

Exploring the third pole



Welcome to thethirdpole.net reader

PART 6: URBANISATION AND DEVELOPMENT



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 6:

Urbanisation and development

In recent decades, rapid development in the highest inhabited areas of the world has made the third pole region even more vulnerable to natural and man-made disasters. This section provides highlights from the [thirdpole.net](#)'s series on urbanisation in the Himalayas, in which local journalists provide first-hand accounts of the growing pressures affecting urban areas in the region. Ramesh Prasad Bhushal describes the deepening water crisis in Kathmandu, where pollution is destroying rivers and groundwater overuse is literally sinking the valley. Dawa Wangchuk offers a rare glimpse into the reality of the Kingdom of Bhutan, where the capital Thimphu is sacrificing its own environmental resources in a furious endeavour to catch up with the modern world. And Liu Jianqiang travels to Lhasa, where he sees the impact of breakneck development in the wake of the construction of the Qinghai-Tibet railway.

A more profound development boom is coming to the Tibetan Plateau, a region that holds the key to China's accelerating demands for water and minerals. Jiang Yinnan and He Haining write that construction of a massive dam on the Yarlung Zangbo marks a turning point for Tibet. And Gabriel Lafitte raises concerns about the impact of large-scale mining on the plateau.

Urbanisation and development

Contents

5

The dead rivers of Kathmandu

Ramesh Prasad Bhushal

7

Bhutan's modern face

Dawa T Wangchuk

9

Preserving Lhasa's history

Liu Jianqiang

13

New era for Tibet's rivers

Jiang Yannan and He Haining

17

Tibet's mining menace

Gabriel Lafitte

The dead rivers of Kathmandu

Urban sprawl is driving a deepening water crisis in Nepal's capital.

Ramesh Prasad Bhushal reports.



Putting his hands on his forehead, 70-year-old Sadhu Bhai Maharjan explained how he and his friends used to swim in the Bagmati River, a few minutes walk from his home in Kalimati, at the centre of the Kathmandu valley. The valley has witnessed rapid urbanisation in the last few decades and Maharjan is among the few people still engaged in agriculture for their livelihood in the core of Nepal's capital.

Clipping small bundles of vegetables, he said: "Now people don't believe us, but we used to swim in the river flowing nearby a few decades back and enjoyed fishing. The water was used for drinking too." These days, almost all rivers of the valley, including Bagmati – the holiest of them – are as good as dead.

His neighbours, who were farmers until a few years ago, have shifted to urban life. The owner of the large chunk of land next to Maharjan's plot decided to lease it to a college two years ago. A huge building stands there now. "We used to bathe in the river before the crack of dawn and foxes used to howl at night. Those days are no more than memories now," Maharjan added, while the stench of garbage swept in from the river.

Here, large sewerage pipes act as tributaries to the rivers, as most nearby dwellers dispose of their sewage directly into these streams. All rivers in the valley have been turned into dumping sites. The worst have become narrow canals, as more and more people encroach on the riverbeds. The population of the 899-square kilometre valley has increased fivefold in the last 60 years, from 197,000 people in 1952 to

997,000 by the time of the 2001 census. Meanwhile, the built-up area has increased by 134%, from 24.54 square kilometres in 1989 to 57.32 square kilometres in 2006.

Scientists have declared the rivers "dead" as hardly any fish can survive in them anymore. Recent studies show that the fish population has been completely wiped out in the 10-kilometre to 15-kilometre stretch of the Bagmati River that flows through the city centre. And this is Nepal's holiest waterway, which flows past the Pashupati Nath Temple, one of the most sacred Hindu shrines in the world.

“ We used to bathe in the river before the crack of dawn and foxes used to howl at night. Those days are no more than memories now. **”**

Not only is the surface water polluted, groundwater depletion is also very high. Siddhartha Bajra Bajracharya is executive officer at the National Trust for Nature Conservation (NTNC) and team leader of the Bagmati River Action Plan (2009-2014). He said: "Most of the water [of the Bagmati] has been tapped for drinking purpose near the source of the river in Shivapuri National Parks hills in the north-west of the valley and the 'concretisation' has restricted the groundwater from recharging [further downstream]. This has caused the drastic reduction in the flow of water in the rivers of the valley."

The valley requires around 220 million litres of water every day; but the supply is less than half of that – approximately 100 million litres a day. And an estimated 40% of the water supply is lost through leakage from old, rusty and broken pipes. The shortfall is met by people pumping out groundwater themselves. Experts are warning that, if the present groundwater extraction trend continues, then the soil of the valley itself may subside within a few decades.

“Our study has revealed that the groundwater table has been dwindling by 0.7 to 1.7 metres a year,” said Nir Shakya, senior hydro-geologist on Nepal’s Groundwater Resources Development Board. “This is an alarming trend. The valley is becoming more prone to subsidence.” Subsidence – the sinking of land caused by excessive groundwater extraction – is a common problem in cities that swell in size without any water regulation or proper infrastructure. But Nepal’s government still has no plan to address the problem.

