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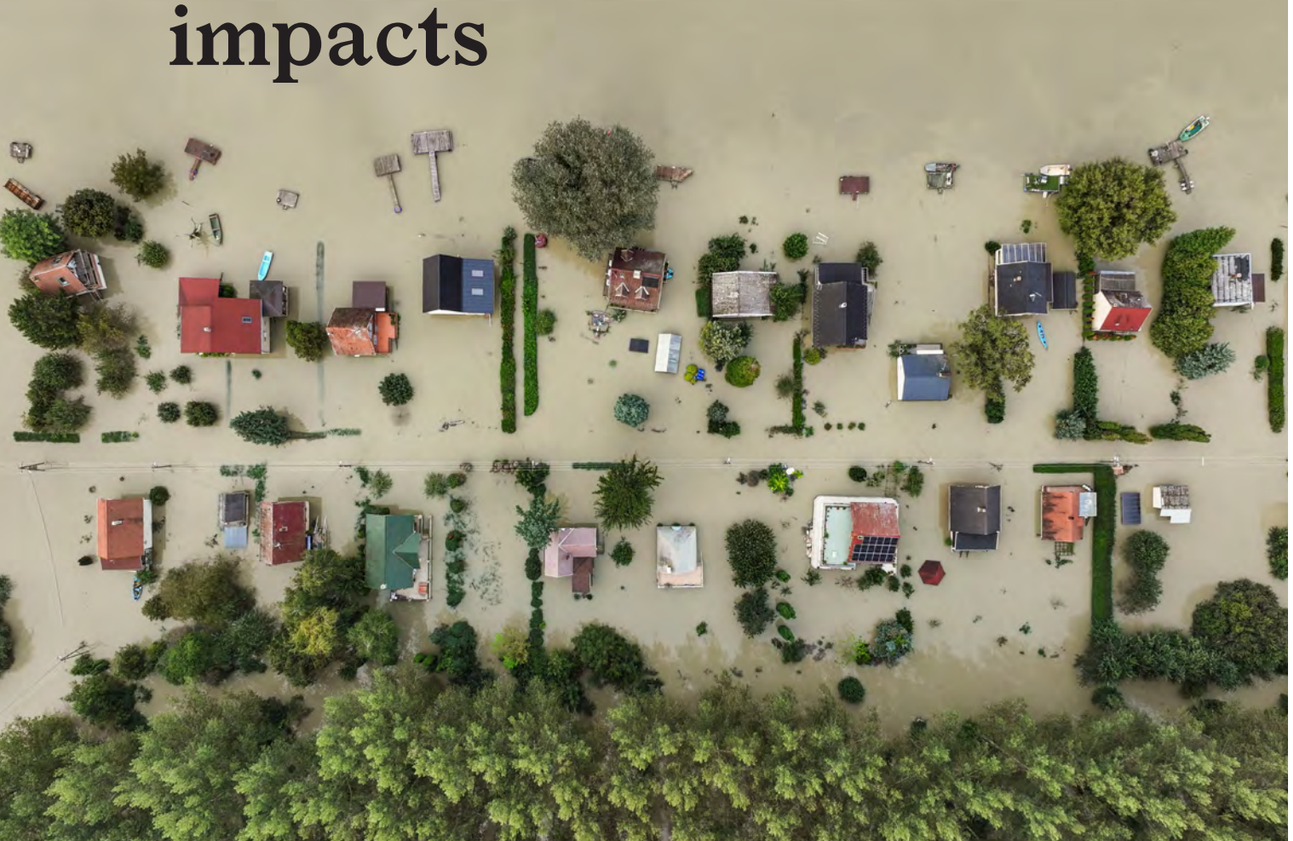
PROF CECILIA TORTAJADA & PROF ASIT K BISWAS

Effective resilience to respond and recover from climate change impacts



As climate change continues to affect populations globally, a pressing concern is that neither governments nor the general public may be adequately prepared to respond to and recover from the risks posed by a changing climate in a timely manner. Global media frequently reinforces this concern by reporting on adverse situations in various parts of the world and their social and economic impacts.

In the case of floods, research estimates that 23% of the global population, or 1.81 billion people, are directly vulnerable to 1-in-100-year flood events. These floods have a 1% chance of occurring in any given year and may happen once or even multiple times in a specific year.

Not everyone is equally vulnerable to floods. Vulnerability is a combination of various factors, including changing rainfall patterns, governance decisions, population exposure, and socioeconomic status. For instance, around 90% of individuals and families at risk reside in low- and middle-income countries; the lower their income, the greater their risk exposure.[1] The risk is heightened for the two billion people living in floodplains globally, primarily in Asia, North Africa, and South America.[2]

From devastation to preparedness

The 2024 global flooding has been catastrophic, with numerous regions experiencing record rainfall and overflow of rivers. Central Europe, for instance, faced severe flooding along the Danube, displacing thousands. Experts predict that 2025 will see even worse conditions, as extreme weather events are expected to intensify due to climate change and global warming.

