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BACK TO THE FUTURE

Heritage-Centric Approaches to Climate Resilience in MENA Cities

UN environment programme

Union for the Mediterranean
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Habitat for Humanity®

This policy brief follows a workshop conducted by Cities Alliance in March 2024 and has been collaboratively written by Giulia Maci, Arne Janssen, Julie Greenwalt, Safaa Charafi, Marie Munzert and Diane Platel, Cities Alliance; Deena Khalil, Habitat for Humanity International; Cecilia Bertozzi, European Commission; Mohamad Abotera, University of Antwerp; Giulio Verdini, University of Westminster; Hanne Knaepen, European Center for Development Policy Management; Oriol Freixa-Matalonga, Jyoti Hosagrahar, UNESCO; Nicolas Galudec, UNEP; Nicola Orsini, AVSI and Bahar Sakizliolu, Institute for Housing and Urban Development Studies. We extend our gratitude to all those who contributed their insights and expertise.

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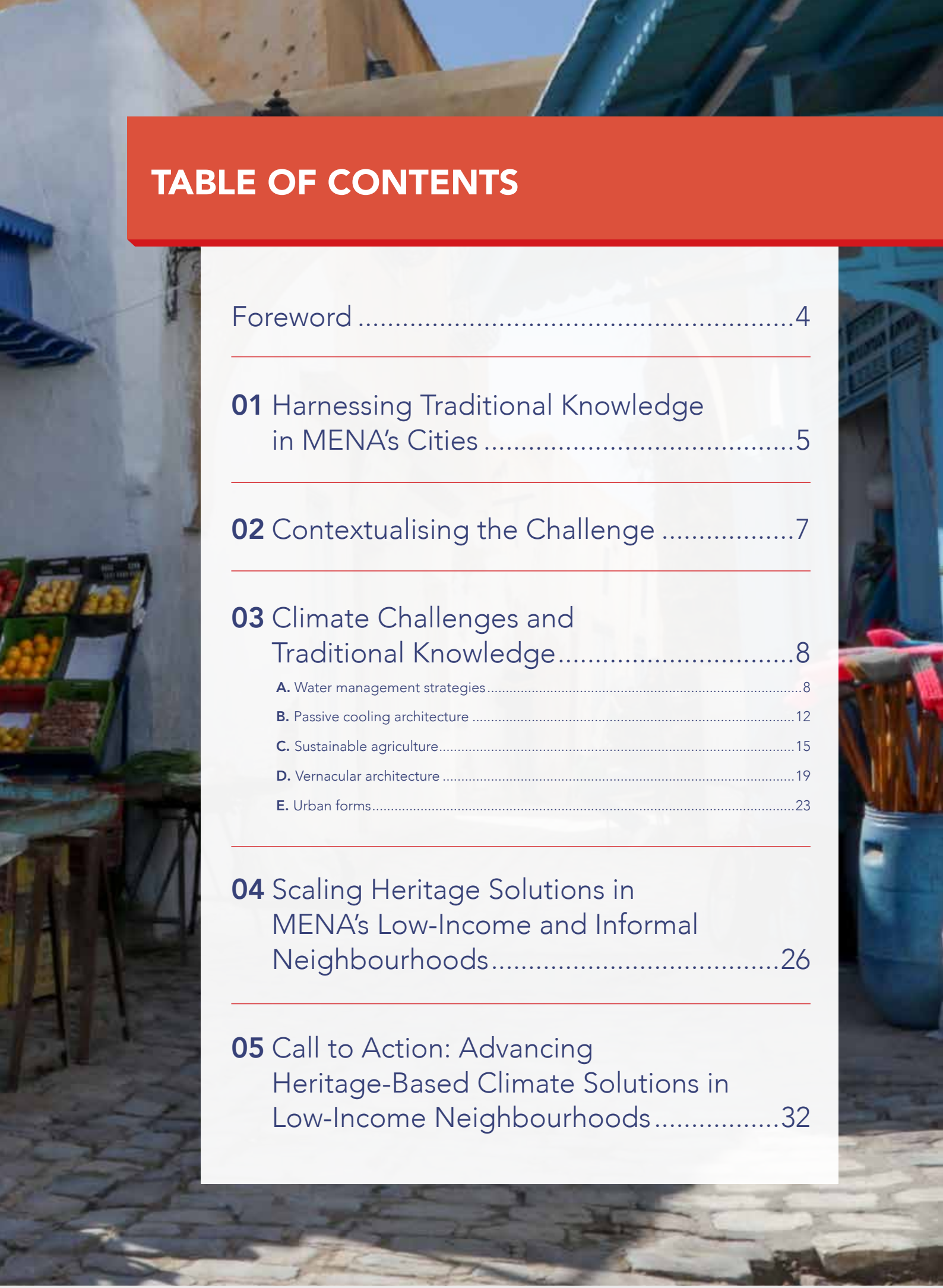

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FOREWORD

As Cities Alliance, we are deeply committed to fostering collaboration with our members and partners in the MENA region to advance the recognition and utilisation of heritage-based urban and architectural solutions within low-income and informal neighbourhoods. By leveraging local knowledge, materials, and expertise, these solutions preserve the rich cultural heritage embedded in their contexts in a way that is cost-effective and sustainable, offering tangible benefits to communities and contributing to inclusive urban development.

— **Giulia Maci, Euro-Mediterranean Programme Manager, Cities Alliance**

Cities and human settlements offer solutions to address social and environmental challenges and are indeed potential drivers for sustainable development, economic growth, and stability. Their material historic legacy, cultural practices, and savoir-faire are testimony to their capability to adapt to changing conditions and generate climate-resilient places. The UfM works to implement the UfM Urban Agenda for the Mediterranean region following a cooperative approach that underscores the joint efforts of governments, local and regional authorities, developers, investors and civil society to improve the liveability of Mediterranean urban areas, learning from the past, innovating, and ultimately ensuring that urban transformation is turned into opportunities.

— **Victoria Jimenez Tejero, Head of Sector for Urban Development, Union for the Mediterranean (UfM)**

Only with a coordinated approach and action at the global, regional, national and local levels, can success be achieved in addressing the triple planetary crisis of climate change and intertwined biodiversity loss and pollution. Cities themselves exacerbate some of the world's most serious environmental and socioeconomic challenges, increasing pressure on citizens' livelihoods and infrastructure. At the same time, cities are also incredible engines for development and provide opportunities for innovation. It is essential, therefore, to make cities an integral part of the solutions to these crises - nature-positive solutions that are both future-proof and enshrined in their local and regional specificities and cultural heritage: eg ecosystems services looking for instance at water, forests or sustainable food systems, sustainable energy sources or resilient infrastructure.

— **Nicolas Galudec, Senior Policy Advisor, UNEP**

Throughout the Middle East and North Africa, communities have long thrived in harmony with their environment. Our region's rich heritage offers a wealth of knowledge about sustainable architectural and resource conservation practices. This publication is a timely exploration of how we can learn from these traditions to address contemporary environmental challenges. Habitat for Humanity International, and its Urban Housing Practitioners Hub, are dedicated to the promotion of adequate, resilient housing as a pathway towards improved lives. By embracing heritage-based solutions, we can not only safeguard our environment but also empower communities to build a more inclusive and resilient future.

— **Deena Khalil, Manager for the Urban Housing Practitioners Hub MENA, Habitat for Humanity**

01 HARNESSING TRADITIONAL KNOWLEDGE IN MENA'S CITIES

The Middle East and North Africa (MENA) region spans an area of 12.5 million km^2, equal to around 9.5 per cent of the world's land.[1] Yet, it holds only around 1 per cent of the global freshwater supply,[2] and is widely recognised as the most water-scarce region on Earth. Combined with rising temperatures[3] and increasing extreme weather events such as heatwaves and droughts, the MENA region is one of the most vulnerable in the world to the impacts of climate change.[4] The intensifying climate crisis is putting immense pressure on the economies of MENA countries; 70 per cent of the region's GDP is vulnerable to water stress.

In MENA's urban centres, which house around 70 per cent of the region's total population,[5] the effects of extreme weather and climate conditions translate into dangerous stressors (heat, pollution and noise, for example) and a lack of access to basic services (e.g., water, sewage, and transportation). The need for immediate action is clear. MENA cities must proactively embrace inclusive strategies that are both economically viable and feasible to implement so that they can master the swift transformation towards climate-adaptive cities and ensure the future well-being and health of their populations.

This policy brief advocates for a paradigm shift towards rediscovering the ancient wisdom embedded in traditional architectural practices, water management techniques, and urban design principles that sustained MENA communities and cities for centuries. These designs and practices offer invaluable lessons for today's climate challenges. Honed over time, they are proven solutions rooted in the region's rich cultural heritage and provide cost-effective, easily replicable strategies for climate resilience. Yet, urban development approaches of recent decades have overlooked the wealth of indigenous knowledge and existing heritage-based solutions in MENA cities in favour of more modern approaches. As cities increasingly bear the brunt of climate-induced stresses, there is a pressing imperative to rediscover, document, and integrate indigenous wisdom into contemporary urban climate adaptation programmes and strategies. With a growing international interest for

1 FAO (Food and Agriculture Organization of the United Nations). "Land Area and Estimated Average for the MENA Region," AQUASTAT Database, https://www.fao.org/aquastat/statistics/query/ index.html.

2 Kandeel, Amal. "Freshwater Resources in the MENA Region: Risks and Opportunities." Middle East Institute, 10 July 2019, https://www.mei.edu/publications/freshwater-resources-mena-region-risks-and-opportunities.

