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Urban Resilience to Climate Change in Hyper-arid Environments: The Case of the UAE

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Summary

- In 2025, the UAE recorded over 180 days of temperatures surpassing 35°C, while the country's annual temperature in 2025 averaged over 29°. Extreme heatwaves are projected to likely increase in duration, frequency and intensity, with temperatures reaching 56°C by the end of the century. In April 2024, The UAE experienced extreme rainfall with parts of the UAE measuring 254.8 mm of rain in 24 hours, resulting in floods that disrupted everyday lives and caused infrastructure damages.
- The IPCC predicts a sea level rise between 0.28 m and 1.01 m under various GHG emissions scenarios. Approximately 3,100 km² of coastal areas along the Gulf coast lie at or below one meter above sea level, making them highly vulnerable to sea-level rise.
- With the current trajectories and future predictions in mind, this Insight looks at the UAE's current policies at the federal and emirate level with special focus on partnerships and new technological advancements that play an important role in advancing urban resilience. Both Dubai and Abu Dhabi have developed a digital twin platform integrating spatial data with urban models, in which environmental models can be incorporated.
- The Insight also reflects on steps that other cities around the world are taking to improve resilience to climate change. Copenhagen and Medellín, for instance, are tackling the problem by combining green and grey infrastructure to protect against floods and extreme temperatures, with Medellín decreasing its temperature by more than 3°C in some zones, successfully reversing the urban heat island effect.
- Finally, the Insight outlines strategies through which the UAE can achieve better resilience. A combination of grey and green infrastructure, where careful design with suitable materials is coupled with additional green spaces, natural coastal protection and increased permeable surfaces, can achieve healthier cities that are adapted to climate change.
- It concludes with the following recommendations:

  1. Build centralised, science-driven data platforms to map climate risks and guide locally tailored, resilience-focused urban planning.
  2. Expand and enforce regulations to explicitly integrate climate risks and biodiversity into all urban development decisions.
  3. Foster strong public–private collaboration with clear targets to align development with national climate adaptation goals.
  4. Create a standardised regional framework of nature-based solutions tailored to Gulf conditions, emphasising scalable and interconnected approaches.

The Issue

The United Arab Emirates's (UAE) 2,263 km² of urban area is characterised by low elevation, extensive sealed surfaces, limited drainage capacity, and limited green infrastructure. It also accounts for 85% of the population, making it a densely populated environment with 4,166 people per km². [1] These characteristics make people and urban infrastructure in the UAE more vulnerable to climate change impacts such as sea level rise, sand and dust storms and extreme weather events like high temperatures and flooding caused by heavy precipitation. Climate change is already exacerbating the UAE's harsh climatic conditions, with predictions pointing to more frequent extreme weather events in the future.

At the same time, the UAE is experiencing continuous economic and population growth, with population estimates reaching up to 15 million and 26 million by 2050 and 2100, respectively. [2] Climate change could threaten the liveability of urban areas, as extreme temperatures and sea level rise affect human health, productivity, and tourism, while heavy flooding damages infrastructure.

This raises questions of how urban areas in the UAE can adapt to future climatic changes in a way that sustains economic development and societal well-being, and more importantly, what resilience should look like in the context of this region. To be able to answer those questions, it is important to first understand what urban resilience is. It can be defined as "… the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity." [3]

With that in mind, the following sections from this Insight examine climate change risks in urban areas in the UAE and look at the current policies in place that help mitigate those risks. It then presents examples from countries that are addressing similar challenges and offers recommendations to minimise future risks and allow for the prosperous development of resilient cities.

Hyper-arid and Arid Urban Environments at the Forefront of Climate Change

Rising Temperatures

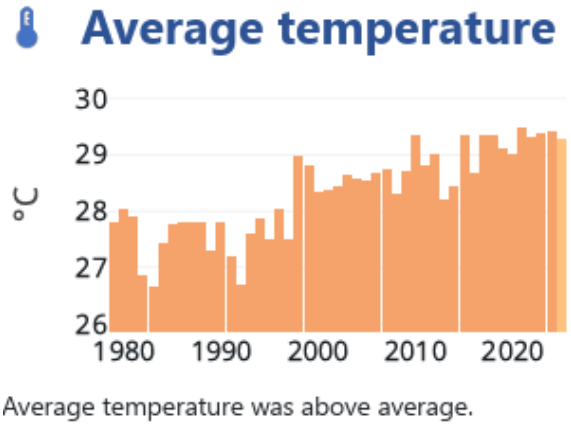
In 2025, the UAE recorded over 180 days of temperatures surpassing 35°C, while the Arabian Peninsula had around 160 occurrences of such extreme hot days.[4] Furthermore, the UAE's annual temperature in 2025 averaged over 29°C whilst in 1980 the average annual temperature was just under 28°C. Similarly, the Arabian Peninsula in 1980 had annual temperature averages of just under 27°C, while today the temperature is around or just under 28°C (Fig 1). Recent study focusing on the MENA region predicts that, by the turn of the next century, Middle Eastern extreme heatwaves are likely to increase in duration, frequency, and amplitude, with temperatures reaching 56°C.[5]

