

Should we be concerned for our environment, ecology and biodiversity?

By Hynd Bouhia, PhD

Summary

The future of our environment, ecology and biodiversity raises a number of questions. Vigilance is critical to preserving both Morocco and the planet for future generations. This Paper highlights the importance of ongoing government, private sector and civil society initiatives to ensure adaptation to, and mitigation of, climate change. Morocco is at the forefront of this momentum, as illustrated by the organization of the COP22 in Marrakech in 2016, the implementation of a National Strategy for Sustainable Development, and its commitment to achieving UN Sustainable Development Goals for 2030. The review of Morocco's ecological footprint and its environmental degradation costs, stress the urgency of transitioning to a sustainable development model and implementing a new economic, social and environmental pact that engages all citizens, particularly youth and women.

Should we be concerned for our environment and ecology, health and food? For our forests and beaches? For our ecosystem, nature and resources? For our flora and fauna?¹

Those are the questions we face today, as we watch fires ravage Australia, cyclones and storms in Asia and Europe, year-round floods, and record-breaking global heat waves. Climate and the environment permeate every conversation and concern scientists, policy-makers, leaders, artists, entrepreneurs, children, youth and global citizens.

1. Excerpt from Hynd Bouhia's contribution to "Maroc: Aujourd'hui ou Jamais", a collective book published by Editions Orion.

Morocco, since hosting the COP22 in Marrakech in 2016, as part of the United Nations Climate Change process, has demonstrated genuine mobilization at every level of society, government, private sector and civil society... Children, youth and the not-so-young alike are mobilized. As a result, Morocco, under the impetus of His Majesty King Mohammed VI, stands out as a leader in the global fight against global warming.

The National Strategy for Sustainable Development places the environment and sustainability of current development models at the heart of sectoral government policies; and drives both the private sector and civil society to act for mitigation and adaptation to climate

change effects. Morocco is also committed to achieving the 17 Sustainable Development Goals (SDGs) of United Nations' Agenda 2030.² This Agenda revolves around five principles, referred to as the "5Ps" for transforming our world, namely Partnerships, Peace, Prosperity, the Planet, and People. Morocco is therefore compelled to act urgently to ensure that every initiative, program and project is systematically integrated into a multi-scale, multi-sectoral and multi-dimensional approach for transition towards sustainable development.

Schools prepare children to incorporate the environment into everyday life and grow to become environmentally responsible citizens. One tree planted, one beach cleaned, one animal saved, basic acts of cleanliness and conservation can make a difference for entire future generations. Yet, the adverse impact of large cities, industries, fossil fuels, diesel pollution, waste, toxic substances, and other daily activities, is overwhelming. Hence, concern for Morocco's environment and ecology is increasingly real, perceptible and well-founded.

Concern for the environment

Morocco's natural environment was always a major resource and asset, both in terms of socio-economic productivity and quality of life and tourist appeal. Ranging from coastal areas, with splendid bays such as Marchica and its pink flamingos, to the Atlas Mountains, once home to the Lion of the Atlas, aligning white peaks beyond palm-populated oasis towns, through to fertile plains, dense forests crossed by rivers and waterfalls, and argan trees unique to this country, climbed by goats, all the way to breathtaking desert stretches of dunes.

Such ecological beauty persists today thanks to a natural balance that has been maintained for years. In fact, Morocco hosts the highest concentration of marine bio-capacity and the second highest concentration of terrestrial biodiversity in the Mediterranean region. There is today genuine alarm that this natural ecosystem wealth and its biodiversity are at risk.

2. SDG1- No Poverty; SDG2- Zero Hunger; SDG3- Good Health and Well-being; SDG4- Quality Education; SDG5- Gender Equality; SDG6- Clean Water and Sanitation; SDG7- Clean and Affordable Energy; SDG8- Decent Work and Economic Growth; SDG9- Industry, Innovation and Infrastructure; SDG10- Reduced inequalities; SDG11- Sustainable cities and communities; SDG12- Responsible consumption and production; SDG13- Measures to combat climate change; SDG14- Marine life; SDG15- Terrestrial life; SDG16- Peace, justice and effective institutions; SDG17- Partnerships to achieve the goals. (<https://www.un.org/sustainabledevelopment/>)

Demographic growth, urbanization and changing lifestyles, including family nuclearization and consumption patterns, lead to significant natural resource and energy needs and generate substantial waste and pollution.

