


THE COUNCIL OF MINISTERS APPROVED
THE NATIONAL ENVIRONMENTAL STRATEGY
BY EDICT NO. 02 - 1902,
AT THE SESSION HELD ON 8TH OCTOBER 2006





Final review and editing by:

Professor Ismail Mohammed Al-Madani, General Directorate
for the Protection of Environment and Wildlife

Professor Waleed Khalil Zubari, Arabian Gulf University

Dr. Asma Ali Aba-Hussain, Arabian Gulf University

Eng. Abdul Rahman Darweesh, Ministry of Electricity and
Water

Eng. Zahwa Mohammed Salim Al-Kuwari, General Directorate
for the Protection of Environment and Wildlife

Eng. Suzan Mohammed Al-Ajjawi, General Directorate for the
Protection of Environment and Wildlife

Executive Director: Dr. Shakir Khamdan, General Directorate
for the Protection of Environment and Wildlife

The National Environmental Strategy

Contents

Subject	Page
General background	12
Section 1:	14
Human development and the environment in the Kingdom of Bahrain:	14
- Man and the environment	16
- Future principles of human and environmental development.	19
Section II:	20
The institutional and legislative framework of the Environment in the Kingdom of Bahrain:	20
- The General Directorate for Protection of Environment and Wildlife	23
- Strengthening the capabilities of the environmental institutional and legislative framework	26
Section III:	30
Environmental media and natural resources management:	
1- Air	30
- Key environmental issues	30
- The strategic vision	32
2- Water:	34
- Key environmental issues	35
- The strategic vision	36



Subject	Page
3- Exploitation of land resources:	38
a- Agriculture:	38
- Key environmental issues	38
- The strategic vision	40
b- Other land uses:	42
- The strategic vision	42
4- Marine and coastal environment:	43
- Key environmental issues	44
- The strategic vision	44
 Section IV:	 46
Issues crosscutting with the environment	46
a- Tourism and environment in Bahrain	48
- Key environmental issues	49
- The strategic vision	49
b- Transportation and the environment	50
- The strategic vision	51
- Key environmental issues	52
c- Wastes management	52
- Key environmental issues	52
- The strategic vision	53
Conclusion	54
List of members for the National Strategy Task Force	56

The National Environmental Strategy



At a historic convention held in 1992 in the City of Rio de Janeiro, Brazil, the United Nations called on and impressed upon the member states the imperatives of considering the environmental considerations when drafting their developmental plans in all sectors, and the need for the introduction of suitable mechanisms and tools for implementation of sustainable development policies.

In response to this call, and as part of our endeavours towards total and sustainable development in the Kingdom of Bahrain, the Public Commission for the Protection of Marine Resources, Environment & Wildlife embarked upon its role and responsibilities to implement the directives of the international community. This has involved initiating a National Strategy on the Protection of the Environment as of the year 2002. The Commission launched its effort to develop the national strategy based on the principle of collective participation and involvement and invitation of all sectors and organizations of the Bahraini community to take part in this national endeavour. This included government authorities, such as ministries and organizations, as well as relevant civil society



institutions, universities and research centres. A substantial support was received from the United Nations Developmental Program (UNDP). The first phase witnessed the formulation of the foundations for the development of the preliminary document and procedures, which was worded on the basis of reports generated by nine sectors concluded to be of importance and priority in the developmental projects of the Kingdom of Bahrain under the supervision of international and local experts.

Im pleased to present the National Environmental Strategy document. It is intended to ensure the national support for finalization of the procedures required and for the transformation of the strategy into a tangible reality and practical programmes, which will culminate in the drawing up of a national action plan for implementation of this document in line with the development plans and programmes in our beloved Kingdom.

Abdulla bin Hamad Al-Khalifa,
Chairman,
Public Commission for the Protection of Marine
Resources, Environment & Wildlife

The National Environmental Strategy



One of the cornerstones and prerequisites for the success of the environmental action and achievement of sustainable environmental development involves the formulation of appropriate, practical and comprehensive strategies. Clarity of vision, methodology espoused by all authorities concerned with the protection of the environment and its living and inanimate natural resources require the definition of the near and distant term objectives, followed by the development of the suitable implementation programmes and plans that would ensure achievement of the practical implementation of this strategy.

The Constitution of the Kingdom of Bahrain clearly mentioned in Article No. 11, the significance of the State's preservation and sophisticated investment of its natural resources. The National Action Charter has demonstrated in the Third Chapter, the attention that the Kingdom allocates to the development of a national strategy for the protection of the environment and prevention and the solution of major environmental problems. Over and above, the Constitution of the Kingdom of Bahrain sought to consolidate this important environmental aspect by requiring the State in paragraph 1 of Article 9 to take the necessary actions and arrangements to maintain the environment and preserve the wildlife.

The environmental conversation can be achieved with the cooperation and



support of all government authorities, such as ministries and organizations. It also requires the involvement of non-governmental establishments, such as civil society organizations and individuals. Additionally, the United Nations' Developmental Program (UNDP) is involved to participate in integrated task force in order to achieve this general strategy for the protection of the environment, which covers all developmental sectors.

It gives me great pleasure on this auspicious occasion to extend my thanks and appreciation to all ministries , government and non-government organizations, national and international experts and members of the committees , for all the assistance and support they have extended to us and for providing their valuable remarks and comments. Meanwhile, I appeal for more collective and joint by all concerned endeavours for achieving the target objectives . Namely the comprehensive and total development.

