



BAHRAIN NATIONAL ASSESSMENT REPORT

ON

**IMPLEMENTATION OF THE MAURITIUS STRATEGY
(MSI) OF THE BARBADOS PROGRAMME OF ACTION
(BPOA)**

Prepared by

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Environment and Wildlife
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November 2009

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ACRONYMS

BD	Bahraini Dinar
BPOA	Barbados Programme of Action
BSOE	Bahrain State of Environment
CAM	Coastal area Management
CBD	Convention on Biological Diversity
CCJC	National Climate Change Joint Committee
CDM	Clean Development Mechanism
CO2	Carbon Dioxide
COP	Conference of Parties
EIA	Environmental Impact Assessment
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GEF	Global Support Programme
HDI	Human Development Index
Km	Kilometer
MT	Million Tones
NBSAP	Biodiversity Strategy and Action Plan
NCSA	National Capacity Self-Assessment
NEAP	National Environmental Action Plan
NEIU	National Environmental Information Unit
NES	National Environmental Strategy
NO2	Nitrogen Dioxide
ROPME	Regional Organization for the Protection of Marine Environment
SIDS	Small Island Developing State
SLR	Sea Level Rise
SWM	Solid Waste Management
UN	United Nation
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nation Development Programme
UNEP	United Nation Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
WSSD	World Summit on Sustainable Development

EXECUTIVE SUMMARY

The kingdom of Bahrain possesses a prosperous economy and a high standard of living. Nearly all population has access to potable water, sanitation and health services. However, with its small area, high population density, and limited natural resources the country has great concerns over its future sustainable development. Bahrain is striving to diversify its economy and to manage properly its natural resources. Furthermore, being an island state, climate change poses serious threats to the existence of the country due to risks sea level rise posed.

The Kingdom of Bahrain has a quite number of initiatives within the national framework for sustainable development. Socio-economic initiatives include, the national economic strategy, the economic vision 2030 for Bahrain, national environmental strategy, Bahrain 2030 national planning development strategies, and future skills strategy for Bahrain. On the environmental fronts, initiatives include national environment strategy, the national biodiversity strategy and action plan, the national desertification plan and strategy, and Bahrain 2030 national land use strategy. Some of these strategies are still in draft formats, however, some in their final stages of development.

Some progress has been made in implementing BOAP however, lack of financial resources, and inadequate technical and technological capacities make achievements are neither comprehensive nor substantial. In this context, capacity building is of prime importance to enable national institutes in Bahrain to overcome difficulties and meet the challenges.

The current report highlights aspirations, as well as the concerns Bahrain facing. Special emphasis is placed on environmental problems of which sea level rise is the most challenge of all.

1. INTRODUCTION

The Barbados Programme of Action (BPOA) was adopted in the first Global Conference on the Sustainable Development of small island developing states (SIDS) which was convened in Barbados from 25th April to 6 May 1994. BPOA set four specific actions and measures to be taken at the national, regional and international levels in support of the sustainable development of SIDS. The World Summit on Sustainable Development (WSSD) in 2002 reaffirmed the special case of SIDS and highlighted a series of SIDS-specific issues and concerns in the Johannesburg Plan of Action adopted by the Summit. In a follow-up to WSSD, the United Nations General Assembly (UNGA) adopted Resolution A/57/262.

Being a member of SIDS, the Kingdom of Bahrain has made considerable progress in the implementation of many of the initiatives in the Barbados Programme of Action. This Report is intended to highlight the Kingdom of Bahrain' progress in implementing the BPOA. It also illustrates the Kingdom's economic, environmental and social vulnerability, and possible actions which may be needed in order for the country to overcome potential threats that may affect its ability to achieve sustainable development. The report addresses the issues of economic, Environmental and Social Vulnerabilities.

