

Staying above water:

Singapore's blueprint for flood-ready cities

As climate variability and extreme weather intensify across Asia, cities face rising pressure to strengthen flood resilience. Singapore, a low-lying island, contends not only with sea-level rise and heavy rainfall but also with land subsidence and ageing infrastructure. Without strong flood defences, the risks include infrastructure failure, economic losses and threats to public safety.

Through planning, regulation, collaboration and innovation, Singapore has transformed itself from a flood-prone island into one of the world's most water-resilient cities. Its experience offers lessons for other urban centres.

INTEGRATED STORMWATER MANAGEMENT

Singapore's resilience rests on a layered strategy managed by PUB, the national water agency. At the source, surface runoff is slowed and collected through green roofs, rain gardens and detention tanks. Along the pathway, canals, drains and waterways are widened, deepened or upgraded to channel stormwater. At the receptor level, vulnerable buildings and infrastructure are protected from potential damage.

This framework is embedded in PUB's Code of Practice on Surface Water Drainage, which sets design standards such as minimum platform levels, crest heights and stormwater controls. Together with drainage improvement projects, these measures have reduced flood-prone areas from 3,200 hectares in the 1970s to fewer than 30 hectares today. Since 2021, Singapore has also advanced coastal protection planning to prepare for rising seas.

KNOWLEDGE AND COLLABORATION

Resilience is reinforced through research

and partnerships. Institutions such as the Centre for Climate Research Singapore and local universities build expertise, while PUB engages in joint studies and pilot projects with global experts. The private sector also contributes specialist solutions. FloodX, a Singapore-headquartered provider, has delivered building-scale flood barriers across Asia and the Middle East, highlighting how local companies are exporting expertise to meet growing demand.

BUILDING-SCALE DEFENCE

National strategies must be complemented by site-level protection. Flood barriers are often the last line of defence, safeguarding lives and property. Their effectiveness depends on site conditions such as flood type, flow paths and entry points. For new builds, engineers work with architects and developers early in the design process, while retrofitting demands adaptation to existing structures.

Barrier systems vary — from demountable panels and hinged gates to automated or self-raising mechanisms — and selection depends on deployment speed, manpower, aesthetics and budget. Examples include discreet barriers for conservation buildings, or self-closing systems where electricity is unavailable. High-risk sites may also combine barriers with detention tanks, smart pumps and backflow preventers, creating multi-layered defence systems that mirror the national approach.

DESIGNING RESILIENCE

Singapore's journey shows that resilience is not accidental but designed. Its blend of foresight, regulation and technology has turned vulnerability into strength. For flood-prone cities across Asia, the message is clear: the time to act is now, because the deluge is already here. www.floodx.sg



- 1 Foundation works for anchoring a flood barrier system, with reinforcement and mounting plates prepared at site level (Images: PUB)
- 2 A flood-protected door installed at building entry, designed to safeguard critical interior spaces from water ingress (Images: PUB)