3 Climate models are predicting temperature increases 20 per cent higher than global averages, according to UN Climate. "MENA Climate Week 2023: Driving Regional Action on Climate Change," 8 October 2023, https://unfccc.int/news/mena-climate-week-2023-driving-regional-action-on-climate-change.

4 The World Bank. "Climate and Development in the Middle East and North Africa," 30 November 2023, https://www.worldbank.org/en/region/mena/brief/climate-and-development-in-the-middle-east-and-north-africa.

5 Jaad, Ahmed and Khaled Abdelghany. 2021. "The Story of Five MENA Cities: Urban Growth Prediction Modeling Using Remote Sensing and Video Analytics." Cities, Vol. 118. https://doi.org/10.1016/j.cities.2021.103393.

the potential of heritage solutions in relation to climate change, it is essential to highlight the possibilities of traditional knowledge and architecture for climate adaptation in the MENA region, a region too often overlooked in that regard.[6]

Cities Alliance, Habitat for Humanity International, Union for the Mediterranean, and United Nations Environment Programme have collaborated on this policy brief for two main reasons: to advocate for increased funding for climate adaptation initiatives in cities that utilise existing knowledge and initiatives; and to provide guidance for ongoing projects centred on heritage preservation in urban areas and climate action. Designed as a toolkit for heritage-based climate adaptation solutions, the brief aims to be a valuable resource for MENA cities as well as the broader Mediterranean region.

6 Simpson, N.P. et al. ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International CoSponsored Meeting on Culture, Heritage and Climate Change. Charenton-le-Pont & Paris, France: ICOMOS & ICSM CHC, 2022.

> Urban settlements evolve and change to fulfil their inhabitants' requirements.
>
> — *Ahmed Mohamed Shehata, Professor and Director of Development and Planning at Umm Al-Qura University in Saudi Arabia*

02 CONTEXTUALISING THE CHALLENGE

The sprawling MENA region is an exceptional tapestry of cultural diversity that defies easy categorisation. Nonetheless, its urban history, current state, and future trajectory are shaped by overarching trends: Industrialisation, globalisation, urbanisation, conflicts, and, increasingly, climate change. The evolution of urban landscape and practices – including heritage-based ones – throughout history is a natural indication of the passage of time.

The MENA region urbanised rapidly, its urban population rising from 46 per cent in 1974 to 64 per cent in 2013.[7] However, its cities did not fully capitalise on this growth potential. For instance, enhanced resource efficiency measures could have alleviated resource scarcity. Instead, regional urbanisation added new stressors, a phenomenon characterised by Egyptian sociologist Saad Eddin Ibrahim as "urbanisation without urbanism."[8] Globalisation transformed MENA's cities, aligning them more closely with western paradigms of modernity.[9] What followed was a "gradual shift from a harmonious pedestrian-oriented built environment into a fragmented vehicular-oriented one."[10] Traditional practices in cities were, to some extent, substituted by international ones less contextualised to the local environment: High buildings, increased motorised traffic, and mechanical air-conditioning.[11] MENA's urban heritage experienced enduring transformation and suppression.

Understanding the history and current climate challenges of MENA's cities highlights the urgent need for climate adaptation and resilience. It also underscores the potential of heritage-based solutions to address these challenges. In response to such pressures, it is crucial to undertake a comprehensive re-evaluation of urban planning strategies. Beyond simply adapting to change, it involves proactive efforts to shape urban landscapes that can withstand and thrive amid the evolving challenges of climate change in the region.

The subsequent sections explore the most critical climate change impacts in the region and showcase existing, heritage-based solutions to address them. Blending modern innovation with the architectural wisdom rooted in the region's history and reviving overlooked heritage practices can pave the way for resilient, sustainable urban development in the MENA region.

7 Elgendy, Karim and Natasha Abaza. "Urbanization in the MENA Region: A Benefit or a Curse?" Friedrich Ebert Stiftung, 2 October 2020, https://mena.fes.de/press/e/urbanization-in-the-mena-region-a-benefit-or-a-curse.html.

8 Ibid.

9 Shehata, "Current Trends in Urban Heritage Conservation."

10 Ibid.

11 Ibid.

Citation reference: Shehata, Ahmed Mohamed. 2022. "Current Trends in Urban Heritage Conservation: Medieval Historic Arab City Centers." *Sustainability* 14:2. https://doi.org/10.3390/su14020607https://www.mdpi.com/2071-1050/14/2/607.

03 CLIMATE CHALLENGES AND TRADITIONAL KNOWLEDGE

A. WATER MANAGEMENT STRATEGIES[13]

Water scarcity emerges as a crucial concern, with the MENA region identified as a hotspot for water stress by the Water Scarcity Atlas.[13] The intricate interplay of growing populations and erratic precipitation patterns heighten the strain on available water resources, necessitating innovative water management strategies to address agricultural and urban demands. The MENA region is also increasingly susceptible to unpredictable weather events, ranging from intense storms to prolonged droughts. The Global Risk Index underscores the vulnerability of several MENA countries to climate-related disasters, which need anticipatory measures in urban planning to enhance societal resilience.

Throughout history, MENA cities have been adept at managing water resources in arid landscapes. Complex water systems comprising aqueducts, cisterns, and gravity-based underground tunnels *(qanats)* underscored their capability to secure and conserve water. Insights from these historical water management practices offer pragmatic solutions for addressing contemporary water scarcity challenges in urban settings. Rainwater harvesting[14] is one good example. Traditional urban settlements often incorporated rainwater harvesting systems to capture and store rainwater for domestic use, irrigation, and groundwater recharge. Dating back to the 15th century B.C., the ancient Tawila cisterns in Yemen's port city of Aden ingeniously managed floods and droughts by channelling rainwater through volcanic ash channels. These channels directed water away from vulnerable areas, preventing floods. The cisterns historically provided up to 20 million gallons of accessible drinking water annually.[15] However, they have unfortunately fallen into disuse as the result of a lack of maintenance.

12 Gleick, P.H. 1998. "Water in Crisis: Paths to Sustainable Water Use." *Ecological Applications.* 8:3, pp. 571-579.

13 Global Water Scarcity Atlas, https://waterscarcityatlas.org.

14 Campisano, A., et al. 2017. "Urban Rainwater Harvesting systems: Research, Implementation and Future Perspectives." *Water Research*, vol. 115, pp. 195-209.

15 Gebeily, Maya. "Yemeni City Looks to Ancient Past to Survive Climate Change." Thomson Reuters, 16 March 2022. https://www.preventionweb.net/news/yemeni-city-looks-ancient-past-survive-climate-change.

Other examples include:

Stormwater management: Heritage-based stormwater management practices focus on slowing down the flow of rainwater and reducing surface runoff to prevent flooding and erosion. On the other hand, modern techniques such as permeable pavements, green roofs, bioswales, and roadside ditches help absorb and infiltrate stormwater can replenish groundwater and mitigate the impacts of heavy rainfall events, thus protecting historic and cultural heritage.

Traditional water infrastructure: Many historic cities developed sophisticated water supply and distribution systems to meet the needs of growing populations. Ancient aqueducts, wells, canals, and reservoirs are examples of heritage-based infrastructure that can inspire modern water management solutions. These systems can be rehabilitated, upgraded, or integrated with contemporary technologies to enhance urban water resilience.

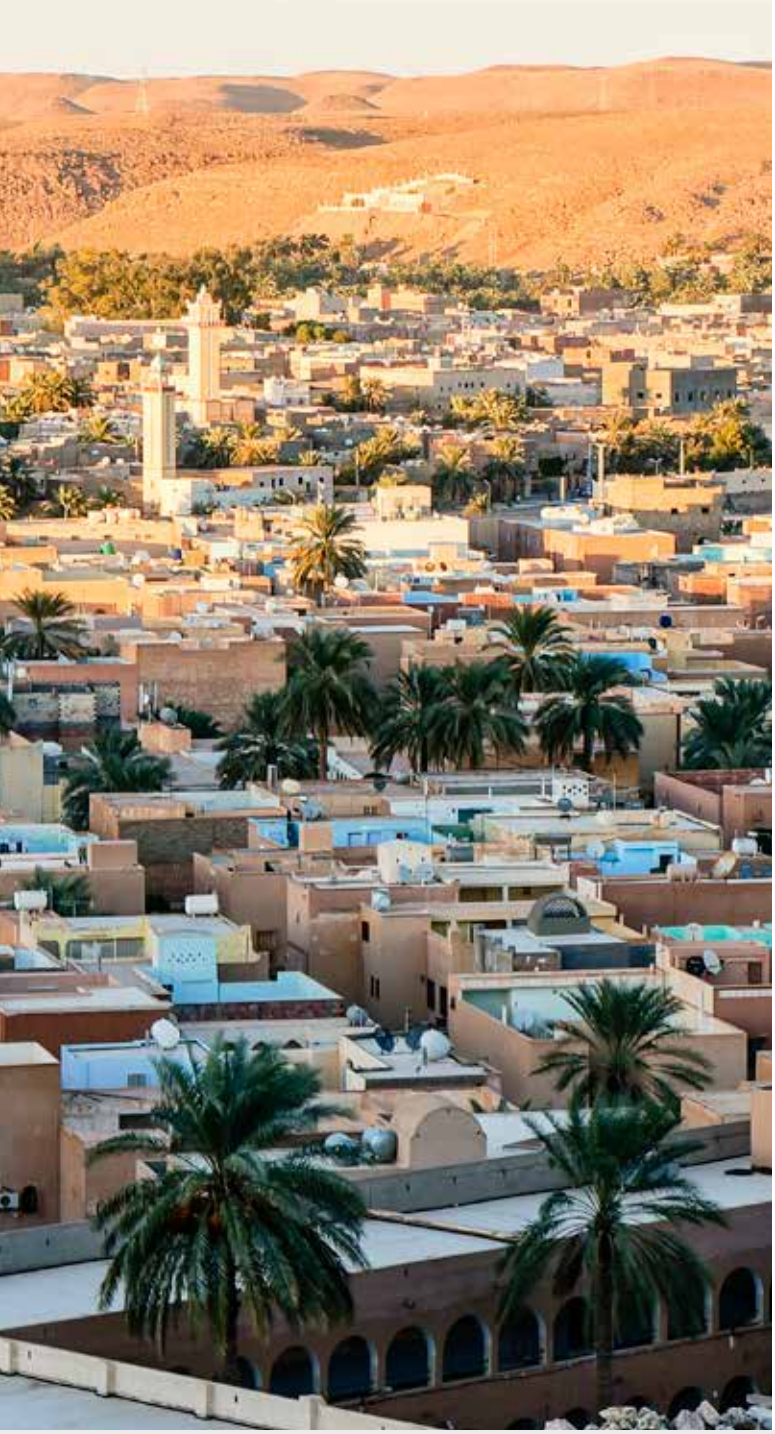
Natural waterways and green spaces: Historically, natural waterways, wetlands and green spaces were part of the urban fabric and naturally helped to manage water flow, reduce flooding, and improve water quality. However, in many places modern urban development deprioritized these natural areas and methods. Restoring and preserving these natural features can enhance urban biodiversity, provide recreational amenities, and mitigate the impacts of climate change-induced flooding and heatwaves.