2. GENERAL CHARACTERISTICS

2.1. Physical and Environmental Characteristics

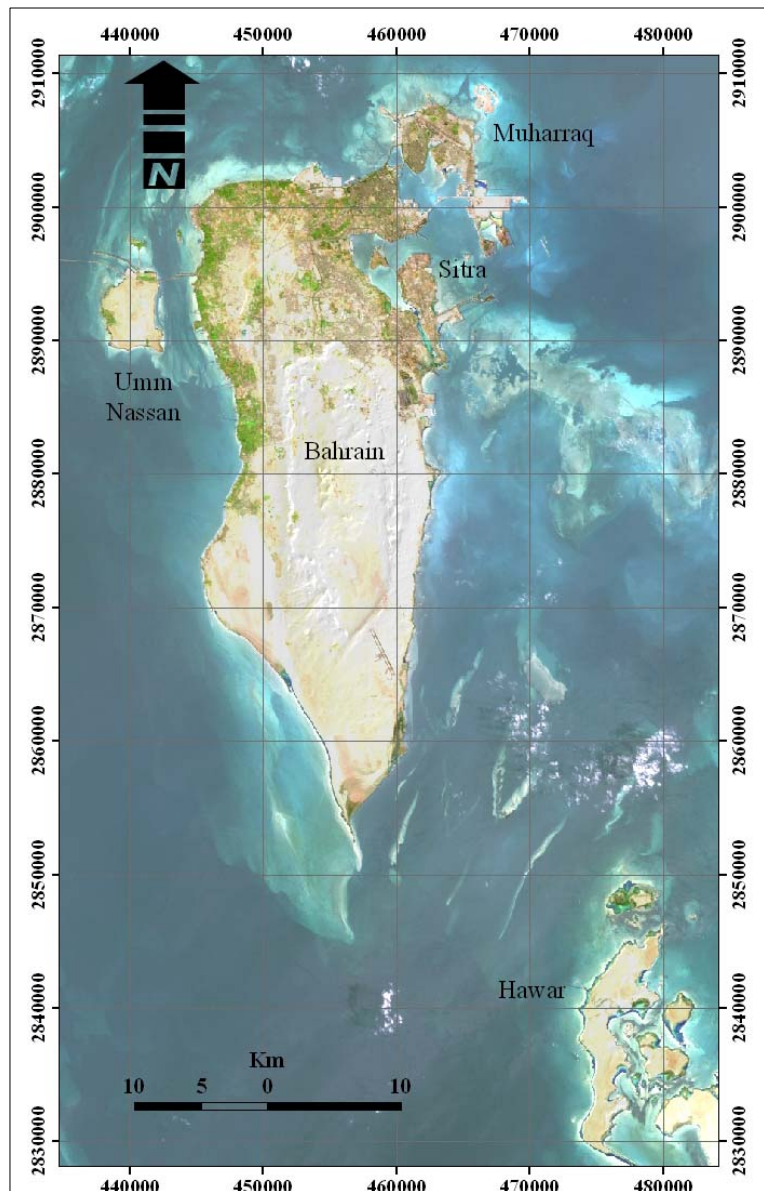
The Kingdom of Bahrain represents a unique case of a small island developing country. It is an archipelago, comprises a group of some 40 islands, numerous small islets, shoals and patches of coral reef. It is located centrally on the southern shores of the Arabian Gulf, to the right of Saudi Arabia and North State of Qatar, between latitude 25° 32' and 26° 20' North and longitude 50° 20' and 50° 50' East, Figure (1).

Bahrain is limited on geographical scope; thereby government policy is concentrated on the expansion of land area to offer a nick for the development. Consequently, large areas of the coastal zones in some of the

main islands, mainly, the northern part of the Bahrain Island have been subjected to extensive dredging and infilling activities since the seventies for developmental purposes. As such, the total land area of the country is always on the increase. Currently, total area is about 790 Km² and total coastal length is more than 537, where marine area reaching 8000 Km² of the Arabian Gulf Area. More than 7210 km² of this area is considered as marine ecosystems.

The main islands occur in two groups of unequal size. The larger, including Bahrain, Muharraq, Sitra, Jiddah and Umm Nassan, is located in the centre of the gulf, while a second group of small islands, of which Hawar and Sawad are among the largest, occurs close to the Qatari coast.

Bahrain is the largest Island of the main group where the capital city, Manama, is situated. It is about 48 km long from north to south and up to 16 km wide at its maximum point east to west, and accounts for nearly 85% (609.33km²) of the total area of the Kingdom. The next largest island is Hawar (52.10km²), followed by Muharraq Island (50.23km²), Umm Nassan (20.47 km²), and finally Sitra (15.38km²). The remaining small islands, islets and coral reefs combine to make up the rest of the



uninhabited land mass.

Figure (1)

The relief of the island is small with well over half of its surface lying below 5 meters and composed mainly of low angle slopes Figure (2). All the islands are low-lying lands, although Jabal Dukhan, situated in island Bahrain, is the highest point in the country. It rises to about 134 m above mean sea level.

The climate is predominately arid to hyper arid reflects the proximity of the tropics and the occurrence of a virtually land-locked sea bordered by extensive arid landmasses, and is typical of the Arabian Gulf. The temperature is generally high with an average of 35⁰ C, ranging from 14 to 41 degree Celsius.

Amount of rainfall averages 74 mm/year, varying from 39-128 millimeters per year (mm y-1), while annual potential evaporation may exceeds 2800 mm. Mean monthly relative humidity is typically high reaching 67% with mean daily maxima ranging from 78% to 88%. The high seawater temperatures of the Arabian Gulf and the development of temperature inversions result in generally high humidity levels, so that the occurrence of fog and dew is very common.

