Theme Overview – Adaptation and Resilience

In this document

Challenge Prompt

Climate adaptation refers to adjusting how we live, work, and build our cities to withstand climate impacts. Resilience refers to strengthening our communities, ecosystems, and economies so they can recover and thrive despite these impacts.

Within the broader theme of adaptation and resilience, there are a number of hazards that are expected to have a significant impact on exposed and vulnerable people, nature, and assets. Whilst some innovators might wish to consider the broad problem space to identify challenges and relevant solutions, others might prefer a more bounded challenge. For this reason, this year we are adding some detail to the ***specific sub-theme of water***, within the broader theme of adaptation and resilience. We hope this additional resolution will help frame-shaper problems and get started quickly. However, any entries in the broader theme of adaptation and resilience will be welcome.

So, for this challenge, you need to develop a solution that enhances the resilience and ability of people, infrastructure, or natural systems to withstand and adapt to the intensifying impacts of climate change. Solutions may address disaster preparedness, resilient infrastructure, climate-smart agriculture, water security, or other critical adaptation needs through technical, policy, design, or social approaches.

Problem Details

Adapting to the Challenge of Water Variability

Water is a resource for life, ecosystems, and economies. It is vital to multiple SDGs: from hunger (SDG 2), health (SDG 3), to ecosystems (SDG 14 & 15). Water is increasingly subject to unpredictable swings in availability and intensity as a result of climate change, land-use change, and natural weather patterns. This can result in droughts, floods, or abrupt swings between extremes, affecting the lives and livelihoods of individuals, nations, and regions.

Water variability impacts food security as a result of crop failures, urban vulnerabilities when areas cannot adapt to a rapid succession of flooding and water scarcity, and ecosystem impacts on people and nature when water sources run dry or overflow.

The primary causes of these weather patterns can be attributed to climate change, which alters precipitation patterns, increasing the frequency of heavy storms and the direction of dry periods (Wardekker et. al); land-use change and overextraction, which create local water stresses (UNDP) ; and natural oscillations such as El Niño, La Niña, and monsoons that shift regional water cycles (OECD).

Recent satellite observations show that flood and drought events have doubled in frequency and intensity over the past five years compared to 2003–2020 (Time). Climate change results in warmer air that retains more moisture, increasing rainfall intensity, while higher temperatures boost evaporation and causes more extreme droughts (WayFinder). In 2024 alone, water-related disasters led to over 8,700 deaths and $550bn in losses globally (Cornell University).

This is felt at the regional and national levels. For example, floods and droughts are common in China's northern Haihe basin, and climate change has increasing dryness in the region over the 21st century (Liu Y, et. al.). Bangladesh has experienced catastrophic monsoon floods and dry-season scarcity, with the 1998 flood affecting 30 million people, destroying crops, infrastructure, and wells (International Water Management Institute).

The effects of climate change on water are compounded by the El Niño effect and human activities. These have caused record-low river levels, water shortages, wildfire outbreaks, and a decline in hydroelectric power in Southern Brazil and the Amazon (The Guardian).

Water variability has consequences for people, and this is highly dependent on context. For example between 2008 -2010 Kenya experience severe drought with compromised livestock and food security for 11 million people, significantly affecting vulnerable pastoral communities (Financial Times). Copenhagen, in contrast, was designed for temperate rain, but now experiences intense cloudbursts and summer droughts. This has forced it to adapt by transforming parks into rainwater reservoirs and upgrading stormwater systems. Failure to adapt can increase negative impacts, as seen in the south and central regions of Turkey. Climate change, coupled with inefficient irrigation, contributed to 2021 being the driest year in 20 years (Liu Y, et. al).

Subthemes

Adaptation and resilience (A&R) are essential strategies for managing water variability, but their importance and application differ based on geographical and political context.

Geographic Context	Unique Water Challenges	Examples of Adaptation and Resilience Strategies
Arid or Drought-Prone Areas	Irregular rainfall, groundwater depletion, and crop failures	☐ Ecosystem restoration ☐ Plant breeding
Flood-Prone Regions	Heavy rains, river floods, storm surges	☐ Flood barriers ☐ Floodplain restoration ☐ Early warning systems
Seasonal or Variable Regions	Alternating between droughts and floods, unpredictable seasonal shifts	☐ Flexible water storage ☐ Insurance ☐ Integrated water resource management
Urban Areas	Stormwater overload, aging infrastructure, contamination risks	☐ Green infrastructure ☐ Permeable pavements ☐ Smart drainage
Transboundary Basins	Conflicting water-use between nations, changing flows due to upstream decisions, or climate	☐ Cooperative agreements ☐ Data sharing ☐ Joint infrastructure

Well-Designed Interventions for Adaptation and Resilience

Well-designed adaptation strategies help to protect lives and livelihoods by changing behaviours and systems to cope with changing water patterns. For example, drought-resistant crops can be grown in arid regions or elevated homes in flood-prone areas. Resilience complements adaptation. It means that societies can anticipate, absorb, and recover from water shocks quickly and equitably. Investing in water resilience, including developing early warning systems, water infrastructure, and nature-based solutions, has been projected to result in returns of over $7 trillion by 2030 (time.com).

Political & institutional factors strongly influence adaptation. Strong institutional foundations are essential to enable effective responses to water viability issues. Political will determines how resources are allocated and governance decisions affect marginalized communities (climatepromise.undp.org). Most OECD countries have more funding and institutional capacity for infrastructure and tech solutions. Those with national adaptation plans are better positioned to implement coordinated water systems (oecd.org). In contrast, low- and middle-income countries often depend on cost-effective adaptation like integrated water resource management (unepdhi.org) and local planning (e.g., Nepal's LAPAs) that fosters community-driven water resilience and culturally relevant solutions.