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## Slow drowning of Tibetan grasslands fenced in by Beijing

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- Communal pasture was divided up and fenced to protect grassland
- Meltwater is submerging pasture and snowstorms have hit trapped herds
- Mobility and cooperation used to make Tibetan herders self-reliant in the past

The glacial lake of Siling Co embodies both the splendour and perils of Tibet's highlands. Its waters reflect a cobalt sky dotted with clouds. At 4,500 metres above sea level, the air is thin and clear, and the light almost unearthly. The turquoise lake frames a flock of black-necked cranes foraging on the shore. Nearby, Tibetan antelopes stop grazing to cautiously observe a man slowly picking his way to the water's edge.

For Bumtar, a 32-year-old herder from Village Three in the town of Xiongmeizhen, the tranquil scene disguises looming danger. Until a decade ago, Bumtar — who, like many Tibetans, uses only one name — lived by the lake with his family, where they grazed their 35 yaks and 200-odd sheep on 340 hectares of pasture. But higher up, in the surrounding mountains, a disaster (<http://www.scidev.net/global/environment/disasters/>) was unfolding that would drive his family from their home.

The disaster is accelerating with every warm year. Due to climate change (<http://www.scidev.net/global/environment/climate-change/>), more and more meltwater from shrinking glaciers and defrosting soil is flowing into Siling Co, also known as Serling Tso, causing the lake to swell and drown surrounding land. "More pasture got flooded every year and, eventually,

we had to entirely abandon our house and land in 2011,” Bumtar says.

### Tibet's largest lake

And the water is still advancing: the lake is rising by more than half a metre every year. Around 5,300 hectares of the village's pasture are now submerged. According to an environmental assessment report released by the Chinese Academy of Sciences (CAS), the lake expanded by nearly half its original size between 2005 and 2014. It has now been crowned Tibet's largest lake.

For Bumtar, this is a dubious honour. “You could still see the roof of our house a couple of years ago,” he says, pointing across the lake. “Now it's all gone.”

What is happening to the Siling Co herders is not exceptional. All over Tibet, climate change is forcing people to resort to desperate measures to eke out an existence on the ever-more hostile land. The problem has laid bare the glaring inadequacies of grassland management policies (<http://www.scidev.net/global/governance/policy/>) created decades earlier by the Chinese government, which administers Tibet.

“Serling Tso is just one of the 1,230 or so Tibetan lakes that are rapidly expanding due to increased precipitation, glacier melt and permafrost thaw,” says Su Fengge, a hydrologist at the CAS's Institute of Tibetan Plateau Research in Beijing. Since 1970, the number of lakes in the region has grown by 14 per cent, while three-quarters of existing lakes are expanding. The total area of Tibet covered by water grew by 19 per cent during the same timeframe, says the CAS report.



“This has devastated surrounding pastures,” says Su.

Doyong, the chief of Bumtar's village, is at a loss about what to do. Dozens of families in the village have lost their pasture. “And other villages around the lake are similarly affected,” Doyong explains.

He has experienced first-hand how policies intended to protect the environment (<http://www.scidev.net/global/environment/>) have destroyed the herders' traditional way of life. Because of a series of Chinese government initiatives launched since 1980 to protect Tibet's grasslands by limiting grazing, most pasture is now divided up between individual households, with fences marking boundaries. This means families affected by flooding cannot easily move their herds, Doyong says. As a result, some herders have been forced to take up poor-quality pasture far from lakes and rivers. Others, such as Bumtar, rent lakeside land at considerable cost.

But with water levels continuing to rise, Bumtar says this is only a short-term solution. "I don't know how long this will last," he says, gesturing at the soggy grassland under his feet.

### Remote control

Although Tibet has its own regional government, policies concerning what is called the Tibet Autonomous Region are effectively handed down from the Chinese government in Beijing. One concern is that the central government may not know the reality on the ground from thousands of kilometres away. And while Tibet is heavily subsidised and many of Beijing's policies are probably well-intentioned — aiming to boost economic development, for example — the lack of a transparent and democratic political system that recognises local culture, knowledge and sensitivities is sorely felt in day-to-day policymaking.