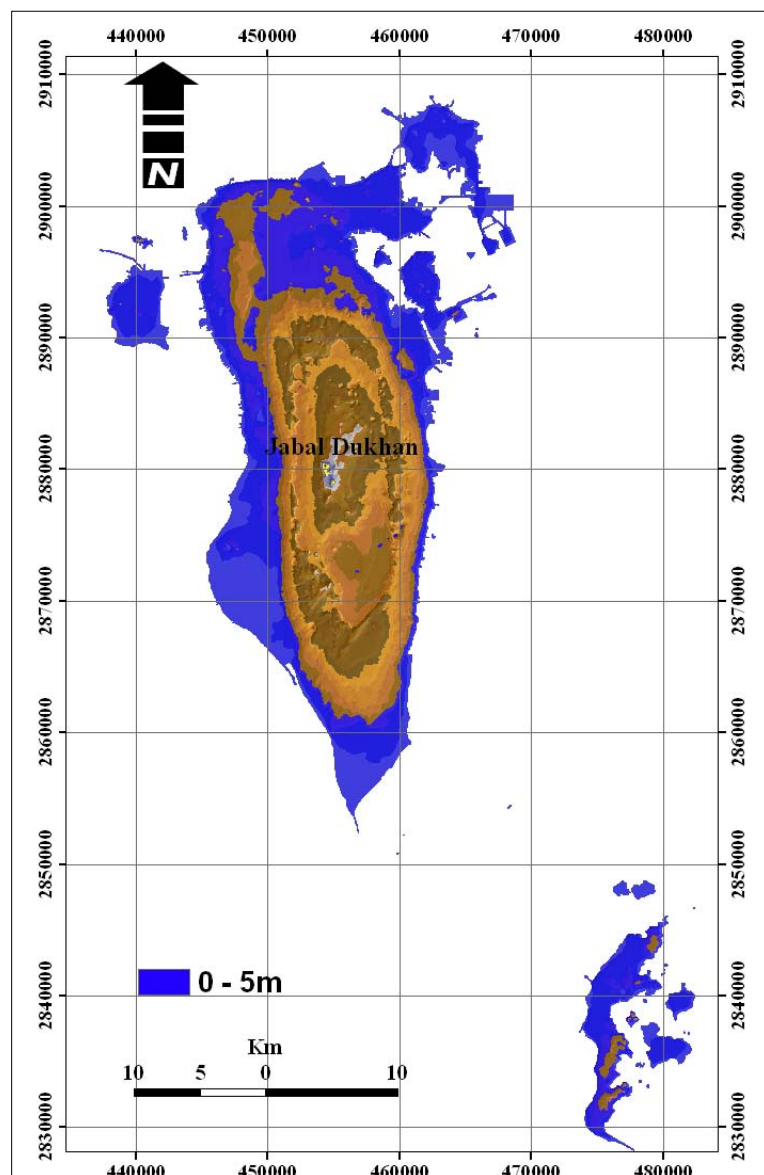


Figure (2)

Main agricultural areas are concentrated along the western coast of Bahrain main island. Major agricultural products include, among others, date palms, vegetables and forage crops. Despite the difficulties facing agriculture in Bahrain due to soil nutrient deficiencies, scarcity of irrigation water, and the limited supply of skilled workers, agricultural production has increased because of crop intensification practices and expansion of cultivated areas.

Due to its limited area, arable lands do not exceed 6,000 ha. Natural vegetation is degraded and mostly composed of xeric and halophytic vegetation. Main species are composed of low shrubs and few native fruit trees as well as many exotics. Arable and permanent crop areas occupy about 8200 ha.

Agriculture contributes to food security and most importantly provides job opportunities for more than 3400 people. According to the statistical report, issued in 2003, the number of employees in the agriculture sector has risen to 5524 persons. Nearly 90% of employment is in the private sector. The total employment could rise to 10,000 persons.

2.2. Socio-Economic Characteristics

Bahrain's economy is a market-based economy. The diversification of the economy is the main objective of the economic policy. Oil, which was the mainstay of the economy in the early stages of development, contributed around 24.65% of the real GDP in 2007, Manufacturing, 15.32%, and financial corporation, 22.73%. Major industrial establishments include water desalination plants, aluminum smelting, petrochemical, and shipyard repairs. These industries are concentrated mostly along the eastern coasts of Bahrain Island.

The Ministry of Finance vision for the national economy for the coming decade concentrates on building and expanding a knowledge-based economy, with six clusters of activities being selected to lead the drive. These clusters are information technology-based services, financial services, business services, healthcare, education and training, and tourism, while developing downstream industries to accelerate economic growth.

In the context of economic policy, the Ministry's vision seeks to balance the budget over the medium term while maintaining low levels of external debt. In order to achieve this objective, the Ministry is in the process of diversifying the revenue base through enhancing non-oil revenues and increasing the role of the private sector of the economy. The Ministry will continue to accord priority to safeguard social welfare and support infrastructure projects. Latest figure on GDP per capita was reported at US\$17,653 (6,673BD).

