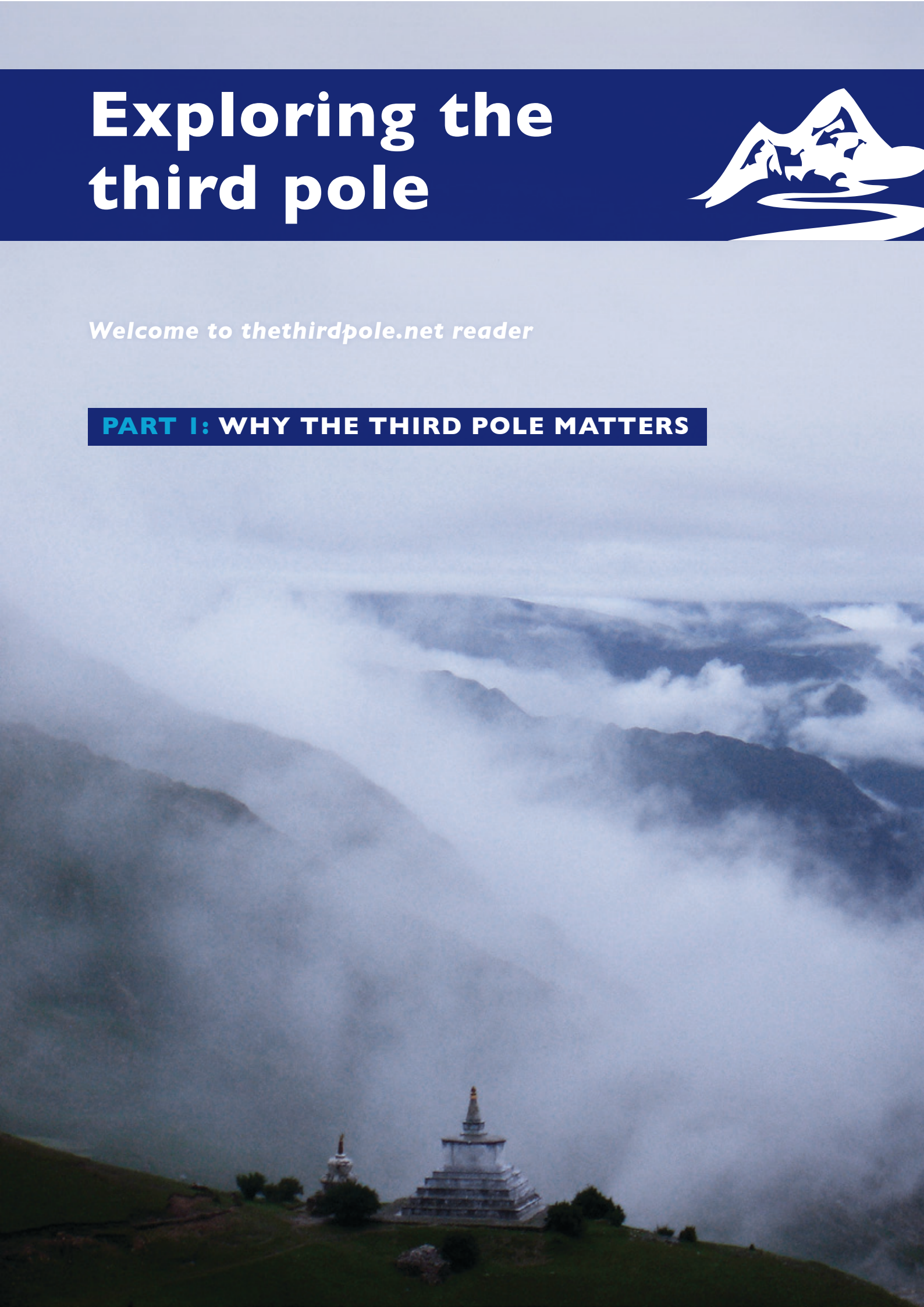
Exploring the third pole

Welcome to thethirdpole.net reader

PART I: WHY THE THIRD POLE MATTERS



Exploring the third pole
Editor's note

Welcome to thethirdpole.net reader

Since its launch in 2009, thethirdpole.net has provided a unique platform for information, reporting and discussion on the ecology, environment and climate of the Hindu Kush-Himalayas, the Qinghai-Tibet Plateau and the rivers that originate there. We aim to facilitate the free flow of accurate information and analysis and thereby support well informed policymaking in this region. Good governance is crucial to protecting ecosystems on which around 1.3 billion people depend directly or indirectly for their food, water and other vital services.