Professor Ismail Mohammed Al-Madani,

Deputy Chairman,

Public Commission for the Protection of Marine Resources, Environment & Wildlife

Director-General,

Protection of Environment and Wildlife

The National Environmental Strategy



In the year 2005, the leaders of the world made a promise to achieve what was termed "the objectives of the third millennium". There are eight specific objectives placed within a specific timeframe, and all countries of the world are striving to attain them by 2015. In December 2005, leaders of the world met again in the United Nations in New York to deliberate and discuss together the magnitude of progress made in attaining the objectives of the third millennium. This meeting represented a rare opportunity for the adoption of conclusive and definitive decisions for handling challenges, which involve development, security, human rights and the restructuring of the United Nations. One of the net results of this summit was a concrete and unconditional commitment and agreement by all governments of the world on the imperative of attaining the objectives of the third millennium by 2015.

The experts concerned with the issues of the environment have been aware that attaining the objectives of the third millennium, at the top of which is the elimination of poverty, will require the management of natural resources in a sustainable manner and utilization of non-renewable energy sources and alternatives. Over the recent years, environmentalists have been aware of the impact of the deterioration of the environment on human development and that the greatest burden of this impact will affect the poor world in the form of deterioration of land resources, air and water pollution and extermination of the ecological diversity. As a result, the seventh objective of the third millennium, which involves the need to protect the environment and its management in a sustainable fashion, does occupy a very special status among the objectives of the millennium.

As far as the Kingdom of Bahrain is concerned, discovery of oil in the year 1932 marked the beginning for achieving high rates of economic and industrialization development. It has also set the appropriate conditions and stage for explosive rates of population growth and urban expansion. This development carried in its folds ramifications on the water and natural resources. Being keenly aware of the fact that the development



must be achieved within the framework of proper management of the environment, such attainment of a measure of sustainable development would call for a joint effort between the Public Commission for the Protection of Marine Resources, Environment & Wildlife, on one hand, and the appropriate authorities of the State on the other. In order to benefit from the experiments of a number of countries in this field, a cooperation agreement was signed between the United Nations Developmental Fund and Public Commission for the Protection of Marine Resources, Environment & Wildlife for the purpose of formulating a national strategy and work plan for the environment in the Kingdom of Bahrain. Thanks to the continuous commitment by the Government of Bahrain to treat and resolve the issues of the environment, this strategy has borne fruits whose key elements will be consolidated in a work plan to be implemented by all the parties concerned and in cooperation with the United Nations Development Programme and other competent international bodies. This endeavour has been characterized by the proactive participation of all agencies concerned with the environmental affairs from the various sectors under the leadership of the Public Commission for the Protection of Marine Resources, Environment & Wildlife and the Directorate General for the Protection of the Environment and Wildlife. We look at this experiment as one of the successful action, which will no doubt produce a qualitative change in the management of environmental issues and will contribute to attain the objectives of the third millennium as far as the Kingdom of Bahrain is concerned. The United Nation is hopeful that this document will serve as a basic building block for taking the appropriate decisions related to the management of the environment.

Sayed Agha,

United Nations Resident Coordinator,
Resident Representative,
United Nations Development Programme (UNDP)

The National Environmental Strategy

General background:

The document of the National Environmental Strategy in the Kingdom of Bahrain has been prepared under project document No. BAH/01/004, signed on 2nd May 2002 between the Public Commission for the Protection of Marine Resources, Environment & Wildlife and the United Nation Development Programme (UNDP). The Bahraini specialists (listed in Appendix No. I) of the General Directorate for the Protection of the Environment and Wildlife and the other concerned ministries and organizations developed the detailed papers on the proposed sectors while one of the United Nations ESCWA experts wrote the titles in September 2000. The document covered the following sectors:

- Air.
- Water.
- Land uses and agriculture.
- Marine and coastal environment.
- Environment health.
- Oil, industry and energy.
- Environmental awareness and tourism.
- Biological diversity.



In December 2003 an international expert was commissioned to work for two weeks on reviewing the progress of the teams and their initial reports. The report was reformulated in mid January 2004 for better highlighting the issues directly related to the National Environmental Strategy. The drafting of the reports was rewritten in accordance with the proposed structure. The final draft of the National Strategy in the Kingdom of Bahrain was finalized in April 2004. The foundations of this national strategy are the reports filed by the proposed sectors. This included the expanded summary of those reports drafted as a document to be used in the formulation of the strategy and the key themes in light of which the projects of the subsequent environmental action plan will be developed.

A unique natural and geographical characteristics of the Kingdom of Bahrain, is being a small island nation (population estimated at 707,200 – 2004 figures). Recognizing Bahrain's rates of human, economic and social development, as well as sensitive ecological system, and the limited land area, the strategy highlights the reciprocal connection and interrelation between the environment and the economic and social development. The future vision of the environment may be based on this uniqueness of the Kingdom for



the purpose of maintaining the sustainable human development, economic growth and natural resources, coupled with the prevention of environmental deterioration and depletion of resources. These factors will be incorporated in the environmental action plan and translated into environmental projects and procedures, based on the development of the applications of sound environmental management. It is also based on strengthening the creation of an effective mechanism for environmental surveillance where the Bahraini community and all its civil organizations will contribute subject to the following principles:

- Taking precautionary actions to prevent further environmental deterioration;
- Introducing the polluters pay principle;
- Adopting participatory counselling principle;

Considering the importance of strengthening the institutional and legislative aspects of the issue, in addition to adequate reinforcement of the environmental decisions, the strategy document discussed the importance of building and enhancing the capacities of the institutional and legislative aspects of the environment. The strategy document also addressed the status quo of the environmental media in which human being lives and derives benefits from, namely water, air; land resources application and the land and marine environment. The document also mentions the overlapping topics, namely tourism and the environment, transportation and the environment, wastes and municipal waste management resulting from the activities of the oil, industry and energy sectors as being the greatest source generating gaseous, solid and liquid waste in the Kingdom of Bahrain.



