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Policy Brief

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Morocco's Water Security : Productivity, Efficiency, Integrity

Prepared by Global Nexus

Summary

Since inception nearly a century ago, corporations and industries have coevolved with Morocco's legacy of peace and prosperity. With a growing pressure on agricultural production and natural resources, exacerbated with climate change, there is urgency to define sustainable strategies that would reassure corporations and industries for long-term prosperity and for a healthy economy.

Studies have highlighted the perilous state of our natural environment, the exhaustion of our aquifers, the challenges facing our GDP growth, and the unraveling of our social fabric. The underlying science is well established striving to search for new solutions, for us to better manage our resources and improve the industrial processes, through research and on-going creativity.

In fact, it has become important to take pragmatic measures to ensure that Morocco adapts to escalating crisis, and lays the foundations of a climate-proof culture. The industrial sector should take the lead to the road of resilience. Not only will it make it possible to endure the coming shocks of stress and scarcity, but to prevail over them.

This policy brief will demonstrate how resilience will spread.

Introduction

In an arid land, Morocco is endowed with a foundation of fresh-water. To secure that broad foundation, the first step is to accept the finite and shrinking limits of this most valuable and renewable resource. We have to understand the importance of determining the right value of water.

While industrial activity and tourism combine to require less than one percent of Morocco's potential water, they need to take seriously the need to produce much more prosperity with much less water. Thus, water need to be recognized, respected and valued as Morocco's most previous natural resource and an essential input to the industrial process.

Therefore, the answer is to optimize water by investing in measurable outcomes that are delivered and documented under three reinforcing axes: freshwater productivity, efficiency, and integrity.

To maximize yields from every cubic meter of water, a wide range of aggressive and innovative water optimization strategies were put into place, from extraction to export, and throughout the production cycle. Water productivity emerges through reduced water losses and the integration of the desalination of seawater and the reuse of treated wastewater, as a non-conventional water source. Calculating the water footprint is a way to define how water is valued throughout the industrial system.

In reference to His Majesty King Mohammed VI speech: "The time has come for us to radically change

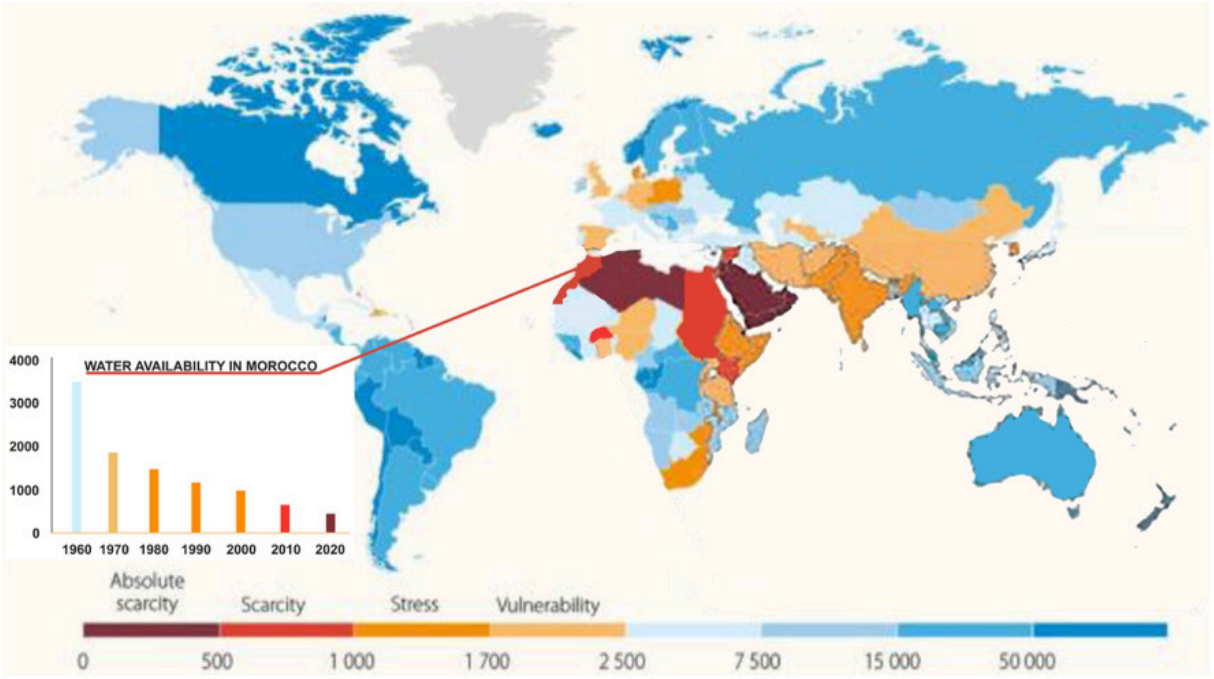
our perceptions and our attitudes towards water through managing the demand for this resource and the rationalization of its consumption. Moreover, it is necessary to follow up on efforts that are engaged to mobilize all the water resources possible". The water strategy goes back to 1964 with the construction of on dam per annum as a way to mobilize surface water and contribute to agriculture growth. This strategy was followed by several programs to improve water efficiency.