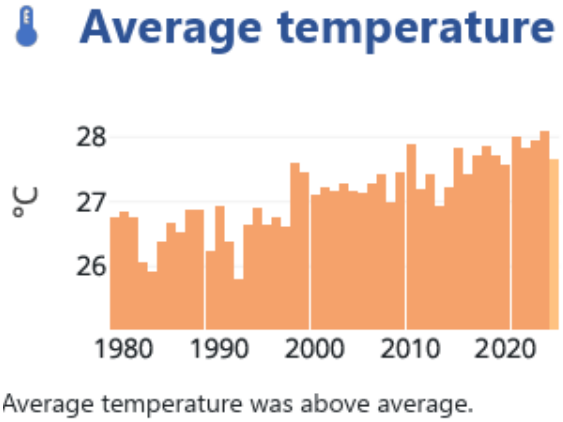
A study that examined future liveability and walkability in Saudi Arabia under different climate change scenarios found that the Kingdom can expect significant increase in very uncomfortable days[i] across most parts of country during this century.[6] The study also concluded that urban environments such as Jeddah, Dammam, and Medinah will experience the sharpest increase in the highest levels of discomfort days (up to 35°C) under the SSP5-8.5 scenario by 2100. Another study examined the potential risks of Wet Bulb Temperatures (WBT)[ii] for the UAE in which extreme heat combined with elevated humidity reduces the body's ability to regulate temperature. The study concluded that Abu Dhabi and Dubai are likely to be the hotspots for WBT impacts by 2100, with vulnerable groups such as people with chronic health conditions, children, the elderly, and people working outdoors throughout the year being at the forefront.[7] For example, by 2030, it is estimated that 164,100 full-time jobs will be lost in the UAE, equating to a loss of around 2.6% of working hours.[8] The study therefore recommended decentralising the population inland and away from the coast towards other urban centres such as Al Ain at the foothills of the Hajar mountains. The Gulf coast is already experiencing high levels of WBTs in summer months with WBT reaching a dangerous 31°C and 32°C along the coast of Abu Dhabi and Dubai. With higher projected temperatures, WBT becomes a real risk that will require serious policy consideration.[9]

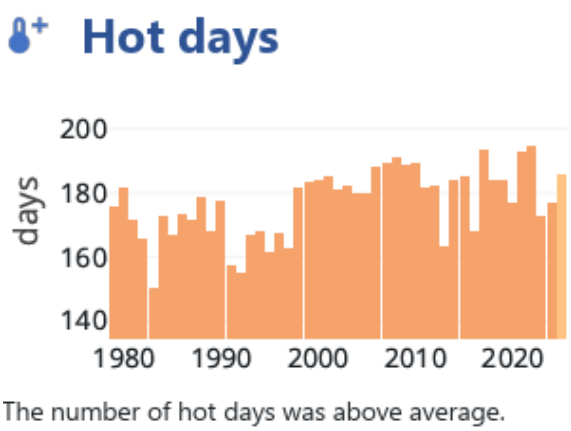
The trajectory for the UAE and Arabian Peninsula is evident – average temperatures and very hot and humid days are on the rise and, as such, are testing the limits of human ability to live, thrive and stay productive in densely populated urban areas. Urban areas on the Arabian Peninsula could apply adaptation strategies such as enhanced shading, cooling infrastructure, and heat-resilient urban design to make cities more liveable as the temperatures rise.[10]

[i] According to 3 levels of discomfort (Discomfort Index), very uncomfortable level is in the range between 27 and 29 °C characterised by most of the population feeling discomfort, extremely uncomfortable level is in the range between 29 and 32 °C characterised by everyone feeling severe stress and dangerous level is when temperatures surpass 32 °C mark characterised by medical emergency.

[ii] The Wet Bulb Temperature is defined as "… the lowest temperature that can be achieved through evaporative cooling". (Source: UK Met Office, 2025).







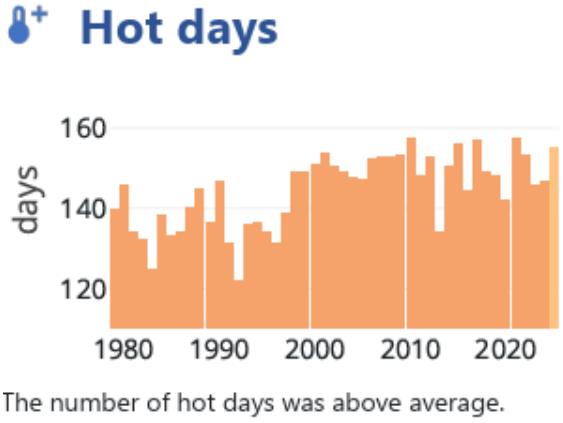


Figure 1: Average Temperatures (above) and Number of Hot Days (below) in the UAE (left) and Arabian Peninsula (right) from 1980 to 2025 (Source: www.globalwater.online)

Cities at the Forefront of Flood Risks

Extreme precipitation, which can cause damages to infrastructure and disrupt lives, is already increasing in frequency and intensity in the UAE.[11] Such extreme weather events are already impacting the region. The most recent event occurred in April 2024 when heavy rains caused floods in the Arabian Peninsula, with the UAE and Oman being the most affected. During the event, the UAE saw an extraordinary amount of rainfall, with the highest precipitation recorded in the Khatm Al Shakla area in Al Ain, where an incredible 254.8 mm of rain fell in 24 hours. The event caused 20 fatalities in Oman and 4 in the UAE, power outages, transport-related disruptions (cancelled flights, closed metros and flooded roads), infrastructure damages, and other disruptions to everyday life (schools and majority of workplaces were closed and people and children reverted to remote working and schooling). A study that examined this event in detail found that a "combination of record-breaking precipitation amounts, made worse by anthropogenic forcing, changes in land use land cover, infrastructure distribution, and population increases" was what made the impacts of the event so severe.[12,13] Figure 2 below demonstrates the level and intensity of the impact of the floodings with particular focus on infrastructure such as roads and airports, and locates areas in Dubai with significant damages to buildings. This exposes the vulnerabilities of the UAE's urban areas that were built while factoring in normal precipitation. Such events underscore the urgent need for more robust flood management strategies in the UAE.

