

Policy Paper

# Using Decentralized Renewable Energies in the Water-Energy-Food Nexus to Strengthen Resilience with Moroccan Rural Communities

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# 1. Promoting Synergies for Climate, Biodiversity, and Human Development

We are living in a time of unprecedented and interlinked challenges—mitigating climate change, building resiliency to its impacts, protecting biodiversity, and ensuring human well-being. The Intergovernmental Panel on Climate Change reports, “Global warming has led to widespread shrinking of the cryosphere,” with massive loss of snow cover, ice, and glaciers, and increased temperatures (IPCC, 2019). The dangers of climate change have been known since the 1980s, but a lack of societal awareness and political and economic investment has inhibited the necessary vigorous change.

We are now at a crucial moment where, with every degree, a cascade of tipping points and a “hothouse Earth” will beco-

me more probable. Limiting global warming to 1.5° Celsius—a strategy to prevent poverty and other climate-related risks for billions of people—will require far-reaching, radical changes (United Nations, 2015). At the same time, the COVID-19 pandemic has disrupted socio-economic systems and threatens the development gains of the past decades.

Thus, it is imperative to undertake dynamic initiatives for COVID-19 recovery. This entails encouraging actions that promote effective partnerships and address interdependencies around climate mitigation, systems adaptation, healthy ecosystems, and community well-being, including sustainable water-energy-food (WEF) management.

## Meaningful Community Participation & Engagement

The participatory approach entails that local people are engaged in every step of the development process – from identifying challenges to finding innovative solutions, managing projects, monitoring, and evaluating results.



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## 2. The WEF Nexus in Morocco

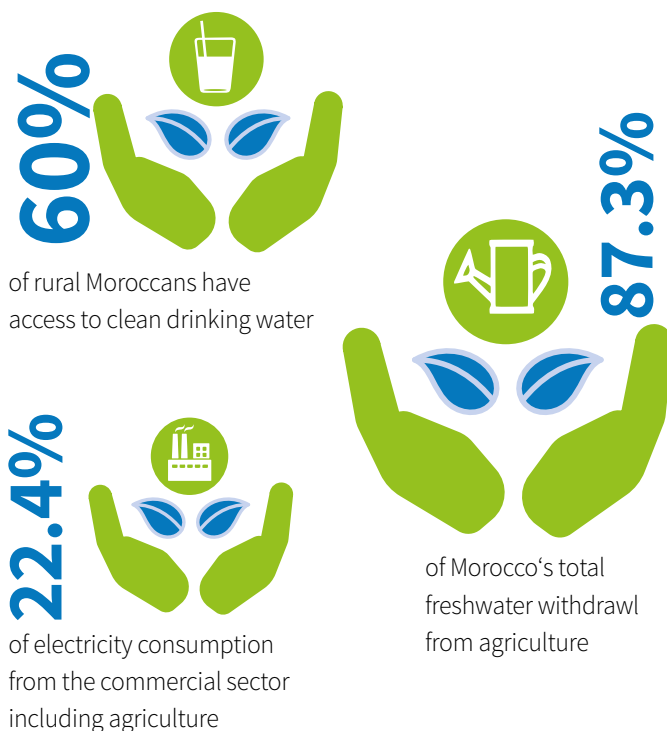
Sustainable development and human well-being require us to protect WEF resources. Simultaneously, energy consumption and agriculture are two of the strongest drivers of the global climate crisis. In 2016, they were responsible for the largest greenhouse gas emissions in Morocco. In fact, Morocco imports almost all of its energy needs, deriving more than 75% of it from coal, hydroelectricity, and fuel oil, and less than 25% from natural gas, wind, and solar power (International Trade Commission, 2020).