Floodplain management: Many historic cities were built on floodplains, where periodic flooding was a natural phenomenon. Heritage-based floodplain management strategies include zoning regulations, land-use planning, and flood-resistant building techniques to minimise the risk of flood damage and protect vulnerable urban areas from inundation.

FOCUS ON:

M'ZAB VALLEY, ALGERIA

Rediscovering Traditional Flood Management in the M'Zab Valley



Comprised of *ksour* and palm groves of El-Atteuf, Bounoura, Melika, Ghardaïa and Beni-Isguen (founded between 1012 and 1350), the M'Zab Valley has conserved practically the same way of life and the same building techniques since the 11th century, ordered as much by a specific social and cultural context as by the need for adaptation to a hostile environment.

The traditional settlements of the M'Zab valley were adapted to their environment and climate. Floodable areas were occupied only by temporary structures and not by dwellings. Water infrastructure was a core community concern, and a community organisation managed the shared water infrastructure. The abandonment of these traditional practices has led to increased vulnerability to flooding. The M'zab Valley is vulnerable to climate change, with periodic overflows becoming increasingly frequent (Djellouli Tabet and Sioussiou, 2009).

In the face of climate change, there is a significant need to enhance the risk preparedness of the water distribution system. During the catastrophic floods of 2008, the damages were worsened by improper constructions and a lack of maintenance of water management infrastructure. To safeguard these values and improve environmental sustainability, the management authority has developed educational materials and workshops on traditional water management systems and wells, traditional construction techniques and the traditional construction management system.

Excerpt from the UNESCO World Heritage Canopy.[16]

16 The UNESCO World Heritage Canopy. "Climate Change Case Studies: Promoting Traditional Environment Knowledge in the M'zab Valley (Algeria)," retrieved from: https://whc.unesco.org/en/canopy/mzab/.

FOCUS ON:

KAIROUAN, TUNISIA

Providing Water Access and Empowering Women with Heritage-based Solutions

The northern Tunisian city of Kairouan suffers from limited access to potable water, despite its renowned network of *majels*, or domestic cisterns that collect rainwater. Established in the 9th century, *majels* became less relevant over the past century with the progressive generalisation of running water. However, with the national water supply at historic lows and an insufficient, leaky infrastructure,[17] the city experiences constant threats to water access and availability.

In a direct correlation between climate change and the deepening of gender inequalities, the growing water scarcity is particularly burdening girls and women, who are typically responsible for water management and provision at the domestic level. Yet, their expertise and the impact of water management on their daily lives is overlooked and ignored at higher levels of decision-making, from the municipal to the national and international levels. With rapid climate evolution and the heightened threat to water resources, novel approaches to water management are needed – especially ones that engage women and recognise them as central actors of change.

As part of its Women and Sustainable Cities initiative, Cities Alliance in 2023 launched an initiative linking *majels* to gender-responsive water management in Kairouan. The project has three main components:

- Mapping functional *majels* and water itineraries to sources and public fountains;
- Engaging women and girls in a selected neighbourhood to co-design solutions to create new collective *majels* and facilitate women's access to water in the surrounding public spaces; and
- Building capacity for local authorities to develop gender-responsive strategies for water management, governance, and maintenance of the *majels*.

The initiative also aims to integrate gender into the development of urban practices for equal access to water as well as sustainable and integrated management of rainwater and drinking water in cities.[18]

17 Zaghouani, Fatma. "Kairouan a soif: La situation ne s'améliore pas…" La Presse, 23 July 2022. https://lapresse.tn/135532/kairouan-a-soif-la-situation-ne-sameliore-pas/.

18 Cities Alliance. "Kairouan: Advancing Gender-Sensitive Water Management," 3 November 2023, https://www.citiesalliance.org/newsroom/news/results/kairouan-advancing-gender-sensitive-water-management.

B. PASSIVE COOLING ARCHITECTURE[20]

The MENA region shows an accelerated trend of rising temperatures, surpassing the global average, as documented by the Intergovernmental Panel on Climate Change (IPCC).[20] The Arab region is, on average, warming twice as fast as the rest of the world. This temperature surge poses multifaceted challenges, impacting daily life and intensifying energy demands for cooling systems. Notably, electric fans and air conditioners contribute about 20 per cent to global building electricity use. Since the turn of the century, the energy demand for cooling buildings has doubled, marking it as the fastest-growing end-use sector within the built environment. By 2050, the World Bank forecasts that the number of air-conditioning units around the globe will triple to five billion. In countries with warmer temperatures, buildings may depend too heavily on air conditioning instead of natural cooling, using design elements such as glass-filled facades that increase heat indoors. Or, features that reduce energy consumption may be excluded from building design to lower costs.[21] In light of these challenges, it is imperative to confront the associated CO_2 intensity of space cooling, urging the development of more efficient and eco-friendly technologies to tackle the environmental footprint head-on.

Passive cooling is precisely highlighted by the UN Environment Programme as one of three sustainable measures with the potential to cut carbon emissions related to cooling demands by 60%.[22] This carbon neutral solution for cooling could have an essential impact in the MENA region, where traditional architecture is rich in examples of passive cooling techniques regulating internal temperatures like natural ventilation and shading. This historical approach presents an opportunity for modern urban planners to optimise climate-responsive design, thereby diminishing reliance on energy-intensive cooling systems.

Traditional cooling methods in the Persian Gulf, such as wind towers (*barjeel*), have historically drawn air from inside buildings, creating a cooling effect as fresh air is funnelled downward. In Dubai, the Al Fahidi and Al Bastakiya neighbourhoods highlight the cultural significance of wind towers. In rooms with two openings to the outside, a natural cooling effect occurs as cooler air enters through the lower opening, while warmer air exits from the upper opening. Cross-ventilation, achieved by aligning windows to facilitate airflow from one end to the other, is another effective strategy. However, implementing natural ventilation becomes challenging in high-rise buildings due to increased wind speeds at elevated levels, posing safety risks for open windows. Despite this limitation, designers explore passive cooling approaches and focus on the indoor micro-environment, prioritising occupant comfort over cooling the entire building.

19 Tamini, A. and H. Alibaba. 2017. "Integration of the Vernacular Passive Cooling Systems with Contemporary Architecture in the Middle East." *International Journal of Recent Research in Civil and Mechanical Engineering*, 3:2, pp. 8-16.

20 IPCC (Intergovernmental Panel on Climate Change) Reports. https://www.ipcc.ch/.

21 Bardsley, Daniel. "Beat the Heat: Sustainable Ways to Make Buildings in the Middle East Cooler," The National News, 19 October 2021. https://www.thenationalnews.com/uae/environment/2021/10/19/beat-the-heat-how-to-make-buildings-in-the-middle-east-cooler/.

22 UN Environment Programme. 2023. *Keeping it chill, How to meet cooling demand, while cutting emissions.* Global Cooling Watch 2023.

Other examples include:

Orientation dynamics:

Rooted in the architectural traditions of Turkey, the deliberate orientation of rooms emerges as a pivotal strategy for passive cooling. During winter, south-facing bedrooms capture sunlight for warmth, while a seasonal shift to north-facing rooms in the summer minimises direct sunlight exposure – creating a naturally cooler indoor setting.

Thermal zoning methodologies:

The implementation of thermal zoning also strategically allocates spaces based on seasonal considerations, which optimises comfort by leveraging varying thermal conditions throughout the year.

Architectural configurations:

Examining ancient architectural configurations, notably the U and T-shape designs prevalent across diverse cultures, reveals their inherent contribution to passive cooling. These structures facilitate natural ventilation and shading, creating environments that inherently promote thermal comfort.

Compact building design (surface-to-volume ratio):

Emulating principles observed in compact buildings becomes a crucial strategy to reduce heat absorption by minimising the external surface exposure. These are particularly evident in regions such as Iran, where the surface-to-volume (S/V) ratio is minimised.

Mashrabiya window design:

Incorporating elements such as the *mashrabiya* from Middle Eastern architecture introduces a nuanced approach to window design. These intricately crafted latticework screens enable ventilation and strategically limit direct sunlight exposure.