Using thethirdpole.net's unique reach across the region, we have been able to publish articles by journalists and experts from the various countries that share the benefits and risks of the world's highest mountain range and plateau, from Tibet to Bangladesh. Recognising the continued and pressing need for a regional perspective in a part of the world where access to accurate information is problematic, we are launching the first of a series of thethirdpole.net readers. These special publications will offer invaluable background material to policymakers, academics and other stakeholders.

Important articles are classified by theme and this reader is free to download. We hope that you find it useful and we encourage you to circulate the link. Please also help us to improve and develop this resource by sending your comments and feedback to joydeep.gupta@thethirdpole.net or beth.walker@thethirdpole.net.

Isabel Hilton and thethirdpole.net editorial team

June, 2012

Part 1: Why the third pole matters

The region that encompasses the Himalaya-Hindu Kush mountain range and the Tibetan Plateau is widely known as the third pole, because its ice fields contain the largest reserve of fresh water outside the Polar Regions. It is also called the water tower of Asia because it gives birth to 10 major rivers that sustain around two billion people, spread over much of the continent. The region is now under serious threat from climate change, deforestation and ill-planned projects.

In this section, Daniel J Miller explains the global environmental significance of the region. Edward Grumbine and Xu Jianchu warn that climate change may lead to unpredictable and dangerous consequences for water systems, biodiversity and human livelihoods. And Hashi Tashidorjee, through his photos, shows how global warming and economic development are already altering landscapes and lives on the Tibetan Plateau.

Cover image shows low clouds in east Tibet by Joe Orton

Why the third pole matters
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March 05, 2009

Why Tibet matters now

Few places are as globally important as the Tibetan Plateau, writes Daniel J Miller. Understanding this means looking at the region from a holistic, ecological standpoint.

From a global environmental perspective, few places in the world are as important as Tibet. Rising concerns about global warming, climate change, receding glaciers, desertification, food insecurity and loss of biodiversity all point to the significance of Tibet. Tackling these important issues requires greatly increased scientific research in Tibetan areas and improved understanding of current land use practices, especially of agriculture, forestry and livestock grazing. Critical examination of existing environmental conservation and economic development policies and new thinking on how we view the Tibetan landscape are required.

In this article, I use the term "Tibetan Plateau" to refer to a unique geographical area of Asia; a landscape not marked by lines drawn on a map, but defined by topography. It is a region with particular geological, ecological and socio-cultural characteristics. Tackling global environmental challenges in the twenty-first century demands that we view the Tibetan Plateau holistically to understand its unique ecology, its natural resources and illustrious cultural heritage.

Encompassing an area of about 2.5 million square kilometres, or about one-third the area of the continental United States, the Tibetan Plateau is the largest and highest region on Earth. With an average elevation of 4,500 metres above sea level, the Tibetan Plateau stretches for almost 3,000 kilometres from west to east and 1,500 kilometres from south to north. The Plateau is ringed by high mountains – the Himalayas to the south, the Karakorum in the west and the Kunlun across the north. The Tibetan Plateau goes beyond political frontiers and encompasses much of the higher elevation Himalayan regions in Pakistan, India, Nepal and Bhutan as well as all of the Tibetan Autonomous Region, Qinghai, western Sichuan, northern Yunnan, western Gansu and southern Xinjiang Uyghur Autonomous Region in China.

