Water and Climate Risk in the Asia-Pacific

Policy Brief

In the Asia-Pacific region, climate risks are exceptionally high, and impacts are already experienced through water—as drought, flood, or compromised drinking water quality. The Asia-Pacific not only has a high proportion of vulnerable coastal megacities, but it also has significant aquatic biodiversity and millions of people whose livelihoods rely on healthy water systems. Climate models predict an increase in wet and dry extremes, and more variability, so water management will only become both more challenging and more important for achieving the Sustainable Development Goals (SDGs). How we use water, manage water, and plan for water extremes must be central to the solutions we devise to reduce climate change risks.

Climate-related water risks are severe in Asia and the Pacific

The Asia-Pacific region's ecosystems, livelihoods and economies are already being impacted by various and accelerating climate extremes. Interlinked climate and water security risks impact every aspect of sustainable growth and development in the region.

- The Asia-Pacific is home to many of the fastest growing economies in the world and the largest number of poor and disadvantaged people on the planet.
- Under a business-as-usual greenhouse gas emissions scenario, the mean summer temperature is projected to increase by more than 6°C above the pre-industrial level by the end of the 21st century in some parts of Asia, with devastating consequences.
- Current temperature extremes will become the new normal from 2070 onwards with some areas, particularly Southeast Asia, plunging into a new climate regime of unprecedented heat extremes.
- The region will experience a pronounced increase in the frequency and intensity of heavy rainfall events, particularly in Southeast Asia.
- Asia's cities are especially vulnerable, being home to 19 of the world's 25 cities deemed most exposed to a 1m sea level rise.

Water security is central to understanding future risks to lives, economies and livelihoods in Asia and the Pacific

Increasingly variable and extreme climate events are escalating risks to water security across the Asia-Pacific region. Water security does not refer just to the availability of water, but to the broader issues of quantity and quality of water to sustain livelihoods, human well-being, and socio-economic development—ensuring protection against water-borne pollution and water-related disasters, and preserving ecosystems.

These broad effects are measurable at a national level across the Asia-Pacific through five domains: household, economic, urban, and environmental dimensions, as well as resilience to water-related disasters. At its core, water security means that populations need the capacity to safeguard sustainable access, cutting across both water resources management and water, sanitation and hygiene.

Climate risks should be understood through a socioecological lens

Climate risks to water security are highly interrelated with social and economic factors. Across the Asia-Pacific, high-level risk analysis can miss important local risk factors, vulnerabilities and adaptation strategies.