Morocco invested heavily in infrastructure in recent years, positioning the Kingdom as a true economic and logistics platform between Europe, America and Africa. Major investments in energy and industry boosted economic growth and contributed to social progress. Investments in renewable energy produced positive environmental returns, and include the deployment of one of the world's largest solar power plants in Ouarzazate and the launch of a number of energy footprint enhancement initiatives, including solar pumping and energy efficiency systems.

This economic and industrial development, however, has real impact on the environment as waste and pollution increase. All sectors of the economy depend heavily on natural resources and exacerbate their consumption: water and soil for agriculture, soil for construction, coastline for tourism, natural resources for mining, marine resources for the fishing industry and aquaculture, raw materials, water and energy for industry, etc.

Besides, urbanization and population growth mean increased air emissions and waste from towns and cities, and while many landfills are managed professionally, uncontrolled dumping grounds still exist, releasing toxic substances hazardous to the health of neighboring people and wildlife. Fear grips one encountering the informal landfills at the edge of our towns and cities and the ragpickers who make a living there sorting through the waste. Children roaming and playing on and around these dumps are still a haunting reality. Toxic, polluted stagnant waters flow into the ocean where we fish and where Moroccans bathe in summer.

Beautiful landscapes are dotted with modern industrial zones, pillars of the Moroccan economy, releasing air and noise pollution, and impacting soil equilibrium and fertility and contaminating groundwaters.

Food quality inspection has repeatedly detected toxins originating from these various pollutants. This is frightening considering that, in the past, we ate healthy and organic. Food safety and security is increasingly a concern that directly affects the state of our environment and the health of our citizens.

Morocco's ecological footprint

Morocco has seen increased natural resource overexploitation in recent years. This is reflected in ecological footprint trends, measuring development stresses on resources and the environment. This indicator measures the productive ecological surface area necessary to maintain current population living standards in terms of energy and raw materials supply, waste absorption using existing technologies and eco-services provided e.g. drinking water, forests, etc.... Using World Wide Fund for Nature (WWF) terms,³ the ecological footprint assesses the bio-productive land area needed to produce the goods and services we consume and absorb the waste we generate.

Morocco's Ecological Footprint is growing. It rose from 1 to 1.47 global hectare (hag) per capita between 1990 and 2010, while bio-capacity, which represents the productive surface area per capita, has decreased by 25% since 1960, falling from 1.14 to 0.86 hag. These levels are below the 2.84 hag global average per person for the ecological footprint and 1.68 hag per person for bio-capacity.

Clearly, the environment is exploited and polluted beyond its productive and regenerative capacity. This widening gap jeopardizes natural resource availability, on which entire economic sectors depend. The effects of this are already visible in water scarcity impacting agriculture and the deterioration of various tourist sites, and in the considerable economic losses already quantifiable in a number of areas.

Changing ecological footprints cast new light on development models responsible for Morocco's environmental degradation. A number of initiatives have however been put in place and are beginning to alleviate the pressure on resources. That said, the good news is that Morocco is far from being one of the world's most polluting countries.

The cost of environmental degradation

Environmental degradation costs can now be quantified by sector and region. The World Bank (WB), together with the Secretariat of State in charge of sustainable

development in Morocco, published a report on "the cost of environmental degradation in Morocco" in January 2017. The model developed in the report uses several methods to estimate impacts. The study focuses on six environmental components that potentially impact national economic value, and gross domestic product. These six components are: water, air, soil, waste, coastline and forests.

The report estimates the cost of environmental degradation at nearly MAD 32.5 billion, i.e. 3.52% of GDP, amounting to nearly MAD 960 per capita per year. Damage caused by greenhouse gas (GHG) emissions to the global environment is estimated at 1.62% for 2014.

Water pollution (1.26% of GDP) is the main vector of environmental degradation at the national level. It is calculated by assessing impacts on both the environment and the economy: silting of dams, groundwater overexploitation, wetland degradation, climatic variability in water availability, discharge of domestic and industrial water; as well as diarrhoea and malnutrition. Air pollution (1.05%) is the second highest cost, and is assessed in terms of impact on health. Soil degradation also carries significant costs (0.54%) in terms of productivity and market price variation, due to the impact of erosion on cropland and salinization of irrigated cropland. Soil degradation costs also include the impact of land clearing, desertification and deterioration.

Waste is another substantial cost (0.4% of GDP). It is determined by the cost of waste collection, restoration of polluted groundwater, and the opportunity cost of lost electricity and recycling potential. Cities, nevertheless, show clear improvement in household waste collection, and a downward trend in this cost. Hazardous industrial waste costs are also included. Finally, the damage generated by coastal degradation (0.27% of GDP), and the cost of deforestation and forest fires (0.004%) is low given government preservation efforts.