Agricultural development, including fisheries and forests, is part of Morocco's energy efficiency strategy. The associated supply chain represents only about 7% of total energy consumed in Morocco, coming from diesel and liquified petroleum gas for tractors, fishing boats, pumps, irrigation systems, engines, dryers, and livestock buildings (Ministry of Energy, Mines, Water, and Environment, 2016). Moreover, the commercial sector, which includes agriculture, accounts for 22.4% of electricity consumption (Country Fact Sheet, 2016). Agriculture also accounts for 87.3% of Morocco's total freshwater withdrawals, making it the largest user of water and an important driver of water overexploit-

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*Solar-powered drip irrigation is a zero-emission technology that provides water efficiently for agricultural use.*



tation, with a 3-billion-cubic-meter imbalance between water supply and demand (Geosciences, 2020). In particular, the use of groundwater to secure irrigation water supply and meet the drinking water needs of Morocco's growing population has led to widespread aquifer overexploitation.

Morocco already struggles with creeping desertification, compromised forested areas, and high vulnerability to climate change and natural disasters, aggravated by the projection that climate change, population growth, and economic development will increase WEF demand. Thus, understanding WEF interdependencies is crucial for developing effective, sustainable strategies for their use. In this context, the WEF Nexus aids in analyzing how to achieve socioeconomic and environmental goals through coordinated management of natural resources across sectors. The Nexus can help build mutually-beneficial partnerships, reduce trade-offs between sectors, and allow better coordination and informed decision-making.

### 3. Current Actions in Morocco

Morocco's government has realized the urgency of these issues and has accordingly devoted large sums into climate mitigation, adaptation, and green development (New Development Model, 2021). It was one of the first African countries to champion renewable energy (RE) and align economic development with environmental protection and sustainable development, as follows:

1. Pledging to reduce greenhouse gas emissions (GGE) and generate 52% of electricity needs from RE by 2030;
2. Lifting all subsidies on diesel, gasoline, and heavy fuel oil to encourage efficient, sustainable use of energy while freeing resources to transition to a green economy;
3. Investing in RE, particularly solar photovoltaic (PV) water heating and irrigation systems, to make RE technology more competitive with fossil fuels;
4. Revising law 10-95 to create a stronger regulatory framework for water management and addressing the issue of groundwater overexploitation;
5. Investing in directing more surface water to recharge aquifers;
6. Incentivizing modern irrigation techniques for efficient water use through Plan Vert, providing farmers with reliable water access.<sup>1)</sup>

Despite those laudable efforts, what is still lacking is an integrated look at the interdependent challenges. Most strategies in Morocco only address one part of the WEF Nexus with limited consideration of its interconnection, leading to some serious and unintended consequences. For example, recent policy reforms have incentivized using solar pumping technologies to reduce fossil fuels consumption (gas, oil, butane) for greater energy efficiency. Solar pumping enables farmers to less expensive water access. Previously, farmers could not pump groundwater diurnally due to restrictive electricity, gas, oil, or butane costs, but solar pumps allow them to do so. Unfortunately, such unlimited access to water during daylight hours, while it might increase agricultural productivity, could increase water resource depletion even with efficient drip irrigation techniques: a process called “the rebound effect.”

Water deeper than 40 meters below the soil surface is restricted from pumping, but this is very rarely enforced. Hence, if not adequately regulated through authorizations for groundwater use, solar water pumping subsidies can lead to water resource depletion, becoming a serious food security issue and endangering human well-being.

### 4. Using the Nexus Approach for Community Energy Projects

Looking at the WEF challenges from a nexus perspective sheds light on the wider implications of sectoral interventions and helps us identify holistic management strategies (irrigation techniques, groundwater management, agricultural practices, community guidelines, traditional knowledge). Implementing solar cooperatives in Morocco, for instance, entails clarification and development of needed frameworks (regulations of farmers' grid connections, solar energy valuation, etc.). We also see that more efficient pumping equipment is needed for energy and water efficiency.

Experiential lessons from other nations can help to develop long-term, sustainable initiatives. For example, in India, where solar pumping depletes groundwater, solar cooperatives were built as a resource-management innovation. Cooperative members use solar power to run their irrigation pumps for agricultural use and also sell the surplus energy to the electricity grid (Dhundi Irrigators' Cooperative Study, 2017). Diversifying farmers' livelihoods avoids groundwater overexploitation and shows the need to improve cross-sectoral and policy coordination to account for trade-offs and increase WEF interconnectedness.