Water is not the only natural resource at risk in this beautiful country of high mountains and panoramic vistas. Massive deforestation and rapid, poorly planned infrastructure development have become critical threats to flora and fauna. The bird population in the valley is dwindling at an alarming rate. “The habitable banks of rivers have turned uninhabitable, which has reduced the water bird population by at least 90% in the last two decades. Other birds are also facing a huge threat,” said Hem Sagar Baral, senior ornithologist at conservation institute Himalayan Nature and writer on the birds of Nepal.

The only good news is that many years ago conservationists persuaded the Nepali authorities to declare the sandstone mountains which encircle the valley as an official protected area. So the mountains from Phulchowki in the south-east, Chandragiri and Champa Devi in the south-west, Shivapuri in the north-west and Nagarkot in the north-east have been preserved. Today, the people of Nepal earn more money from tourism in these areas than they

would have if these mountains had been covered with concrete. Perhaps that will convince the authorities that, in the long run, preserving the environment profits everyone.

Ramesh Prasad Bhushal is a Kathmandu-based journalist.

Image by Phil @ Delfryn Design

Bhutan's modern face

Thimphu, the kingdom's fast-developing capital, is one of the cities most vulnerable to climate change in the world. But it is unprepared for the crisis, reports [Dawa T Wangchuk](#).



Over the past few decades, Thimphu – the capital of Bhutan – has transformed from a beautiful little town into a modern, concrete city. But urban expansion has come at the cost of severe environmental degradation.

Climate change is putting the city at even greater risk. Thimphu is one of 15 cities in the world most vulnerable to the impact of global warming, according to a recent report by the International Institute for Environment and Development, a London-based research organisation.

The city sprawls down steep slopes between altitudes of 2,248 metres and 2,648 metres. Thimphu's sharp inclines – many with gradients greater than 30% – make the city particularly vulnerable to landslides. Heavy rainfall and sudden cloudbursts, which increase the risk of landslides, will become more frequent as a result of climate change, according to the Intergovernmental Panel on Climate Change (IPCC) 2007 assessment report.

Thimphu's urban development began at a slow pace in 1961, with the launch of Bhutan's first Five-Year Plan. But it was not until the kingdom opened its doors to the outside world in the 1970s, that the process of urbanisation really started to take hold. Since then, there has been considerable construction in the city centre and suburban development has mushroomed.

According to Bhutan's National Statistics Bureau, Thimphu had a population of 104,214 in 2010, and is growing at a rate of 1.3% every year. Thimphu will

continue to expand in the future, as migration from villages to the city becomes ever more popular.

The environmental effects of this urban expansion are visible to anyone who visits the capital. In the past, ecologically rich wetlands were interspersed with the city's buildings – visible by the swimming pool complex and the Changlimithang Stadium, south of the sewage-treatment plant in Babesa, near the cremation ground by the river and next to the settlement of Langjophaka. Today, most of the wetlands have been converted into residential areas, shopping complexes, sports and recreational spaces. Only a few remain, but they too are at risk of disappearing.

“ *Thimphu's steep slopes – many with gradients greater than 30% – make the city particularly vulnerable to landslides.* ”

Predictably, urbanisation has had a negative effect on flora and fauna. Wood snipes, once common in Thimphu, have not been seen since 1999, according to ecologist Rebecca Pradhan from Bhutan's Royal Society for Protection of Nature.

Waste management has always been a problem in Thimphu, but the situation has deteriorated with the expanding population. According to Thimphu City Corporation records, the capital of Bhutan produced about 18,000 tonnes of waste in 2009, which means almost 50,000 kilograms every day. The waste-

management system is already struggling to cope, but it is estimated that, by 2020, some 81,000 kilograms of waste will be produced every day.

In 2009, local waste comprised mainly organic materials, as well as some paper and plastic. But now electronic waste – particularly refrigerators, computers and mobile phones – is being dumped out in the open along with other waste, increasing the risk of dangerous chemicals leaking into soil and downstream water supplies.

With more and more Bhutanese settling in Thimphu, the numbers of vehicles are increasing too. Of the 53,382 vehicles in the country, 29,139 are in Thimphu and major cities in the west, according to the Royal Bhutan Police Traffic Division. Higher vehicle numbers have led to a higher demand for road construction in the fragile mountains, and increased traffic on the 11-kilometre Thimphu-Babesa expressway has destroyed many bird habitats. The ongoing river diversion work on the Thimphu River has also resulted in further destruction of bird habitats.

According to the National Environment Commission, Thimphu and the town of Phuentsholing on the border with India have experienced deteriorating air quality over the years. Daily air-pollution levels now often exceed WHO guidelines. Sources of air pollution include combustion of biomass and fossil fuels, industrial emissions, dust from unpaved roads, new construction sites and bitumen heating for road construction.

Houses in Thimphu are poorly designed when it comes to storing heat during the cold winters. Improving building design could save energy and money in the long run. If building designs are improved, energy consumption could be drastically reduced. For example, in an average household, windows account for 15% to 30% of the total heat loss. Well-designed, large glass windows could save energy through the benefits of passive solar heating. While the initial cost of installing double-glazed windows is high,

by reducing energy loss by up to 18%, such a move would eventually pay for itself. Advanced insulation materials can reduce the energy consumption of buildings by as much as 90%, according to the architect Herbert Girardet.

Although such solutions are available, they are seldom used, while the capital of this remote country hurtles to catch up with the rest of the world.