Water

Morocco has always been fragile in terms of water resources; at 650 m³/inhabitant, it is under water stress. Both water quantity and quality suffer from continuous external pressures, including groundwater overexploitation, landfills, wastewater and climate change. Declining water quantity and deteriorating water quality have consequences on the national economy and

3. The World Wildlife Fund-- <https://www.worldwildlife.org>

environment. Furthermore, water quality, sanitation and hygiene have a direct bearing on health. That said, over-exploitation and the discharge of untreated liquid waste from industry and cities remains one of the most important problems in Morocco. The model estimates the effects on water at MAD 11.7 billion, i. e. 1.26% of GDP.

Air

Air pollution and automotive and industrial air emissions have serious negative impacts on health, as a result of long-term exposure to particulate matter, such as PM_{2.5}.⁴ Outdoor and indoor air pollution causes acute respiratory diseases in children and premature death and morbidity in adults due to cardiovascular incidents, pulmonary inflammation and other causes. Using methods developed in epidemiology, costs have been estimated at MAD 9.7 billion, or 1.05% of GDP. Pollution, increasingly present in large cities such as Casablanca, Marrakech and Tangiers, accounts for 75% of the cost. Internal pollution in rural homes using solid fuels continues to account for a quarter of air pollution costs.

Agricultural land

Morocco has a long agricultural history dating back to its characterization as a wheat production basket, and over 60% of employment originates from the agricultural sector. Over the last 50 years, Moroccan agriculture has made great progress in terms of modernization and diversification. With 9 million ha of agricultural land and 30.4 million ha of permanent rangelands, it now accounts for 14% of GDP in value added terms. Human activities, deforestation, urbanization and extreme natural factors nevertheless degrade these lands in a variety of ways. Erosion degradation affects 5.5 million ha and salinization degradation 160,000 ha, resulting in losses equivalent to MAD 1.7 billion. Degradation also impacts other lands as a result of land clearing, desertification and overexploitation. These different costs are estimated at MAD 5 billion, i.e. 0.54% of GDP.

4. PM_{2.5}- Particulate Matter represents particles in the air that have a diameter of less than 2.5 micrometers, i. e. 3% of the diameter of a hair. These very fine particles come from industrial plants, vehicle engines, airplanes and forest fires. They are dangerous because easily absorbed by humans and animals and penetrate lungs and circulatory systems.

Forests

Forests in Morocco cover 9 million ha in total, accounting for 12.7% of the country's surface. These forests face a number of pressures, including land clearing, amounting to 880 ha per year, fires, reaching 3,415 ha per year, timber overexploitation and other types of degradation. Costs related to these degradations are estimated at MAD 40 million or 0.004% of GDP in terms of loss of wood, cork, fodder, recreation and other related products.

Waste

Despite advances achieved in waste management, e.g. better management of municipal waste and the creation of controlled landfills, waste management continues to generate significant costs to society. Additional negative impacts stem from the non-collection of waste, and groundwater pollution caused by leachate infiltration from uncontrolled landfills. The lack of a sorting and recycling system results in lost benefits to the economy, which become costs. This also applies to hazardous waste, both in terms of economic loss for the non-recovery of waste oils and for the impact of lead exposure, particularly on children's health. Hence, including the costs of non-integration of economic benefits, waste management costs an estimated MAD 3.7 billion, or 0.4% of GDP.

Coastline

Morocco boasts 3400 km of coastline spanning the Mediterranean Sea and the Atlantic Ocean, and the basis of a diversified and multi-sectoral blue economy that includes tourism, port and fishing activities. These activities generate pressure on coastal areas, with overfishing damaging marine biodiversity and beach degradation undermining all tourist and recreational activities. Hence, the cost of coastal degradation is estimated at MAD 2.5 billion, or 0.27% of GDP. The figure would be higher if pollution were included. Plastic also poses a major threat to the marine ecosystem. Indeed, 90% of waste found at ocean surface is made of plastic, 60% of which is plastic bags. Lastly, besides ocean acidification caused by excess CO₂ dissolved in surface waters, thawing northern sea ice threatens to raise ocean levels and thus the safety of Morocco's coastal infrastructure and cities.

Biodiversity loss fears

Morocco features a wide diversity of topography and climates, and this is reflected in the great bio-ecological diversity of its soils. These soils however suffer from a number of causes of depletion and degradation. The quality of soils and their fragile capacity to maintain abundant, rich and perennial biomass and biodiversity is a source of vulnerability for Moroccan biodiversity. National biodiversity is of particular ecological importance and of fundamental socio-economic interest for Morocco's development. Biological resources contribute to a significant share of national wealth in a number of economic sectors including agriculture, animal husbandry, fisheries and forestry.