1) The Programme National d'Economie d'Eau d'Irrigation (PNEEI, National Irrigation Savings Plan) under the Plan Maroc Vert seeks to convert surface and sprinkler irrigation to drip irrigation over an area of 920,000 hectares by 2030, resulting in water savings of 2.4 billion m<sup>3</sup>/year.





*Women empowerment training for women and girls in Youssoufia in Morocco, facilitated by the High Atlas Foundation. The empowerment training aims to enable participants to create the life they most want and to strengthen women as rights holders by providing tools to advocate and act on their needs and goals.*

## 5. The Role of Women in Decentralizing RE

Fruit tree agriculture and production has traditionally been within the male domain in many societies. When agricultural projects are implemented without the full integration of women, evaluations have shown that the generated revenue and benefits typically stay within men's control, and indirect benefits (women's literacy, women's growth opportunities) go unfulfilled.

Thus, integrating women from the outset – building their capacities, confidence, self-belief, and their own agricultural ideas for change – is essential for gender equality, but also greater food security, adaptable water and environmental management systems, education, decent work, economic growth, responsible consumption and production, and less poverty.

For this reason, the High Atlas Foundation (HAF)—a US-Moroccan non-profit organization that has been applying the Moroccan development model for over twenty years—faci-

litates the rights-based “Imagine” self-discovery workshops for women prior to their participation in collective development planning. Initiated by New York's Empowerment Institute and adapted to African and Middle Eastern countries, the Imagine methodology focuses on overcoming limiting beliefs surrounding seven core life areas: emotions, relationships, work, money, body, sexuality, and spirituality. Community development design activities based on self-defined visions for one's future enable pursuit of a clearer sense of purpose and confidence and result in greater gender parity, freedoms, and independence.

Thus, excluding women from the sustainable development process is ill-advised, and failing to engage them in an empowerment training process from the very outset dramatically reduces the potential of the participatory approach and significantly increases the likelihood for further gender stratification and deepening social control.

## 6. Fostering meaningful community participation and engagement

Sustainable resource management cannot take place without the support of all stakeholders, starting at the consumer level. Active community involvement in identifying local solutions and priority intervention measures is inseparable from governance processes and crafting incentivization. For example, communities that are dependent on groundwater pumping need to identify solutions and develop plans to halt overdraft and balance water exploitation with replenishment. The development of long-term, sustainable management strategies maximizes benefits while minimizing trade-offs, and this requires meaningful community engagement through participatory methods.