Dawa T Wangchuk is a reporter for Business Bhutan, the country's only financial newspaper.

Image by lupic

Preserving Lhasa's history

The Qinghai-Tibet railway brought a wave of travellers to Lhasa. But many found a city threatened by irresponsible tourism and breakneck urbanisation, says [Liu Jianqiang](#).



At over three and a half kilometres above sea level, Lhasa is the world's highest city. Many people decide to visit this enchanting place, known as the "holy city in the land of the snows".

On July 1, 2006, the Qinghai-Tibet railway opened and crowds of people from China's cities clambered aboard to visit the place they had dreamed of – including my friend, Tian.

Tian is a journalist with the Xinhua news agency, and had always wanted to visit Lhasa. At the end of August, Tian boarded the train to Tibet. But three days later he returned, deeply disappointed. Hotel prices had rocketed – a decent, reasonably-priced room was almost impossible to find. "And it was boring," he added, "just the same as any Chinese city." The tall buildings, congestion, noise and street hawkers had left his dream in ruins.

Nor is he the only one disappointed. A scientist friend from Peking University went to Lhasa in mid-August hoping to buy a Tibetan-style courtyard home – she imagined leaving behind the bustle of Beijing, sipping sweet Lhasa tea with a view of the Potala Palace. But Lhasa's reality did not match up to her vision. Property prices had risen; the money which would previously have bought her a courtyard would only purchase a single room. Tall buildings crowded a skyline where once even four-storey structures were rare, blocking the view of Lhasa's iconic Potala Palace.

In the seventh century, Songtsen Gampo unified Tibet and moved the centre of political power from Shannan to the site of present-day Lhasa – pastureland at the time – and founded the powerful, slave-owning Tubo Kingdom. He also built the Jokhang Temple, Ramoche Temple and the first Potala Palace. Legend has it that Songtsen Gampo used soil carried to the site by goats to build the Jokhang Temple and the city was thus named "Resa", from the Tibetan words for soil (re) and goat (sa). With the adoption and rise of Buddhism, the number of pilgrims rose steadily. Hotels, shops, homes and administrative centers sprung up around the Jokhang Temple, forming the circular street known as the Barkhor. As Buddhism flourished, the Tibetan people started to call the city Lhasa, which means the "holy city" or "place of the Buddha".

“ Tall buildings crowded a skyline where once even four-storey structures were rare, blocking the view of Lhasa's iconic Potala Palace. ”

In the mid-17th century, the Qing emperor authorised the Fifth Dalai Lama, Lobsang Gyatso, to consolidate his political and religious power, with Lhasa as the centre of government. The Potala Palace was rebuilt to a height of thirteen storeys – almost 120 metres – and became the residence of the Dalai Lamas, seat of their political and religious rule and a landmark on the Lhasa skyline.

The Potala Palace makes a great visual impact as you first arrive. In 1936, F. Spencer Chapman, a member of the British Government's mission to Lhasa, wrote in Lhasa, The Holy City: "Unlike any other building in the world, the Potala has the presence of a New York skyscraper and a subtle similarity to the Pyramids of Egypt...not only are the design and color of the building breath-taking in their beauty, it is also of enormous size. This majestic beauty can best be appreciated in the government park below the Potala." But for Tibetans, the Potala's impact is not merely visual. Karma, from Tibet's Chamdo region, told me of how he wept and prayed when he first glimpsed the Potala. Many Tibetans have similar tales to tell. For them the Potala is not just a building, it is the home of their faith – and it is this which makes Lhasa holy.

It was in the 17th century that Lhasa first started to evolve into a city. Official residences, mansions, guesthouses and shops were built flanking the Barkhor, but on a small scale. As late as 1906, there was only a small residential area near the Jokhang. The city had expanded by 1935, when the "Snow Village" residential district was built in front of the Potala. But by 1950, Lhasa still had a population of only 30,000 and covered less than three square kilometres, with dirt roads and no sewers.

It was later that the process of urbanisation really started to take hold. By 1975, Lhasa covered 18 square kilometres and had a population of 100,000. According to statistics from the city government's website, Lhasa is now 18 times the size it was in 1959, with a quarter of a million people living in the urban area (100,000 of those migrants). Locals have told me that since the opening of the railway and the arrival of many more wealthy people, the actual population has already risen far beyond that figure.

Some examples may help to illustrate the changes in the city. For instance, when Chapman visited Lhasa 70 years ago, he described seeing women dumping all kinds of rubbish in front of the Potala, forming

10-foot-high piles by the roadside. When I visited in May, the Potala was fronted by a huge, clean plaza.

But before 1959, the Potala was a solemn and sacred place. Now it is a tourist attraction. Another friend of mine from Beijing took the train to Lhasa in July. When she set foot in the Potala it wasn't the architecture, the culture or the history that struck her – it was the hordes of tourists streaming like termites over the wooden floors. Previously, visitor numbers were limited to 850 a day in order to protect the building, but this number was raised to 1,500, and then to 2,300 visitors a day once the railway was opened – earning huge amounts of money for the Potala's managers.

