**Amazigh Water Management Practices: Indigenous Solutions to the Climate Crisis**

The Amazigh Peoples are Indigenous to Morocco and the wider North African region.[1] Numbering roughly 20 million in Morocco and more than 30 million across North Africa, they primarily speak varieties of Tamazight.[2] Living predominantly in arid and semi-arid environments in the mountains, the Amazigh have long relied on traditional knowledge transmitted through generations to thrive in challenging climatic conditions.

Since the 1960s, much of North Africa has experienced a decline in average annual rainfall,[3] partly offset in some western areas by episodes of heavy rainfall and flooding. Overall, however, the region is becoming increasingly drier,[4] heightening water stress and threatening agricultural productivity and food security.[5] In response, the Amazigh communities continue to draw on and adapt using deep-rooted traditional practices for conserving and distributing water.

In an interview for this case story, Amina El Hajjami, an Amazigh knowledge holder, outlined how these practices support adaptation to current climate challenges.

**The Khettara System**

A *Khettara* (also known regionally as a *Qanat*) is a network of underground irrigation canals that capture run-off or shallow groundwater in foothills and directs it downslope by gravity. The water channels can reach 45 kilometers in length and be intersected by hundreds of wells. Because the water flows through covered tunnels, evaporation is minimized – an essential adaptation in the arid climate. When properly maintained, a *Khettara* can provide a steady, year-round flow to downstream fields without overdrawing deeper aquifers.

*Khettaras* are considered one of the oldest traditional irrigation systems in Morocco and around the world, with a history spanning over a thousand years. Found in abundance in the southeastern regions, particularly in the Drâa-Tafilalet and Marrakesh-Safi regions of Morocco, customary law ensures fair

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[1] IWGIA - International Work Group for Indigenous Affairs. (2024, 18. März). Morocco - IWGIA - International Work Group for Indigenous Affairs. IWGIA - International Work Group for Indigenous Affairs. https://www.iwgia.org/en/morocco.html

[2] Ibid.

[3] Trisos, C.H., I.O. Adelekan, E. Totin, A. Ayanlade, J. Efitre, A. Gemeda, K. Kalaba, C. Lennard, C. Masao, Y. Mgaya, G. Ngaruiya, D. Olago, N.P. Simpson, and S. Zakieldeen, 2022: Africa. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1285–1455, doi:10.1017/9781009325844.011.

[4] Ibid.

[5] Malak Altaeb. (2024). Ecological Security Threats in North Africa for 2040: Water Scarcity and Desertification. Council on Strategic Risks. https://councilonstrategicrisks.org/2024/07/18/ecological-security-threats-in-north-africa-for-2040-water-scarcity-and-desertification/

distribution of water from the *Khettara*. Water is distributed through equal shares among communities, accounting for the effort each beneficiary contributed to digging the *Khettara* and building its wells.

"*It is not only about building the Khettara in Twiza but also about management.*"
- Amina El Hajjami

The term Twiza/ ⵜⵡⵉⵣⵉ stands for collective labor for the common good. *Khettara* systems are excavated, maintained and cared for through Twiza, strengthening social ties and a shared sense of responsibility. Elders mentor younger generations, ensuring both technical know-how and cultural heritage are passed on, inspiring adaptation in harsh environments.

*Khettara. Photo courtesy of Amina El Hajjami*

**Living Heritage: Blending Amazigh Wisdom with Sustainable Technologies**

The revitalization of the *Khettara* system in Morocco offers a valuable opportunity to combat drought. Renewable energy and consistent maintenance can sustain sufficient water flow in *Khettaras* for agricultural activity to persist even during the driest months. In many High Atlas villages, shallow *Khettara* galleries now feed into wells equipped with solar-powered pumps. As a dynamic cultural heritage system, the *Khettara*, rooted in ancient knowledge and enhanced with new technologies, is promoting sustainable water management and building collective climate resilience.

**Beyond the Khettara: Wells and *Matfia***

Ms. El Hajjami also highlighted two complementary practices:

- Wells – ranging from 5 and 400 meters deep, depending on the regional groundwater table and rainfall – are now commonly fitted with solar pumps and provide back-up supply when surface storage is exhausted.

- *Matfia* – a subterranean cistern resembling a room, typically built 3–5 meters underground, is designed to collect and store rainwater while keeping it clean for use during the dry summer months. *Matfias* supply water not only for drinking, domestic use, and livestock, but also serve as an accessible water source for firefighting.

*Matfia (left) and well (right). Photo courtesy of Amina El Hajjami*

Together, these systems create a layered safety net against increasingly irregular rainfall, reflecting Amazigh's adaptive strategies for managing water resources in harsh climates.

**Lessons for a Warming World**

As North Africa grapples with rising water scarcity, the *Khettara* and similar traditional practices stand as powerful examples of climate solutions and resilience. Preserving and adapting such living heritage like the *Khettara* can complement new technologies and expand global approaches to water management. In a climate-constrained world, the Amazigh remind the global community that sustainable innovation is often grounded in cultural values and collective stewardship.

*This case story is part of a series on the LCIPP webportal showcasing the climate leadership and nature stewardship of Indigenous Peoples and local communities, rooted in traditional knowledge, values and worldviews, and local knowledge systems.*

*The story follows the rights safeguards and protocols of the LCIPP webportal, ensuring ethical knowledge engagement and adherence to the principle of free, prior, and informed consent.*

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*This story was researched and compiled by Raghda Al-Hourani during her internship with the LCIPP Team at the UNFCCC Secretariat.*