The provisional data for the national accounts indicate that Bahrain's economic growth rate in year 2007 rose by (8.1%) compared with (6.7%) in the year before, where the Gross Domestic Product (GDP) at constant prices increased to (BD 4440.6 million) from BD 4109.1 million during year 2006. This growth is ascribed to the improvement in most of the non oil sectors and other economic activities, particularly financial cooperation, manufacturing, construction, government services, education and health services, real estate and business activities. The GDP at current prices increased from BD 5960.3 million in year 2006 to BD 6936.0 million in year 2007 (or 16.4%) due to the rise in world oil prices and a substantial improvement in the performance of the financial co-operation sector, manufacturing, construction, real estate, and business services.

2.3. Demographic Characteristics

First population census was taken in 1941. Thereafter, seven censuses have been conducted in 1950, 1959, 1965, 1971, 1981, 1991, and 2001. The most recent population census was in 2001 where, total population was 650,604. A remarkable increase in the population has been observed since 1971 when it was approximately half of the current population. Average annual growth rate was estimated at 2.7% for the period 1991- 2001. In 2007, resident population was estimated at 1,039,297. The majority of the population is young of which 28% is under the age of 15. Quite a large percentage of the population lives along the coast or in very close proximity to it (taking into account the 12 km average width of the island). With a density of more than 1386 persons per square kilometer, Bahrain is considered as one of the most densely populated countries in the world,

Although the State of Bahrain is composed of various islands, the majority of the population is in the main Island Bahrain. It is the center for most activities and public services. The largest city is “Manama”, its capital and the principal commercial and cultural center. It had an estimated population of 159,319 in 2001.

Manama's expansion since 1960, when its population was only 62,000, has resulted in incorporating entire villages, fields, palm and fruit groves located to the east, north, and south of the city as part of the urban sprawl. Manama also spread to the west through the reclamation of hundreds of hectares from the sea. Muharraq, the second largest island Bahrain, lies northeast of the main island. It had an estimated population of 95,592 in 2001 and considered the country's second major city.

With an average annual population growth rate of 2.3%, the total population of Bahrain is estimated to be 1,039,297 in 2007 with the number of expatriates equals the number of the nationals. Approximately 92% of population is urban and lives within close proximity to sea. The Government of Bahrain has made significant improvements in raising the standard of living of the population. This can be inferred by Bahrain rankings of 41 among countries of the World and the highest among Arab countries in terms of Human Development Index (HDI).

A significant increase in life expectancy has been reached, from 63.5 in the seventies to 72.9 years in the nineties, with an index of 0.8 in 1999. Infant mortality rate dropped significantly from 55 per thousand births in 1970 to 13 in 2001. Literarily, one hundred per cent of the population has access to safe water, sanitation and health services.

2.4. Education and Health

Education in Bahrain is composed of three stages: Primary stage (6 years), Intermediate stage (3 years) and Secondary stage (3 years). Higher Education is available for graduates of secondary education and can be obtained through Governmental Universities namely, Bahrain University, inter-governmental university; Arabian Gulf University, and 12 recently established private universities, and specialized institutes. Noticeably, the numbers of students

and trainees enrolled in governmental and private schools as well as training centers are increasing. This underscores the high value attached to education and training by both the government and citizens. In this respect, the government spares no effort to establish new schools and training centers, and provide them with highly qualified teachers and most advanced education relate technology.

The number of students in the government schools bounds from 75,434 in 1982-1983 to 129,110 in 2005-2006, while the number of teachers jumps from 4409 to 10836 in the same period. Bahrain registered the highest gross school enrolment in the Arab region in 2007. The ratio for primary, secondary and tertiary education was 86.1 per cent for Bahrain.

Health Services in Bahrain started in 1900's. Since then, the Government is working very hard to provide advance free medical care to all inhabitants of Bahrain. Health establishment includes 4 hospitals, 6 maternity hospitals, 122 public health centers, 6 environmental health centers, and 20 child welfare.

The first formal Ministry of Health plan was introduced in 1989 and emphasized facility requirements, specifically the number of hospital beds. The second one was the National Health Plan, "Better Health for All 2000" covering the period 1993-2000, focusing on the following 10 priority areas: - cancer, circulatory and cardiovascular diseases, dental health, diabetes, hereditary diseases, injury prevention, respiratory illness, maternal and child health, mental and emotional health and physical and learning disability.

In 2000 a new document "Bahrain health Strategy – Framework for action was introduced with 12 strategic goals for the health system to be achieved in the period of 2002-2010. The goals do not address issues pertaining to a division or department in isolation, but provide a platform for focusing and integrating various efforts with the overall goal of organizational development. The 12 Goals are as follows: Health gain, quality-clinical excellence and performance improvement, primary care development; service development, new investment, partnership working, community involvement, organization and management, human, education, research and

development, financial management, information and communication technology.

2.5. Distribution and Settlement

The majority of the population is settled along the coasts of the main islands of the kingdom (Bahrain, Muharraq, Sitra, and Nabih saleh). The accelerated growth in population size, coupled with economic and social development has increased demand on land to cater for housing and development needs. This has forced local authorities to resort to the reclamation of shallow water coastal zones and the transformation of agricultural areas into urban and commercial areas. As a result, Bahrain's area grew from 670 km² in 1936 to 790 km² in 2009 - an average increase of 1.4 to 1.5 km² per year.