> *Unhindered by the clutter of political boundaries, the land is defined by watersheds, by mountain ranges and large lakes; the natural demarcations of an environment.*

I have a plastic, raised-relief map of China in which the Tibetan Plateau and adjoining mountain ranges stand out clearly. It depicts the vast area encompassed by the plateau and the abrupt uplift of the Himalaya rising from the plains of northern India. Looking at this map you can see how the Tibetan Plateau dominates the geography of Asia.

Photographs taken by astronauts at heights of 200 to 400 kilometres above the earth also provide an out-of-the-ordinary observation of the Tibetan Plateau. Unhindered by the clutter of political boundaries, the land is defined by watersheds, by mountain ranges and large lakes; the natural demarcations of an environment.

These views from space provide a perspective that helps one to think globally and to see the landscape in

its entirety. Environmental conservation strategies for the Tibetan Plateau need to encompass a broad scale and implement programs at the level at which natural systems operate. This landscape level of attention ensures persistence of populations and ecological processes and has to work across political boundaries. Man-made lines on a map do not stop a river from flowing downhill nor do they prevent black-necked cranes from migrating or Tibetan argali and Tibetan wild ass from crossing international borders in search of forage. Birds and animals travel across the earth and we need to adopt a similar style in how we perceive landscapes.

The American poet Gary Snyder wrote, "Now, with insights from the ecological sciences, we know that we must think on a scale of a whole watershed, a natural system. A habitat. To save the life of a single parrot or monkey is truly admirable. But unless the forest is saved, they will all die." Saving the Tibetan Plateau requires an approach that recognises watersheds to define plans of action for conservation and development. It also requires acceptance of the complex nature of the Tibetan landscape, not only in the physical forces that shape it, but also in the interaction of socio-economic and institutional forces that impact the nomads and farmers who use the natural resources.

The Tibetan Plateau plays an important role in global climate change. With its extensive alpine grasslands that store carbon in their plants and soil, the Plateau is a significant carbon pool. The carbon stored in the grassland ecosystem is important to regional and global carbon cycles; it has the potential to modify global carbon cycles and influence climate. What takes place in the Tibetan grasslands therefore should be of increasing importance to a world more and more concerned about climate change.

With thousands of glaciers scattered across the Plateau and the Himalayas, the region has the most snow and ice outside of the polar regions. The glacier-fed rivers originating from the Tibetan Plateau make up the largest river run-off from any single location in the world. With global warming, the total area of glaciers on the Tibetan Plateau is expected to shrink by 80% by the year 2030. The loss of these glaciers will dramatically affect major rivers that provide water for more than one-third of the world's population. The effect of glaciers receding will be felt well beyond the borders of the Tibetan Plateau, with profound impacts over a wide area in Asia and great risks of increased poverty, reduced trade and economic turmoil. This presents major political, environmental and socio-economic challenges in the years ahead.

The Tibetan Plateau forms the headwaters environment where the Yellow, Yangtze, Mekong, Salween, Brahmaputra, Ganges, Sutlej and Indus rivers originate. In addition, rivers from the northern edge of the Tibetan Plateau flow into the Tarim Basin and the Gansu Corridor, providing precious water for the oasis towns along the old Silk Road. The management of these river source environments has global implications, as the water from their watersheds will be of increasing importance in the future. The water they provide is critical to the survival of millions of people downstream. The recent floods in the Indian states of Bihar and Assam draw attention to the critical role of the Tibetan environment in regulating water flow to downstream areas. How many people realise that the Kosi River, which recently flooded and displaced millions of people in the northern Indian state of Bihar, actually has its origins on the north side of Mount Everest? Or that almost 60% of the total length of the 2,906 kilometre-long Brahmaputra River that floods India and Bangladesh every year is located in Tibet? Simply for the water that it provides, the Tibetan Plateau demands greater attention.