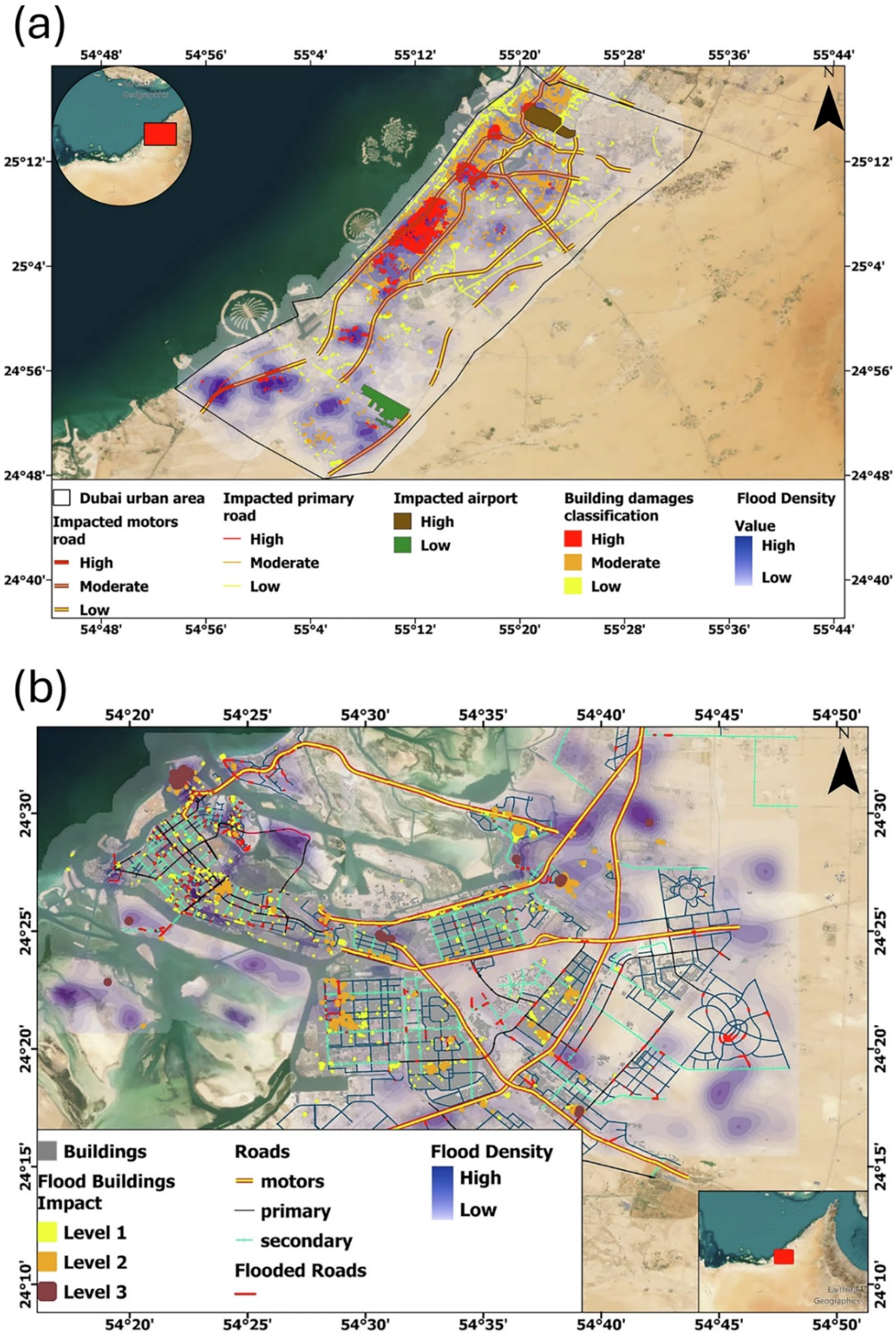


Figure 2: Effects of 16 April 2024 historical rainfall event on infrastructure (namely roads, buildings, and airports) and flooded regions (purple shading) in the (a) Dubai and (b) Abu Dhabi urban areas, respectively (Source: Francis, D., Fonseca, R., Nelli, N. et al. (2025))

Rising Seas

The International Panel on Climate Change (IPCC), in its AR6 Synthesis Report, concluded that global sea level rise (SLR) by 2050 is likely to be between 0.15–0.23 m in the very low GHG emissions scenario (SSP1-1.9) and 0.20– 0.29 m in the very high GHG emissions scenario (SSP5-8.5). By 2100, those predictions reach between 0.28–0.55 m under SSP1-1.9 and between 0.63– 1.01 m under SSP5-8.5 (Figure 3).[14]

