

What are climate risk narratives?

- Climate Risk Narratives are imaginative descriptions of what the world might look like under different plausible climate futures.
- They aim to make quantitative climate information more accessible to non-scientist audiences, embedding climate information into real-world contexts.
- The approach was first developed to support climate change decisions in southern African cities (Jack et al., 2021) and is now being used in other regions.
- Their value lies primarily in the process of starting conversations and encouraging dialogue, rather than as an end-product.

Jack et al. (2020). Climate risk narratives: An iterative reflective process for co-producing and integrating climate knowledge. *Climate Risk Management*, 29, 100239.



Co-producing climate risk narratives

The process can be adapted depending on the aims. In Nepal, three initial narratives were drafted by the project team; one present day narrative and two imagined worlds set in 2050, one optimistic and the other pessimistic, spanning two plausible climate futures of rainfall extremes. The content was based on understanding of the context, informed by multi-year engagement between hydropower stakeholders and climate scientists. They were shared with participants at a collaborative workshop in July 2022 (photo, left) who agreed titles and edited them to add their unique perspectives (see pages 2-4).

What did we learn, and what's next?

The workshop session was a great way to engage participants and encourage discussion of possible futures. Conversations about the present-day climate risk narrative helped identify opportunities and barriers to incorporating climate information in current decision processes, as well as highlight the non-climatic factors that impact decision-making. The future climate risk narratives helped people frame short-term actions that have long-term implications. The narratives highlighted how key decisions and policies impact future climate resilience, and who should be engaged in further work.



The Present Day

It is mid-July 2022. Nepal is experiencing a challenging economic situation. With rising fuel and food costs, Nepal's inflation rate is at a six-year high of 7% compared with 4% one year ago.

Meanwhile, Nepal's monsoon season is in full swing. Heavy rains arrived earlier than usual this year with particularly high rainfall in late June associated with a strong monsoon trough, causing flooding in some places. This is concerning since disaster preparedness in these regions is poor.

94% of Nepal's 30 million people have access to electricity. Demand is increasing as standards of living across the country improve over time. The government recognises this and are promising to invest in new, renewable sources of energy to bring affordable, quality, and reliable electricity to people.

Electricity demand outweighs supply, especially in the dry season when rivers run lower and run-of-river hydropower plants generate less electricity, which has negative impacts on industry. Nepal relies on imported electricity from India to make up the shortfall, and is dependent on Indian imports of fuels for transport and cooking. Scheduled power cuts are rare but an inadequate distribution system and transmission lines cause problems as the infrastructure cannot cope at times of very high demand.

There is significant investment in new generation capacity from the government and private sector, with 2000 MW currently installed and a further 2000 MW capacity to be installed over the next 4 years. Neighbours India are also investing billions of dollars in infrastructure, including hydropower plants supported by an electricity trading deal with Nepal. In May it was announced that an Indian company and the Nepal Electricity Authority will jointly invest in a 695 MW hydropower plant - the Arun IV project on the Arun River in eastern Nepal - with most of the electricity being exported to India and Bangladesh.

Weather-related extreme events, such as floods and landslides driven by periods of heavy rainfall and fragile geology, also impact generation as plants need to shut down to minimise turbine damage from sediment and debris. In June 2021, heavy rainfall and flash floods from the Melamchi and Indrawati rivers resulted in 5 deaths and 20 missing persons, along with heavy damage to the Melamchi water supply project, cutting off road access to several villages and destroying a hydropower plant. The disaster was the result of multiple anthropogenic and climatic factors that occurred along the Melamchi river.

Although some technical guidance is available, lack of accessible data and no incentives for climate-smart investors mean climate information is rarely used when planning and operating Nepalese hydropower plants. There is concern about climate change and organisations are starting to address this, with help from international investments. Current design standards are based on understanding of historic climate risks, though rainfall and run-off data is sparse since the national observation network was not designed with the information needs of hydropower organisations in mind. Relevant climate information is missing – no-one is satisfied with current information.

There is increasing awareness of climate change in urban areas but understanding in isolated, rural communities lags behind. The future looks uncertain and more needs to be done to build climate resilience.

The Glorious Future / “Happy Nepali, Prosperous Nepal”

It is mid-July 2050. Nepal’s economy is booming, and everyone is getting excited about the start of the FIFA Football World Cup, with Nepal having qualified for the very first time.

Nepal’s population is 35 million, growing more slowly than expected over the past 20 years. Quality of life has vastly improved for people across Nepal due to sustained investments in healthcare, technology and social welfare. The tourism sector has also grown, particularly for tourists from India thanks to the new high-speed trainline from Delhi to Kathmandu and good rail connectivity within Nepal.

Hydropower generates over 80% of Nepal’s electricity with the remaining electricity coming primarily from solar and geothermal. Careful management of resources and advances in battery storage have meant that power generated in the monsoon season can be used in the dry season. Energy supply is keeping up with demand. Nepal has been a net exporter of low-carbon electricity to countries across South Asia since 2030 and is being paid green C-credits, making up 10% of GDP.