Fenced-in pastures do not allow herders to continue their nomadic lifestyle

The initiative that led to pasture being fenced off is the latest in a string of Chinese grassland policies that have followed a tumultuous course. After China took control of Tibet in 1951, the young communist republic abolished serfdom. It shared out animals and land to form collectives, laying the groundwork for intense livestock [production in large state farms](http://www.scidev.net/global/agriculture/livestock/).

Then, in the mid-1980s, as the fervour of the market economy swept across Asia, Beijing swung to the other extreme: privatising pastures to incentivise individual households to boost productivity on the blocks of land they were allocated. As a result, Tibetans, with financial support from the government, were compelled to build fences to mark the boundaries between households and villages.

The policies are hugely unpopular among researchers and herders alike. There is widespread disappointment that they are not guided by science. Yet Tibetans must comply with policies handed down to them by faraway policymakers with little understanding of the working and complexity of the Tibetan landscape. And with climate change getting a grip on Tibet, the fences increasingly threaten the herding lifestyle.

Privatisation and fencing "have effectively settled the herders for good", says Yonten Nyima, a Tibetan policy researcher at Sichuan University in Chengdu, capital of Sichuan province, which lies to the east of Tibet. Tibetan herders are now confined to their allocated grasslands instead of heading for the best pastures at high elevations in summer and coming down to more sheltered valleys during winter.

Nyima is starting a project to assess how lake expansion affects herders' livelihoods and to suggest adaptations. Such new policies are urgently needed as more and more herders lose their homes and livestock to the

meltwater flood climate change.

### Another menace

But lake expansion is not the only menace threatening the fenced-in herders. At the village of Dotse in Yushu prefecture in the northern part of the Tibetan Plateau, 72-year-old herder Tsoje recalls the horror of watching a severe snowstorm in 1995 decimate her livestock. Her tone is calm as she describes how her sheep and yaks wasted away in her fields.

“The snow reached the knee and blanketed many pastures in the region,” she says. “The livestock had nothing to eat for weeks. They were so hungry that they ate each other’s fur.”



Tsoje’s herd was nearly wiped out in a severe snowstorm

Tsoje and her four grandchildren, aged between a few months to eight years old, share a meal of hot, milky tea, *tsampa* (roasted barley bread) and dried yak meat prepared by her daughter. The stove in the centre of their simple, incense-filled mud house crackles as she tells them how fencing turned the self-sufficient herders into helpless onlookers during the disaster.

“The grasslands were all divided up, so we couldn’t herd the animals to places that were not affected by the snowstorm,” she says. “We lost half our livestock, about 54 yaks and more than a hundred sheep. They all starved to death.”

Tsoje’s case is just one of many disasters that have befallen Tibet’s herders. Along with flooding, snowstorms pose an ever-increasing risk to animals and people alike. According to a study led by Long Ruijun, an ecologist at Lanzhou University in China’s Gansu province, 39 per cent of livestock in Yushu prefecture died in the 1995 disaster. And between 1980 and 1990, 42 per cent of livestock, or about 2.3 million animals, were killed by snowstorms in Nagqu prefecture in central Tibet alone. As a result, more than US\$100 million were lost to Nagqu’s economy over the decade, Long found.

### The danger of settling down

“Snowstorms are a major threat to the livelihood of Tibetan pastoralists,” says Dondrup, a former herder from Yushu who is now a project officer for China Plateau Perspectives, a non-governmental organisation based in China’s Qinghai province that seeks to improve the lives of those living on the Tibetan Plateau and protect its environment. He puts the blame for herd loss from storms squarely at the door of settlement policies.

“Snow disasters have always been a part of the plateau life,” he says. But “pastoralists’ ability to cope with such disasters may be changing when they move away from nomadic pastoralism”.