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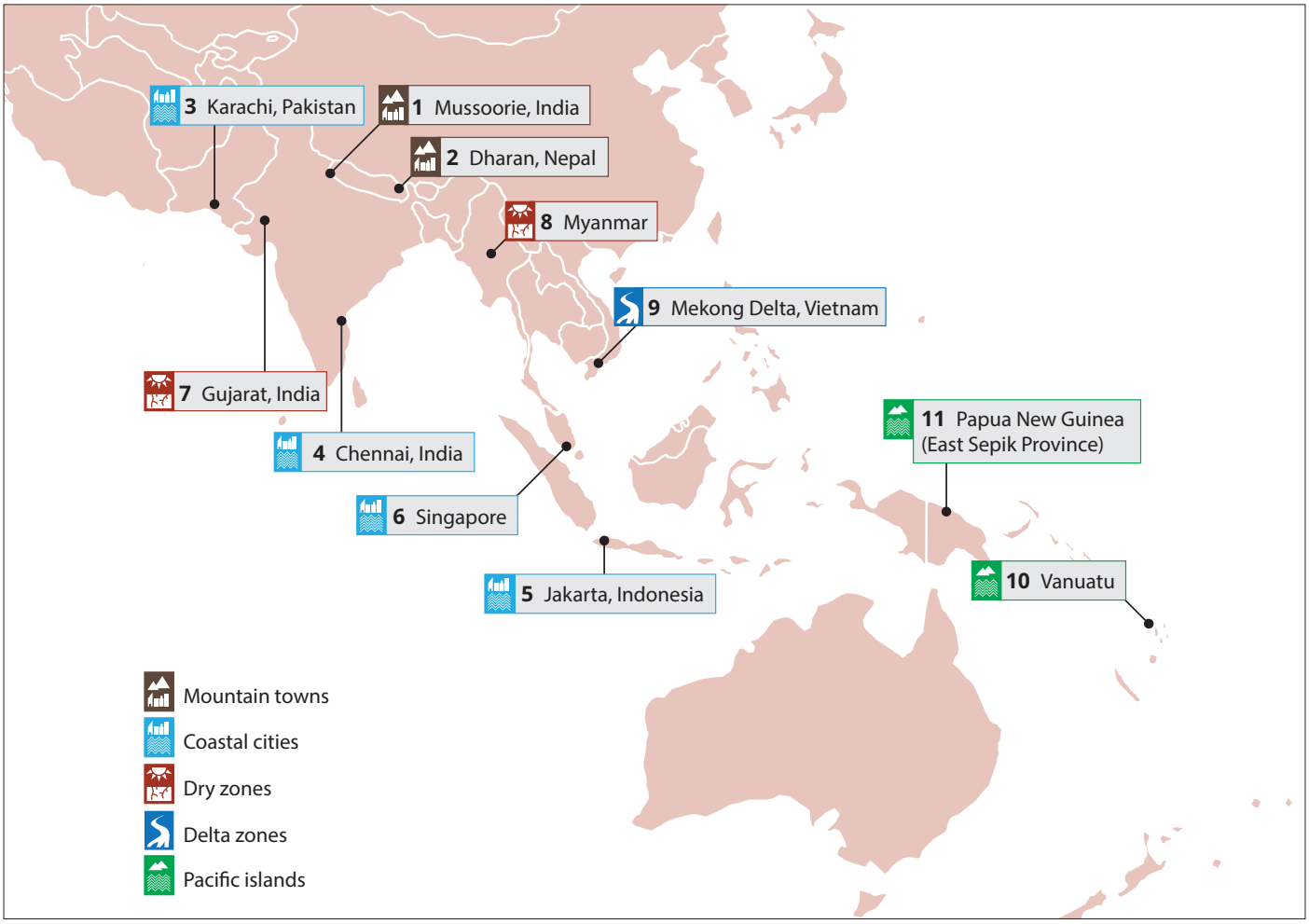
A socioecological zone approach is one way for agencies concerned with water security to help build contextually differentiated but regionally connected climate and water knowledge. This evidence can, in turn, inform and drive innovation in practice, policy, strategy and investment.

Five example socioecological zones in the Asia-Pacific region are mountain towns, dry zones, delta zones, Pacific Island countries, and large coastal cities (mega cities).

As risks vary across different countries, socioecological zones, and communities, so do the risk management capacities in each location. Risk management and adaptive capacity to tackle threats is dependent on existing readiness and vulnerabilities, and countries have a diverse range of capacities.

While climatic hazards are intensifying around the globe, it is still the local vulnerability conditions that are primary contributors of risks to water security in several situations. Understanding local contexts and involving local communities in risk management adaptation planning is essential to ensure inclusive solutions that address social and technological facets are addressed. However, a localised approach alone is not enough. Local actions need to be simultaneously connected to larger-scale processes of risk management planning and policy at national, transboundary, and regional levels.

The following map shows example locations of socioecological zones across the Asia-Pacific, with a description of the key climate risks experienced in each zone on the next page.



Key socioecological zones	Example locations	Key climate risks to water security
Mountain towns	1, 2	Floods in the wet season and drought in dry season; drying up mountain springs; weak local and provincial governance capacity to manage water insecurity; increasing concerns for inequitable access, especially in urban areas.
Dry zones	7, 8	Limited groundwater recharge, groundwater depletion, poor water quality, and limited governance arrangements.
Delta zones	9	Sea level rise, saltwater intrusion, floods, delta retreat from sediment starvation.
Pacific islands	10, 11	Tropical cyclones, coastal inundation, saltwater intrusion.
Large coastal cities	3, 4, 5, 6	Sea level rise, subsidence, drought, groundwater depletion, storm water floods, water supply and water quality.