Today it is still the sight of the Potala Palace, perched on top of the Red Mountain, which heralds the traveller's arrival in Lhasa. But as you get closer to the city it becomes lost behind modern buildings. Buildings and roads named after places in northern and eastern China roll past – Jiangsu Road, Beijing Road, Shanghai Plaza and Shangdong Mansion. You may find yourself asking whether you are in Lhasa at all.

Once a "holy city" of unique tradition, Lhasa is undergoing huge and very complex changes – some bad and some good.

Balancing tradition with development

Karma arrived in Lhasa in the winter of 1986, cold and hungry after a 10-day journey on the back of an open truck. His first act was to complete a circuit around the Jokhang Temple, weeping as he prostrated himself. Karma then worshipped in the temple – something all Tibetans aspire to do.

Karma stayed in Lhasa, and is now one of Tibet's most successful businessmen. Pilgrims like Karma, who end up staying in Lhasa, form a part of Lhasa's growing population. But a bigger spur to Lhasa's growth has been the increase in governmental, industrial and commercial activity. An elderly Tibetan told me that

in 1950, there were so few Han households that he could name them all. Nowadays, you can take 10 taxis in Lhasa, and eight or nine of the drivers will be from the mainly Han Chinese province of Sichuan.

On a mid-May afternoon I stood on a road running between the Potala Palace and the Jokhang Temple. In 10 minutes, over 100 people passed me by, but not one was wearing traditional Tibetan clothes. Some of those passers-by were Tibetan, but it was as if they had abandoned their dress and their culture.

Lhasa has already abandoned enough. When Karma first arrived, almost all traditional Tibetan buildings – religious and secular alike – were still intact. Two decades later, only one-third of the traditional-style secular buildings still stand.

“Lhasa’s personality is changing,” said Dawa Tsering, head of WWF’s Lhasa office. He told me that Lhasa’s architecture should represent the city’s unique cultural values, but local tradition is being ignored. Lhasa is being developed in the same way as Beijing or Shanghai, as part of a quest for modernisation.

Tsering admitted that tradition could not always be completely retained. For instance, traditional Tibetan buildings tend to lack light and space. But this is no reason to abandon them entirely – a redesigned interior which still retains the external appearance could make Tibetan buildings suitable for modern living.

A Tibetan sociologist, who declined to be named, said that the demise of Lhasa’s traditional architecture can be put down to the sources of investment in the city. Most funding comes from Chinese investors in faraway provinces. For instance, Jiangsu Road was built with money from eastern China’s Jiangsu province, whereas the Lhasa People’s Hospital was paid for by Jiangsu province, Beijing municipality and the Ministry of Health. Provincial and government support for infrastructure construction is no bad thing, but it’s difficult to ensure it will produce Tibetan-style buildings.

The sociologist added that in the past two decades, failures in urban planning have led to the excessive outward expansion of the city. In 1992, Lhasa relaxed its restrictions on private construction, leading to a building boom fuelled by property developers. Many residents relocated to the outskirts of the city. A new district arose to the west of Lhasa, devoid of any Tibetan characteristics. Many Tibetans from outside Lhasa moved into the city, buying and building houses. And although these buildings do have some Tibetan characteristics, they lack any overall planning or proper sewage treatment facilities.

“ *In 10 minutes, over 100 people passed me by, but not one was wearing traditional Tibetan clothes. Some of those passers-by were Tibetan, but it was as if they had abandoned their dress and their culture.* ”

Over recent decades, Lhasa has been marching towards “modernisation”. According to the city government’s website, average per capita housing space has risen from 7 square metres in 1959 to 25 square metres today. Government investment has brought infrastructure construction and has funded the preservation of the Potala Palace and Lhasa’s temples. But the city has grown too rapidly, leaving sewerage, roads, electricity and telecommunications infrastructure struggling to keep up. Lhasa has recently built an up-to-date solid waste treatment plant, but there is still no such facility for sewage – which is discharged raw into the Lhasa River, known as the mother of the Tibetan civilisation.

There are also issues with the ethnic layout of the city. A survey by Peking University found that Han and Tibetan populations keep to their own districts, limiting interaction between the two groups. This segregation also affects children, who are likely to attend schools close to their own homes. Tibetan residents in the old city tend not to have Han friends

or neighbours, Han people are often ill-informed about Tibetans.

Lhasa has already expanded as far as it can, so these issues will have to be resolved within the current city limits. And bringing two populations together is not as simple as adding Tibetan features to buildings. The real challenge is how a traditional culture can survive in the modern world. Karma says that the biggest threat to Tibetan culture is not the influx of Han Chinese – it's globalisation. Businesses from Lhasa and elsewhere are turning this holy city into a marketplace. The Potala Palace and many of Lhasa's temples have become commercialised and monks are being tempted back to a secular life. Tibetans have put away their traditional clothes, and money has become paramount as young farmers and nomads leave the land for the city lights.

People like Karma have started trying to save the city's culture, not by rejecting Lhasa's commercialisation, but trying to make it work for Tibetan culture, not against it.

Karma answers the phone in English, but keeps his hair in Tibetan-style braids and often wears Tibetan clothing. Most importantly, he retains his kind heart, his honesty and his Buddhist faith.

Karma is working to establish the first five-star hotel in Lhasa. In talks with the chief executive of a major international hotel chain, he requested that the proposed hotel should keep to traditional Tibetan designs, and that it should face the Potala. The American executive sneered: "Our guests want to stay in a hotel, not your Potala Palace." But Karma retorted: "Guests will come from around the world to see Tibetan traditions – not your hotel."