FOCUS ON:
IRAQ

Traditional Architecture and Passive Technologies in Iraq

Traditional passive architecture can achieve remarkable results for thermal comfort and well-being, and there are some outstanding examples preserved in Iraq. Traditional building techniques still implemented in some Iraqi villages rely on mud bricks, cedar wood, and thick clay to provide effective insulation from rain, sun, and wind, making the building hospitable in a hot climate where summer days can exceed 48°C. Even more remarkably, the traditional dark, high, and tall tunnels with two open ends for wind circulation allow efficient food storage, even in soaring summer temperatures.[23]

Another traditional element of Iraqi architecture is the courtyard house, typical of Baghdad. These houses are designed and built with specific attention to sun orientation and wind direction to maximise passive thermal performance.[24,25] They often display *shanasheel*, the Iraqi variation of *mashrabiya*, or carved wooden panels on the building's frontal facade or windows. These features block sun radiation while allowing wind circulation to cool down the interior.[26]

23 Al-Hashimi, M. "Architecture and Passive Solar Technologies in Iraq: Personal Reflections," LinkedIn, 18 March 2017. https://www.linkedin.com/pulse/architecture-passive-solar-technologies-iraq-personal-al-hashimi/.

24 Baiz, W. H. and Shaida J. Fathulla. 2016. "Urban Courtyard Housing Form as a Response to Human Need, Culture and Environment in Hot Climate Regions: Baghdad as a Case Study." International Journal of Engineering Research and Application, 6: 9, pp. 10-19. https://www.ijera.com/papers/Vol6_issue9/Part-1/C0609011019.pdf.

25 Agha, R. 2015. "Traditional Environmental Performance: The Impact of Active Systems upon the Courtyard House Type, Iraq." Journal of Sustainable Development, 8:8; pp. 28-41. Doi: 10.5539/jsd.v8n8p28.

26 Said, Q. "Shanasheel (balcony)." The Encyclopedia of Crafts in Asia Pacific Region. https://encyclocraftsapr.com/shanasheel/.

C. SUSTAINABLE AGRICULTURE[28]

Rising temperatures and sea levels are increasingly putting pressure on the agricultural sector of the MENA region. A warming scenario in which global temperatures increase by 2°C could reduce freshwater availability in the region by 15 to 45 per cent, causing its GDP to decline between six to 14 per cent by 2050.[28] A one per cent increase in winter temperatures has already been estimated to decrease agricultural production by 1.12 per cent.[29] With precipitation expected to decrease significantly, agricultural productivity in the region – which is 70 per cent rainfed – is bound to decline, endangering livelihoods. The need for sustainable and climate-adaptive agricultural practices is immense.[30]

Historically, MENA's cities seamlessly integrated agriculture into their urban fabric, creating local food production to reduce reliance on external sources. These heritage practices in the agricultural sector can offer valuable lessons in adapting to the local climate conditions and applying a particular sensitivity towards efficient usage of resources. The historical coexistence of urbanity and agriculture serves as a model for contemporary urban spaces seeking to establish sustainable and locally sourced food systems. These sustainable, heritage-based agriculture techniques draw upon traditional knowledge and practices passed down through generations.

A good example is the traditional farming technique known as *Ramli* that originated in Tunisia in the 17th century. *Ramli* is gaining global attention for its unique ability to support year-round crop cultivation while promoting biodiversity conservation. Developed by Jewish and Muslim communities in the Ghar El Melh area, *Ramli* involves cultivating crops in sandy plots near a lagoon irrigated with fresh underground rainwater. The delicate balance requires meticulous measurement of sea water levels to prevent saltwater intrusion, ensuring the crops receive necessary water without compromise. Recognised by the UN Food and Agriculture Organization's Globally Important Agricultural Heritage Systems (GIAHS) initiative, *Ramli* farms showcase sustainable practices with international acclaim. However, climate change, erratic rainfall, rising sea levels, and encroaching real estate development pose threats to this centuries-old system, requiring preventive actions for its preservation. As experts emphasise the importance of embracing traditional methods for food security and biodiversity conservation, the global recognition of *Ramli* is a testament to its effectiveness and cultural significance. Despite these challenges, the resilience of *Ramli* remains important in bridging ancestral wisdom with contemporary science to navigate the impacts of climate change on agriculture in the region.[31]

27 Mengist, B. 2022. "The Roles of Urban Agriculture for Climate Change Adaption in the Case of Debre Markos Town and Surrounding Districts East Gojjam Zone Amhara Region Ethiopia." Journal of Earth Science & Climatic Change, 13:10.

28 UNEP FI (United Nations Environment Programme Finance Initiative). 2023. *Adapting to a New Climate in the MENA Region*. UNEP: Nairobi. https://www.uncclearn.org/wp-content/uploads/library/Adapting-to-a-new-climate-MENA.pdf.

29 Ibid.

30 Ibid.

31 Koigi, Bob. "The Ancient Farming Technique Navigating Climate Change." Fair Planet, 27 October 2023. https://www.fairplanet.org/story/farming-technique-tunisia-sea-level-rise-climate-change/.

Other examples are:

Crop rotation:
This approach involves alternating the types of crops grown in a particular field seasonally or annually. It helps maintain soil fertility, prevents pest and disease buildup, and reduces the need for chemical fertilisers and pesticides.

Community-based water governance:
Traditional water management systems often involved community-based governance structures that regulated access to water resources and coordinated water allocation and usage among different stakeholders. Such participatory approaches to water governance promote social cohesion, equity, and sustainability by empowering local communities to manage and protect their water sources.

Agroforestry:
Trees and shrubs are integrated into agricultural systems, providing multiple benefits such as soil conservation, biodiversity enhancement, carbon sequestration, and increased resilience to climate change.

Terracing:
Creating flat platforms on sloped terrain prevents soil erosion and improves water retention. It has been practised for centuries in hilly or mountainous regions to make land suitable for agriculture while minimising environmental degradation.

Seed saving and exchange:
Traditional farmers have long saved seeds from their crops for future planting, selecting and preserving varieties that are well-adapted to local conditions. Seed exchange networks facilitate the sharing of diverse genetic resources, promoting biodiversity and resilience in agriculture.

Polyculture and crop diversity:
Traditional agricultural systems often involve growing multiple crops together in the same field, known as polyculture. This promotes ecological balance, reduces reliance on chemical inputs, and enhances soil health by mimicking natural ecosystems.

Water harvesting and conservation:
Techniques such as rainwater harvesting, contour bunds, and check dams are used to capture and store water for agricultural use, particularly in arid and semi-arid regions where water is scarce.

Livestock integration:
Integrating livestock into agricultural systems, such as rotational grazing or mixed farming, helps improve soil fertility, manages pests, and minimises waste by using animal manure as natural fertiliser.

Traditional irrigation methods:
Techniques such as drip irrigation, furrow irrigation, and *qanat* systems have been used for centuries to efficiently deliver water to crops while minimising waste and energy consumption.

FOCUS ON:

FIGUIG, MOROCCO

Ensuring a Resilient Community-Based Water Management System

The oasis town of Figuig is located in eastern Morocco, near the border with Algeria. The town still has a sophisticated water system based on *foggaras* – the North African term for the *qanat* – that allows the extraction of groundwater to feed the productive palm groves around seven ancient *ksour.* Water pumps were installed in the late 1960s to ensure a regular supply of water due to decreased water flow levels, but the community-based water management system is still functioning as it did in the past. A well-respected member of the community, the *sarayfi,* manages the water rights and the irrigation time for each farmer's unit.

Figuig's water system has faced numerous challenges, including the deterioration of the *foggara's* canals, water loss from the widespread abandonment of old buildings in the *ksour*, the impact of drought, and lack of precipitation. Nonetheless, the system persists, and the community's livelihood is still dependent on palm groves and date production. This is also due in part to the strong cultural identity among Figuig's "sentimental farmers," who are attached to the historic oasis and continue to work the land despite the decreasing profitability of cultivation.

The municipality launched a participatory scenario planning experiment in 2022 that aims to:

- Ensure Figuig's transition towards sustainability and resilience in light of climate change, devising scenarios for the future on culture and inclusion, water management, common space, and heritage; and
- Include local stakeholders, especially historically marginalised ones such as women and youth, in a process of consultation *(pacte citoyen).*[32]

Since 2023, Figuig has partnered with Cities Alliance for the Women and Sustainable Cities initiative, which promotes women's inclusion in water management.[33]

32 Verdini, G., et al. 2023. Climate Adaptation and Cultural Resilience: The Case of the Oasis of Figuig, Morocco. International Laboratory of Architecture & Urban Design Press: Milan and Rabat. https://www.ilaud.org/wp-content/uploads/2023/12/figuig_low.pdf.

33 Cities Alliance. "Regional Programme: Women and Sustainable Cities." https://www.citiesalliance.org/regional-programme-women-and-sustainable-cities.

FOCUS ON:

MENJEZ MUNICIPALITY, LEBANON

Preserving and Expanding Historical Water Management Systems for Irrigation

A small municipality close to the Syrian border, the village of Menjez is a mostly rural community with a river and natural springs. Its agricultural sector is especially vulnerable to climate change, and increased pests and diseases have already affected production. To better adapt to climate change, Menjez is managing its water access and provision independently.

The municipality has taken steps to ensure a supply of drinking water for its inhabitants and the irrigation of the fertile agricultural plains surrounding the village. It uses a combination of traditional practices, historical infrastructure, and modern measures. A 60,000 m^3 reservoir harvests rainwater, and the village treats its greywater for reuse.

Most significantly, Menjez has preserved its 2,000-year-old Roman aqueduct system, actively maintaining and developing it with irrigation canals built using ancient techniques and natural, locally sourced materials. The development of the aqueduct and the new canals are essential for irrigating the surrounding farmlands and preserving the livelihoods of the inhabitants.