Climate resilience is building through emerging local water solutions

There are already a wide range of ways climate change risks are being addressed through water management across socioecological zones, and operational, management and policy domains. Solutions fit within dynamic, multi-scalar and multi-dimensional processes. Responses include those addressing identified or anticipated risk (targeted response) or enhancing water system resilience generally (system-wide response).

For **mountain towns**, such as in the Himalaya, many policy reforms, transboundary cooperation and institutional responses are underway. For instance, the Government of Pakistan formulated a comprehensive water policy in 2018, identifying key priorities for tackling water insecurity—emphasising conservation and efficiency, storage, integrated water resources management, technological upgrades, managing the nexus with energy, and regulatory reform.

In the **dry zones** of Myanmar and western India, hundreds of thousands of tubes and dug wells draw down on declining groundwater supplies but there is no central database for monitoring. The Indian state of Gujarat is one of the most water-stressed areas in South Asia, with two-thirds of the state prone to drought and water scarcity. An ambitious long-term strategy to develop a state-wide water supply grid was adopted in 2002, sourcing water through the Narmada canal network from Sardar dam. This has become the major water lifeline of Gujarat for both water supply and irrigation. The grid connects 75 percent of Gujarat's population (nearly 47 million), covering 15,000 villages and 145 towns. Several other complementary measures have been adopted to reduce the risk of water insecurity, such as through water conservation, water harvesting and demand management.

In the **Mekong Delta**, sediment retention upstream by the 120 dams along the river and tributaries is diminishing the size of the delta and contributing to subsidence. With average elevation 1m above mean level and a lack of coastal barriers, saline intrusion is already destroying crops, and this will likely worsen with climate change in the future. The Mekong Delta Plan provides a guide for future decisions, legislation and investment, encompassing solutions such as rehabilitating and developing irrigation, drainage and flood protection infrastructure.

The populations of the **Pacific Island Countries** (PICs) are already faced with serious water security risks, with only around 50 percent of the population having access to safe water. Solutions to improve access through individual and community-level rainwater harvesting are common in most PICs for both drinking as well as irrigation. Climate-related disasters in the Pacific are not new and communities have successfully adapted

to such risks through their traditional knowledge and institutions, though capacity and resource constraints hamper efforts. For Papua New Guinea (PNG), the Pacific's most populous nation, international partnerships have been a crucial source of technical knowledge and financial resources. The PNG-Australia Climate Change Action Plan, a ministerial agreement between countries, is an example of such a bilateral initiative. Australia's support aims to enhance the resilience of PNG communities to climate change impacts, and of critical social and economic infrastructure to climate change.

There is a trend towards nature-based solutions and harnessing natural ecosystem services to increase resilience to floods, droughts and heatwaves regularly experienced in **large coastal cities**. For example, Chennai (India) has faced multiple severe droughts over the last six years. To protect itself from the impacts of future droughts, the Chennai Metropolitan Water Supply and Sewage Board aims to meet future demand through diversifying sources. These include restoring and rejuvenating water bodies, expanding rainwater harvesting, recycling wastewater, and bringing a desalination plant online.

The water sector in the Asia-Pacific region has seen a wide variety of responses to climate risks and associated vulnerability. These responses include efforts made by the community, local governments, national governments, and regional agencies or development partners. Responses have been designed to tackle a variety of risk situations across sub-regions and localities that face varying intensities of hazards, have different conditions of exposures, and diverse institutional capacities to respond. Responses to water security risks are emerging but are still inadequate to tackle the extent and magnitude of predicted climate change risks threatening the region.

Knowledge sharing and integration across disciplines are the keys to securing water through climate risk

Climate change impacts will continue to be experienced through water, the excess or lack of it, and the intensification of the hydrological cycle. How well water is managed now and into the future is critical to how Asia-Pacific governments respond to, cope with, and adapt to increasing shocks. What is clear so far is that there is a tendency in the region to rely on complex technological solutions at the expense of inclusive, locally-grounded solutions that fit and draw on each sociocultural context. In reality, multiple sources of resilience need to be integrated across social, technological, and natural sources. Risk management approaches need rethinking to be holistic and cross-disciplinary. This means taking into consideration engineering, water management, community engagement, policy, and partnerships in designing solutions.