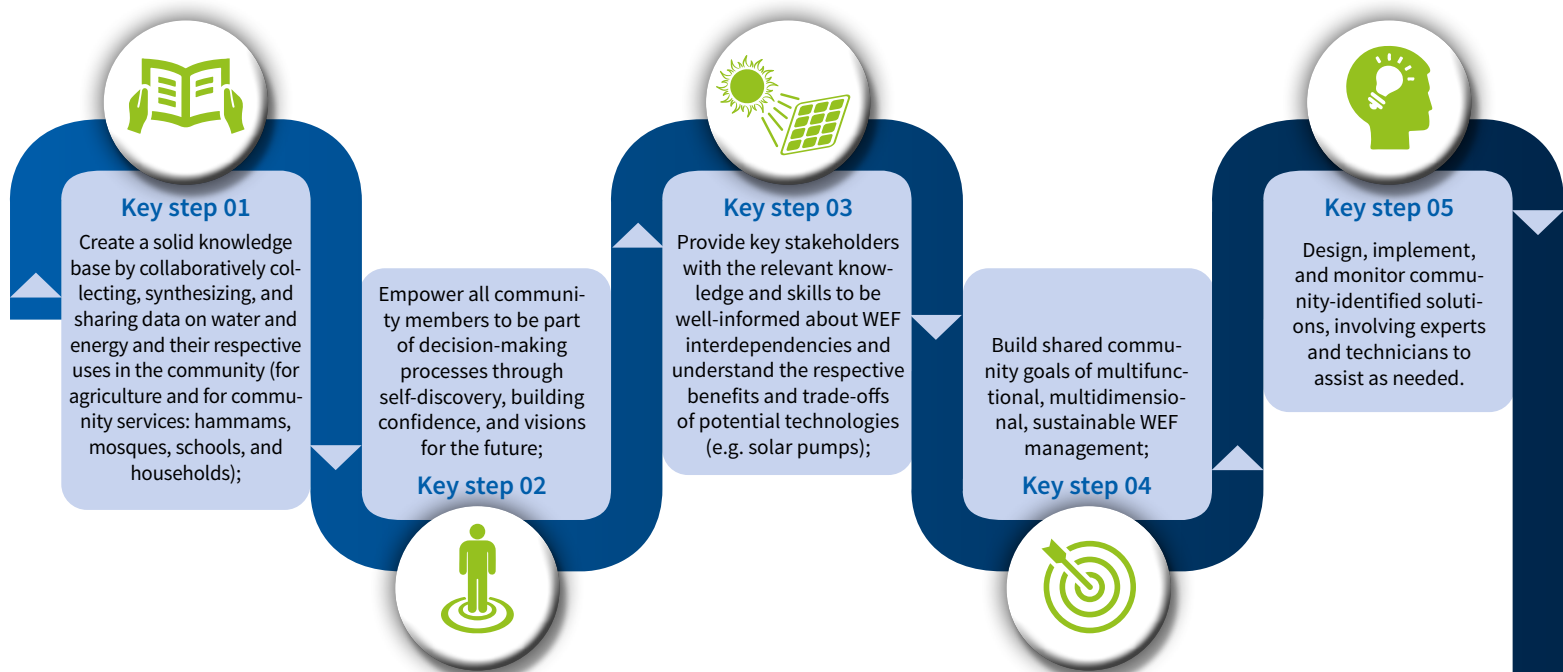
The participatory approach entails the overall development process being driven by local people who are engaged in every step – from identifying challenges to finding innovative solutions, managing projects, monitoring, and evaluating results – with integration into all project phases. Under this framework, resulting initiatives directly satisfy communities' needs and are well-suited to local social and environmental conditions.

Meaningful engagement first requires an enabling environment of inclusive participation: running capacity workshops, empowering women, providing skills-training, promoting literacy, engaging in group dialogue, etc. Power dynamics and the lack of resources can hinder many interested stakeholders from active involvement, so appropriate engagement formats should be developed, attempted, and, if effective, implemented or modified to meet the intended participants' needs and expectations.

The experiences and knowledge gathered on the ground from the community-driven participatory planning process can then in turn inform other processes.

These include, for example, the development of one-, three-, and five-year municipal development plans, which are required under Morocco's Municipal Charter and relevant environmental, agricultural, health, educational, and other policies on municipal, regional, and national levels.

