Finally, the process of decentralisation has conferred more power and responsibilities on local governments without necessary providing them with the means to fulfil them. Local governments have responsibilities to address their local problems as well as to provide local funds to do that. Therefore, they tend to favour economic development over environmental issues and an effective implementation of environmental protection become difficult at the local level (OECD 2006: 18-19).

The structure of China's environment protection institutions gives local governments a high degree of autonomy over environmental policy and enforcement decisions. All the environment staff is funded, employed and controlled at the local level. It's hard for provincial, municipal, district, and village-level environment authorities to implement national policy and enforce national laws and regulations (Pong (ed.) 2009: 529-30).

Environmental Legal Systems in China

China paid little interest and attention to the environment before the 1970s. In the 1970s and early 1980s, there were hardly any independent environmental movements or NGOs. Coordination between state authorities and local departments were weak with environmental authorities having limited power. Emphasis on pollution control

was one of the first initiatives taken in the early 1970s, after the first global environmental conference - the United Nations Conference on the Human Environment in 1972 in Stockholm.[7] The conference attended by forty Chinese delegates and Professor Qu Geping who became the first director of China's Environmental Protection Agency in 1987, led the delegation.[8] In an interview in 2004, he said that the Chinese people hardly had any idea about modern environmental concepts before the 1970s. They thought that pollution and economic damage were the fruits of the capitalist system, and had nothing to do with socialist China (China Daily 2004). This interview shows the ignorance of the Chinese on the issues of environment before the 1970s as was the case with any other people in the world.

China's environmental laws and regulations developed along with the institutional growth. In 1984, environmental protection was defined as a "basic national policy". Fundamental principles for environmental protection were introduced, including 'prevention is the main, then control', 'polluter responsibility for pollution control', and 'strengthening environmental management' (Mol. A.P.J and Neil T. Carter 2006: 152). Subsequently, national environmental executive regulations, standards, and measures were formulated (see table: 2.3).

The Environmental Protection Law (EPL) came into effect in 1989 and in 2014 Chinese legislators passed the first amendments to the EPL in 25 years. The law lays out general principles of environmental protection and key mechanisms for environmental management. Thus article 6 of the EPL recognises the right to report or file charges against the cause of pollution by individuals and organisations: "All units and individuals shall have the obligation to protect the environment and shall have the right to report on or file charges against units or individuals that cause pollution or damage to the environment" (MEP 1989).

[7] The first UN summit on the environment and it put the environment on the political agenda. No country in the world had a ministry of the environment before Stockholm Conference.

[8] Professor Qu was a pioneer in China's environment protection. He was also the Director General of the Department of Environmental Protection in the Ministry of Urban and Rural Construction and Environmental Protection and Vice Chairman of the Leading Group of Environment Protection under the State Council of China.

The law further emphasis the Environmental Impact Statement:

> Article 13 Units constructing project that cause pollution to the environment must observe the state provisions concerning environmental protection for such construction projects. The environmental impact statement on a construction project must assess the pollution the projects is likely to produce and its impact on the environment and stipulate the preventive and curative measures; the statement shall, after initial examination by the authorities in charge of the construction project, be submitted by specified procedure to competent department of environmental protection administration for approval. The department of planning shall not ratify the design plan descriptions of the construction project until after the environmental impact statement on the construction project is approved (MEP 1989).

The Environmental Impact Assessment (EIA) is another important instrument to assess the environmental impact of proposed projects that include: (a) integrated plans for land use and regional development, development of drainage areas and marine areas; (b) specific plans for industry, agriculture, animal husbandry, forestry, energy, water management, transportation, urban construction, tourism and the development of natural resources (Wu et al. 2004). The Law on EIA came into effect in 2003 and has been implemented in China for more than 20 years. Four stages are involved in an EIA investigation: design of the investigation, evaluation of background environmental quality, prediction of environmental impacts and assessment and analysis of the environmental impacts (Wenger, RB et al. 1990). Article 1 of the EIA law states, "This law is formulated for the purpose of realizing sustainable development strategy, preventing adverse impacts on the environment from implementation of plans and construction projects, and promoting coordinative development of the economy, society and environment" (EIA Commission).

The origin of the EIA can be traced back to the late 1960s when the US National Environmental Policy Act of 1969 was enacted. Since then countries all over the world have adopted the concept, with China adopting it too in 1979 during the Fifth National People's Congress by the Standing Committee (Wenger, RB et al. 1990).

Different views were expressed concerning the effectiveness of the EIA program in protecting the China's environment. Some argue that the EIA has brought improvement in environmental protection whereas some argues that the program has

had little effect in preventing pollution due to poor enforcement and implementation (Ren 2013; Wu et al. 2005). The main reasons for the weak implementation of the EIA include the institutional arrangements, poor incentive mechanisms, lack of financing for EIA initiatives, and the low level of environmental awareness and ethics among governmental officials and the general public. Finally, although public participation plays a significant role in making EIA effective, major constrains include the limited access to information, limited access to judicial redress and remedy and limited impact of the public in decision-making (Zhao 2010).

At a national level, China has some 20 environmental laws adopted by the National People's Congress, the legislative body; around 140 executive regulations issued by the State Council, the chief administrative council in China; and a series of sector regulations and environmental standards set by the SEPA (Mol. A.P.J and Neil T. Carter 2006: 152). Thus, since the mid-1990s environmental legal code was introduced with many new environmental standards and regulations (Shapiro 2012: 64).

(Table: 2.3) Key Plans by China on Environment and Development

Year	Plans
1973	First Environmental Protection Working Conference Proposed policies and stated work on environmental protection
1978	Environment was included in Constitution
1979	Approved China's First basic law of Environmental Protection- "Environmental Protection Law of People's Republic of China (Trial)" (Adopted in 1989)
1982	Marine Environmental Protection Law of PRC was adopted
1983	Second Environmental Protection Working Conference Identified environmental protection as a basic national policy
1984	Law of the PRC on Prevention and Control of Water Pollution
1985	Law of Grasslands
1986	Law on Fisheries Law on Mineral Resources
1988	Law on Wildlife Protection
1989	Environmental Protection Law of the PRC is adopted
1991	Law on Water and Soil Conservation
1992	The China's Ten Strategic Policies on Environment and Development announced that China would adopt the sustainable development strategy
1993	The 2nd National Conference on the Prevention and Control of Industrial Pollution proposed the notion of ''Three Shifts''

	(1) Shift from end-of-pipe treatment to whole-process control (2) Shift from concentration control to both concentration and total amount control (3) Shift from scattered treatment to a combination of scatter treatment and centralized treatment
1994	Released China's Agenda 21, White Paper on Population, Resources, and Environment and Development Incorporated sustainable development strategy into long-term planning for social and economic development
1995	Law on the Prevention and Control of Atmospheric Pollution Law on the Prevention and Control of Environmental Pollution by Solid Waste China sought to achieve two fundamental transformations: (1) From planning economy to socialist market economy (2) From extensive to intensive economic growth mode
1996	Law on Prevention and Control of Pollution from Environmental Noise The National People's Congress approved The Ninth Five-Year Plan for State Economic and Social Development and Long-Term Objectives for 2010 The State Council convened the 4th National Conference on Environmental Protection and issued the Decisions on a Number of Environmental Issues. Law on Mine Law on Coal
1997	15th CPC National Congress- Defined sustainable development as a strategy for national development Circular on Further Strengthening the Land Management to ensure the Conservation of Cultivated Land Report on China's Situation of Biodiversity Law on Energy Resources
1998	Plotting Programs for Acid Rain Control Region and SO_2 Control Region National Ecological Restoration Plan Circular on Protecting Forest, Banning Felling to Reclaim Wasteland and Occupying Woodland Circular on Stopping the Production and Sales Gasoline Containing Lead Law on Land Resource
1999	Law on Marine Environment was revised and promulgated Circular on the Collection of Wastewater Treatment Fees and the Establishment of Urban Pollution Discharge and Centralized Treatment was issued
2000	Law on the Prevention and Control of Air Pollution was amended for the 2nd time The Western Great Development Strategy emphasized the importance of infrastructure construction and ecological conservation Regulations for the Implementation of Forestry Law of the PRC Circular of the State Council on Urban Water Supply, Saving Water and Water Pollution Control
2001	The Tenth Five-Year Plan and Sectorial Plans Law on Prevention and Control of Desertification
2002	16th CPC National Congress- Proposed to build a moderately prosperous, well-rounded society and set the objectives of ecological and environmental

	improvement and sustainable development
2003	Law on the Promotion of Cleaner Production Law on the Environmental Impact Assessment Law on Radioactive Pollution Prevention and Control
2004	Law on Administrative Permission Interim Measures on Administrative Permission Hearings for Environmental Protection
2005	Law on the Promotion of Renewable Energy. Decision of the State Council on Implementing Scientific Outlook on Development and Strengthening Environmental Protection The State Council issued the Interim Provisions on Promoting Adjustment to Industrial Structure SEPA issued the Measures on Preventing and Controlling Environmental Pollution due to Disused Hazardous Chemicals
2006	SEPA jointly issued Interim Measures on Public Participation for Environmental Impact Assessment The Ministry of Supervision and the State Environmental Protection Administration jointly issued the Interim Provisions on Administration of punishing illegal behaviours for Environmental Protection The State Environmental Protection Administration and the National Bureau of Statistics jointly issued the China's Green GDP 2004
2007	17th CPC National Congress- Proposed ecological civilisation construction for the first time
2009	Announcement on Amending Catalogues of Imported Wastes Management
2011	Suggestions of the State Council on Strengthening Major Activities of Environmental Protection
2012	18th CPC National Congress Elevated ecological civilization as a political outline and national strategy of governance
2014	Environmental Protection Law of the PRC is amended
2015	Opinions on Accelerating the Promotion of Ecological Civilization and Overall Plan for the Reform Defined the overall design and roadmap for ecological civilisation construction in the future
2016	Outlines of the 13th Five-Year Plan for National Economic and Social Development Proposed the concept of green development and incorporated ecological civilisation as an important part of the Five-Year Plan
2017	Renewable Energy Law of the PRC The Belt and Road Ecological and Environmental Cooperation Plan

(Sources: Zhang, Kun-ming and Zhong-guo Wen 2008: 1251; UNEP 2016; MEP; OECD 2006)

Subsequently China has made efforts to incorporate environmental goals in its five-year plans, particularly the 11th Five-Year Plan (2006-2010) that successfully reduced energy intensity by 20 percent by raising non-fossil fuel use from 8 to 11.4

percent. Carbon Dioxide (CO_2) emission was cut by 17 percent and major pollutants such as nitrogen oxide (NOx) and sulphur dioxide (SO_2) were reduced (Shapiro 2012: 63). China has quite successfully suspended particulates and SO_2 concentrations since the late 1980s and late 1990 in most major Chinese cities. By the end of 2000, almost 30 companies were closed which led to a decrease of CFC production by 33 percent since the mid-1990s (Mol. A.P.J and Neil T. Carter 2006: 153). The 12th Five-Year Plan (2011-2015) had the objectives of sustainable development goals being incorporated into Chinese manufacturing practices with emphasis on environmental issues and natural resources. This shows remarkable improvement in the environment of China given the great emphasis equally paid on economic development.

Over the years, China's policies on environment and development have evolved in following five phases (Kunmin et al. 2007; Wang 2010).

1. *Status from national basic state policy to sustainable development strategy*

In 1983, the State Council announced that the environment is China's national basic state policy. Nine years after later just two months after the Rio Conference, China issued *Ten Strategic Policies for Environment and Development* and announced that it is implementing national strategy of sustainable development. China was the first developing country to declare the adoption of a sustainable development strategy. In 1994, China published Agenda 21, which was also the first national - level "*Agenda 21"* in the world, promoting its implementation in different areas such as planning, policy, legislation, public participation, and communication. In 1996, the Ninth Five-Year Plan (1991-1995) listed sustainable development among essential strategies along with science and education. All national and local governments used sustainable development concept to guide their work.

2. *Focus changed from pollution control to combination of pollution control and ecological protection*

   From the early 1970s to early 1990s, China has focused on environmental protection from wastewater, emission and solid waste treatment, aiming mainly to control pollution. In 1998, however, when the Yangtze flood hit China, it realised the urgency of protecting the natural environment and introduced various

measures like afforestation and formation of natural protection zones, and established ecological pilot region/unit.

3. *Method changed from end control to source control*

   China has changed from end control to whole process control, solely concentration control to combined control, and decentralised treatment to centralised treatment to the industrial pollution control. It has also put limits to development of heavier pollution, higher resource consumption industries and has begun to introduce cleaner production with loans from the World Bank. This has helped to reduce damages to resources and environmental pollution from the sources.

4. *Moved from point source treatment to catchments and regional treatment*

   The "Polluter Pay" policy focused on point source control and concentration control. In 1996, three state departments: the State Planning Commission, the State Economic and Trade Commission and the National Environmental Protection Agency jointly issued *Plan on Total Emission Control of Major Pollutants during the Ninth Five-Year Period*. Between 1996-2005, *Plan on Trans-Century Green Project* was implemented to three rivers (Liao, Hai, Huai), three lakes (Taihu, Dianchi and Chaohu) and two zones (SO2 Pollution Control Zone and Acid Rain Control Zone), one sea (Bohai), and one city (Beijing), the Three Gorges Reservoir and the upper reaches of the Yangtze River, and Area of Project on Water Pumped from South to North. The plan promotes the treatment of environmental pollution in key catchments and regions.

5. *Management style change from administrative management-based method to a legal and economic instruments-based method*

   Since 1990s, environmental legislation in China has been improved and increased year by year. To date nine environmental laws, including *Law on Environmental Protection* and *Law on Prevention and Control of Water Pollution*, and 15 laws regarding natural resources, including *Law on Water* and *Law on Forestry* have been passed. The State Council has released over 50 administrative regulations

and SEPA has issued nearly 200 regulations and over 500 national environmental standards.

Thus, the Chinese government has passed many laws on environmental protection. Recently, Premier Li Keqiang stated that the government will "resolutely declare war against pollution as we declared war against poverty" (Reuters, 5 March 2014). Yet environmental groups argue that China's biggest challenge is the gap between legislation and implementation. Ma Tianjie, program director for Greenpeace East Asia states, "if you look at China's air pollution or water pollution control laws, they're pretty good compared to global standards, but no matter how good (they) look on paper, the true test will always be the willingness of local authorities to enforce them" (The Guardian, 25 April 2014).

China's Environmental Diplomacy

China has also signed and ratified many international environmental treaties, such as the 1971 Ramsar Convention on Wetlands, the 1973 Convention on International Trade in Endangered Species (CITES), the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, the 1989 Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, the 1992 United Nations Framework Convention on Climate Change (UNFCCC), and the 1997 Kyoto Protocol to the UNFCCC. Chinese officials have attended the key United Nation conferences, including the pivotal global environmental conferences in 1972 in Stockholm, 1992 in Rio, 2002 in Johannesburg, 2012 in Rio, China and the G-77. Since 1994 China has had an administrative centre for China's Agenda 21 (the sustainable development action plan that emerged in 1992). The country has done a great deal to reduce the percentage of non-renewable fossil fuel resources in its energy mix.

In 2007, the government passed a Medium and Long-term Development Plan for Renewable Energy in China, which requires that 15 percent of China's energy come from renewable sources by 2020. China has accepted the principle of "common but differentiate responsibilities", a core tenet of international environmental law that acknowledges that all countries have a shared interest in dealing with our environmental crises (Shapiro 2012: 62-63).

China will eventually adopt all climate regulations because it will be in its own interest to solve the climate change problems and international pressure will compel Beijing to implement the international environmental regulations. The question is whether China is a global problem or the solution for a global environment? China being the largest greenhouse gas emitter since 2007 is also responsible for 27 percent of the global emission in 2014, more than the US and the European Union (EU) combined (Sun 2016). China has been also blamed for wrecking the climate negotiation in Copenhagen. In 2009, at the UN Conference on Environment and Development, the Chinese Premier Minister emphasised economic development and national sovereignty as the nation's main concern. China has also not signed the final agreement at the UN Conference on the Human Environment in 1972.

However, China's environmental diplomacy seems to have changed over the last few years, with its ambitious actions and plans at the domestic level and active participation in global environmental governance. China has made efforts to decrease national energy intensity and build up a set of strategic low - carbon industries, at the same time shutting down thousands of inefficient power plants and factories. Internationally, China has played a key role in facilitating the conclusion of the Paris agreement since 2014, and recently ratified the Paris Agreement.

Positive Development of Environmental Policies and Regulations

China's environmental policies have evolved from its early stage of focusing on enhancing administrative institutions of environmental protection and improving environmental legislature to its new stage of emphasising economic development and environmental protection. Some of the positive developments of environmental policies are increased investment in environmental protection, green technologies and renewable energy, model environmental cities, and ecosystem restoration efforts.

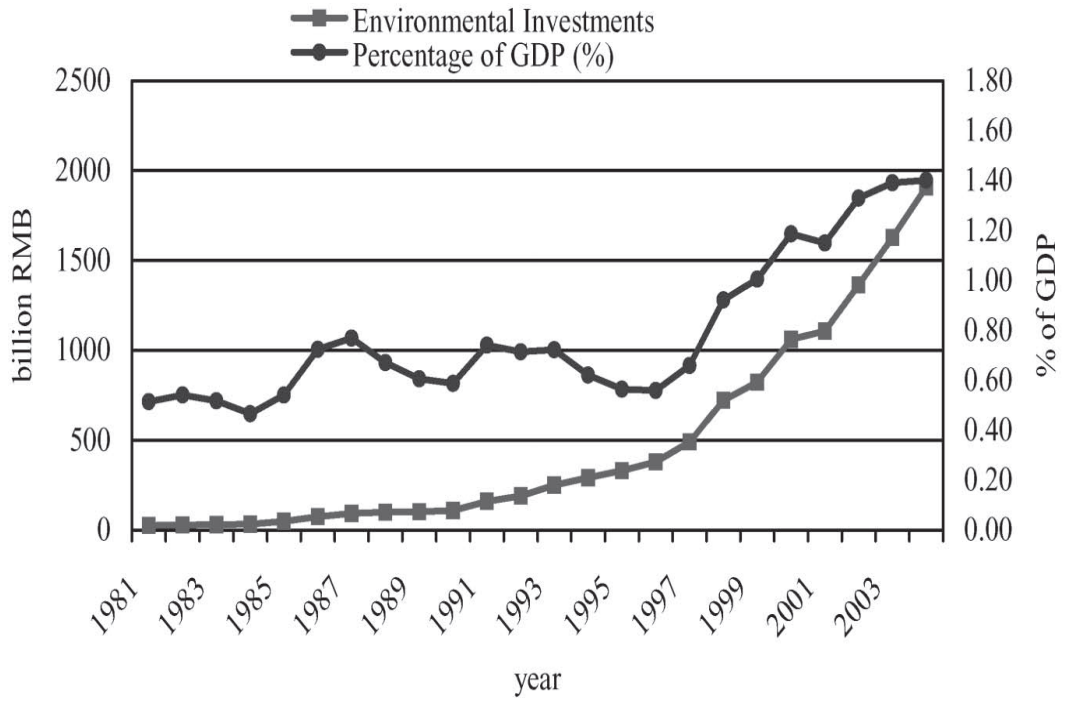
Increased investment on Environment Protection

There has been an increase in government environmental investments in China from 0.6 percent of GDP in 1989 to 1.0 percent of GDP in 1999 and 1.4 percent in 2004

(see figure: 2:3) (Mol, A.P.J and Neil T. Carter 2006: 154). In 2008, China spent 1.49 percent of its GDP on the environment, increased by 3.4 times compared with that in 2000 (Chunmei 1702).

The growth number of firms certified to ISO14001 standards, has grown from nine (in 1996), to around 500 (in 2000) to over 8800 (in 2004), and the closing of heavily polluting factories following influential environmental campaigns during the second half of the 1990s point in a similar direction (Mol, A.P.J and Neil T. Carter 2006: 154).

(Figure: 2.3) Governmental Environmental Investments, 1981–2004: absolute (in billion RMB) and as the Proportion of GDP.



(Source: China Statistical Yearbook (1981–2004)

Green Technologies and Renewable Energy

In recent years, China has successfully taken initiatives on green technologies and renewable energy. China's investment in renewable energy grew by 18 percent in 2007 when the investment in renewable energy by developed countries dropped in 2008. China has been the highest investor in renewable energy in Asia reaching over $15.6 billion (Chunmin 2010: 1702) and is a global competitor in markets like solar

and wind power. However, some developed provinces in China like Shanghai paid more attention to environmental protection by spending 3 percent of its GDP for the environment in 2007.

The government has partnered with industries to provide high incentives to develop renewable energy technologies, which now play a crucial role in China's economy domestically and as well as in the export market. According to Xinhua news agency, the country installed 16 gigawatt (GW) of new wind power in 2010, 62 percent more than 2009, bring the total wind capacity to 41.8 GW, the world's largest. China has an enormous potential for wind energy, which could supply all of China's power needs for the next 20 years if it were fully developed (Shapira 2012: 72).

As for solar energy, China is well ahead of other developed countries with three-fifths of the global production capacity. In the automobile sector, the government is spending billions of dollars in hybrid and electric vehicles. China is now the world's largest automobile market, having surpassed the US in 2011. However, despite the government's effort, consumers are less interested in "green cars" because of their relatively high cost.

Nevertheless, China remains the world's largest emitter of greenhouse gasses, mainly due to its emissions from coal-fired power plants. But China is also the world's biggest producer of electricity from renewable energy sources, producing 378 GW compared to the U.S. that is in second place and produces 172 GW. China produces more electric power from the wind, hydro and solar energy sources than Germany and France combined. China has been aggressively pursuing both production and market growth in renewable resource technology. Looking at renewable energy as a means of providing the country with a secure future (Tech Explore).

Model Environmental Cities

Other measures to improve the country's environmental performance include the creation of 'model environmental cities'. Attaining 'National Model City' status brings benefits the cities to promote tourism, draw investments, and host

international events. Thus, there are numerous competitions and public ceremonies recognising not only cities but also model industries and leading individuals. However, there is always a risk in applying for model status; a city will only force polluting industries to relocate beyond the city limits, which in effect is what happened when Beijing cleaned up its air in preparation for the Olympics (Shapiro 2012: 74).

The effort to create model environmental cities works and could be useful if it encourages other cities to adopt the best practices and as long as local conditions are also respected and the standard is not imposed from the top. There could however be a danger that the local authorities force the creation of model cities to attract tourism and investments without consulting the local people and looking into local conditions.

Ecosystem Restoration Efforts

China initiated ecosystem restoration efforts that aim to improve the environment. Billions of dollars are being spent annually to restore polluted waterways and to restore ecosystems that have been degraded. Much of the rampant deforestation has ceased in the past ten years. According to China's MEP, China invested 1636 billion RMB (ca. US $240 bn) in environmental conservation from 2003 to 2008. Thus, due to such efforts, some environmental parameters have improved; in some regions, the vegetation cover and carbon sequestration have increased, wildlife habitat has improved, and soil erosion has decreased (Chunmei 2010: 1703).

Another ecosystem restoration effort that China has taken is creating a nature reserve system. By the end of 2008, 2538 reserves covering 15.5 percent of China's territory (higher than the world average) were established, almost half of them in the past eight years (Ibid).

Initiatives of Policy Makers

Qu Geping initiated significant reforms, first as director of the State Environmental Protection Administration, and later as Chair of the Environmental Protection and Resources Conservation Committee of the NPC. In 1993, Qu persuaded many

government departments to support a national media campaign to expose polluters. Prior to this time, the media had avoided covering environmental issues for fear of appearing anti-socialist. Since then the number of stories about the environment during the next 15 years totalled 220,000. Tens of thousands of the worst factories were closed. However, pollution continued to build up.

In 1994, environmental groups/ NGOs were allowed to form, although they had to register under the authority of existing institutions. Qu's most significant contribution and the fulfilment of his lifelong ambition was to get the approval of EIA law in 2003 and see its coming into effect in 2004. This provision allowed ordinary citizens to participate in the governmental assessment of major projects, like dams, which would have a significant environmental impact. The law requires developers to obtain approval from the MEP before proceeding. However, some developers often forged ahead without permits like Huaneng and Huadian power plants, being willing to pay the relatively small fines to the MEP rather than wait for approval (Shapiro 2012: 67). Thus, even though the state has formulated rules and regulations, and laws to protect the environment, the environmental problems continue to persist due to many challenges.

Limitations of Environmental Policy Instruments and Mechanisms

The overall positive environmental impact of these efforts may be less than it appears, as the renewable mix includes hydropower and nuclear plants, which come with environmental and social problems that are often quite severe. Top-down approach to environmental management, fragmented authority and budget allocation problems, no incentive to local leaders for environmental protection, backward and out-dated technologies and techniques and lack of space for ENGOs are the challenges that China faces today.

Top-Down Approach to Environmental Management

The distinctive feature of China's environmental policy system is vertical, using a "top down" approach to environmental management (Chunmei 2010; Gang 2006). At the central level, the leading institution for environmental management and implementation is the State Environmental Protection Commission. The executive

arm of this State Council organisation is the NEP, while the EPBs function all over China at the provincial level. Each provincial organisation runs its network of prefecture and county EPBs. This national environmental protection system is responsible for all environmental affairs of China. At the central level, the main task is to set general principles for each sector's policy, and form national standards for environmental quality. The concrete tasks of enforcement and implementation are left to the local agencies.

Fragmented Authority and Budget Allocation Problems

China's environmental conservation efforts are managed by different government departments according to what is called a "fragmented authoritarianism model;" for example, soil and water conservation is guided by the Ministry of Water Resources, grassland restoration by the Ministry of Agriculture, forestry by the State Forestry Bureau, and air and water pollution by the MEP. The MEP serves as a forum for reconciling conflicts among major ministries, for coordinating their activities and for facilitating enforcement of environmental regulations. The MEP's authority in such matters is limited, however, by the need to seek consensus among its constituent members, consisting of representatives from more than 20 ministries. The MEP has comparatively little enforcement power. It supervises EPBs and offices in a pyramidal fashion opening downward to the provinces, counties, townships, and so on (some localities did not even have EPBs until the 1990s (Shapiro 2012: 68).

The commission cannot compel cooperation because it lacks any formal mechanism that would allow it to do so. As a result, some influential ministries with their own agendas simply ignore troublesome and potentially costly environmental measures. Problems often arise from weak or absent coordination of the efforts of different ministries, but a more serious problem may be political. To increase their departmental budgets, the implementers of each department's approach to ecological restoration have sometimes focused more on the money they receive and spend than on the effectiveness of their policy or on cooperation with other departments whose efforts would be affected by the policy (Chunmein 2010: 1709).

Regarding rank, provincial governments hold status equal to central ministries. Therefore, in practice, a central ministry like the MEP cannot issue a

binding order to a provincial government. Moreover, local governments are often funded by the same industries that the EPBs are supposed to regulate.

Environmental officials are often hired by and beholden to the local party and answer to it rather than to their superiors in the environmental bureaucracy; indeed local EPBs budgets, leadership and personnel decisions, and decisions to close plants are still made by the local government (Economy 2004). Local EPBs must often obtain permission from the local government to close down enterprises, which makes it extremely difficult for the local EPBs to act independently because of their weak structural position.

Local officials have been given wide powers to implement central government goals of both economic growth and environmental protection; in case of conflicts of goals, they prefer economic growth and industry (Shapiro 2012: 69).

Local Leaders - No Incentive for Environmental Protection

Local leaders have both environmental and production responsibilities but have no incentive to improve environmental conditions. Indeed, they face demanding production targets, which offer monetary rewards and promotion bonuses when completed and penalties when not. Unlike production goals, there are almost no rewards or punishments explicitly tied to success or failure in executing environmental laws. Given this system, China's rural environmental protection efforts should be expected to be ineffective, since they have, in effect, put the "fox in charge of guarding the chicken house". What's more, under the current system, there is no independent watchdog-type agency. Production-oriented bureaus and agencies have obvious conflicts of interests. For many fairly apparent reasons, sectorial leaders have an incentive to implement protection efforts less strictly than other political goals (Chunmei 2010: 1708).

Backward Technologies and out-dated techniques and products

The output of primary products is made through utilisation of backward technologies and consumption of high amount of materials and energy. The pulp and paper and textile and refinery sectors are major sources of pollution. Therefore, China should

devote greater efforts to develop more resource-efficient and less pollution-intensive technologies and facilities. By the end of 2000, China had shut down 47,000 small coalmines (the reduction of coal production totalled 350 million tonnes) and made progress phasing out out-dated technologies in several sectors like textiles.

Lack of Space for Environmental NGOs

By the late 1990s, environmental NGOs (ENGOs) such as Friends of Nature, the Global Village Environmental Culture Institute of Beijing, Green Earth Volunteers, and the Beijing Environmental Protection Foundation had emerged in China and become increasingly influential.[9] They focused on promoting environmental awareness and activities like tree planting and recycling, environmental education, raising voices against large-scale infrastructure projects, lack of enforcement of environmental laws and regulations, and misappropriation of funds by the administration. The Chinese government also encouraged their efforts and in 2001, 20 ENGOs joined in the drafting of a plan for a "Green Olympics" in 2008, and in 2002, more than 30 Chinese ENGOs attended the World Submit on Sustainable Development in Johannesburg. China also has grassroots ENGOs, including student groups and environmental clubs to promote public participation in decision-making (OECD 2006).

Although ENGOs are developing in China, their independent environmental protection initiatives and operations are constrained and suppressed (Wang 2010; OECD 2006; Li 2006). China's legal framework does not promote the creation of independent ENGOs (Wang 2010). Furthermore, they are characterised by political constraints, lack of management skills and environmental expertise and scarcity of financial resources. All ENGOs must register and be approved by the government, and they need official government sponsors to guide them through the registration process. Many are established to meet the objectives of the government.

[9] Friends of Nature is the oldest and largest ENGOs in China , and is established in 1994. They have "focused on protecting endangered species such as the Tibetan antelope and the snub-nosed monkey; environmental education through camps, field trips, and most importanlty, teacher-training; and \ awareness-raising campaigns such as photo exhibition and publications" (see more on http://www.fon.org.cn). Global Village Environment Culture Institute of Beijing, Green Earth Volunteers and Beijing Environmental Protection Foundation were established in 1996.

The laws concerning civic organisations change frequently. The 1998 Registration Regulations for Social Organisations imposes a number of rules on the establishing of NGOs: a) they need to have a sponsoring institution, b) need more than 50 members, c) a minimum level of financial resources and d) no two organisations in the same field or sector and in the same jurisdiction (OECD 2006: 45). Thus, many NGOs remain unregistered to avoid these restrictions, which also restrict them from obtaining telephone lines or leasing office space, nor can they offer personnel benefits like pensions and medical insurance to their staff.

China needs to develop public participation to respond to the growing environmental crisis and strongly encourage ENGOs to embrace the diversity of citizens groups. They should be provided more space and also access to information to help the government to bring clean environment.

Conclusion

China's efforts to protect the environment started only after the 1972 UN Conference on Human Environment held in Stockholm. Thereafter, the institutional framework slowly grew and an Environmental Protection Bureau was set up, which later renamed the National Environmental Protection Agency and again renamed the State Environmental Protection Administration. Fundamental principles were introduced such as 'prevention is the main, then control', 'polluter responsibility for pollution control', and 'strengthening environmental management'. The state also strengthened environmental legislation, laws, and regulations. These environmental policies, regulations and laws created some positive developments such as increased investment in environmental protection, green technologies and renewable energy, model environmental cities, and ecosystem restoration efforts.

However, the condition of the environment in China is not as bright as it appears. Rapid economic development and urbanisation have led to severe environmental pollution and degradation such as water and air pollution, acid rain, desertification, deforestation, soil erosion, grassland degradation, and disappearing of wetlands. These problems are shifting from cities to rural areas due to lack of effective control of ecological degradation and weak infrastructure for dealing with

rural pollution. The growing population of China further acerbates pollution by putting massive pressure on resources.

The social and economic costs of environmental pollution are enormous; it brings migration, social unrest and decline in economic productivity. Secondly, every year hundreds of environmental protests happen in China mainly due to petrochemical plant expansion and coal fire power plants, which harm people's health and pollutes rivers. All these factors cost huge amounts of money and reduce economic productivity. However, the MEP is aware of all these problems and has taken various steps introducing laws and regulations but the problem continues.

China has failed to address a few of the problems, which could improve the environment such as the top-down approach to environmental management, fragmented authority and budget allocation, lack of incentive for local leaders for environmental protection, backward technologies and outdated techniques and products, and lack of freedom and space for ENGOs. If it could address these problems effectively and efficiently, then the next generation would enjoy a healthy environment in China. The next chapter will discuss the China's environmental policies to Tibet.

CHAPTER THREE

China's Environmental Security Policies in Tibet

Introduction

The Western Development Campaign was an important and urgent economic and ecological plan for China. The campaign introduced numerous environmental policies and measures to protect the Tibetan environment. However, Tibet continues to face various environmental problems. The study evaluates the rationale behind the Western Development Campaign and how this programme has brought about economic and environmental changes in Tibet. China introduced four major ecological protection plans in Tibet, afforestation, grassland and biodiversity protection, and construction of nature reserves. The study critically analyses the impact of those policies on the environment and people.

This section of the thesis also deals with the historical environmental protection and policies in Tibet - before the Chinese occupation of Tibet. It further studies the formulation of environmental regulations and legislation in Tibet from 1951 to 2013. Finally, the chapter will review China's ecological protection projects in Tibet.

Traditional Environmental Protection in Tibet

Historically, the Ganden Phodrang (the Tibetan government) promoted environmental protectionism through religious teachings every year after the Tibetan New Year and Monlam celebration in Lhasa (the capital of Tibet). The environmental laws and observances regarding wildlife conservation and other matters were issued through the Mountain Valley Edicts (ri-lung tsa-tsig) (Norbu, 8 December 2008; Lowe December 1992). Copies of these edicts were distributed in every district throughout Tibet. Such practices and beliefs became a part of social life and state policy.

As early as the 17th century, the 5th Dalai Lama, Ngawang Lobsang Gyatso, sought to protect the environment. In the tenth month of every year, a decree for "the Protection of Animals and the Environment" was issued in his name. These environmental directives forbade the killing of all creatures, polluting water sources, depletion of forests, and consequent misuse of the land.

In 1901, the 13th Dalai Lama Thupten Gyatso issued a general Decree on Wildlife Conservation:

> From the first month of the Tibetan calendar to the 30th of the seventh month, except tigers, leopards, bears, hyenas, rats and rushu, nobody will hunt, let alone kill the birds of the air, the animals of the hills and forests, fish and otter of the water… in fact, any animals dry (land) or wet (water), no matter how big or small. Nobody, however noble or humble, should do violence to them or harm them. All the district officials and governors, instead of exerting all their energy for private gain, should see that these laws are fully and completely enforced.
>
> From the Potala Place, 1901 (DIIR 2000: 143).

According to this decree, people should not kill animals. District officials and governors were empowered to enforce these laws. In 1944, Taktra Rinpoche, the Regent of Tibet, issued another Wildlife Conservation decree:

> For the health of His Holiness the Dalai Lama, for the sake of the Dharma and for the benefit of all sentient beings, the village heads, officials, and governors of all districts of Tibet are commanded to prevent the killing of all animals, except hyenas and wolves. The fish and otters of the water, animals of the hills and forests, the birds of the air, all animals endowed with the gift of life, whether great or small, must be protected and saved. Governors must see that the contents of this decree are carried out fully.
>
> 28th day of the seventh month of the Wood Monkey Year [1944] (DIIR 2000: 144).

The decree was greatly influenced by Buddhism. It states that for the health of the Dalai Lama (then the political and spiritual leader of Tibet), for the sake of the Dharma and all sentient beings, people should not kill animals. This was fully implemented, and Tibetans have always respected the cycle of nature.