The National Environmental Strategy



Section One:

Human and environmental
development in the Kingdom of Bahrain





fortresses that are still visible to the eye today at various locations. The ancient civilizations are also manifest in Barbar and Saar twin temples, Aali burial mounds, Bahrain Fort, Arad Fort, and Al-Khamis Mosque. In more recent times, man gravitated toward the sea to highlight his proficiency in taking advantage of this important environmental medium, leading to a flourishing wooden shipbuilding, pearling and fishing industries. The Bahraini people were also interested in utilizing spring water in cultivating palm tree groves, thereby creating a sustainable balance between fulfilling their living demands and the exploitation of their environmental resources.

The discovery of oil in the year 1932 brought about the changes in living standards, lifestyles and types of nutritional demand leading to an urban expansion with which the visible boundaries between the village and the city gradually disappeared. All this has culminated in the deterioration of agricultural lands. The urban expansion spread to the coasts, leading to the burial of extensive coastal areas to the extent that the rate of increase in the area of Bahrain reached about 5.1 kilometres annually. Construction of King Fahd Causeway in the year 1986 ushered in a qualitative leap in the number of visitors to Bahrain, which contributed to the accelerated growth in the activities of the tourism sector and other associated businesses. This has also contributed in making a change in living patterns and the nature of social relations. These changes have in turn had their own impact on the environmental media and natural resources. The environmental pollution sources and problems and resource depletion exacerbated with the exponential effect of the limited area of Bahrain.

Since man is the focus, tool and target of development, conservation of the environment and sustainability of resources therefore represent, the key challenges for an environmental strategy that would ensure sustained economic growth. It will take into consideration a population growth rate of 2.7 (between 1991 and 2001 censuses) and confined land area and a population density of 950 persons / one square kilometre, which is, one of the highest in the world.

The Kingdom of Bahrain has made during the past few years some impressive achievements in the area of human development, ranking, the top across the Arab countries and the 37th rank worldwide for the year 2005. Similarly, the Country's interest in boosting the role of young people on the issues of the environment reflected in a positive way by the dedication of an independent chapter on the environment as part of the national strategy for youth in order to promote the concept of youth participation in the environmental awareness drive.

Examination of the health indices would reveal that the statistics indicated that the percentage of children who have been inoculated against children diseases (polio, whooping cough, German measles, tetanus and diphtheria) totalled to 99.9 % in the year 2002.

Where education is concerned, the Government of Bahrain does encourage education to the

The National Environmental Strategy

extent that, in the school year 2001-2002, an enrolment percentage of 100 % was achieved in primary education and 73% in secondary education. This increase was attributed in part to increased investment in the education sector, which amounted to 3.3% of the gross domestic product, excluding university education, coupled with increasing the allocation for each student by 25.5% in the year 2001, compared with the year 1991. At the level of university education, the number of students enrolled in the University of Bahrain in the academic year 1990-1991 raised from 3,595 students and to 19,000 in the academic year 2001-2002.

The fundamental challenge before Bahrain lies in promoting the content of all education stages, including environmental education, and enhancing both the quantity and quality of the education subjects, particularly the subjects related to informatics, technology and applied sciences, matching with the standards of the 21st century in order to meet the requirements of the local labour market. In spite of the growing numbers of graduates, the labour market in the Kingdom of Bahrain is barely capable of accommodating the total number of school and university graduates, especially those who have received conventional education. At the same time, pressures are growing for investment in the existing education system, not only to accommodate the increasing number of children to be enrolled in schools, but also to grant the opportunity to more citizens to obtain higher standards of education. The number of females exceeds males in all levels of education, subsequently the percentage of unemployment is also higher among women, which necessitates for a change in the traditional look at the woman's role in the community, economy, and in the workplace, and increasing her role in the environmental area. It is worth noting that the Bahraini woman assumes a significant role in the various environmental issues. This role of the woman is not confined to environmental education and awareness raising at schools and providing environmental education for children at home only, but it also actually transcends these boundaries to active involvement and participation in popular societies and organizations in general as well as in specialized environmental organizations and environmental employment positions in the government and private sector. With the growing importance of the woman's role in the area of environment, the Supreme Council for Women has dedicated an independent chapter in the charter of the National Strategy for the Promotion of the Bahraini Women. The chapter focuses on educating the women, building their capacity and ensuring their participation in the conservation of the environment and contribution to the sound management of the natural resources. The Council has also instituted among its permanent committees, a committee called the Committee on Health, Population and Environment whose efforts will concentrate on amplifying the woman's role in conserving the environment and its



natural resources and investing in and boosting the woman's role in educating the young on the sound environmental behaviour:

The future principles of human and environmental development:

The National Environmental Strategy of the Kingdom of Bahrain will be based on the following principles:

- Improving the status quo of the environment;
- Taking the precautionary measures to prevent environmental deterioration;
- Imposing fines on the people and organisation causing the pollution resulting in environmental damages;
- The principle of partnership.

The mechanism for implementation of the environmental policies and procedures will be based on the following:

- Requiring the projects to carry out an environmental impact assessment study during the planning phase and at the time of implementation and after commissioning;
- Adopting the sound environmental management principles in the integrated management of land and marine areas and embracing the mechanism for the appraisal (establishing a price) of the value of the environmental resources in the various activities and determination of the cost of deterioration, as well as the cost of rehabilitation of the environment thereafter;
- Enhancing the capabilities of the agencies in charge of the environment and strengthening their institutional and legislative capacities.
- Involving the citizens through their popular organizations and municipal councils in the environmental monitoring and surveillance, and in the decision making process related to the management of environmental resources and their sustainable development in their areas.
- Paying attention and giving priority to the treatment of the harmful effects of environmental pollution on the public and human health.
- Taking the necessary action on an urgent basis to bring to an end the continuous and ongoing environmental deterioration, as well as for the protection of the green belt, treatment of the environmental problems in environmentally sensitive areas, such as Tubli Bay, Ma'aameer, Hidd and other areas, where the intensity of environmental damages has aggravated.
- Expanding treatment, and utilization of sanitary drainage water and its applications;



The National Environmental Strategy

Section two:

The Institutional and Legislative Framework of the Environment in the Kingdom of Bahrain



The National Environmental Strategy

In spite of the recent history of association between the environmental affairs and the economic and social development, the Kingdom of Bahrain has enacted over the past three decades several laws, Royal decrees and ministerial orders. These legislations are designed to regulate the utilization of the natural resources related to the environment and to preserve their sustainability so that they may keep pace with the accelerating development growth. These laws, decrees and orders cover the streamlining of the authority concerned with the environmental affairs and ratification of regional and international environmental treaties and agreements.