### Key steps forward are as follows:



## 7. Increasing Cross-sectoral Partnerships and Coordination

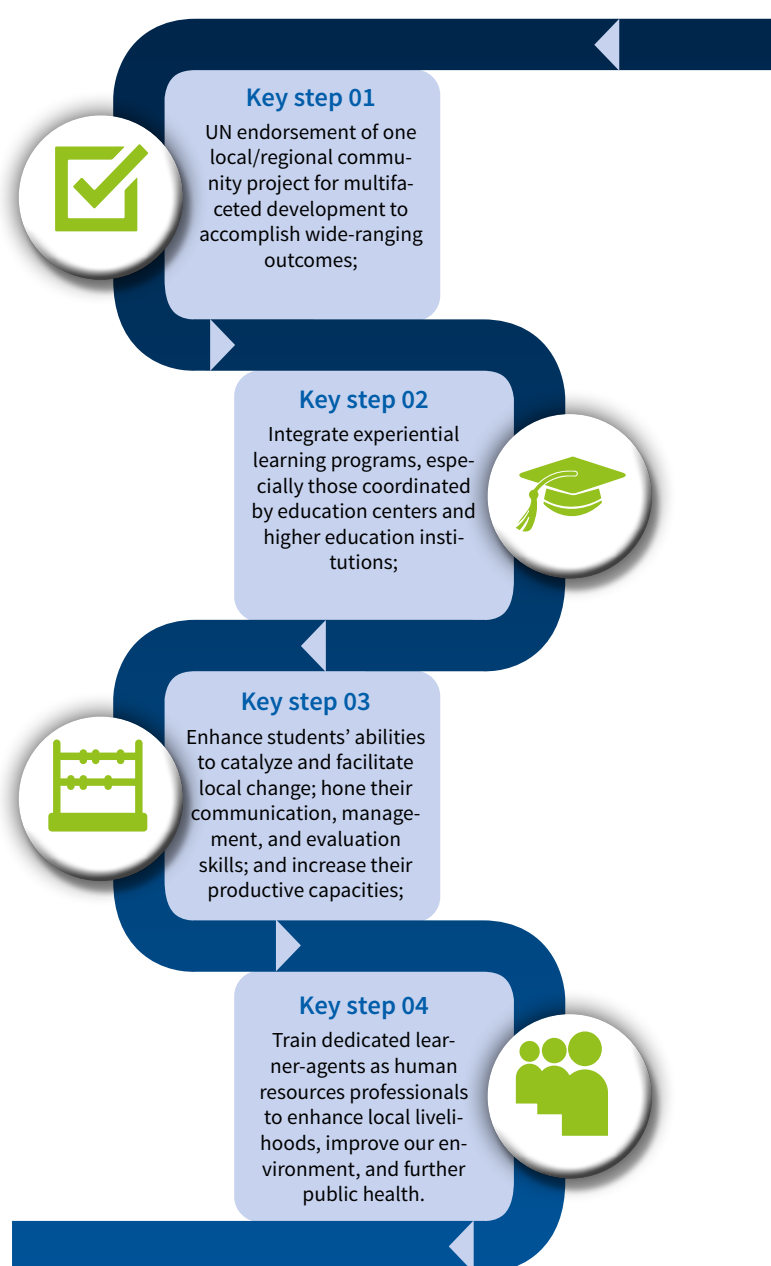
Strategies and regulations are often designed without cross-sectoral coordination, targeting sector-specific optima, with only limited consideration of the impacts, risks, and uncertainties for other sectors. Finding sustainable, integrated solutions that maximize benefits and minimize trade-offs requires enhanced cooperation across sectors and decision-making processes reflecting the dynamic nature of complex systems. These ideally involve a broad range of stakeholders—local and national governments, the private sector, civil society, NGOs, research institutes and universities, development banks, and trade unions—to define and coordinate expectations, create trust, and enable information-sharing.

Transformative changes cannot be achieved by actors working separately. Such transformative changes include improved national and regional participatory democratic frameworks, guarantees, and support mechanisms; empowered local communities to federate their local associations and manage their priority human development and energy projects; business models implemented by the growers that are upstream in the agricultural value-chain; and adapted decision-making and technologies.

One example of a Moroccan initiative composed of stakeholders from the economic and private sector, civil society organizations, decision-makers, scientists, and researchers is the “Plateforme Marocaine de Décentralisation des Énergies Renouvelables” (PMDER). A trusting, cross-sectoral partnership enacted at the regional, national, and international level, PMDER was launched by HAF and Germanwatch e.V. in 2019 to promote a decentralized approach to Morocco’s energy transition. More of these partnerships must be formed and formalized to put such initiatives to scale.