Protecting biodiversity on the Tibetan Plateau

A number of biodiversity "hotspots" are located on the Tibetan Plateau. With their highly distinctive species, ecological processes and evolutionary phenomena, these areas are some of the most important areas on earth for conserving biodiversity. The Tibetan Plateau

is one of the most ecologically diverse landscapes on earth. It includes the most intact example of mountain rangelands in Asia with a relatively intact vertebrate fauna, and is one of the largest remaining terrestrial wilderness regions left in the world. The area is home to numerous rare and endangered wildlife species such as the wild yak, Tibetan wild ass, or kiang, the migratory Tibetan antelope, or chiru, Tibetan argali and snow leopard. Conserving these animals and their habitat is an important priority for the global conservation community.

George Schaller, the renowned field biologist who has spent decades working to conserve the wildlife of the Tibetan Plateau and adjoining Himalayan regions, wrote of the vast rangelands of the northern Tibetan landscape, "The beauty of these steppes and peaks will persist, but without wildlife they will be empty and the Tibetans will have lost part of their natural and cultural heritage. To bequeath the Chang Tang [the Tibetan word for the extensive steppes of the northern Tibetan Plateau] far into the next millennium will require a never-ending moral vigilance, a passion to understand the ecology, and a deep commitment to a harmonious coexistence between the nomads with their livestock and the wildlife. Without such dedication there will ultimately be a desert where only howling winds break a deadly silence."

Schaller's exhortation for heightened devotion to conserving the Tibetan ecosystem should be taken as a wake-up call for everyone interested in Tibet.

The Tibetan antelope, perhaps more than any other animal, embodies the expanse of the Chang Tang ecosystem. The chiru is a migratory animal and needs a vast landscape in which to travel between its winter ranges and birthing grounds. They cover distances of up to 400 kilometres, across the steppes and over mountains on their seasonal migrations. In 1994, I attempted to follow the chiru's migration across the Chang Tang, to their birthing grounds on the northern edge of the plateau. Observing herds of hundreds of female chiru, with their female young

of the previous year, travelling on ancient paths as they have for thousands of years is to bear witness to one of the earth's outstanding ecological spectacles. Understanding chiru migratory movements could provide valuable insight into the structure and function of the Tibetan Plateau ecosystem and assist in efforts to protect biodiversity.

> *"The wild yak is an indicator species; its presence reveals a special place – a sacred space. With wild yaks roaming the landscape, an ecosystem is still intact."*

The continuation of Tibetan antelope migration, one of the last great natural marvels on earth, depends on better protection of the species, improved understanding of their ecology and better insights into the dynamics of the Tibetan Plateau ecosystem. It also requires innovative approaches to conservation and pastoral development that adopt participatory, integrated ecosystem management models that work at the landscape level.

If the antelope embodies the expanse, the wild yak characterises the elemental wild nature of the Chang Tang. I made a number of excursions to the Tibetan Plateau to conduct research on wild yaks. Standing almost two metres high at the shoulders, weighing up to a tonne and with horns a metre long, wild yaks are magnificent creatures. The wild yak is an indicator species; its presence reveals a special place – a sacred

space. With wild yaks roaming the landscape, an ecosystem is still intact. If the land can provide habitat for wild yaks, many of the other species of Tibetan wildlife will be there as well.

The wild animal most commonly seen by travelers today in Tibet is the kiang. Galloping across the steppes, their russet and cream-colored bodies contrasting with the golden hue of the grasslands, kiang suggest a sense of unbridled freedom. The remote, northwestern part of the Tibetan Plateau offer notable examples of rangeland ecosystems relatively unchanged by humans and provide the untrammelled space for large herds of kiang to still run wild across the steppes. Wildlife conservation efforts have succeeded in protecting kiang, and their numbers have increased in many areas to the point where nomads now complain that large herds compete with their livestock for grazing.