Tibetans also practised "sealing (of) the hills and valleys" (ri-gya lung-gya dom-pa) as a part of the effort to protect wildlife and environment. This ecological institution has evolved from older religio-political systems to 'Territorial Sealing" (ri-gya dom-pa). By the 15th century, this practice of sealing had evolved into a "… more Buddhist inspired ethico-legal institutions used to especially prohibit all kinds of hunting and trapping of wild animals" (Huber 2004).

The first examples of territorial seals pertaining especially to prohibition of hunting and fishing are found in documents issued by the lay Tibetan ruler of Gyantse, Rabten Kunsang, between 1415 and 1440 (ibid). This led to a system of what in modern parlance might be described as wildlife sanctuaries, nature reserves, or even national parks. Thus, protection was also extended to the forests, grasslands, lakes and streams (Norbu 2009). Environmental protection in Tibet was also influenced by Buddhist concepts and beliefs.

The Buddhist concept of "interdependence" of both living and non-living elements of the earth has influenced Tibet's environmental policies. Relationships between human beings, animals, nature and non-living elements like rivers, sunshine, sky, mountain valleys have helped people to protect the environment. In fact, it has become difficult to differentiate between the practice of religion and the concern for the safety of the environment. For example, land irrigation and cultivation was and is still forbidden during the holy month of Saka Dawa, the month in which the Lord Buddha attained enlightenment. The main reason is that many insects and worms are killed during the tilling process. These beliefs were further strengthened by the "principle of self-contentment" in traditional Tibetan Buddhism, wherein it is decreed that the environment should be used to fulfil one's needs and not greed (CTA 2011).

Another significant influence by Tibetan Buddhism on environmental protection was the belief in the world of deities and demons. Tibetans believe that mountains, lakes, ponds, springs and river sources are dwelling places of various trans-worldly deities who protect Tibet. Mountains like Everest (Jomolangma),

Amnye Machen, and Mount Kailash (Gang Rinpoche) are regarded as the abodes of various deities that were believed to be present at the formation of the Tibetan landscape and civilisation. Even lakes such as Manasarovar (Mapham Yutso), Turquoise Lake (Yamdrok Yutso) and Kokonor Lake (Trishor Gyalmo) and others are widely revered as abodes of various female deities such as Vajra Yogini (Dorji Phagmo). Lakes like Lhamo Lhatso and Tsari Yutso are believed to have contributed in identifying the reincarnation of lamas including the current Dalai Lama. Mount Kailash and the River Ganga are sacred places of worship for Tibetans and for many in India and Nepal (Choezin 2004).

Thus, "this [Buddhism] religion was the principal source of all Tibetan environmental knowledge and understanding" (Huber and Pedersen 1997: 579). Traditional Tibetans are said to have the same ecological awareness as that developed by Western scientific thought. Yuthok says, "The Tibetan traditional heritage, which is known to be over three thousand years old, can be distinguished as one of the foremost traditions of the world in which the humankind and its natural environment persistently remained in perfect harmony" (Ibid).

Chinese scholars like Luorong Zhandui and Fan Yibing of China Tibetology Research Centre (Beijing) have done a detailed study on the Tibetan people's traditional way of preserving and maintaining the holy Mount Kailash (Tibetan: Ghang Rinpoche) sacred landscape where the environment is rather fragile. According to Luorong and Fan Yibing (2011), the Tibetan people of the Mount Kailash region have maintained a sustainable way of living and protected the environment. Many of their practices are greatly influenced by Buddhism and Bon religion. Luorong and Fan further state that the people of the Kailash sacred land have a deep respect for nature that shapes their production techniques, their way of life, their social behaviour, their traditions and their correspondent culture. In time, all of these elements were gradually extracted from the local people and subjected to their religious perception, which in turn impacts on their understanding and behaviour towards nature.

Hence, Buddhism plays an important role for Tibetans in maintaining and sustaining the harmonious relationship between human beings and nature. One of the most sustainable and environmentally protective strategies in the Tibetan rangeland has been the Tibetan nomadic pastoralism. Tibet's rangeland covers approximately 70 percent of the total area of Tibet's plateau. It extends from the Northern Plateau of Upper Tibet (Jangthang) to the extreme edge of the plateau. The Tibetan nomadic pastoral area is a sub-region of the Tibetan Plateau where pastoral nomadism is the dominant land use, which sustainably protected the rangeland.

Nomadic Pastoralism in the Traditional Era

Nomadic pastoralism had survived for over 4000 years on the Tibetan Plateau. Over the centuries, Tibetan nomads had acquired sophisticated knowledge and understanding of the environment in which they lived and upon which their lives depended. Nomadic pastoralism on the Tibetan Plateau fostered a balance between highly adapted herds, maintained a sustainable and mobile lifestyle, and demonstrated adaptation to a cold environment (Miller February 1999: 17; Norbu July 2012; DIIR 2009: 17).

Tibetan nomads herded livestock on the grasslands and raised different kinds of animals like yaks, sheep, goats, and horses. Every animal has his or her special characteristics and adaptive capacities in relation to the local environment. Raising various kinds of animals together also maximises the use of rangeland vegetation more efficiently than keeping only a single species. Thus, this way of life demonstrated sophisticated adaptive responses by nomads to the complex environment and the availability of resources (Miller, February 1999: 17). Moreover, the Tibetan rangelands favour livestock production over agriculture. The nomads of the Tibetan Plateau have developed a mobile way of life with sustainable ways of utilising the entire plateau. Their seasonal migration from winter to summer pastures and from autumn to spring pastures lands allowed sufficient time for replenishment of the pastures. Pasture allocation and

reallocation was another unique feature of the traditional pastoral system. It has also been characterised as one of the grand progressions in the evolution of human civilisation.

Pastoralism on the Tibetan Plateau is a form of adaptation to extremely cold environments at an elevation above the limit of cultivation. The climatic condition of the Tibetan plateau is harsh and the temperature in winter drops to minus 30 degrees Celsius. Snowstorms are common even in summer. Heavy snowfall can devastate livestock, but it did not work in adverse effect to the rangeland. In fact, heavy snowfall increases the grass growth in the next spring reducing the livestock, thus easing the pressure on the rangeland and vegetation (DIIR 2009: 17). Currently, Tibetan nomads are forced to confront many challenges from China's developmental policies that threaten their livelihood as well as the grassland itself.

However, according to the State Council's White Paper released in 2003, "Ecological Improvement and Environmental Protection in Tibet", the environmental condition of Tibet before 1951 was "in a state of passive adaptation to natural conditions and one-way of exploitation of natural resources… lack of objective law of the ecological environment of Tibet and ecological improvement and environmental protection" (State Council 2003). The White Paper further stated that it was only after the 'peaceful liberation' of Tibet in 1951, that ecological improvement and environmental protection on the Tibetan Plateau was carried out.

With the occupation ('liberation') of Tibet in the 1950s, China got complete control over the region and established the Tibet Autonomous Region in 1965 (areas ruled by the Dalai Lama's government in Lhasa) and formalised the rest of the Tibetan regions into ten Tibetan Autonomous Prefectures and two Tibetan Autonomous Counties in four provinces of Qinghai, Sichuan, Gansu and Yunnan. China slowly introduced various policies into the Tibetan areas including environmental policies.

China's Environmental Security Policies in Tibet, 1951-2000

China has introduced various environmental policies in TAR since the 1950s. The initial plans were mainly focused on exploration and studying the region's ecosystem and resources. The first 'Tibet Work Team of the Government Administration Council' was organised in 1958 to carry out exploration of Tibet's natural resources such as forests, mineral resources, and water. The exploration was led by the 'Tibet Comprehensive Exploration Team' of the Chinese Academy of Sciences (CAS; State Council 2003) (see table: 3.1). The team put forward a proposal for scientific development, which initiated the process of scientific understanding and protection of the ecology in Tibet.

(Table: 3.1) Environmental Regulations in TAR (1951-2000)

Year	Environmental Regulations
1958	Tibet Comprehensive Exploration Team of the CAS
1972	Symposium on the Scientific Survey in the Mt. Qomolangma was held by CAS
1973	Comprehensive Scientific Survey Plan for the Qinghai-Tibet Plateau for 1973 1980 by CAS
1975	Leading Group for Environmental Protection of TAR and its General Office
1977	All-round survey of the Forestry resources across Tibet by the Ministry of Agriculture and Forestry
1983	Urban and Rural Construction and Environmental Protection Department under the government of the TAR
1982 -1994	Regulations for Environmental Protection in the TAR
2000	Eco-environmental Improvement Plan of the TAR by the People's Government of the TAR

(Sources: State Council 2003; State Council 2013; State Council 2015)

The Chinese government also carried out a series of scientific surveys on the Tibetan Plateau. In 1972, the first symposium on Scientific Survey on the Mt. Qomolangma Area was organised by the CAS in Lanzhou. CAS also formulated the "Comprehensive Scientific Survey Plan for the Qinghai-Tibet Plateau" for

1973-1980. In 1977, the Ministry of Agriculture and Forestry organised a survey of the forestry resources across Tibet. Moreover, the eco-environment researchers also began to monitor and trace the impact of human activities on the ecological environment and carried out remote-sensing monitoring of the eco-environment for agricultural development on the middle reaches of the "Three Rivers" (the Yarlung Tsangpo, Lhasa and Nyangqu rivers), and survey of the grain pollution (State Council 2003).

After the founding of the People's Government of the TAR in 1965, ecological improvement and environmental protection were included in government agenda. In 1975, the 'Leading Group for Environmental Protection of TAR' and its General Office were established. In 1983, the 'Urban and Rural Construction and Environmental Protection Department' under the government of the TAR was established.

When the Central Government concluded the Third Forum on Work in Tibet in 1994, it made an important decision to extend the support of the whole nation to Tibet and to accelerate the ecological improvement and environmental protection work in Tibet. The Tibet Work Forum is a high-level meeting convened by the CCP of all the relevant Party offices to make a coordinated policy to advance the achievement of official goals. China has held five Tibet Work Forums, in 1980, 1984, 1994, 2001, and 2010 respectively.

From 1982 to 1994, the Standing Committee of the People's Congress and the People's Government of the TAR implemented more than 30 relevant local regulations, governmental standardization documents, and departmental rules and regulations, which formed a relatively systematic local legal regime concerning land management, mineral resources administration, forest protection, grassland protection and control, water and soil conservation, wild animals protection, nature reserves administration, and pollution treatment.

In 2000, the TAR government established the Eco-Environmental Improvement Plan. The National Plan inspired the Eco-Environmental Improvement Plan and the National Program for Eco-Environmental Protection formulated by the State Council in 1998 and 2000 respectively (State Council 2003). According to the 2001 White Paper released by the State Council, the TAR government has invested a huge amount of money in environmental protection projects:

> Over the past few years, Tibet has invested over 50 million yuan in the control of waste water and gas at enterprises and institutions such as the Lhasa Brewery, Yangbajain Power Plant, Lhasa Leather Plant, People's Hospital of the Autonomous Region and Lhasa Cement Plant, effectively improving the urban environment and the quality of the region's water. Since 1991, Tibet has invested a total of 900 million yuan in carrying out the development projects in the areas of the Yarlungzangbo, Lhasa and Nyangqu rivers, playing an active role in the prevention and control of soil erosion and the halting of desertification through the construction of water conservancy works, the improvement of pastures, the amelioration of medium- and low-yield fields, and large-scale afforestation, achieving remarkable comprehensive benefits for coordinated social, economic and environmental development. According to the environmental evaluation indices, Tibet's ecology, which basically remains in its primordial condition, is the best in China in terms of environmental conditions (State Council 2001).

According to the 2001 White Paper on 'Tibet's March Towards Modernisation', the TAR government has invested over 50 million Yuan in wastewater treatment and over 900 million Yuan in prevention and control of soil erosion and the halting of desertification. "With the introduction of an effective supervision and management system for environmental protection and pollution control, most of the forests, rivers, lakes, pastures, wetlands, glaciers, snow mountains and wild animals and plants in the region are well protected, and the water, air and environmental quality is excellent" (Ibid). The report further stated that the region is planning to invest 22.7 billion Yuan and launch 160 key projects for ecological protection by the mid-21st century.

Since 2001, environmental protection regulations and measures have increased as China changed its economic development strategy and convened the Fourth Tibet Work Forum in 2001 and also introduced the 'Open Up the West' (Go West)/Western Development Campaign (Xibu da kaifa) (Great Western Development Programme) for implementation during the Tenth Five-Year Plan (2001-2005).

China's Environmental Security Policies in Tibet, 2001- 2013

TAR government has implemented a series of plans for environmental protection and construction including the Eco-environmental Improvement Plan, Plan for Water and Topsoil Conservation, Comprehensive Improvement Plan for the Environment in Farming and Pastoral Areas, and Ecological Function Zoning (State Council, April 2015). The Plan for Environmental Protection of Drinking Water Sources in Urban Areas, 12th Five-Year Plan for Comprehensive Prevention and Treatment of Heavy Metal Pollution, Plan for Pollution Control on the Upper Reaches of the "Five Rivers" (the Yarlung Tsangpo, Lhasa, Nyangqu, Nyakchu and Nyang Rivers)" were also introduced (State Council 2013).

The central government approved the Plan for Ecology Safety Barrier Protection and Improvement in Tibet (2008-2030) in 2009, aiming to complete the Tibet ecology safety barrier by 2030 with an investment of 15.8 billion Yuan (State Council April 2015; State Council 2013). The plan was set up by academicians, experts from the Chinese Academy of Science, State Commission of Natural Science Foundation, and the China Meteorological Administration. The Plan will "check the degenerating trend of ecological systems around the headwaters of rivers and the key lakes in Tibet, maintain ecological functions on the Tibet Plateau such as water source conservation, biodiversity protection and the conservation of social and water" (Beijing Review, 30 October 2008).

Tibet has further introduced the Regulations for Environmental Protection and Methods on Oversight and Management of Eco-environmental Protection. The

People's Congress and People's Government of the TAR have promulgated relevant local laws, regulations and administrative decrees, including the Regulations for Environmental Protection in the TAR, Rules for the Implementation of the Grassland Law of the People's Republic of China, Measures for the Implementation in the Tibet Autonomous Region of the Law of the People's Republic of China on the Protection of Wildlife, and Opinions of the People's Government of the Tibet Autonomous Region on the Implementation of the Decision of the State Council on Implementing the Scientific Outlook on Development and Strengthening Environmental Protection (State Council 2013) (see table 3.2).

(Table: 3.2) Environmental Regulations in TAR (2001-2013)

1.	Plan for Ecology Safety Barrier Protection and Improvement in Tibet (2008-2030) approved by the National government
2.	Plan for Water and Topsoil Conservation
3.	Comprehensive Improvement Plan for the Environment in Farming and Pastoral Areas, and Ecological Function Zoning
4.	Regulations of the TAR for Environmental Protection
5.	Methods of the TAR on Oversight and Management of Eco-environmental Protection.
6.	Rules for the Implementation in the TAR of the Grassland Law of the PRC
7.	Measures for the Implementation in the TAR of the law of the PRC on the Protection of Wildlife
8.	Implementation of the Scientific Outlook on Development and Strengthening Environmental Protection
9.	Regulations on the Administration of Geological and Mineral Resources
10.	TAR established Forest Law Enforcement Organs
11.	Tibet Armed Police Forestry Contingent

(Sources: State Council 2003; State Council 2013; State Council 2015)

Another regulation that China adopted on the exploitation of mineral resources was Regulations on Supervising the Exploration and Exploitation of Mineral Resources. The authorities believe that they had brought exploration and

exploitation of mineral resources under its unified management, controlled the access to mineral development licenses through stricter environmental standards and cancel any project that fails to meet the environmental standards. Beside environmental regulations and plans, China introduced the Fourth Tibet Work Forum and the Western Development Campaign in Tibet, which mainly focused on infrastructure development and ecological protection. The Western Development Campaign was introduced in 1999 and implemented in 2001 throughout the western regions of China.

The Western Development Campaign

China is geographically and economically categorised into three regions: the Eastern (coastal), the Central and the Western Regions (see map: 3.1). The Western Region comprises Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai Provinces; Chongqing Municipality and the five autonomous regions of Tibet, Ningxia, Inner Mongolia, and Guangxi. It covers 75 percent of China's total area with a population of 371 million, about 28.7 percent of the country's total population. In the West is found 85 percent of the country's total grassland area of 400 million mu. The western region contains vast minerals and energy resources, 80 percent of nation's potential hydropower and 58 percent of the nation's natural gas reserves (Ibid).

(Map: 3.1) China's Regions

(Source: Tian 2004: 613)

During the economic reforms in China in the 1980s, the focus was primarily on the coastal regions. The western regions were sidelined and Deng Xiaoping's slogan, "Lets some regions get rich first", laid the ideological basis for the formulation and subsequent implementation of this economic program (Barabantseva 2009: 232). Deng Xiaoping explained, "the coastal areas…should accelerate their opening to the outside world, and we should help them develop rapidly first, afterward, they can promote the development of the interior" (People's Daily 1988). In late 1999, after two decades of coastal development, Chinese leaders declared a change of China's regional development strategy and initiated the Western Development Campaign.

There were several reasons for China to introduce the Western Development Campaign. China faced a threat to its national security due to environmental diasters in the late 1990s. Severe droughts in the lower reaches of the Yellow River in 1997 and a flood in the provinces of Yangtze in 1998 left around 50,000 people dead or missing and losses exceeding 540 billion Yuan. There was an also increase in the number of sandstorms in China with 13 in the 1970s, 14 in the 1980s and 23 in the 1990s. Chinese economy had been badly affected by floods, sandstorms and water shortages. Chinese leaders were hopeful that the Western Development Campaign would play a vital role in improving China's ecology especially in controlling soil erosion and desertification. They also expected the western region to satisfy the nation's rising demand not just for water but also for minerals and energy. Since the western region has 1,863.4 billion cubic meters of water resources, 52.5 percent of the national total which could be used in to alleviate the longstanding northern water shortage (Lai 2002: 444-45).

The Western Development Campaign was also an important and urgent economic, ecological and social developmental plan for China. Zhu Rongji and Wen Jiabao, then Premier and Vice Premier, became its director and vice director, and seventeen other ministers, along with two ministerial-level party officials, later

became members of the leading group to develop the western regions (Xibu diqu kaifa lingdao xiaozu).

The two-pronged strategy of the campaign consists of two major fields of investment: infrastructure projects and ecological construction. The Chinese government announced measures to build a road system in the West: national highways, regional and interprovincial and local highways, and roads between townships and villages. To develop the western region's railway system, the centre initiated the expansion of the rail network from east to west and internal and external routes. The state started the construction of the Xi'an-Hefei section of the Xi'an Nanjing Railway, the Chongqing-Huaihua Railway in 2000, and the Qinghai-Tibet railway in 2001, completed in 2006. The centre also upgraded and enlarged national airports as well as regional hubs, and investing 5 billion Yuan to renovate twenty airports (People's Daily 2000). A gas pipe-line 4,200 kilometres long, running from the Qaidam Basin to Shaighai and passing through eight provinces, was constructed in 2000. In the same year, construction of the Sebei Qaidam Basin-Xining-Lanzhou Natural Gas Pipeline began. Three similar projects to transport gas from Shaanganning, the Tarim Basin and Sichuan, and three west to east power generation and transmission systems have been planned. Several large and medium scale irrigation projects to improve utilisation of the water resources, especially in the northwest, have been set up.

The state also wanted to improve environmental protection along with the development in the west. The authorities outlined three key environmental projects. The first was afforestation in the upper reaches of the Yangtze River down to the Three Gorges Reservoir area and in the upper and middle reaches of the Yellow River to the Xiaolangdi Reservoir area. In 772 counties in thirteen provinces, including Yunnan, Sichuan, Shaanxi, and Gansu, the cutting of natural forests was prohibited and afforestation was initiated. The second project was to control desertification in the northwest, far north and western part of the northeast.

The third project was to construct shelter forests in the northwest, north and northeast.

The reform, however, faced many challenges: poor infrastructure, inadequate human capital, slow flow of information, a dominant state sector, traditional and anti-market ideas and corruption. The second obstacle was the already prevalent ethnic tension. The Western Development Program attracted Han immigrants with higher education and better vocational skills than the ethnic minorities, surging into towns largely populated by ethnic minorities and depriving the latter of job prospects and educational opportunities for their children. This led to income disparities and increased ethnic tension, hindering the development program in the western provinces.

The purpose of this development plan was not only related to infrastructure and ecology protection but also to build stability between the ethnic minorities and Han. Jiang Zemin also announced that the Western Development Campaign would ensure the continued stability of local societies while contributing to China's ethnic and national unity (DIIR 2008: 7). In fact, whether the Western Development Programme has brought stability, security and peace in the region is still unknown since the Chinese leaders have not shown any sign of revising their religious policy, which has radicalised many Tibetans and Muslim Uyghurs. Therefore, the question of whether economic development will ultimately bring ethnic harmony remains (Wei and Clarke 2011).

The Western Development Campaign in Tibet

The Western Development Campaign has been carried out extensively in Tibet as well. The major emphasis was on the infrastructure development and ecological construction. The infrastructure projects investment such as the Gormo-Lhasa Railway, potash fertilizer plant ($338 million), natural gas pipeline stretching 950 km to Lhanzhou ($300 million), and hydroelectric power stations (DIIR 2008: 7) were given preferential policies such as exemption from tax for importing

equipement related to the projects and exemption of value-added tax to attract foreign investments in these and other projects.

The second investment was in the ecological construction projects. Two major ecological environmental construction plans were launched after the introduction of the 'Open Up the West' and Western Development Campaign: the "farmland into forest" or "grain into green" and "pastures into grassland" program (Good 2004: 391). The "grain into green" program converted steep cultivated land into forest, whereas in the grassland areas it is known as the "pastures into grassland". These "re-greening" plans in western China have two distinct aspects of environment protection: creation of environmental protection areas and a large-scale programme of farmland retirement, pastoral restoration and afforestation**.**

In 2007, The Chinese Academy of Sciences issued a report, which includes the above programs:

> The projects designed to protect natural forests, to facilitate forestation and to build planted forests should continue so as to increase forest coverage to about 35 percent in 2050 and about 40 percent in 2100. Construction of nature reserves should be sped up, the project to ''revert cultivated land back to forestation" should be improved and the natural grassland and pasture should be protected and improved. The goals and tasks specified in the 'National Plan for Ecological Environment Construction' should be implemented in a comprehensive way...The construction of national nature reserves should be strengthened and the ratio of nature reserves should be raised (CAS 2007).

This passage refers to a set of environmental projects begun in China in 1998 due to various natural disasters and the launching of the Open Up the West Campaign (Yeh 2009: 886). For example, the Qinghai provincial government has developed and started to implement a "provincial ecology environmental construction plan" that focuses on farmland retirement and afforestation (Good 2004: 391). Such projects received financial support from the central government as they are identified by the State Council as part of the original proposal to develop the western region at the beginning of 2000. Three important plans will be focused in

this chapter: Green into Green Program, Pastures into Green Land and Nature Reserves.

Grain into Green Program

The government introduced the Natural Forest Protection Program (NEPP, to protect natural forests, to facilitate forestation and to build planted forests) and the Sloping Land Conversion Program (SLCP, to revert cultivated land back to forestation). The NEPP was launched in 2000 and is also referred as "the logging ban". It banned commercial logging in the upper reaches of the Yangtze River and middle and upper reaches of the Yellow River, and reduces timber output in other state-owned forest areas. SLCP, is also known as "grain for green", is the largest land retirement program in the world. It called for a the conversion of 14.67 million hectares of cropland, especially cropland on steep slopes of more than 25 degrees, to forests as well as afforesting 17.33 million hectares of "wasteland" by 2010 (Wang et at. 2005: 885). This program also promises farmers grain and cash subsidies lasting five years for those planting 'economic forests', eight years for 'ecological' forests and two years for grasslands.

However, studies of the ecological effectiveness of the program have been limited to date, and it varies in implementation. In northwest Yunnan, logging by local villages continued despite the logging ban because the national economic reforms have left them behind; thus, logging is a form of protest against marginalisation. Like NEPP, SLCP has seen variation in implementation. There is currently no provision for subsidies to the farmers after their short-term subsidies run out. At some areas, not all farmers have received their subsidies. Moreover, compensation has not been adequate for many farmers to develop off-farm income (Yeh 2005; Feng et al. 2005; Qiao and Pei Xiaofei 2004).

The protection of natural forest resources has been implemented in the three counties of Jomda, Gonjo and Markam, which cover a total area of 31,000 sq. km in Sichuan Province. In 28 counties along the upper reaches of the Jinsha,

Lancang and Nujiang rivers and the drainage area of the Yarlung Tsangpo river farmland has been converted into forest, in the course of which the afforested area has topped 83,700 ha, while 338,700 ha of mountainous areas have been sealed off to facilitate afforestation. By 2002, some 6,700 ha of cultivated land had been restored to forest and 6,700 ha of barren mountains and wasteland afforested. The forest coverage rate has now risen to 11.91 percent in 2013 (State Council 2013).

Implementation of the key projects, such as the afforestation project in Lhasa and its outskirts, the construction of the shelter-forest system of the Yarlung Tsangpo River, the pilot project of the Yangtze River shelter-forest system in Markam and the pilot project for controlling sand by afforestation in Shigatse, has, to a great extent, improved the natural eco-environment of those localities. Since 1996, the State has begun to build a shelter-forest system along the upper and middle reaches of the Yangtze River (State Council 2003).

The government introduced a “felling by quota” policy, which allows the authorities to control the scale of tree felling in forests. The annual felling amount for commercial purpose is limited to 150,000 cubic metres (State Council 2003).

Another important policy in terms of afforestation in Tibet is the participation of local Tibetan- laypersons, monks and nuns - everyone take complete responsibility for protecting the environment on the Tibetan Plateau by planting trees in their courtyards, streets, and along major highways. According to the 2003 White Paper on Tibet, some 70,000 ha of land have been afforested in Tibet, 90 million trees have been planted in villages, at the waterways and roads, and 1.5 million cash trees have been grown (State Council 2003).

According to Zhiming Feng of the Chinese Academy of Sciences, for decades farmland in western China have suffered from severe soil erosion, flooding, and ultimately land degradation, which led China to build a national development strategy to promote economic development and maintain the long-term stability of the country. He further states that these strategies have the

following objectives: "To accelerate agricultural restructuring and rural development, to increase farmers' income, to upgrade the industrial sector and revitalize enterprises and traditional industries with high technologies, and to step up infrastructure construction and to enhance environmental projection" (Wang et al. 2005: 301).

Protection of Biodiversity

Tibet is one of the most typical biodiversity regions in the world. At present, there are over 9,600 wild plants in Tibet, 39 of which are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora and are under special State protection as rare and endangered species. There are 798 species of vertebrates and nearly 4,000 species of insects in Tibet, 125 of which are under special State protection, accounting for more than one third of the wild animals under special State protection. Approximately 600 species of higher plants and more than 200 species of terrestrial vertebrates are endemic in the Qinghai-Tibet Plateau (State Council 2003).

According to China's 2003 White Paper on Tibet, Tibet has a rich biodiversity which has prompted China to introduce various State laws and regulations such as forest law enforcement organs, the Tibet Armed Police Forestry Contingent, Hohxil Action Number One and other special campaigns in the border areas of Qinghai, Xinjiang and Tibet to protect the Tibetan antelope and other rare animals. The white paper further states, "over the past 50 years or more, not one species in Tibet has suffered extinction" (State Council 2003).

The above statement by the State Council is contradicted by reports and studies done by many groups. According to WWF, Tibetan antelope, the chiru, is on the brink of extinction due to illegal hunting, expansion of livestock herding into remote areas, fencing of pastures on the Tibetan Plateau and the construction of the Gormo-Lhasa railway, all of which facilitates poaching. Demand for shahtoosh to make luxury shawls produced from the Tibetan antelope's undercoat

of soft and warm wool, which has been traditionally given as wedding gifts in India (WFF). A more detailed study on the poaching of the chiru will be discussed in the next chapter.

Construction of Nature Reserves

Eighteen nature reserves at the national and provincial levels have been established, including those in Changtang, Mount Qomolangma and the Yarlungzangbo Grand Canyon, whose combined area accounts for half of the total area of China's nature reserves, playing an important role in the protection and improvement of the fragile plateau eco-environment (State Council 2001)

Tibet Autonomous Region has 22 ecological functioning conservation areas, eight national forest parks, four geological parks, three national wetland parks, three state-class scenic area and 47 nature reserves including nine national level, fourteen at the autonomous region level and 24 at the prefecture or county level, covering a total area of 413, 700 sq. km, and accounting for 33.9 percent of the total land area of the region (State Council 2013). Human activities such as economic development are strictly limited in the nature reserves. Thus, according to the Chinese government, the ecological environment in most of the nature reserves has become stable. Ecosystems for rare and endangered species, wetlands for migratory birds, as well as the natural landscapes, geological sites and biological sites of scientific importance are now well protected (State Council 2003).

Lhasa, the capital of TAR, has the Changtang Tibetan Antelope and Wild Yak National Park, which was opened in 2015. The national park has rare and endangered wild animals like Tibetan antelope, wild yak, Tibetan wild donkey and snow leopard. These national parks were built to protect wild animals, habitats, and ecosystems (China Tibet Online, 24 September 2015).

Sanjiangyuan Nature Reserve

Another famous nature reserve on the Tibetan Plateau is the Sanjiangyuan Nature Reserve, which was established in 2003 (See Map 1) with the State Council approving the Sanjiangyuan General Plan in 2004. Sangjiangyuan or "Three Rivers' Source" is the origin of three major waterways: the Yellow River, the Yangtze and the Lancang River. It provides 25 percent of the water volume of the Yangtze River, 49 percent of the Yellow River and 15 percent of the Lancang River (Wang: 443). Thus, it is also known as the "Water Tower of Asia" provides about 40 billion cubic meters of water a year for the lower reaches and supplying a population of 600 million. Sanjiangyuan is located in Southern Qinghai at 4,000 metres above sea level and covers an area of 363,000 square kilometres.

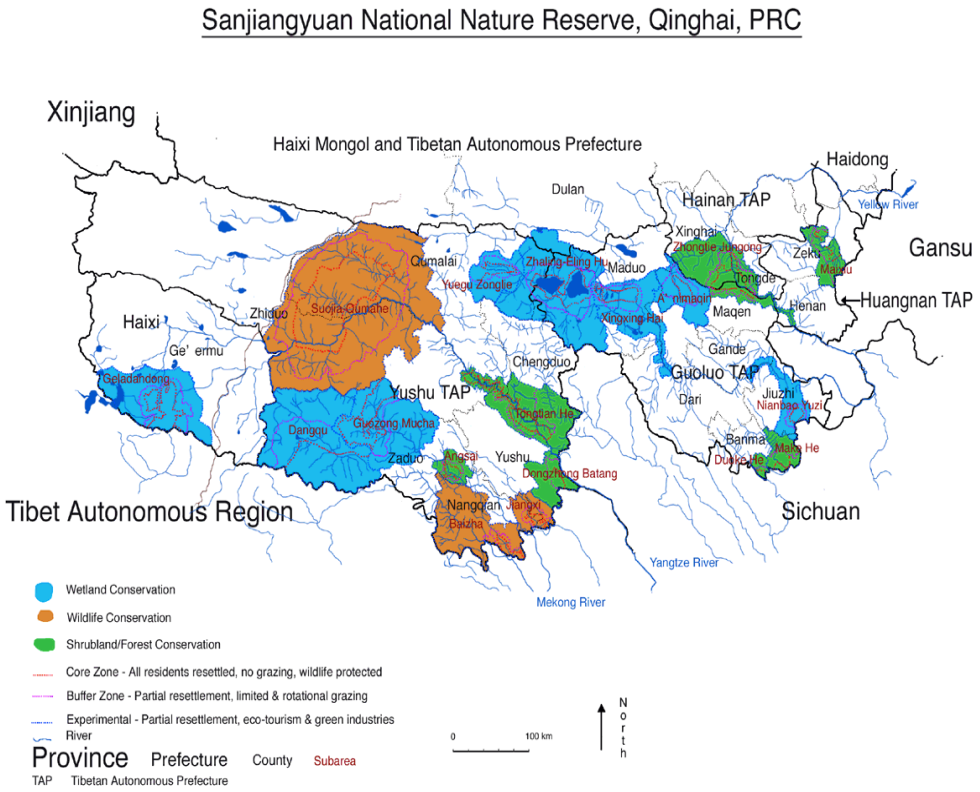
The nature reserve covers four Tibetan Autonomous Prefectures (Yushu, Golok, Hainan, and Huangan), 16 counties and 127 rural townships with a population of 557,200, mostly Tibetans. The nature reserve comprised 42 percent of Sangjiangyuan and is divided into three zones: the core zone of 31,218 sq. km, 20.49 percent of the nature reserve area, a buffer zone of 39,242 sq. km, 25.76 percent of the reserve, and an experimental zone of 81,882 sq. km, 53.75 percent of the reserve (Du: 117).

Fachun Du, an Associate Professor at the Institute of Ethnology and Anthropology, Chinese Academy of Social Sciences, has done an extensive study on the Sanjiangyuan nature reserve and nomad resettlement. According to him, the Sanjiangyuan General Plan contained three main projects and twenty-two sub-projects. The first main project was the ecological protection project to restore former grazing land to natural pasture, restoring cropland to forest, treating lakes that had been degraded by pike infestation, launching fire prevention work in forests and on the grasslands, initiating water and soil conversation projects, and protecting infrastructure. The second main project was building infrastructure, building of new towns and rural townships, and drinking water infrastructure for livestock and human consumption. The third main project focused on supporting

ecological protection by cloud seeding, providing technical support and ecological monitoring (Du 2012: 122).

When the government established the Sanjiangyuan Nature Reserve, people living in the region were relocated and resettled. A large number of Tibetan herders were resettled from their grassland to nearby cities or towns with minimum state subsidies. Details concerning the change in livelihoods of resettled nomads from the Sanjiangyuan area will be discussed below.

Map: 3.2 Sanjiangyuan Nature Reserve



(Source: Meltdown in Tibet)

Pastures into Grassland Program

In 2003, the Western Development Office of the State Council listed the restoration of 100 million *mu* of pasture to grassland as one of the fourteen 'key projects' for the western region. According to the Director of the Office of the

State Council Leading Group of Western Development, "the implementation of *tuimu huancao* is an important decision made by the Communist Party and central government under the strategies of sustainable development and Open up the West" (Yeh 2005: 10).

China's State Council's White Paper (2003), *Ecological Improvement and Environmental Protection in Tibet*, stated detailed policies of grassland ecology protection in Tibet:

> First, emphasis has been placed on fencing and building water conservancy projects on natural grassland, and raising both the output level of grassland and its carrying capacity per unit area. Secondly, a pasture responsibility system has been implemented. In line with the principle of limiting the number of grazing animals by the size of the pasture, rotations grazing periods, rotation grazing areas and "no-grazing areas" have been designated. Thirdly, man-made grassland is being promoted so as to ease the pressure brought to bear on natural grassland by the ever-growing livestock population. Fourthly, efforts are being intensified to prevent or control hazards caused by mice, insects and poisonous weeds, and to maintain the natural ecological balance of the grassland by utilizing scientific means, and artificial and biological technologies. Fifthly, to enhance grassland amelioration in the pastoral areas, change the nomadic way of production, speed up economic development in pastoral areas and improve herdsmen's living standards, projects to construct grassland in the pastoral areas, build permanent settlements for roving herdsmen, and restore and improve natural grassland have been launched since 2001. These measures not only have steadily raised the income of farmers and herdsmen and enhanced their living standards, but also ensured the sound development of the grassland ecology (State Council 2003).