The example of OCP is a great illustration of how water could be valued throughout industrial processes. In fact, OCP has defined its economic water footprint, as it consumed in 2015, 110 million cubic meters (surface diversions, groundwater withdrawals, sea-water desalination and purified or recycled wastewater). Thus, at USD $39.31 per cubic meter, OCP Group generates nearly four times the level of the national productivity. There is also a large range of opportunities around the site for more water savings and a higher economic value.

I. The Challenge of Time

Although in an arid land, Morocco stands on a foundation of fresh water. To secure that broad foundation, the first step is to accept the finite and even shrinking limits of this most valuable and renewable resource, and to understand the importance of determining the right value of water.

Figure 1: Water Availability, 2013 (m^3 per person per year)



Source : FAO, Aquastat

Right now, Morocco's total annual runoff reveals our potential available water reserve. Roughly 18 billion cubic meters (83 percent) flow on the surface, while 4 billion cubic meters (17 percent) recharge groundwater. Since 1960, annual per capita water availability has plummeted from 3,500 cubic meters to 750. Within five years, the total amount – less than 1,500 liters per person, per day – will fall well below the UN definition of "absolute water scarcity." It gets worse, as climate change keeps compressing that threshold of stress even further.

The UN Intergovernmental Panel on Climate Change (IPCC) classifies Morocco, as well as the rest of the African continent as "very vulnerable." Average temperatures are projected to increase 1-1,5°. Annual precipitation will drop 10-20 percent across the country. There will be more rain that will fall, accelerating early runoff as snowpack reserves diminish. Dry spells and heat waves will last longer and grow more frequent. Erratic weather patterns will intensify extremes in drought and deluge. As sea levels rise between 18 and 59 cm over the century,

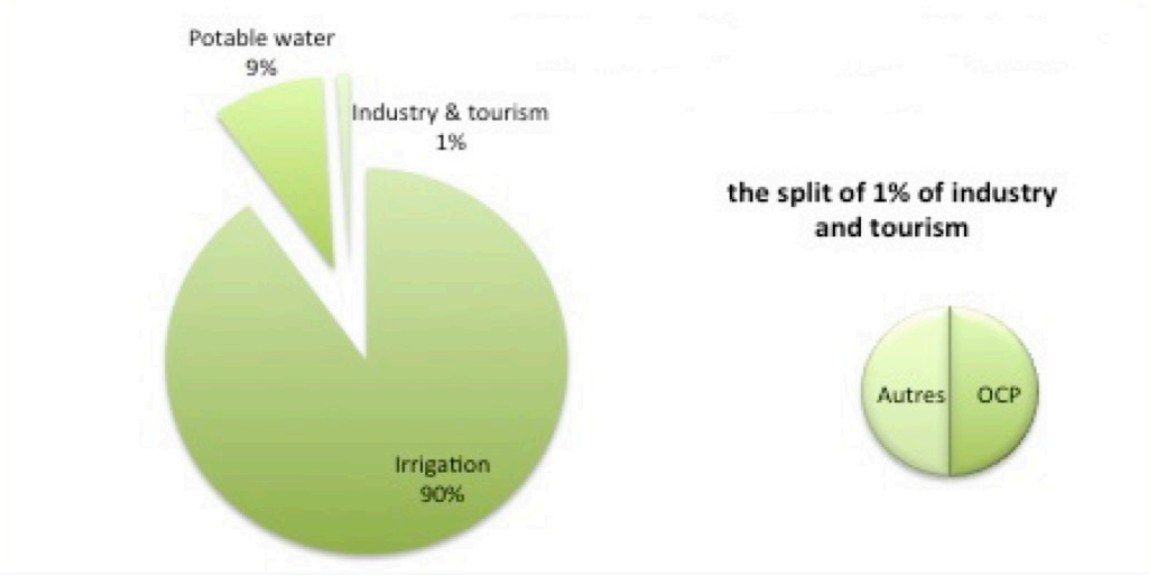
saltwater will pollute coastal aquifers beneath cities. Even as natural water supplies shrink, Morocco reveals a prodigious thirst. Early nineties, the country held five million people in dispersed rural settlements. By 2050, 42 million increasingly urbanized people, living and working along the coast, will compete for food, water, and jobs in a globalized economy. To maintain 4-5 percent growth, Morocco directs 9-15% of its investment budget toward climate change adaptation. That means it will mobilize freshwater in more optimal ways that support families, farms, domestic firms and foreign tourists. We all share the same water, the same risks, rights and responsibilities. As the population expands, and the economy requires more, no single entity can grow by taking water at the expense of others.