As a rangeland ecologist, grasses and the interactions between vegetation and the animals – both wild and domestic – interest me. In my numerous journeys on the Tibetan Plateau I have endeavored to understand the ecology of the rangelands. Why are distinctive plant communities found in certain areas? What species of plants dominate these plant communities? What grasses are grazed by livestock? Do wild ungulates eat the same plants? Why are wildlife found in certain locations and not in others? Is there really competition for forage between kiang and livestock? These are questions I asked myself as I walked across the landscape, my eyes trying to pick out patterns on the ground. To the untrained eye that is unable to distinguish one plant from another, Tibetan rangelands, especially in the vast northern steppes, can appear boring and lifeless, particularly when majestic mountains dominate the horizon. But it is the diversity in plant species and mix of plant communities on the rangelands that influences the grazing patterns of livestock and the behaviour of wildlife. And it is this remarkable variation in vegetation on the steppe and the ecological dynamics of the Tibetan Plateau ecosystem that needs to be understood in order to sustain the natural resources for future generations.

Daniel J Miller is a rangeland ecologist and agricultural development specialist with over 15 years professional experience in agricultural development, natural resource management and biodiversity conservation in Asia. He has worked in Bhutan, China, Mongolia, Nepal and Pakistan and has traveled widely throughout South and South-east Asia. He speaks Nepalese, Tibetan and some Chinese.

Images by Daniel J Miller

June 05, 2009

Cascading effects at the third pole

Climate change may lead to unpredictable and dangerous consequences for water systems, biodiversity and human livelihoods across the Himalayas. Ed Grumbine and Xu Jianchu ask how such risks can be addressed.

Published reports about the likely consequences of climate change across the Greater Himalayas (including the Qinghai-Tibetan Plateau) reveal broad agreement that warming in the region will lead to long-term:

- Loss of glacial ice with a corresponding reduction in water availability;
- Increasing incidents of natural disasters such as flooding and glacial lake outburst floods;
- Greater environmental and social risks to both upstream and downstream human communities.

Studies of climate change across the Greater Himalayas portray a very uncertain future, yet governments of countries in the region have been slow to begin planning for climate adaptations. There are still many information gaps, and data that do exist are complex and often difficult to interpret. Integrated ecological, hydrological and social studies have yet to be completed. The problem is that people must act now in order to reduce future negative consequences.

In order to help citizens, community leaders, politicians and policymakers understand better projected climate-change impacts in the Greater Himalayas, we performed a comprehensive review of current studies with an eye toward cascading effects on water, biodiversity and human livelihoods. Cascading effects are those unanticipated events that result as ecosystems respond to change. When these effects are accounted for, a more nuanced and problematic picture of regional climate impacts emerges.

The Greater Himalaya region, also known as "Asia's water tower", covers some seven million square kilometres and has a highly heterogeneous geography: from subtropical semi-desert and low tropical evergreen forests, to alpine ecosystems below the highest peaks in the world. The Himalayan massif affects regional weather; the mountains form a physical barrier to atmospheric circulation for the summer monsoons and winter westerlies. Species and ecosystem diversity is high; of the world's 34 biodiversity hotspots, four are found here. Beyond biodiversity, the Greater Himalayas form the headwaters of 10 of the largest rivers in Asia, whose basins provide water for about 1.3 billion people.

> *Some 22% of all people on earth are sustained by Asia's water tower, but there are no full-scale studies of how climate change may reduce downstream flows.*

Climate-change impacts are already occurring in the Greater Himalayas, most notably the widely reported reduction of glacial ice. Regional temperatures are increasing at about three times the global average. United Nations Intergovernmental Panel on Climate Change (IPCC) 2007 data, now considered by many to be too conservative, project further warming of 3° Celsius by 2050 and about 5° Celsius in the 2080s over the Asian land mass. Warming will be even greater on the

Qinghai-Tibetan Plateau. Though glacial loss may be mitigated somewhat by projected increases in precipitation, the best current projections show that ice may disappear from the Greater Himalayas by mid-century or before.