According to the 2003 White Paper, the State Council has introduced five policies on the management of grassland: First, fencing and building water conservancy projects. Secondly, pasture responsibility system- rotations grazing periods, rotation grazing areas and no-grazing areas have been designated. Thirdly, man-made grassland was promoted. Fourthly, prevention or control of hazards caused by mice, insects, and poisonous weeds. Finally, building permanent settlements for roving herdsmen. These policies have been implemented in the nomadic areas of both TAR and other Tibetans areas; however, enforcement and intensity varies from one area to another.

These five policies will be broadly explained under four major topics: the Pasture Responsibility System, Retire Livestock and Restore Grassland, the Destocking Policy, and the Comfortable Housing Project. Before explaining these policies, it is important to understand and analyse the rationale behind them. The State Council had two main rationales and objectives when they introduced the above-mentioned grassland management policies.

According to Fachun Du (2012), Ptackova (2011) and Kenneth Bauer (2015), the rationale behind the grassland policies is oriented from the developmental and environmental perspective; to alleviate rural poverty in the Tibetan areas, modernize the animal husbandry and to help degraded landscapes to recover. This is declared in the State Council's 2003 White Paper, which states that these policies have "steadily raised the income of farmers and herdsmen and enhanced their living standards, but also ensured the sound development of the grassland ecology" (State Council 2003).

The question of poverty alleviation and recovery of degraded landscape will be discussed below in detail, but it is still debatable how far the grassland policies have alleviated the rural poverty and improved degraded landscape. Underlying these policies, there are a few assumptions; nomads are 'backward' and 'underdeveloped', and they practice "unproductive form of livelihoods or inefficient methods of land and livestock management that are associated with poverty and environmental degradation" (Bauer 2015: 58). Thus, they try to replace the traditional and "backward" way of Tibetan pastoralism by "modern lifestyle" and modern animal husbandry.

Pasture Responsibility System

China introduced the 'Pasture Responsibility System' or the 'Household Responsibility System'[1], which was 'privatisation' of grasslands in the early 1990

[1] Household Responsibility System was introduced in China in early 1980s, replacing the production team system as the unit of production and income distribution. It was an agriculture production system, which allowed households to contract land, machinery and other facilities from

(DIIR 2008: 6; Yeh, 26 January 2010). Under this system, land and animals are distributed to the nomads; land contract was granted to individual households on a long-term lease basis of 30-50 years. The ownership of the land remains with the State. The rationale for the promotion of privatisation was based on the assumption that this would give herders proper incentives to better manage both their land and also to become more efficient market producers (Yeh, 26 January 2010).

Tuimu Huancao (2003)

China's policy of 'retire livestock and restore grassland' (*tuimu huancao*) was introduced in 2003 in Tibet (Yeh 2003; DIIR 2009: 32). The *Tuimu Huancao* policy calls for "limiting the number of grazing animals by the size of the pasture, rotation grazing periods, rotation grazing areas and no grazing areas" (State Council 2003). Thus, this policy calls for removal of livestock and the complete removal of nomads from grasslands, grazing bans and restrictions by fencing for the purpose of restoring purportedly degraded rangeland and protecting rangeland.

The implementation of the programme entails division into three new types of zones:

1. Zones in which grazing is to be completely banned (most serious degradation)
2. Zones in which grazing is to ceased temporarily, generally for a period of three to ten years (moderately degraded).
3. Zones in which pastures are to be seasonally closed or managed with seasonal rotational grazing (only lightly or not degraded) (Yeh, 2005: 9).

The Ministry of Agriculture defines *tuimu huancao* as a basic rangeland construction project that aims to restore vegetation, improve rangeland ecology, enhance rangeland productivity through fencing, seeding of grass (bubo), grazing

collective organizations. This institutional change has resulted in remarkable growth in agricultural productivity in China.

bans (jinmu), grazing restrictions (xiumu) and rotational grazing (lunmu).[2] In April 2007, the Ministry of Agriculture set targets for total *jinmu* and *xiumu* areas on the Tibetan Plateau of 12 million hectares and 25 million hectares respectively by 2010, and 13 million hectares and 42 million hectares respectively by 2020. Accordingly, *tuimu huancao* will be implemented in all of China's pastoral counties by 2030 (Nyima 2012: 2-3). But the authorities believe that a large area of grassland land will still be available for grazing, 69.1 million ha. There was a total of 85.11 million ha of natural grassland at the end of 2012 (State Council 2013).

In the TAR, the program was launched in 2004 in two counties in Nagchu Prefecture and one county in Ngari. With time passing by, the project is now being implemented in almost all the pastoral counties in the region. There is no uniform policy on the duration of these grazing bans. In the TAR, in most cases, a *jinmu* zone needs closing off for ten years and a *xiumu* during the growing season; and there is no *lunmu* component of the program. By the end of 2010, the total central government investment in these programs in the TAR was 1.929 billion *Yuan* and the area of fenced zones was 4.56 million hectares (Nyima 2012: 2-3).

Tuimu Huancao is implemented differently at different places. However, this is implemented quietly but forcefully "in the core area of the Sanjiangyuan (the source of the three rivers- Mekong, Yangtze and Yellow River) National-level Nature Reserve in Qinghai region which has been dubbed as China's "water tower," and is considered vital to the country's ecological security" (Yeh 2003).

Ecological Migration

In the Qinghai province, 33 million ha of land area is grassland, which equals 54 percent of its total land. There are around 800,000 Tibetans and Mongolian herders in Qinghai province. Resettlement was pursued through 'ecological migration',

[2] Rangeland construction (caochang jianshe) refers to rangeland improvement through man-made measures such as irrigation, seeding, fencing, etc. It is a concept that can be traced back to the early years of the PRC, the underlying principle is being that rangeland should be managed like farmland.

much more vigorously than other areas because the headwaters of Yangtze and Yellow Rivers are found in Qinghai, in Golog and Yushu TAP.

According to 2001 study, *Tuimu Huancao* was actively implemented in Qinghai, example by the cultivation of perennial grass on 1330 ha of seriously degraded natural grasslands; enclosure of both types of areas and elimination of rodents (pikas) through poison. The central government invested 2.5 million RMB in the project, which leading to 181 participating pastoral households to taking out poverty alleviation loans to cover further costs (Yeh 2005: 22).

This created problem because households were required to take loans of 5000 RMB that they might not able to repay. The project also did nothing to provide alternative employment or training for local residents, and may have left households and local governments in debts (Ibid). By 2003, the Qinghai *tuimu huancao* programme had been expanded. The grasslands of Golog and Yushu TAPs in Qinghai have been zoned in four types of management regimes:

1. Core zone for implementation of *tuimu huancao* on natural grasslands
2. Zone for ecological migration.
3. Zone of grazing bans and livestock numbers reduction.
4. Zone for rotational grazing and seasonal closures.

(Table: 3:3) Qinghai Programme Plan

Type of Programme	**Affected People (Households)**	**Area of Implementation in million mu**	**% of total grassland in Golog and Yushu**
Zone1	6,515 (1,448)	32.34	11.2
Zone 2	21,164 (4,326)	78.43	28.6
Zone 3	108,800 (21,976)	104	37.9
Zone 4	146,600 (23,659)	60.2	21.9

(Source: Yeh 2005: 22)

Notes:

Zone 1: sedentarisation and 'transformation' (i.e. resettlement, abandoning pastoralism) of 6515 herders, in accordance with the plan set out by the Three Rivers Nature Reserve

Zone 2: Sedentarisation and transformation of 21,164 herders

Subsidies of feed grain of 2. 75 kg/*mu*/year, over five years

Zone 3: 50 million *mu* of enclosures

- Construction of 20,000 houses (sedentarisation) and 20,000 dual-use sheds
- Subsides of feed grain of 2.75kg/*mu*/year
- Reduction of total number of livestock by 50 percent

Zone 4: 50 million *mu* of enclosures

- Construction of 20,000 houses (sedentarisation) and 20,000 dual-use sheds
- Subsidies of feed grain of 0.69kg/*mu*/year for a total of 34.5 million kg/year over five years (Yeh 2005: 22)

The Destocking Policy (2008)

In 2008, the State Council introduced the destocking policy as "a compensatory mechanism for grassland ecology has been created: a balance is maintained between the grass and livestock; a system is adopted to prohibit grazing, to have a stretch of grassland rest or grazing in rotation; and the numbers of livestock grazing are controlled to prevent it from deteriorating" (State Council, 29 October 2008). The destocking policy is intended to adjust the herd size to carrying capacity through a reward mechanism for protecting rangeland, according to Yunden Nyima (2012). This is done by creating a zone in which grazing is to be permanently banned, and zone where grazing should be cease for several years or be seasonally closed (Yeh 2005: 12).

On 22 August 2009, the TAR government officially launched another major rangeland protection program, Compensation for Ecosystem Services (CES) in five pastoral counties with funding from the central government. The program was carried out by 'rewards for livestock numbers determined by forage

availability', providing compensation to pastoralists in exchange for not exceeding their livestock quotas based on carrying capacities of their rangeland. After one year, the program was included in the national CES program to be implemented in eight pastoral regions (Inner Mongolia, Xinjiang, the TAR, Qinghai, Sichuan, Gansu, Ningxia and Yunnan) with an annual budget since 2011 of 13.4 billion Yuan from the central government.

Comfortable Housing Project (2006)

The State Council's 2003 White Paper as well the Eleventh Five-Year Plan (2006-2010) introduced the rural reconstruction campaign under the slogan of 'building new socialist countryside' - the "Comfortable Housing Project" - implemented in Tibet in 2006. According to scholars from the Institute of Social Economy of China Tibetology Research Centre, the project is "aimed at improving the living conditions for local farmers and herdsmen and helping them settle down by providing affordable housing to 80 percent of them within five years" (Luorong and Yang Minghong, 28 January 2012).

According to the TAR government, China moved 250,000 Tibetan farmers and herdsmen into a total of 47,000 new houses in 2006. The government stated that they invested about 2.5 billion Yuan in housing projects in 2006 and apparently have announced plans to improve the housing conditions of all rural Tibetans, who represent 80 percent of the total population of Tibet in 2010. Again in the same year, Chinese officials stated that they had solved housing problems for 1.2 million farmers and herdsmen from 230,000 farming and herding families and accomplished their goal for the Comfortable Housing Project more than one year ahead of schedule (Tibet.news.cn, 14 January 2010). According to Human Rights Watch, 90 percent of the Tibetan nomadic population will have been moved into the sedentary houses by the end of 2013 (VOA, 29 July 2013). Fachun Du (2012) of the Chinese Academy of Social Science also questions the resettlement project, saying, "Grassland degradation cannot simply be attributed to overgrazing

and population growth, hence the idea of improving grassland by simply implementing resettlement projects may sound implausible".

Tsering Woeser, a Tibetan writer based in Beijing, provides a different view of the Chinese government on the impact of China's "Comfortable Housing Project" on the Tibetans. According to her, the continuous mining activity has been the main cause of the destruction of the grasslands, whereas China puts the blames on Tibetan nomads (Woeser, 4 May 2011). There are many other factors which led to criticism of grassland management policies in the Tibetan Plateau, such as the political implications of nomad resettlement, livelihood of nomads, exclusion of nomads in the decision-making process, marginalizing and restraining them from using the native populace's centuries-old wisdom and knowledge in protecting the environment, increased dependency on the state subsidies, and unemployment.

The nomad relocation and ecological migration on Sanjiangyuan is the top-down approach, which led to the promotion of community-based and participatory approaches to conservation. However, participatory projects in which parks and pastoral grazing systems are jointly managed are also frequently flawed, particularly in their implementation. Many of these projects continued to be coercive even while maintaining the appearance of a consultative and participatory project. Focusing too much on the 'the local' scale and rigidly adhering to models imported from elsewhere "runs the risk of increasing local ecological and economic vulnerabilities" (Yeh 2005: 23-24).

Socio-Economic Changes and the Status of Resettled Nomads

The nomad resettlement policy has been implemented vigorously and extensively in the Tibetan areas. Although these policies are claimed to be measures to address poverty alleviation, ecosystem protection and integration of Tibetans into China's 'modern' development, the Tibetan nomads are currently forced to confront challenges that threaten their livelihood. These policies are implemented with the

underlying assumption that the nomads are 'backward' that they practice 'inefficient' methods of land and livestock management that they are associated with poverty, backwardness and environmental degradation.

Livelihood Sustainability and Security

Sustainable livelihood is one that "can cope with and recover from stress and shocks, maintain and enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation" (Chambers and Conway 1992:1). It is important whether the resettlement of Tibetan nomads from their grassland has brought sustainable livelihood or, on the contrary, it has threatened their livelihood.

The ecological resettlement has to some extent improved the housing, education, medical care and transportation conditions of the migrants but their overall living standard has fallen short of what they have been promised or what was projected by the central government. Changes are noted in income, spending and investment strategies that are likely to increase a household's vulnerability in the shift from subsistence to a cash-based economy. In fact, the resettlement programme threatens their livelihoods as there are few alternative job opportunities created for them and the subsidies provided them were insufficient to meet their daily needs such as food, water, electricity, clothing, transportation and religious activities. Depending on the state subsidies and reliance on outside sources with no long-term guarantees also creates unstable lives, undermining self-sufficiency to the resettled people (Bauer 2012).

Some settlers took off-farm activities such as gathering caterpillar fungus, knitting blankets for sale, operating small businesses or working as security guards, taxi drivers or construction workers. A significant portion of the household income of the rural Tibetans is dependent on harvesting caterpillar fungus although its availability from year to year is subject to volatility. The unstable nature of their income has made their standard of living decline. Very few nomads are able to earn a steady income from earning fixed wages labour, as Tibetan nomads do not

have basic skills to compete in the labour market and to access to new forms of employment in urban areas.

A survey has been conducted to show that resettlement has not improved their livelihood. Tashi Nyima's field research at Rawa town in Yushu county suggests that expenses have increased significantly in the new home while the household income remained roughly the same (see table. 3.4).

(Table: 3: 4) Estimated Average Household cash Income before and after Resettlement (in Yuan)

Income Source	**Before Resettlement**	**After Resettlement**
Sale of animal products	4,000	0
Caterpillar fungus	3,500	3,500
State compensation	0	3,000 or 6,000
Total	7,500	6,500 or 9,500

(Source: Nyima 2012: 144)

Identity Crisis

Resettled nomads are faced with the challenge of settling into a new environment and assimilating the new cultural environment. Thus, resettlement requires difficult social and psychological adjustment and generates challenges like culture shock, social disruption, and identity crisis due to increasing marginalisation. Nomads do not hold urban resident registration identity cards to become citizens.

Most resettled people had little formal education and due to lack of Chinese language skills, they face marginalisation in every sphere of life. Therefore, most young resettled people remain unemployed, which leads them to excessive alcohol consumption, losing Tibetan Buddhist and traditional values.

Housing

Most of the houses remain unoccupied right now in the resettlement areas. Resettled Tibetans nomad families in Qinghai are often divided, with elderly and school-age children living in the resettlement and adults maintaining livestock herds. Since the income at the new home and state subsidies are not sufficient to feed the whole family, a large part of their food comes from their old village.

Relatively little support has been given in the process of resettlement. However, even after nomads have moved out from the grassland, new housing lacks sanitation and running water. The facilities of the new houses are not as promised before they moved from the grassland (Nyima 2012).

Control of Land and People

Urban resettlement of nomads has led to political control of the Tibetan Plateau (Ptackova 2011; Yeh 2005). According to Ptackova, nomad resettlement also leads to an assimilation of the inhabitants of the Tibetan Plateau into Mainland China, making it easier for the state to control over China's western regions. Traditionally, nomads move from one place to another, making it difficult for the state to control them. When nomads are relocated into urban settlements, they are obliged to stay in a stable place and they are given identity certificates, which makes it easy for the state to control them.

Loss of Traditional Lifestyle

In 2009, the state media Xinhua reported that the resettled nomads had lost their traditional lifestyle. "Nomads who have left the grassland lost their traditional lifestyle. They have been resettled temporarily for 10 years, in the beginning, they relied on government support now they struggle to make a life" (Xinhua 2009). As a consequence of resettlement, millions of children will grow up without the pastoral traditions and the environmental knowledge of their parents, making a return to that lifestyle difficult, if not impossible. The loss of this place-based

knowledge may affect the on-going viability of communal forms of socioeconomic organization and the reproduction of traditions that have sustained these communities for millennia (Bauer 2012: 64).

Moreover, the resettlement diminishes the importance of place in the construction of individual and community identities. Loss of place-based attachments, knowledge embodied by living in these landscapes, dismantles indigenous production systems built upon the particular environment (Ibid: 65).

Allocation of limited land to the nomads has forced them to sell their livestock to reduce their herds; thus, male herders remain unemployed. While some are employed as unskilled construction labourers, most are subsisting only on temporary subsidies and income generated from digging caterpillar fungus. However, some of the Chinese government's policies have had some positive impact on the environment, and the Chinese government is investing a lot of money on such projects.

Environmental Sustainability of Sanjiangyuan Nature Reserve

China has made significant efforts to pursue sustainability while seeking to combine environmental protection and social improvement with economic growth (Liu 2008; Zhang et al. 2008). However, these efforts have not been successful in areas characterised by poverty and that are ecologically fragile. Such conditions characterise 40 percent of the country's territory, and are home to ethnic minorities. Challenging climates, depleted soil and rough terrain reduce the resilience of these environments so that they become sensitive to human-induced activities that aggravate land degradation, desertification and soil erosion (Zhang et al. 2008: 12). However, local authorities give priority to economic growth and neglect the sustainability of development projects.

The Maduo County (Qinghai Province) of Sanjiangyuan Nature Reserve is the an example of such cases, being among China's ten poorest counties in 2004, 90 percent of its lakes having dried up due to overgrazing. It became part of the

Sanjiangyuan Nature Reserve in 2001, but its environment continues to degrade, and economic conditions of the Tibetans to weaken. By 2007, most of the people had to migrate from the Maduo because the place became unsuitable for human habitation due to ecological collapse.

However, the Chinese government uses Sanjiangyuan Nature Reserve as a resource for development and ecotourism and showcases it as a solution for nature-reserve sustainability. However, the case of Maduo County suggests how ecotourism development may not be sustainable.

Conclusion

The chapter tested the first hypothesis: China's policies in Tibet have contributed to the degradation of the environment. According to few scholars, Tibetans have protected its environment before coming of Chinese into Tibet in early 1950s. The practice of territorial sealing and their belief on the Buddhist concepts of 'interdependence', 'principle of self-contentment', and sacred mountains have helped them to protect wildlife and create awareness of their environment. Moreover, 70 percent of Tibet's area is covered by rangeland. The Tibetan nomadic pastoral area is the sub-region of the Tibetan Plateau where pastoral nomadism has been the most sustainable and environmentally protective strategies.

However, in 1951, Chinese have marched into Tibet and claimed, it 'liberated' the Tibetans and introduced various social, economic, religious, cultural, and environmental policies in Tibet. The chapter focused on the economic and environmental policies. The first 'Tibet Work Team of the Government Administration Council' was organised in 1958 to carry out exploration of Tibet's natural resources. The Chinese government also carried out a series of scientific surveys on the Tibetan Plateau. In 1975, the 'Leading Group for Environmental Protection of TAR' was established. China accelerated the ecological protection work through the Tibet Work Forums, which held in 1980, 1984, 1994, 2001, and 2010 respectively.

In late 1999, China changed its regional development strategy and initiated the Western Development Campaign. Severe droughts in the lower reaches of the Yellow River in 1997 and flood in the provinces of Yangtze River in 1998 led the Chinese government to shift their development strategy and moved focus in the western regions of China. They hoped that this policy would improve China's ecology and satisfy the rising demand of water, mineral resources, and energy. The major emphasis of the campaign was on infrastructure and ecological construction projects. The chapter focused on four ecological projects in Tibet; 'grain into green program', protection of biodiversity, construction of nature reserves, and pasture into grassland program.

The grain into green program called for conversion of cropland in forests, banned the logging and the forest coverage has increased too. They introduced the Forest Law Enforcement Organs and the Tibet Armed Police Forestry Contingent to protect the biodiversity and other rare animals like Tibetan antelope. Large number of nature reserves, forest parks, and geological parks were constructed. Finally, the grassland policies have led to resettlement of nomads, fencing the grassland, rotations of grazing periods and promotion of man-made grassland. The permanent houses were built for the nomads to move from the grassland.

However, the ecological effectiveness of the policies remains questionable. Those Tibetan who have removed from their land have not been given enough subsidies, their economic condition have remain the same if not weaken. The resettlement policy has threatened the sustainability of their livelihood; they are left with no alternative jobs, and remain unemployed. Moreover, the resettlement policy has led to an assimilation of Tibetan nomads into Mainland China and gain control over the land, which allows them to do the mining activities. Tibet still is facing many environmental challenges like grassland degradation, desertification, water pollution, and permafrost thawing. These environmental problems will be discussed in the next chapter.

CHAPTER FOUR

Environmental Issues in Tibet

> Political agenda should be sidelined for five to 10 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', but the Tibetans could wait five to 10 years for a political solution.
>
> The Dalai Lama told US diplomats and revealed by secret American cables leaked by the Wiki leaks website (The Guardian, 16 December 2010).

Introduction

The Tibetan Plateau is now facing great danger from major environmental degradation, which is both man-made and natural. This study will analyse the various environmental challenges on the Tibetan plateau due to human-induced factors - more specifically through China's developmental policies in Tibet. Grassland degradation, endangered wildlife, permafrost melt, water pollution, deforestation, and desertification will be discussed in detailed. Due to the environmental degradation in Tibet, Tibetans have raised their voice against it. Thus, the chapter will study the anti-water pollution and anti-mining protests.

The Tibetan Plateau plays an important role in water security in Asia. The degradation of the Tibetan Plateau will not only affect Tibet but also threaten the lives of millions of people living downstream. Finally, the chapter will analyse the impact of climate change on the Tibetan Plateau and Asia, China's trans-boundary river politics and the security implications of trans-boundary water disputes.

Environmental Problems on the Tibetan Plateau

China is geographically and economically categorised into the Eastern (coastal), the Central and the Western Regions. The Western region consists of twelve provinces and the national autonomous regions covering 75 percent of China's

total area. Since the introduction of its economic reforms, China has focused primarily on the coastal areas. In 1988, Deng Xiaoping encouraged a rapid development in the coastal areas, planning to concentrate on the development of the other regions later (People's Daily, September 1988). Deng's slogan, "let some regions get rich first" laid the ideological basis for the formulation and subsequent implementation of this economic trend (Barabantseva 2009: 232). In the later part of 1999, after two decades of coastal development, Chinese leaders declared the change of China's regional development strategy and initiated the "Western Development Campaign".

With the introduction of "Western Development Campaign" in China, major developmental policies were implemented in Tibet such as the building of the Gormo-Lhasa Railway, exploitation of natural resources, construction of dams and water diversion plans (the South-North Water Diversion Project had not yet begun in Tibet), and urbanisation and infrastructure developments. These policies mainly favoured urbanisation and infrastructural development but ultimately compromised the environment of Tibet by threatening its ecological stability. Some of the major environmental problems caused by the above-mentioned developmental policies are grassland degradation, endangered wildlife, permafrost melting, water pollution, deforestation, and desertification. They will be discussed in detail below.

Grassland degradation

Nearly 40 percent of China's total landmass is grassland and most of which is found in only a few provinces or autonomous regions: Tibet, Inner Mongolia, Xinjiang, and Qinghai. 60 percent of Tibet's landmass is open grassland, which sustained the Tibetans and their pastoral herds over the millennia. At present 90 percent of Tibet's grasslands are showing deterioration, however, threatening the livelihood of Tibetan nomads and imposing grave consequences on the environment.

According to the World Bank (2001), the total area of degraded grassland in China had increased from 1989 to 1998, with a notable acceleration in the middle of the late 1990s. This report further noted that it is hard to avoid the conclusion that the most fundamental underlying cause has been weak government development policies (World Bank 2001: 24). Table: 4.1 shows two levels of grassland degradation: degraded rangeland and black soil on the Tibetan Plateau in Tibet Autonomous Region (TAR), Qinghai, Ngaba, and Kanlho regions of the 1980s and 1990s. The degraded rangeland can still maintain herds, but at reduced levels as grasses die in patches, invasive species take over, and explosion of infestations by burrowing animals combine to render the grasslands completely exposed to gales, blizzards, rain, hail and snow, with the result that it may soon be stripped down to bare rock - never to regenerate (DIIR 2009: 22). At this stage, the degradation is, however, reversible with contribution from local labour. The percentage of grassland degradation has increased steadily over the years from the 1980s to the 1990s. The TAR has witnessed the highest percentage of grassland degradation from 18 percent in the 1980s to 30 percent in 1990s, followed by Qinghai with 28 percent in 1980s to 32 percent in 1990s, Ngaba/Karze with 27 percent in 1980s to 33 percent in 1990s, and Kanlho with 44 percent in 1980s to 49 percent in 1990s.

The second stage of land degradation turns to the black soil where the soil is desertified thus cannot maintain herds. Therefore, rangeland degradation has become a serious threat to both herds and nomads. In the 1990s, 16 percent of TAR's land was black soil, 21 percent in Qinghai, 13 percent in Ngaba and Karze in Sichuan Province, and 12 percent in Kanlho. Whereas in the 1980s, 15 percent of TAR's land was black soil, only 13 percent in Qinghai, 9 percent in Ngaba and Karze and 8 percent in Khalho prefecture (see table: 4:1). The Chinese government blames the Tibetan nomads and global warming for grassland degradation in Tibet. Thus, the Chinese government had attempted to address this issue by introducing various policies to 'protect' and 'preserve' the grassland degradation on the Tibetan Plateau.

(Table: 4.1) Degradation of the Tibetan Rangelands

Tibetan Province	Grassland areas (In sq. kms)	Degraded rangeland (Percent)		Rangeland degraded to black soil (percent)	
		1980s	1990s	1980s	1990s
TAR	644,000	18	30	15	16
Qinghai	316,000	28	32	13	21
Ngaba/Karze	142,000	27	33	9	13
Kanlho	161,000	44	49	8	12
Total (in sq. kms)	1282,000	321,000	425,000	169,628	215,240

(Source: Miller, Daniel (ed.) et al., ICIMOD, Kathmandu 1997, table 5, pp. 105-114, cited in DIIR 2009: 22).

However, grassland degradation is complicated; it cannot simply be attributed to overgrazing and population growth. There are both natural, and human factors that have led to the degradation of pastureland on the Tibetan Plateau such as global warming, unsustainable mining, and improper management of grassland due to a change in the system of tenure. Since the 1990s, the effect of global warming has contributed to rapid evaporation from the soil surface in the grassland and weakens the soil's water-holding capacity, leading to desertification.

Tibetan plateau has rich mineral resources. Mining generates large - scale waste and debris, disruption to the water table, destruction of the habitat and severe degradation of the traditional grazing lands.

Improper Management of Grassland due to a Change in the System of Tenure

Grassland management has been changing since the 1950s in Madoi County, Qinghai Province the source of Yellow River and a major part of the Sanjiangyuan area. From 1950-1980 the grassland was owned in Madoi by the Tibetan communities as a whole, and used by nomadic herders. From 1983-1992 the

Household - Contracted Responsibility System (HCRS) and privatisation of grassland was introduced, weakening the power of the community to manage grassland and contributing to overgrazing. After 1992, the regional government launched the Four Infrastructure Activities Project: construction of permanent houses, animal sheds on the winter pasture, fencing, and grass planting. This resulted in grassland fragmentation; overgrazing and livestock were contained without transhumance (Du: 120-121).

Nevertheless, according to the Chinese government, the solution for grassland degradation is to resettle the nomads and temporary banning grazing. Many scholars argue, however, that the herd and pasture management strategies of the Tibetan nomads have protected the ecosystem of Tibet's rangeland over many centuries and they had lived in harmony with nature.

Endangered Wildlife

Another environmental problem caused by Chinese development strategies in Tibet is the endangering of wildlife. The most vulnerable are the Tibetan antelope or chiru (one of the mascots of the 2008 Beijing Olympics). The annual migration of the endangered female Tibetan antelope from their winter ranges to their traditional birthing grounds is truly one of the most outstanding ecological spectacles (ICT 2011: 214). The railroads create huge disturbance to the migration pattern and the food sources of these Tibetan antelopes, with the the Gormo-Lhasa railway having reduced chiru migratory herd sizes. Studies have also shown that the Tibetan antelope's greatest barrier to reproduction over the past 50 years has been the highway, which hinders the movement required for mating and birthing practices (DIIR 2009b: 42).

Chinese scholars' study on 'The Effects of the Qinghai-Tibet Railroad on the Migration of Tibetan Antelope", underscores that chiru are active in the daytime and their migration season is in summer. However, the construction of the railway was completed in 2006 and highway constructions and other activities on the plateau are carried out in summer too. Human activities like chasing, shouting

and taking pictures scare the chiru herds. Thus, the increasing human presence associated with railways and highways may be the greatest threat to the chiru now, and in the future may become greater than the threat from the infrastructures per se (Xia et al. 2007).

Animal smuggling is another grave concern caused by the railway in Tibet (Peng et al. 2007: 547). There are records of illegal poaching of Tibetan antelopes for Shahtoosh[1] (high-quality fabric made from the wool of endangered Tibetan antelope) (DIIR 2009b: 39; UNPO 2007: 10). It is used in traditional Tibetan and Chinese medicine, but medicinal use count as a minor reason for the poaching of the antelopes. The main aim of poaching is for shantoosh (DIIR 2005: 43). Thus, in 2003, the International Union for Conservation of Nature and Natural Resources listed the Tibetan antelope as a threatened species (DIIR 2009b: 39).

According to the Chinese government and a few Chinese scholars like Changhui Peng, the Gormo-Lhasa railway is an "environment-friendly project" (China Tibet Online, 30 March 2012) and "green railway in China" (Peng et al. 2007: 546), which has not harmed the wildlife and the environment of the Tibetan plateau. Changhui Peng argued that the Chinese government has adopted "green policy" while constructing the railway to protect soil, vegetation, animals, and water resources. To minimise the adverse impacts of the construction, the Chinese government has taken four major measures while constructing the railway; locations were carefully selected, vegetation and topsoil removed from the sites during the construction were restored after the work was completed, bridges were built to minimize the impact on the sensitive natural zones, and finally insulation and temperature reducing facilities for frozen layers were used to stabilise permafrost along the railway line. The Chinese government spent 26.2 billion Yuan (US $3.39 bn) for the Gormo-Lhasa railway and allocated 1.54 billion Yuan for ecosystem restoration and environment protection (Peng et al. 2007: 546).

[1] Shahtoosh is a fabric made from the chiru or the Tibetan antelope. It is known for its lightness, warmth and softness. The shawl is sold for very high prices in the luxury markets.

Peng further notes that the Chinese government has established five nature reserves along the route; Kekexili (Hoh Xil), Qinghai Sanjiangyuan, Chang Tang, Lin-Chou Pengbo, and La-Lu and built more than 33 passageways in the Hoh Xil and Changtang Nature Reserve to protect animals and permit their smooth migration. Building huge railway bridges across three big rivers to protect water bodies were also prioritised.

However, much of this investment in biodiversity protection was primarily an engineering necessity, such as building the rail line well above the ground, on embankments and bridges, to hold temperatures steady and avoid permafrost meltdown. China turned an engineering necessity into an environmental virtue. With the construction of a railway, more and more roadways and hotels are springing up on the Tibetan plateau, adding to the degrading of the Tibetan environment by hindering the preservation of wildlife and exacerbating permafrost melting.

Permafrost Melt

The Lhasa – Gormo railway is built on 632 kms of permafrost, of which 550 kms is continuous permafrost with 190 kms categorised as unstable and 100 kms as being highly unstable (Chinese Academy of Sciences). Tibet has vast areas with high-altitude permafrost or seasonally frozen ground that has been below zero degrees Celsius for most of the year for at least two consecutive years (see map 4.1). During the past forty years, the permafrost on the Tibetan Plateau has undergone noticeable degradation along the Siling (Xining)-Lhasa highway. Permafrost degradation can increase greenhouse gas emissions from frozen layers, which further increase greenhouse gases in the atmosphere (DIIR 2009: 52; Norbu 2011).

Although railroads and oil pipelines have been built on permafrost since the early 1900s in Alaska, Canada and Russia, these projects require extensive maintenance. In these frigid climates, permafrost is an apt name, where in Tibet subsoil temperatures are close to melting point. That is why the permafrost is

prone to disappearing and with it the subsoil moisture available to plants, especially in wetlands. The Russian railway on which the Chinese researchers modelled their engineering experienced a 30 percent failure rate, and nearly a third of the track has had to be reconstructed every few years.

Such changes in permafrost brought about by both climate change and engineering activity could cause land desertification, ecosystem deterioration and changes in carbon pools and fluxes. Many Chinese scholars have researched the effect of climate change and the engineering activity on the permafrost on the Qinghai-Tibet Plateau. According to these scientists, the impact of the climate change is larger than the effect of engineering activity for cold permafrost, but the effect of climate change is smaller than the effect of engineering activity for warm permafrost (Qingbai et al. 2007: 683).

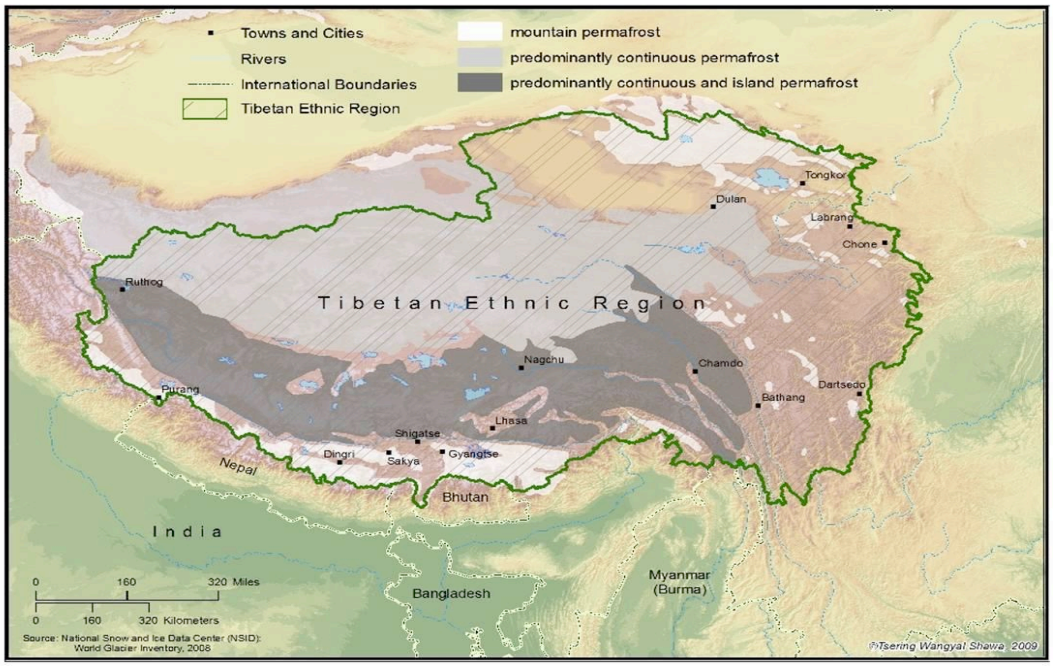
Zhang Shiyun, General Manager of the Lhasa-Gormo Railway Corporation, states that they have installed ventilation pipes and thermo siphon to maintain the ground temperature. In thermo siphon, the ammonia become a gas at a low temperature, giving off a vapour that draws heat from the bottom of the tube and flushes it out from the top, cooling it at the same time. However, the cost of these pipes is very high and demands costly scientific solutions for their maintenance. These expensive ways of holding temperatures steady have been necessitated by the seasonal heaving of roadbeds in winter as water expands, as it becomes ice; and the warmer months slumping down of roadbeds, as the ice melts and trickles away. This seasonal alternation of heaving and slumping has restricted new transport into Tibet and prompted 40 years of research for methods of control.