Whether this city remains sacred will be determined by people like Karma, and whether the government will adopt the same attitudes to tradition, faith and modernisation that he holds.

Liu Jianqiang, born in 1969, is a senior reporter with Southern Weekend and has a long-standing interest in environmental issues.

Image by wanderfolly

A new era for Tibet's rivers

Construction of a massive dam on the Yarlung Zangbo marks a turning point for Tibet, write [He Haining](#) and [Jiang Yannan](#). A development boom is coming.



The rushing waters of the Yarlung Zangbo, the last of China's great rivers to remain undammed, will soon be history. On November 12 last year, the builders of the Zangmu Hydropower Station announced the successful damming of the river – the first public announcement on a matter that, until now, has been kept under wraps.

The Zangmu hydroelectric power station is being built on the middle reaches of the Yarlung Zangbo (known as the Brahmaputra when it reaches India) between the counties of Sangri and Gyaca. Around 7.9 billion yuan (US\$1.2 billion) is being invested in the project, located in a V-shaped valley 3,200 metres above sea level. At 510 megawatts, the plant is much smaller than China's 18,000-megawatt Three Gorges Dam, but still equivalent to the entire existing hydropower-generating capacity of Tibet.

The construction workers have now reached the centre of the river. The water is being diverted into sluiceways and rows of grouting machines and stone crushers are working at full pace, while trucks come and go. One worker said that the winter here is mild, so there'll be no need to stop work. Geologist Yang Yong said the activity represents the start of a new age: "Hydropower development on the Yarlung has begun, marking the start of a hydropower era for Tibet's rivers."

A series of hydropower stations is proposed for the Yarlung Zangbo. If they are all built, Zangmu will be the fourth in a row of five on the Sangri to Gyaca stretch of the river, between the Gyaca and Jiexu

plants. There has been no official confirmation that the construction of these will go ahead. But Yan Zhiyong, general manager of China Hydropower Engineering Consulting, said in a recent media interview: "By about 2020 most of China's hydropower projects outside of Tibet will have been completed, and the industry's focus will shift to the Jinsha, Lancang, the upper reaches of the Nu River and the Yarlung."

“ *Boreiur? Rae vera con nobitae site conse vollabo rruptatquos dolupta eperspicid eatur, ex ere inus sus nonsequ iatquat. Perchitiis at. Mus. Ucidererati ut volorrundis iunti velit essit exes.* ”

Several well-known Chinese hydropower firms have already made their way into Tibet. The backer of the Zangmu project, the Tibet Generating Company, has already built a residential area on the open spaces alongside the river at Zangmu and a flourishing town is taking shape, with a supermarket better-stocked than those in the county's main town. The boss, from Zhejiang, moved here from the Xiaowan dam in Yunnan, south-west China, two months ago and is positive about the future: "There'll be loads of workers next year, business will be great."

The Zangmu dam is located in the southern Tibetan county of Gyaca, which has a population of around 17,000. "The economy here is going to be among the fastest-growing in Tibet," said businessman Li

Hua, who has already invested in a three-star hotel here – a five-storey building that is now the tallest in the area.

Work on a highway to the administrative centre of Lhoka prefecture is to start in 2011, cutting travel time in half. “Hydropower development will very quickly spur mining, and there’ll also be very rapid growth in road and railways. The Tibetan hinterland will see a new development boom,” predicted Yang Yong.

Guan Zhihua is a researcher at the Chinese Academy of Sciences’ Institute of Geographic Sciences and Natural Resources Research. In 1972 the academy established a survey team to study the Qinghai-Tibetan Plateau, and Guan – now in his seventies – was the head of the group charged with calculating the hydropower potential of the Yarlung Zangbo, China’s highest river. As if describing a family heirloom, he said: “The river flows for 2,057 kilometres within China’s borders, and its hydropower potential is second only to the Yangtze. It has more power-generating potential per unit of length than any other river in China.”

Guan’s was the first comprehensive and systematic study of the plateau – a four year field project carried out by more than 400 people across 50 different disciplines. But the study of the Yarlung Zangbo and its tributaries was only a part of the survey, and at the time nobody had any idea of the extent of the river’s potential. The entire basin was found to have hydropower potential of 114 gigawatts – 79 of which was on the main river. And this potential was highly concentrated, with the possibility of a 38-gigawatt hydropower facility at the Great Bend in Medog county, equal in power to the Three Gorges Dam.

In 1980, a nationwide survey of hydropower resources was carried out and 12 possible dam locations identified on the Yarlung Zangbo. “This would have been the first hydropower plan for the Yarlung,” recalled Guan.

In the 1980s, Tibet twice planned to dam the Yarlung Zangbo, but in neither case did the project get off the ground

Zhang Jinling, a 76-year old retiree from the Tibet Surveying Institute, recalled the first bid to build a dam here: “In the 1980s, Shigatse [a city in southern Tibet] wanted to build a hydropower station at Jiangdang and that would have been the first attempt to dam the river.” But there were concerns: this part of the river carries a lot of silt and the project would have required swaths of land to be inundated and many people to be relocated – and the dam would only generate 50 megawatts of power. The plan was submitted to Beijing, but was not approved.