Water is a critical resource for ecosystems and people; there will be multiple cascading effects from the reduction of Greater Himalayas ice and snow. Processes determining the conversion of frozen water into downstream flow are complex, but based on current knowledge the rivers most likely to experience the greatest reduction in water availability are the Indus, Yangtze, Tarim, Brahmaputra and Amu Daryu. The Indus, for example, gets 44.8% of its stream flow from melt water. The Yangtze receives somewhat less than 20%. Reductions in these flows should trigger concern: the number of people living in these two basins is 178 million and 368 million, respectively.

Species are already responding to climate change in the Greater Himalayas. Rhododendrons are flowering up to a month earlier than historical averages. For other plants, rising temperatures are altering the timing of flowering and leaf flush and these changes will cause cascading effects in the behaviours of pollinators and other flower-dependent animals. Historical plagues of the high elevation Tibetan migratory locust, for example, are closely related to droughts. Spider predation on grasshoppers decreases with rising temperatures. In general, the overwintering eggs of insect pests are likely to have higher survival rates with warmer winters, which will lead to more herbivory on crop plants. Weedy, exotic species from lower elevations will likely invade into higher areas. Less water and disruptions of the normal timing of ecological events will have uncertain consequences for many species; some species will decrease, some will increase. The potential for species extinctions due to climate change has been reported widely, but the consequences of complex cascading effects are underappreciated by most people.

Ecosystem dynamics are expected to change, too. It is highly likely that the composition and distribution of vegetation types throughout the Greater Himalayas are very likely to shift significantly. Water timing and availability influence where high-altitude meadows, steppes, grasslands and deserts are distributed. Today on the Qinghai-Tibetan Plateau, alpine steppe and deserts cover 33.5% of the region; these ecosystems are expected to contract in area by about 16%. Forests on the Plateau are projected to increase in area. Since 1923, tree lines have shifted upward by 67 metres in northwest Yunnan province, while over the last decade in the western Himalayas, upward shifts have averaged about 16 metres. It remains unclear what such wholesale shifts in plant communities will mean for ecosystem functioning over time.

Water availability, species interactions, ecosystem shifts and stability are linked by multiple ecological feedbacks, but basic research exploring these interconnections is notably lacking in the Greater Himalayas. To complete our review, we focused on two broad categories of cascading effects: ecosystems and livelihoods impacts; and downstream and global consequences.

One primary concern we have with impacts on ecosystems and livelihoods is the unprecedented speed and scale of projected climatic changes. Many of the endemic species that live in the Greater Himalayas may not be able to adapt to such rapid transformation of the environmental conditions that they have evolved in. This same logic applies to humans. For people, effective climate adaptations include the capacity to gather and interpret new information, the creation of responsive governance, as well as actual changes in livelihood practices to meet changing conditions. Climate change is not new for Himalayan people. Mountain dwellers across many cultures, for example, have used riverbank retaining walls and terraces to mitigate flooding, as well as regional migration to avoid the worst environmental hazards. But there are virtually no studies that examine existing adaptive capacities and potential

vulnerabilities of local communities across the Greater Himalayas.

Quantitative projections of potential downstream and global cascading effects due to climate change are also rare. We are especially concerned about cascading effects influencing downstream water availability, atmospheric circulation, sea level rise and loss of Qinghai-Tibetan Plateau permafrost.

Some 22% of all people on earth are sustained by Asia's water tower, but there are no full-scale studies of how climate change may reduce downstream flows. Reduced downstream flows mean reduced food production in a region where there are already 523 million undernourished people and population growth rates are some of the highest in the world.

While regional food production is critical to the well-being of many people, the Greater Himalayas also play a key role in global atmospheric circulation. In summer, the vast highlands heat up more than the Indian Ocean, leading to a pressure gradient that drives the Indian monsoon. There is some evidence, however, that this gradient may be changing due to the reduction of ice and snow in the Greater Himalayas.

Loss of regional ice and snow will have still-unknown cascading effects on global sea-level rise. Recent research projections have doubled the worldwide minimum average rise to 80 centimetres by 2100, which would have severe effects on human populations and agricultural lands in the coastal mega deltas of Asia, where Greater Himalayan rivers meet the sea.