Menjez Municipality is a testament to the pivotal role heritage-based solutions, enhanced with modern knowledge, can play to preserve natural resources and ensure their sustainable and collective management.[34]

34 Kassen, J. "Menjez: The Tiny Lebanese Municipality That's Racing to Resilience." Climate Champions, 26 October 2021, https://climatechampions.unfccc.int/menjez-the-tiny-lebanese-municipality-thats-racing-to-resilience/.

D. VERNACULAR ARCHITECTURE[36]

Globally, the construction sector and built environment are responsible for 37 per cent of energy use, 39 per cent of CO_2 emissions, and around 40 per cent of material use.[36] The cement sector alone accounts for 5 to 8 per cent of global yearly CO2 emissions.[37] While the MENA region's footprint is comparatively low, its per capita greenhouse gas (GHG) emissions have outpaced its population growth, with an increase of 30 per cent from 2010 to 2015.[38] The construction sector is not set to reach carbon neutrality by 2050[39], and yet the need to decarbonise the construction sector is immediate . Vernacular architecture, the practice of using local or regional materials and traditional construction practices, could be an effective tool to address this issue.

Vernacular architecture practices are the result of evolutionary developments and are highly contextualised to local conditions (such as climate, topography, and culture), making them an important part of a region's cultural identity.[40] Vernacular construction practices are also considered much more environmentally friendly, as emissions from production and transportation can be saved through a localised value chain. Buildings in cities such as Sana'a and Shibam in Yemen offer insights into the climatic benefits of these practices. Traditional features, including thick walls and courtyards, offer passive cooling mechanisms and align with sustainable practices and locally responsive designs.

35 Elsheshtawy, Y. 2008. *The Evolving Arab City: Tradition, Modernity and Urban Development*. Routledge: London.

36 UN Environment Programme. 2021. Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector. UNEP: Nairobi. https://www.unep.org/resources/report/2021-global-status-report-buildings-and-construction

37 Cheng, D., Reiner, D.M., Yang, F. et al. 2023. "Projecting Future Carbon Emissions from Cement Production in Developing Countries." Nature Communications, 14:8213. https://doi.org/10.1038/s41467-023-43660-x https://www.nature.com/articles/s41467-023-43660-x.

38 Lienard, Clémentine. "Mitigating Climate Change in the MENA: Shifting to a New Paradigm." Brussels International Center, 28 April 2022. https://www.bic-rhr.com/research/mitigating-climate-change-mena-shifting-new-paradigm.

39 UN Environment Programme and UN-Habitat. 2024. *Outcome Document of the Local Leaders' roundtable on decarbonising buildings*. https://unhabitat.org/sites/default/files/2024/03/outcome_document_local_leaders_roundtable.pdf

40 Ghisleni, Camilla. "What Is Vernacular Architecture?" ArchDaily, 25 November 2020. https://www.archdaily.com/951667/what-is-vernacular-architecture.

Other examples are:

Siwan architecture in Egypt:

The traditional adobe houses in the Siwa Oasis use locally sourced mud and straw, incorporating thick walls that provide effective thermal mass. Another type of Siwan architecture uses salt blocks taken from the nearby salt lakes. The blocks are used in masonry with an abundant mud mortar also rich in salt. These construction methods ensure temperature regulation and a comfortable interior environment.

Ghorfas in the Maghreb region:

Ghorfas are vaulted rooms used as traditional grain storage buildings with thick walls that insulate against the intense desert heat. Their compact design and strategic location contribute to effective temperature control.

Kasbahs in Morocco:

Constructed from traditional mud brick, these fortified desert citadels adeptly use local materials to establish thermal mass for effective temperature regulation. The architectural design, characterised by courtyards and narrow winding streets, strategically enhances natural ventilation and shade, thus contributing to a proficient passive cooling system.

Dars or Ryads:

Traditional courtyard houses, known as *dar* in Tunisia and *ryad* in Morocco, embody the principles of low emission living in addition to their passive cooling features. Their architectural design optimises shade, airflow, and natural ventilation, creating a cool and comfortable interior living environment while simultaneously minimising the reliance on mechanical cooling systems. By maximising natural resources and reducing energy consumption, these houses contribute to sustainability efforts and align with contemporary initiatives aimed at mitigating climate change within historical contexts.

Levantine stone houses:

In arid regions of the Levant, particularly in Syria and Lebanon, stone houses are excellent at temperature regulation. Thick stone walls provide insulation, and the use of local stone materials reflects an adaptation to the region's climate.

FOCUS ON:

CAIRO, EGYPT

Community-Centred Revitalisation of Cairo's Souq al-Silah

The historic district of Darb al-Ahmar is part of the World Heritage property of Historic Cairo. The neighbourhood has suffered profound cultural and social changes in the last decades, mostly due to modernisation, industrialisation and internal migration. These factors have led to a separation between the site's cultural heritage and the community that inhabits it. Historical public buildings, such as public baths, caravanserais and sabil-kuttab (water station and school) are increasingly in disuse. On the other hand, protected buildings are fenced and locked, often subject to vandalism.

An essential aim of the project was to increase the local community's understanding of cultural heritage. For this goal, 29 workshops were carried out. At the same time, the workshops were used to understand the potential uses of the Beit Yakan community centre, a restored historical building located on the street. The workshops took place in cultural heritage sites, such as the Azhar Park, Islamic Art Museum and historical mosques, which helped residents to re-discover these sites.

During the initial phase of the project, the community workshops were targeted towards local women and children. This strategy allowed researchers to build trust with the community. During the workshops, women identified their priorities for community development: to improve children's education, to have safe public spaces in which they can socialise while children play, and to learn some skills to improve their livelihoods.

On a second stage, the workshops were expanded to include the local men, especially craftsmen and woodworkers. The workshops led to a reinvigoration of the woodworkers' guild, identifying the Souq Shirah brand identity and establishing a woodcraft training facility in the community centre.

Excerpt from the UNESCO World Heritage Canopy. [41]

41 UNESCO World Heritage Canopy. "Community-Centred Revitalisation of Souq al-Silah in Cairo (Egypt),"retrieved from: https://whc.unesco.org/en/canopy/cairo/.

FOCUS ON:
YEMEN

Promoting Local Employment Through Heritage Conservation in Historic Cities

In the context of long-standing conflict, a cash-for-work scheme provides young people with employment opportunities while contributing to the conservation of urban heritage in four historic cities in Yemen. The initiative aims to meet the most urgent humanitarian needs of the crisis while promoting local ownership over the safeguarding of World Heritage.

The project "Cash for Work: Promoting Livelihood Opportunities for Urban Youth in Yemen" aims at employing 4,000 young men and women to safeguard cultural heritage in four different historic urban centres: Sana'a, Shibam, Zabid and Aden. Sana'a, Shibam and Zabid are home to the World Heritage sites of Old City of Sana'a, Old Walled City of Shibam and Historic Town of Zabid, respectively.

The UNESCO-EU project in Yemen approaches livelihoods and culture needs for youth and local communities through contextualised methodologies for modern heritage rehabilitation and social protection. The project development team carried out community-based assessments of priorities and consultations with local government agencies and master builders' associations. The joint initiative is a pioneer project promoting participatory cash-for-work schemes in heritage restoration and urban regeneration in World Heritage Sites, implemented through cohesive community-led approaches.

As a consequence, the rehabilitation works respond both to residents' needs and heritage concerns. The activities have contributed to progress in meeting the most urgent humanitarian needs of the crisis (providing access to livelihoods, strengthening economic resilience and restoring social cohesion) while promoting local ownership over the safeguarding of World Heritage.

This unprecedented large-scale intervention reaffirms the importance of human-centred approaches to safeguarding cultural heritage and enhancing urban resilience, in a way that ensures community ownership over heritage. The project contributes to an environment for sustainable cultural development that allows communities to come together and maintain their connections with heritage and each other, while appreciating the diversity of cultural traditions and contributing to rebuilding dialogue and peace.

Excerpt from the UNESCO World Heritage Canopy.[42]

42 UNESCO World Heritage Canopy. "Cash for Work: Promoting Local Employment Through Heritage Conservation in Historic Cities (Yemen)," retrieved from: https://whc.unesco.org/en/canopy/cash-for-work-yemen/.

E. URBAN FORMS

The rapid urbanisation of MENA's cities has added many stressors to the daily lives of their citizens. Increased traffic, air pollution, and extreme heat are just a few of the elements affecting the well-being and health of urban residents. The urban heat island effect in particular is putting lives in danger. With the current path of climate change, 50 per cent of the region is expected to experience "super extreme" weather events and heat, with maximum temperatures over 60°C by 2100.[43] Historic medinas are an excellent example of traditional cities built to enable comfortable living in hot cities. In Arabic, the word "medina" means an urban settlement or its "older" part.[44] With their inherited climate-adapted characteristics, the design and planning of medinas can provide valuable principles to newly created neighbourhoods in MENA's growing cities.

Cities such as Marrakesh and Cairo are prime examples of urban planning that mitigates and adapts to climate challenges. Narrow shaded alleyways provide relief from the scorching sun and promote natural ventilation, reducing the need for energy-intense air conditioning.[45] Houses in the medinas are low-rise but close together, maximising shade with a high thermal mass that limits temperature changes. This also means that the medina's heavy shading reduces temperatures and makes it easier for people to reach their destination by foot.

43 Cool Coalition. "Beating the Rising Heat: Cool Solutions for Resilient Communities," https://coolcoalition.org/middle-east-and-north-africa-climate-week-beating-the-rising-heat-cool-solutions-for-resilient-communities/.