Bahrain's socio-economic development has been marked by an increased demand for land for urban development, and declining area under agricultural areas. Dredging and reclamation operations continue to expand Bahrain's coastal zones to accommodate for new residential and commercial areas as well as artificial leisure islands, seaports and bridges, and power generation and water desalination plants.

The number of housing units, buildings and installations increased by nearly 30% from 81552 in 1991 to 105, 686 in 2001, and is expected to exceed 231000 in 2030 equivalent to an increase of approximately 118 %.

The continuous increase in population had a significant role in increasing the demand for water and electricity. Demand for electricity had increased from 793 megawatts in 1992 to 2319 megawatts in 2006, while per capita annual electricity generated by 1.4% rose from to 6614 kilowatts/hours in 1991 to 6706 kilowatts / hours in 2006.

The fresh water (groundwater) is equal to 59% of the total annual water budget, while the rest comes from the desalination of sea and saline water. The water production has increased by about 66% from 22072 million gallons in 1991 to 36684 million gallons in 2006. The daily rate of consumption increased by almost the same percentage from 60.47 1991 to 100.41 million gallons in 2006.

The Kingdom of Bahrain is experiencing inconsistent disparity in population, buildings, built-up areas and lengths of paved and unpaved roads (main roads, secondary roads, routes and corridors). The development of road network is very slow compared with the large increase in the number of cars per year. The percent of increase is 7%, while the annual increase in the length of roads per year is around 3%. Because of this increase, it has become necessary to stretch the lengths of roads, bringing the total length of roads to 3942 km in 2008 compared to 2922 km in 1995.

2.6. Governance

The Kingdom, under the auspices of H.M. King Hamad Bin Isa Al Khalifa put the National Action Charter – considered, the blueprint for democratic reforms in the country – to referendum. It was passed by an overwhelming 94.8% of voters in February 2001. The political reform agenda included municipal and parliamentary elections, the most recent of which witnessed the participation of women, not only as voters but as competitors to male counterparts. In addition to the creation of an independent judiciary, a bicameral legislature was established with an appointed body (Shura Council) and an elected house (Consultative Council). United Nations Development Programme (UNDP) is supporting Bahrain's reform agenda through numerous capacity building measures and enhancing democratic and good governance principles; including the following initiatives, voice and accountability, political stability and lack of violence, government effectiveness, regulatory quality, rule of law, and control of corruption by implementing a participatory approach to policy development. This comprehensive framework initiative is elaborated on through different projects.

3. NATIONAL FRAMEWORK FOR SUSTAINABLE DEVELOPMENT

3.1. National Environmental Strategy

National environmental strategy was officially approved by the Cabinet of Ministers through Edict No. 02-1902 released during the session held on 8th October 2006. It contains a foresight and action thoughts for a number of environmental issues including air pollution and climate change, water conservation and pollution control, land resources, and marine and coastal

environment. Other sections of the strategy dealt with issues of mainstreaming environment into sustainable development. In this context, special attention was given to issues of tourism, transport and waste management. However, implementations of NES require action plan as the latest is being reviewed and awaiting formal approval.

3.2. Bahrain State of Environment Report (BSOE)

Work on Bahrain State of Environment Report (BSOE) was initiated in 2007. The aim of the report is to assess state and trend of the environment in the country and foresee possible development scenarios. Main issues dealt with in BSOE include marine and coastal environment, air, water resources, land use and biodiversity, and climate change. Work on BSOE is in its final stages.

3.3. National Biodiversity Strategy and Action Plan (NBSAP)

A national biodiversity report was prepared last year. Content of report is under consideration to be adopted as the first national Biodiversity report to biodiversity convention.

3.4. National Desertification Plan and Strategy

Bahrain national action plan (NAP) on combating desertification was prepared within the framework of sub-regional action program under the United Nations Convention to combat Desertification. NAP is currently under final review for formal adoption.

3.5. National Economic Strategy

The Kingdom of Bahrain seeks proper measures to mainstream environmental concerns in the national planning. This was affirmed in NES (2006-2011) and the National Economic Strategy (2009-2014). This comes in line with the new global governance of environment aiming at bringing about green solutions to development and promoting an environmentally-friendly economy at all levels.

In this regard, the National Economic Strategy prioritized sustainability in future economic growth, while taking environment into consideration. A five year set targets were elaborated upon in the strategy. Particular

concerns were given to actions aimed at reducing energy consumption, clean energy technology, enforcement of pollution control laws, Improving water resource management, and conservation of biodiversity.

3.6. The Economic Vision 2030 for Bahrain

The economic vision 2030 for Bahrain is based on the premises of promoting factors that drive prosperity of the Bahraini community. Within this context, three interrelated principles emerged, which guide Bahraini ambitions: sustainability, competitiveness, and fairness. It is envisaged that national authorities will seek promotion and finding the proper environment to enable Bahraini communities of achieving these premises.