According to a study done by the Chinese Academy of Sciences, high temperature and the global climate change has emerged as one of the most challenging issues related to the railway on the Tibetan Plateau. If the ecological balance is upset, the consequences will be irrevocable and disastrous. Thus, it is of great importance to the China's Railway Ministry, construction planners, engineers and environmental scientists to work together and maintain the safety of

the railroad. However, Chinese scientists from Cold and Arid Regions Environmental and Engineering Research Institute, who designed the railroad, state:

> Environmental management and protection along the Qinghai-Tibet Engineering Corridor is urgent and important for the long-term stability of engineering foundations, and for sustainable development on the Qinghai-Tibet plateau. Proper protection and management require the development of a non-interference plan and acceleration in the enactment and enforcement of environmental protection (laws, regulations and stipulations) based on an extensive and thorough understanding and practical rehabilitation techniques for disturbed or damaged permafrost environments (Jin et al. 2008).

(Map: 4.1) Permafrost Cover on the Tibetan Plateau



(Source: Norbu 2011)

They stated that the environmental management and protection of the Tibet railway is urgent and acknowledged the importance of the long-term stability of the engineering foundations for the sustainable development on the Tibetan Plateau. Therefore, the surface disturbances like infrastructure development causes permafrost degradation on the Tibetan Plateau. Global warming has

played a secondary role in speeding up this deterioration, which finally leads to desertification. More importantly, the permafrost temperature at the sources of Yangtze and Yellow River has risen since the 1980s, resulting in an increase in the soil layer, lowering of the water tables, and lake water levels, which could impact not only Tibetans but also millions of people from downstream nations.

Water Pollution

According to the Intergovernmental Panel on Climate Change (IPCC), the rivers flowing from the Tibetan Plateau form the eleven Asian mega-deltas. These mega-deltas are in megacities like Tianjin, Shanghai, Guangzhou, Bangkok, Calcutta, Dhaka, and Karachi (Chellaney 2011: 97). These mega-deltas are "critical diverse ecosystems of unique assemblages of plants and animals located in different climatic regions" (IPCC 2007). The Indus and Brahmaputra, two of the principal rivers of Asia, originate from the southern Tibetan belt, the Himalaya rim. The Sutlej (Langchen Khabab), 1,550 kms long, also originates from this belt, viz. the southern slopes of Mount Kailash finally draining into the Indus in Pakistan. The south-east and eastern part of the Tibetan Plateau is an equally significant source of water. The Salween originates near the town of Nagchu in the TAR and the Mekong from the remote Thangla Mountains of Tibet's Amdo region, now in Qinghai Province. In their southward course, the Salween and the Mekong run parallel through the Tibetan Plateau into Yunnan before separating, the former entering Burma and the latter, joined by the Ngomchu River, flowing into Laos (see table: 4.2).

The Yangtze (Asia's longest river) and the Yellow River also originate from the eastern part of the Tibetan Plateau. The Yellow River originates from an rea which China has designated the "Yushu Tibetan Autonomous Prefecture" (Yushu, or "Jade Tree," is the Mandarin name for the area, the Tibetan name of the place is Kyegudo). The Irrawaddy, Burma's major river, also originates from the Tibetan Plateau and is fed by three Tibetan streams in Zayul County, near the border of India. The Manas through Bhutan and north-east India, originated in Tibet (Chellaney 2011: 103)

(Table: 4.2) Tibet's Major Rivers

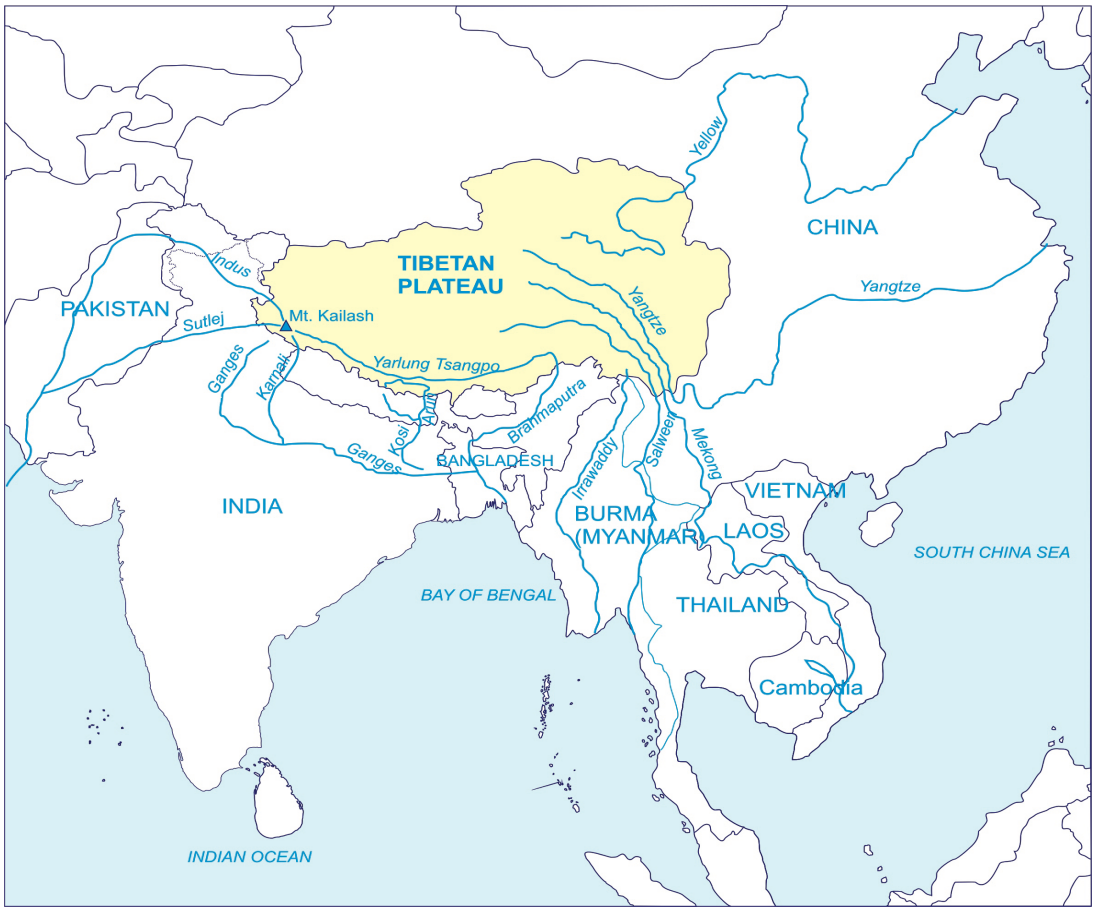
Tibetan	International	Chinese	Source (ht.in meters)	Length (Km)	Watershed regions	Outflow
Machu	Yellow River	Huang He	Amdo Bayanhar Mountain (5266)	5,464	Tibet, China, Inner Mongolia	Yellow Sea
Drichu	Yangtze	Chang Jiang	Mt. Thangla (6328)	6,380	Tibet, China	East China Sea
Zachu	Mekong	Lancang Jiang	Mt. Thangla	4,500	Tibet, China, Vietnam, Laos, Cambodia, Thailand	South China Sea
Gyalmo Nyulchu	Salween	Nu Jiang	Mt. Thangla	2,800	Tibet, China, Burma, Thailand	Andaman Sea
Yaglung Tsangpo	Brahmaputra	Yarlung Zangbo	Mt. Tesi Range	2,900	Tibet, India, Bangladesh	Bay of Bengal
Macha Kbab	Karnali	Maqa Zangbo	Mt. Tesi Range	1,609	Tibet, Nepal, India	Bay of Bengal
Langchen Khabab	Sutlej	Langquen Zangbo	Mt. Tesi (Kailash)	1,450	Tibet, India, Pakistan	Arabian Sea
Senge Khabab	Indus	Senge Zangbo	Mt. Tese (6638)	3,100	Tibet, India, Pakistan	Arabian Sea
Bhumchu	Arun		Mt. Shishapangma (8012)	1,207	Tibet, Nepal, India	Bay of Bengal
Lhodrak Sharchu	Norbu Lakchu or Manas		Mt. Zholchen (6106)	380	Tibet, Bhutan, India, Bangladesh	Bay of Bengal

(Source: Norbu 2011)

(Lhodrak Sharchu to Tibetans and Norbu Lakchu to Bhutanese) a 376 km river flowing.

Though the Tibetan Plateau has abundant water resources, they are in great danger. In March 2007, a report by the World Wildlife Fund (WWF) stated that four of the world's ten most endangered rivers are in Tibet: Drichu (Yangtze), Gyulmo Nyulchu (Salween), Zachu (Mekong), and Sengye Khabab (Indus), all of them threatened by dams, pollution, overfishing and climate change. Water pollution is largely caused by mining activities that take place in Tibet (see map 4.2).

(Map: 4.2) Tibet's River System



(Source: Chellaney 2013)

Mining and Water Pollution

Mining is one of the Beijing's 'Four Pillar' industries in the TAR. China's economic development and industrialisation demand vast mineral resources thus investing a massive amount of money in it. Ever since the Chinese occupation of Tibet in the 1950s, China started conducting surveys for locating mineral deposits in Tibet.[2] The mining industry expanded considerably during the economic reforms of the 1980s and 1990s. However, it remained a small-scale business during that period. As China began to face growing shortages of the mineral resources, there had been an accelerated exploitation of minerals from Tibet

[2] History of Discovery of Minerals of Tibet, Geological Publishing House, 1996.

(UNPO 2007; Lafitte 2013: 41). But China has failed to see the impact of mining on the environment in Tibet. Infrastructure development on the Tibetan Plateau further facilitated the exploitation of the natural resources. The extensive mining activities have led to water pollution, destabilisation of the fragile mountain slope, degradation of pastures, soil erosion, increased rates of sediments in river catchments, deforestation and other perils such as contamination of water, air pollution and noise pollution.

Water pollution is caused by three main factors: sedimentation, acid mine drainage, and metal deposition. The most serious concern in water pollution is acid mine drainage. When sulphide-bearing minerals such as pyrite or pyrrhotite are exposed to oxygen or water, sulphuric acid is produced. Many of these sulphide minerals originate from waste rock removed from the mine or tailings. Waste rock, which accounts for more than 80 percent of the rock mined at many copper sites, tends to contain high concentrations of sulphide, toxic metals, and non-metals. These waste rock piles are often the source of acidic effluents. This acid mine drainage is hazardous to humans if acidic waters are discharged into nearby streams and surface waters and also have severe impacts on aquatic life (DIIR 2009c: 177).

The erosion of waste from rock piles or runoff after heavy rainfall also increases the sediments of nearby water bodies. High sediment concentration increases the turbidity of natural waters, which reduces the light that is available to aquatic plants for photosynthesis. The Tibetan Plateau, having formed quite recently in a geological time frame, is not only uplifting but also eroding rapidly, naturally causing a high sedimentation rate. That is why the Yellow River is yellow. When the sediments settle on the streambed, it reduces the depth of the streams, often leading to flooding. Mining may also modify stream morphology by disrupting a channel, diverting stream flows or changing the slope or bank stability of the channels, which significantly reduces the water quality.

A study revealed the presence of a high concentration of zinc in a tributary of the Gyalmo Nyulchu (Salween River) and a relatively high concentration of nickel was identified in a tributary of the Drichu (Yangtse). Though the exact origin of these elements is not known, it could be caused by mining activities (DIIR 2009b: 40). Tibetan scientists stated that there is already a natural heavy metal load in the river, and if there is any leakage from the hillside, dam waste tailings could be disastrous (Huang et al. 2010). This will affect the rivers flowing downstream into India and Bangladesh, and if the planned water diversion of Tibetan rivers to the Yellow River (Huang He) that includes capturing the Yarlung Tsangpo was to be executed, China's water purity would also be threatened (Lafitte, 11 October 2011; Buckley 2014).

The Gyama (Jiama) mine controlled by the Vancouver-based China Gold International in TAR is also a threat to the purity of the water in Tibet's most sacred city, Lhasa (capital of Tibet). The area is unstable and vulnerable to earthquakes. The mine is close to the railway route that is to be built from Lhasa to Nyingtri (Nyingchi). It poses a grave threat to the downstream rivers. Due to its destructive mining operation in the region, Tibetan villagers in the Gyama Township of Maldrogungkar County, Lhasa, protested on 20 June 2009 (Tibetan Review, 19 August 2009).

Water Megaprojects and Water Pollution

The Tibetan Plateau's vast freshwater supply is emerging at the centre of the increasingly tense political strife between China and Tibet. Tibet's vast water resource is an important cultural and political strategic element that China is intent on managing and controlling (Schneider and C.T Pope, 8 May 2008; Chellaney 2011: 129). Nevertheless, China's waters are either too polluted or filled with silt to provide its 1.3 billion population with sufficient fresh water. Thus, China has set its eyes on Tibet's water resources for a long time (Buckley 2014). They have built dams in Tibet for hydropower and to transport water hundreds of miles to the north and east of China for agricultural and industrial purposes.

China is currently pursuing a major inter-basin and inter-river water transfer projects on the Tibetan plateau by putting severe pressure on the natural flow of water. Furthermore, China has megaprojects for building dams, barrages, and diversion in southern and south-eastern Tibet, close to other countries, which immensely decrease water flow downstream. If the water is consumed or diverted upstream, it damages the fluvial ecosystems resulting in reduced water supply downstream. The existing hydro-engineering facilities have started to affect the hydrology of the rivers flowing out of the plateau and their sediments loads, increasing the risk of earthquakes, besides promoting riparian-vegetative attrition and stream-bank erosion and disturbing or depleting aquatic life.

Dams are known to be contributing millions of tonnes of harmful greenhouse gases and spurring on global warming. As water flow is stopped, vegetation and soil in the flooded areas are usually left to rot, thus dead fish and other animals that die in the dam release carbon dioxide, methane and nitrous oxide into the air (Jissica, 4 September 2007). Therefore, forests play a very crucial role in the environment, as being nature's agents of controlling stream flows, maintaining ecological services, storing carbon, generating rainfall and climate, and also conserving soil. It is home to 90 percent of the land-based plants and animal on the Tibetan Plateau, but the alarming rate of deforestation in Tibet further adds to existing pressure on the Tibetan environment.

Deforestation

The Tibetan Plateau has trees of tropical and subtropical-montane coniferous forests, with evergreen spruce, fir, juniper, pine larch, cypress, birch, and sclerophyllous oak. Most of the forest cover on the Tibetan Plateau is found in the Tibet Autonomous Region (U-Tsang in the centre and parts of Kham in the east). U-Tsang[3] has the largest forest cover in Tibet (see table: 4.3). The south-

[3] Traditional Tibet is regionally divided into three provinces, namely U-tsang, Amdo and Kham. U-tsang consists of current Tibet Autonomous Region, and Amdo is the Qinghai Province and Gansu Province and Kham is Sichuan Province. However, a significant part of Kham is within the TAR.

eastern region of the Tibetan Plateau has extensive mountain forests and such forests are also found in parts of western Sichuan and south-eastern Qinghai.

25.2 million hectares of forest were found in Tibet but since the Chinese occupation of Tibet in 1959, forest cover in Tibet have reduced to 13.57 million hectares in 1985. Thus, around 46 percent of Tibet's forests cover has been destroyed by China so far. The ravages of such massive deforestation have been witnessed in west Sichuan and more specifically in Kardze and Ngaba (Aba) Autonomous Tibetan Prefectures. According to some studies, the forest cover in this part of the Tibetan Plateau decreased by nearly 50 percent from 30 percent in the 1950s to 14 percent in the 1980s.

(Table: 4.3) Threats to Tibetan Rivers

River	Internation-al Name	Percentage of Forests	Percentage of Original Forest Lost	Percenta-ge of basin protected	Dams in basin
Sengye Khabab	Indus	0.4	90	4.4	(3)
Yarlung Tsangpo	Brahmaputra	18.5	73	3.7	(3)
Gyalmo Ngulchu	Salween	43.4	72	2.2	4 (5)
Zachu	Mekong	43.2	80	3.8	22 (25)
Drichu	Yangtze	6.3	85	1.7	63 (101)
Ma Chu	Yellow River	1.5	78	1.3	40 (47)

(Sources: D. Viviroli et al., 2003: 23-40; UNEP 2005 cited in DIIR 2009: 127)
Figures in brackets are dams under construction with walls of 60 meters high or more.

Deforestations also took place in the TAR. The forest regions of Nyingtri, Gyalthang, and Drag had 18 million cubic meters of timber being transported down rivers (Palden 1996). TAR is crossed by four highways making it easier to carry the timber. According to figures monitored by Radio Lhasa, 2.5 million cubic meters of timber valued at 75 million Yuan (US $20.3 million) were

transported between 1960 and 1985 from the forest cover of Chamdo Prefecture in TAR. According to the official Chinese census, the total value of timber that China extracted from Tibet until 1985 is estimated at US $54 billion (Palden 1996).

China's modernization had therefore directly led to the reduction of the forest covers on the Tibetan Plateau by nearly 50 percent. This happened through planned commercial timber extraction from Tibet to China, not through local population pressure (Palden 1996; Winkler 1995; Tracy 2009; Clarke 1995: 87). However, in the 1980s, Chinese scientists blamed the local people for firewood gathering, grazing, cultivation, cutting trees for constructions, causing, it was claimed, deforestation (Winkler 1995: 87).

Forest destruction is more evidently severe along major highways and rivers. In the past, timber production mainly depended on rivers to float the logs down to the basin of Sichuan, but China has built a massive road network to serve the forest industry. Thus, China's massive plan to build roadways and railways is aimed to exploit Tibet's resources.

(Table: 4.4) Forest Stock and Density in Tibet

Region	**Forest Area (km sq.)**	**Forest Area %**	**Forest Area (km sq.)**	**Forest Area %**	**Total volume of forest stock (million m sq.)**	**Timber vol. extracted (million m sq.)**
	1950		1985		1985	1950-1985
Amdo	37,500	5	19,500	536	536	495
U-Tsang	96,000	8	61,500	1,511	1,511	897
Kham	88,300	30	53,000	1,599	1,599	1,050
Total	221,800	9	134,000	3,646	3,646	2,442

(Source: Palden 1996)

Deforestation has serious implications for the freshwater reserves, stream-flow regimes and the survival of endemic species (Chellaney 2011: 119; Palden 1996). It also causes soil erosion, landslides and floods that affect the livelihood of people downstream and it drastically affects trans-boundary downstream countries like India, Bangladesh, Bhutan, Cambodia, and Vietnam. For example, the 1998 flood in the Yangtze basin killed more than 4000 people, affected 223 million people and caused more than US $36 billion worth of economic loss (Xeufen et al.: 5). According to official Chinese reports, summer floods have destroyed over 6618,000 acres of farmland and caused 30 percent decrease in grain production in the affected regions (Palden 1996).

Logging has been carried out by China for more than six decades until 1998 when the devastation caused by the Yangtze flood forced China to end logging and implement reforestation (see table 4.4). Although China claims that reforestation has been carried out in Tibet, the total afforested area in the south-western mountain region was only 12.7 percent of the deforested area in the 1990s. It is also uncertain as to how many of the planted trees will grow into trees, as Tibetans are not employed to care for seedlings exposed to intense cold. Secondly, once the forests are destroyed and replaced by grasslands the regrowth of forests can be seriously hindered, especially if slopes are used for grazing (Winkler 1995: 89).

Desertification

The Tibetan Plateau is one of the seriously desertified regions (CCICCD 1997). Xinhua, the Chinese official news agency, reported in 2009 that conditions of desertification are spreading in Tibet. 21.7 million hectares of land (18 percent of Tibet's land) had already desertified, with an annual increase of 39,600 hectares (China Tibet, 18 June 2009). Sandy desertification of the Tibetan Plateau is still in a rapid developmental stage. Desertification is widespread on the whole Tibetan Plateau, affecting four provinces. Within these four provinces namely TAR, Qinghai, Sichuan and Gansu, desertified land on the Tibetan Plateau occupies

63.76 percent, 35.88 percent, 0.35 percent and 0.01 percent of their respective total land area (Liu Yi-hua 2005: 290).[4]

Sandy desertified lands of the Tibetan Plateau occur in river valleys, lake basins and piedmont diluvial and alluvial plains; especially seriously sandy decertified lands are mainly distributed in the valleys of the Yarlung Tsangpo, the Yangtze River, the Yellow River and their tributary valleys. The development of sandy desertification affects people's livelihood, disturbs local ecological stability and contributes to environmental degradation. The process of sandy desertification leads to sand drifting which damages water conservancy, hydropower projects, railways, highways, civil aviation, communication, and transmission lines. It also decreases the usable land area and reduces the soil quality and agricultural-livestock production level.

Sandy desertification of the Tibetan Plateau may have severe consequences in the surrounding regions as well. It influences the stability of the flow of many rivers which often causes the increase in river sediment content, seasonal water shortage and flood inundation in the wet season. The decrease in vegetation coverage changes the climatic pattern, which may leads to a reduction of precipitation and increase of air temperatures as well as the increase in dry degree, thus inducing environmental degradation and the development of sandy desertification (Ibid: 291).

The Tibetan plateau is one of the coldest, driest and windiest regions in the world compared to others with the same altitude. It has a sparse precipitation of only 100-200 mm per year, except in the wetter south-east. The wind, which is one of the natural causes of desertification, is very powerful during winters in Tibet. The drought and windy seasons occurring in the same period accelerates the desertification process (Yang et al. 2004: 49; Cui 2009: 56). Moreover, arid and semi-arid land occupies more than two-thirds of the plateau's total area, often classified as alpine desert. In the arid and semi-arid regions of the plateau,

[4] The study has not included the Tibetan ethnic area in Yunnan.

trees are sparse, some sparse and dwarf grasslands having only vegetation coverage of 20-30 percent and plant height varing between 5-20cm. The growth season is short, and most of the sandy surface is directly exposed to strong wind-flow.

According to Sun Zhizhong of the Chinese Academy of Sciences, temperatures on the Tibetan plateau have risen over two degrees Celsius in recent decades leaving a significant portion of the frozen earth to defrost. The moisture is soon lost and as water quickly evaporates under the plateau's blazing sun, the soil begins to dry up and eventually turns into desert. Another researcher, Qu Jianjun from Chinese Academy of Sciences, stated that desertification is a trend that is hard to reverse in the near future. The Qinghai-Tibet Plateau may one day become a major source for sandstorms (Xinhua, 30 July 2012).

The rapid growth of population also significantly contributes to desertification. The rise of the population leads to increasing demand for food, mineral resources and fuel which results in overgrazing, over-cultivation, abusive gold mining practices, uncontrolled logging and digging of the vegetation for fuel. These factors together lead to accelerated desertification (Yang et al. 2004: 51; Cui 2009: 56). Thus, desertification on the Tibetan plateau is also caused by mining, overpopulation, and infrastructure developments. However, the Chinese government continues to circumvent the facts and blames the Tibetan nomads for desertification and deforestation. For example, Sangye Drawa, a former head of the Regional Forest Bureau of Tibet, stated that the causes of desertification on the Tibetan Plateau are its dry weather, low forest coverage rates of just 11.3 percent, cutting of trees, and overgrazing (China Tibet, 18 June 2009).

On July 2012, Xinhua published an exclusive report by saying that desertification threatens the world's highest railway as a result of global warming. According to Wang Jinchang, a senior engineer of Qinghai-Tibet

Railway Company, research shows that the threat of soil erosion has increased near rivers and wetlands along the railroad from Gormo to Lhasa, and the number of affected rail tracks being almost doubled from 2003 to 2009. For example, sands burying rail tracks and disrupting train services have occurred over 1,362 times from 1984 to 2002 on the Xining-Gormo section of the railway which was operationalised in 1984 (Xinhua, 30 July 2012).

China began taking measures to control desertification in Tibet in the 1970s, but no visible result was achieved. On February 2009, according to Xinhua, the central and local government unveiled a national plan to preserve Tibet's ecology, through measures like afforestation, construction of sand preventing shields and water conservancy (Tibet China, 17 March 2010). However, afforestation is usually done by dropping seeds from planes, which is not an effective method, especially on sloping deforested land.

Desertification is a result of the combination of both natural and human-induced factors (Yang et al. 2004: 49; Cui 2009: 56). The natural factors for desertification of the Tibetan Plateau are the climate, frozen soil conditions, frequent droughts and strong winds, and the human-induced factors are the region's socio-economic system. Both natural and man-made factors are equally responsible for the desertification processes; being directly and highly correlated, they can intensity or contribute to reduce their respective effects. When Tibetan people raise their voices against environmental destruction, they are often treated as being "anti-China" and harmful to "unity", with the Chinese government using force against peaceful protesters. If the Chinese government would pay serious attention towards these concerns, many of the environmental problems could be solved in Tibet.

Environmental Protests in Tibet

The recent protests in Tibet are caused by China's continuous destruction of the Tibetan environment. The peaceful environmental protests have taken place all across areas of Tibet: Tibet Autonomous Region, Tibetan areas in Sichuan,

Yunnan, Gansu and Qinghai province (see table 4.5). Some protests have involved a significant number of people with different strategies to pass their message across; however, many of them have been brutally suppressed. Large numbers of these peaceful protests were against mining activities in the Tibetan area. Since the plateau has rich mineral resources like gold, copper, iron, lead, lithium, mercury, nickel, platinum, silver, uranium and zinc, China has been exploiting and extracting these minerals for a period.

Anti-Mining Protests

Mine extraction in Tibet has caused the largest environmental protests in Tibet. The Chinese companies engage in mining activities in the places that are sacred for the Tibetan population. Historically Tibetans have been worshipping sacred mountains, and they believe that it protects them. However, Chinese miners have disrespected their sentiments and disregarded the sacred places, which further adds to Tibetans resentments and hostility towards the Chinese government (Lafitte 2013: 41).

Nevertheless, Tibetans have always carried out peaceful demonstrations, but they have been constantly crushed with violence and imprisonment, adding to resentment and anger towards the government. For example, on 17 August 2010, Chinese police in Palyul (Baiyu) County of Karze (Ganzi) Prefecture in Sichuan Province opened fire on a group of Tibetan villagers petitioning against a hugely expanded Chinese gold mining operation in their area. Chinese police killed four and injured 30 local Tibetans (see table: 4.5). Tibetans demanded compensation from the government for environmental damages and livelihood destruction by mining (Tibetan Review, 29 August 2010). In another case, around 50 Tibetans were arrested in July 2011 by the Chinese police in Dzogang County of Chamdo Prefecture, TAR, for protesting against several mining projects in the area (Tibetan Review, 7 August 2011). On 6 March 2012, a group of monks from Lingka Monastery, Tamo town and Xietongmen county in TAR were sentenced to four or five years by the court in Shigatse Prefecture of TAR for protesting against rampant Chinese mining in their area between 22

November to 18 December 2011. Tamo Town is internationally well known for copper and gold (Tibetan Review, 6 March 2012).

Mining activities have severely damaged the landscape of the Tibetan plateau. Despite protests by the local population, the pastoral land of Tsalung, Diru in Kham has been turned into a mining zone. Nomads and farmers of Nagchu, Central and Eastern Tibet raised their objections when gold mining activities began on their pastureland, but no positive result has been achieved so far (DIIR 2000: 95). There are many such incidents where Tibetans get arrested, jailed and shot dead for protesting peacefully to protect their lands from miners.

The Tibetan Plateau is geologically volatile and prone to earthquakes and landslides. Such disasters are further exacerbated by mining and damming activities. In March 2013, around two million cubic metres of mud, rock and debris engulfed the Gyama (Chinese: Jiama) Copper Gold Polymetallic Mine in Meldro Gungkar County near Lhasa. The mudslide killed 83 of the workers stationed at the mining site. Only two of the dead miners were Tibetans, which highlights that the local communities are hardly getting job opportunities in these economic activities.[5]

Anti-Pollution Protests

Another environmental concerned pollution protest occurred in Madang Township, Sangchu County, Khalho Tibet Autonomous Prefecture, and Gansu Province. The area has a rich pastoral land, and people are engaged in pastoral activities, rearing yak and other animals. In 2010, villagers protested against a local cement factory causing pollution in the area. The factory polluted the grasslands, bringing sickness among their livestock. Local people have peacefully appealed to the authorities by submitting a petition about the pollution caused by the factory; however, the authorities have ignored their appeal. On 15th May 2010, armed police opened fire on the local people and fifteen people were

hospitalised when the villagers gathered to build a road from Madang Township to Yarshul village, which had been blocked by expansion work at the factory site (Tibet Watch 2015).

(Table: 4.5) Environmental Protests in Tibet

Date	Protest Type	Place
2010	Anti-Dam and Mining Protest	Driru County, Nagchu Prefecture, TAR
May 2010	Anti-Pollution Protest	Sangchu County, Kanlho TAP, Gansu Province
August 2010	Anti-Mining Protest	Palyul County, Kardze TAP, Sichuan Province
April 2011	Anti-Mining Protest	Lhundrub County, Lhasa Municipality, TAR
2012	Self-Immolation	Amchok Township, Sangchu County, Kanlho TAP, Gansu Province
May 2013	Anti- Mining Protest	Driru County, Nagchu Prefecture, TAR
August 2013	Anti-mining protest	Dzatoe County, Yushu TAP, Qinghai
October 2013	Water pollution protest	Dartsedo County, Kardze TAP, Sichuan
December 2013	Anti-Mining Protest	Derge County, Kardze TAP, Sichuan
April 2014	Anti-mining protest	Dzogang County, Chamdo Prefecture, TAR
July 2014	Anti-mining protest	Dechen County, Dechen TAP, Yunnan
August 2014	Anti-mining protest	Nangchen County, Yushu TAP, Qinghai

[5] China's "economic development" plans in Tibet is still questionable whereas, the majority of the workers are Chinese migrants moreover, the Chinese labourers are paid higher than the Tibetans labourers if any of them are hired.

This incident has caused international attention and Tibetans outside Tibet have raised this issue in international media, highlighting the various environment related problems in Tibet.

Water Pollution Protests

Water pollution is yet another critical environment problem in Tibet. In October 2013, Tibetans from Balang village gathered at Lhagang township government office to present a petition. Lhagang Township is in Dartsedo County, Kardze TAP, Sichuan Province. In October, a contaminated water pond at a mining site overflowed into rivers near Balang village and caused the death of thousands of fishes and animals and even contaminated the drinking water of local people. The mining project was located at the Kargyaka site near Balang village and continued to operate even after the protest by the local people in 2005.

After the incident, communication lines in the area were cut down, but officials promised to raise the issue with higher authorities but in fact took no further action. Local people were disappointed by authorities responses. The number of police was increased in the area in order to control the villages. Young people from that the area shared their concerns on social media like Weibo and appealed for relevant departments to take action over the issue (Tibet Watch 2015).

Self-immolations

Since 2009 over more than 150 Tibetans have self-immolated in protest against China's illegal occupation and repressive policies in Tibet. They called for freedom in Tibet and return of Dalai Lama in Tibet. Tibetan people who have set themselves on fire are layperson, monks, nuns, mothers and fathers; and some are as young as 15 years, and others as old as 80 years. One of the reasons why Tibetans set themselves on fire is environmental destruction on the Tibetan Plateau (Woeser 2016; Free Tibet; Samphel 2014). Many of self-immolations have taken place in regions that are experiencing environmental exploitation. In 2012, two self-immolation protests took place near a mining site in Amchok

Township in Gansu Province - 34 years-old Tsering Dhondup and 18 years - old Kunchok Tsering (Free Tibet).

According to a Tibetan writer based in Beijing, Tsering Woeser, destruction of the environment on the Tibetan Plateau has been a key grievance behind the self-immolations. Mining copper, gold, and silver, building dams and polluting water have further threatened the ecosystem of the Tibetan Plateau (Woeser 2016). Similarly, Thubten Samphel, the director of the Tibet Policy Institute in Dharamsala, notes, "rampant mining and the damage done to the environment have driven several Tibetans to register their protest by setting themselves ablaze" (Samphel 2016). Some protesters have left behind written and recorded messages. Thus, Sonam Topgyal, a 27-year old monk who self-immolated in July 2015, left a letter saying that "Chinese authorities repress with their violent and brutal law, by demolishing our religion, tradition and culture and causing environmental devastation. Meanwhile, people have no freedom of expression nor can they convey their grievances" (Free Tibet).

Another massive protest occurred in Tibet in 2008. The 2008 protests in Tibet were directed against China's economic marginalisation of Tibetans, Han migration and the ruthless repression of Tibetan religion and ecology, and marked the failure of China's repressive policy towards Tibet.[6] The protest spread across TAR and even in Kham and Amdo: the traditional Tibetan areas that have been incorporated in other provinces of China. It was the largest rebellion after 1959 when the Dalai Lama was forced to flee to India.

These waves of protests are increasing in each year, but the Chinese government is failing to address the underlying causes of this discontent. Such

[6] The 2008 10-14 March unrest was predominantly in rural areas, most of which have not seen nationalist uprisings since the 1950s, and some of which enjoy the highest level of economic development and educational opportunities of all Tibetan regions of the PRC. If it were true that the majority of rural Tibetans are reconciled with Chinese communist rule and prospering under recent economic policies, Khalho Tibetan Autonomous Prefecture (Chinese: Gannan TAP) in Gansu Province and eastern Qinghai, the most affluent Tibetan regions, with close proximity to urban centres in Mainland China, should provide evidence of this. Instead, they were at the forefront of the uprising (see ICT 2008: 15).

grievances create distrust to officials, in the long term threatening political stability and posing a potential challenge to the regime. Nevertheless, till now the environmental protests in Tibet remained localised, and are unlikely to develop into a large-scale, countrywide social movement.

Therefore, environmental negligence, lack of proper implementation of the central government's environmental policies, laws, rules, and regulations, as well as lack of respect for the sentiments of residents have caused social unrest in Tibet. Environmental protests in Tibet will increase if the government still fail to address these critical issues, thus hampering development in Tibet. It is crucial to protect the environment of the Tibetan Plateau for Tibet, China as well as for the rest of Asia.

Impact of Climate Change on the Tibetan Plateau and Asia

There is a growing security challenge to Asia: the water scarcity. This lack of freshwater resources has been exacerbated by population growth and the impact of global climate change. Moreover, the pace of climate change in Asia is uncertain, but there is a consensus among climate scientists that the shift in temperature, erratic monsoons, desertification, and glacier melt will strike Asia as much as the rest of the world. The rate of glacier melt on the Tibetan plateau has accelerated in the past century as the region's climate is changing; billions of people's livelihood are affected by rivers that have their headwaters in the Tibetan Plateau. A study published by the Committee on Himalayan Glaciers, Hydrology, Climate Change and Implications for Water Security asserts "that the social effects of climate change are already more extensive than previously thought or recognised, are mounting more quickly and more extensively then predicted".

China's Dam Building on the Tibetan Plateau

China has dammed almost all the rivers on the Tibetan Plateau for electricity generation, irrigation, and mineral resource extraction. Most significantly, China's megaprojects on water have steadily been moving from the Han

heartland to ethnically distinct lands from east to west, constructing dams which are now increasingly concentrated in the minority province of Yunnan and Tibet. China has had its eyes on Tibet's water resources for a long back since its own water was either too polluted or salty, not only unfit for agricultural use and industrial product but most importantly not sufficient to provide its 1.3 billion population with fresh water. China has dammed the Yangtze, the Yellow, the Indus, the Sutlej, the Shweli and the Karnali River. In addition, a series of new giant dams are planned or are currently under construction on the Mekong, the Salween and the Brahmaputra (Chellaney 2011: 130).