On another occasion, plans were drawn up to dam the river outside Lhasa. Zhang’s team carried out preliminary surveys, drilling rock samples out of the mountainsides to acquire geological data. But a large reshuffle of officials in both 1981 and 1982 saw the team lose two-thirds of its manpower. Plans were shelved.

Those plans were spurred by a shortage of electricity in Tibet. Zhang recalled that the Tibetan government was seeking a quick way of providing power by any means – diesel-fired and geothermal power generation were also used.

During the 1980s, Lhasa, with 120,000 residents, only had 20 or 30 megawatts of power-generating capacity, mostly provided by several hydropower stations each providing a few megawatts. In winter there was no choice but to rotate power supplies to different areas of the city, with those cut off using kerosene for heating.

When Zhang retired in 1995, the electricity grid in eastern Tibet was just beginning to take shape, but it has remained isolated from the national grid. A connection between Tibet and Qinghai is due to be completed in 2012, which will relieve the electricity shortages Tibet suffers in winter and spring.

“It wouldn’t have been possible to build a large dam on the Yarlung before the Qinghai-Tibet railway was completed – you need a rail line to move the building materials,” said He Xiwu, who was head of the survey team’s water-resources group at the time.

In 1994, work started on the Three Gorges Dam, but plans for the Yarlung Zangbo were kept quiet. The low-key approach was unusual given the river’s huge potential. Even recently, a water-resources official with the Tibetan government stressed that developing hydropower in Tibet was mostly about self-sufficiency.

Since the early 1990s, Tibet has built a series of medium-sized hydropower stations, of about 10 megawatts each, such as the pumped-storage hydropower station at Yamdrok Lake and the dam at Zhikong. These are intended to relieve electricity shortages in the Lhasa area.

Although government work reports mention it every year, hydropower development on the Yarlung Zangbo was never made a priority. But in the final years of the 11th Five Year Plan, things changed. “The current proposal is an appropriate degree of industrialisation, with a process of capacity building, then focusing on priorities, and then overall development,” said He Gang, research fellow at the Tibet Academy of Social Sciences’ Institute of Economic Strategy. “The priorities most often proposed are mining and hydropower.”

Behind the scenes, preparations for hydropower development on the Yarlung Zangbo have been constant. In a recent media interview, Zhi Xiaoqian, head of the Chengdu Surveying Institute, said that plans had been drawn up for all of Tibet’s major rivers, including the middle reaches of the Yarlung Zangbo. But a lack of clear policy direction has meant approval for those plans has been slow and the projects have not commenced. “Now the time and conditions are ripe. China’s energy supply is becoming ever more pressured, and there’s an urgent need to develop the rich hydropower resources of Tibet,” Zhi said.

Currently less than 0.6% of Tibet’s hydropower resources have been developed. In comparison with the rest of China, this is virgin territory.

The Zangmu Hydropower Station is only the start. The huge potential of the Yarlung Zangbo is concentrated at the Great Bend in Medog county, where two or more dams the size of the Three Gorges could be built. This is also the most spectacular section of the river, where it falls steeply as it makes a u-turn, and is regarded as one of the world’s most striking river sections.

As early as 1998, Chen Chuanyou of the Institute of Geographic Sciences and Natural Resources Research at the Chinese Academy of Sciences published an article in *Guangming Daily* entitled “Could the world’s biggest hydropower station be built in Tibet?” He proposed building a reservoir on the middle reaches of the Yarlung Zangbo to raise the water level, and then drilling a 16-kilometre tunnel to carry the water to its tributary, the Duoxiong – a drop of 2,300 metres that would allow for three hydropower stations. For the sake of safety and the environment, they could be built underground, he said.

In 2002, Chen published another paper in *Engineering Sciences*, looking at the positive impact that a hydropower station at the Great Bend would have on electricity generation in south-east Asia, and pointing out that, if there were financial issues, funds could be raised both domestically and abroad, and that electricity could be exported to south-east Asia.

He Xiwu said: “I’ve heard there is still no plan for the Great Bend. The state should spend a bit every year on long-term research. There’s 38-gigawatts of potential there, but the geology is complicated and construction would be difficult. It has to be done carefully.”

“Hydropower development in Tibet has come late, but it is on the agenda now,” said Fan Xiao, chief engineer for the regional geological survey team at the Sichuan Bureau of Geological Exploration. What worries

Fan, however, is this: “Tibet’s ecology is extremely vulnerable, and would be very hard to restore if damaged. This kind of full-river development can’t just see the Yarlung Zangbo as a hydropower resource – everything needs to be taken into consideration.”

This article was first published by Southern Weekend.

He Haining is a reporter and Jiang Yannan an intern at Southern Weekend. Feng Jie, also a reporter, contributed to this article.

Image by Fighting Irish 1977

Tibet's mining menace

The Tibetan Plateau holds the key to China's accelerating demand for heavy metals, say authorities. But this plan is driven by resource nationalism rather than market logic, argues [Gabriel Lafitte](#).