3.7. Bahrain 2030 National Planning Development Strategies

Bahrain 2030 National Planning Development Strategies project put a development plan concentrating on the possible ways of integrating environment into development. More precisely, how environment can support development without repercussion impacts. The National Development Planning Strategies contains five parts dealing with mostly with economic issues and social welfare. Environmental issues were given a special attention too by emphasizing the necessity for conservation and protection of natural resources.

3.8. Bahrain 2030 National Land Use Strategy

The 2007 National Structural Strategic Plan presented a long-term vision for the Kingdom of Bahrain over the 2030 horizon. The Plan emphasized the need to incorporate environmental considerations in the planning of all major projects in the country. The plan reflects the desire of relevant authorities to balance between economic, social and environmental sustainability in an effort to achieve sustainable development.

3.9. Future Skills Strategy for Bahrain

This strategy is designed to support the creation of high value-added jobs for Bahrainis in rewarding careers and better match labour supply to future demand. The strategy outlines sector-based strategies to assist skills development in four areas expected to make a significant contribution to

economic growth and provide opportunities for Bahrainis in high skilled occupations. These areas include manufacturing, health, tourism, and infrastructure and Services sectors.

4. NATIONAL PROGRESS MADE & PROBLEMS ENCOUNTERED IN THE IMPLEMENTATION OF THE BPOA

4.1. Economic Vulnerability

Bahrain's economy is a market-based economy. The period 2003 to 2007 witnessed a rapid economic growth where GDP attained a 7.1% growth. The diversification of the economy is the main objective of the government economic policy. Oil contribution to GDP is about 18% while manufacturing, trade and financial corporation contributions amounted to 12%, 13% and 19% respectively.

However, government is striving for diversifying the revenue base through enhancing non -oil revenues and increasing the role of private sector in the economy. Currently, Bahrain's economy is one of the most diversified economies in the GCC countries. A number of measures were taken including joining the world trade organization.

One of the most remarkable achievements in the field of banking systems is the Islamic finance institutions. Today, Bahrain is widely recognized as a global leader in Islamic finance, playing host to the largest concentration of Islamic financial institutions in the world. Presently, there are 36 specialist Islamic banks operating in the Kingdom whilst many conventional banks, recognising the growing importance of Islamic banking, have successfully integrated Islamic windows within their operations

Being well integrated into the GCCs economies and World economy, the economy of Bahrain is considered vulnerable to financial fluctuations due to fluctuation of oil prices as such any downward fluctuations in oil prices would affect Bahrain's economy. Furthermore, Bahrain limited area is considered a disadvantage by itself as its socio-economic structure remains prone to natural disasters.

4.2. Environmental Vulnerability

4.2.1. Climate Change and Sea Level Rise

The Kingdom of Bahrain as a small island state has a limited capacity to adapt to relative sea-level rise and climate change, including accommodating landward migration of people and coastal habitats. This is a result of the small land mass, high population densities and population growth rates. All the country islands do not exceed 5 m above current mean sea level, and most development is located on narrow coastal plains. Thereby, it may be physically and economically difficult to retreat from landward coastal habitats, or establish zoning setbacks from coastal habitats for new development.

The first initial communications to the United Nations Framework Convention on Climate Change identified sea level rise (SLR) as the most serious threat of climate change to the Kingdom of Bahrain and its population. Models reveal that the kingdom of Bahrain is vulnerable to SLR under different SLR Scenarios. More than 17% of the country total area may be inundated under 1.5 m SLR in 2100. In this context, the total area that might be lost under different sea level scenarios will vary from more than 77 km² if SLR reaches 0.5 m, to about 100 km² under 1.0 m SLR and may climb to 124 km² under 1.5 m SLR scenario. The total inundated areas due to risk scenarios will reach 133 km², if the SLR rises to 2.0 m, which is estimated to be more than (22%) of the main island total area. Hawar islands, one of main islands of the kingdom, group would lose about (30%) of its total area under 2.0 m SLR.

Other threats include the socio-economic implications of climate change. This may include health and economic impacts. However, such detailed studies are lacking. In this regard the following actions have been taken:

- The framework for policy response to SLR is being suggested and under review. It started with acquisition of information, planning and design, implementation, and monitoring and evaluation. However, a range of policy adaptation options/initiatives to sustain coastal developments under the likely effects of SLR need to include cost benefit analysis of various options. It is imperative to take action in this regard and start adapting to upcoming threat through very detailed socio-economic studies to come up with most appropriate options. In

this regard, lack of capacity and shortage of finance are main impeding issues to be resolved.