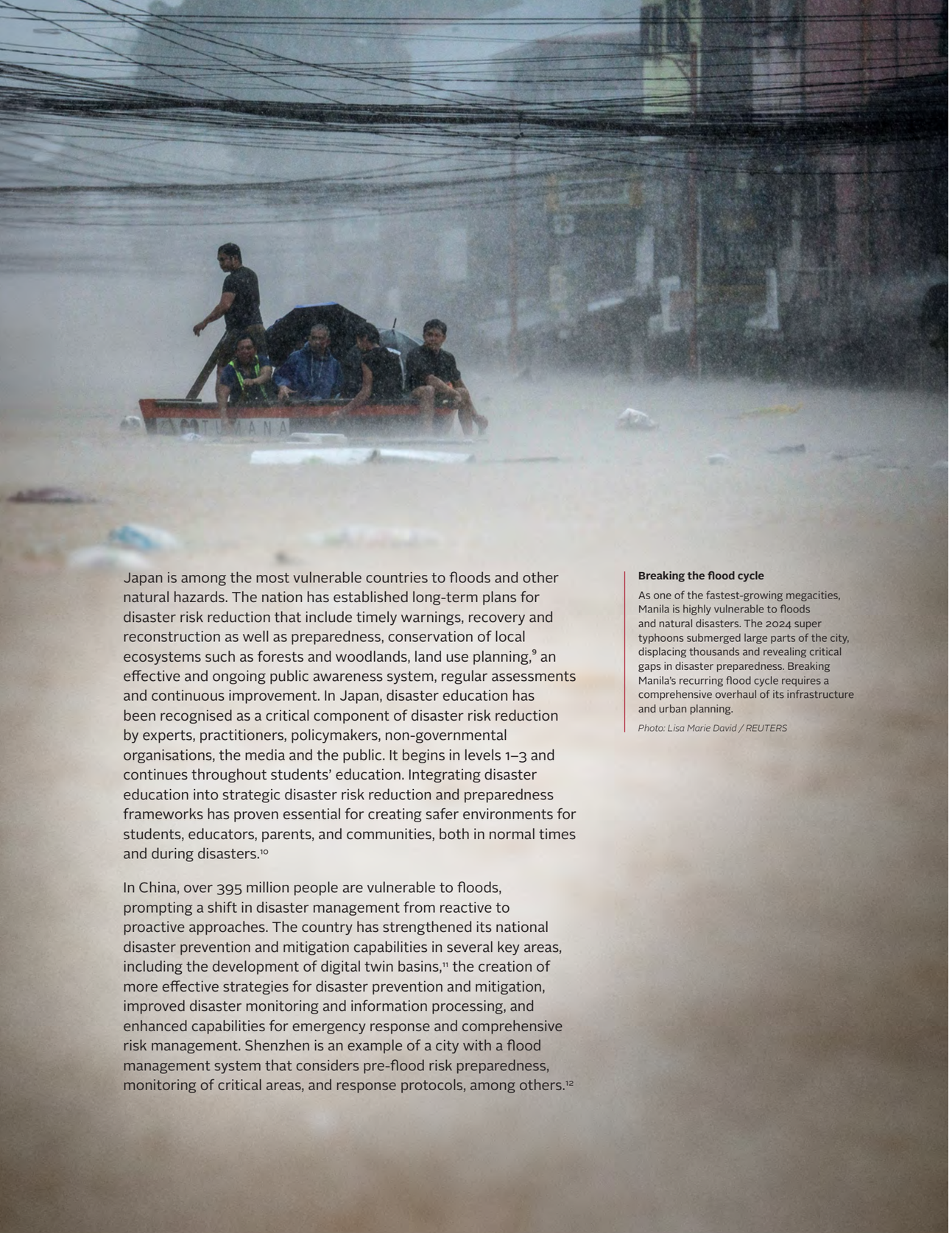
Photo: Fedja Grulovic / REUTERS

Research estimates that 23% of the global population, or 1.81 billion people, are directly vulnerable to 1-in-100-year flood events.

In most countries of the global North, the impacts of floods have steadily decreased due to improved urban design standards, environmental regulations, flood management infrastructure, effective forecasting and warning systems, and social and financial support. Even so, there are regions and countries where relative exposures have increased, such as along the east coast of the United States[3] or the western and southern European countries, including France, Germany, Italy, the Netherlands[4] and Spain. The unfortunate events in Valencia, Spain, in October 2024,[5] and Wales, UK, in November 2024,[6] remind us that more effective and timely preparedness is essential.