China's fast growth continues, largely financed by state investment and, until very recently, cheap finance from state-owned banks. Fast growth and massive infrastructure construction require heavy usage of metals, energy and raw materials. Although the two latest Five-Year Plans talk about balancing environmental protection with social needs, as well as the fastest possible growth rate, nothing so far has slowed China's accelerating consumption of global resources.

Few in China see anything problematic here: China is simply catching up with the rest of the world, and on a per capita basis, its metal consumption is still far behind the richest countries. That may not, however, be true for much longer. Take copper. Not only is China by far the world's biggest producer of copper, consumption per person is already higher than in Canada, France or Russia and will soon overtake Australia, the European Union and Japan. This is not surprising when one looks at where copper is used: to produce the growing number of cars, household appliances and power cables consumed by the increasingly wealthy Chinese market.

China has also emerged as the world's second biggest consumer of gold, surpassed only by India, where gold jewellery has long been culturally embedded. With the enthusiasm for gold as an investment as well as for its industrial uses, the World Gold Council confidently expects consumption in China to double within a decade.

But where will the copper and gold come from for all those cars and cables transmitting ultra high voltage electricity across China? Ironically, these heavy metals and the electricity are to come from Tibet.

Both copper and gold are booming and new mines are coming on stream around the world, as prices dipped only briefly during major financial crises, and then rose to even greater heights. This has not been a problem for China's metals manufacturers, which have ridden the boom. The coastal location of most smelters and their manufacturing customers has helped, giving them ready access to global supplies.

“ *Gyama mine is already operational and, located just upstream of Lhasa, poses a threat to the purity of the water in Tibet's most sacred city.* ”

All this is now changing. Global sourcing of raw materials for coastal industries is shifting to domestic sourcing far inland. Manufacturing is moving inwards, encouraged by central policies to soften the extreme inequality between the east coast and the interior. In western China, the new Chongqing-Chengdu industrial hub is fast emerging, preparing itself to export to the world via the Yangtze. It is now as if the coast of China extends 2,000 kilometres inland.

But the Volvo cars made in Chongqing, the Ford cars made in Chengdu, the Hewlett-Packard, Apple iPad and Lenovo computer factories in these two

cities, will all need plenty of metals. And the solution, according to central planners, is to tap into sources of copper and gold more remote than China's current mines in Zambia, Peru, Mongolia, Laos, South Africa and Kazakhstan. The answer to China's accelerating demand for copper and gold is the Tibetan Plateau.

China has long known of the mineral wealth of the Tibetan Plateau but until now it has been easier and cheaper to buy minerals overseas. Tibet has been too remote, too cold, the air too thin and the infrastructure absent. Small-scale extraction of surface gold from riverbeds has been frequent, and environmentally destructive, with much use of dredges, cyanide and mercury that kill aquatic life and poison streams; but large scale exploitation is new. Publicly, small-scale mining is now banned, but in practice it persists, especially in districts where there are no longer Tibetans on their lands to protect it, having been removed in the name of watershed protection.

Now a new era is under way. The state has paid for the necessary infrastructure of roads, railways, power stations and urban facilities. State geological exploration teams have spent decades mapping known deposits, preparing sites for full-scale extraction. Tibet Autonomous Region (TAR) chairman Pema Choling, reporting on the achievements of 2010, said: "With the focus on opening up to the country's hinterland region, we have actively merged with the Chengdu-Chongqing economic sphere."

The biggest copper and gold deposits in Tibet, from west to east, are in Shetongmon, Gyama and Yulong districts, where central planners say there will be many mines, ore crushers, chemical concentrators and smelters. Large-scale industrial mining has arrived. These mines contain silver, lead and zinc as well as copper and gold, although the lead and zinc will go to waste. And all these mines are situated in the watersheds of Asia's major rivers that support hundreds of millions of people downstream.

Shetongmon mine was the first major project to attract publicity, partly because of its sensitive location so close to the Yarlung Zangbo and Shigatse city, the historic seat of the Panchen Lamas; and partly because it was for some time owned by Canadian investors. By the time the railway to nearby Shigatse is completed in 2014, the mine will be operational.

Its proximity to a major river raises serious environmental concerns, since the steep site will have to securely hold at least 75 out of every 100 tonnes of rock mined and crushed to powder to extract a concentrate that can be sent by rail to a distant smelter. According to recent research by Tibetan scientists, there is already a natural heavy-metal load in the river; any leakage from the hillside dam waste tailings could be disastrous. Not only would downstream India and Bangladesh be affected; if the planned water diversion of Tibetan rivers to the Yellow River includes capturing the Yarlung Zangbo, downstream China's water purity would be threatened too.

Gyama mine, controlled by Vancouver-based China Gold, is already operational and, located just upstream of Lhasa, poses a threat to the purity of the water in Tibet's most sacred city. Like most of Tibet, the area is seismically unstable, vulnerable to earthquakes. A study of water quality below the Gyama mine carried out in 2010 revealed that "elevated concentrations of heavy metals in the surface water and streambed at the upper/middle part of the valley pose a considerably high risk to the local environment... and to downstream water users. Environmental changes such as global warming or increased mining activity may increase the mobility of these pools of heavy metals."

Local Tibetans have protested and sent a petition to Chinese authorities demanding the closure of the mine. The mining operation has reportedly dried up spring waters, poisoned drinking water, killed 1,000 domestic animals and destroyed flora and fauna in the region. Despite this, in August 2011, China Gold announced that it had boosted the resources of the

mine by over 400% and will proceed with a major expansion of the project.