- A national Climate Change Joint Committee (CCJC) was established through the Cabinet of Ministers' Edict No. 05-1926 released during the session held on 15th April 2007. CCJC main responsibility is developing national climate change policies and providing strategic guidance steering the decision-making process of various climate change activities/issues.
- Submitting Bahrain first initial communication report to the United Nations Framework Convention on Climate Change.
- Work is progressing on the second national communication report to the United Nations Framework Convention on Climate Change.
- Conducting a training workshop to introduce CDM to targeted sectors, where, CDM's mechanism, cycle and potential projects were demonstrated. Sectors that may potentially benefit from CDM were explored and identified too. In this regard, plans to strengthen relevant national capacities to maximize the benefits of Bahrain from CDM are being under preparation.
- Active Participation in the UNFCCC meetings and negotiations leading to Copenhagen COP15.
- Formulating a country position on issues of shared vision, mitigation, adaptation and mechanisms of implementation.
- Fundamental changes in power generation especially electricity production through installing efficient gas units and increasing efficiency of plants were major interventions of the government during the past five years.
- Clean production policy was adopted in most industrial activities and services.

4.2.2. Management of Wastes and Chemicals

Waste management is currently considered one of Bahrain's most important challenges as it poses intricate and complex problems for urban cities. Over the past thirty years solid wastes in Bahrain have grown in quantity and quality at an annual growth rate of 18.4%. Annual per capita reached 1,538 kg in 2008 which is the highest average per capita producer of domestic solid waste in the Arab region. Wastes include domestic, agriculture,

industrial and medical wastes. On the other hand, the total amount of hazardous waste reached 35,008 MT in 2007.

Waste problem has become one of the main challenges for sustainable development in Bahrain. The country is currently struggling to manage wastes from multiple sources including household (domestic), industrial, agricultural, and healthcare. Bahrain's waste management crisis is exacerbated by the accelerated increase in waste volume as limited geographical area, scarcity of safe waste-disposal sites, and the lack of environmentally appropriate technologies for waste handling and treatment problems prevails. Inappropriate waste handling and disposal can result in soil, water and air pollution. Solid Waste Management (SWM) has therefore become a national concern. In this context, the following measures were taken by authorities:

- A multi-disciplinary committee for environmentally sound management of waste and chemicals was established with a main task of preparing a national strategy for implementing Agenda 21.
- A decree No.4 was issued in 2005 to regulate disposal of industrial wastes.
- A decree No.3 law was issued in 2006 which regulate disposals of hazardous wastes.
- Initiating a public awareness campaign to reduce/minimize wastes and rationalize consumption.
- A number of initiatives were launched. These include, setting standards and environmental criteria for waste management, encouraging recycling of wastes, and building waste data base for monitoring and management purposes.
- A comprehensive national strategy for waste management is yet to adopt in the country.

4.2.3. Coastal and Marine Resources

The coastal zone plays an integral role in Bahrain, serving as home to most of the population, providing recreation opportunities and supplying numerous valuable products and ecological services. Coastal and marine resources are of great importance as artisanal fishing is predominant. The number of fishermen in the country is about 6000. At the same time, these

areas are constantly evolving and facing a wide range of natural and human-induced stresses, including pressure from development and recreational activities. Major sources of pollutants are oil explorations, industry and shipping. Land-based pollutants include domestic sewage, agricultural and industrial wastes. These wastes eventually find their way to the sea. Domestic sewage is partially treated and significant amount of it is discharged into the sea. Continued dredging and coastal reclamation operations are putting additional pressures on coastal and marine habitats, especially coral reefs.

Bahrain is a member of the Regional Organization for the Protection of Marine Environment (ROPME) and joined a number of multi environmental conventions dealing with seas. The following national measures were taken to protect coastal areas:

- Plans are being prepared to adopt an integrated coastal area management (CAM) approach for strategic planning.
- Building a fish stock and other marine fauna database
- Mandating environmental impact assessment (EIA) for newly established projects.
- Declaring mangrove associations at Tubli Bay and Hawar islands and their marine surroundings as wetland protected areas.

4.2.4. Freshwater Resources

Water resources are scarce in Bahrain. The country is totally dependent on groundwater resources and on desalination plants to meet its demand for freshwater. Groundwater contributes to 54.6% of total demand while desalinated and treated wastewater contributed by 35.6% and 9.7% respectively. Steady and heavy use of ground water resulted in substantial groundwater level decline coupled with deterioration of its quality. Five desalination plants exist in the country with total annual capacity of roughly 132.3 Mm³.

The government has taken a number of actions to alleviate pressures on groundwater resources including the followings:

- Strictly enforcing laws to reduce groundwater abstraction for agriculture and increasing its efficiency use.

- Expanding the use of recycled wastewater in watering forage crops and landscapes.
- Continuation of public awareness campaigns to reduce water consumptions.

4.2.5. Land Resources

The majority of soils in Bahrain are mostly sandy with poor physical and chemical characteristics. They are vulnerable to wind erosion if left unprotected. Valuable arable lands are located along the western coast of Bahrain island. Date palms, vegetables and forage crops are the major commercial commodities. The arable lands decreased by almost 60% from 11,000 hectare in year 1985 to 6,400 hectare in 2007, while the actual cultivated areas decreased by 6% between the years of 1995 and 2009.