Also, the environmental legislations in the Kingdom of Bahrain embody several of the special laws, resolutions and agreements related to the environment and the utilization of environmental resources which fall under the jurisdiction of other ministries and executive agencies.

It is mandatory that a process of review be undertaken for the laws and orders on a regular basis (say every ten years) during the initial stage of economic development and at shorter intervals, if necessary. This calls for the joint efforts of an integrated task force of legal specialists in the first place, who can solicit the assistance of technical specialists and specialized scholars on needed basis. Such laws may be revised and updated at longer intervals once the legal awareness is elevated to higher levels and the commitment for compliance with enforcement of the laws turns into a normal daily behaviour of all categories of the community.

legislative - Decree No. 21 for the year 1996 with respect to the environment aims at protecting the environment against polluting sources and factors. It also aims at preventing environmental deterioration by introducing plans and policies required for the preservation of the environment against harmful effects resulting from activities that cause damage to human health, agricultural crops, marine and land, and other natural resources, as well as climate. Such plans and policies will provide for appropriate actions, and measures to eliminate or minimize the environmental deterioration in all forms and shapes for the benefit of current and future generations, through realization of the objectives of sustainable development.



The General Directorate for the Protection of the Environment and Wildlife:

Bahrain established under Amiri Decree No. 7, (promulgated in August 1980) the Committee for the Protection of the Environment. The Technical Secretariat for the Protection of the Environment was set up as an executive arm of that Committee. This reflects the early interest of the political leadership in environmental affairs. The accelerated economic growth in the Kingdom made it clear that the sound environmental management and regulation of the sustainable utilization of the natural resources represented a guarantee for sustainable economic development, enhancement of the standard of living and the quality of the life of citizens. Based on this premise, legislative - Decree No. 21 for the year 1996 was promulgated providing in Article 3 thereof as follows:

“ The environmental authority shall be in charge of issuing decisions and instructions on all matters related to the environment and shall exercise all powers and authorities required for this purpose, including the following, in particular”:

- 1- Draw up plans and policies and supervising their implementation in a way conducive to realizing its objectives.
- 2- Participate in the formation of a scientific research policy related to the environment in cooperation with the competent authorities.
- 3- Demand to be provided with the information it deems necessary from any agency engaged in an activity that may lead to pollution or deterioration of the environment.
- 4- Review the contracts and agreements that grant rights to or entails obligations on the environmental authority.
- 5- Other jurisdictions set forth in this Law.

legislative - Decree No. 21 for the year 1996 defined at that time the environmental authority as being the body concerned with the environment, which reported to the Ministry of Housing and Municipalities. However, Decree No. 41 for the year 2002 was issued subsequently on the organization of the Public Commission for the Protection of Marine Resources, Environment and Wildlife. It was followed by Decree No. 50 for the year 2002 on the establishment of the Public Commission for the Protection of Marine Resources, Environment and Wildlife,

The National Environmental Strategy

combining all authorities concerned with the environment under a single umbrella. Article 4 of Decree No. 4 for the year 1996 on the environment, provided that the environmental authority, for the purposes of achieving its objectives, may cooperate and coordinate with all concerned agencies in order to achieve the following:

- 1- Prepare standards, guidelines, and legislations and issue regulations that would ensure the safety, protection and development of the environment.
- 2- Propose nationwide, research and study of overall plans and policies on environmental matters and concerns.
- 3- Review and discuss national plans and policies established by the ministries, and government organizations, institutions and companies that are engaged in an activity that may have an impact on the environment. Also, propose solutions for any environmental problems or constraints related to these programs and projects.
- 4- Research, study and prepare with proposals and solutions to any problems or issues related to the environment that may be referred to by the Council of Ministers or any other official or informal agency in the Kingdom.
- 5- Perform and supervise comprehensive discussion papers and studies on the pollution and monitoring of its harmful and negative impacts on the health and the environment, as well as take all necessary and feasible preventive measures to minimize all forms and kinds of environmental pollution and prevent environmental degradation.
- 6- Establish the necessary concepts for linking the environmental considerations to the planning and development policy nationwide through the introduction of the environmental management concept as an integral and inseparable part of the designated policy of planning, follow up and implementation of developmental projects which are being implemented by the government authorities or the private sector after evaluation of the environmental benefits of the projects.
- 7- Monitor the public and private activities that may have a negative impact on the environment.
- 8- Study the nature of the soil, water and energy and propose ways and means to conserve them against degradation and reduction of efficiency, while applying the necessary controls to minimize abuse and destruction.
- 9- Study the nature of the coastal areas and marine environment and propose ways and means for the protection, development and conservation of resources.
- 10- Propose and promote preventive measures related to minimization of marine