The climate is warmer now than ever before. Temperatures are 1.5°C warmer globally, and 1.8°C warmer in Nepal, than the pre-industrial period. But there is hope that temperatures won’t rise further thanks to decisive action taken at COP-30 in 2026, where countries came together like never before. Many countries have now met their net-zero carbon targets, including Nepal.

Because of climate change, extreme rainfall events are now 15% more intense on average than at the start of the century and records are being broken regularly. In June, the Dudh Koshi basin experienced the highest daily rainfall on record. What was a 1 in 100 year flood event in 2020 now occurs once every 70 years. However, the “transboundary multi-hazard warning programme”, introduced in 2042, provides 98% of people across the HKH region with access to real-time warnings, sent to smart watches, homes and autonomous vehicles (e.g., self-driving buses). Loss of life due to floods is now rare. And since COP-35, chaired by Nepal in 2031, an effective “loss and damage” mechanism provides compensation to local communities and those who operate infrastructure, including hydropower plants, from disasters made more likely by climate change.

A 2GW hydropower plant built in the Koshi basin in 2039, designed according to long-established guidelines for climate risk stress testing, has recently completed a 5-year pilot study, showing how weather warnings, seasonal forecasts and 3-year climate predictions can be used to better manage climate risks. The guidelines also allow for flexible Q-values which has increased total energy generation. The scheme will now be rolled out across Nepal.

Observed hydro-climate information is readily available and easily accessed. DHM’s hydromet observation network has grown considerably, with more dense and better coverage in high altitudes; hydropower organisations contributed 50% of the installation costs for new observation stations. The network now utilises data from sensors in personal devices and new data is coming from community science projects. Despite the political sensitivities, the HKH “common data act” was signed and came into effect in 2045, supporting data sharing agreements between neighbouring countries.

Thanks in part to climate-smart hydropower development, Nepal is considered a climate resilient country and a leader in the region.

The Gloomiest Future / “Sad Nepali, Dark Nepal”

It is mid-July 2050. Nepal is still recovering from the 2047 global financial crisis and unemployment remains at a 10-year high. Rapid government turnover and political corruption mean inequality is entrenched, with the gap between the rich and poor higher than ever before. There has been massive migration to urban areas, causing localised unrest, and many educated people are moving abroad seeking employment and a more prosperous future.

Nepal’s population is 40 million, with growth higher than expected over the past 20 years. There has been a significant increase in those aged 65 and over, at around 2 million people 30 years ago to more than 9 million people today, increasing the tax burden on the working population. Electricity is expensive and low-income groups can’t afford it, instead cutting down trees to heat their homes, decreasing air quality and increasing landslide risks.

Hydropower generates 60% of Nepal’s electricity. Despite efforts to grow the renewables sector, electricity from fossil fuel plants in India remains cheaper and Nepal imports over 20% of its electricity. High sediment volumes have decreased estimated capacity of hydropower plants, and, combined with a series of successive disasters, hydropower is no longer an attractive investment. Three investment banks have gone bankrupt as hydropower plants have failed to make payments.

The climate is warmer now than ever before. Temperatures are 2°C warmer globally, and 2.8°C warmer in Nepal, compared to the pre-industrial period. Two-thirds of the glaciers have melted, decreasing dry season flows. Despite promising signs in the 2020s, international efforts to try and reach global agreement and reduce greenhouse gas emissions have been largely ineffective.

Because of climate change, extreme rainfall events are now 40% more intense on average than at the start of the century and records are being broken regularly. Due to recent transboundary floods, relations with India and China are at an all-time low. Economic blockades have been imposed until watershed management improves. In June, the Dudh Koshi basin experienced the highest daily rainfall on record, for the third successive year. What was a 1 in 100 year flood event in 2020 now occurs once every 30 years. While early warnings have improved, and there are areas of the country where warnings are effective, a lack of coordination and sustained investment means that other areas do not receive effective warnings, further isolating vulnerable populations.

A 2GW hydropower plant built in the Koshi basin in 2039 failed to take into account climate change risks in the design stage. There were major issues with sediment and a large part of the plant was destroyed in an unprecedented flood and landslide event in 2044, and it is still not back to full operational capacity. The operators are now looking to improve the plant for the future so it is more resilient to changing risks.

Access to observed hydro-climate information is difficult. DHM’s hydromet observation network requires more funding to maintain, and coverage in high altitudes is poor, but the government has limited funds. Data sharing between countries has not happened due to political sensitivities and a lack of resources.

Nepal still has a long way to go to be considered a climate resilient country. And the outlook is ominous, with latest climate projections showing a further 2° increase in temperatures and a 50% increase in extreme rainfall intensity by the 2080s.