A forthcoming Australian Water Partnership publication 'Climate Change and Water Security in the Indo-Pacific Region: Risks, Responses, and a Framework for Action' reviews hundreds of studies of both predicted climate impacts and responses at multiple levels of governance, to distil a framework for climate action for water security. The following practical principles are offered as a guide to the water sector as it works towards climate adaptation and resilience.

Principles for addressing climate risks to water security

1. **Focus on context**
   The socioecological zones suggested in this brief may differ from existing administrative and governance units. Actors need to be able to localise risk assessments to specific socioecological zones and work across sectors to integrate risk assessments. Relevant fields will include water resources, water supply and wastewater management, and more broadly cover areas such as agriculture and economic growth.

2. **Anticipate and iterate**
   Planning must take place in a context of limited knowledge and considerable uncertainty, which challenges static models and long-term strategies. Current actions to mitigate risks should be tested with both known and predicted scenarios, as well as unknown scenarios. The ability to test, learn and iterate over time has become crucial to managing large uncertainties and long timeframes inherent in understanding the influence of climate as well as other socioeconomic and biophysical changes.

3. **Identify solutions that work to achieve multiple goals**
   Water is a cross-sectoral system—traversing natural systems, infrastructures, and societies—in constant motion through the hydrological cycle. Building resilience in local water systems can also provide coherence and have benefits within

and across other sectors and scales. Combining climate change adaptation and mitigation, through water, is a win-win-win endeavour. This is because the water-focused approach improves the provision of water supply and sanitation services, helps tackle both the causes and impacts of climate change, and contributes towards meeting several of the SDGs. Strengthening cross-sectoral coordination in water management can deliver multiple benefits and help build system-wide resilience.

4. **Be inclusive and co-design solutions**
   Evidence suggests that current climate risk management efforts can be presented as highly technical, too often ignoring the voices of the community and practitioner knowledge. Gender equality, disability, and social inclusion in particular needs to be addressed almost everywhere in water resource decision-making. If not addressed, knowledge of and access to water is divided, creating differentiated exposures with women and girls and the already vulnerable suffering the most. Proactive and deliberate participation of women, and gender or socially discriminated people, is needed at all stages of water management.

5. **Link policy and actions across scales**
   The response to climate risks cannot just be left to the local or national level alone—it has to be considered at all levels of planning and decision-making. Actors from households through communities to sub-national and national governments all need to act in tandem to contain the risk of floods or drought. Currently, risk governance is predominantly state-centric and should be linked more effectively to lower-scale sub-national and community-level planning and risk management processes. There is a need to strengthen feedback loops between processes, implementation and policy across scales and jurisdictions.

6. **Share knowledge and strengthen partnerships**
   Containing escalating risk is an enormous challenge and actions are needed across multiple sectors, scales and domains (social, technological and policy). Most countries in the Asia-Pacific region require enhanced capacity to create knowledge and design solutions to tackle climate risks for every socioecological context. Enhancing water security thus requires widening and strengthening of knowledge, partnerships and collaboration. Building on traditional and local knowledge of ecosystems is critical, particularly in the Pacific. Fostering South-South cooperation also contributes to learning and sharing of solutions.

7. **Integrate focused projects with high-level coordinated management**
   A great policy challenge lies in recognising locally-defined risk and solutions while remaining coordinated and integrated with system-wide dynamics. Investments in risk management may be enhanced if such targeted risk mitigation is articulated well in the overall resilience-building strategy that requires coordination across sectors and scales. Managers need to be able to deal with a high level of complexity, and to work beyond traditional water and climate management apparatus in government to include other stakeholders, particularly planning and finance ministries, the private sector, and civil society.

For more information and to download Water and Climate Risk in the Asia-Pacific, visit **waterpartnership.org.au/publications**

This policy brief was co-authored by the Australian Water Partnership and Bronwyn Powell from Griffith University's International WaterCentre. It draws on the AWP publication 'Climate Risk and Water Security in the Indo-Pacific: Risks, Responses, and a Framework for Action' by Dr Hemant Ojha (Institute for Study and Development Worldwide) and Professor Nicholas Schofield (Global Future Research).

Photo: Lumpini park and Bangkok city skyline, Thailand (Credit: anekoho / Adobe Stock)
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