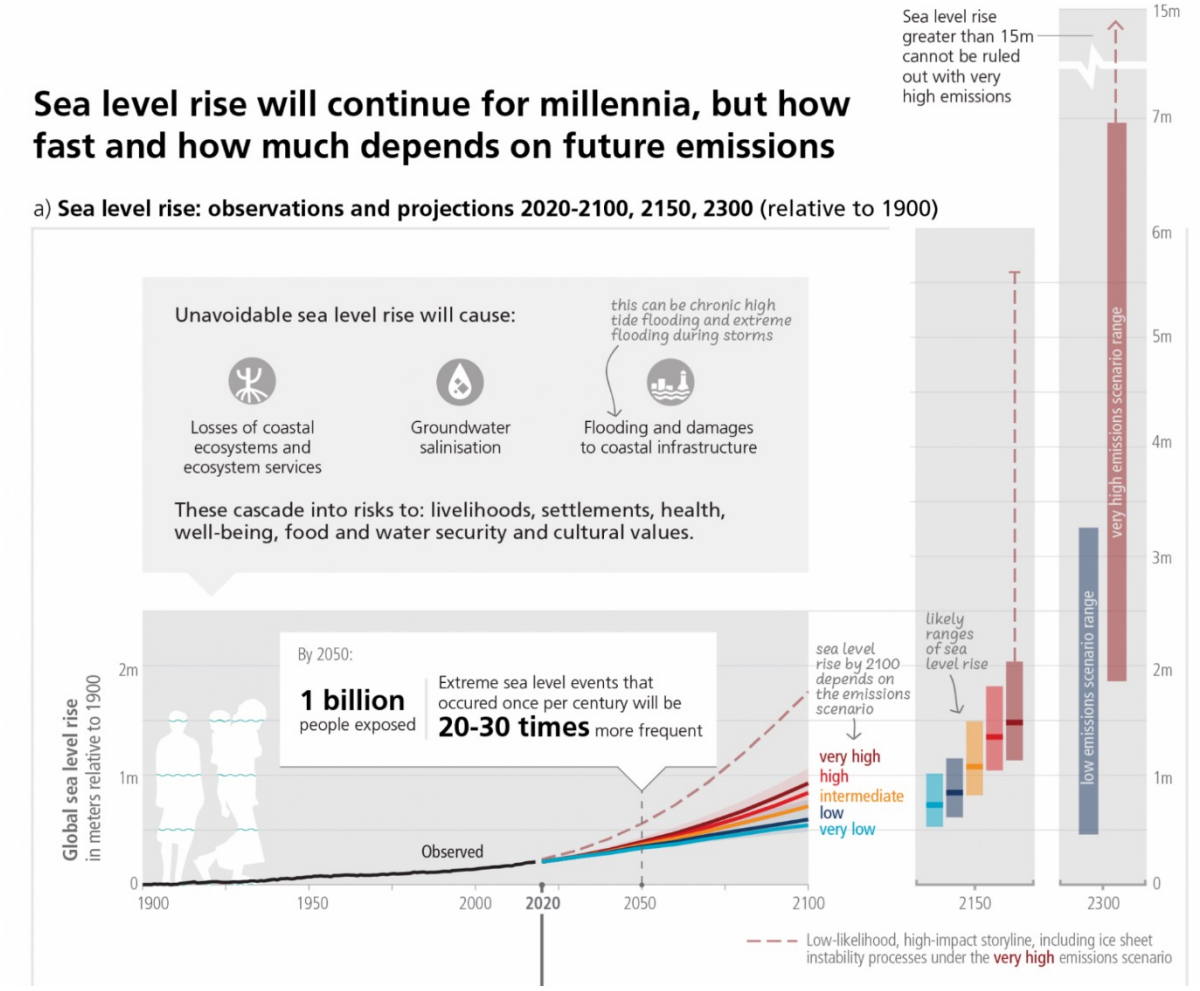


Figure 3: Sea level rise: observations and projections 2020-2100, 2150, 2300 (relative to 1900) (Source: IPCC AR6 Synthesis Report LR, Figure 3.4 Panel (a))

Global predictions for SLR do not necessarily mean that there will not be regional variability around the world, so what do they mean for the UAE and the Gulf region? There is growing research focusing on climate change impacts, including SLR, in the Gulf region, especially between 2020 and 2024, in comparison to previous years.[15] However, to be able to better predict the SLR in the UAE and the region, more locally-led research and investment in knowledge and data sharing will be necessary.[16] Under the high emissions scenario, by 2100, one-meter sea level rise would affect 571 km^2 of the UAE's coast and permanently inundate 270 km^2. This, in turn, would affect 85% of the UAE's inhabitants and 90% of the infrastructure, especially Abu Dhabi and Dubai (Figure 4).[17,18,19] For the Arabian Gulf coast, the models have shown that 3,100 km^2 of coastal areas are at one-meter elevation and thus making it likely that the stretch of the coast will be inundated.[20] The UAE has established the Emirate Polar Program, with one of the aims being expanding the understanding of the polar regions and their contributions to future sea level rise.[21]