II. Unlocking the Potential of Morocco's Liquid Asset

Water being Morocco's most precious natural resource, it calls for recognition and respect, and is valued as an essential input to the industrial processes. It forms the backbone of Morocco's economy. If ever depleted, water will have a direct visible impact, as it would grind industrial operations and agriculture to a halt and tear the fabric of society.

Today's generation cannot just claim and use water only for themselves. Rather, water is borrowed from the next generation, and must preserve it intact. To do so, every institution must recognize the role it plays.

Figure 2: National Water Resource Effectation 13.3 billion m^3



Source: Morocco's Minister in charge of water (2015)

While industrial activity and tourism combine to require less than one percent of Morocco's potential water, every corporation should reduce its own vulnerability to water scarcity. Yet, at the same time, corporation should increase water for people, nature, and future generations. That presents a daunting but worthy challenge.

In particular, for industrial structures such as OCP, water is used at every stage in the industry. It is mainly used to reduce dust on roads on the sites, to wash and transport phosphate, to cool sulfuric acid, to transfer heat, and to make phosphoric acid.

This global fertilizer-food-water nexus leads to confront the question of how can the world's farmers be empowered to do more with less, while also securing the prosperity and equity of Morocco's increasing water demand?

This is why, corporations show non-ending efforts to strive for productivity in reduced water consumption and add value to the supply chain. The circle represents this continuous dedication to get a better economic value for water.

Corporations' answer is to optimize water by investing in measurable outcomes that are delivered and documented under three reinforcing axes: freshwater productivity, efficiency, and integrity.

III. Productivity: Catalyst of Growth

Industries that use water as an input, has been emphasizing on the ability to boost productivity, typically through a focus on food. By increasing the productivity of land, farmers can increase their yields and ensure more crops per square meter of soil. Productivity can then be measured in terms of water, particularly for water scarce countries.

« To maximize yields from every cubic meter of water, several corporations have embarked on an innovative water optimization strategy.»

Research in Morocco and elsewhere has shown how the appropriate amount of phosphorus fertilizer can increase the fertility of low-grade soils, boosting crop harvests within existing constraints of rainfall or irrigation. Scaled up, this lowers agricultural demands for water by increasing yields per hectare, a productivity metric known simply as more crop per drop. Indeed, as a soil amendment, combined with groundwater extraction and irrigation technology, phosphate helped drive the Green Revolution that feeds booming populations around the world. Can phosphate be too productive, a victim of its own success? In some regions, careless and excessive use of fertilizer and water have sped depletion of both. It is then important to encourage precise application of phosphorous and irrigation to maximize yields from each.

Turning to the industrial operations, the same water productivity metric is rigorously applied. To maximize yields from every cubic meter of water, several corporations have embarked on an innovative water optimization strategy, seeking to produce more value at every stage, from extraction to export, and throughout the production cycle.

Water productivity comes from "thinking outside the reservoir." That is why the priority should be given to ways to mobilize the so-called "unconventional resources." One city's trash is considered another industry's treasure. With that in mind, the core investment strategy is to capture, recover and repurpose municipal wastewater, and reuse it to process and enrich phosphates.

Another measure of productivity emerges through water desalination, as a non-conventional source. Due to its high-energy consumption, desalination of seawater can be a very costly process to generate freshwater supplies. It becomes economically justified, however, if it is: 1) integrated deep into an existing system; 2) judiciously developed with defined outcomes; and 3) designed specifically to reduce pressure on surface reservoirs or deplete vital groundwater reserves.