The intensive and sometimes abusive use of resources, as well as the discharge of waste into the environment, directly deteriorates the habitat we share with other species. This in turn impacts society, human health, the economy, food production, tourism, ecology and biodiversity.

Hence, our concern for biodiversity stems from the threats caused by human activity; urbanization and coastalization; and the effects of climate change. Aspects related to the accumulation of solid and liquid waste, air pollution and the degradation of biodiversity are altering the Morocco we leave to our children and future generations.

The Convention on Biological Diversity (CBD) was adopted by the international community in 1992, at the Rio Earth Summit, to conserve and sustainably use biodiversity and access genetic resources, with equitable sharing of its benefits. Pursuant to this and as part of this process, the National Biodiversity Strategy for Morocco enables the implementation of CBD objectives. As part of its revision for 2030, the strategy aims to conserve, restore, enhance and rationally use biological diversity, ensuring the maintenance of ecosystem services for the benefit of all, while contributing to sustainable development and the well-being of Moroccan society.

Climate Change Threats

Climate change is well established. It has become a global reality confirmed by recent events, from devastating cyclones, to the ravages of fires and the extinction of flora and fauna. Climate change is simply the result

of increasing greenhouse gas emissions, exponential environmental degradation, and overexploitation of natural resources. The more technology advances, the more consumption is stimulated, the more waste increases and degradation follows. Prosperity and development do not come without a cost, hence the notion of sustainable development, failing which development becomes harmful.

The world today faces a new set of risks. Climate change effects are no longer in doubt, with the devastation caused by fires in Australia, resulting from three consecutive years of drought due to rising temperatures. Storms and cyclones are increasingly devastating. Climate change is the direct result of greenhouse gas emissions, generated by human activity, altering the makeup of the planet's atmosphere.

The World Economic Forum recently published the Global Risks Report 2020, where half of global risks facing the world today fall into the environmental category, namely extreme weather, unsuccessful climate action, natural disaster, loss of biodiversity, man-made environmental disasters and the water crisis.

Does climate change impact Morocco?

Morocco, by virtue of its geographical position, climate, history and structures, is home to unique and specific eco-systemic diversity. Indeed, Morocco has five main eco-systems: forest and steppe ecosystems;⁵ Saharan ecosystems; marine and coastal ecosystems; inland water ecosystems; and caves. This has allowed the development of over 24,000 animal species and 7,000 plant species, 1,700 of which are rare and endangered. Such biodiversity is important because it contributes to natural and environmental balance, territorial resilience and the well-being of Moroccans. It is now at risk due to human activity, changes in ecosystems, and the effects of climate change.

Climate is different from one region to another. Admittedly, Morocco has faced several cycles of drought in the past. Today, it faces a general rise in temperature. Between 1960 and 2010, average annual temperatures rose by 1.0°C to over 1.8°C; and rainfall has fallen by

5. Steppic: plant formation consisting of herbaceous or woody xerophytic plants, often in spaced tufts. Such vegetation grows in dry continental or tropical climates.

between 3 and 30%---the northwest, having always been the wettest region, has seen its rainfall fall by 26%.

These changes are a result of global climate change impacts and could worsen as global greenhouse gas (GHG) emissions increase. A World Bank study reveals in its conclusions that Morocco could in the future, be exposed to moderate drought occurrence every three years, average droughts every five years and severe droughts every 15 years.

Morocco's environment presents undisputable vulnerability to climate change, and this is likely to increase in the future. The economic cost of climate change can already be estimated. Indeed, humanitarian organization DARA,⁶ estimates the direct losses of climate variability disasters in 2010 to over USD 3 billion. Other data compiled by the International Disaster Data Center, indicates that GDP in at-risk areas could be impacted by up to US\$ 110 million due to floods, storms and landslides. In addition, the risks of increased drought could affect up to 7 million Moroccans.

Carbon emissions assessment and cost

The economic development Morocco experienced over the past ten years generated emissions of a number of greenhouse gases (GHGs), such as carbon dioxide (CO₂), sulphur dioxide (SO₂) and methane (CH₄).