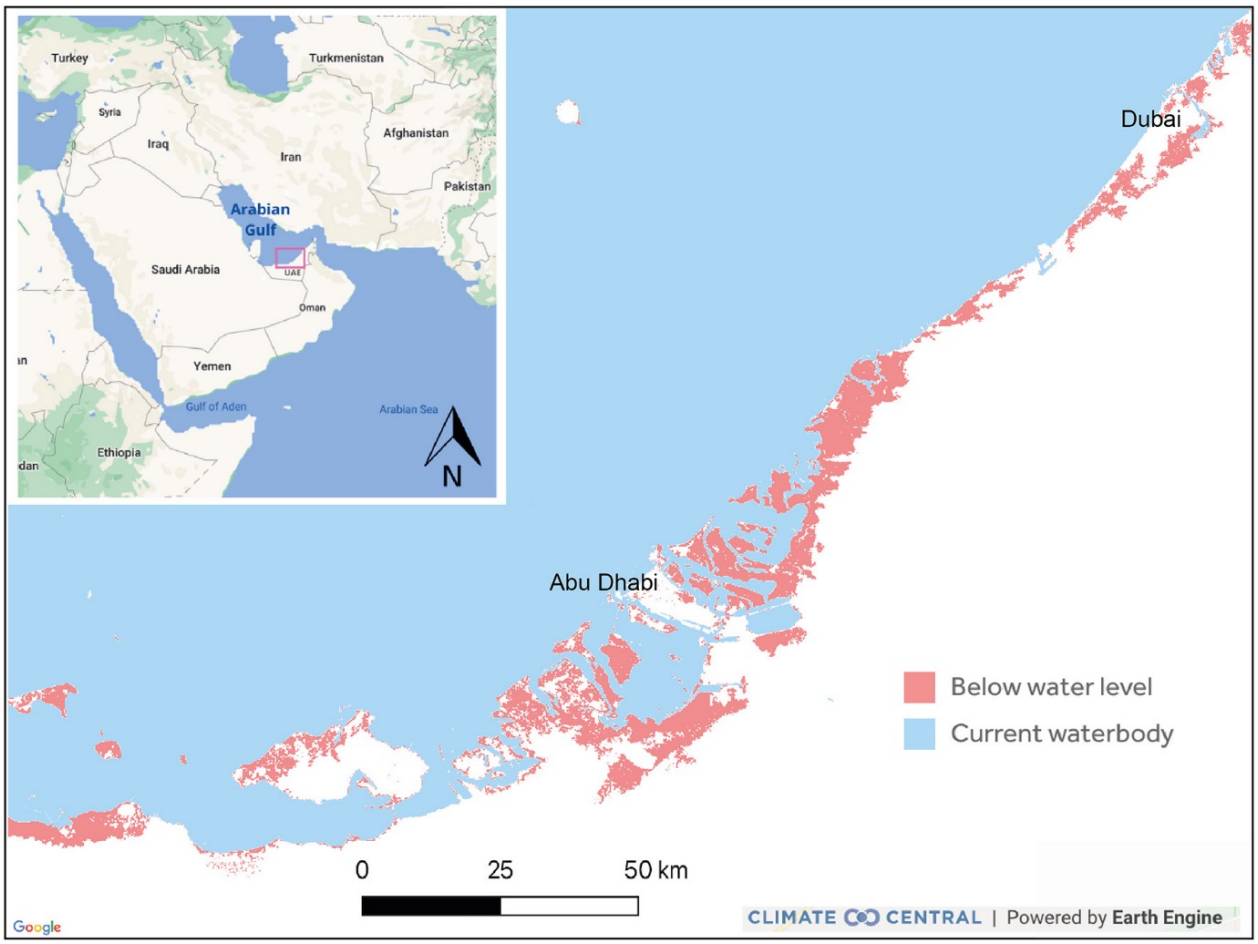


Figure 4: Extent of projected Sea-Level Rise for two major cities in the UAE. Red shading shows regions expected to experience flooding by 2100 under a moderate 2° Celsius warming scenario (RCP 4.5) (Source: Melville-Rea et al. (2021))

Government Policies as Vehicles Towards Resilient Cities

The UAE, at the time of writing, has not submitted its National Adaptation Plan (NAP)[iii] to the UNFCCC, although the official status of its NAP is "in progress". However, in 2019, the UAE assessed and identified climate-related risks in key sectors (Figure 5).[22] During the risk assessment, it identified four priority risk areas: health, energy, infrastructure, and environment. Although not explicitly identified as a priority risk, urban areas are likely to be the most affected by all of the identified impacts.

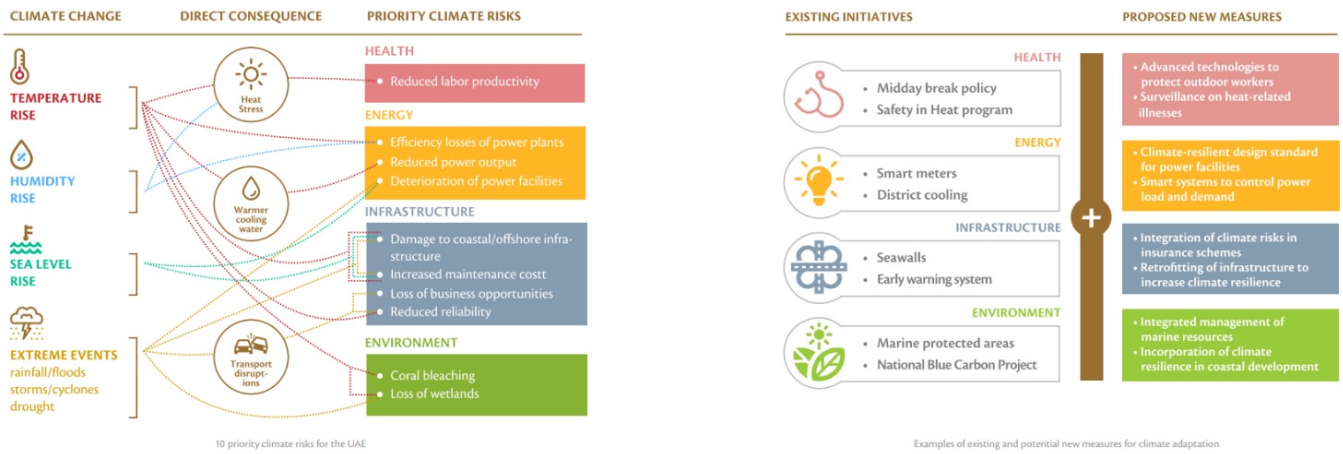


Figure 5: Ten priority climate risks and measures for the UAE (Source: MOCCAE. (2019)

[iii] NAPs are the main mechanisms under the UNFCCC for the Parties to identify their adaptation needs and develop strategies to address those. (UNFCCC)

Since the risk assessment, the UAE has progressed in creating its NAP by publishing the NAP Roadmap in 2023. In the Roadmap, the government outlines a path towards creating a cross-sectoral and institutionalised NAP. Although urban systems were not included as a priority sector for climate risk in 2019, they are set to be assessed as part of comprehensive climate risk and vulnerability assessments during the NAP process.[23] The Roadmap was also a significant development as it clarifies the governance of the process, with Ministry of Climate Change and Environment (MOCCAE) and the Climate Change Council supporting the development of the NAP.

The UAE's adaptation intent is also embedded within its latest Nationally Determined Contributions (NDCs) published in 2024, which details the impacts of climate change on the beforementioned key sectors and the ways the UAE plans to adapt to them, with the infrastructure and health sectors being directly linked to urban environments.[24] The NDC includes green infrastructure and building materials as federal policy levers. It also promotes the integration of technology and innovation, highlighting the National Smart Construction Guideline for the construction sector and digital twin technology. The NDC document also mentions building and infrastructure regulations as one of the ways to implement adaptation measures.

The UAE has an overarching framework called The National Green Building Regulation (NGBR) that currently sets mandatory, minimum energy and water efficiency standards for all new buildings. This framework is used as a basis for emirate-level frameworks and building codes.[25] Tools such as NGBR represent an opportunity, if designed with climate change resilience in mind, to effectively address climate change impacts within policy, ensuring inclusion and efficient implementation across all emirates. Some of the world's leading certification systems in building, such as LEED v5, already include climate resilience assessment as a component.[26]

The NDC document also acknowledges the impact of climate change on human health and how the UAE is starting to design policies to address it. For example, labour workers are required to take breaks during peak temperatures and plans are in place to improve the early warning system to include dust storms and high temperatures.