While the main focus of climate change discussions has been on adaptation, this should shift towards disaster prevention and preparedness.[7] When it comes to floods, populations expect more from their governments than simply "moving to higher ground" due to inadequate advanced planning. The question is, how can affected populations be better protected so they do not lose their lives, homes, and livelihoods?

Policy instruments for disaster prevention and preparedness include improving communication between the population and government agencies at various levels,[8] as well as fostering learning networks that share both positive and negative experiences among cities so that accurate and timely decisions can be made. Early warning systems are also essential. It is equally important that policymakers and the general population are fully informed about how they function, their benefits, and their limitations.



Japan is among the most vulnerable countries to floods and other natural hazards. The nation has established long-term plans for disaster risk reduction that include timely warnings, recovery and reconstruction as well as preparedness, conservation of local ecosystems such as forests and woodlands, land use planning,[9] an effective and ongoing public awareness system, regular assessments and continuous improvement. In Japan, disaster education has been recognised as a critical component of disaster risk reduction by experts, practitioners, policymakers, non-governmental organisations, the media and the public. It begins in levels 1–3 and continues throughout students' education. Integrating disaster education into strategic disaster risk reduction and preparedness frameworks has proven essential for creating safer environments for students, educators, parents, and communities, both in normal times and during disasters.[10]

In China, over 395 million people are vulnerable to floods, prompting a shift in disaster management from reactive to proactive approaches. The country has strengthened its national disaster prevention and mitigation capabilities in several key areas, including the development of digital twin basins,[11] the creation of more effective strategies for disaster prevention and mitigation, improved disaster monitoring and information processing, and enhanced capabilities for emergency response and comprehensive risk management. Shenzhen is an example of a city with a flood management system that considers pre-flood risk preparedness, monitoring of critical areas, and response protocols, among others.[12]

Breaking the flood cycle

As one of the fastest-growing megacities, Manila is highly vulnerable to floods and natural disasters. The 2024 super typhoons submerged large parts of the city, displacing thousands and revealing critical gaps in disaster preparedness. Breaking Manila's recurring flood cycle requires a comprehensive overhaul of its infrastructure and urban planning.

Photo: Lisa Marie David / REUTERS

Singapore has successfully reduced flood-prone areas from 3,200 hectares in the 1970s to fewer than 30 hectares in 2023. It has implemented its characteristic comprehensive approach to flood management by employing a systems approach at the catchment level. The city extensively uses both grey and green infrastructure. It has developed the 'Source-Pathway-Receptor' strategy, which takes into account areas that generate stormwater runoff, the paths through which this runoff travels, and the locations where flooding may occur. Additionally, the city-state has initiated community tabletop exercises on climate threats, with the primary objective being preparedness.[13]

These examples differ from locations in countries such as India (which has 390 million vulnerable people), where floods and casualties in the state of Assam have unfortunately become a regular occurrence.[14] A sole focus on structural or built infrastructure, such as embankments for flood management, has fostered a false sense of security among the population, leading to increased settlements along riverbanks as people mistakenly believe they are completely safe. The annual scale of human and economic losses (2.4 million people affected in 2024) has prompted societal calls for greater preparedness to prevent deaths and financial losses. The academic community has advocated for the planned relocation of communities in high-risk areas. Clearly, more comprehensive, multi-dimensional flood management strategies that address both physical and socio-economic vulnerabilities are required.

Regarding global climate finance, COP29, which took place in November 2024, reached an agreement to significantly increase climate finance for developing countries, raising the target from USD 100 billion annually to USD 300 billion annually by 2035. While this represents a commendable step forward, it is essential to evaluate the challenges that have impeded the fulfilment of the previous commitment of USD 100 billion per year made at COP15 in 2009. Without such an evaluation, efforts to provide financial support for vulnerable countries will remain ineffective.

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Climate change is expected to intensify in the coming decades. It will continue to adversely impact populations globally due to frequent and severe floods, prolonged droughts, heatwaves, wildfires, and rising sea levels. Both short- and long-term planning are crucial to developing strategies for disaster risk reduction and preparedness, which should include clear institutional responsibilities and adequate budgets for action. Flood risk maps, incorporating indicators of social vulnerability such as poverty, are necessary to safeguard the most vulnerable populations.[15] Most importantly, it is essential not to assume that events will not occur and that preparations are unnecessary.

Risk cannot be managed by a single institution and should not be approached solely through a sectoral response. Since the aim is to save lives and livelihoods, continuous risk management must become a way of life.