Global GHG emissions by country are assessed and monitored by National Communication to the United Nations Framework Convention on Climate Change (UNFCCC). Net GHG emissions in Morocco reached 100.5 million tons of CO₂ equivalent (i.e. CO₂ emission threshold causing similar radiative forcing), or 3.1 tons of CO₂ equivalent per capita for the year 2012.⁷ Moroccan emissions originate from energy (57%), agriculture (21%) and waste (8%). Assuming a carbon value of MAD 46/ tCO₂, as per the international market price for carbon, and a social value of MAD 253/ tCO₂, costs to the environment amount to MAD 15 billion, i.e. 1.6% of GDP. Morocco's emissions remain low compared to global GHG emissions. The main emitting country is China, with 2014 emissions of 11,912 million tons of CO₂ equivalent, representing 26% of global GHG emissions. China's

emissions increased by over 70% in 10 years. Canada, for example, registered 745 million tonnes of CO₂ equivalent in 2014, or 1.6% of global emissions. By way of comparison, Canada's CO₂ emissions stood at 20.4 equivalent tons of CO₂/ inhabitant against 3.1 equivalent tons of CO₂/ inhabitant for Morocco.

Sustainable development is the solution

Faced with all these concerns, all initiatives and development projects need be undertaken within a framework of sustainability and protection of our environment, health, ecosystem and biodiversity.

Integrated approaches with sustainable visions will help structure the framework for the country's socio-economic development, industrial growth and social cohesion, and ensure its prosperity and international influence.

Professor Peter Rogers of Harvard University⁸ began explaining sustainability to his students in the 1990s as a term used to bridge the gap between development and the environment. Initially, the term was used for logging, fishing and groundwater pumping. The term was then used to refer to sustainable groundwater extraction rates, allowing the continuous replenishment of groundwater without exceeding the natural rate. Likewise, for timber exploitation without altering forest constitution, and for fishing, without impacting marine equilibrium. The notion of sustainability is nowadays applied to all facets of development. The first discussions on sustainability can be found in the 1987 report of the World Commission on Environment and Development (WCED) founded by the United Nations in 1983. The report defines "sustainable development" as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs".

Definitions of sustainable development were subsequently refined to cover all three approaches: (1) economic: for maximizing income while maintaining a constant or growing stock of capital; (2) ecological: for maintaining the resilience and robustness of biological and physical systems; and (3) socio-cultural: for the stability of social and cultural systems.

6. <https://daraint.org>

7. Third National Communication to the UNFCCC, April 2016

8. Sustainable Development course based on the book: Rogers, Jalal and Boyd. An Introduction to Sustainable Development. Harvard University Press

In its Moroccan version, the concept of sustainable development attuned to local realities, highlights six goals:

1. Territorial' economic and social attractiveness;
2. Optimal utilization of natural resources;
3. Societal resilience to climate, energy, technology, and economic shocks;
4. Natural resource protection and mitigation of environmental externalities;
5. Social cohesion (social mixing and bonding, shared values and prosperity, equity and social justice, efficient public service, democracy); and
6. Citizen well-being (access to a healthy and sustainable environment, fulfilment through culture, education, health, the right to employment, etc.).

In conclusion, by leveraging this approach at all levels - local, national, and regional - we are building a better future for our children and future generations. Successful transition towards sustainable development requires a new economic, social and environmental pact that puts all citizens, particularly women and youth, at the heart of the decision-making process. On this basis, we shall alleviate our concerns and possibly even transform them into opportunities for collective and shared prosperity.

About the author, Hynd Bouhia

Hynd Bouhia holds a PhD in Environment and Sustainable Development from Harvard University in 1998; an MA from SAIS John Hopkins University, and an engineering degree from Ecole Centrale de Paris. She has held several positions at the World Bank in Washington, D.C., the Prime Minister's Office in Rabat, and the Casablanca Stock Exchange. She specializes in sustainable development strategies for both the public and private sectors.

About Policy Center for the New South

Policy Center for the New South, formerly OCP Policy Center, is a Moroccan policy-oriented think tank based in Rabat, Morocco, striving to promote knowledge sharing and to contribute to an enriched reflection on key economic and international relations issues. By offering a southern perspective on major regional and global strategic challenges facing developing and emerging countries, the Policy Center for the New South aims to provide a meaningful policy-making contribution through its four research programs: Agriculture, Environment and Food Security, Economic and Social Development, Commodity Economics and Finance, Geopolitics and International Relations.

The views expressed in this publication are the views of the author.



Policy Center for the New South

Suncity Complex, Building C, Av. Addolb, Albortokal Street,
Hay Riad, Rabat, Maroc.

Email : contact@policycenter.ma

Phone : +212 (0) 537 54 04 04 / Fax : +212 (0) 537 71 31 54

Website : www.policycenter.ma