- pollution by oil and other harmful substances and activities, as well as train and qualify the workforce for efficient implementation of pollution control plans.
- 11- Set up a reference laboratory and induce qualified technical manpower and equipment required for its successful operation.
 - 12- Identify and monitor the controls and allowable limits for the levels and concentrations of environmental pollutants.
 - 13- Promote awareness in the educational, media, highlight social and cultural aspects designed to increase and boost environmental awareness and knowledge, and consequently enable the communities to effectively participate in the achievement of the objectives sought from conservation and development of the environment.
 - 14- Draw up the necessary plans and programs required for training and qualifying technical staff in the field of environmental affairs.
 - 15- Take comprehensive stock of the problems resulting from human settlement and track the effects of growth of the economic and social circumstances on human clusters and their impact on the environment, as well as propose and execute programs that would provide suitable solutions for such problems.
 - 16- Draw up systems that would guarantee the gathering, analysis and exchange of data and information by utilizing research institutes and specialized organizations and societies in the area of environmental affairs within and outside the country.
 - 17- Review the international, regional and arab conventions and treaties related to the environment and coordination with the concerned authorities in its applications and enforcement.
 - 18- Coordinate with the competent authorities national, regional, international arab organizations concerned with environmental affairs.
 - 19- Identify the controls and monitoring mechanisms related to the importation, handling and utilization of chemical and radioactive substances, and monitoring their uses and applications.
 - 20- Establish control and monitoring mechanisms for the sound management of industrial, health care and domestic wastes.
 - 21- Coordination with the regional and international organization regarding the safety, protection, and conservation of the environment.

The National Environmental Strategy

Strengthening the Capabilities of the Institutional and Legislative Framework of the Environment:

Execution of the duties entrusted to the General Directorate for Protection of Environment & Wildlife, as provided for in Article 4 of Legislative - Decree No. 21 for the year 1996 on the environment requires building the capabilities of the organizations of the General Directorate for Protection of the Environment and Wildlife. Such duties, and tasks include the contribution to the implementation of the objectives of the environmental strategy through the implementation of environmental action plan. It will also be imperative to make available the following mechanisms:

- The General Directorate for Protection of Environment & Wildlife must serve as an organ capable of communications at ministerial levels to make the coordination process with the government authorities and official agencies more effective and fruitful, and to have the government decisions on the environmental considerations assume the force of law;
- The General Directorate for Protection of Environment & Wildlife must have the capability to provide advice where the environmental issues are concerned in the relevant proposed laws, legislative decrees and ministerial orders. As an organization, the General Directorate for Protection of Environment & Wildlife must also possess the capability to participate in providing legal opinion on how to apply the environmental rules and regulations;
- The General Directorate for Protection of Environment & Wildlife must be in possession of the required flexibility and financial wherewithal to conduct environmental studies and research in cooperation with other research centres and institutes in the Kingdom, as well as the ability to coordinate with and support private organizations concerned with environmental issues;
- The General Directorate for Protection of Environment & Wildlife must have the technical and technological capability to coordinate with other government organizations and commissions in the Kingdom on the environmental issues embodied in this strategy and to coordinate the subsequent projects which will be



initiated the strategy, such as the issues of integrated management of the coastal areas and the integrated management of water resources, assessment of the environmental impact and appraisal of the environmental resources;

- The other government bodies and organizations in the Kingdom of Bahrain must maintain administrative technical liaison points for effective coordination with the General Directorate for Protection of Environment & Wildlife in connection with the sustainable management of the natural and environment resources and with the reinforcement of the participatory methodology in the management of the environment. The General Directorate for Protection of Environment & Wildlife must also have the capability to enhance capabilities and organize training programs not only for its own personnel, but also for the personnel of other concerned government authorities and bodies, as well as environmental activists in private organizations, public welfare organizations and municipal councils for coordination of sustainable management of environmental and natural resources;

On the legislative front, it is important to highlight the significance of reviewing the existing legislations, rules and regulations on the jurisdictions of the various government organizations concerned with the environment in order to eliminate the gaps, loopholes and deficiencies in such legislations. It is also aimed to eliminate conflicts and redundancies in the environmental laws, rules and regulations, and clarify the texts and languages, which will consolidate the capabilities related to laws and agreements within the General Directorate for Protection of Environment & Wildlife.



The National Environmental Strategy

Section Three:

Environmental Media and Management of Natural Resources





The National Environmental Strategy

The environmental strategy is primarily based on the importance of the conservation of the elements of the environmental media related to habitation on land, such as air, water and earth resources, coupled with due consideration of the current environmental status. The strategy is also based on the sound management, conservation and optimum investment for the purpose of sustainability of the natural resources and environment, including marine and coastal environment, natural sanctuaries, and fishery resources

I-Air

Over the past two decades, the Kingdom of Bahrain has experienced comprehensive developmental and economic growth in a number of sectors, including the industry, communications and tourism sectors. This growth has resulted in the diversification and increase in the atmospheric pollution sources. Currently, the transportation and industry sectors and power generation and transmission are the primary sources for aggravating the problem of air pollution in the Kingdom of Bahrain. Since public health and safety are the key concerns of the environmental safety and health, the quality of air and sanctity of the atmosphere remain the main topics in the formulation of the environmental strategy.

Air Pollution:

The air pollution is defined as the presence of one or a combination of pollutants in the air in quantities and concentration levels and for durations that may cause damage to public health or comfort, or disable his ability to perform work or life.



Industrial emissions- are one of the reasons for air pollution

Key Environmental Issues:

The key environmental issues where the quality of air is concerned lies in the following aspects:

- Lack of information on certain pollutants and the small number of air quality monitoring stations (currently there are five mobile monitoring stations in the Kingdom of Bahrain).
- Shortage of technical personal



Carbon mono oxide (CO):

This is an odourless and colourless gas that is highly toxic owing to its ability to quickly react with the haemoglobin in the blood. It is the most prevalent of the basic pollutants in the air, especially in urban areas. It is emitted as a result of incomplete combustion of hydrocarbon fuels. The various means of transportation are considered the primary suspect of air pollution by this gas, accounting for 70%.

Measurements of air pollutants in the Kingdom of Bahrain

- Reduced air quality on account of the emissions resulting from generation and transmission of electricity as well as emissions from the industrial sector and vehicular exhaust (particularly emissions of diesel - operated vehicles which release soot and smoke).
- Higher concentrations of dust particles in the air due to the varied locations of construction and building sites and crushers, the scarcity of vegetation cover, desertification and sand storms to which the area is prone.
- Lack of early warning system for air pollution in Bahrain.

specialized in the field of air pollution;

- Need of research in the area of air pollution impacts on health as well as research on cleaner production technologies suitable for the Kingdom.