The Gyama mine has already operated for many years on a smaller scale, under various owners who lacked capital to invest in sufficient health and safety practices. Of particular concern for human health, especially for the growing brains of the children of Lhasa, is the lead content of the Gyama deposit, which will not be recovered, and so lie forever in waste dumps below the mine.

But this is the first highly profitable project in Tibet, both for the mining company, which will have sales of 45.6 billion yuan (US\$7.2 billion) over the mine's life, and for China's central government, which will earn 4.9 billion yuan (US\$767 million) in revenue from taxes. These figures are based on 2010 copper and gold prices. If mid-2011 prices are used, profit will be a lot higher.

The Gyama deposit contains less than one million tonnes of copper metal, but nearby, also upriver from Lhasa, is Chulong, a much bigger copper deposit (seven million tonnes) and commercially attractive molybdenum metal as well. The recently discovered Chulong deposit is in a mountain chain that drains northwards to the great Ganden monastery and southwards to Samye, location of the first Buddhist monastery built, over 12 centuries ago, and thus deeply venerated. Heavy metals escaping from Chulong to air and water would be an even greater threat to all these places in one of the most densely populated parts of Tibet.

Yulong is one of a cluster of copper and gold deposits in eastern Tibet, in a remote and rugged area between the watersheds of the Yangtze and Mekong rivers. Electricity sufficient to power a smelter will be supplied by hydropower dams that central planners have announced will be built on these great rivers and their major tributaries, causing massive interruptions to wild mountain rivers.

These mines are planned to add hundreds of thousands of tonnes of copper each year to China's supply, which is both a lot and not very much. For Tibet it is a lot, signifying nothing less than the remote region's integration into the Chinese industrial economy. It is also a lot for Tibetans who, even after the mines are exhausted and closed, will have to bear the environmental costs, but are not permitted to establish NGOs to give voice to environmental concerns. Nor will Tibetan communities receive royalties from these projects.

Yet these mines will do little to reduce China's reliance on global sources for raw materials. China's copper-smelting capacity is just over four million tonnes a year, with a further 600,000 tonnes due to begin production soon. But China's copper consumption is now seven million tonnes a year. The difference is made up by imports. Even if the new mines meet production targets, despite several recent delays, China's imports of copper and gold will continue to rise.

Although Chinese state-owned mining companies are now adept at operating and raising capital globally, they are also good at drumming up resource nationalism. The reality is that the Tibetan deposits being turned into mines are hardly world scale. The biggest copper deposits in the world hold over 100 million tonnes of actual copper each; and have the capacity to produce, on average, a 345,000 tonnes of metal a year, and none produce less than 200,000 tonnes. Even the biggest deposit in Tibet, Yulong, is only a small fraction of the size of the largest mined deposits worldwide. It currently produces 10,000 tonnes of copper a year, but according to officials this might reach 100,000 tonnes by 2015. But these deposits are currently the biggest in China, a fact strongly emphasised by their corporate owners, keen to elicit state subsidies.

While patriotic Chinese netizens might presume it is better to source copper from Tibet than Peru or Zambia, China's mining companies would seldom invest abroad in copper deposits of only a few million tonnes, especially if bigger deposits are on

the market. So why are remote Tibetan mines going ahead, if they cannot be justified on market economy grounds? Commercial considerations are only part of the picture.

The mining companies benefit from state financing of railways, power stations and much other infrastructure, as well as receiving finance at concessional rates to corporate borrowers, tax holidays, minimal environmental standards and costs, no royalty payments to local communities and subsidised rail freight rates to get concentrates to smelters or metal to markets. It is these state subsidies that tip the balance towards medium-scale mines in several Tibetan locations, rather than one more big Chinese copper mine overseas.

The Shetongmon mine was originally scheduled to begin production in 2010, but the operational date has been put back to when a rail line connecting via Lhasa to inland Chinese smelters and markets can be completed. The same is true of the Gyama mine, which is on the route of another new rail line from Lhasa to Nyingtri in southern Tibet. And the Yulong mine has been slow to develop beyond a modest scale, while awaiting the completion, at state expense, of hydropower dams and a rail line, still some years away.

A further reason for delay is the difficulty – given the steep terrain draining both the Yangtze and Mekong – of guaranteeing no leakage of toxic metals into rivers. The Qinghai-based Western Mining and Zijin, China's biggest gold producer, own Yulong mine. In early 2011, Zijin was found guilty of a toxic spill in Fujian province that poisoned fish and polluted the drinking water of tens of thousands of people last year. In March 2011 Xinhua reported that "after a short period of trial operation, the Yulong project was suspended due to environmental issues. It is unclear when the project will be continued." However, Zijin is too influential a company for the project to be long delayed.

China's 12th Five-Year Plan says Tibet will become a "non-ferrous metals base" for inland heavy manufacturing concentrated in Chongqing and Chengdu. If this is to happen, it will not be driven by market economy logic, but by a nation-building agenda subsidised by the centre.

Gabriel Lafitte is an environmental policy consultant who has worked with Tibetans for over 30 years.

Image by Preston Rhea