The Greater Himalayas are also an important carbon sink. Frozen soils subtending Qinghai-Tibetan Plateau grasslands store some 2.5% of global soil carbon, but projected warming and the resulting shift in ecosystems could lead to the near-complete disappearance of permafrost, with the cascading effect of releasing most of the region's soil carbon. No model exists yet that captures the interactions of these critical variables: melting glaciers and snow; degraded permafrost and wetlands; shifting alpine ecosystems; and potential changes in monsoon moisture patterns.

Current trends portray great environmental uncertainty in the Greater Himalayas. Given the general lack of data and levels of scientific uncertainty, we recommend: more widespread and long-term tracking of glacial ice volumes; monitoring of high-altitude flora and fauna; open sharing of data; and greater cooperation between all countries in the Greater Himalayas. At the local level, we believe upstream rural people should be brought into natural resource decision-making. Policies addressing downstream populations, urban infrastructure, and large-scale agricultural systems must be integrated with mountain peoples' livelihoods issues and concerns. River basin research should emphasize reducing overall water demand and modernising irrigated agriculture with maximal efficiency in mind.

Across all countries in the Greater Himalayas, risk assessment and mapping would help decision-makers select appropriate strategies. But we found no regional or transboundary authority addressing the complexities of climate-induced cascading effects outlined here. This situation must change. China and India play critical roles because most of the Greater Himalayas are within the borders of these two nations. We would like to see these two countries exert more leadership. As much as we would welcome the formation of a regional Greater Himalayan climate-change authority, we recognise that top-down policymaking has a mixed track record in the region. But current evidence and the potential for severely negative cascading effects show that the status quo can no longer hold; political leaders must act.

Dr R Edward Grumbine teaches in the Environmental Studies Program at Prescott College, Arizona, United States. His interests include biodiversity protection and conservation practices in China.

Dr Xu Jianchu works at the Key Laboratory of Biodiversity and Biogeography, Kunming Institute of Botany and the World Agroforestry Centre, China Program, Kunming, China. He focuses on river basin biodiversity and local livelihoods throughout the Greater Himalaya.

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Image by DexterPerrin

February 07, 2012

The face of Sanjiangyuan

As global warming and economic development alter landscapes and lives in western China, Hashi Tashidorjee has been out with his camera. Here he shows the third pole the results.

The Sanjiangyuan region of the Qinghai–Tibet plateau contains the headwaters of three of Asia's major rivers: the Yangtze, the Mekong (also known as the Lancang) and the Yellow River. This delicate corner of western China is known as the country's "water tower". But, against the background of economic development and climate change, its high grasslands are quietly changing.

For many years, Hashi Tashidorjee of local NGO the Snowland Great Rivers Environmental Protection Association has been documenting these changes and their impacts on the lives of local herders in photographs. Here, he talks chinadialogue's Zhou Wei through a series of the pictures he has taken, and the stories behind them.

Hashi Tashidorjee is vice secretary-general of the Snowland Great Rivers Environmental Protection Association.

Zhou Wei is assistant editor in chinadialogue's Beijing office.

Images by Hashi Tashidorjee

THE FACE OF SANJIANGYUAN

***The Amne Machin Snow Mountain**, in Golog prefecture, Qinghai, is one of the sacred mountains of the Qinghai–Tibetan Plateau. This important source for the Yellow River – it is the only glacier that feeds into the waterway – is currently receding. This photograph was taken late in the year (in November 2009) but, under the noon sun, the icicles are dripping. Every year, glacier avalanches terrify the locals, who revere the sacred mountain. Local lama Wangqiong says it's a lack of concern for others in the world that is causing the glacier to shrink.*

Desertification is visible in Yanzhanggua Valley, Yushu prefecture, on the upper reaches of Sanjiangyuan's Tongtian River. I remember walking on this grassland when I was little and there was no sand back then. There was one pass we used to take to cross the mountain and it was completely clear. Twenty years later, the pass is full of sand and the blockage has created a lake. The Tongtian River – an upper stretch of the Yangtze – flows through this place, and every summer the desert turns the river water yellow. This picture was taken in 2006.