44 Ben Salem, Sarah, Chaima Lahmar, Marianna Simon, and Kinga Szilágyi. 2021. "Green System Development in the Medinas of Tunis and Marrakesh—Green Heritage and Urban Livability." Earth 2, no. 4: 809-825. https://doi.org/10.3390/earth2040048.

45 Elsheshtawy, E. 2004. *Planning Middle Eastern Cities: An Urban Kaleidoscope in a Globalizing World.* Routledge, London.

Other examples are:

Compact urban morphologies:

The compact layout of medinas, with their closely spaced buildings and narrow streets, provides ample shade and shelter from the sun, making it easier to cope with extreme heat. This design also reduces solar heat gain and creates comfortable outdoor spaces for residents and visitors to escape the heat.

Building materials:

The choice of building materials in medinas is influenced by the local climate. Traditional materials such as adobe, stone, and plaster have excellent thermal mass properties, helping to regulate indoor temperatures by absorbing heat during the day and releasing it at night.

Courtyards and ventilation:

Courtyards, central to the design of many medina buildings, serve as outdoor living spaces and facilitate natural ventilation. They allow for airflow through the building and promote cooling during hot weather. The design of windows and vents in medina architecture enhances cross ventilation, further aiding in cooling.

Water management:

Water scarcity is often a concern in arid climates, where many medinas are situated. Historical medinas feature intricate systems for water harvesting, storage, and distribution, reflecting an understanding of the importance of water management in sustaining urban life in challenging climates.

Cultural adaptations:

The design of medinas also reflects cultural adaptations to the local climate, with architectural features and urban layouts that have evolved over centuries to meet the needs of inhabitants in harsh environmental conditions.

FOCUS ON:

TUNIS, TUNISIA

Challenges and Opportunities of Historic Urban Centres: The Medina of Tunis

The World Heritage site of the Medina of Tunis is a complex urban ensemble, covering approximately 295 ha. Its management framework includes national and local institutions, as well as different levels of statutory protection. As the centre of a bustling metropolis, the Medina of Tunis is developing a number of actions to strengthen its role within the city through the preservation and promotion of its cultural heritage.

The Medina of Tunis is facing a number of challenges. These include issues related to outdated infrastructures, the precarious living conditions of local residents, abandonment of ancestral dwellings, heritage degradation, disappearance of traditional economic activities, and absence of integrated vision for the management and protection of the medina.

In order to face the upcoming challenges, the Medina of Tunis has developed a number of objectives for the future development of the property, including ensuring the integration of the Medina within the larger metropolis, conserving its identity and unity, and promoting a global approach which balances cultural and heritage values and socio-economic needs. At the same time, it is essential to promote the engagement of local communities and stakeholders in the management and conservation of the property.

To reach the goals above, a number of short, medium and long-term projects are being developed, including:

- Urgent interventions, such as the consolidation of historic buildings in a poor state of conservation, avoiding further deterioration.
- Development of an inventory of built heritage and a diagnostic assessment;
- Creation of touristic routes within the Medina;
- Restoration of monumental heritage, such as the Mausoleum Torbet El Bey and the gate of Beb Ejedid;
- Elaboration of a Management and Promotion plan.
- Promotion of new technologies, such as the virtual platform medina stories.

The Medina of Tunis is a complex site, a living World Heritage site at the heart of a bustling metropolis. Its outstanding cultural heritage and location creates great possibilities to promote sustainable culture-based development that sustains local livelihoods. However, turning this possibility into a reality requires the collaboration of a large number of partners and institutions and the implementation of a wide programme of actions targeting both tangible and intangible heritage, in line with the strategic vision of the site and conservation and management goals.

The ultimate goal of the site management authority is to ensure the sustainable safeguarding of living heritage in a way that enables its continuous evolution and adaptation. Additionally, the site management authority aims to enhance the sensitive dimension of the territory, to be as close as possible to its material and immaterial realities, exploring the interactions and sensitive experiences between residents and their territory.

Excerpt from the UNESCO World Heritage Canopy.[46]

46 UNESCO World Heritage Canopy. "Challenges and Opportunities of Historic Urban Centres: Case Study of the Medina of Tunis (Tunisia)," retrieved from: https://whc.unesco.org/en/canopy/tunis-medina/.

04 SCALING HERITAGE SOLUTIONS IN MENA'S LOW-INCOME AND INFORMAL NEIGHBOURHOODS

In cities, the impacts of climate change affect all inhabitants, but they are more harshly felt by the urban poor. Exposure and vulnerability to natural hazards are increased in informal settlements or low-income neighbourhoods lacking adequate and functional services.[52] With 58 per cent of world refugees originating from the MENA region, of which 60 per cent remain to live there often in vulnerable informal settlements or slums[53], the need for inclusive climate adaptation solutions is pressing. Yet, environmental policies in the region tend to be following top-down approaches and focusing on capital-intensive and green technologies solutions. Recognising the interdependence between urban resilience and inclusivity, this policy brief thus advocates for solutions based on traditional knowledge and materials. Affordable and accessible to all, these solutions are particularly beneficial to low-income and informal neighbourhood, where they can make climate adaptation a tangible reality.

There are nonetheless multifaceted challenges when it comes to replicating heritage-based climate solutions in low-income and informal settlement areas across the MENA region. First, the centralised governance structure in many cities limits their autonomy and ability to prioritise initiatives tailored to these vulnerable communities. Informal settlements – where issues such as access to land, water, electricity, and services intersect – often lack attention due to the complexity of urban problems. Integrating low-cost, flexible approaches within existing frameworks becomes imperative to address these intertwined challenges effectively. Moreover, the disproportionate impact of climate change on women and youth in these areas is exacerbated by the lack of comprehensive data and evidence on property rights, access to services, and usage patterns.

Second, regulatory constraints hinder local planning efforts, impeding the integration of climate resilience strategies into municipal policies. While annual budgeting and local planning processes are already in place, incorporating additional processes for climate planning poses practical challenges. Understanding the context and integrating participatory, heritage-based designs within existing budget formulation processes is essential for sustainable implementation. Third, limited capacity and funding at the local level further impede the execution of climate resilience strategies.

52 Eltinay, N.& Egbu, C. 2023. Urban Resilience and Climate Change in the MENA Region
53 Cities Alliance. 2023. Climate-proof cities, cities for people. Cities Alliance Strategy for the Middle East and North Africa (MENA) region.

In scaling up heritage-based and simple solutions for climate resilience at the city level, particularly in informal and low-income neighbourhoods, several critical considerations emerge:

Identifying the necessary resources and tools is paramount. This includes financial support, technical assistance, and capacity-building initiatives tailored to the specific needs of each city. Given the decentralised nature of many cities in the MENA region, a key challenge lies in navigating central government regulations that may hinder local planning efforts. Overcoming such obstacles necessitates a concerted effort to institutionalise initiatives and establish robust partnerships between local governments, civil society, academia, and the private sector.

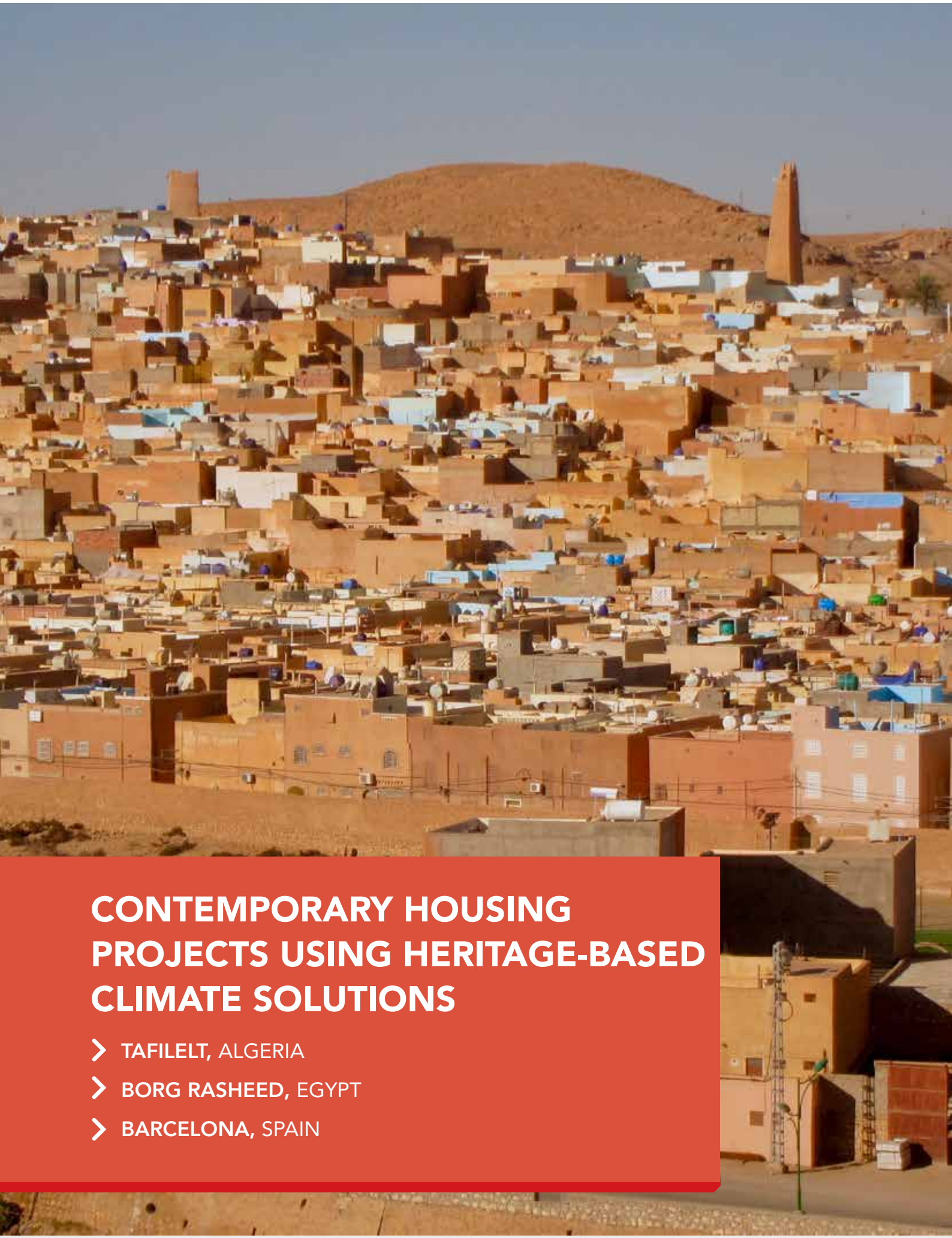
The MENA region is characterised by a multitude of crises, including political instability, economic challenges, and conflicts. Prioritising climate adaptation amidst these pressing issues can be daunting, leading to a lack of focus and resources dedicated to long-term resilience measures. Innovative financing mechanisms and partnerships can play a pivotal role in surmounting barriers to scaling up solutions in informal settlements. This could involve exploring co-financing arrangements, leveraging funds from international organisations and development banks, and incentivising private sector investment through mechanisms such as land value capture. Moreover, a shift in the traditional loan paradigm towards more flexible and accessible financing options is imperative to support climate adaptation efforts at the local level.