Finally, it should be recognised that sub-state actors (such as cities) and non-state actors (including the private sector and non-governmental organisations) must be involved in disaster risk reduction and preparedness. Risk cannot be managed by a single institution and should not be approached solely through a sectoral response. Since the aim is to save lives and livelihoods, continuous risk management must become a way of life. ∞

NOTES

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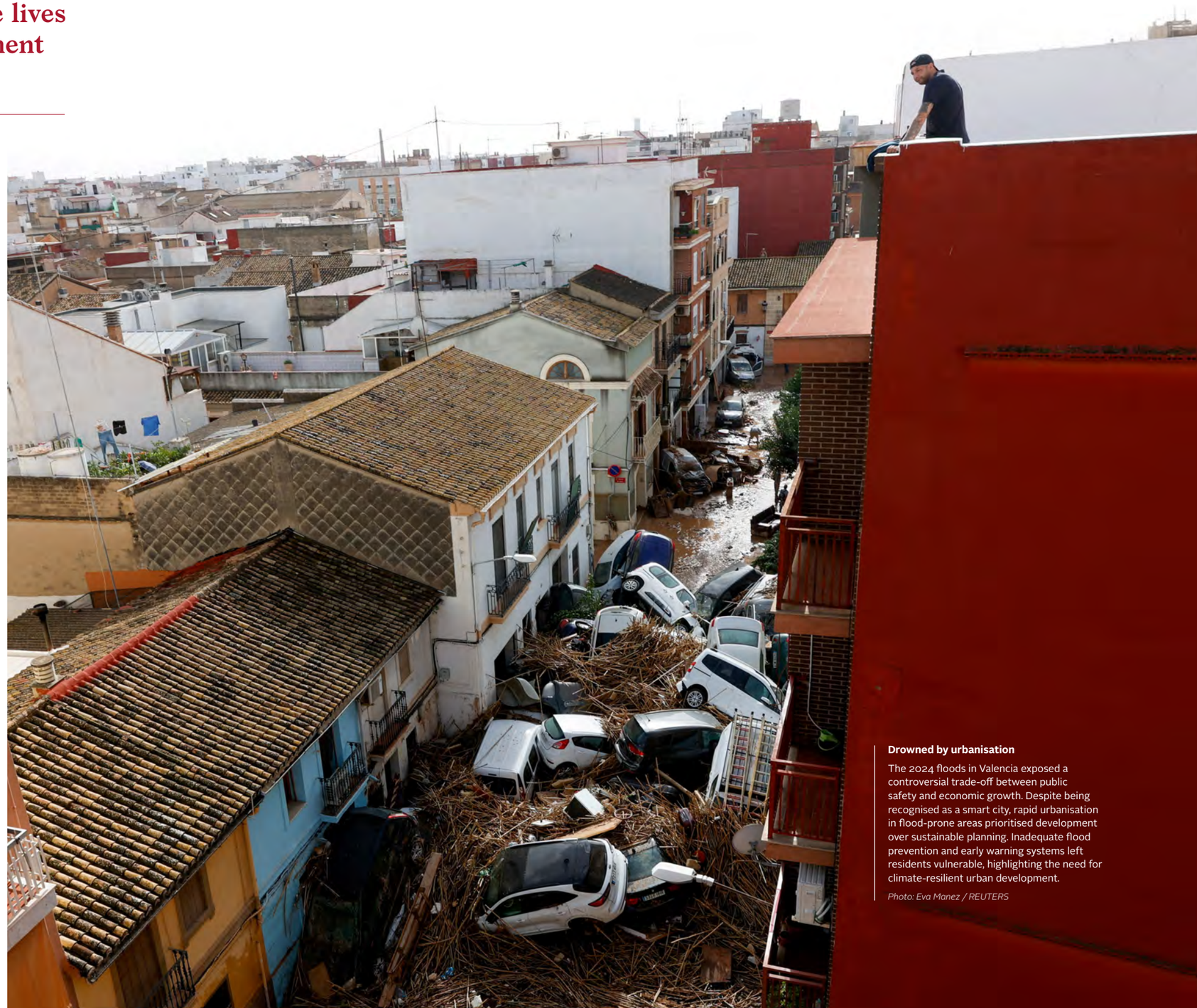

Drowned by urbanisation

The 2024 floods in Valencia exposed a controversial trade-off between public safety and economic growth. Despite being recognised as a smart city, rapid urbanisation in flood-prone areas prioritised development over sustainable planning. Inadequate flood prevention and early warning systems left residents vulnerable, highlighting the need for climate-resilient urban development.

Photo: Eva Manez / REUTERS