This photo, which was taken by Wang Xin, reminds me of my friend Suonan Dajie, who was killed trying to protect the Tibetan antelopes of Kekexili. The poachers got him in the end, as well as these antelope. In Sanjiangyuan, destruction of wildlife, fauna and ecosystems seems constant. For me, this is the impact of a system that places so much weight on markets, trade, capital and power. People may dress up the unfettered consumerism at the heart of global markets as science and technology, national development and an effort to eradicate poverty. But, ultimately, it destroys life. That is what killed Suonan Dajie and the antelopes.

This is a lumber plant on the upper reaches of the Lancang River. Felled trees are put in the river to float downstream to the processing plant, where they are fished out of the water and placed on a conveyer belt to be cut up into planks. The locals deplore what is happening. They say felling teams are progressing along the banks of the river and will soon reach the foot of the sacred mountain. The Lancang is an international river – are there rules about where felling can take place and to what extent? We locals don't know these things.

This picture was taken one morning in 2009, before the Yushu earthquake on the Zhaxikecao Grasslands of Yushu. Plastic detritus lies scattered along the roadside, while a shepherd boy walks behind his sheep, a satchel slung on his back. I remember the grasslands of my childhood: the roads were lined with wild flowers, cattle and sheep. It made you break into song. Children today walk through rubbish. What are they going to sing?

These sheep died after eating plastic garbage near Jiegu town in Yushu, in 2009. It's common for livestock to die after accidentally eating waste that litters the town and surrounding grasslands. In 2003, the Sanjiangyuan Commission persuaded the Yushu government to ban plastic bags, but it didn't last long. For effective environmental protection, the government and the people need to work together over the long term. The herders now have their own environmental protection movement. There's an annual ecological festival at the source of the Lancang River, where the local lama encourages people not to use plastic bags. Five hundred herding households have made an oath to follow his instructions. I hope that, in future, plastic pollution won't be a problem in Sanjiangyuan.

Roads here are badly designed and cars and vehicles often drive onto the grass, packing down the soil until grass can no longer grow there. Roads and power lines have torn open the grasslands, leaving wounds that struggle to heal. The wind and rain get in and make the wound bigger. Installing a single power–transmission pole requires large amounts of soil to be excavated, and the planners never consider the environment – sometimes they even cut right through water sources.

Thousands of herder families, called "ecological migrants", have been relocated away from the grasslands. The Sanjiangyuan area is the "water tower of Asia" and home to a unique alpine grassland ecology. But, for the locals, the ecosystem involves people as well as nature. Properly identifying the environmental issues here requires serious research. Without that, remedial actions may have unintended consequences, and even make things worse. Even within Sanjiangyuan, different regions and different altitudes have their own ecologies, and you can't apply the same policies wholesale. Protecting the environment is a matter of culture, society and ecology. It's not clear that the ecological migration policy has taken this into account.

These fences, photographed at Maduo at the source of the Yellow River in 2003, designate grassland ownership. In the past, there was no such thing. Herding was traditionally tribal, and the tribe moved around to find land for grazing. Fencing off the grasslands doesn't suit local characteristics and fails to take into account how wildlife, plants and people interact. Birds can't see the fences, and many have been snared on the wires.

A Tibetan wild ass is trapped by a fence in the Suoka area of Zhiduo county. After the fences went up, the wild ass and other animals lost their habitat. We once saw a young ass and its mother stuck on opposite sides of a fence. The rare Przewalski's gazelle, which lives by the shores of Qinghai Lake, is also entrapped. Some get stuck as they try to get over the barriers and die a slow death. Some try to get to the lake to drink, but don't have the strength to get over the final fence. One herder goes around helping bharals (also known as Himalayan blue sheep) who get their horns caught. In one winter alone, he freed 49 of them.

The distribution of wild animal populations wasn't considered when the fences were erected.