Researchers have not yet established whether snowstorms are becoming more intense or frequent on the plateau. But atmospheric scientists such as Zhang Renhe, former head of the Chinese Academy of Meteorological Sciences in Beijing, say snow cover on the plateau has significantly risen in the past decades. And “severe snowstorms are often followed by weaker Asian monsoons and summer droughts”, he says.

This exacerbates the problem, says Tsechoe Dorji, an ecologist at the Lhasa branch of the Institute of Tibetan Plateau Research, who grew up in a herder family in western Tibet: “It’s a double whammy for livestock, making them more vulnerable in the following winter.”

In traditional pastoralism, pastures are communally managed, and the community shares not only a considerable body of practical knowledge — which is passed down from generation to generation — about surviving in their uncertain environment, but also a strong sense of kinship and reciprocity. “Their vulnerability is, therefore, cushioned by cooperation and joint ownership of assets and resources,” says Nyima of Sichuan University.

### **Complex risks**

According to the latest set of assessment reports (<https://www.ipcc.ch/report/ar5/>) from the Intergovernmental Panel on Climate Change, the Tibetan Plateau will be a hotspot for extreme climate events such as floods, drought and snowstorms. But the plateau occupies 2.5 million square kilometres — equivalent to more than a quarter of China’s landmass — and is home to various climate zones, making climate change’s true impact hard to assess.

With pressures on Tibetan herders increasing, scientists and local government officials are lobbying for more opportunities to understand their complex predicament. There should be efforts, for instance, to study the processes driving lake expansion and to predict how they will change in the future, says Guo Hongbao, director of Nagqu prefecture’s livestock and husbandry bureau.

**“Mobility and cooperation are the cultural fabric of Tibetan pastoralism that empower the community and make them self-reliant.”**

**Emily Yeh, University of Colorado at Boulder**

“Only then can the government work out compensation and contingency plans for the affected regions,” says Guo. Lake expansion “is a relatively new phenomenon and we are still struggling to come to terms with it”, he says.

But herders whose land now lies submerged acutely need government intervention. In a project supported by the US National Science Foundation, Nyima and his colleagues assessed how recent grassland policies have affected how herders cope with snowstorms. Between July 2009 and September 2010, Nyima lived in five villages in Nagqu, observing and participating in everyday life and pastoral practices. He interviewed 120 households on past and current strategies to cope with snowstorms.

### **Decline in livestock quality**

“Most pastoralists lament having to fence in their animals,” says Nyima. They are seeing a decline in livestock quality due to restricted mobility and continuing grassland degradation, which they think makes the animals more vulnerable to severe winter conditions, he says. Moreover, the herders often feel helpless in extreme climate events, he adds.

When a snowstorm hit previously, a group of herders could ask to use the pastures of other groups, Nyima explains. Such informal arrangements developed over time, and included the understanding that the favour would be returned.

“Now herders have to negotiate with individual families on their own, often with little success,” says Nyima. “Most of them are simply trapped in their own plot of land and have nowhere else to go.”



#### Settled herders are losing out on informal herding arrangements

Other scientists are worried about increasing conflict between families and villages in Tibet since privatisation. “This is not terribly surprising,” says Emily Yeh, a Tibetologist at the University of Colorado at Boulder, United States, who worked with Nyima on the National Science Foundation project. “The current economic policies encourage households to act individually as profit-maximising agents competing with their neighbours.”

In a separate study, Yeh and her colleagues found people charged extraordinary prices for access to unaffected pastures during snowstorms in Gouli, a town in the northern Tibetan Plateau. “This is not at all traditional,” she says. “It undermines the spirit of cooperation, which is crucial for coping with climate change and natural disasters.”

There are, however, exceptions, says Yeh. She tells *SciDev.Net* about a resourceful herding family that trucked their yaks to a town 40 kilometres away, where there was little snow. This family lost fewer livestock during severe winters. But you need “connections, resources and labour power for such long-range mobility”, Yeh points out.

#### Grassland damage

All the while, it is becoming clear that grassland privatisation, which was introduced to protect the environment, is causing biodiversity loss and a decline in grassland quality.