Most farmlands are experiencing some form or another of desertification. Salinity rises in cultivated lands due to ground water depletion and seawater intrusion. Furthermore, high demand for housing and recreational facilities has its toll on arable and range lands. Most of valuable agricultural lands and wild land have been converted to residential areas as prices of lands have soared and demand continued to escalate.

Land scarcity, coupled with high population density, and strong demand for housing and commercial compounds forced authorities to review building codes and allows for high-rise buildings. The following actions were taken to protect land resources:

- Regulating waste dumping throughout Bahrain.
- Adopting a strict policy on the use of listed agricultural chemicals to reduce environmental pollution and control its impact.
- Regulating the conversion of farms into other land uses especially urban development.
- Conducting projects for land reclamation and desertification control.
- Formulating a national action plan for combating desertification in the framework of sub-regional action program of UNCCD. Main themes of this plan include, but not limited to awareness raising, promoting research and studies, efficient utilization of groundwater and treated sewage effluent, developing comprehensive water

resources management plan, improving existing land drainage, and capacity building.

4.2.6. Biodiversity Resources

Bahrain is relatively rich in Biodiversity with hundreds of species of flora and fauna. Still, urbanization, industrial and oil pollution, and over-fishing are forming major threats to biodiversity components in Bahrain. Forms of biodiversity degradation include habitat degradation and species loss, as well as invasive alien species. Coral reefs, mangrove associations, coastal salt marshes, inland Sabkhas and beaches are the main coastal ecosystems. They provide invaluable ecological and economical functions. The marine ecosystem is rich in fish stocks, sea grasses and corals. For instance, mangrove habitats which are the only natural woody vegetation are considered remains of a larger area offering many ecological services.

Unfortunately, mangrove associations are now experiencing severe threat due to reclamation for coastal development. Bahrain joined the Convention on Biological Diversity (CBD) and is currently implementing its provision. National Biodiversity Strategy and Action Plan (NBSAP) was prepared in Bahrain and awaiting final adoption.

In general due to the limited scale of monitoring programs, it was difficult to draw thorough quantitative conclusions regarding the status and trends of biodiversity at the ecosystem, species and genetic levels. The trends at the ecosystem level seem unlikely to be promising given the accelerated urbanization, particularly in the northern Bahrain.

The following highlights actions undertaken or in progress:

- Formulation a National Biodiversity Committee
- National Biodiversity Strategy and Action Plan (NBSAP) is being prepared and currently under final review. When completed and implemented, NBSAP will promote national effort of protection of biodiversity and sustainable use of its components.
- Declaration a number of protected areas in the country including Tubli Bay (Ras Sand) and Hawar islands.
- Enacting over a 17 decree related to biodiversity conservation.

- Amiri Decree Laws were enacted to protect areas such as Hawar Island Mangrove area, which are well-known internationally as wet land areas.
- Public awareness campaigns are being main instrument of promoting biodiversity conservation. Various publications are being prepared and distributed periodically.

5. NATIONAL INSTITUTION AND ADMINISTRATIVE CAPACITY

Environmental governance in Bahrain has developed along the years parallel to socio-economic development of the country. After several amendments and restructuring decrees, The General Directorate for the Protection of the Environment and Wildlife is currently the authority that is in charge of environmental affairs in Bahrain. With a wide spectrum mandate, the Authority works as an implementing and coordinating agency among various ministries and institutions. The agency is required by law to coordinate environmental issues among ministries, and follow up environmental development at regional and international levels. GDPEW lacks technical capacities and is in very much in need for adequate technical, technological and financial support.

6. SCIENCE AND TECHNOLOGY

The National Environmental Information Unit (NEIU) was established in 2007 with a primary objective of developing a central environmental database providing information of particular significance to decision-makers, researchers, environmentalists as well as public. However, maintaining stations, collecting and storing information, as well as converting data to information for the purpose of decision making require technical skills which is currently inadequate. Capacity building and steady adequate financial support are needed in this regard.

7. IMPLEMENTATION, MONITORING AND REVIEW

Implementation is rather modest in all aspects of environmental management despite political and institutional commitments. This is attributed to a number of reasons. The most notable one is the lack of financial resources as

the latest being directed towards other sectors of the economy. The second major factor is the weaknesses of environmental institutions in terms of technical capacity. Generally speaking political and institutional commitment is long-rooted, but achievements are neither comprehensive nor substantial.

Furthermore, there are other challenges that must also be overcome to properly address vulnerability aspects in Bahrain. It starts with inadequacy of information and research material on the vulnerability of communities and ecosystems to climate change in general and SLR in particular taking into account possible adaptation options. Technology and skilled human resources are inadequate to address such a very complex and delicate issue, especially availability of necessary data and developing a local/regional climate models. Lastly, the difficulty in integrating climate change precautions, SLR in particular, in planning and management cycle due to lack of socio-economic analysis of the impact incurred by the phenomena.