Urban Resilience at the Emirate Level – Smart Cities through Policies, AI, and Partnerships

Having clear guidance at the federal level is essential for national climate action, but it is at the local level where this action is realised. Emirates are increasingly engaging with the topic of urban resilience to climate change.

In 2025, Abu Dhabi published its Climate Change Adaptation Plan for Environment 2025-2050 to enhance the resilience of its environment to climate change. Although the focus of the Plan is the natural environment, it is likely to have a significant impact on the urban environment given the proximity and interconnectedness of the two systems. In its assessment of the risk of climate change in Abu Dhabi, the Plan identifies the city's urban population as one of the at-risk groups, especially in relation to further groundwater depletion.[27] The Plan also identifies around 145 actions focused on improving groundwater, soil and biodiversity. Led by Environment Agency – Abu Dhabi (EAD), it further identifies 16 key performance indicators (KPIs) through which progress will be tracked. In publishing the Plan, Abu Dhabi is directly linking environmental protection to the long-term resilience of cities, infrastructure, water systems, and human well-being.

In 2021, Dubai published its urban strategy, the Dubai 2040 Urban Master Plan, setting several targets to help achieve sustainable urban development as it plans for further population increase. By 2040, Dubai aims to double the size of green and recreational spaces; protect 60% of the city as dedicated nature reserves and rural natural areas; create several green corridors linking service areas, residential areas, and workplaces; increase areas for tourists by 134%; increase the length of public beaches by 400%; and increase the land area for education and health by 25%.[28] Although Dubai's plan puts significant emphasis on sustainability and 'greening' the emirate, it could benefit from a stronger integration of climate change risks, including consideration of how greening impacts water demand.[29] As the plan covers the period up to 2040, some of the climate change impacts will likely already be present.

For cities to properly implement urban resilience policies and strategies, it is essential to rely on quality data and evidence. In one example from Saudi Arabia, Riyadh city used various datasets to create a flood risk map with different flood risk zones. The model was also validated before and after the rainfall events, enhancing the accuracy of the data and allowing for a model that can be used by urban planners and disaster management professionals to prepare for future flooding.[30]

When local research is coupled with new technologies such as AI, it could provide a powerful tool necessary for mitigating future climate change impacts. Both Dubai and Abu Dhabi have developed a digital twin (DT) platform – an AI-supported project that integrates spatial data with urban models, and in which environmental models can be incorporated.[31,32] Embracing such technologies enables cities to continue developing and growing their populations without major negative climate change impacts. DTs can be used in different stages of development to track urban sprawl, monitor air quality, prepare for natural disasters by facilitating faster emergency response through early warnings, and forecast future climate change impacts such as sea level rise and Urban Heat Island (UHI) effects[iv]. They are also useful in detecting environmental conditions such as air and water quality and pollution sources.[33]

Dubai has joined global partnerships to enhance its urban resilience, including the Global Resilient Cities Network and the C40 initiative.[34,35] As part of this effort, it launched the Dubai Resilience Centre in 2024 to effectively tackle urban pressures, as well as adapt to and recover from stresses and shocks.[36] Knowledge exchange between cities around the world is at the heart of these partnerships, helping them learn from each other.

To achieve future resilience of urban areas, it is crucial to put resilience and adaptation to climate change at the heart of policies and strategies and embed it in public and public-private partnerships, while guiding the private sector along the way. Utilising technologies such as remote sensing and AI can help decision makers take steps that are proactive rather than reactive to climate change impacts.

Becoming Resilient to Climate Change

Cities around the world are already dealing with the impacts of climate change. The term 'sponge cities' has recently emerged as a response to extreme weather events to describe urban areas that are utilising nature to absorb excess water in such situations. They do this by integrating green spaces with permeable surfaces and adding natural features such as lakes that can collect excess water. Cities such as Auckland and Nairobi have a high 'sponginess' of around 35% and 34%, respectively, allowing them to absorb more water during heavy rainfalls.[37] The following examples demonstrate how two cities have tackled two different problems caused by climate change – flooding in Copenhagen, Denmark and high temperatures and flooding in Medellín, Colombia.

Lessons from the Nordics – Copenhagen's Flood Resilience Story

Copenhagen is a low-lying capital built on clay soils and located on the coast of the Baltic Sea. The combination of these factors makes Copenhagen vulnerable to sea level rise and urban flooding caused by cloudbursts. In July 2011, the city experienced heavy rains when 150 mm of rain fell in two hours, flooding the city and causing $1 billion in damages including to critical infrastructure. This prompted decision-makers to develop the Cloudburst Management Plan, focusing on various solutions combining blue, green, and grey infrastructure, with an estimated cost of $1.8 – 2 billion.[38]

The project started with mapping and modelling the surface water flow in the city. Based on these models, the city came up with a suite of solutions to slow the water flow and retain it within the green and grey infrastructure. One of the solutions included upstream storage that slows the water coming down the system. The city also used roads and streets to direct this downstream flow to less stressed areas, which was then combined with rain gardens and pocket parks along the streets to protect buildings and infrastructure. An important part of the plan was the creation of additional value for residents, such as increased social resilience, recreational value and health benefits, economic growth, accessibility, safety, and biodiversity value.

As a result, Copenhagen has created a connected system combining green, blue, and grey infrastructure, and although it is estimated that the implementation of the plan will take 20-30 years in total, the city has already deployed a number of projects. For example, Enghave park has a storage capacity of 22,000 m^3 during flooding, including a hydraulic system that is activated when a high level of water is detected, protecting the area surrounding it. Another project involved multiple sunken gardens developed in partnership with residents, which in case of flooding can retain 1500 m^3 of rainwater. Another notable example where additional value was created is a skate park situated in a socially vulnerable area that in case of flooding can also retain significant amounts of water. The plan is meant to be continuously revised and improved as places, legislations and climate change predictions are changing and evolving.