Muhammad Ismail, an expert on natural resource management at the International Centre for Integrated Mountain Development in Nepal, says traditional herding, which was practised in Tibet for thousands of years without significant impact on the land, needs to be reintroduced.

Researchers found that rearing livestock in fenced-in pastures is more damaging than allowing them to roam over a large area. This is because it involves repetitive trampling and because grass on each piece of pasture has insufficient time to regrow before animals are rotated back to it.

“Pastoralism is most effective and most environmentally friendly when it’s a communal activity,” says Ismail. “There is an urgent need to restore community connections to the land [in Tibet]. It’s the path to building resilience to climate change.”

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But while recognising the importance of mobility and cooperation in adapting to a changing environment, “this is far from enough, especially in extreme cases of floods, droughts and snowstorms”, says Guo, whose office is tasked with keeping Nagqu’s stock and herders safe.

“We need to take a holistic approach and rely on a whole suite of different measures,” he says, adding that such adaptation strategies “must be based on a proper assessment of risks and vulnerability”.

### **Prepare for the unpredictable**

A lack of information is certainly no longer an excuse for inaction. Tibet has recently been the focus of a flurry of reports and studies designed to help the region cope with climate change. When it comes to extreme weather, for example, the 2014 Chinese Academy of Sciences report named four prefectures — Nagqu, Yushu, Ngari in Tibet and Aba in Sichuan province — as hotspots for severe snowstorms.

“This should form a good basis for adaptation strategies,” says Meng Deli, vice-chairman of the Tibet Autonomous Region. The government is deliberating how the region could better cope with various environmental changes, especially extreme climate events, in coming decades.

To help the herders, these strategies need to consider the inherent problems of livestock husbandry in the harsh Tibetan winter, says Wang Xinchuan, an ecologist at the Breeding Centre for High-Quality Grasses on the northeastern Tibetan Plateau. Even during a normal winter, animals can lose up to 30 per cent of their body weight. “In high-risk regions, the government ought to stockpile sufficient blankets and supplementary hay as emergency measures,” he says.



Research scientist Wang Xinchuan cultivates plant mixes for animal feed

The hay would be used in addition to the dried vegetation the animals are normally given over the winter. One big challenge, Wang says, is that “we are unable to cultivate the nutritious species that livestock prefer” because such plants rarely produce seeds on the high plateau and instead spread by developing shoots.

In addition, he says, species commonly planted on the plateau have “low yields and poor nutrition levels, especially protein content, and struggle to survive winter at high altitudes”. But hope may be on the horizon. After years of breeding research, Wang and his colleagues have developed a way

to cultivate a mixture of selected grass and legume varieties that, he says, rivals any of the species currently grown separately for animal feed.

### Get moving again

The problem remains, however, that there is no simple way to protect herders and their livestock. Researchers favour introducing a range of strategies to help Tibetans adapt to climate change. But these cannot function in a social vacuum, nor will they happen without ongoing government support, says Yeh, from the University of Colorado.

And, according to Yeh, such strategies will fail without a back-to-the-roots movement among herding communities. Therefore it is essential for both herders and their environment that the animals get moving again. “Mobility and cooperation are the cultural fabric of Tibetan pastoralism that empower the community and make them self-reliant,” she says. Without reclaiming many of their nomadic traditions, she adds, these values will be lost.



Lake expansion in Tibet continues to engulf houses and pastures, posing a serious threat to fenced-in herders

This loss is palpable at Siling Co, where Bumtar examines some shoes and medicine bottles that have reached the shore from villages drowned under the lake. Bobbing up and down under the sweeping vista of Tibet's highlands, now mostly devoid of herders, these remnants of humanity are symbols of disaster and displacement that are not lost on Bumtar.

“I don't know what the future will hold for us,” he says. “We have no control over our own destiny.”

*Want to read more? See Jane Qiu's feature in Nature*  
<http://www.nature.com/news/1.19139>.

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