- The overlapping of the industrial zones and residential areas which increases the probabilities of the residents' exposure to air pollutants;

Sulphur dioxide (SO₂)

This is another colourless gas with a pervasive odour which is irritant to the breathing apparatus. It oxidizes in the air to produce sulphur trioxide which quickly dissolves in water to produce sulphuric acid which falls in the form of acid rains or, in the case of high humidity, as acidic drizzle. The sulphur dioxide is emitted as a result of combustion of fossil fuels (coal and oil) which contain the sulphur element, in addition to the oil extraction, production and refining processes in addition to the sulphuric acid industries, vehicular exhaust emissions and energy and water generation plants operations.

Measurements of air pollutants in the Kingdom of Bahrain

The strategic vision of the air quality sector; aims in general for the protection of public health in the Kingdom of Bahrain from harmful air pollutants, by prevention of emission, this can be achieved by restricting the pollutants and reducing air pollutants to the allowable limits and minimization of potential exposure to them to the minimum levels. For the formulation of this strategy, it is imperative that it be based on the following:

- Provision of adequate number of air pollution monitoring stations and their geographical distribution to cover all areas of the Kingdom of Bahrain;
- Availability of national capabilities in the area of air quality and pollution monitoring and

The National Environmental Strategy

The ozone (O₃) and photochemical oxidants:

This is a gas of bluish colour with a pervasive odour of bluish colour. The gas is generated at ground level as a result of the photochemical reaction of nitrogen oxides with hydrocarbon vapours, carbon mono oxide and water vapour in the presence of sun rays. It is also generated by the oxygen oxidation by thunder bolts and welding operations, in high tension electrical currents applications, such as the electrical kilns used in iron and aluminium smelting operations. The gas leads to damages to the lung tissues. It is also toxic to fauna and flora life and has environmental impacts on the atmosphere.

Air pollutants measured in the Kingdom of Bahrain

as al – Ma'aameer, Sitra, Jaw and Hidd). And to consider the co- relation with the health impacts on public productivity and the costs incurred by the State in the form of health care.

- Assessment of predicted measurements for air pollution levels and anticipated cases of exceedance.
- Promulgation and enforcement of special legislations requiring the industries to submit the required environmental information and air pollution parameters.

The proclaimed conclusions of the environmental strategy are based on the standards of air pollutants issued by the General Directorate for Protection of Environment & Wildlife. They are also based on a series of facts on the percentages of pollution components from the various gas emissions sources, the figures recorded by the monitoring stations for a period of more than ten years and the figures and volumes of exceedance incidences of the highest allowable ceilings.

The strategic vision

There exists a necessity for building a database on the air pollutants

analysis.

- Carrying out the environmental and health studies which include the impacts of air pollutants on public health, particularly in the residential areas located near the sources of industrial emissions (such

Nitrogen oxides (NO_x)

Both nitrogen mono and dioxides are considered among the gases with the greatest and most important impact in the field of air pollution. These gases are emitted as a result of the combustion of fossil fuel, from the oxidation of nitrogen compounds, vehicular exhaust emissions, high temperature ignition plants and nitric acid industries. The various nitrogen oxides are also produced in the air from nitrogen monoxide reactions (NO) which plays a basic role in photochemical reactions, where they oxidize and change in to nitrogen dioxide (NO₂) which has the potential of reacting with the hydrocarbons in the presence of sunrays to produce photochemical fogs, such as ozone. They may also react with hydroxyl (OH) producing nitric acid, which in turn causes acid rains. Attention has been focused on nitrogen dioxide owing to its impacts on health and the environment and for this reason environmental standards have been drawn up for it. It is a gas of reddish brown colour with pungent odour and exposure to it may result in damages to the breathing and the heart and impaired visibility as well as its impacts on the plants.

Air pollutants measured in the Kingdom of Bahrain



Hydrocarbons (HC):

Hydrocarbons are multiple organic compounds resulting primarily from the union of hydrogen with carbon and which are emitted as a result of incomplete combustion of fuel, such as in vehicular exhaust emissions and oil and petrochemical industries as a result of the biological decomposition of the organic substances. Hydrocarbons also include volatile organic compounds such as benzene, toluene, and xylene. They also include multi organic compounds such as phenyl, naphthalene, and formalin. All of these compounds have health impacts on man in general and some of them may cause cancerous diseases.

Air pollutants measured in the Kingdom of Bahrain

and assessment of their impacts on the health and environment in the Kingdom of Bahrain. The database will form the backbone of the environmental strategy and its overall trends. Due to the absence of the relevant studies associated with the air pollutants, their sources and health impact on residents in the Kingdom of Bahrain, the environmental strategy must stress the need for adapting the following key

measures in the area of air quality:

1- Focusing on professional building, and the national capacities of the environmental organization in charge of the air quality through enhanced training of the technical staff specialized in this field.