What is the optimally sustainable outcome of productivity? It can be quantified as part of a triple bottom line that values people, planet, and profits.

Defining the Water footprint

The water footprint has been used to assess alternatives and benchmark performance against other options. The metric – how much freshwater is required to produce a unit of any given commodity? – Has been mostly developed in agriculture. For example, it takes roughly 18,900 litres of water to produce 1 kilogram of roasted coffee (130 litres per cup). Likewise, cotton requires 10,000 litres per kilogram (2,500 litres per t-shirt), while a kilogram of rice needs 2,500 litres per kilogram. As water stress rises, and constrains irrigation, farmers may decide to plant coffee, cotton, or rice, depending, at least in part, on the price each kilogram may yield producers. Water footprints also have relevance from the perspective of the consumer, measuring impacts of his or her purchases or food choices.

« The economic water footprint is a good indicator of how water is consumed within the industrial system.»

What about commercial enterprises, industries, restaurants or retailers? Water in the corporate supply chain has become a material risk to investors and business executives alike. The economic water footprint is a good indicator of how water is consumed within the industrial system.

That water footprint has different levels of social and ecological impacts, as it is broken down the source of the intake supplies by: surface diversions, groundwater withdrawals, seawater desalination and purified or recycled wastewater. Indeed, there is a shift in water productivity portfolio from a high reliance on the first two conventional sources, to a far greater emphasis on the

latter two, reducing the impact on nature and society.
How do water footprints translate into productivity? The World Bank estimates that Morocco generates USD $10.39 of GDP for every cubic meter of freshwater used. OCP's economic water footprint, at USD $39.31 generates nearly four times that level of productivity.

By other metrics of productivity, OCP generates orders of magnitude more employment per unit than if that water was allocated elsewhere. Compared with agriculture, for example, the water footprint generates seven times more jobs than vineyards, fourteen times more jobs than orchards, eighty-three times more jobs than cotton, and 250 times more jobs than rice.

> « *Industries and societies need to work within and across their human and industrial operations to squeeze waste out of the system.*»

More importantly, the economic water footprint study is conducted for each site by location: Khouribga, Jorf Lasfar, Benguerir, Youssoufia, Safi, and Laayoune. By tracking supply and demand of water within each site, we can focus internally on water use outcomes, and optimize performance by allocating water to its most productive use. Phosphates, phosphoric acid, and fertilizers for improved efficiency break it down.

In order to unlock the overall productive value of the water footprint, a thorough understanding of the system is called for. Water usage data is collected, aggregated, and homogenized in order to verify the most recent updates from the various work sites.
Then, the overall quantity of water produced, recycled, consumed, and transferred, is identified. This comprehensive measurement effort has intrinsic value, as it reveals gaps, leaks, and opportunities to the company.

Above all, it offers a new way to assess the 'worth of water' as the water required throughout every stage of the industrial processing system against economic variables like revenues, profits, employment, and impacts is reconciled. The result of US$39.31 per cubic meter summarizes OCP's various impacts on water throughout its production and distribution chain. It includes an organizational and spatial dimension, so the footprint can be managed and minimized by specific entity or geographic location.

The approach is adopted by several leading multinationals, which have already calculated their water footprint. In addition, it includes the goals, methodologies and risk matrices that have been advanced by a network of global partners, such as the World Economic Forum, the World Business Council on Sustainable Development, the World Water Council, and the International Council of Mines and Minerals.

Freshwater productivity is a constant process of investing in optimization, although, this represents only the first step to develop resilience against the coming era of water scarcity.

IV. Freshwater Efficiency: Creating More by Wasting Less

Efficiency in freshwater management is essential for a productive stream to protect this valuable resource. The impact it has on environment and the economy is greatly important and therefore, an efficient system is due in place.

It reveals how to create more value for all from freshwater, but instead of adding more through applications of energy and technology, efficiency arises from using less. Coupled with an innovative mind-set, it requires a high level of discipline. Thus, industries and societies need to work within and across their human and industrial operations to squeeze waste out of the system.

> « *Industries are encouraged to phase out entirely the consumption of groundwater for industrial use, and replace it with surface water supply systems, in addition to unconventional sources.*»

First, a hard look is taken at what could be done at little or no cost. The water related research process itself identified ways to reduce the need for freshwater. But larger gains in large industrial corporations would only come by investing staff time, energy, and money into efficiency, all of which put a premium on the value of water.