In 2002, the Chinese government planned to build the third hydropower dam on the Mekong (Tib: Zachu) and five more are planned to be built by 2020 (Economy 2004: 204). The Department of Information and International Relations of the Tibetan exile government stated in 2008 that fourteen dams had been designed on the Mekong, with some dams already completed and others under construction. In 1996, China secretly built the 1,500-megawatt Manwan Dam on the Mekong, located 100 kilometres south of Dali in Yunnan. More dams on the Mekong followed in quick succession: 1,350 megawatt Dachaoshan, located in the Dachaoshan Gorge; the 750 megawatt Gonguoqiao; and the 1,750-megawatt Jinghong, near Jinghong City, about 30 kilometres north of Chiang Rai, Thailand, all completed in the first decade of the twenty-first century (Chellaney 2011: 131).

China's Policy for Trans-Boundary Rivers

China shares trans-boundary rivers with thirteen directly bordering countries. China is located in the upper reach of rivers in most cases. It has set up multiple trans-boundary rivers cooperation mechanisms with twelve neighbouring countries concerning "hydrological data provision in flood season, flood control, emergency response, boundary rivers improvement, utilisation and protection of water resources, etc." (Ministry of Water Resources, PRC, April 2015) (see table: 4.6). The Ministry of Water Resources of PRC further states that it "sticks to the principle of putting people first, emphasising equality and rationality, balancing

development and protection, and enhancing good-neighbourly friendship and cooperation" (ibid).

(Table: 4. 6) China's Trans-boundary Rivers Cooperation Mechanism

Country (Organization)	**Trans-boundary Rivers Cooperation Mechanisms**
Sino-MRC	Dialogue meeting Provision of Hydrological data
Sino-Kazakhstan	Joint Steering Commission Experts Group
Sino-Russia	Joint Steering Commission Experts Group
Sino-Indian	Expert-level Mechanism
Sino-Mongolia	Joint Steering Commission Experts Group
Sino-Vietnam	Exchange of Hydrological data
Sino-DPRK	Hydrological Cooperation
Sino-Bangladesh	Provision of Hydrological data

(Source: Ministry of Water Resources, The People's Republic of China April 2015)

It has river cooperation with the Mekong River Commission in terms of dialogue meeting and provision of hydrological data, with Kazakhstan in the form of a Joint Steering Commission and Experts Group, with Russia in Joint Steering Commission and Expert Group as well, India in Expert level Mechanism, Mongolia in Joint Steering Commission and Expert Group, Vietnam in Exchange of Hydrological data, Democratic People's Republic of Korea (DPRK) in hydrological cooperation, and Bangladesh in provision of hydrological data.

However, scholars have different views on China's trans-boundary river policies. According to Selina Ho, China has adopted very stringent rules with regard to trans-boundary river, domestically and internationally. Domestically, trans-boundary rivers remain in the peripheral vision of Chinese policymakers.

For example, the Department of Boundary and Ocean Affairs, which was established in 2009 under the Ministry of Foreign Affairs to negotiate Chinese territorial and maritime disputes, does not include international river disputes among its duties (Ho 2014: 4). Internationally, China was one of only three countries to vote against the UN Convention on the Law of the Non-Navigational Use of International Watercourses.[7] The other countries were the Turkey and Burundi. It has also has withdrawn its commissioner from the World Commission on Dams in 1998 and rejected the final report of the Commission[8]. Why does China adopt such unfriendly policies when it comes to trans-boundary rivers? This could be because China enjoys the position of the upstream superpower of Asia whereas less than 1 percent of China's water originates in others countries; it outflows is over 40 times as large as its inflows. Other Asian countries have high freshwater dependency, such as Bangladesh with91.44 percent, Cambodia 74.67 percent, Vietnam 59.35 percent, and India 30.52 percent (see table: 4.7).

(Table: 4.7) Water Dependency Ratio (%) (2016)

China	0.96
India	30.52
Bangladesh	91.44
Laos	42.91
Cambodia	74.67
Thailand	48.81
Vietnam	59.35
Myanmar	14.13

(Source: FAO, Aquastat Main County Database)

Note: Dependency ratio is the ratio of incoming water to total renewable water resources. Countries are not necessarily solely dependent on resources coming from China.

[7] This law has certain important provisions related to international watercourse such as prior notification of planned measures, not to cause significant harm, equitable and reasonable utilization, and protection, preservation and management of international watercourses.

[8] "The WCD's final report describes an innovative framework for planning water and energy projects that is intended to protect dam-affected people and the environment, and ensure that the benefits from dams are more equitably distributed" (International Rivers: People, water, life, Assessed 10 April 2017 (Online web): https://www.internationalrivers.org/campaigns/the-world-commission-on-dams).

Therefore, China continues to build hydropower dams on their rivers to fulfil their energy demand, which further stresses the water security in the region. Beijing's lack of transparency in dam constructions and unwillingness to formulate formal water-sharing agreements, and cooperation and multilateralism have aggravated its downstream nations, who are notably also damming the same trans-boundary rivers for their own electricity generation. Therefore, the region needs "institutionalised water-sharing agreements and practices" (Turner et al. 2013) because countries are overexploiting the rivers and there is an increasingly unknown effect of climate change on the Himalayan Rivers.

Many scholars and experts view China as pursuing "upstream strategy" when rejecting multilateral framework for managing its trans-boundary waters. Moreover, China does not believe seem to believe in multilateralism. It fears that multilateralism will infringe on its sovereign rights and freedom of action in managing natural resources. The greatest challenge to the region's efforts to establish multilateralism is the "acute power imbalance" (Turner et al. 2013) between China and its downstream nations - China controls the headwaters of these rivers and additionally China is the most dominant power in the region. The power relation between China and states along the Mekong is asymmetrical with regard to population, economy and military power. Therefore, Beijing has "little incentive" to enter into formal agreements with its neighbouring countries.

Thus, China does not have a single water-sharing treaty with any of its neighbours. It has consistently preferred to negotiate bilaterally rather than multilaterally with its neighbours, which allows Beijing greater scope for furthering its preferences. Furthermore, weakness of regional institutions like the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) provides China with an incentive to deal with countries bilaterally. ASEAN's ten member countries - Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam – have rarely been able to find common ground on a wide range of issues like climate change and water security. Effective cooperation between SAARC countries -

Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka and India - has been severely hampered by the mistrust between India and Pakistan. Therefore, without united and strong regional institutions, it is hard for the China's downstream nations to bring China to the negotiating table.

However, China's willingness to pursue multilateralism depends on its interests and level of trust and engagement with other countries. Thus, its policies towards the Mekong and Brahmaputra rivers vary. China and Indochinese states have forums like ASEAN plus three, ASEAN regional forum, ASEAN-China Summit that have helped build mutual trust and confidence. The trust between them has led to greater cooperation with regard to the Mekong though China is still not a member of the Mekong River Commission (MRC). As for the Brahmaputra, there is little information sharing and almost no joint development with riparian states, partially due to limited avenues for confidence building between China, India and Bangladesh (Ho 2014: 4).

China's Policy to the Mekong River

The Mekong (Chinese: Lancang) River flows 4,909 km southward from the Tibetan Plateau to its mouths in the South China Sea in South Vietnam, crossing six countries: China, Myanmar, Thailand, Lao PDR, Cambodia, and Vietnam. More than 60 million people live in the Lower Mekong Basin (MRC; Weatherbee.1997: 168). 70 percent of the water is used for irrigation purposes; mainly rice cultivation in the lower Mekong basin where approximately 60 percent of the Mekong river basin's populations have their livelihood (map 4.3). Fishery is another main occupation in this region, accounting for nearly 12 percent of Cambodia's GDP and 7 percent of Lao PDR's GDP (MRC b).

China's participation in the Greater Mekong Sub-Region (GMS) began in 1992 when the six countries, with the assistance of Asian Development Bank (ADB), entered into a sub-region economic cooperation. China is slowly taking on a "benefactor role" (Seng: 41), especially after hosting the Second GMS Submit in

2006. China has committed US $20 million as a poverty reduction fund under the auspices of the ADB and spent around US $4 billion on highways connecting Kunming with different parts of the GMS (Seng: 41).

China's policies with regard to the Mekong can be identified in three main areas: limited multilateral cooperation, preference for bilateral engagement, and unilateral approach to dam building (Ho 2014: 7). China has been most cooperative in the area of navigation, and almost every other multilateral Chinese initiative towards the river involves improving navigability because it facilitates trade between Yunnan Province and the lower riparian states. Thus, it is a signatory of the Lancang-Upper Mekong River Commercial Navigation Agreement.

Secondly, China signed GMS[9] agreement[10] in 2006 with Laos, Myanmar and Thailand for a trial program of shipping oil on the Mekong during the wet season as China focuses on economic and infrastructure initiatives and not on sensitive environmental issues. Finally, China has been a dialogue partner of the MRC[11] since 1996, but refused to join MRC because it does not want to be subjected to the MRC's provisions on aquatic environmental issues and restrictions on dam building.

[10]"Greater Mekong Subregion (GMS) is a natural economic area bound together by the Mekong River, covering 2.6 million square kilometres and a combined population of around 326 million. … In 1992, with assistance from Asian Development Bank, the six countries entered into a program of subregional economic cooperation, designed to enhance economic relations among the countries" (https://www.adb.org/countries/gms/overview).

[11] GMS is seen as a China-ASEAN-ADB joint effort to lay the proper foundation for the GMS countries to adapt to trade and investment initiatives such as the World Trade Organization, ASEAN Free Trade Agreement and ASEAN-China Free Trade Agreement. The GMS Programme identified nice areas of cooperation- agriculture, energy, environment, human resource development, investment, telecommunications, tourism, trade and transport (Seng: 40).

[12]"MRC is the only inter-governmental organization that works directly with the governments of Cambodia, Lao DPR, Thailand and Vietnam to jointly manage the shared water resources and the sustainable development of the Mekong River. .. The MRC is a platform for water diplomacy and regional cooperation in which member states share the benefits of common water resources despite different national interests… It also looks across all sectors, including fisheries sustainability, identification of opportunities for agriculture, freedom of navigation, sustainable hydropower, flood management and preservation and conservation of important ecosystems… China and Myanmar, the upstream countries of the Mekong River Basins, are Dialogue Partners of the MRC" (http://www.mrcmekong.org/about-mrc/).

China prefers engaging riparian states at the bilateral level. It imports mineral resources from and exports manufactured goods to Vietnam, Cambodia and Laos. China is Vietnam's leading trade partner and Vietnam's biggest importer and third largest exporter.

China adopts a unilateral stance on dam building. It has been evasive and secretive about its dam building activities, providing limited data on the operations of its dams and has not shared results from its research on their downstream impact (Ho, 2014: 8). According to International Rivers, China has built seven hydropower dams on the upper Mekong River and planned to build 21 more. These dams cause negative social and environmental impacts on the downstream countries and ecosystems.

China has also introduced the "New Security Concept" in 1997 which involves strengthening dialogue and promoting mutually beneficial cooperation through bilateral and multilateral dialogue with Mekong basin. Furthermore, China's emphasis on 'Peaceful Development' than 'Peaceful Rise' since 2000 favoured greater cooperation. However, Alex Leibman refutes the notion of China's peaceful intentions and in fact he argues that the "China has by and large pursued its own interests without regard for how these actions will affect its downstream neighbours" (Liebman 2005).

Chinese domestic factors have also influenced in its policies towards trans-boundary rivers such as the drive to acquire hydropower for China's impoverished western region and the rapidly developing coastal areas. In the case of Mekong, the Yunnan provincial leaders regularly represent the central government in greater Mekong sub-region meetings and commercial agreements. This has led to more favourable policies and greater cooperation. Whereas in the Brahmaputra, a key concern for Indian officials is the possibility of China diverting water from the Brahmaputra for the western route of its south to north water diversion project. The multiple and complex Chinese domestic players like the six arid western provinces that are set to benefit from the diversion, the People's Liberation Army, the

Ministry of Water Resources and Ministry of Foreign Affairs and various think tanks further complicate cooperation between China and India with regard to the Brahmaputra.

(Map: 4. 3) Mekong Mainstream

(Source: International Rivers)

However, despite these good relations with Mekong countries, Beijing still needs to address the historical differences it has with them, particularly the territorial dispute with Vietnam in the Tonkin/Beibu Gulf. Moreover, China's economic interests and rising investment in the sub-region could intimidate the less-developed countries, and result in anti-Chinese sentiment. Thus, Beijing has to ensure that its aim is only to help the development process of the GMS countries (Seng: 39).

Security Implications of Trans-boundary Water Disputes

According to a number of scholars, water disputes can lead to "water wars". Peter Navarro's book *The Coming China Wars* and Brahma Chellaney's *Water: Asia's*

New Battleground discuss the chances of water wars and the threat to peace and stability in Asia. Moreover, former UN security general Kofi Annan also supports the above agreement and shows concerns of water security and its challenges. However, others argue that States are more likely to cooperate than fight over water. The Oregon State University and UN study concluded that cooperative relation between riparian states over the past 50 years have outnumbered conflictive interactions by more than two to one.

According to the study, since 1948, there were 37 incidents of acute violent conflicts over waters and but in the same year 295 international water agreements were negotiated and signed. Out of the 37 conflicts over water, 30 were between Israel and its neighbours. However, this study does not assess the quality of cooperation between riparian states. The past with its political tension and instability is not always a guide to the future. Moreover, Asian water shortages have worsened in the past four decades. Similarly, shared water resources are sources of political and environmental security threats because they are 'common pool resources'. UN Convention on the Law of the Non-navigational Uses of International Watercourses of 1997 has stalled because 38 signatories of the convention have not ratified it. Upstream users place "equitable use' while downstream users push for "non-appreciable harm".

Conclusion

The Tibetan Plateau faces enormous environmental challenges such as grassland degradation, endangering wildlife like the chiru, permafrost melting, water pollution, deforestation, and desertification. 90 percent of Tibet's grassland is deteriorating, endangering the livelihood of Tibetan nomads. The Chinese government persistently blames the climate change and over-grazing by the Tibetan nomads for grassland degradation. Both natural and human factors have led to grassland degradation; climate change, unsustainable mining, and improper management of grassland due to changes in the system of tenure are the primary causes. Although the government has introduced policies to protect the pastureland, efficient execution of these policies at the local level are lacking.

Another environment problem that Tibet faces is an endangered wildlife, especially the Tibetan antelope. The railway is the largest disturbance to the migration pattern and reproduction of the Tibetan antelopes. Moreover, highway constructions and human activities like chasing and shouting have disturbed the movement of these animals. Poaching of the Tibetan antelopes for shahtoosh production is another grave concern caused by the railway in Tibet. While the Chinese government claims that necessary measures have been taken to protect the environment and animals during the construction of railways, these investments and actions were in fact an engineering necessity to hold temperatures steady and to avoid permafrost meltdown so as to protect the railway tracks.

The Tibetan Plateau has abundant water resources, however; four of the world's ten most endangered rivers are in Tibet too. Mining in Tibet is a major cause of water pollution, causing poses devastating social, economic and ecological consequences for the local Tibetans. It contaminates the water when waste rock is discarded from mine sites into river systems harming human health, livestock, and wildlife because many Tibetans who rely on the agriculture - based economy are settled near the sites of mining deposits. The grasslands of these areas become degraded due to the mining activities, impacting the livelihood of local residents. Thus, mining has degraded the Tibetan environment by degrading the pasturelands, contamination of water and destabilisation of a fragile mountain slope, soil erosion, deforestation, and air and noise pollution.

Deforestation has been another major problem faced in all Tibetan areas. Forest destruction is more evidently severe along major highways and rivers. The Chinese government blames the local people for firewood gathering, cutting wood for constructions and grazing. Logging had been carried out for more than six decades until 1998 when the Yangtze flood hit China terribly and forced the government to end logging and implement afforestation.

Desertification is also caused by both natural and human-induced factors like climate, frequent droughts, strong winds, mining, overpopulation and infrastructure developments. Desertification also threatens the Lhasa - Gormo railway and affects rail tracks, often disrupting train services.

Tibetans have witnessed the changes in their environment and raised their concerns to higher authorities. Peaceful anti-mining protests, water pollution protests, and other forms of anti - pollutions protests have occurred throughout the Tibetan areas of Tibet: TAR, Sichuan, Yunnan, Qinghai and Gansu. However, protesters inevitably are either jailed or are subjected to police violence. Some have set themselves on fire as an act of opposition to the environmental destruction in Tibet. China considers "economic development" as the primary solution towards addressing social unrest, but local authorities neglect the sentiments of residents and fail to implement the central government's laws and regulations to protect the environment.

If the Tibetan Plateau gets further degraded, it not only threatens the lives of Tibetans but also the lives of millions of people in Asia. The Tibetan Plateau is the "Water Tower of Asia" and the "Rain Maker of Asia". However, the Tibetan Plateau is affected by climate change, leading to melting of glaciers, unpredictable rainfall and changes in temperature, which will impact the downstream nations of the Tibetan Plateau.

In addition, China has dammed almost all the rivers of the Tibetan Plateau, further threatening the water security of Asia. It has dammed the Brahmaputra, the Mekong, the Yellow River, the Yangtze, the Indus and the Sutlej - the major rivers of Asia. China's has set up trans-boundary rivers cooperation mechanisms with twelve neighbouring countries regarding hydrological data sharing, expert level mechanism, joint steering commission and expert group, but China voted against the UN Convention on the Law of the Non-Navigational Use of International Watercourses. Similarly, Beijing lacks transparency in dam constructions and has not signed a single water-sharing agreement with its downstream neighbouring nations. However, China has been a dialogue partner of the MRC but although

refused to join it. The next chapter will deal with the importance of the Tibetan Plateau to India environmentally and how it affects India concerning climate change, glacier melt, and dam building on the Brahmaputra.

CHAPTER FIVE

Implications of Tibet's Environmental Degradation on India

Introduction

The confluence of three factors: China's increasing demands for hydroelectric power, the trans-boundary nature of rivers, and water scarcity are causing tension in the Himalayan watershed (Turner et al. 2013). China's hunger for energy to build big cities and fuel industries, at the same time reducing greenhouse gas emission have pushed it to construct dozens of mega-dams on these trans-boundary rivers. The International Energy Agency (2012) estimates that China's energy demand will rise by 60 percent from 2012 to 2035. China aims to secure 15 percent of its energy from non-fossil fuel sources by 2020, of which 9 percent from hydroelectricity power. However, 70 percent of China's electricity comes from coal; thus, China needs to double its output of hydroelectricity power (Turner et al. 2013).

Secondly, China has an advantageous geographical position, and it has the largest freshwater reserves in the world. Most of the major trans-boundary rivers originate in the Tibetan Plateau such as Mekong, Brahmaputra, Indus, Yangtze River, and Sutlej. China lies in 19 international river basins and represents their upstream country. This trans-boundary nature of China's rivers has favoured China in dam construction.

Finally, the demand for hydroelectricity power as an alternative to coal is problematic because China is already a water-stressed nation. Northern and western regions of China face water shortage. Northern China has 34 percent of the country's total population but has only 7 percent of China's water resources; thus, there is an uneven distribution of waters in China, the greater part of available water is in the south (Tibet). According to a survey done by the Chinese Ministry of Water Resources in March 2013, 23,000 rivers in the country have disappeared in the past 60 years (Jacobs, 4 May 2013).

During the twelfth five-year plan (2011-15), the central government has proposed to construct 60 medium and large dams on the rivers flowing into South and South-east Asian countries. The proposed dams threaten the water security of downstream nations and increase tension with China. China has already built one dam on the upstream Brahmaputra and has proposed to build three more dams on the Brahmaputra. Similarly, the Indian government has also tamed and exploited the Brahmaputra and has built many dams on this river and its tributaries.

The 2030 Water Resources Group study estimated that the demand for freshwater in India would grow to the double of its current water supply almost 1.5 trillion cubic metres. Thus, "most of India's river basins could face a severe deficit by 2030 unless concerted action is taken" (The 2030 Water Resources Group 2009: 10). Whereas China's demand for freshwater in 2030 is expected to reach 818 billion cubic meters, of which 50 percent will be from agriculture, 32 percent of industrial demand and the remaining domestic (Ibid). Therefore, both China and India's hydropower race on the Brahmaputra puts the Himalayas at risk, affecting the entire region. Moreover, the Tibetan Plateau has been hit by the climate change which leads to glacier melt, the rise in temperature, and unpredictable rainfall patterns, which also impacts India.

Impact of Climate Change on the Rivers and Its Implications for India

According to Intergovernmental Panel on Climate Change (IPCC) (2014), climate change is "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/ or the variability of its properties and that persists for an extended period, typically decades or longer", whereas the UN Framework Convention on Climate Change defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

Human influence on the climate change is clear, and moreover, impacts of climate change on human and natural ecosystems have widespread effects such as the atmosphere

and ocean have warming, the rise of sea level and diminishing of snow and ice. The primary cause of climate change is anthropogenic greenhouse gas driven largely by economic and population growth, which has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide (IPCC 2014: 4). Global warming and the associated changes in precipitation, unexpected and extreme weather events, glacial melt, and sea-level rise are causing considerable socioeconomic and the environmental impact on water, agriculture, health, biodiversity, and land resources threatening already stressed livelihoods (ICIMOD 2010: 1).

A study carried out by Chinese scientists, *Evidence of Warming and Wetting Climate over the Qinghai-Tibetan Plateau,* concludes that the amount and the number of days of precipitation have increased significantly on the Tibetan Plateau. The scientists analyse the station data of annual, monthly and daily temperature and precipitation from the China Meteorological Administration from 1961-2007, over 66 stations examining temperature, precipitation and aridity. The stations are in Qinghai province, the TAR, the Autonomous Prefectures of Gannan in Gansu province, Ganze, and Aba in Sichuan Province and Diqing in Yunnan Province. The study observed the decrease in extremely low-temperature events in northern Qinghai and serious dry events over south-eastern Tibet and western Sichuan. Therefore, warm and wet events have increased, and cold and dry events have decreased in the Tibetan Plateau (Lin Li et al. 2010).

A study done by Fapeng Li of Development Research Centre, Ministry of Water Resources of China, Zongxue Xu and Wenfeng Liu from College of Water Sciences, Beijing Normal University and Yongqiang Zhang from CSIRO Land and Water from Australia on the *Impact of Climate Change on runoff in the Yarlung Tsangpo basin in the Tibetan Plateau* clearly shows that the mean annual air temperature will increase with the estimate of + 3.8^{0} Celsius during 2046-2065, and the mean annual precipitation decreases with the median estimates of -5.8 percent (Li et al. 2014).

Climate change will have dire socioeconomic consequences for the Tibetan Plateau, which plays a significant role in maintaining the ecological security of China

(Lin Li 2010) and its neighbouring countries. However, in the past decades, the Tibetan Plateau has experienced an increase in temperature resulting in ecological degradation and a shortage of water resources, affecting the sustainable socioeconomic development in the region. Thus, the climate change on the Tibetan Plateau is closely related with Indian monsoon and glacial melt.

The Tibetan Plateau and the Indian Monsoon

The monsoon is extremely crucial for the farmers of India, who rely on the rains for food production. Changes to monsoonal rainfall patterns could affect agricultural productivity and thus threaten food security. Crops are extremely susceptible to changing patterns of rainfall, and they get destroyed if they fail to receive the right climatic conditions. Thus, changing or unpredictable rainfall patterns have grave consequences on agriculture and on people's livelihood, creating food insecurity for an entire season. According to the Indian Parliament, 5535 Indian farmers committed suicide between 2010-2012 due to debt, drought, and crop loss (Cecile: 6). The Indian monsoon rainfall is entirely dependent on the presence of the Himalayas and the Tibetan Plateau.

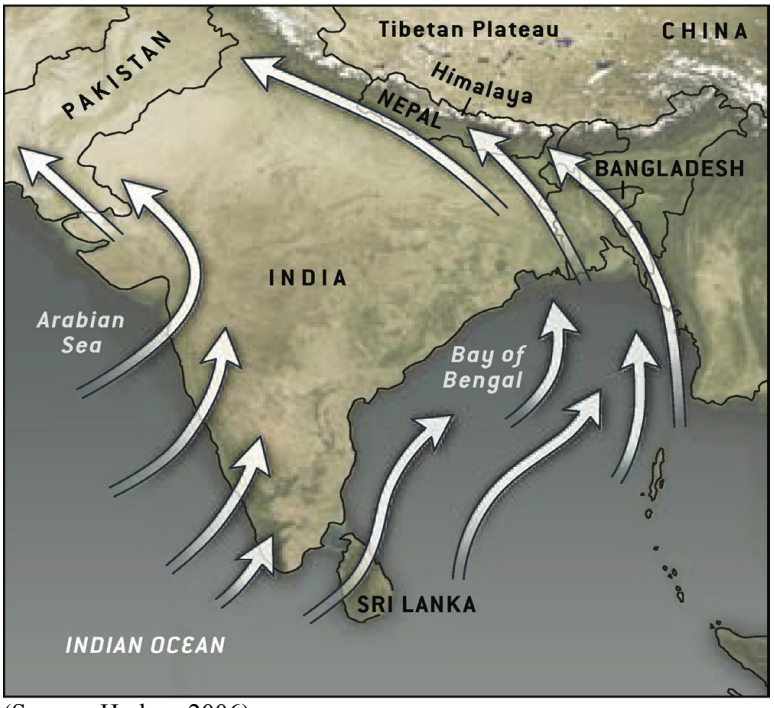
The Tibetan Plateau with the Himalayas has significant influence on the Asian monsoon system (Committee on Himalayan Glaciers et al. 2012), East Asian atmospheric circulation pattern, and even global climate change (Li, Fapeng et al. 2014). The region has a tropical climate at the base of the foothills with permanent ice and snow at the highest elevations. During the late spring and early summer, the Tibetan Plateau surface heats up fast and serves as an elevated heat source, which draws warm and moist air from the Indian Ocean toward the Himalayans and the Tibetan Plateau region (see map: 1) As the monsoon flow transports moisture from the Arabian Sea to the Indian subcontinent, it spurs heavy monsoon rain over the Indo-Gangetic Plain and the Bay of Bengal (Li, Fapeng et al. 2014: 23).

The Asian monsoon also has a correlation with the snows of Tibet and climate change. According to Henry Francis Blanford, (An English meteorologist working in India in 1884) the greater the snow over on the Tibetan plateau, the later the Indian

monsoon wets the parched earth on India. The lesser the winter snows in Tibet, the earlier the snowmelt and the earlier the monsoon in India. Thus, the snows of Tibet and the Indian monsoon are causally connected.

Climate change also affects the Indian monsoon. Studies suggested that in the last three to four decades, warming in the Himalayas has been more than average of 0.75 percent over the last century and in 2012, specialists found a 4.5 percent decline in the monsoonal rain in the three decades up to 2009 (Cecile: 4). On the contrary, the World Climate Research Programme's Third Coupled Model Inter-comparison Project predicts that the climate change will increase monsoonal rainfall in South and South East Asian Countries and the Western Pacific Ocean as well. Therefore, the increased precipitation along with increased glacial melt led to a flood in Pakistan in 2010 affecting thousand of people, their land and properties. The 2010 flood in Pakistan devastated the nation. Many local and global experts claimed that the warming climate pattern in the Himalaya caused this event.

(Map: 5.1) Asian Monsoon



(Source: Hodges 2006).

- White arrows indicate the moist air currents that drive the South Asian Monsoon. Monsoon flow transports moisture from the Arabian Sea to the Indian subcontinent, resulting in heavy monsoon rain over the Indo-Gangetic Plain and the Bay of Bengal.

Climate Change and its Impact on Glaciers

The glaciers in the Himalayas and Karakoram ranges (40,800 km^2) are the primary sources of the river systems of the Tibetan Plateau. Approximately 6-45 percent of rivers flows in the Tibetan plateau are dependent on glacier melt and this increases to 70 percent in summer (see table: 5.1). According to NASA scientists (2010), 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 (Norbu 2011a). The glacier retreat in the Tibetan Plateau and the Himalayan region started in the early 20th century, according to some Chinese scientists. It became more intensive with climate warming in the region. Before the 1950s, most glaciers on the Tibetan Plateau advanced, although some glaciers shifted from advance to retreat (Yao, Tandong et al. 2007).

After the 1950s, a large percentage of glaciers retreated and continued to retreat till the 1970s. Many studies suggest that more than half of the glaciers were retreating and about one-third advancing at the time, while the rest were stable. The scientists further state that between the 1970s and 1980s, glacial mass balances were somewhere positive and snowlines dropped. Most of the glaciers were advancing during that period and fewer glaciers retreated. From the 1980s to the 1990s, glaciers started to retreat rapidly again and only 10 percent of the glaciers were advancing. From the 1990s on, the glacial retreat has been more extensive than in any other period in the 20th century although there are still some glaciers that are advancing (Ibid).

Similarly, by looking at the current trends of the glacier melts, the International Centre for Integrated Mountain Development (ICIMOD) predicted that the Ganges, Indus, Brahmaputra and other rivers across the northern Indian plains could most likely become seasonal rivers in the near future (Norbu 2011a). The 2014 IPCC report also predicts that the Himalayan glaciers will lose around three-quarters of their mass by 2100. Thus, glaciers are melting rapidly on the Tibetan plateau with a population more

than 1.4 billion being dependent their water resources; this could completely disrupt future water security, as there will be an increase in demand for water as population rises dramatically.

(Table: 5.1) Contribution of Glaciers in Water Resources

River Basin	Mean Discharge (m^3/s)	Contribution of glacier melts in river flow (%)	Water availability per person (m^3/person/year)
Indus	5,553	44.8	978
Ganges	18.691	9.1	1,447
Brahmaputra	19,824	12.3	5,274
Irrawaddy	13,565	Unknown	13,089
Salween	1,494	8.8	7,876
Mekong	11,048	6.6	6,091
Yangtze	34,000	18.5	2,909
Yellow	1,365	1.3	292

(Source: Xu et al. 2007)

China's Demands for Hydroelectric Power and Its Impact on India

China introduced economic reforms and opening up of markets in the 1980s, primarily focusing on the coastal regions. China is geographically and economically categorised into the Eastern (coastal), the Central and the Western Regions. Deng Xiaoping's slogan, "Let some regions get first rich", laid the ideological basis and implemented the economic trend (Barabantseva 2009: 232). This kind of development, therefore, led to regional inequality and the interior regions' discontent (Zheng and Minjia, September 2007). Thus, after two decades of coastal development, Chinese leaders declared a change in China's regional development strategy and initiated the "Western Development Campaign" (*Xibu da kaifa)* in 1999. Through this campaign, Chinese government invested in infrastructure, environment, resources and hydroelectric power

stations in the western regions[1]. A rapid expansion of hydropower capacity and further exploitation of the irrigational potential of rivers were a key emphasis in the "Western Development Campaign". Hydropower has become the "panacea" in China's new energy demand. China now has the largest dams in the world. There are around 50,000 large dams in the world of which 22,000 are in China. In 1950, China had 22 dams and this increased to 22,000 by 2010. China is the most dammed country in the world.

Under China's 12th Five-Year Plan (2011-2015), the Chinese government proposed to build 120 GW of new hydropower plants on the Salween, Upper Mekong, Upper Yangtze, and the Yarlung Tsangpo. In January 2013, the State Council released its 12th Five-Year Plan for Energy Development in which, it proposed to construct 160 GW of hydropower capacity and to raise nationwide hydropower capacity to 290 GW (Bo et al.) by 2015. To reach these hydropower development goals, the 12th Five-Year Plan prioritised the construction of more than 50 large-scale hydropower plants on the Jinsha, Yalong, Dadu, Lancang (Mekong) and Yarlung Tsangpo rivers, as well as on the upstream of the Yellow River (Ibid).

[1] The western regions comprises of 12 provinces and municipalities: Chongqing, Gansu, Guangxi, Guizhou, Inner Mongolia, Ningxia, Qinghai, Shaanxi, Sichuan, Tibet Autonomous Region, Xinjiang, and Yunnan.

(Table: 5.2) Hydropower Stations on Mainstream Yarlung Tsangpo

Name of Project	District/ County	Installed Capacity (MW)	Height (m)	Primary Stakeholder (s)	Status
Dagu *	TAR, Lhoka, Sangri	640	124	China Huadian Tibet Branch	Site Preparation *(Proposed)
Ba Yu	TAR, Lhoka, Sangri	780	95	China Huadian Tibet Branch	Site Preparation
Jiexu *	TAR, Lhoka, Sangri	510-560	105	Tibet Huaneng Power Company Limited	Site Preparation *(Proposed)
Zangmu	TAR, lhoka, Gyatsa	510	116	Gezhouba Group; Tibet Huaneng Power Company Limited	Completed
Jiacha *	TAR, Lhoka, Gyatsa	320-360		Tibet Huaneng Power Company Limited	*(Proposed)
Lengda	TAR, Lhoka, Gyatsa	n/a		China Guodian Tibet Branch	Site Preparation
Zhongda	TAR, Kongpo, Nang	480		China Guodian Tibet Branch	Site Preparation
Langzhen	TAR, Kongpo, Nang	340		China Guodian Tibet Branch	Site Preparation
Motuo	TAR, Kongpo, Metog	38000		China Guodian Corporation	Proposed
Daguaiwan	TAR, Kongpo, Metog	4900		China Guodian Corporation	Proposed
Daduqia	TAR, Kongpo, Metog	43800		China Guodian Corporation	Proposed

(Sources: International Rivers; The Tibetan Plateau)

- Dams announced by China's State Council in January 2013, in Energy Development Plan.

In response to this plan, 19 Chinese environmental NGOs have released a report called “China’s Last Rivers Report” in March 2014 and urged the Chinese government to recognise the value of healthy rivers. The report concluded that hydropower is not the answer to China’s carbon emission reduction goals but rather threatens China’s ecological resilience (Ibid).

The Yarlung Tsangpo Dam Construction and Water Diversion

The Yarlung Tsangpo is a major international river shared between Tibet/China, India, and Bangladesh. It stretches over a total length of 2880 km flowing from west to east on the Tibetan Plateau from its sources near the sacred Mt. Kailash, then turning north to take a sharp U-turn (known as the Great Bend) to flow south into India (see map: 5.2).

The Yarlung Tsangpo enters India in the Siang District of Arunachal Pradesh of India and where it is known as Siang River. It is joined by the Dihang and Lohit rivers when it enters Assam and is from that point onwards referred as the Brahmaputra. Entering Bangladesh, the river joins with the Ganga and then merges with the Meghna from where it is known it as the Jamuna, finally dividing into hundreds of channels to form a vast delta stretching into the Bay of Bengal (Arpi 2008: 59).

Until recently, the Yarlung Tsangpo was considered undammed and the last free-flowing river in Tibet. However, eleven hydropower stations are planned on the Yarlung Tsangpo (Yang Yong, 05 March 2014) namely: Jiacha, Zhongda, Lengda, Jiexu and Langzhen (Tibetan Plateau, 06 October 2009; International Rivers), Dagu, BaYu, Zangmu, Motuo, Daguaiwan, and Daduqia (see table: 5.2 and map 5.3). The Dagu- 640 MW, BaYu- 780 MW, Jiexu- 510-560 MW, Zangmu- 510 MW, Jiacha- 320-360 MW, and Lengda-capacity currently unconfirmed, are located in Lhoka (Shannan) Prefecture of Tibetan Autonomous Region (TAR). The Zhongda- 480 MW, Langzhen-340 MW, Motuo- 38000 MW, Daguaiwan-4900 MW, and Daduqia- 43800 MW are located in Kongpo, TAR.

China's new Energy Development Plan of January 2013 included several controversial dams that had previously been suspended as a result of environmental concerns and public opposition. Among them were three new hydropower dams on the middle reaches of the Brahmaputra River, the Dagu, Jiacha, and Jiexu Dam.

(Map: 5.2) The Yarlung Tsangpo

(Source: Wikipedia)

The Zangmu Dam

The Zangmu Dam was the first dam to have been constructed on the Yarlung Tsangpo in 2010. It has a capacity of 510 MW, standing 116 meters tall. According to the China's state-run news agency Xinhua, the Zangmu dam is Tibet's largest hydropower station and became partly operational in November 2014 (Xinhua, 23 November 2014). The first section of the Zangmu Hydropower Station cost 9.6 billion Yuan (US $1.5 billion). It is designed to generate 2.5 billion kilowatt-hours of electricity annually (Xinhua, 23 November 2014a).