Further, vertical and horizontal integration of the individual government departments could up-scale successful approaches to decentralized RE. Enhanced integration of municipal, regional, and national tiers (vertical cooperation) and of ministries, such as the MEMEE and the Ministry of Interior (horizontal cooperation) will enable the development and exchange of best practices. In addition, the United Nations

could assist single development initiatives to realize nations’ fulfillment of multiple goals. In fact, sustainable development is significantly a function of the extent to which multiple needs and interests are met, proportionately encouraging the initiatives to endure and benefit the people.



## 8. Developing an Integrated WEF Policy Framework for Sustainable Development

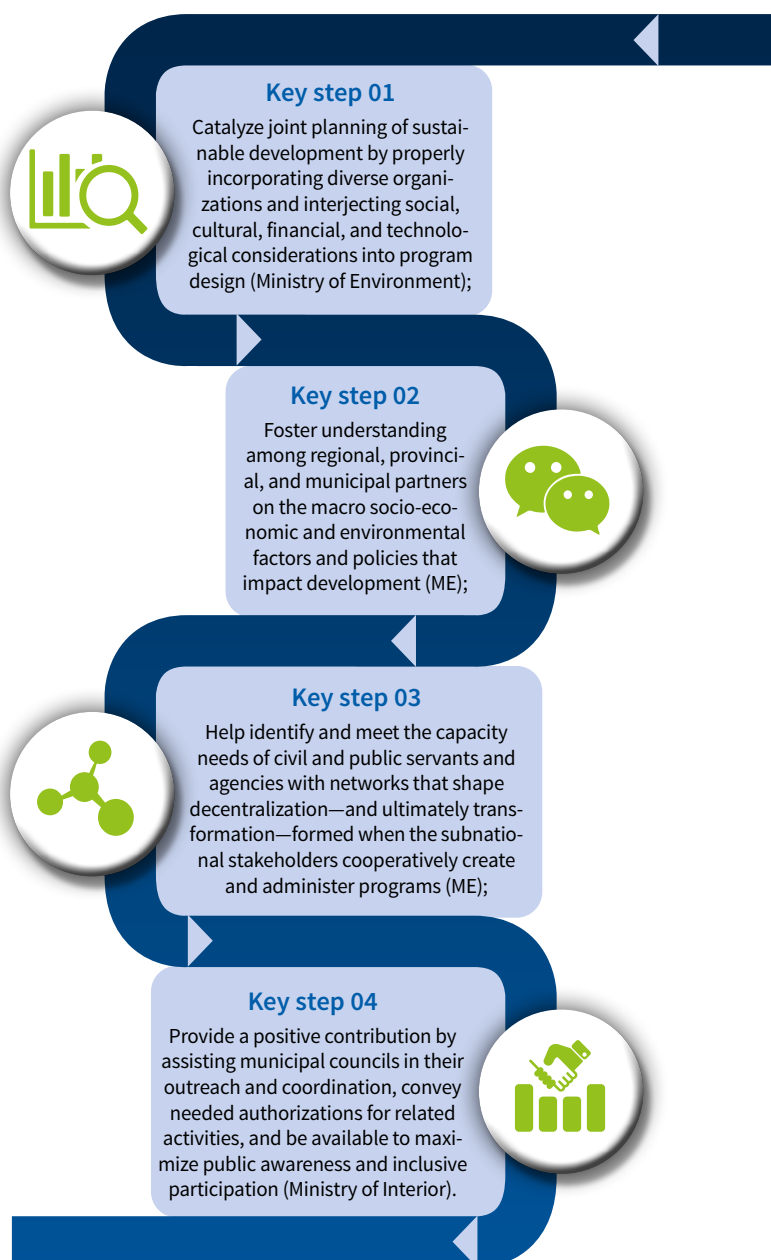
Morocco's policy frameworks for sustainable development and for water and energy management are individually well-developed, yet those agendas, to date, have had limited integration into planning processes and policies, having been largely developed without considering the cross-sectoral consequences. Implementing agencies often work in isolation, increasing the disconnect between agriculture, water, and energy, resulting in failure to anticipate all social, economic, and environmental costs. Therefore, policy coordination is urgently required to account for trade-offs and to build on WEF interconnectedness by eliminating competing or contradictory policies and developing WEF-Nexus projects.