New water related plans would be generated with a range of water optimization projects throughout the

industrial processes, with self-financing options. Finally, the global water footprint of any industrial structure will be improved, as well as the overall economic productivity.

V. Integrity: Forging Resilient Linkages

Industries cannot thrive in a vacuum. Any industry is inextricably part of the social and cultural landscapes, groundwater basins and watershed institutions to which we belong. To address the growing needs of people, and elevate the kind of workforce needed to hire in the 21st century, corporations invested in institutions of health, education and security. The same integrated partnerships approaches to water have been applied.

Social responsibility is gaining over the industrial arena, as corporates and industrials are positioning themselves with the local community where they operate, by providing water to families of men and women employed by the company. Industries and corporations are sharing a social contract with its workforce and neighbours. The challenge in water scarce regions is to ensure the sustainability of this resource.

To a large extent, it is recognized that much of that water secure future lies underground. The government has wisely ranked groundwater, as a strategic national reserve. Consequently, industries are encouraged to phase out entirely the consumption of groundwater for industrial use, and replace it with surface water supply systems, in addition to unconventional sources.

> *« Water scarcity is a real and urgent risk, but it is also an opportunity.»*

The traditional path to water security has been for water scarce cities and industries to enhance, and increase resource supplies. But that is only half the equation. The fastest, cheapest and cleanest way to add new supplies of water is to reduce existing demands for it. Industries have begun exploring new ways to effectively and affordably "crowd source" additional quantities of clean water, by producing through non-conventional sources and launching water efficiency initiatives.

Crowdsourcing water from existing users could be a game changing approach, because it addresses what is known as the 'tragedy of the commons.' The paradox is this: Morocco's water belongs to everyone and thus no one. Everyone who enjoys open access to this common pool resource knows that it is limited, but is led by self-interest to use more and more until crossing a watershed's point of irreversible systemic collapse.
For example, every cubic meter of water in the river basin that any industry saves through productivity and efficiency may still be depleted or wasted by others outside our operations. The only way to change that is if each unit has economic value for all users.

It is important, particularly for water scarce cities, to be fully aware of the limitation of the water resource and to ensure the reverse of the decline of groundwater and surface flows in that specific region.

VI. Outcome Destination

When it comes to building water security, industries are constantly on the lookout for new ideas, cutting edge tools, breakthrough models that can boost water productivity, drive water efficiency, and restore the integrity of water throughout groundwater basins and watersheds in ways that secure more than enough for all.

To accomplish this, industries have adopted state-of-the art methodologies, like water footprint benchmarks, from other industries and applied them to its' own.

By prioritizing the 'one water' approach, using less water, with dramatically reduced impacts on people and nature. How? By phasing out pumping of groundwater, reducing the share of surface flows' dependence, introducing reused purified wastewater in the operations process, and increasing the proportion of seawater desalination in the usage volumes. Studies have shown that wastewater reuse and desalination would represent more than 60% of the water need.

A solution always exists, although to the naked eye may seem impossible. This could result, for example, from creating renewable energy sources for seawater desalination. Or it could mean an internal policy direction to lower our reliance on groundwater.

Water scarcity is a real and urgent risk, but it is also an opportunity. The research departments of universities both in Morocco and abroad are working closely with

industries to pioneer new ways of valuing water. That may come through internal water savings platform that motivate all the consumption points, at every level to seek out and discover new technologies.

Finally, water security is the aspiration not only for industries and corporations in the century ahead. It is the foundation on which all Moroccans will stand, together, anchored by these common roots of resilience in the hotter, drier, yet climate-proof future we share.

About the Global Nexus

Global Nexus is based in Casablanca Finance City, and is dedicated to strategy, advisory and investment in areas related to water, energy, agriculture, and all the sectors of green business and sustainable development. Global Nexus works on the integration of innovation and the financing of startups, with an African perspective. Global Nexus works in partnership with the environmental engineering department of Harvard University, as well as other specialised international structures.

About OCP Policy Center

OCP Policy Center is a Moroccan policy-oriented Think Tank whose mission is to contribute to knowledge sharing and to enrich reflection on key economic and international relations issues, considered as essential to the economic and social development of Morocco, and more broadly to the African continent. For this purpose, the Think Tank relies on independent research, a network of partners and leading research associates, in the spirit of an open exchange and debate platform.

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