However, Chinese officials have failed to mention who is benefited from this hydropower station. In fact, many observers are still unclear about where do this hydropower is transported since there are very few Tibetans living along the upstream

Yarlung Tsangpo in Tibet. Thus, the Chinese government should provide the clear information about the purpose of these dams on the Yarlung Tsangpo and who benefits from these power plants.

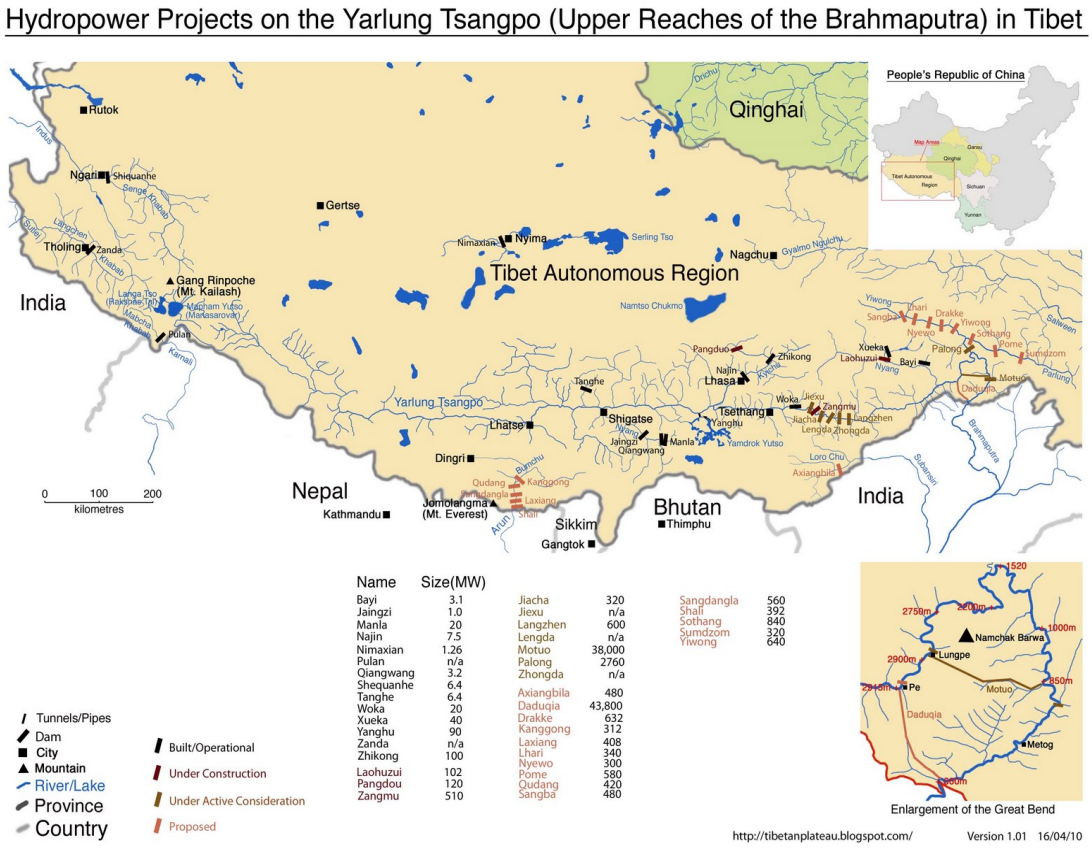
Moreover, this announcement of dam project completion raised concerns from many Indians, both towards China and the Central Government of India. The *Hindustan Times* wrote, "Water resources experts from Assam say Zangmu and other dams on Yarlung Zangbo (Yarlung Tsangpo) have the potential to sweep away highland settlement and forests and busy the lowlands in silt" (Hindustan Times, 27 November 2014). Various organisations in Guwahati protested against Chinese dam construction on the Yarlung Tsangpo and they also complained about the Central Government of India's negligence of Assam or the Northeast. The Leader of Asom Jatiyatabade Yuba Chatra Parishad (AJYCP) Manoj Baruah said during the protest on 24 November 2014, "The present government has also failed to take any step in this regard. The Centre now should take the initiative to resolve the issue" (*The Telegraph,* 24 November 2014).

However, Chinese have assured India that the dam would neither divert the flow of water nor affect India's rights as a lower riparian state. Nevertheless, the announcement of the Zangmu dam completion caused tension within India and also between India and China. The impact of the Zangmu dam on the environment and downstream nations is still unknown. Furthermore, there are speculations that China will build another mega-dam –the Metog Dam- at the great bend of the Yarlung Tsangpo.

The Metog Dam Construction

The Metog (Chinese: Motuo) dam project at the Great Bend would be the world's largest hydropower station and could generate about two times the capacity of the Three Gorges Dam (Yong, 05 March 2014). When the Yarlung Tsangpo enters one of the

(Map: 5.3) Hydropower Project on the Upper Reaches of the Brahmaputra



(Source: Tibetan Plateau)

world's deepest and largest gorges, starting from a 4,900 meter cleft between two of the highest mountains in Eastern Himalaya, the 7756 meters high Namchak Barwa and the 7294 meters tall Gyala Pelri, the river drops nearly 2500 metres in altitude, forms several waterfalls and providing a huge potential for hydropower generation (Tibetan Plateau, May 24, 2010).

According to the HydroChina Corporation, China's biggest dam builder, the Metog dam will generate 38,000 MW (see table: 5.2) at an estimated cost of $30 billion (Chellaney 2011:131; Yong, 05 March 2014). The HydroChina Corporation is in charge of conducting the hydropower planning for the upper reaches of the Mekong, the Salween, the Yellow, and the middle reaches of the Brahmaputra.

This project may be feasible from an economic and engineering perspective, but major environmental and seismic issues will be inevitable if the Chinese government decides to build a dam of such scale. An alternative proposal to harness the hydroelectric potential of the Great Bend is Daduqia, which is smaller but the 2400 metres drop in altitude offers a very considerable potential. However, because of its proximity to the border of India, it could trigger further tensions between India and China.

The Brahmaputra Water Diversion

Many discussions have taken place in regards to the idea of the Brahmaputra diversion where the water will be pumped northward across hundreds of kilometres along with the Yellow River and finally fall into the city of Tianjin on China's East Coast. In early August 2011, Green Earth Volunteers, a Chinese NGO, organised a seminar on the Shoutian Canal (Great Western Route scheme) with experts in geology, meteorology and wetlands (China Dialogue, September 20, 2011). Zhou Wei, the assistance editor in China Dialogue's Beijing office, was present at the seminar and witnessed the plan of the Shoutian Canal. Zhou saw the promotional material of the Shuotian Canal Preparatory Committee where they showed the canal crossing five different rivers, requiring ten separate reservoirs, crossing more than 14 provinces and municipalities in the west and north of China such as Qinghai, Gansu, Inner Mongolia, Xinjiang and Beijing (Ibid).

Many scholars state that Chinese scientists have dreamed up a scheme of diverting the Yarlung Tsangpo along a course that follows the Lhasa-Gormo railway through the Gansu corridor and finally to Xinjiang, in north-west China (Arpi 2008: 59; Chellaney 2011:131). In fact, a few Chinese and army generals have actively proposed the idea of the Yarlung Tsangpo diversion.

This project was the brainchild of Guo Kai, the chief designer and project's initiator. Guo was a retired technical cadre coming from a hydraulic engineer family. He was the vice-director and secretary general of the Shuotian Canal Preparatory

Committee and chairman of the Beijing Shuotian Consulting Development Company. According to Guo, the Yarlung Tsangpo diversion would solve the water shortage in the northern part of China, stop desertification, produce electricity, grain and oil, and reduce pollution. During the seminar, he explained that he originally planned to bring water from the Yellow River to Beijing but the Yellow River dried up. Then he saw the Brahmaputra, which has "plenty of water and it won't make any difference to India," he said (Ibid). Chinese army generals supported his idea when he proposed the plan (China.org, 08 August 2006) and Guo was also shown support from senior levels of government during the seminar.[2]

The idea of rerouting the Brahmaputra was also clearly visible in Li Ling's book *Tibet's Water will Save China,* published in 2005. Inspired by the ideas of Guo Kai, Li proposes that China can go beyond simply damming Tibetan tributaries of the Yangtze, channeling them north to the Yellow River, but also damming the Yarlung Tsangpo to direct its flow of water northward.

The idea of water diversion can also be traced to the late Masaki Nakajima, founder and special advisor to the Mitsubishi Research Institute of Japan. He first proposed a $500 billion project to the Global Environment Fund in 1977; however, there is no evidence of the Chinese government's interest in it. Moreover, as stated earlier, these proposals are neither feasible nor practical concerning economic cost of the project (Tibetan Plateau, 04 May 2010).

Wang Guangqian, a scholar at the Chinese Academy of Sciences and director of Tsinghua University's State Key Laboratory of Hydroscience and Engineering, attempted to push forward the proposal, but the Minister of Water Resources rejected his efforts (Ke, 16 June 2011). Zhang Ke, a reporter at China Business News, said, "Wang revealed that the authorities are considering a water-diversion plan for western China". According

[2] The project, which has obtained support from a total of 118 generals… has a large backing among the NPC (National People's Congress) deputies and CPPCC (Chinese People's Political Consultative Conference) members with military background. In the 1990s, 208 NPC deputies and 118 CPPCC members came up with proposals supporting the project, six and ten times respectively (China.org, August 8, 2006).

to Wang, the diversion was necessary because water usage had dramatically increased on the lower reaches of the Yangtze River and the Yellow River, causing desertification and groundwater extraction in Northwest China. Thus, it was important to exploit the water resources of the Tibetan Plateau to "ease water shortages in the north of China, but also transform desert landscapes, increase farmland, provide power and create jobs" (Ibid).

However, the Yarlung Tsangpo diversion to the parched Yellow River is an idea that China does not discuss in public. Many experts do not find the Yarlung Tsangpo water diversion feasible and practical. This project could bring earthquakes and geological disaster on the Tibetan Plateau. It is not practical in terms of climatic conditions; the Tibetan plateau would be below freezing point during winter and early spring when water demand is highest in North China. Moreover, the Yarlung Tsangpo diversion would not able to supply the quantity of water claimed in the proposal and the canal would change the entire distribution of water across China (China Dialogue, 20 September 2011).

Many Chinese experts have also objected to the project, such as Qian Zhengying, the former minister of water resources and supporter of the Three Gorges Dam Project. Qian told the State Council in July 2000 that there would be "no feasibility, technical or economical, for the Great Western Route scheme" (China.org, 08 August 2006). Chen Chuanyon, a research fellow at the Chinese Academy of Sciences' Institute of Geographic Sciences and Natural Resources Research, asserted that the Yarlung Tsangpo Valley is an ecological marvel, attained after millions of years of evolution, and if human activities caused damage to the ecosystem, the loss would be incalculable (Ibid). The project not only destroys the ecosystem of the Yarlung Tsangpo but it could impact neighbouring countries.

Political Implications of Damming the Yarlung Tsangpo

There are two wide arguments on the China's dam construction on the Brahmaputra: strategic and economic (Wirsing 2013). China's dam construction on the Brahmaputra has strategic implications, but Beijing's leadership is indifferent to the impact of its dams

on the downstream nations. Brahma Chellaney, the author of *Water: Asia's New Battleground* argues, "by having its hand on Asia's water tap, China is, therefore, acquiring tremendous leverage over its neighbours' behaviours*"* (Chellaney, 30 August 2011). China now has more large dams than the rest of the world combined, but it does not have a single water-sharing treaty with any of its downstream nations.

Other observers argue that "China's dam building activity is motivated overwhelmingly by the clear-headed recognition that the country's future political and social stability are heavily dependent on continued economic growth, which is, in turn, equally dependent on overcoming the country's mounting water and energy scarcities" (Wirsing 2013: 23). Pau Khan Khup Hangzo adds that China dam building "has more to do with the need to power its energy-intensive economy, than with any policy of weaponisation in order to assert a hegemonic role in the region" (Hangzo 2012).

Institute of Defence and Strategic Analyses, an Indian think tank based in New Delhi, states, "the differing positions on Line of Control and China's claims on the territories that are parts of India further complicate the issues". There is no discharge data on the Yarlung Tsangpo and no reliable information on the present or proposed water-related developments and projects in the Tibet region (IDSA 2010).

The project implies environmental devastation of India's north-eastern plains and eastern Bangladesh. Thus, damming on the international rivers would be akin to a declaration of water war on these states (Chellaney Fall 2009: 39).

Thus, the "hydropolitics" (Su Liu: 84) and "potential source of enduring discord" (Chellaney Fall 2009: 38) between China and its neighbouring countries would severely harm their relationships. Therefore, the Tibetan Plateau's vast freshwater supply is emerging at the centre of the increasingly tense political strife between China and its neighbouring countries. "Tibet's vast water resource is an important…strategic element that China is intent on managing and controlling" (Schneider and C.T Pope, 8

May 2008; Chellaney 2011: 129), harming environment and livelihood conditions of its neighbouring countries.

It is agreed that water shortage in China is becoming a national security issue and the Great Western Route is offering a tentative plan for the solution. The Chinese government might approve the project if its supporters could provide accurate data for the project's feasibility study because, despite much criticism and difficulty, the Gormo-Lhasa Railway on the 5000 reaching an altitude of metres was completed in 2006 and the Lhasa-Shigatse Railway in 2014. However, the environment and social impact of the railway lines on the Tibetan Plateau is enormous and critical.

The Indus River

The Indus River flows through five countries: Tibet (PRC), Nepal, Afghanistan, India, and Pakistan. Pakistan (52.48 percent) and India (33.51 percent) have the largest portion of the basin (see table: 5.3). The river originates from the Lake Ngangla Rinco on the Tibetan Plateau and has the tributaries Ravi, Beas, Sutlej in India; Swat, Chitral, Gilgit, Hunza, Shigar, Shyok, Indus, Shingo, Astor, Jhelum, and Chenab in Pakistan; and Kabul River draining parts of Afghanistan. The 10 square kilometres (km^2) of the basin is covered by in Nepal but is generally, neglected. The river flows about 3,000 km through mountains, the plains of the Thar desert, and delta ecosystems merging into the Arabian Sea, covering an area of about 1,081,718 km^2 forming the sixth largest fan-shaped delta of the world (ICIMOD 2010).

63.1 percent of the Indus Basin is dry area; the river flows through a much drier climatic region of north-western India and eastern Pakistan before draining into the Arabian Sea. Historically, the Indus basin was home to one of the world's earliest civilisations and supported a highly stratified and powerful irrigation society. In the modern era, the Indus River has continued to play a major role in the regional economy - the British, Pakistanis and Indians have all constructed irrigation systems depending on the Indus. Thus, the basin now has some of the most extensive irrigation networks in

the world, accounting for nearly 6 percent of all irrigated land globally (Singh 2011: 57).

Almost 215 million people are currently dependent on the Indus River basin. Eleven big cities are located in the basin: Amritsar and Haryana in India; Faisalabad, Islamabad, Karachi, Lahore, Multan, Peshawar, Quetta, Rawalpindi, and Sukkur in Pakistan.

(Table: 5.3) Indus Basin and the Different Portions of Different Countries

Countries	**Area of basin in country**	
	Km2	**%**
Pakistan	597,700	52.48
India	381,600	33.51
China	76,200	6.69
Afghanistan	72,100	6.33
China control, claimed by India	9,600	0.84
Indian control, claimed by China	1,600	0.14
Total basin area	**1,138,810**	**100.00**

(Source: UNEP 2002).

The Indus River basin faces a major threat to its water security. Downstream areas are dependent on water resources originating in the upper mountainous watercourse. It has the highest dependence on meltwater discharge. The river is a lifeline of Pakistan's huge and growing population. In 2013, the tri-nation study of the water resources in the Indus Basin gave a forecast where India's population is expected to reach 1.7 billion in 2050 and Pakistan's 275 million, the annual availability of renewable water per capital across the basin could fall below 750 cubic meters - an international recognized threshold for severe water scarcity (Indus Basin Working Group 2013).

The major problems facing the Indus River basin is a scarcity of critical mass of automatic weather and hydrological stations in glacial areas, lack of basin-wide and

trans-boundary models to chart trends and future scenario with regard to the water supply situation, the shortage of basin-wide data on glaciers and their dynamics including changes in mass and their impacts on melt waterriver runoff, and finally the lack of scientific consensus on the impact of climate change on glacier fluctuations.

The Indus Water Treaty - 1960

The Indus Water Treaty was signed in 1960 between the Prime Minister of India, Jawaharlal Nehru, and Pakistan's President, Mohammad Ayub Khan. After the independence movement, both India and Pakistan came into a dispute over their share of water in the Indus River. After more than eight years of negotiation, both India and Pakistan reached an agreement on 19 September 1960. According to the treaty, "All the waters of the Eastern River (Ravi, Beas and Sutlej) shall be available for the unrestricted use of India" and "Pakistan shall receive for unrestricted use all those waters of the Western Rivers (Indus, Jhelum and Chenab) which India is under obligation to let flow" (MEA). Most importantly, the treaty also discussed details regarding the exchange of data (Article VI) and future co-operation (Article VII). The World Bank functioned as a mediator between India and Pakistan during the negotiations.

However, the contentious domestic politics within India and Pakistan create problems within the basin. In India, Punjab, Haryana and Rajasthan fight over their rightful share of the waters of the Ravi, Beas and Sutlej, likewise in the provinces of Pakistan there is disagreement over the Indus, Jhelum and Chenab (Swain, 15 March 2017). Moreover, Pakistan worries about Afghanistan, as Afghanistan will build a dam on the Kabul River. India is also worried about China, as a report of a small - size Chinese dam near Demchok, Ladakh on the Indus has ruffled the Indians who suspect that China might build dams on the Sutlej upstream. Finally, Ashok Swain (15 March 2017) states that some of the important water development projects on the Indus River failed to materialise, particularly in India and Pakistan because of mutual mistrust and internal politics. Thus, it is important to have an independent river basin organisation where all the four riparian states are involved.

Social and Environmental Consequences of Dams

The total number of people directly displaced by dams in the world is estimated at 40-80 million (Gupta: 31). However, less attention has been paid to populations living downstream of dams whose livelihoods have been affected by dams. By significantly changing natural flow patterns of rivers and blocking movements of fish and other animals, large dams can severely disrupt the fisheries, flood recession agriculture and dry season grazing, thus affecting farmers and fishers but construction may also cause environmental problems, displacement of people and geological risks.

Large dams became a prominent instrument for economic development in the past century. There were only 5000 large dams in the 1950s in the world, whereas in 2000 large dams had increased to over 45,000 in more than 140 countries. Today, the numbers of large dams are exceeding 50,000 (Berga et al. 2006).

These large dams provide water storage to the major cities and supply hydropower to rapidly expanding industrial and urban economies. Large dams are also utilities for agriculture as half of the world's large dams are built primarily for irrigational purposes, particularly in Asia. According to the World Commission on Dams, 12-16 percent of global food production receives a contribution from large dams. Thus, large dams contribute to economic development.

However, large dams have caused severe social and environmental damages. The benefits of dams have delivered to urban centres or industrial-scale agricultural development, whereas river-dependent populations located downstream of dams experience loss of food security, disruption or destruction of downstream habitats and life cycle for fish and other river species. Dams may have benefited the downstream communities from some degree of flood protection and enhanced irrigation opportunities; however, adverse impacts have been far greater than the benefits to downstream people by reducing their incomes and livelihoods (Richter et al.: 15).

Increasing the number of dams in Tibet severely raises pressure on the rivers running from the region. Damming will affect not only Tibet but also the neighbouring countries, and China could perhaps be the most affected due to its high level of pollution. Furthermore, climate change is putting Tibet's rivers in danger. Glaciers serve as storehouses of fresh water, during cold weather the glaciers accumulate in size and consequently melt in warmer seasons.

However, global warming as a result of climate change has increased the runoff and glaciers in Tibet are melting faster than anywhere else on the planet. In some regions of Tibet, glaciers are decreasing by three feet per year (Schneider and C.T Pope, 08 May 2008) leading to increased levels of melting and raising the possibility of a water crisis. Thus, "at least 500 million people in Asia and 250 million people in China are at risk from declining glacial flows on the Tibetan Plateau," said Rajendra K. Pachauri, chairman of the Intergovernmental Panel on Climate Change (Ibid). With China's water resources being insufficient to support agricultural, industrial, and fresh water needs for its 1.3 billion inhabitants, it has turned attention to exploiting Tibet's water resources.

Environmental Consequences of Dams

The cascade of dams planned for the Yarlung Tsangpo and its tributaries threatens an already fragile environment. The Yarlung Tsangpo Gorge is a young and still active in the geological formation, any interference to it could have disastrous effects, with ecosystems being unable to recover. Moreover, the long-term impact of climate change on the Tibetan Plateau is still unknown, but the glaciers of the Himalayans are retreating, depriving courses of their sources. If it continues, the plateau's water could dry up completely, and it will become a desert.

Today, the ecosystem of the Gorge region is already in decline. The primary forests are over-matured, and swathes of forest over 2,500 metres in altitude are dying. Meanwhile, the Monpa and Luopa people who live deep in the gorge continue slash-and-burn methods of farming and the forests on many steep slopes have been burnt to

provide farmland, resulting in the rapid increase of soil erosion and landslides (Yong, 05 March 2014).

The Yarlung Tsangpo gorge is one of the most biodiverse regions of the world, and yet, this diversity is facing extinction. The ecosystem of the gorge has become fragmented giving animals smaller areas in which to roam; this, in turn, leads to an imbalance in the food chain, while the mono-cultural secondary forests prevent populations from growing and surviving.

The fragile environment of the Tibetan Plateau is significant to the health of the Yarlung Tsangpo, which should not be neglected. However, the Tibetan environment is facing environmental degradation due to climate change and man-made factors, which further degrades the ecologies of the Yarlung Tsangpo and other rivers. Moreover, the hydropower projects on the Yarlung Tsangpo will cause additional harm to the ecosystem of the river and have a negative impact on the downstream people of India and Bangladesh.

If the Metog dam were constructed, it would create a huge artificial lake inundating vast areas of virgin forest along the Brahmaputra gorge and beyond. The reservoir would stretch hundreds of kilometres along upstream Yarlung Tsangpo into the Kongpo region. Moreover, it will have a great implication for South Asia where "India and Bangladesh would have to rely on China for adequate release of water during the dry season and for protection from floods during the rainy season," according to Lieutenant Colonel J S Kohli who has served in Assam, Nagaland and Arunachal Pradesh.

Large Dams and People

The World Commission on Dams (WCD) released an extensive report in 2000 on the social and environmental impacts of large dams. China has dismissed the report of WCD. However, the social impacts of large dams on people's livelihood, health, social systems, and culture are enormous. The benefits it provides are associated with

providing water, electricity, and flood control. However, at the same time dams have a negative impact on people and societies. According to WCD report:

> Large dams have significantly altered many of the world's river basins, with disruptive, lasting and usually involuntary impacts on the livelihoods and socio-cultural foundations of tens of millions of people living in these regions. The impacts of dam-building on people and livelihoods - both above and below dams - have been particularly devastating in Asia, Africa and Latin America, where existing river systems supported local economies and the cultural way of life of a large population containing diverse communities (WCD 2000: 102).

For communities who are dependent on land and natural resources, displacement often results in the loss of access to livelihoods, including agricultural production, fishing, livestock grazing, and gathering of fuel wood. The implications for downstream livelihoods come after completion of the dam. The changes in the flow of water slowly lead to the degradation of ecosystem function and loss of biodiversity.

The downstream communities lack social, economic and political power to seek mitigation of these adverse effects. Moreover, downstream communities face some of the most extreme impacts of large dams in fishing, herding, agriculture and gathering floodplain forest products. Thus, the disruption of downstream economies leads to migration, dependence on informal wage labour in urban areas and impoverishment.

As illustrated in table 2 and figure 1, the potentially affected populations are heavily concentrated in Southeast Asia and India, where more than half of all large dams are built in the world's most populous region (Richter et al. 2010: 28). According to Richter et al., the term 'potentially affected' people are either exposed to reduced food security and availability of ecosystem goods and services or have to make adjustments in their livelihoods in response to dam-induced changes in the river environment. The degree to which they are impacted may depend on many variables, including both the extent to which they were dependent upon the river ecosystem originally and availability of other livelihood options and economic opportunities.

Another aspect of the construction of dams on Tibet's river is the displacement of many ethnic Tibetans affecting the livelihood of ordinary citizens as their social and economic conditions further deteriorates. It presents equally serious challenges in providing assistance to migrants' psychological needs, career development, educational opportunity, retirement life, cultural heritage, and social capital reconstruction (Bo et al.). Minority groups' culture and livelihood are inextricably linked with the collective ownership and use of natural resources and are protected by the Constitution in China and the Law on Regional National Autonomy. However, migrants are only compensated by their individual property rights if they are compensated at all.

Where compensation is provided, it will hardly be adequate, and those who are resettled have rarely had their livelihoods restored because resettlement programmes are primarily focused on physical relocation rather than on the social and economic development of the displaced. There is a clear interconnection between the magnitude of displacement and the ability to rehabilitate and restore livelihoods - the larger the scale of displacement; the less likely the livelihoods are to be restored (WCD 2000: 129).

The Pondo Water Control Project in Lhasa is designed to irrigate over 400 sq. km and generate 599 million kilowatts of electricity annually. However, it draws criticism for its impact on the massive relocation of people and the environmental impact of altering the landscape and ecosystems (The Third Pole). If China plans to divert the Yarlung Tsangpo, the local people will suffer great hardship and will be forced to leave their ancestral lands through government mandated relocation.

(Table: 5.4) The Number of 'potentially affected' rural people (in millions) living downstream of large reservoirs close to (<10km) rivers.

Region	Total
Africa	40.5
Asia	399.6
China	143.1
India	122.6
Bangladesh	89.7
Thailand	8.4
Pakistan	15.3
Global Total	**472.3**

(Source: Richter et al. 2010)

The Arunachal Floods

The Indian states of Assam and Arunachal Pradesh frequently face severe floods causing great damage and loss of lives. There are two main lines of arguments as to what caused the floods in Arunachal and Assam: Chinese activities on the Tibetan Plateau, or climate change. In June 2000, Arunachal and Assam had severe floods, and many were confused where this huge mass of water came from. Claude Arpi the French Tibetologist based in India states that "the ISRO scientists confirmed that the release of excess water accumulated in the Sutlej and the Siang River basins in Tibet had led to the flooding" (Arpi 2008: 63). Some Indian media believe that the huge mass of water came from the Tibetan Plateau. The weekly *India Today* said, "while the satellite images remain classified, officials of the Ministry of Water Resources indicate that these pictures show the presence of huge water bodies or lakes upstream in Sutlej and Siang river basins before the flash floods took place. However, these lakes disappeared soon after the disaster struck Indian Territory. This probably means that the Chinese had

breached these water bodies as a result of which lakhs of cusecs of water were released into the Sutlej and Siang river basins" (India Today, 25 June 2001).

The second argument on the cause of floods is climate change. Climate change leads to a rise in temperature, which leads to melting of glaciers and this melting of glaciers coupled with increased precipitation, finally leads to more run-off water and ultimately to flood events. These floods destroy agricultural fields, infrastructure, and affects human population. Floods bring various waterborne diseases like malaria, diarrhoea and cholera due to deterioration in the quality of drinking water.

The study done by the Committee on Himalayan Glaciers et al., have a different view of the monsoon flooding. The study argues that monsoon floods can be caused by heavy rain as in 2010 in Pakistan and the 2008 flooding of the Kosi River, which led to a dispute between Nepal and India. The study further points out that the monsoon floods frequently occur from June through September in the foothill regions along the arc of the Himalayas, and low - lying areas at the head of the Bay of Bengal. Other factors leading to heavy rainfall are the land use changes, deforestation, a glacial lake outburst flood (GLOF) and landslide lake out-burst flood (LLOF). GLOF is a flood that occurs when water dammed by a glacier or a moraine is rapidly released by the failure of the dam, and LLOF is a sudden release of impounded water from behind a natural dam formed by a landslide (Committee on Himalayan Glaciers et al. 2012).

Floods pose a threat to people, property, and the environment. The impacts of flooding are devastating, croplands get destroyed or damaged, millions of people get killed and displaced, properties get damaged, and it further creates political tension within the nation and between neighbouring countries. However, the causes of monsoon floods remain unclear. Thus, areas that are to be monitored on a regular basis need to be selected carefully. There is a need for joint scientific research on the areas such as the Hindu-Kush region with its varied topography as well as climate.

Large Dams and Earthquakes

The Tibetan Plateau is a region prone to seismic activity, creating high risks. The Himalayas and the Tibetan Plateau are formed by the collision of tectonic plates. The high level of seismic activity poses a grave threat to dams. Thus, there could be catastrophic repercussions for the Plateau if an earthquake were to take place. Dams could be destroyed, causing not only impact on various levels domestically but also downstream in neighbouring countries (Yunnan Chen, 28 February 2014; Bo et al.; Jackson, April 2012). Some Chinese researchers believe dams are both the trigger and the victim of these quakes (Bo et al.). Cascade Dams are likely to cause chain reactions and expand the impact of any earthquake.

(Table: 5.5) Percentage of Total Dams (based on the 137 dams in the ziyuan_b map) in each Seismic Hazard Zone for Selected Rivers in Western China

River	Dams in the high to very high seismic hazard zones (percent)	Dams in the Moderate seismic hazard zones (percent)	Dams in the low seismic hazard zones (percent)
Dadu	10.9	6.6	0
Mekong	3.7	9.5	0
Min	0	2.2	0
ParlongTsangpo	5.8	0.7	0
Salween	3.7	16.1	0
YarlungTsangpo	2.9	0	0
Yalong	9.5	2.2	0
Yangtze	11.7	2.9	0
Yellow	0	10.2	1.4
Total Percent	**48.2**	**50.4**	**1.4**

(Source: Jackson 2012: 18)

*The data is based on the map published by HydroChina. The status of the 137 dams has changed since 2004.

In 2012, Probe International published a study on "Earthquake Hazards and Large Dams in Western China". According to this study, China has large dams[3] under construction or proposed large dams for the Yarlung Tsangpo, Parlong Tsangpo, Salween, Mekong, Yangtze, Yalong, Dadu, Min, and Yellow river headwaters in western China. 48.2 percent of these dams are located in zones of high to very high seismic hazard, 50.4 percent are located in zones of moderate seismic hazard and only 1.4 percent are located in zones of low seismic hazard (Jackson April 2012) (see table: 5.5).

Due to the rapid pace of large dam construction in the drainage basins of the above-mentioned rivers, these areas of high natural seismicity combined with many areas of shallow earthquake focal points, create high risks of damage to dams and causalities among populations downstream from naturally occurring or reservoir-induced seismicity (Jackson, April 2012: 13).

The greatest danger to a large dam at the Great Bend of Brahmaputra is seismic activity. The Metog County had a moderate earthquake in 2008 before the disastrous Sichuan Earthquake that killed over 90,000 people. The 2010 earthquake of 7.1 magnitudes in Yushu destroyed the town of Yushu Tibetan Autonomous Prefecture and damaged three dam complexes, the Xihang, Dangdai, and Changu dams, all located on a Yangtze tributary. This is a nerve-wracking example for people living downstream in India and Bangladesh, given the proximity of the Great Bend to India (Tibetan Plateau, 24 May 2010).

Decisions made by upriver countries about extraction and diversions are bound to have a major impact on future water security in Bangladesh. Bangladesh has very high exceptionally unfavourable freshwater dependency ration. The county receives an estimated 91.4 percent of its surface water from 57 out-of-country rivers, primarily from India and China (Wirsing, 2013: 20). Bangladesh is expected to grow its population

[3] A large dam is "a dam with a height of 15 metres or greater from lowest foundation to crest or a dam between 5 metres and 15 metres impounding more than 3 million cubic metres" (International Commission on Large Dams, http://www.icold-cigb.net/GB/dams/definition_of_a_large_dam.asp).

from 161 million in 2012 to over 194 million in 2050 (ibid). Extensive dam building activities on the Brahmaputra River (by China and India) and on the mainstreams and tributaries of the Ganges, Teesta, and Meghna Rivers will exacerbate the water scarcity and water dependence, threating the lives of millions of people.

China - India Cooperation on the Brahmaputra

The major rivers originating from Tibet and flowing into India are the Brahmaputra in the North East and the Indus and Sutlej in the north-western part of the country, but China and India do not have any water sharing treaties. Several memorandums of understanding (MoU) have been signed between them in which China shall provide the "hydrological information[4] on the Yarlung Tsangpo/Brahmaputra River in flood season to India"
(Ministry of Water Resources, River Development & Ganga Rejuvenation). India and China signed the first MoU in 2002. In the MoU, "the Chinese side provided hydrological information (Water level, Discharge and Rainfall) of three stations, Nugesha, Yangcun and Nuxia located on the Yarlung Tsangpo from 1st June to 15th October every year, which was utilized in the formulation of flood forecasts by the Central Water Commission of India" (Ibid).

[4] Information is defined more broadly as general qualitative information, such as communication that a flood is impending or other conclusions reached from the analysis of hard data. Data are defined as 'hard' number relating to water resources, such as rates of river flow and level of water quality (Gerlak, 2014).

(Table: 5.6) Status of MoUs Signed between China and India

Date of signing/ renewal	Broad Objective	Present status of the implementation	Benefits derived so far	Remarks
05.06.2008. Renewed on 20.05.2013 for a period of five years.	Cooperation on Provision of Hydrological Information of the Brahmaputra/ Yaluzangbu River in Flood Season by China to India.	Hydrological data is being provided by Chinese side regularly.	The MoU enabled India to improve advisory forecasts in the downstream reaches of the Brahmaputra River for taking suitable administrative/evacuation safety measures and for monitoring of blockages in river Brahmaputra due to any landslides.	B&B Wing, which is dealing the MoU has stated for its continuance as it is very necessary for sharing of hydrological information.
11.04.2005 Renewed on 16.12.2010 for a period of five years.	Cooperation on provision of Hydrological Information of the Langquen Zangbo / Sutlej River in Flood Season by China to India Rivers.	Hydrological data is being provided by Chinese side regularly.	The MoU enabled India to improve flood forecasting and timely warning for mitigation measures in the downstream reaches of the Sutlej River.	B&B Wing, which is dealing the MoU has stated for its continuance as it is very necessary for sharing of hydrological information.
20.05.2013 for a period of five years.	Cooperation in the field of Water Efficient Irrigation	Visit of delegation from both the sides which was scheduled in May and September 2014 (during the beginning of crop season) could not take place.	Exchange of water related acts, policies and manuals have been carried out.	PP Wing (which signed the MoU) has informed that Planning Commission has proposed to drop the MoU.

23.10.2013 for a period of five years. (Source:	Cooperation on trans-border rivers, Expert-Level Mechanism on provision of flood-season hydrological data and emergency management and exchange of views on other issues of mutual interest.	Hydrological data is being provided for longer period now.	(i) The two sides recognized that transborder rivers and related natural resources and the environment are assets of immense value to the socioeconomic development of all countries. (ii) The two sides agreed to further strengthen cooperation on trans-border rivers. (iii) For flood forecasting, now we are getting data on water in respect of Yaluzangbu/ Brahmaputra river from China for extended period (15th May to 15th October now, in place of previous 1st June to 15th October every year).	B&B Wing, which is dealing the MoU has stated for its continuance as it is very necessary for sharing of hydrological information.