Replicability and scalability of solutions across different urban contexts hinge upon various factors. These include the adaptability of strategies to local conditions, the involvement of grassroots organisations and communities, and the transferability of knowledge and experiences through platforms for sharing best practices. This also includes considering the historical climate they were designed for, acknowledging that some solutions may no longer be appropriate, and adapting them to shifting ecological zones. For example, solutions effective in the MENA region may not be suitable for Southern or Eastern Europe. Therefore, thorough climate assessments should guide the adaptation of these strategies for contemporary low-income neighbourhoods.

Partnerships between stakeholders at multiple levels, starting with local and national, are critical for replicating and scaling up successful initiatives. Despite the shared challenges posed by climate change, fostering regional cooperation among MENA countries can be challenging due to geopolitical tensions and competing priorities. Organisations such as the Cities Alliance can serve as catalysts for collaboration, providing platforms for knowledge exchange and capacity-building initiatives. Bridging the gap between national policies and local action requires early involvement of all relevant stakeholders and the development of cross-border instruments to address regional challenges collaboratively.

Capacity-building at the local level is essential to empower civil servants and enhance strategic planning capabilities. Detailed methodologies and toolkits can facilitate the dissemination of regional knowledge and enable cities to adopt cost-effective climate resilience measures. Adopting a learning-by-doing approach, where capacity-building is integrated into project implementation rather than relying on separate training programmes, can enhance the effectiveness of initiatives. Additionally, aligning annual municipal budgets with climate goals and prioritising sustainable development objectives, such as the Sustainable Development Goals (SDGs), can provide a framework for guiding municipal action and resource allocation.

Fostering a culture of transparency, accountability, and community engagement is crucial for ensuring the success and sustainability of climate adaptation efforts. By harnessing the rich heritage and local knowledge inherent in MENA's cities, policy makers can leverage past successes to build more resilient and inclusive urban environments for future generations.



CONTEMPORARY HOUSING PROJECTS USING HERITAGE-BASED CLIMATE SOLUTIONS

- **TAFILELT,** ALGERIA
- **BORG RASHEED,** EGYPT
- **BARCELONA,** SPAIN

FOCUS ON:

TAFILELT, ALGERIA

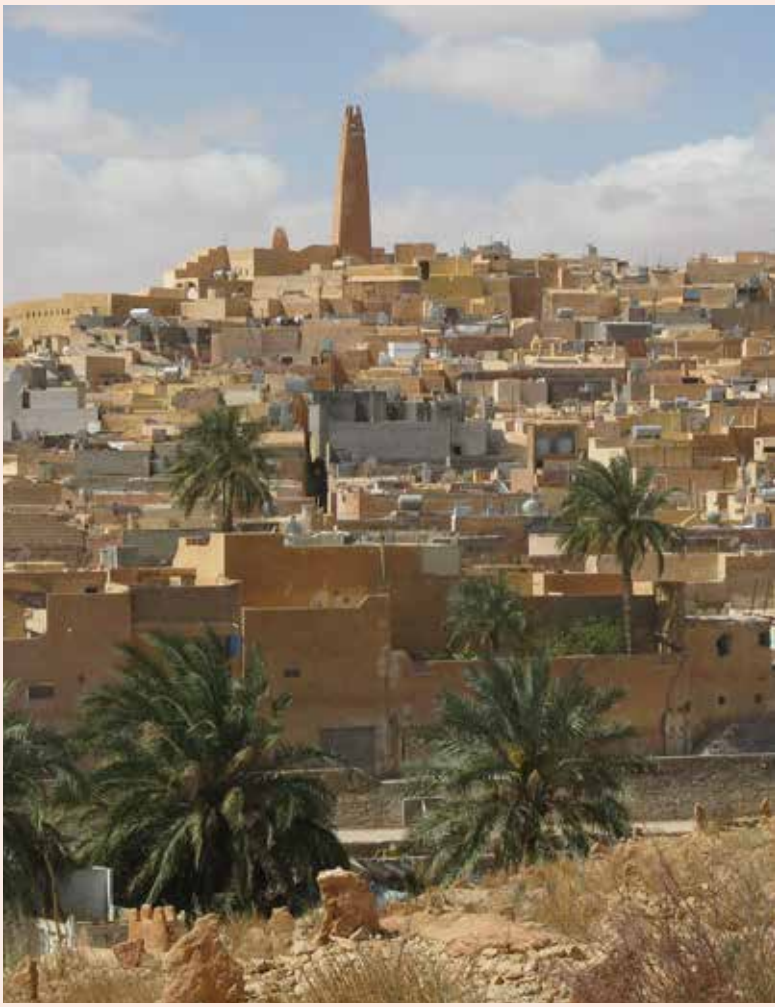
A Neo-Traditional and Eco-Friendly Ksour in Algeria

The M'Zab Valley of Ghardaïa, Algeria, has witnessed significant urban growth and industrialisation associated with the rapid decline of traditional oasis agricultural activities in recent years. A housing shortage has led to illegal conversion of rural-to-urban land, generating unsustainable sprawl and environmental problems.

In response, a local foundation, Amidoul, initiated a housing development project from the bottom up in 1997. Seeking the support of the government and the local community of Mozabites, the project aimed to build a new town for the lower middle class, based on the principles of sustainable urban development and using traditional construction techniques. By 2011, 1,050 housing units were completed on an area of 22.5 ha. The new neighbourhood, named Tafilelt, adopted the principles of compactness and landscape integration at the urban scale. It preserved the surrounding palm groves typical of old *ksour* and controlled the size and orientation of streets to limit insulation and favour natural ventilation, thus reducing the overall surface temperature.

In terms of architecture, traditional patio housing units were adapted to contemporary lifestyles (more space, laundry in the terrace, etc.) while employing traditional, energy-saving construction materials including locally sourced adobe and stones. The designs kept symbolic elements of traditional neighbourhoods such as wells, minarets, and watchtowers, and housing decor preserves the spirit of old *ksour*.[54]

The construction process followed a community-based approach. Households contributed financially to its realisation and became involved in waste management as well as the collective management and cleaning of open space. Tafilelt is considered to be a neo-traditional model of *ksour*,[55] and it has been globally recognised: The town won first prize in the sustainable cities category at COP22 in Marrakesh in 2017.



54 Ksar Tafilelt city website. http://tafilelt.com/site/.

55 Manel, S., and B. Siham. 2019. "Tafilelt, the Neo Traditional Model of Ksour in Algeria: Assessment of the Multifunctionality of Urban Spaces." Journal of Contemporary Urban Affairs, 3:2, pp. 99–107. https://doi.org/10.25034/ijcua.2018.4706.

FOCUS ON:

BORG RASHEED, EGYPT

Mixing Voids and Palm Trees for Heat Reduction and Ventilation in Hot, Humid Conditions

Borg Rasheed is a small, unplanned rural settlement located at the tip of the Rasheed (Rosetta) Nile branch just before it empties into the Mediterranean. The village is close to sea level and thus threatened by the rising sea levels. In addition, Borg-Rasheed's climate is hot and humid with an increasing frequency of extreme weather.[47] Especially in summer, heat and humidity create thermal discomfort, which is typical for coastal Northern Egypt.

As an unplanned area, the settlement lacks governmental building measures and architectural technical solutions. Residents of informal areas also pay less attention to the impact of architecture on thermal discomfort, instead prioritising factors such as size and economy[48] – leading to dense, badly ventilated spaces. As a result, climate solutions in informal areas such as Borg Rasheed tend to be improvised and community-based rather than educated decisions.

Borg Rasheed has begun implementing a very promising solution for the heat. Inter-house voids shaded by palm trees or canopies made of palm tree leaves are found throughout the village. The arrangement is similar to the courtyards of heritage houses in Egypt and other MENA countries that have played a positive role in heat reduction and ventilation for centuries. Borg Rasheed has, however, customised the approach to its informal context. The courtyards in the village are not the core space of a single-family house as they were traditionally; they are common spaces shared by a number of houses or buildings belonging to different households.