[iv]An urban heat island phenomenon occurs when an urban area experiences much warmer temperatures than a nearby rural area.

The Copenhagen example successfully combines nature's ability to protect the city from flooding with existing infrastructure and technology to create numerous benefits for its residents. Although the plan is mainly funded by the municipality, these types of projects could be suitable for public-private partnerships, especially in the UAE where property developers could play a big role in advancing urban resilience.

Medellín, Colombia – Tackling Inequality and High Temperatures with Nature-based Solutions

In 1993, Medellín was suffering from violence, crime, pollution, and poverty, and was labelled as one of the most violent places in the world. As the city started to recover, new policies, introduced by the city's leadership, made space for a new city – a 'City of Life'. The main goal of the new policies was to integrate the marginalised population into the city centre and provide a healthier environment for all.

Medellín lies in a tropical zone and is influenced by El Niño and La Niña, making it vulnerable to climate change. Its positioning and topography reveal a risk of high temperatures, natural disasters such as landslides and flooding, and pollution. One of the flagship policies that were aimed at tackling social and environmental issues was investing in greening the city to make it a healthier place to live. Over 30 green corridors were planted across the city, providing valuable spaces for people to use and clearing the air from the pollution.[39] The solutions mainly focused on protecting the existing green spaces, as well as creating "large urban parks or forests", "pocket parks/neighbourhood green spaces", and "green corridors and green belts".[40] Since initiation of the programme in 2016, Medellín has managed to reduce its temperatures by 2°C across the city, and in some zones by more than 3°C,successfully reversing the urban heat island effect it was experiencing.[41]

The programme has proven to be particularly popular with the local inhabitants due to the significant inclusion of their opinions in its implementation. For example, the city has a municipal participatory budget whereby residents get to decide which initiative they want to be funded.[42] The estimated cost to establish this programme stands at $16.3 million with an annual maintenance cost of $625,000 in 2022.[43] Medellín is a good example of a nature-based solution (NbS) where relatively low investments deliver multiple benefits such as increased integration of marginalised groups, protection of the region's biodiversity, climate change adaptation and resilience, and reduction of landslide risks during extreme weather events.

Combining Grey and Green Infrastructure as the Solution for Urban Resilience

Upgrading drainage systems and infrastructure is essential for addressing extreme rainfall and floodings. Similarly, to protect coastal areas from sea level rise, coastal erosion, and flooding, it will be necessary to apply grey infrastructure solutions such as sea walls. When it comes to the urban heat island effect, the design and selection of building materials of new developments are also likely to have an impact on outdoor thermal conditions around the buildings.

In a study conducted in the UAE, thermal performance of the traditional architecture of the Al Fahidi neighbourhood was compared to the contemporary architecture of a new district in Ajman. The study found that there was a reduction of approximately 1°C in the traditional area in comparison to the contemporary district.[44] Al Fahidi is a traditionally designed neighbourhood with narrow alleyways and public courtyards often featuring large trees and wind towers (Barajeel), all of which contribute to more pleasant temperatures in the area. It is interesting to note that the life span of buildings in the UAE is up to 30 years.[45] A relatively short life span is partly due to the materials used and the country's harsh climate. With higher-quality materials, appropriate maintenance, and climate change adaptation measures, the life span of buildings could be significantly prolonged to around 50 years, which is closer to some other countries around the world (71 years in parts of Europe and the US).[46]

However, in addition to using technology and appropriate building materials, as well as improving the existing grey infrastructure, nature plays critical role in achieving resilient cities. The solution often lies in combining green, blue, and grey infrastructure as demonstrated in the examples from Colombia and Denmark. Furthermore, local research conducted in Al Ain also supports the idea that a combination of strategies is necessary to effectively deal with flash

floods. These include "upgrading drainage infrastructure, incorporating permeable surfaces, expanding green infrastructure, and enforcing zoning regulations to limit further development in high-risk areas". [47]

The Internation Union for Conservation of Nature (IUCN) defines nature-based solutions as "actions to protect, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits".[48] But what do nature-based solutions look like in reality, especially in dry regions such as the UAE? Using NbS to address urban climate change challenges is not a new concept, and it has been applied by many cities around the world. However, scientific studies focused on assessing the effectiveness of NbS are mostly centred on the Global North, which comprises 69% of research, while cities in arid climates comprise only 7%.[49] This lack of available data for arid and hyper-arid regions makes it difficult for policymakers to determine the solutions that work best for this climate and emphasises the need for the region to generate its own evidence database for NbS. Nevertheless, there is still some valuable research emerging from the region on this topic. For example, research from the Eastern Province of Saudi Arabia that examined the potential of NbS in hyper-arid climates noted the following common principles specific to the region:

- Hydrological integration – given acute water scarcity in the region, water monitoring and appropriate irrigation are essential.
- Species selection – native species should be prioritised as they are already adapted to hypersalinity and droughts.
- Appropriate governance – polycentric governance rather than a top-down approach, coupled with inclusivity, achieves better ecological outcomes.
- Adaptive management – includes continuous monitoring, feedback loops, and community participation, and enables enhanced resilience in times of ecological uncertainty.
- Socio-cultural context – indigenous knowledge and traditions are utilised and valued.
- Maximising benefits from NbS – additional benefits such as biodiversity, recreation, health, cooling, and carbon sequestration are recognised, valued, and maintained.[50]

Regardless of the climatic conditions there is a common principle when it comes to NbS: actions that protect and sustainably manage existing NbS should be prioritised.[51] Instinctively, when it comes to an urban environment with sealed surfaces, the creation of new NbS is the only solution.