A starting point for the development of an integrated policy framework is energy as a cross-cutting issue because it can lead to benefits in other sectors, such as poverty reduction, environmental protection, and agricultural advancements. Currently, RE regulatory frameworks mostly favor large-scale RE production installations, and financing and incentives for small- and medium-scale producers is less developed. For example, clear guidelines regarding access to the low voltage grid have not yet been developed.

Integration is crucial for solutions such as solar cooperatives, where farmers are acting as power producers by selling surplus electricity to the national grid. Initiatives that provide sustainable, intersecting solutions result from complementing the energy sector with agricultural management strategies (promotion of drought-resistant cash-crops, efficient irrigation systems, etc.) and water conservation strategies (alternative water supply programs, such as desalination and wastewater treatment, or community aquifer co-management). Governments, policy makers and regulators must establish institutional frameworks and national strategies planned in coordination with other development policies.

Morocco's Ministry of Environment (ME)—dedicated to coordinating among other ministries, agencies, and organizations—is in a prime position to create the cross-sectoral and multi-tiered partnerships that embody decentralized management. In addition, the Ministry of Interior has the infrastructure and human resources to be the primary carrier for enacting Moroccan decentralization.

Finally, the ongoing central, vital role of King Mohammed VI of Morocco in the mission of sustainable development must be recognized for his steadfast dedication to the participatory vision since his ascendancy to the throne in 1999. This has led to its embedding in the formative national frameworks for growth and justice (The New Development Model, 2021).





## Strengthening Communities in Youssoufia Province

The major challenges to implementing RE projects with local communities through the decentralization mechanism are not sector-specific, but relate to the national need for a singular decentralization strategy furthered by the quality implementation of Morocco's existing participatory, sustainable development frameworks. Representatives and community members benefit from applied learning workshops organized by government, civil society, universities, and socially-responsible businesses to provide them the real experience needed to effectively implement sustainable development. Having elected officials learn and work alongside ordinary members of civil society in this cohesive way also gives an opening for them to discern how RE can be integrated into people's development projects.

Given the added value that decentralized renewable energies can bring to Morocco's recognized contribution to the field of green energy, the pilot project intends to take part while deploying a participatory approach. This pilot pro-

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*Site visit by a water technician to identify the availability and quality of groundwater in Jnane Bouih in the Youssoufia province.*



ject is aimed at a rural community based in the commune of Jnane Bouih, in the province of Youssoufia. The selection of this site took into consideration the socio-economic and cultural situation of the local population. Data from the Higher Planning Commission (HCP, 2014) and other local sources reveal considerable local renewable energy potential, relatively high poverty rates, lack of water resources, and low school enrollment rates, particularly among female students.

The Youssoufia province itself is primarily rural, with its only major urban area being the city of Youssoufia. As reported in A World Bank loan report, the primary means of employment within the province is agricultural based (livestock farming and non-irrigated agriculture), with approximately 45% of the population of the Marrakesh-Safi region working in the sector (World Bank Report, 2019). Much of the employment of the region is also informal in nature, mostly as self employment or unpaid work. As a result, the Youssoufia Province has one of the country's ➔



highest multidimensional poverty rates. Despite the mineral deposits in the region, the only mined material (Francevillite), is highly radioactive.

This project adopts a WEF Nexus approach that capitalizes on local solar potential and the competitiveness of solar PV systems. Organized in phases, the project targets specific objectives that address several cross-cutting issues, including improvement of rural citizens' quality of life; agricultural development activities; financial resources creation and diversification; jobs creation; women's income stimulation; decreased school dropout rates, especially among young girls; private investment; and anchoring of the rural population through citizens' return from urban to rural areas.

