



Investing in risk-informed infrastructure to support flood resilience

Despite being a global issue, effective flood risk management is highly complex and there is no one-size-fits-all solution to implement universally. Investment in infrastructure is a cost-effective way to ensure flood resilience, but it must be risk-informed and be part of an integrated flood management strategy.

Key recommendations

- *Development must be restricted in hazard zones, and incentives for development that lead to urbanization of risk areas should be avoided.*
- *Provision must be made for effective large-scale flood risk management practices including soft (erosion control, river widening, natural retention areas) and hard (levees, reservoirs and other constructional features) protection.*
- *Technical protection should be used to safeguard existing settlements rather than to encourage new assets in floodplains.*
- *Clear and up-to-date building codes that mitigate flood risk should be provided, and communities must adhere to them.*
- *Enable communities to enhance self-protection and risk reduction through incentives and subsidies.*

Man-made consequences of a natural hazard

Floods affect more people globally than any other type of natural hazard. They cause some of the largest economic, social and humanitarian losses, affecting on average some 250 million people each year. While floods are natural, there is

nothing 'natural' about their disastrous consequences. Rapid urbanization, economic expansion to flood-prone areas, more extreme weather events and sea-level rises are just some of the drivers behind the acceleration of flood-related disasters in the last two decades.

Investing in infrastructure

Investment in infrastructure is a key flood risk reduction measure, but it needs to be risk-informed and accompanied by clear regulation to avoid further expansion in hazard-prone areas. Infrastructure alone does not reduce the hazard and there is always residual risk to be considered as well.

The responsibility of investing in infrastructure solutions to protect communities against flooding often falls on local and national authorities. Governments can provide incentives to communities to enhance their protection through different types of subsidies for physical protection.

Investing in flood protection is costly. But it proves to be a financially valid, successful and important investment when compared with losses where no such or poor protection is in place. However, infrastructure investments need to be part of a portfolio of solutions that provides communities with an ongoing flood risk reduction strategy¹, as we suggest below.

A holistic and long-term strategy

As floods are spatial hazards, we can avoid the risk by building outside flood zones. Modern land planning should consider this accordingly. It is better to be outside a natural flood plain than to be located where technical protection is required.

Where flooding is a risk, flood control should start with soft solutions upstream to reduce the peak flow such that it can be handled by the river cross-section or flow capacity of the water body (downstream of retention). If natural retention is not possible then technical retention can be used to reduce the peak flow at a given location, but technical measures need authority, control, and maintenance – and they can fail. There is always a residual risk that must be managed.

If retention is impossible then technical river construction means can be considered to handle the flood peak flow where it cannot be further reduced. Wherever possible, these should comprise permanent and centrally organized means. If permanent technical flood control is not possible, mobile flood protection is the last resort of the flood control chain.

All these methods must be integrated into 'human element' aspects such as building occupancy compatible with flood exposure and up-to-date flood emergency and contingency planning, as well as good flood awareness and preparedness by the population or the professional staff on site.

References

¹Zurich Insurance Group (2015). *Turning knowledge into action: processes and tools for increasing flood resilience*. Zurich Risk Nexus.

²Venkateswaran et al. (undated) *The PERC manual. Learning from disasters to build resilience: a simple guide to conducting a post event review*. Zurich Insurance Group.

³Zurich Insurance Group (2014). *After the storm: how the UK's flood defences performed during the storm surge following Xaver*. Zurich Risk Nexus.

Evidence from the field

Through Zurich's post-event review capability² (PERC), we have studied a number of major flood events that provide important lessons on infrastructure investment for flood risk reduction.

The Xaver storm surge³ in the UK in December 2013 clearly demonstrated that most of the 2800 km of coastal flood defences set up by the UK government performed well and saved billions of pounds of economic and insured losses, compared with the cost of an event of the magnitude of the surge in 1953 when either no or inadequate defences were in place, which resulted in over 2000 lives lost.

In August 2014, three days of torrential monsoon rainfall led to devastating floods of the Karnali river in Western Nepal⁴. The floods killed 222 people and had a major impact on 120,000 others. Embankments had been built without considering the rate at which sediment is deposited, safe-failure modes, or the increasing trend in rainfall intensities observed over the past two decades. They were also designed in ways that attracted development, and with little thought given to maintenance, control and lifecycle management. A combination of the design and poor land use regulations led to increased development adjacent to embankments and exacerbated the long-term flood risk.

⁴Zurich Insurance Group (2015). *Urgent case for recovery: what we can learn from the August 2014 Karnali River floods in Nepal*. Zurich Risk Nexus.

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Photo credit: Barriers to protect communities from flood-related mudslides in the Rimac Valley, Peru. Michael Szönyi / Zurich (September 2016).

The Zurich Flood Resilience Program

An increase in severe flooding around the world has focused greater attention on finding practical ways to address flood risk management. In response, Zurich Insurance Group launched a global flood resilience programme in 2013. The programme aims to advance knowledge and develop robust expertise and design strategies that can be implemented to help communities in developed and developing countries strengthen their resilience to flood risk.

<https://zurich.com/en/corporate-responsibility/flood-resilience>