Focusing on the three main impacts of climate change on urban environments – extreme temperatures, flooding, and sea level rise –some of the solutions for the UAE include:

In all of these examples, there will be multiple other benefits emerging from NbS such as carbon sequestration, health benefits, tourism and recreational benefits, and biodiversity improvements. Biodiversity improvements are also likely to have a positive effect on air quality.[52] Improving biodiversity in urban areas will also contribute to the Convention on Biological Diversity (CBD) vision of a world living in harmony with nature by 2050.[v]

[v]The UAE is one of the Convention's Parties. The vision of the Kunming-Montreal Global Biodiversity Framework is "a world of living in harmony with nature where "by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people"". (CBD, https://www.cbd.int/gbf/vision)

Scale / Type of Intervention	Solution	Addresses (Impacts)	Additional Benefits
Building Scale	Green roofs, heat-resistant facades, water collection systems	Extreme temperatures, water scarcity, flooding	Biodiversity, building insulation and cooling, rainwater harvesting, communal spaces
Community Scale / Streets	Rain gardens, permeable pavements, detention, retention areas	Flooding, extreme temperatures	Stormwater management, cooling, community spaces, water quality
City / Community Scale	Parks, green playgrounds, pocket parks, urban forests with native trees	Extreme temperatures, flooding, water scarcity	Recreation, biodiversity, community wellbeing, carbon sequestration
Urban Linear Infrastructure	Green corridors, avenues, street tree canopies	Extreme temperatures, dust storms, flooding	Air quality improvement, shading, biodiversity, stormwater control
Urban Coastal Ecosystems	Mangroves, saltmarshes, seagrass meadows, coral reefs	Sea level rise, storm surges, coastal erosion, heat	Biodiversity, coastal protection, recreation
Urban Wetland Systems	Protection, restoration, creation of wetlands	Flooding, extreme temperatures	Wastewater treatment, biodiversity, recreational spaces

Dubai's infrastructure improvement project, the Tasreef Programme, presents itself as a timely opportunity to implement some of these solutions.[53] Dubai is investing AED 30 billion to enhance the city's infrastructure with the aim of making it more resilient to heavy rain. The city could adopt a combined approach for its resilience by incorporating some of the mentioned NbS. Special attention could be given to areas where the most deprived populations live, as they are where the greatest benefits can be achieved. For example, applying nature-based solutions in neighbourhoods with a high concentration of blue-collar workers can generate more diverse and compounded positive outcomes. These communities often have less disposable income to travel to natural areas for cooling and recreation. Bringing nature into these neighbourhoods—by creating accessible green spaces where people can relax, gather, enjoy shade during the summer, and benefit from cleaner air—can therefore deliver multiple social, health, and environmental benefits.

Conclusions and Recommendations

The United Nations Environment – Finance Initiative estimates that the MENA region will lose between 0.4% and 1.3% of GDP due to climate change, with the potential of that value reaching 14% of total GDP unless appropriate action is taken.[54] Preparing for the future impacts of climate change will be critical for the region. The GCC countries have thus far successfully dealt with climate-related challenges and, despite harsh conditions, achieved impressive growth. The latest analysis from The Global Risk Report 2025 by the World Economic Forum ranks extreme weather events second after state-based armed conflict.[55] The Gulf region is particularly susceptible to climate change related risks, and it is important for the UAE to develop strategies to deal with these risks. Its economic and population growth depends on it.

However, to be able to implement any solution for urban resilience, a comprehensive understanding of how systems in urban areas react to climate change stresses is imperative. This Insight, drawing from the latest available local research and the IPCC's assessment, showcased some of the predictions and the current state of climate change impacts that are likely to affect the UAE and the region. What it does not do, however, is translate these predictions into real life impacts. For example, what does it look like when 85% of the UAE's inhabitants and 90% of infrastructure in urban areas are affected? How are people likely to respond and what is the role of decision makers in these situations? Equally,

what are the impacts that can be avoided if policies are put in place now? What are the effects on the UAE's economy and healthcare if summer months make it impossible for people to work and, worse, if lives are lost due to extreme heat stress?

Analysing future impacts and playing out scenarios can help steer policy in the right direction and avoid some of the potential impacts, thus enabling continuous economic growth and wellbeing in the UAE. It is also important for analysis to encompass a variety of relevant perspectives and data, such as from public health and socioeconomics points of view.[56] Organising such an exercise can shed light on how well prepared the UAE is for climate change and what immediate steps the country can take to avoid some of the impacts and adapt more easily. The solutions are likely to be a combination of nature-based and engineered ones, powered by new technologies and AI.

Recommendations:

1. **Develop integrated urban climate risk data platforms and investment in local research and innovation.** Each emirate could establish a centralised data repository and maps supported by science, remote sensing, artificial intelligence, and digital twin technologies. These platforms could identify high-risk areas exposed to flooding, sea level rise, and extreme heat. Such spatially explicit data can provide a robust evidence base to guide policymakers, planners, and developers in designing climate-resilient infrastructure. Furthermore, approaches to finding solutions could reflect the UAE's geographic variability, ensuring that interventions in coastal, desert, and mountainous areas are context appropriate.

2. **Strengthen climate-specific regulatory frameworks.** At the moment, laws that mandate new developments to assess climate impacts on the environment exist, but they are not sufficient to fully address the scale of the challenges at hand. Existing environmental regulations could be expanded to explicitly require the integration of climate change risks and biodiversity considerations into urban planning and development processes. Clear, enforceable standards will enable developers to systematically incorporate resilience measures and nature-based solutions into project design and delivery.

3. **Align public and private sectors around national adaptation goals.** Policymakers could strengthen collaboration with the private sector to align development practices with national adaptation priorities, including forthcoming National Adaptation Plans (NAPs). This includes setting ambitious, measurable targets and fostering shared responsibility across government, developers, and communities. Demonstrating the economic and social value of resilience, particularly through nature-based solutions, will be key in driving adoption.

4. **Establish a regional nature-based solutions (NbS) framework.** A standardised, regionally relevant portfolio of nature-based solutions could be developed for the Gulf region. This framework could include tested and scalable interventions suitable for local climatic conditions, along with guidance on implementation, maintenance, and performance monitoring. Emphasis could be placed on maximising co-benefits through systems-based approaches, such as connecting green spaces to integrated ecological networks.

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