The solution's environmental efficiency is achieved in two interconnected ways. First, the courtyard keeps the cool night air inside for longer periods and regulates a suitable airflow around the adjacent rooms,[49] replacing hot humid air with cool and fresh air. Second, palm trees provide shading, and together with the surrounding buildings, they cast shadows on the courtyard preventing solar exposure and overheating.[50] Palm trees are native and abundant in this particular region and grow naturally in the courtyards. If they do not, the village residents use palm leaves to build canopies in the courtyards, creating a similar effect. Apart from being ecologically considerate and economic, palm trees are exceptionally good thermal insulators[51] and their leaves allow air flow, which is necessary in the humid conditions.

Borg Rasheed's solution is, at the same time, heritage based, culturally compatible, and community-led, with negligible costs and maintenance. It can be adopted and scaled-up in similar rural and urban informal settlements. Some limitations and considerations apply. Inter-house shaded courtyards are contingent on the availability of voids, which may not be present in dense informal urban areas. And other priorities for land use (communal or official) may cause the courtyards to be built up at any time. Government will probably have less power or interest in enforcing or protecting the courtyards, since these areas are unlicensed.

47 Galal, L. 2024. Enhancing Walkability to Mitigate Climate Change and Empower Women in Borg Rasheed. PhD Thesis.

48 Ghodbane , D. 2020. Without a Plan? An Ethnography of Architecture, Domestic Microclimates, and Building Practices in Contemporary Cairo. PhD Thesis. https://n2t.net/ark:/12658/srd1319397.

49 Rajapaksha, I., H. Nagai, and M. Okumiya. 2003. "A Ventilated Courtyard as a Passive Cooling Strategy in the Warm Humid Tropics." Renewable Energy, 28:11, pp. 1755–1778. https://doi.org/10.1016/s0960-1481(03)00012-0.

50 Lin, C., J. Yang, J. Huang, and R. Zhong. 2023. "Examining the Effects of Tree Canopy Coverage on Human Thermal Comfort and Heat Dynamics in Courtyards: A Case Study in Hot-Humid Regions." Atmosphere, 14:9, pp. 1389–1389. https://doi.org/10.3390/atmos14091389

51 Belatrache, D., S. Bentouba, N. Zioui, and M. Bourouis. 2023. "Energy Efficiency and Thermal Comfort of Buildings in Arid Climates Employing Insulating Material Produced from Date Palm Waste Matter." Energy, Vol. 283, 128453. https://doi.org/10.1016/j.energy.2023.128453.

FOCUS ON:

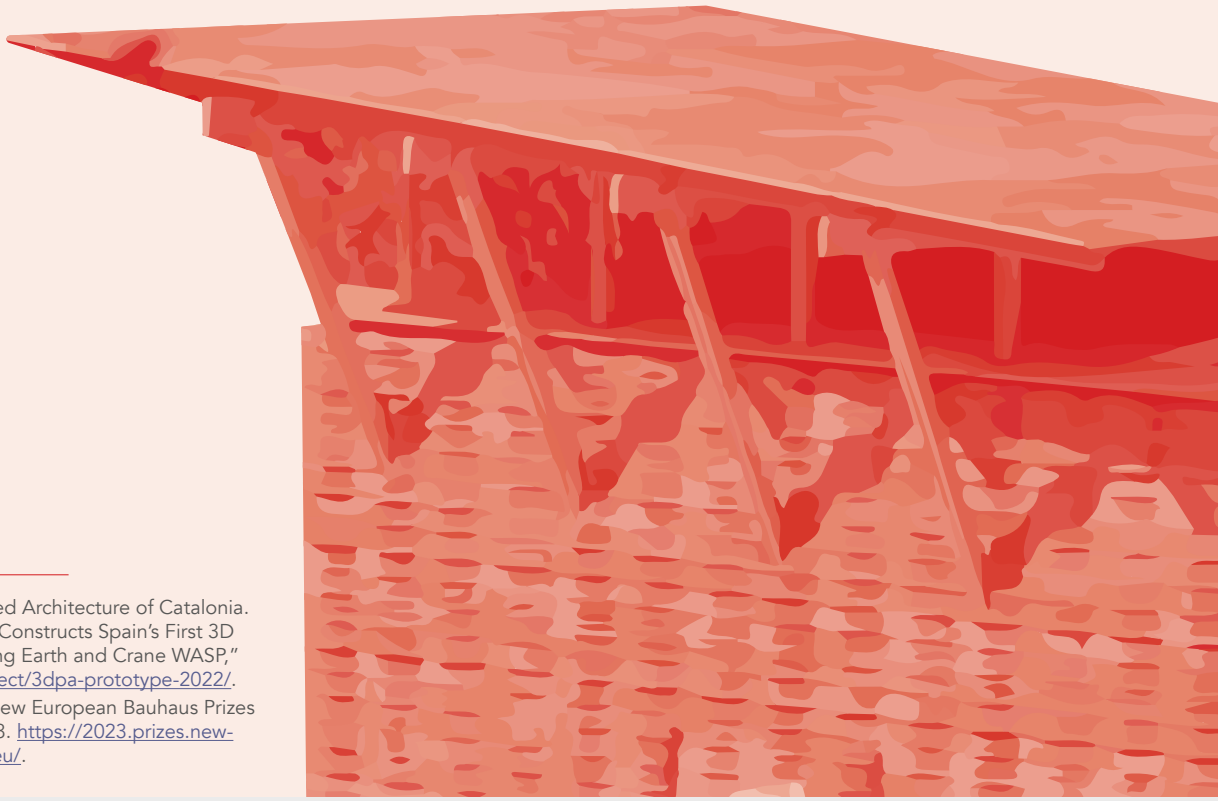
BARCELONA, SPAIN

TOVA Becomes Spain's First Building 3D-Printed with a Crane WASP

TOVA is one of the first architectural constructions to be built entirely with a collaborative 3D printing system known as a crane WASP. Conceived as a promising solution to the global housing crisis and climate emergency, TOVA represents a unique modern innovation that takes inspiration from heritage-based building methods and traditional and local materials.

Current construction methods contribute to the climate crisis without providing a sustainable and responsive solution to the global housing crisis. They account for 40 per cent of global CO_2 emissions and lead to further soil sealing as well as greater competition for increasingly scarce resources.

On the other hand, TOVA housing projects can be completed within two months. They use only locally sourced and renewable materials, generate no additional waste, have almost no carbon emissions, and can be reproduced almost anywhere with relatively low costs and training compared to modern building solutions.[56] TOVA houses were tested in Spain but proved to be an easily replicable and scalable alternative to housing in vulnerable areas or temporary settlements. They provide resistant, resilient, easily adaptable, low cost, and decent housing solutions in record time[57] – a testament to local solutions with the potential to address global challenges.



56 Institute for Advanced Architecture of Catalonia. "IAAC Designs and Constructs Spain's First 3D Printed Building using Earth and Crane WASP," https://iaac.net/project/3dpa-prototype-2022/.

57 European Union. "New European Bauhaus Prizes 2023," 22 June 2023. https://2023.prizes.new-european-bauhaus.eu/.

05 CALL TO ACTION: ADVANCING HERITAGE-BASED CLIMATE SOLUTIONS IN LOW-INCOME NEIGHBOURHOODS

As stakeholders commit to the resilience and sustainability of cities in the MENA and Mediterranean regions, this policy brief advocates for urgent action to prioritise adaptation funding for informal and low-income neighbourhoods. Currently, the bulk of funding is directed towards mitigation efforts – overlooking the critical need to harness indigenous knowledge and heritage-based solutions to address the impacts of climate change in these vulnerable communities. It is imperative that focus shifts towards adaptation, leveraging historical insights and local wisdom to build climate-resilient cities.

By reimagining historical architectural and urban practices, this brief highlights the potential for adaptation in MENA and Mediterranean cities. The next step is to translate its insights into actionable steps and advocate for change on multiple fronts.

Position and way forward:

Facilitate capacity building and knowledge sharing. We must facilitate workshops, training sessions, and platforms for knowledge exchange to empower urban planners, local authorities, and community stakeholders. Toolkits and guidelines should be developed and disseminated to enhance adaptive capacity while preserving cultural heritage.

Advocate for policy integration. We call for the integration of climate adaptation and heritage preservation within urban planning frameworks. Collaboration with national and local governments is crucial to embed heritage considerations in climate action plans and urban development strategies.

Support research and data collection. Support for research initiatives is essential to assess vulnerability, identify adaptive strategies, and collect data on the environmental and social impacts of climate change on urban heritage. We must develop holistic cost-benefit analyses and understand non-economic loss and damage to ensure adequate resource allocation.

Build partnerships and collaboration. Forge partnerships with international organisations, NGOs, and academic institutions to leverage expertise and resources for comprehensive climate adaptation and heritage preservation initiatives. Collaboration with local heritage organisations and NGOs is vital to maximise impact at the community level.

Demonstrate successful projects. Implement pilot projects in selected cities to showcase the effectiveness of heritage-based climate adaptation strategies. These projects will serve as practical examples for replication in other urban contexts, raising awareness and garnering support.

Advance inclusive urban planning. Promote inclusive urban planning that integrates heritage preservation and climate adaptation, ensuring that vulnerable populations are not disproportionately affected. Green and culturally sensitive infrastructure should be developed to enhance resilience while preserving the urban and social fabric.

In conclusion, we urge a diverse community of practice to join us in advancing heritage-based climate solutions in low-income neighbourhoods. Together, let us prioritise adaptation funding, integrate heritage considerations into policies and practices, and empower communities to build climate-resilient cities for future generations. It is time to take decisive action and ensure a sustainable and inclusive future for all.

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