2- Conducting studies on the environmental and health impacts of the air pollutants on public health, especially in the residential areas located under the influence of the industrial zones, by extending the opportunity to the health care professional and researchers to conduct studies on the relationship between the air pollutants and the diseases, related to hydrocarbons and solid particles and the links between atmospheric pollutions and cancer, skin and other diseases that

Particulate Matters (TSP, PM₁₀)

The particulate matters are micro molecules of solid or liquid matters in diameters ranging between 0.1 and 100 microns, which makes them suspended in the air for lengthy periods of time and enables them to spread for long distances from their emission sources. Their physical and chemical compositions depend on the nature of the emission sources. They may be emitted from volcanoes, the seas, and the soil as natural sources, as well as from cement and block industries, exhaust emissions of the various means of transportation, tire erosion and complete combustion operations which yield ashes and plant fires. The particulate matters' chemical composition, level of concentration in the atmospheric air and volumes or diameters play a significant role in their impacts on the environment and man's health. In particular, they significantly affect the health of the persons exposed to them; the smaller the size the greater the impact as the small size enables them to reach and settle in the lower respiration system. For this reason, attention has been given to air suspended molecules in volumes of 0.1 micron and less (PM₁₀) owing to their ability to access the respiratory system causing multiple health complications. Recently, the World Health Organization (WHO) started to pay extra attention to the molecules in diameters of 5.2 microns. The propagation of molecules suspended in the air leads to direct impacts on the health due to the presence of toxic metals and harmful chemical compounds, such as lead, mercury and vanadium which will exasperate cases of asthma, allergy and other breathing complaints. The particles also impair the photosynthesis process in addition to their toxic impacts on fauna and flora.

Air pollutants measured in the Kingdom of Bahrain

The National Environmental Strategy

are likely to occur as a result of prolonged exposure to high levels and concentrations of to the atmospheric pollutants for longer duration.

- 3- Upgrading and expanding the air pollution monitoring system in the Kingdom of Bahrain, including location and timing design and defining the various gaseous pollutants to be monitored by the stations.
- 4- Establishing measurement forecasts for the pollution levels and anticipated cases to limit exceedance, and installing an early warning system for air pollution in the Kingdom of Bahrain.
- 5- Enacting legislations related to air polluting technologies and other relevant legislations as incentives and encouragement for the use of clean technologies and requiring the companies and industries to submit the required environmental information and air pollution measurements.

2- Water:

The water resource is characterized by being a strategic and vital resource that is indispensable to human life. In the Kingdom of Bahrain, water represents the most serious and unrivalled challenge by all standards. This is owing to the scarcity of water resources, its direct association with the development effort in general and its multiple and inescapable utilization for domestic and agriculture purposes, water and food security, water and population growth, water and industry, and finally water and health and environment. These multiple utilization are required to be addressed in exhaustive details in the various aspects of the comprehensive water strategy, which cannot be discussed in this report. Consequently, the report is restricted solely to the exposition of the health and environmental aspects related to the water sector and its protection. Perhaps, the most salient recommendation that we may come with in this effort is, the need for extensive and detailed handling of the comprehensive water sector strategy in the Kingdom of Bahrain for the purpose of achieving sustainability of the water sources as part of the sustainable economic and social development in the Kingdom.

The predicament involving water in the Kingdom of Bahrain comes into sharp focus as it carries along with it some major challenges on account of the limitations of the water and financial resources on one hand and the population density and the high population growth rates on the other hand. The population growth requirements, food production and other



developmental needs are increasing at a speed and rates beyond assessment, and in excess of the Kingdom's ability to develop its water sources, which are basically limited at the moment to desalination and recycling.

Available information on water sources and its utilization, current environmental status in the Kingdom, as well as the information on the water desalination issues, domestic water and sanitary sewage treatment and recycling, reflects inadequate administrative system. It also indicates poor water policy and a lack of integration with the participatory methodology, and reliance.

Key environmental issues:

The most salient environmental issues can be summarized on the basis of the current data available on the water sector as follows:

- Continuous drop and degradation in the quality of underground water because of over utilization and salinity, coupled with the surface water contamination as a result of existing human activities and the shortfall in the areas of underground water suitable for direct domestic consumption.
- Dryness and aridity of natural springs as a result of the depletion of underground water, deterioration of the natural ecology and habitats of associated Wildlife, fauna and flora, loss of the biological diversity in these sanctuaries, in addition to the loss of many sanctuaries of migratory birds which considered the natural springs as one of their main stops;
- Salinity of the agricultural lands (which primarily rely on underground water irrigation) utilization of most lands for investment purpose, due to desertification and conversion into residential areas as a result of the growing demand for residential lands and the higher economic returns in comparison with agricultural investment;



Al-Saffahiya water spring



Al-Raha water spring



Adhari water spring



photographs clearly demonstrate the deterioration and dryness of the natural springs in the Kingdom.

The National Environmental Strategy

- Environmental degradation in the context of desalination and power generation installations in the form of thermal, saline and chemical pollution to the marine environment as well as in the form of gaseous emissions by these plants;
- Hydrocarbon and chemical pollution of the seawater used in the desalination process and possible contamination of drinking water;
- Fluctuations in the quality of domestic water and higher ratio of salinity in certain areas of Bahrain to levels in excess of the specifications approved for drinking water in the Kingdom because of growing municipal demand on desalination plants and also as a result of resorting to underground water to make up for the deficit as well as total dependence of certain areas on underground water;
- The treated sanitary drainage water utilization in the agricultural sector need a number of precautionary measures and constant monitoring for the purposes of controlling the quality of the water used, in addition to training the farmers on how to use this water for irrigation of any agricultural crops and on the health and environmental concerns that may arise in the event of defective treatment and utilization systems, in addition to formulating a contingency plan in the event of the failure of this system;

The lack of administrative clarity in the identification of the competent agency responsible for the environmental and health aspects related to the utilization of recycled and treated sanitary drainage water; monitoring of its quality and taking the precautionary measures for conservation of health and the environment represents one of the administrative loopholes of the project.

- Failure to incorporate in legislative - decree No. 21 for the year 1996 on the environment any express clause on the conservation and protection of underground water against pollution as well absence of any provision on the utilization of recycled and treated water;

The strategic vision

Based on the parameters, the environmental strategy for the water sector will focus on the importance of the following topics:

- 1- Drawing up a comprehensive strategy on water based on the principles of integrated management of water resources (cost effectiveness, social justice and sustainable ecology) with the objective of providing optimal investment on the water resources through maintenance of the quality of underground water; protection against



pollution and concerned efforts to preserve its sustainability as a natural resource, and strategic reserve in cases of emergency.