For the project's different implementation phases, other funders—including the commune—are anticipated to contribute through the allocation of the intended land; technical expertise provided by the Moroccan Agency for Energy Efficiency (AMEE); financial contribution of the National Initiative for Human Development (INDH); and fruit plants and technical expertise supplied by the High Atlas Foundation.

Of the approximately 36 households in El Kdirat, averaging from six to twelve people in size, 23 women from the village of El Kdirat in the Jnane Bouih commune of the Youssoufia province, have already participated in a four-

day Imagine women's empowerment workshop (June 21-24, 2021) conducted by HAF in partnership with the USAID Farmer-to-Farmer Program and Germanwatch. They ranged in age from 14 to 64 years, many of whom had been unable to attend formal schooling because the nearest of the community's two schools—one elementary school and one middle school—is three kilometers away.

This is the first time that HAF has conducted a workshop with a community belonging to the Ahmar tribe (Red tribe), one famous for its mausoleum of Sidi Shiker, a great conqueror of the Maghreb (one of the oldest shrines in Morocco), as well as the Mawlawi school, where the princes of the Alawite state used to study the military arts of equestrianism, archery, and more.

Other shrines in the territory also elicit annual community festivals in the summers here, indicating a group with a long history of traditional cultural practices.

The pilot project will provide a well and water storage with a solar pump to distribute water to the douar and schools and install solar panel systems in homes without access to electricity. In the second phase, a hammam will be constructed with a solar water heater, and homes will receive solar oven prototypes. Finally, a new fruit tree nursery with solar power and efficient drip-irrigation systems will be built to diversify income sources and create new jobs.



# Conclusion

Moroccan decentralization is designed in a manner where it is formation and efficiency are derived from other well-implemented sustainable development frameworks, including the Municipal Charter, INHD, related articles in the family code (moudawana), policies related to multiculturalism, and other key pillars that guide social change. The essential common denominator through all of this is the primary reliance on community determination of their development course and the bottom-up movements to achieve livelihood and critical sustainable benefits that are intended to be catalyzed. If local communities and neighborhoods of people do not plan and act and implement projects they want in their lives, decentralization will not have the necessary building blocks and partnerships to be formed.

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*Only approximately 60 percent of rural Moroccans have access to clean drinking water. Clean drinking water projects remain a top priority expressed by rural communities.*



The WEF Nexus, by its very concept, requires the integrated analysis, design, solution, diversity of partnerships, and ranging benefits. In order to achieve this kind of dynamic interplay of perspectives and capacities necessarily requires a true participatory approach that all stakeholders in direct dialogue as WEF initiatives become defined and carried out. Furthermore, it is also these often-times complex yet manageable processes that help create adaptive and resilient decisions that are highly considerate of project contexts and therefore enhancing of sustainability.

The final recommendation of the Special Commission for the New Development Model is to forge a National Development Compact that commits all sectors and government tiers to embrace and fulfill Morocco's dynamism, potential, and sustainability. The national commitment captured in such a compact, one that guarantees local communities' actualization of their visions, which is essentially the national development vision, is a great Moroccan hope to, all at once, move toward.

# High Atlas Foundation



The High Atlas Foundation is a Moroccan association and a U.S. 501(c)(3) nonprofit organization founded in 2000 by former Peace Corps Volunteers committed to furthering sustainable development. HAF supports Moroccan communities to take action in implementing human development initiatives. HAF promotes organic agriculture, women's empowerment, youth development, education, and health. Since 2011, HAF has Consultancy Status at the United Nations Economic and Social Council. HAF is dedicated to local initiatives that community beneficiaries determine and manage:

**Sustainable agriculture:** Nurseries of fruit trees and wild medicinal plants, irrigation infrastructure and efficiency, organic certification, technical skills-building, carbon sequestration, and commercialization

**Education:** School infrastructure, gardens, and environmental stewardship

**Health:** Clean drinking water and waste management

**Women's and youth empowerment:** Self-discovery, human rights, and cooperative development

**Capacity-building:** Participatory planning and project, organizational, and environmental management

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