(Source: Ministry of Water Resources, Government of India 2015)

On 30th June 2014, during the visit of Vice President Hamid Ansari of India to China, he signed the Implementation Plan on the provision of hydrological information of Brahmaputra on 30th May 2013, which was revised during the 8th meeting of India-China Expert Level Mechanism on Trans-border Rivers held at New Delhi from June 24-27 2014. India will pay over Rs 82 lakh annually for hydrological data sharing to China (*The Economic Times,* 01 July 2014). Indian media covered the agreement extensively where *The Hindu* announced that "China will be more transparent on trans-border river projects" (Subramanian, 24 October 2013) while the *Indian Express* wrote that "China's acceptance of downstream rights is without precedent, and this is to date China's only written agreement with a neighbour on these issues" (Wang: 19). In reality, it was only a follow-up to the agreement signed in October 2013.

An Expert-Level Mechanism (ELM) to discuss interaction and cooperation on the provision of flood season hydrological data, emergency management and other issues regarding trans-border rivers between India and China was set up in 2006. Eight meetings of ELM have been held so far. However, this did not produce effective measures as every year the middle and lower reaches of the Brahmaputra caused devastating floods killing thousands of people. Recent floods in 2000 two Indian states, Himachal Pradesh and Arunachal Pradesh, were also destructive of people and the land. Such devastation is happening because there are no multilateral agreements between China and India for joint management of rivers; moreover, China withholds data on its upstream projects.

The Indian government has been continuously pressuring China for "transparency, greater hydrological data sharing, and a commitment not to redirect the natural flow of any river or diminish cross-border water flow" (Chellaney Fall 2009: 39). China's reluctance to share hydrological data during a critical season can be seen using water as a 'political tool', according to Brahma Chellaney, Professor at the Centre for Policy Research in New Delhi. Such leverage could, in turn, prompt a downstream state to build up its military capability to counterbalance this disadvantage (Ibid).

The issue of dam building on the Brahmaputra has been continuously discussed in the Indian Parliament sessions. Neeraj Shekhar, a Member of Parliament, asked questions regarding dam building on the Brahmaputra in December 2015 to the Minister of External Affairs of:

Q NO.52 DAM ON BRAHMAPUTRA BY CHINA
December 03, 2015

RAJYA SABHA
STARRED QUESTION NO.52
TO BE ANSWERED ON 03.12.2015

DAM ON BRAHMAPUTRA BY CHINA
*52. SHRI NEERAJ SHEKHAR:

Will the Minister of EXTERNAL AFFAIRS be pleased to state:

(a) Whether China has operationalised the biggest dam on Brahmaputra recently in October, 2015, if so, the details thereof;
(b) Whether Chief Minister of Assam has expressed concern over the Chinese dam on Brahmaputra, if so, the details thereof and the details of steps taken in this regard;
(c) Whether China has started building ten such other dams on Brahmaputra, if so, the details thereof and the reaction and response of Government thereto; and
(d) Whether Government has taken up the matter with Chinese authorities, if so, the details thereof?

ANSWER
THE MINISTER OF EXTERNAL AFFAIRS
(SHRIMATI SUSHMA SWARAJ)

(a) to (d) A Statement is laid on the table of the House.

STATEMENT REFERRED TO IN REPLY TO PARTS (a) TO (d) OF THE RAJYA SABHA STARRED QUESTION NO. 52 REGARDING "DAM ON BRAHMAPUTRA BY CHINA" FOR ANSWER ON 03.12.2015

(a) to (d) According to reports, Zangmu hydroelectric project has been operationalized in October, 2015. Reports indicate that it is a 510 MW run-of-the-river project. The 'Outline of the 12th Five Year Plan for National Economic and Social Development of the People's Republic of China' indicates that three more hydropower projects on the main stream of the Brahmaputra River in Tibet Autonomous Region have been approved for implementation by the Chinese authorities.

Government, in close cooperation with various State Governments including Government of Assam, which are users of the waters of river Brahmaputra, continues to carefully monitor the water flow in river Brahmaputra for early detection of abnormality so that corrective and preventive measures are taken to safeguard livelihood of peoples of these States of Union of India.

Various issues relating to trans-border rivers are discussed with China under the ambit of India-China Expert Level Mechanism which was established in 2006. 9th Meeting of the ELM was held in Beijing in May 2015. Government of India, under the Memorandum of Understanding on Strengthening Cooperation on Trans-border Rivers, signed in October 2013, obtains hydrological data from China on river Brahmaputra.

As a lower riparian State with considerable established user rights to the waters of the River, India has conveyed its views and concerns to the Chinese authorities, including at the highest levels of the Government of the People's Republic of China. India has urged China to ensure that the interests of downstream States are not harmed by any activities in upstream areas. During the visit of Prime Minister Sh. Narendra Modi to China in May 2015, this matter was discussed. The two sides agreed to further strengthen cooperation on the provision of flood-season

> hydrological data and emergency management, and exchange views on other issues of mutual interest through the Expert-Level Mechanism
> (Ministry of External Affairs, 03 December 2015).

This statement from India's Minister of External Affairs indicates that India views China's dam building on the Brahmaputra as a cause for concern; however, it is not known whether China has started building a further ten dams on the Brahmaputra as the Minister avoided answering that particular question. India is dependent on China's cooperation for the provision of hydrological data and has constantly urged China to ensure that the interests of downstream nations are not harmed. According to Lieutenant Colonel J S Kohli, "India knows from its own internal problems how difficult it is to solve a water dispute. When it comes to transboundary questions, it seems practically impossible to find a workable understand…. China, seeking her own interests, could withhold water for power generation and irrigation during the dry season and release water during the flood season with the catastrophic consequences from eastern South Asia" (Kohli 2008: 4).

On the Chinese side, they are concerned with other issues, which they believe are harming India-China cooperation on the Brahmaputra. For example, Li Zhiwen, a deputy researcher at the Chinese Academy of Social Sciences' Institute for Asia-Pacific Studies stated that China was firmly opposed to any attempt by India to strengthen its *de-facto* control of the region (Arunachal Pradesh) by developing the Brahmaputra (Wang: 20). Li further states that real progress in talks on trans-border river issues is unlikely as both India and China has not yet dealt with border issues. Thus, China would see any Indian development of downstream of Brahmaputra as threatening its claims over Arunachal Pradesh, which it refers to as Southern Tibet (Ibid).

Thus, India and China are more actively concerned about their unresolved border issues and political stability in the region than finding solutions for the devastation caused by floods (Tsering, 16 August 2012; Wang, Wirsing 2014). Similarly, there is a competition between China and India as to which country builds the greatest number of many dams on the Brahmaputra. India's Central Electricity Authority announced 146 projects on the Brahmaputra basin in 2007 and today there are about 200 (Jha: 22). In

addition, China has built one dam on the Yarlung Tsangpo and proposed 10 more. Thus, there is an urgent need for an ideal form of development regarding the watershed, which must move beyond "nationalistic approaches of economic growth to focus on people's livelihood and human development" (Ibid).

The Way Forward

The increasing demand for clean energy and China's continued construction of large dams on its trans-boundary rivers have major implications on the environmental sustainability and social stability inside China and its downstream countries. China's dam building are the cause of two major concerns to its neighbours - its unilateral development of dams on the upper reaches of the rivers and its lack of consideration of the social and ecological impact on lower riparian nations. Therefore, it is important to China's neighbouring countries to find unified workable solutions. China can make coal use more costly through consumption caps, trading, and taxes and increase the wind and solar energy development as well as enforce existing laws and regulations to better manage water (Turner et al. 2013).

There are a number of possible proposals which China, India and Bangladesh could work on such as international trans-boundary water agreement, river basin organisations, transparent information sharing, joint scientific research, investigations and assessments, inclusion of the local community in decision-making, and track 2 dialogue.

International Trans-boundary Water Agreement

"A well-established means of achieving cooperation between nation states is the adoption of shared legal frameworks or agreements. Treaties, for example, may stipulate the rights and obligations of signatories in the joint management process and, importantly, place restrictions on actions that may harm other signatories" (Connell 2014: 49). These treaties and agreements provide data and information sharing with regard to the shared water resources. Effective management of the world's water resources requires access to credible and reliable information and data on water

resources, and how they are affected by water use and development, land use practices and climate change (Lautze et al. 2014: 57). States are generally engaged in greater data and information sharing, but many states are reluctant to legalise formal schedules for exchange.

China should reconsider its preference for bilateralism on Brahmaputra issues. It has participated in and even shaped multilateral, institutions since the 1990s – for example, the Six-Party Talks on North Korea, and participation in the Association of Southeast Asian Nations (ASEAN) Regional Forum. China does participate in water diplomacy at a basin-wide level, namely the MRC in supplying hydrological data, and technical exchanges in areas such as river navigation and hydrology development.

Thus, there is a need for a Brahmaputra Treaty between China, India and Bangladesh (Kohli, 2008) and, in general, more cooperation among them (Wuthnow 2014). The Brahmaputra Treaty should also encourage China and India to engage in a basin-wide management of the Brahmaputra. When India and Pakistan could sign the Indus Water Treaty even after a political disagreement on various issues, China and India should put aside their bilateral disputes, learn from the Indus Water Treaty, seek a unified stance, and save the Brahmaputra River, its ecosystem and people living downstream.

However, many scholars are not optimistic about any trilateral water-sharing and basin development accord between China, India and Bangladesh for the foreseeable future (Wirsing 2014; Samaranayake et al. 2016). On the contrary, "mounting tensions and at least verbal skirmishing between China and India over the Brahmaputra's contested waters seem more likely" (Wirsing 2014: 80). The mutual distrust and high-level political tension between China and India could be a major obstacle for them to cooperate but there are several incentives to cooperate with other Brahmaputra riparian nations.

China's reputation would benefit if China takes the leading role in proposing basin-wide cooperation. Secondly, such cooperation would reduce the tension between

China. Thirdly, it would yield a more holistic understanding of the river system and insights into how to address flooding and other challenges. Finally, cooperation on the Brahmaputra would promote "greater regional economic integration and would facilitate the expansion of transport and infrastructure options such as through river navigation networks and joint hydropower projects" (Samaranayake et al. 2016: 86).

River Basin Organisations

Another important method for governing international water resources is through river basin organisations (RBOs) because they can be a product of formal legal agreements. RBOs provide a framework for states to resolve disputes, make decisions, share information and generate knowledge. The mere existence of RBOs does not necessarily ensure that water-related problems will be solved but some RBOs have effectively governed their basin. The Danube and the Rhine[5] RBOs have contributed to improving the water quality of these rivers whereas, in the Mekong River Basin, the Mekong River Commission is struggling to address conflicts over the use of the river and unilateral water use projects (Schmeier 2014: 65).

The Bangladesh-China-India-Myanmar (BCIM) forum could be expanded to address water issues. According to Satu Limaye, BCIM is organisation closest in terms of relevance and membership to a future Brahmaputra RBO. However, according to Satu Limaye, India has no interest in bringing water issues into the BCIM, and it would rather focus only on land transportation connections between the BCIM members.

However, it is the only presence of downstream nations that enable water regime formation, because the downstream hegemon has both the interest in securing its water supply through international regime formation and the power to compel cooperation. In contrast, upstream hegemon does not have the incentive to engage in cooperative arrangement as they need are seen as a constraint to unlimited future action and discriminatory use of a river's resources.

[5] The Danube River flows between Budapest and Passau, Germany, runs primarily through Austria and the Rhine River flows from Basel, Switzerland, to Amsterdam, passing primarily through Germany along the way.

Transparent Information Sharing

Though China and India have hydrological information sharing mechanisms, there is still a lack of information flow among the three nations regarding dam construction on the Brahmaputra River. China should expand access to information regarding its dam construction plans on the Brahmaputra whereas while India should also clarify its plan for the construction of dams on the Brahmaputra River and its tributaries. Bangladesh should seek year-round water flow and rainfall data from India and China year, not only during the monsoon season but should request site visits to dams and barrages in both upper- riparian states (Samaranayake et al. 2016: 90-97).

The Indian government should continue efforts to enhance coordinated hydrological data sharing between the centre and northeast India state governments (Specifically with Arunachal and Assam state government). India's central government and northeast Indian state governments should also cooperate on the production of an updated and comprehensive report on India-China relations regarding the Brahmaputra River. As for the Indus River basin, according to ICIMOD report (2010), there is a need for data access at national and trans-boundary levels among different departments and line agencies and also among the riparian states, particularly in the public sector.

Joint Scientific Research, Investigations and Assessments

Joint water resource data and information gathering can reduce disputes over data and prevent conflict. Therefore, there is a need for joint scientific research, investigations and assessments on the Brahmaputra basin from all three countries: China, India and Bangladesh. Till now there has been no consensus on the impact of climate change on the glaciers and how this will impact the Brahmaputra River. There is also a need to conduct joint research on the impact of dam building on the Brahmaputra basins ecosystem, fisheries, and human security in the Brahmaputra basin.

A number of key collaborative research areas were recommended by The Third Pole report on the *Brahmaputra: Towards Unity* (2006). This report was brought together by scholars from China, India and Bangladesh and they suggested an informal data collection of river flow by using simple methods since it is difficult for an

independent researcher or journalist to obtain water flow data on trans-boundary rivers from the governments. Secondly, people- to- people information sharing about landslide threats and flooding due to cloudburst was recommended to help prevent disasters, and thirdly, research on major earthquakes and the possibility of river navigation on the Brahmaputra were highly encouraged by those scholars.

Dhaka should utilise its active think tank community to analyse the basin-wide management of the Brahmaputra such as the Bangladesh Enterprise Institute, the Bangladesh Institute of Peace and Security Studies and the Centre for Policy Dialogue. These organisations can organise confidence-building dialogues and technical meetings that focus on flood prevention, flood forecasting, pollution, and sedimentation.

Inclusion of local community in decision-making

Local people have lived in the region for thousands of years. They have used their traditional knowledge to maintain the environment. Their traditional community-based knowledge systems should be used in solutions and they should be included in policy formation because they understand the river basin very well.

Track 2 Dialogues

There is a lack of institutional cooperation and interaction at a basin-wide level and there might be avenues for increased engagement among all three riparian countries. Thus, China should convene a Track 2 dialogue to discuss shared water challenges as a starting point with participation from university and think tank scholars, academics, business people, activists, NGOs and environmentalists from China, India and Bangladesh. Over a time this Track 2 engagement might form the basis for cooperation at the Track 1 (governmental) level.

Conclusion

The chapter tested the second hypothesis: the degradation of the Tibetan environment has an adverse effect on the hydrology and atmosphere of India because of the geographical proximity to India. Energy demand and carbon reduction emissions have further pushed

China to build more hydropower dams on the Tibetan Plateau as well as stressing water security. India also faces energy deficiency and pushes to dam its rivers - Brahmaputra, Indus and Sutlej. However, the Asian giants' demand for "clean energy" through hydropower leads to various environmental and social implications for the ecosystem and people living downstream.

Furthermore, the Tibetan Plateau has been greatly affected by climate change leading to glacier melt, unpredictable rainfall patterns and rise of temperature. This further threatens India since the Indian monsoon is widely dependent on the Tibetan Plateau and many Indian rivers have their headwaters on the Tibetan Plateau. However, China's rapid expansion of hydroelectric power has led to dam construction on the Brahmaputra, such as the Zangmu dam and China has officially announced its intention to build three more dams. Dam constructions on the Brahmaputra change the water flow downstream, affecting the farmers and fishers of India and Bangladesh. Upstream, the Brahmaputra has witnessed mudslides and desertification. The biggest risks of damming the Brahmaputra or any river on the Tibetan plateau is that of triggering earthquakes and in turn, how frequent earthquakes and seismic activity on the Tibetan Plateau would bringing the downfall of dams.

Even though India and China have several MoUs regarding hydrological data sharing, they have not signed a water treaty. Moreover, there is competition between them to build dams on the Brahmaputra, compromising the health of rivers that provide multiple ecological values. States look at rivers as water pipes rather than living ecosystems, which makes the situation worse. Thus, the trans-boundary effects of China's megaprojects on the Brahmaputra have not only complicated China's relation with India but serve as a potential stepping stone for a future war on water.

Although the Indus Water Treaty between India and Pakistan is not the ideal water treaty, it has survived even after numerous disputes between the two countries. India and China should learn from the Indus Water Treaty and should propose an International trans-boundary water treaty on the Brahmaputra between China, India and

Bangladesh. They can increase bilateral cooperation and bilateral joint development on the Brahmaputra by forming river basin organisations, implementing transparent information sharing, carrying out joint scientific research on the river basin, the impact of climate change and glacial melt on the major rivers, convening Track 2 dialogues and finally including local communities in the decision-making process to bring sustainable development on the Brahmaputra River and other major rivers.

CHAPTER SIX

CONCLUSION

The debates and discussions on development and environment date back to the mid-nineteenth century and it still continue to be one of the major topics in the international politics. The concept of environmental security emerged when it was understood that environmental degradation could cause violent conflicts over resource scarcities, threatening people, impacting the economy causing inter/intra state conflicts and affecting state security and possibly regime change. The thesis focuses on the environmental threats to the nation and its impact on people and economy.

Chapter two studied the major environmental problems of China, the impact of rapid economic growth, urbanization and population growth on the environment and the social impact of environmental degradation. The chapter further discussed the institutional structure of the environmental protection and major limitations in implementing the regulations and policies. Water and air pollution and desertification have been the major environmental challenges that China faces today (MEP 2010). There is water scarcity in the north, floods in the south, and growing municipal and industrial pollution endangers the whole country (Wu et al 1999: 251).

What are the major causes of these environmental problems in China? There are two major factors: the climate and human factors. The study focused on the human factor in environmental degradation in China. The three aspects of environmental problems in China are rapid economic growth, urbanization and population growth. China is the second largest economy in the world and has the world's largest population. It has achieved a rapid economic growth rate of 8 to 9 percent (The World Bank 2007). However, economic growth has carried a significant environmental cost (Pan 2007; Wang 2006; Chen 2010; Li 2006). Rapid industrialization and increase in consumption of resources with the

increase of urban population has led to resource depletion and pressure on the environment.

Hence, environmental degradation affects the economy and people. For example, in rural area water pollution and scarcity contribute to crop loss to the value of roughly $24 billion annually (Economy 2005: 6). Millions of people are displaced due to dam constructions and there is growing social unrest over water and air pollution in China. Zhou Shengxian, the Minister of SEPA, said that public protests over pollution are increasing by 29 percent per year (CECC, 30 May 2006). These public protests are challenging the stability in the nation and also damage the international image of China.

However, the Chinese government has taken many measures and actions to increase the institutional structure of the environmental protection. The institutional framework grew slowly and the State Environmental Protection Agency was upgraded into cabinet-level Ministry of Environmental Protection in 2008. National, provincial, municipal and county level Environmental Protection Bureaus have been set up, and along with institutional growth, environmental laws and regulations have been promulgated. There are some twenty environmental laws at the national level and140 executive regulations issued by the State Council (Mol. A.P.J and Neil T. Carter 2006). Over the years, the environmental and development policies of China have evolved in five phases: a) status of national basic state policy to sustainable development strategy, b) focus changed from pollution control to combination of pollution control and ecological protection, c) method changed from end control to source control, d) moved from point source treatment to catchments and regional treatment, and e) management style changed from administration management-based method to a legal and economic instruments-based method (Kunmin et al. 2007; Wang 2010).

Finally, Chapter two highlights the limitations of environmental policy instruments. Though China's environmental regulations and laws look good on

paper, people encounter many limitations when practicing them. The five major limitations are the top-down approach to environmental management, fragmented authorities and budget allocation problems, lack of incentive to local leaders for environmental protection, use of backward and outdated technologies and techniques, and lack of space for environmental NGOs. It is also interesting to analyse environmental problems and policies in Tibet. What are the Chinese government's policy initiatives and how is the case of Tibet different from the rest of China?

Chapter three studied China's environmental policies in Tibet. This chapter tested the first hypothesis of the thesis: China's policies have negative impact on Tibet. According to the Tibetans, Tibet was ecologically stable before the Chinese occupation and environmental conservation was an essential component of daily life. The Buddhist concepts of 'interdependence of nature and human', and 'principle of self-contentment' influenced the environmental protection practices in Tibet. Moreover, the Tibetan government issued the Mountain Valley Edicts, ordering the practice of 'sealing of the hills and valleys'. Belief in sacred mountains allowed protecting wild animals and natural resources. Furthermore, a large number of Tibetans were nomads, and living on the grassland sustainably for thousand of years as grazing is more suitable than farming on the Tibetan Plateau.

Tibetans further argue that China's main objective in controlling Tibet is to exploit the natural resources and to integrate Tibet with the rest of China's regions by introducing developmental policies in Tibet. China introduced the Western Development Campaign in Tibet in 2001, leading to the introduction of various developmental policies in Tibet such as exploration of natural resources, construction of hydropower dams, urban and infrastructure development. Since China has brought massive economic development to the region, the Western Development Campaign also focused on ecological construction in the western provinces of China.

The four major ecological construction projects are 'grain into green' program, protection of biodiversity, construction of nature reserves, and 'pasture to grassland program' (Yeh 2009; Good 2004; CAS 2007). The 'grain into green' project is also referred as 'the logging ban' and the Sloping Land Conversion Program. This program calls for conversion of cropland in forests. According to the State Council (2013), the forest coverage rate has increased to 11.91 percent in 2013. The protection of biodiversity has been another plan where China introduced various laws such as the Forest Law Enforcement Organs, the Tibet Armed Police Forestry Contingent, Hohxil Action Number One and other programs to protect antelopes and other rare animals.

The Chinese government has constructed 22 ecological conservation areas, eight national forest parks, four geological parks and 47 nature reserves in TAR (State Council 2013). The Sanjiangyuan Nature Reserve was established in 2003, covering four TAP, 16 counties and 17 rural townships, mostly populated by Tibetans. A large number of Tibetan herders were removed from the area to build the Sanjiangyuan Nature Reserve, and they have again been relocated when the 'pasture to grassland program' was introduced. The main purpose of the program is to restore the grassland. Four policies were introduced on the management of grassland; building fencing and water conservancy projects, pasture responsibility system (rotations grazing periods, rotation grazing areas and no-grazing areas have been designated), promotion of man-made grassland, and finally building permanent settlements for herders.

However, these policies have a negative impact on Tibetans and whether they have restored grassland degradation is remains to be seen. The ecological effectiveness of the 'grain into green program' has been limited to date and implementation varies (Yeh 2005; Feng et al 2005; Qiao and Pei Xiaofei 2004). In some Tibetan areas, subsidies have not been received and those that have been received are not adequate for off-farm income. The major socio-economic impact has been caused by the policy of 'pasture into grassland'. This policy is implemented with the underlying assumption that the nomads are 'backward'

and they practice ‘inefficient’ methods, leading to poverty, backwardness and environmental degradation. The resettlement program, however, threatens their livelihood sustainability (Bauer 2012; Nyima 2012). The nomads are left with no alternative job opportunities and subsidies provided to them were insufficient. As they lack formal education and Chinese language skills, they face marginalization and young people remain unemployed.

Moreover, nomad resettlement leads to an assimilation of Tibetan nomads into Mainland China (Ptackova 2011; Yeh 2005). It has led to political control of the Tibetan Plateau. They are put under state surveillance and are obliged to stay in a stable place. Thus, resettlement allows the state to control both the land and the people. Whether the resettlement has improved the environment is still under study. The case of Tibetan nomads of Sanjianyuan Nature Reserve suggests that the economic condition of Tibetan nomads has weakened and that the environment continues to degrade (Liu 2008; Zhang et al. 2008).

Chapter four tested also the first hypothesis: China’s policies have further degraded the Tibetan environment. With the introduction of the Western Development Campaign in Tibet, China has introduced four major developmental policies in Tibet: the Lhasa-Gormo railway, exploitation of natural resources, construction of dams and water diversion plans and infrastructure development. These development plans have compromised the environment of Tibet by threatening its ecological stability. The major environmental problems that Tibet face currently are grassland degradation, endangered wildlife, permafrost melt, water pollution, deforestation, and desertification.

The Chinese government blames the Tibetan nomads and climate change for the grassland degradation and thus introduced the nomad resettlement policies. However, grassland degradation is complicated and cannot be attributed only to overgrazing and population growth. Both human and natural

factors play a role in grassland degradation, such as unsustainable mining, improper management of the grassland and also climate change. The chapter also discussed how the railway has impact on the permafrost melting. The Lhasa-Gormo railway is built on 632 kms of permafrost, and over the past forty years, the permafrost under the railway tracks has undergone degradation (DIIR 2009: 52; Norbu 2011). Global warming plays a secondary role in speeding up the deterioration of the permafrost, which could lead to desertification. Another major environmental challenge is the water pollution in Tibet, which chiefly caused by mining.

The chapter also answered how Tibetans have responded to these environment problems. Tibetans from all the regions (Cholkha-sum) have risked their lives and raised their voices against environmental problems. Many peaceful protests have been met with brutal repression. The most common protests are the anti-mining protests. Since 2010- 2014, one water-pollution and ten anti-mining protests have taken place in Tibet. Two Tibetans have self-immolated themselves at mine sites. These waves of protests are increasing each year in spite of being suppressed violently. They have occurred because there is lack of respect for the sentiments of Tibetans. Some mining areas are considered sacred for the Tibetans, but the latter were never consulted when the mining activities were planned.

Local Tibetans are never consulted or included in the decision-making process. Thus, it is highly essential that there is a degree of non-interference from the Chinese government and inclusion of local Tibetans in the development projects; this would greatly contribute towards sustainable development in Tibet. Lack of democratic decision-making, lack of transparency, and disregard for environmental and social costs, corruption and poor governance have exacerbated environmental impacts. Therefore, it is important to adopt sustainable development in the region and to bring development based on the needs of the local population and environmental conditions of the Tibetan Plateau.

Chapter five has tested the second hypothesis of the thesis: the degradation of the Tibetan environment has an adverse effect on the hydrology and atmosphere of India because of the geographical proximity to India. China has a huge demand for hydroelectric power because it aims to reduce the greenhouse gas emission. Secondly, China has an advantageous geographical position as major Asian rivers originate from the Tibetan Plateau and it has less than 1 percent freshwater dependency from other countries. Thirdly, China is a water-stressed nation where northern China has 34 percent of the nation's population but only 7 percent of water resources. Accordingly, there is an uneven distribution of water resources in China. Therefore, China and India's hydropower race on the Brahmaputra puts the Himalayas at risk, affecting the entire region. Moreover, the Tibetan Plateau has been hit by the climate change which leads to glacier melt, rise in temperature, and unpredictable rainfall patterns, which also impacts India.

In past decades, the Tibetan Plateau has experienced an increase in temperature resulting in ecological degradation and a shortage of water resources, affecting the sustainable socioeconomic development in the region. Thus, the climate change on the Tibetan Plateau is closely related with Indian monsoon and glacial melt.

Three major Indian rivers have their source in the Tibetan Plateau- the Brahmaputra, the Indus and the Sutlej. China has dammed all these rivers and plans to build more dams on the Brahmaputra, further threatening the farmers and fishermen of India and Bangladesh. China has built one dam on the Brahmaputra, the Zangmu dam, and plans to build three more on the upstream of the Brahmaputra. Indian government has also planned to dam the downstream of the river without consulting the people of Assam and Arunachal Pradesh and nor the Bangladeshis.

The dam constructions on the Brahmaputra have both environmental and social effects on the people. It threatens the lives of farmers and fishermen

whose lives are completely dependent on the river. Furthermore, the Himalaya belt is earthquake-prone zone and dams could cause earthquakes or earthquakes can trigger downfall of dams. However, there is no formal water treaty between China and India over the Brahmaputra.

China has sometimes demonstrated reluctance to compromise on its shared freshwater resources. It has not signed any comprehensive water treaty with any of its riparian neighbour states. Moreover, China has been circumspect about joining multilateral river management institutions as a full member. It has refused to become a full member of the MRC and has been cautious about empowering multilateral organizations of which it is a member such as the Shanghai Cooperation Organization to play a bigger role in questions of joint water governance.

Portraying China as an entirely uncooperative upstream hegemon is, however, flawed and incomplete. To some extent, China has been cooperative, first, with regard to the Mekong with the exchange of hydrological data; second, in confidence building as a dialogue partner in the MRC; third, in multilateral meetings, particularly under the roof of the Greater Mekong Sub-region (GMS); fourth, China signed MOU with India and agreed to set up a joint river commission and finally, in 2001 China agreed to set up a joint river commission with Kazakhstan.

Therefore, China should formulate an international trans-boundary water agreement between China, India and Bangladesh, allowing river basin organisations to resolve disputes, share information and generate knowledge between them. It is also important to have transparent information sharing between the three countries. Finally, inclusion of local community in decision-making would ease the tension and track 2 dialogues would increase the engagement among all three riparian countries.

REFERENCES

(* indicates a primary source)

Allen, Tracy H. (Fall 2009), "Tibet: Landscape of Tradition and Change", *Focus on Geography*: 23-9.

Arpi, Claude (2008), "Himalayan Rivers: Geopolitics and Strategic Perspectives", *Indian Defence Review*, 12 (2): 54-64.

Zhang Bai-ping et al. (2002), "Biodiversity and Conservation in the Tibetan Plateau", *Journal of Geographical Sciences*, 12 (2): 135-143.

Barabantseva, E. (2009), "Development as Localization: Ethnic Minorities in China's Official Discourse on the Western Development Project," *Critical Asian Studies*, 41 (2): 225-254.

Bauer, Kenneth (2015), "New Homes, New lives- The Social and Economic Effects of Resettlement on Tibetan Nomads (Yushu Prefecture, Qinghai Province, PRC)", *Nomadic Peoples*, 19 (2).

Berga et al. (2006), "Dams and Reservoirs, Societies and Environment in the 21st Century", *In Proceedings of the International Symposium on Dams in Societies of the 21st Century*, Barcelona, Spain, 18 June 2006. London: Taylor and Francis Group.

Li Bo et al. (2014), "The "Last Report" on China's Rivers", (Online: web) Accessed 04 April 2014, URL: http://www.scribd.com/doc/211565162/The- Last-Report-on-China-s-Rivers.

Blanford, Henry F. (1884), "On the Connexion of the Himalaya Snowfall with Dry Winds and Seasons of Drought in India", Proceedings of the Royal Society of London, 37: 3-22.

Buckley, Michael (2014), *Meltdown in Tibet: China's Reckless Destruction of Ecosystems from the Highlands of Tibet to the Deltas of Asia*, New York: Palgrave Macmillan.

*Beijing Review (2008), "Ecological Safety Barrier Protection and Improvement", [Online: web] Accessed 29 January 2016, URL: http://www.bjreview.com.cn/special/tibet/txt/2008-10/30/content_160032.htm

Carson, Rachel (1962), "Silent Spring-III" 30 June 1962, [Online: web] Accessed 23 April 2014, URL: http://www.newyorker.com/magazine/1962/06/30/silent-spring-part-3.

China National Committee for the Implementation of the UN Convention to Combat Desertification (CCICCD) (1997), "China Country Paper to Combat Desertification", Beijing: China Forestry Publishing House: 20-21.

*Central Tibetan Administration (2011), "Environment and Development Issues", [Online: web] Accessed 2 April 2012, URL: http://tibet.net/important-issues/tibets-environment-and-development-issues/.

_____*"Issues Facing Tibet Today", [Online: web] Accessed 08 October 2013 URL: http://tibet.net/about-tibet/issues-facing-tibet- today/

Peng, Changhui et al. (2007), "Building a "Green Railway in China", *Science*, 316: 546-547.

Chellaney, Brahma (2011), *Water: Asia's New Battleground*, New Delhi: HarperCollins.

_____ (Fall 2009), "Coming Water Wars**",** *The International Economy:* 38-39.

*China Daily (2004), "The Road Ahead for a Green World", [Online: web] Accessed 20 March 2015, URL: http://www.china.org.cn/english/environment/91507.htm

China Dialogue (2014), "Divided Waters in China", [Online: web] Accessed 01 September 2014, URL: https://www.chinadialogue.net/article/4539-Divided-waters-in-China.

*China Tibet Online (2009), "Desertification Worsening in Tibet, Regional Forestry Official Says", [Online: web] Accessed 11 October 2013, URL: http://chinatibet.people.com.cn/6681243.html

_____(2010), "Tibet Strives to Curb Desertification in 2010", [Online: web] Accessed 23 May 2015, URL: http://chinatibet.people.com.cn/6922559.html

_____(2012), "Environment along Qinghai-Tibet Railway Well Protected: Passenger", [Online: web] Accessed 10 June 2012, URL: http://chinatibet.people.com.cn/96069/7773846.html.

_____2015), "China's first Large-Scale Wildlife National Park Established", [Online: web] Accessed 30 September 2015, URL: http://eng.tibet.cn/2010hb/xw/201509/t20150924_3946134.html

China.org (2006), "Controversial Plan to Tap Tibetan Waters", [Online: web] Accessed 05 June 2014, URL: http://www.china.org.cn/english/MATERIAL/177295.htm.

China.org.cn, "Haihe River", [Online: web] Accessed 25 April 2017, URL: http://www.china.org.cn/english/travel/40457.htm.

China Water Risk (2010), "China Water Crisis Part II- Water Facts At a Glance", [Online: web] Accessed 04 April 2017, URL: http://chinawaterrisk.org/wp-content/uploads/2011/06/Chinas-Water-Crisis-Part-2.pdf.

Chinese Academy of Sciences, "Construction of the Qinghai-Tibet Railway and Permafrost Environment", [Online: web] Accessed 14 September 2009, URL: http://english.cas.cn/ST/BR/br_rp/200909/t20090914_37775.shtml.

Choezin, Tenzin (2004), "Tibetan Perspectives on the Significance of Mountain and Lakes", translated by Tenzin Bhuchung, [Online: web] Accessed 02 March 2012, URL: http://tibetanplateau.blogspot.in/2009/01/tibetan-perspectives-on-significanceof.html.

Wang Chunmei and Lin Zhaolan (2010), "Environmental Policies in China over the Past 10 Years: Progress, Problems and Prospects", *Procedia Environmental Sciences*, (2): 1701-1712.

Committee on Himalayan Glaciers et al., (2012), *Himalayan Glaciers: Climate Change, Water Resources, and Water Security,* Washington, D.C: National Academies Press.

Cui, Xuefeng and Hans F. Graf, (2009), "Recent Land Cover Changes on the Tibetan Plateau: A Review", *Climatic Change*, 94: 47-61.

Cui, Xuefeng et al., (2007), "Hydrological Impacts of Deforestation on the Southeast Tibetan Plateau", *Earth Interactions*, 11.

*DIIR (2008), *Environment and Development in Tibet: A Crucial Issue,* Dharamsala: Environment and Development Desk.

_____(2005), *The Endangered Mammals of Tibet,* Dharamsala: Environment and Development Desk.

_____(2009), *Tibet: A Human Development and Environment Report*, Dharamsala: Environment and Development Desk.

_____ (2009b), *The Impacts of Climate Change on the Tibetan Plateau: A Synthesis of Recent Science and Tibetan Research,* Dharamsala: Environment and Development Desk.

_____(2009c), *Human Development and Environment Report,* Dharamsala: Environment and Department Desk.

_____(2000), *Tibet 2000: Environment and Development Issue*, Dharamsala: Environment and Development Desk.

Du, Fachun (2012), "Ecological Resettlement of Tibetan Herders in the Sanjiangyuan: A Case Study of Madoi County in Qinghai", *Nomadic Peoples*, 16 (1): 116-133.

Economy, Elizabeth C. (2003), "China's Environmental Challenge: Political, Social and Economic Implications", Council on Foreign Relations, Testimony before the Congressional Executive Commission on China Roundtable on Environment.

_____(2004), *The River Runs Black: The Environmental Challenge to China's Future*, New York: Cornell University Press.

EIA Commission, "Environmental Impact Assessment Law of the People's Republic of China", [Online: web] Assessed 3 March 2017, URL: http://api.commissiemer.nl/docs/os/sea/legislation/china_s_ea_legislation_03.pdf.

Free Tibet, "Self-Immolations Protests", [Online: web] Accessed on 28 March 2016, URL: https://freetibet.org/about/self-immolation-protests.

Feng, Zhiming et al., (2005), "Grain-for-Green Policy and its Impacts on Grain Supply in West China", *Land Use Policy*, 22: 301-312.

Gang, Chen (2009), *Politics of China's Environmental Protection: Problems and Progress,* Singapore: World Scientific.

Gerlak, Andrea K et al., (2014), "Greater Exchange, greater ambiguity: water resources data and information exchange in transboundary water treaties" in Grafton, R. Quentin et al., "Global Water: Issues and Insights", Australian National University Press: Canberra.

Goodman, David S.G (2004), "Qinghai and the Emergence of the West: Nationalities, Communal Interaction and National Integration", *The China Quarterly*, (178): 379-399.

Gautam, P. K. (2010), "Climate Change and Environmental Degradation in Tibet: Implications for Environmental Security in South Asia", *Strategic Analysis*, 34 (5): 744-55.

Gustafsson, Jan-Erik (1993), "Land and Water Management in Tibet", *Geografiska Annaler. Series B, Human Geography, 75 (1): 19-29.*

Hardin, Garrett (1968), "The Tragedy of the Commons", *Science,* 162: 1243-1248.

Hays, Jeffrey (2009), "Yellow River", [Online: web] Accessed 26 May 2017, URL: http://factsanddetails.com/china/cat15/sub103/item448.html.

Huang Xiang et al., (2010), "Environmental Impact of Mining Activities on the Surface Water Quality in Tibet: Gyama Valley", The *Science of the Total Environment,* 408 (19): 4177–4184.

Huber, Toni (2004), "Territorial Control by "Sealing *(rgya sdom-pa)*: A Religio-Political Practice in Tibet", ZAS 33.

_____and Poul Pedersen (1997), "Meteorological Knowledge and Environmental Ideas in Traditional and Modern Societies: The Case of Tibet", *The Journal of the Royal Anthropological Institute*, 3 (3): 577-97.

Hindustan Times (27 November 2014), "Chinese Dam Project Worries India", [Online: web] Accessed 29 September 2016, URL: http://www.hindustantimes.com/india/chinese-dam-project-worries-india/story-45Gn85OSe2VrsQbCFZ04qI.html.

ICT (2011), "Tibetan Environment", [Online: web] Accessed 20 March 2012, URL: http://www.savetibet.org/resource-center/all-about-tibet/tibetan-environment.

India Today (25 June 2001), "Made in China", [Online: web] Accessed 23 January 2015, URL: http://indiatoday.intoday.in/story/floods-ravage-himachal-and-arunachal-pradesh-satellite-pictures-suggest-china-hand/1/232112.html.

Indus Basin Working Group (2013), *Connecting the Drops: An Indus Basin Roadmap for Cross-Border Water Research, Data Sharing, and Policy Coordination*, New Delhi: Observer Research Foundation, Stimson Center, Sustainable Development Policy Institute.

International Commission on Large Dams, "Definition of a Large Dam", [Online: web] Accessed 20 May 2017, URL: http://www.icold-cigb.net/GB/dams/definition_of_a_large_dam.asp.

Intergovernmental Panel on Climate Change (IPCC) (2007), "Climate Change 2007: Working Group II: Impacts, Adaption and Vulnerability", [Online: web] Accessed 05 November 2014, URL: https://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch10s10-6.html.

_____(2014), *Climate Change 2014, Synthesis Report,* Geneva: IPCC.

International Rivers, "Three Gorges Dam", [Online: web] Accessed 21 April 2014, URL: https://www.internationalrivers.org/campaigns/three-gorges-dam.

International Energy Agency (2012), "World Energy Outlook 2012", [Online: web] Accessed 9 March 2015, URL: http://www.iea.org/publications/freepublications/publication/English.pdf.

International Centre for Integrated Mountain Development (ICIMOD) (2010), *Glacial Melt and Downstream Impacts on Indus Dependent Water Resources and Energy,* Kathmandu: ICIMOD.

International Organization of Migration (2011), "Glossary on Migration", *International Migration Law Series*, (25).

Institute for Defence Studies and Analyses (September 2013), *Water Security for India: The External Dynamics, IDSA Task Force Report,* New Delhi: IDSA.

Jackson, John (April 2012), "Earthquake Hazards and Large Dams in Western China: A Probe International Study", Probe International.

Jaffe, Aaron and Keith Schneider (01 March 2011), "A Dry and Anxious North Awaits China's Giant, Unproven Water Transfer Scheme", [Online: web] Accessed 17 July 2012, URL: http://www.circleofblue.org/waternews/2011/world/a-dry-and-anxious-north-awaits-china%E2%80%99s-giant-unproven-water-transport-scheme/.

Jessica, Marszalek (2007), "World's Dams are 'contributing to Global Warming", [Online: web] Accessed 11 June 2012, URL: http://www.news.com.au/top-stories/worlds-dams-are-contributing-to-global-warming/story-e6frfkp9-1111114339063.

Jacobs, Andrew (4 May 2013), "Plans to Harness Chinese Rivers Power Threaten a Region", [Online: web] Accessed 23 May 2016, URL: http://www.nytimes.com/2013/05/05/world/asia/plans-to-harness-chinas-nu-river-threaten-a-region.html.

Jha, Prem Shankar, "Why India and China should leave the Brahmaputra alone" in The Third Pole, "Brahmaputra: Towards Unity".

Jin, Hui-jun et al. (2008), "Changes in Permafrost Environments along the Qinghai-Tibet Engineering Corridor Induced by Anthropogenic Activities and Climate Warming", *Cold Regions Science and Technology*, 53: 317-33.

Johnson, Thomas (2009), "Extending Environmental Governance: China's Environmental State and Civil Society", Ph. D Thesis, Scotland: University of Glasgow.

Kohli, Lieutenant Colonel J S (January- March 2008), "Brahmaputra: Dam and Diversion", *Journal of the United Service Institution of India,* CXXXVIII (571): 1-4.

Kunmin, Zhang (2007), "Environmental Policies in China: Evolvement, Features and Evaluation", *China Population, Resources and Environment,* 17 (2): 1-7.

Lafitte, Gabriel (2011), "Copper and Gold Mining in Tibet: The Golden Vision of Tibet's Copper – Coloured Mountains in China's Central Plans", [Online: web] Accessed 23 June 2012, URL: http://rukor.org/copper-and-gold-mining-in-tibet/.

_____(2013), *Spoiling Tibet: China and Resource Nationalism on the Roof of the World*, London: Zedbooks.

Lai, Hongyi Harry (2002), "China's Western Development Program: Its Rationale, Implementation, and Prospects", *Modern China,* 28: 432-66.

Lewis, Charlton (2013), "China's Great Dam Boom: A Major Assault on Its Rivers", [Online: web] Accessed 03 May 2014, URL: http://e360.yale.edu/feature/chinas_great_dam_boom_an_assault_on_its_river_systems/2706/.

Levacher, Cecile (29 May 2014), "Climate Change in the Tibetan Plateau Region: Glacier Melt and Future Water Security", [Online: web] Accessed 20 August 2015, URL: http://www.futuredirections.org.au/publication/climate-change-in-the-tibetan-plateau-region-glacial-melt-and-future-water-security/.

Li, Fapeng et al. (2014), "The Impact of Climate Change on runoff in the Yarlung Tsangpo River basin in the Tibetan Plateau", *Stoch Environ Res Risk Assess,* (28): 515-526.

Li, Xiaofan (2006), "Environmental Concerns in China: Problems, Policies and Global Implications", *International Social Science Review*, 81 (1/2): 43-57.

Lin Xia et al. (2007), "The Effect of the Qinghai-Tibet Railway on the Migration of Tibetan Antelope Pantholops hodgsonii in Hon-xil National Nature Reserve, China," Oryx, 41 (3): 352-357.

Lin Li et al., (2010), "Evidence of Warming and Wetting Climate over the Qinghai-Tibet Plateau", *Arctic, Antarctic, and Alpine Research,* 42 (4): 449-457**.**

Limaye, Satu "The Middle Riparian's Quandaries: India and the Brahmaputra Basin", in Samaranayake et al., (May 2016), *Water Resource Competition in the Brahmaputra River Basin: China, India and Bangladesh*, Virginia: CNA.

Liu Yi- Hua et.al. (2005), "Status, Causes and Combating Suggestions of Sandy Desertification in Qinghai-Tibet Plateau", *Chinese Geographical Science*, 15 (4): 89-296.

Liu, Su "Risks of Intensified Development of Hydropower in Southwestern China", in Wilson Center, "China Environment Series 12: Special Water and Energy Issue, 2012/2013".

Liu, L. (2008) "Sustainability efforts in China: Reflections on the Environmental Kuznets curve through a locational evaluation of "eco-communities"", *Annals of the Association of American Geographers*, 98 (3): 604–629.

Lowe, Justin (December 1992), "China's Assault on Tibet's Environment", [Online: web] Accessed 17 November 2014, URL: http://multinationalmonitor.org/hyper/issues/1992/10/mm1092_08.html.

Luorong and Fan Yibing (2011), "A Study on Traditional Knowledge about Ecology and Environment From Tibetans in Kailash Sacred Landscape (KSL)" [Online: web] Accessed 20 July 2014, URL: http://www.tibetology.ac.cn/en/publications/latest-articles/5486-a-study-on-traditional-knowledge-about-ecology-and-environment-from-tibetans-in-kailash-sacred-landscapeksl?view=article&id=5486%3A

Ma, Jun (2004), *China's Water Crisis*, Connecticut: EastBridge.

Mahbub, Nabaat Tasnima (2012), "Environmental Protection in China: An Analysis and Assessment of Policy and Law", *Quarterly Journal of Chinese Studies*, 4 (4): 36-51.

Malthus, Thomas, "An Essay on the Principle of Population", [Online: web] Accessed 25 April 2012, URL: http://129.237.201.53/books/malthus/population/malthus.pdf.

Meyers, Charles J (1975), "An Introduction to Environmental Thoughts: Some Sources and Some Criticisms", *Indiana Law Journal,* 50 (3): 427-453.

Miller, Daniel J. (1999), "Nomads of the Tibetan Plateau in Western China. Part Two: Pastoral Production Practices", *Rangelands*, 21 (1): 16-9.

_____ (2009), "Why Tibet Matters Now (2)" [Online: web] Accessed 20 September 2013, URL: https://www.chinadialogue.net/article/show/single/en/2814-Why-Tibet-matters- now-2-.

_____ (December 1998), "Nomads of the Tibetan Plateau in Western China. Part One: Pastoral History", *Rangelands*, 20 (6): 24-29.

*Ministry of Water Resources, River Development & Ganga Rejuvenation: Government of India, "India- China Co-Operation", [Online: web] Accessed 22 September 2014, URL: http://www.wrmin.nic.in/forms/list.aspx?lid=349.

_____(2015), "Status of Memorandum of Understanding (MoU) signed with foreign countries in water sector", [Online: web] Accessed 28 May 2017, URL: http://wrmin.nic.in/writereaddata/MOU_ForeignCountries_Status.pdf.

*MEP (08 July 2015), "An Eco-protection Screen for China and beyond", [Online: web] Accessed 01 November 2015, URL: http://english.sepa.gov.cn/News_service/media_news/201507/t20150708_305089.htm.

_____ (2015), "Protecting Yangtze River at Source", [Online: web] Accessed 04 July 2015, URL:http://english.sepa.gov.cn/News_service/media_news/201506/t20150616_3 03838.htm.

_____ (1989), "Environmental Protection Law of the People's Republic of China" [Online: web] Accessed 23 March 2016, URL:http://english.sepa.gov.cn/Resources/laws/environmental_laws/200710/t20071009_109928.shtml.

_____"History", Accessed 30 June 2017, URL: http://english.sepa.gov.cn/About_SEPA/History/.

MEPa, "Leaders of MEP", Accessed 20 April 2017, URL: http://english.sepa.gov.cn/About_SEPA/leaders_of_mep/.

*Ministry of Water Resources, PRC (April 2015), "International Cooperation on Trans-boundary Rivers between China and its Neighbouring Countries", [Online: web] Accessed 28 May 2017, URL: file:///Users/lobsang/Desktop/Water%20cooperation%20PRC.pdf.

*Ministry of External Affairs (03 December 2015) "Q No. 52 Dam on Brahmaputra by China", [Online: Web] Accessed 03 May 2017, URL: http://mea.gov.in/rajyasabha.htm?dtl/26106/Q_NO52_DAM_ON_BRAHMAPUTRA_BY_CHINA

_____"Indus Water Treaty", [Online: web] Accessed 23 May 2017, URL: http://mea.gov.in/bilateral-documents.htm?dtl/6439/Indus.

Mol, Arthur P. J. and Neil T. Carter (April 2006), "China's Environmental Governance in Transition" *Environmental Politics*, 15 (2): 149-170.

McNally, Amy et al. (2009), "Hydropower and Sustainability: Resilience and Vulnerability in China's Powersheds", *Journal of Environmental Management, (*90): 5286-5293.

McNeil, Frank and Max G. Manwaring (2002), "Making Sense of Environmental Security", in Manwaring, Max G (ed.) (2002), *Environmental Security and Global Stability: Problems and Responses,* Maryland: Lexington Books.

New York Times (06 November 2012), "Protests over Large Projects", [Online: web] Accessed 23 June 2014, URL: http://www.nytimes.com/interactive/2012/11/06/business/Protests-Over-Large- Projects.htmL.

Norbu, Jamyang (2009), "Wildlife and Nature Conservancy in Old Tibet", [Online: web] Accessed 14 April 2014, URL: http://www.phayul.com/news/article.aspx?id=26164

Norbu, Tenzin (2011), "The Significance of the Tibetan Plateau", [Online: web] Accessed 21 December 2014, URL: http://tibet.net/wp-content/uploads/2013/05/5.-2011-FNVA.pdf

_____ (2012), "A Cultural Endangered: Depopulating the Grasslands of the Tibetan Plateau", [Online: web] Accessed 13 July 2012 URL: http://www.hrichina.org/crf/article/6136.

_____ (2011a), "Climate Change in Tibet and Asia", [Online: web] Accessed 23 June 2015, URL: http://tibet.net/wp-content/uploads/2013/05/4-2011-VIF-Paper.pdf.

Nyima, Yunden (2012), "From "Retire livestock, Restore Rangeland" to the Compensation for Ecological Services: State Interventions into Rangeland Ecosystems and Pastoralism in Tibet", Ph.D. Thesis, Colorado: University of Colorado.

Organisation for Economic Co-Operation and Development (OECD) (2006), "Environmental Compliance and Enforcement in China: An Assessment of Current Practices and Ways Forward", [Online: web] Accessed 20 May 2017, URL: https://www.oecd.org/env/outreach/37867511.pdf.

Palden, Sultrim Dekhang (1996), "Forestry in Tibet: Problems and Solutions", [Online: web] Accessed 08 October 2013, URL: http://www.tew.org/background/forestry.html.

Pan Yue (17 July 2007), "Green China and Young China (Part I)", [Online: web] Accessed 11 Jul 2012, URL:

http://www.chinadialogue.net/article/show/single/ch/1167-Green-China-and-young-China-part-one-

*People's Daily (1988), "The Central Leadership must have Authority", [Online: web] Accessed 20 May 2012, URL: http://english.peopledaily.com.cn/dengxp/vol3/text/c1910.html.

_____ (2000), "Five Billion to Renovate 20 Airports in China's West", [Online: web] Accessed 12 April 2012, URL: english.people.com.cn/english/200005/18/eng20000518_41112.html.

_____ (September 1988), "The Central Leadership Must have Authority", [Online: web] Accessed May 2012, URL: http ://english.p eop ledaily.co m.c n/de ngxp / vol3 /text/c1910. html.

Pong, David (ed.) (2009), *Encyclopaedia of Modern China*, New York: Charles Scribner's Sons.

Ptackova, Jarmila "Sedentarisation of Tibetan Nomads in China: Implementation of the Nomadic settlement project in the Tibetan Amdo area; Qinghai and Sichuan Provinces", *Ptackova Pastoralism: Research*, Policy and Practice, 2011: 1-4

Wang Qiao and Pei Xiaofei (2004), "Study of Ecological Impact of Environmental Policy in China's Western Development: A Case Study of Converting the Land for Forestry and Pasture", Geoinformatics, Proceeding of 12th International Conference on Geoinformatics- Geospatial Information Research: Bridging the Pacific and Atlantic University of Gavle, Sweden, 7-9 June 2004.

Wu, Qingbai et al. (2007), "Responses of Permafrost on the Qinghai-Tibet Plateau, China, to Climate Change and Engineering Construction", *Arctic, Antarctic, and Alpine Research*, 39 (4): 682-87.

Randall, Alex (2013), "Climate Change Driving Migration into China's Vulnerable Cities", [Online: web] Accessed 23 December 2016, URL: https://www.chinadialogue.net/article/show/single/en/6113-Climate-change-driving-migration-into-China-s-vulnerable-cities.

Ren, Xin (2013), "Implementation on Environmental Impact Assessment in China", Journal of Environmental Assessment Policy and Management, 15 (3).

Richter et al., (2010), "Lost in Development's Shadow: The Downstream Human Consequences of Dams", *Water Alternatives,* 3 (2): 14-42.

Reuters (2014), "China to 'Declare War' on Pollution, Premier Says", 5 March [Online: web] Accessed 14 September 2016, URL: http://www.reuters.com/article/us-china-parliament-pollution-idUSBREA2405W20140305.

Richard, Camille (2000), "The Potential for Rangeland Development in Yak Rearing Areas of the Tibetan Plateau", [Online: web] Accessed 9 April 2013, URL: http://www.eldis.org/fulltext/yakcongress.pdf.

Samphel, Thubten (2014), "Self-Immolation", [Online: web] Accessed 03 March 2015, URL: http://www.huffingtonpost.com/thubten-samphel/self-immolation-tibet-china_b_4537565.html.

Schneider, Keith and C.T. Pope (2008), "China, Tibet, and the Strategic Power of Water", [Online: web] Accessed 23 May 2012, URL: http://www.circleofblue.org/waternews/2008/world/china-tibet-and-the-strategic-power-of-water/.

Schmeier, Sussane (2014), "Opening the black box of basin organisations: in Grafton, R. Quentin et al., "Global Water: Issues and Insights", Canberra: Australian National University Press.

Shapiro, Judith (2012), *China's Environmental Challenges*, Cambridge, UK: Polity Press.

Sinha, Uttam Kumar (2012), "Examining China's Hydro-Behaviour: Peaceful or Assertive?", *Strategic Analysis,* 36 (1): 41-56.

Singh, Rocking Th (2011), *India's Water Relations with Her Neighbours*, New Delhi: Vij Books India Private Limited.

*State Council (2003), "White Paper on Ecological Improvement and Environmental Protection in Tibet", [Online: web] Accessed 21 July 2013, URL: http://en.people.cn/whitepaper/tbpaper/tb.html.

_____ (2008), "China's Policies and Actions for Addressing Climate Change", [Online: web] Accessed 01 January 2014 URL: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File419.pdf.

_____ (2011), "Sixty Years since Peaceful Liberation of Tibet" [Online: web] Accessed 26 July 2012, URL: http://no.chineseembassy.org/eng/zyxw/t841187.htm

_____ (2001), "Tibet's March toward Modernization", [Online: web] Accessed 20 December 2010, URL:http://china.org.cn/e- white/20011108/index.htm

_____ (2009), "Fifty Years of Democratic Reform in Tibet", [Online: web] Accessed 20 January 2013, URL: http://news.xinhuanet.com/english/2009-03/02/content_10928003.htm

_____ (2013), "Development and Progress of Tibet", [Online: web] Accessed 21 December 2013, URL: http://news.xinhuanet.com/english/china/2013-10/22/c_132819442.htm

_____ (2015), "Tibet's Path of Development Is Driven by an Irresistible Historical Tide" [Online: web] Accessed 20 July 2015, URL: http://news.xinhuanet.com/english/china/2015-04/15/c_134152612_2.htm

_____ (May 2004), "Regional Ethnic Autonomy in Tibet" [Online: web] Accessed 27 July 2011, URL: http://english.gov.cn/official/2005-07/28/content_18017.htm
Accessed 11 October 2013, URL: http://chinatibet.people.com.cn/6922559.html.

_____ (2011), "Tibet's March towards Modernisation", [Online: web] Accessed 26 July 2011, URL: http://english.gov.cn/official/2005-07/27/content_17564.html.

Subramanian, Nirupama (2013), "China will be more Transparent on Trans- border River Projects" [Online: web] Accessed 25 September 2014, URL: http://www.thehindu.com/todays-paper/tp-national/china-will-be-more-transparent-on-transborder-river-projects/article5266620.ece.

Sun, Yixian (2016), "The Changing Role of China in Global Environmental Governance", *Rising Powers Quarterly*, 1 (1): 43-53.

Swain, Ashok (15 March 2017), "Expand the Indus Waters Treaty to make Peace", [Online: web] Accessed 20 March 2017, URL: https://www.thethirdpole.net/2017/03/15/expand-the-indus-waters-treaty-to-make-peace/.

The Telegraph (25 November 2014), "Protests in Assam on Dam in China: Project on Brahmaputra ruffles feathers", [Online: web] Accessed 02 January 2016, URL: https://www.telegraphindia.com/1141125/jsp/frontpage/story_19082164.jsp.

The Economic Times (2014), "India Agrees deal with China for Flood Data on Brahmaputra", [Online: web] Accessed 03 May 2014, URL: http://articles.economictimes.indiatimes.com/2014-07-01/news/51002830_1_flood-forecasting-nugesha-yarlung-zangbo.

The 2030 Water Resources Group (2009), "Charting Our Water Future: Economic Frameworks to Inform Decision-Making", The Report.

The Guardian (2014), "China Strengthens Environmental Law", [Online: web] Accessed 29 December 2016, URL: https://www.theguardian.com/environment/2014/apr/25/china-strengthens-environmental-laws-polluting-factories.

The World Bank and SEPA (PRC) (2007), *Cost of Pollution in China: Economic Estimates of Physical Damages,* Washington, D.C: The World Bank.

Tibet Watch (2015), *Environmental Protests on the Tibetan Plateau: Tibet Watch Thematic Report,* London: Tibet Watch.

Tibet.news.cn (2010), "Tibet Meets Comfortable Housing Project Goal Ahead of Schedule", [Online: web] Accessed 12 July 2012, URL: http://tibet.news.cn/english/2010-01/14/c_13135865.htm.

Tibetan Plateau (2009), "Dams on Yarlung Tsangpo (Brahmaputra): More Info", [Online: web] Accessed 20 October 2013, URL:http://tibetanplateau.blogspot.in/2009/10/dams-on-yarlung-tsangpo-brahmaputra.html.

_____ (2010), "Damming Tibet's Yarlung Tsangpo-Brahmaputra and other South Asian Rivers", [Online: web] Accessed 23 November 2013, URL: http://tibetanplateau.blogspot.in/2010/05/damming-tibets-yarlung-tsangpo.html.

Tibetan Review (2009), "Gyama Tibetans Continue Protest! Poisoning from Mine", [Online: web] Accessed 12 August 2013, URL: http://www.tibetanreview.net/news.php?cp=33&&id=4103.

_____(2010), "4 killed, 30 Injured in Firing on Anti-Mining Tibetan Petitioners", [Online: web] Accessed 3 May 2012, URL: http://www.tibetanreview.net/news.php?id=7037&search_url=%2Fsearch.php%3Fq%3Dmining%26search_mode%3De%26cp%3D5%26.

_____ (2010), "Dams, Mining, Deforestation caused Drugchu landslide", [Online: web] Accessed 3 December 2011, URL:http://www.tibetanreview.net/news.php?id=6881&search_url=%2Fsearch.php%3Fq%3Dmining%26search_mode%3De%26cp%3D6%26.

_____ (2011), "Around 50 Held for Mine Protests in Dzogang Country, Tibet", [Online: web], Accessed 3 May 2012, URL: http://www.tibetanreview.net/news.php?id=9352&search_url=%2Fsearch.php%3Fq%3Dmining%26cp%3D2%26.

_____ (2012), "Monks Jailed in Shigatse for Protesting against Rampant Mining", [Online: web] Accessed 12 June 2012, URL:

http://www.tibetanreview.net/news.php?id=10417&search_url=%2Fsearch.php%3Fq%3Dmining%26.

Tsering, Tashi (2012), "A New Course for the Brahmaputra" [Online: web] Accessed 10 July 2014, URL: http://www.thethirdpole.net/a-new-course-for-the-brahmaputra/.

Tsering, Bhuchung K. (2009), "An Analysis of Environment and Development Issues in Tibet", [Online: web] Accessed 10 April 2015, URL: http://tibetreport.wordpress.com/2009/01/16/tibetan-environment-in-new-york/.

Turner, Jennifer L. (July 2013), "China's Upstream Advantage in the Great Himalayan Watershed", *Asia Policy,* No. 16: 11-18.

*UNEP (2016), "Green is Gold: The Strategy and Actions of China's Ecological Civilization", [Online: web] Accessed 23 March 2017, URL: https://www.unep.org/greeneconomy/sites/unep.org.greeneconomy/files/publications/greenisgold_en_20160519.pdf.

*United Nations Development Programme: Wildlife Conservation Society (2007), "Biodiversity Conservation and Sustainable Natural Resource Use in the Chang Tang Region of Tibet", [Online: web] Accessed 5 May 2012, URL: URL: http://www.undp.org.cn/showproject%5Cproject.php?projectid=00057531

VOA- Tibetan (2013), "90 Percent of Tibetans will be Relocated by the End of This Year", [Online: web] Accessed 03 September 2013, URL: http://www.voatibetanenglish.com/archive/tibet-in-review/latest/2656/2799.html.

Wang et al., (2010), "China's largest scale ecological Migration in the Three-River Headwater Region", *Ambio*, 39: 443-446.

Wang Yan "China-India Water Cooperation Tough without Border Resolution" in The Third Pole, "Brahmaputra: Towards Unity".

Wang Jun (2009), "In Defense of Ecological Security", [Online: web] Accessed 13 March 2016, URL: http://www.bjreview.com/quotes/txt/2009-09/02/content_214497.htm.

Wang Yi (Spring 2006), "China's Environmental and Developmental Issues in Transition", *Social Research,* 73 (1): 277-92.

Wang, Lijun (2010), "The Changes of China's Environmental Policies in the last 30 years", *Procedia Environmental Sciences*, (2): 1206-1212.

Wenger, Robert B et al. (1990), "Environmental Impact Assessment in the People's Republic of China", *Environmental Management*, 14 (4): 429-39.

Woeser, Tsering (2016), "Why are Tibetans Setting Themselves on Fire?" [Online: web] Accessed 23 January 2017, URL: http:// http://www.nybooks.com/daily/2016/01/11/why-are-tibetans-self-immolating/.

_____(2011), "Do Tibetans Benefit from "Comfortable Housing"?", [Online: web] Accessed 03 November 2011, URL: http://www.highpeakspureearth.com/2011/05/do-tibetans-benefit-from-comfortable.html.

*WFF, "Tibetan Antelope", [Online: web] Accessed 13 January 2016, URL:http://wwf.panda.org/what_we_do/endangered_species/tibetan_antelope/.

Winkler, Daniel (1995), "Deforestation in Eastern Tibet: Human Impact-Past and Present" [Online: web] Accessed 9 October 2013, URL: http://mushroaming.com/Deforestation_1998.

Wirsing, Robert G. (2014), "The Brahmaputra: Water Hotspot in Himalayan Asia" in Grafton, R. Quentin et al., "Global Water: Issues and Insights", Australian National University Press: Canberra.

_____(2013), "Melting the Geopolitical Ice in South Asia", *Asia Policy,* (16): 19-25.

*World Commission on Dams (2000), "Dams and Development: A new Framework for Decision-Making", Report of the World Commission on Dams. London: Earthscan.

Wuthnow, Joel, "Water Power, Water Worries: China's Goals and Challenges as the Brahmaputra's Uppermost Riparian", in Samaranayake et al., (May 2016), *Water Resource Competition in the Brahmaputra River Basin: China, India and Bangladesh*, Virginia: CNA.

Wu, Jing et al. (2005), "Requirements for Strategic Environmental Assessment in China", *Journal of Environmental Assessment Policy and Management,* 7 (1): 81-97.

Wu, Changhua et al. (1999), "Water Pollution and Human Health in China", *Environmental Health Perspectives*, 107 (4): 251-256.

World Commission on Environment and Development (1987), "Report of the World Commission on Environment and Development: Our Common Future", [Online: web] Accessed 24 April 2015, URL: http://www.un-documents.net/wced-ocf.htm.

*Xinhua (2012), "China Exclusive: Desertification Threatens World's Highest Railway", [Online: web] Accessed 11 October 2013, URL: http://english.cas.cn/ST/BR/br_rp/200909/t20090914_37775.shtml.

_____(2012a), "Desertification Threatens World's Highest Railway", [Online: web] Accessed 01 August 2014, URL: http://www.chinadaily.com.cn/china/2012-07/30/content_15632854.htm.

_____(September 29, 2015), "SPP to Promote Environmental Protection, Law Enforcement in Tibet", [Online: web] Accessed 30 September 2015, URL: http://news.xinhuanet.com/english/2015/09/29/c_134672546.htm.

_____(24 November 2014), "Tibet's largest hydropower station become partly operational", [Online: web] Accessed 02 January 2016, URL: http://news.xinhuanet.com/english/photo/2014-11/23/c_133808455_5.htm.

_____(23 November 2014a), "Major hydroplant goes operational in power-thirst Tibet", [Online: web] Accessed 23 December 2016, URL: http://news.xinhuanet.com/english/china/2014-11/23/c_133808253.htm.

Yang Mu and Teng Siow Song, "China's Looming Water Crisis: Is Beijing Struggling to Overcome It?", in Zhao Litao and Lim Tin Seng (eds.) (2010), "China's New Social Policy: Initiatives for a Harmonious Society", London: World Scientific Publishing Co. Pte. Ltd.

Yang Yong (2014), "World's Largest Hydropower Project Planned for Tibetan Plateau", [Online: web] Accessed 23 May 2014, URL: https://www.chinadialogue.net/article/show/single/en/6781-World-s-largest-hydropower-project-planned-for-Tibetan-Plateau.

Yang, Meixue et al. (2004), "Desertification and Its Relationship with Permafrost Degradation in Qinghai-Xinzang (Tibet) Plateau", *Cold Regions Science and Technology*, 39: 47-53.

Yao, Tandong at al. (2007), "Recent Glacial Retreat and Its Impact on Hydrological Processes on the Tibetan Plateau, China, and Surrounding Regions", *Arctic, Antarctic, and Apline Research,* 39 (4): 642-650.

Yeh, Emily T. (2003), "Taming the Tibetan Landscape: Chinese Development and Transformation of Agriculture", Doctoral Dissertation, California: University of California.

_____(2005), "Green Governmentality and Pastoralism in Western China: Converting Pastures to Grasslands", *Nomadic Peoples,* 9 (1&2).

_____(2009), " Greening Western China", *Geoforum*, 40: 884-894.

_____(2010), "Restoring the Grasslands?", [Online: web] Accessed 26 January 2013, URL: https://www.chinadialogue.net/article/show/single/en/3470-restoring-the-grasslands.

Chen Yunnan (2014), "Dam Building in Tibet Increasing Earthquake Risks", [Online: web] Accessed 01 March 2014, URL: http://www.thethirdpole.net/earthquakes-risks-rise-in-tibet/.

Luorong Zhandui and Fan Yibing (2011), "A Study on Traditional Knowledge about Ecology and Environment from Tibetans in Kailash Sacred Landscape", *China Tibetology*, (1): 63-81.

Zhang Ke (2011), "Diversion Debate", [Online: web] Accessed 10 June 2013, URL: https://www.chinadialogue.net/article/show/single/en/4349.

Zhang, Zhenguo (2008), "Ecotourism and Nature-Reserve Sustainability in Environmental Fragile Poor Areas: The Case of the Ordos Relict Gull Reserve in China", *Sustainability: Science, Practice and Policy,* 4: 12-22.

Zhang, Xiaoming (2004), *China's Tibet,* Beijing: China Intercontinental Press.

Zhao, Yuhong (2010), "Public Participation in China's EIA Regime: Rhetoric or Reality?", *Journal of Environmental Law*, 22 (1): 89-123.

Zhen, Yongnian and Minjia Chen (2007), "China's Regional Disparity and Its Policy Responses", *China Policy Institute*, (25): 1-12.

Zissis, Carin and Jayshree Bajoria (2008), "China's Environmental Crisis", [Online: web] Accessed 04 June 2012, URL: http://www.cfr.org/china /china's - environmental-crisis/p1.

Annexure

(Annexure: 1) Name of the Rivers

Tibetan Name	**English/Chinese Name**
Bumchu	Arun River
Gyalmo	Ngulchu Salween River
Langchen Khabab	Sutlej River
Macha Khabab	Karnali River
Machu	Yellow River, Huangho
Sengey Khabab	Indus River
Yarlung Tsangpo	Brahmaputra River
Zachu	Mekong River
Drichu	Yangtse River
Jomolangma	Mount Everest
Gang Rinpoche	Mount Kailash
Mapham Yutso	Manasarovar Lake
Yamdrok Yutso	Turquoise Lake
Trishor Gyalmo	Kononor Lake

(Annexure: 2) Departments of Ministry of Environmental Protection, PRC

Department	Responsibility
General Office	Responsible for the overall coordination of and supervision and inspection on the administration by the internal departments
Department of Planning and Finance	Responsible for dividing environmental zones, making plans and programs and building basic capacity on environmental protection.
Department of Policies, Laws and Regulations	Responsible for establishing and improving environmental laws, administrative regulations, and economic policies
Department of Human Resources Management and Institutional Arrangement	Responsible for building the ranks of cadres and talents as well as the institutional restructuring, improving the institutional systems and mechanisms, and enhancing the overall capacity
Department of Science, Technology and Standards	Responsible for environmental scientific and technological development and advances; organize the formulation of policies, programs and plans for environmental science and technology
Department of Environmental Impact Assessment	Responsible for preventing and controlling the environmental pollution and ecological damages at the sources
Department of Environmental Monitoring	Responsible for the administration on environmental monitoring and the sharing of environmental information such as environmental quality and ecological conditions
Department of Water Environmental Management	Responsible for the supervision and administration on pollution prevention and control and the analysis of environmental situation
Department of Air Environmental Management	Responsible for monitoring air condition in China
Department of Nature and Ecology Conservation	Responsible for guiding, coordinating and supervising the ecological conservation work

Department of International Cooperation	Work as the focal point to administer international cooperation and communications in the environment field and unify the foreign contacts, and safeguard the environmental rights and interests of China
Department of Publicity and Communication	Responsible for organizing, guiding and coordinating national education and publicity work on environmental protection, and promote the building of conservation culture
The CPC Committee of the Department directly under MEP	Responsible for the Party affairs of MEP Organ, for leading its Beijng-based regional administrative and affiliated institutions in their Party affairs, and for building a harmonious department
Bureau of Environmental Supervision and Inspection	Responsible for the overall arrangement and coordination of major environmental issues and the supervision on law enforcement

(Source: MEP a)

(Annexure: 3) White Papers on Tibet

Years	Title
1992	Tibet: Its Ownership and Human Rights Situation
1998	New Progress in Human Rights in the Tibet Autonomous Region
2000	The Development of Tibetan Culture
2001	Tibet's March Toward Modernization
2003	Ecological Improvement and Environmental Protection in Tibet
2004	Regional Ethnic Autonomy in Tibet
2008	Protection and Development of Tibetan Culture
2009	Report on the Economic and Social Development of Tibet
2009	Fifty Years of Democratic Reform in Tibet
2011	Sixty years Since Peaceful Liberation of Tibet
2013	Development and Progress of Tibet
2015	Successful Practice of Regional Ethnic Autonomy in Tibet

(Source: China.org.cn)