- 2-Revival of some natural springs and their pristine surrounding environment; this will call for bringing to an end to the depletion and over exploitation of underground water for restoration of their water table, as well as protecting the areas in the surroundings of these springs against urban invasion and their utilization in environmental tourism;
- 3-Provision of drinking water in sufficient quantities, and good quality compatible with international and local standards and specifications to meet both current and future demand, while giving priority to human consumption; this will necessitate rationalization of consumption and reduction of municipal demand on one hand and construction of desalination plants on the other hand;
- 4-Mitigation and elimination of the environmental impacts of water treatment and power generation plants on the marine environment and air as well as protection of the desalination plants against marine pollution, particularly hydrocarbon pollution in the waters of the Arabian Gulf;
- 5-Establishment of an institutional and legislative system for treated water utilization project. Such effort shall incorporate all concerned agencies, mainly the Environment Body in its capacity as the competent agency responsible for the environmental and health aspects for recycling treated sanitary drainage water; monitoring its quality, taking the precautionary measures for protection of the environment and health and periodical review of utilization standards.
- 6-Promotion of environmental water awareness highlightings the importance of water and its conservation from depletion and pollution, adoption of consultation / participation principle with all concerned categories of the community, especially the environmental civil society organizations, in the planning and implementation of the water policies, and management and implementation of water resources projects.
- 7-Integration of the agencies responsible for water management in the Kingdom of Bahrain, promotion of interdepartmental coordination as well as coordination with the Environmental Affairs Body on the other hand. This will require review of the existing administrative, institutional and legislative procedures.
- 8-Promotion of the water cooperation with the other Arabian Gulf States and development of ways and means and mechanisms for boosting participation in the management of water in joint underground basins.

The National Environmental Strategy

3- Exploitation of land resources:

a-Agriculture:

The agricultural policy adopted by the Kingdom of Bahrain since the early 1980's was designed to upgrade the growth rates of agricultural production to attain a reasonable measure of self-sufficiency of local food products, enhancing levels of income, and improving the standard of living in rural areas. However, the constant increase in food consumption rates

in the Kingdom of Bahrain, which exceeds by far the available agricultural resources because of the increase in population, changing consumption patterns, in addition to the determinant factors involving water, soil and the environment, has led to a substantial deficit in the commercial agricultural balance. The balance amounted to 148.5 million Bahraini Dinars in the year 2003, where the agricultural imports accounted for 15% of the total value of non-oil imports into the Kingdom of Bahrain. Bahrain's annual imports of vegetables and fruits range between 86 percent and 90 percent, respectively, of total consumption.

Natural Determinant Factors of Agriculture in the Kingdom of Bahrain

The climate of the Kingdom of Bahrain has a great impact on the type, quantity and quality of the agricultural products. Restricting the agricultural season to limited periods of the year and compliance with the single crop system without due attention being paid to the agricultural cycles have greatly contributed to the soil exhaustion, and consequently reduced productivity. High humidity rate throughout the year has also encouraged the development of fungal and microbic diseases.

Bahrain's soil primarily consists of loose sand with little moist and nutrient retention capability. The average salinity of Bahrain's soil is 12.4 mmhos/cm. The virtual depth of the soil is limited. This is due to the high salinity of the groundwater table at a depth of 0.5 to 3 meters, or to the solid limestone strata or solid impermeable layers at a close depth from the ground surface (at 75 centimetres from ground level) which will curb the extension of roots and water movement. This makes of our soil a barrier for the success of agriculture. The soil is also characterized by low contents of organic matters and most of the nutrients required for the growth of plants, which explains the extensive reliance, and use of organic and chemical fertilizers to enhance the properties of the soil and increase production.

Key environmental issues

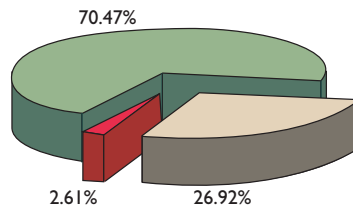
The agricultural activity in Bahrain has shrunk into a tiny traditional sector. Its contribution to the gross domestic product was not more than 1% over the past ten years. The agricultural sector per capita is only 21 Bahraini Dinars, out of 5,249 Bahraini Dinars being the per capita in the gross domestic product for the year 2003, this



percentage is insignificant compared to the adverse environmental effect resulting from activities in this sector; mainly the degradation of the quality of underground water because of depletion by the agricultural sector. This is coupled with the diminished quality of air and soil resulting from the use of excessive fertilizers and pesticides, with their direct and indirect impacts on the environment, health and economy, though limited.

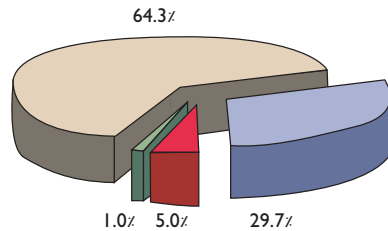
The most important environmental issues associated with the utilization of land for agricultural purposes and which limit the viability of using the limited land resources include the following:

- Diminishing share of the Bahraini national in agricultural land from 0.36 hectares in the year 1924 to 0.009 hectares in the year 2003, coupled with the continuous shrinking in the productivity of the agricultural lands and growing water deficit due to the degradation in the quantity and quality of underground water; thereby leading to further deterioration of the traditional agricultural areas, their conversion into fallow land, and the land which depend on irrigation by underground water being excluded of the investment circle;
- The need for further integrated agriculture – water policies;
- Pollution of the agricultural lands by the chemicals used and potential contamination of underground water by returning irrigation water;
- The urban invasion and encroachment on agricultural lands and the growing value of the lands used for purposes other than agriculture;



Agricultural Domestic Industrial

The water ground consuming sectors in the Kingdom



ground water Desalinated Treated Agricultural effluent

Available water resources for the year 2001 in the Kingdom(m m)³

The National Environmental Strategy

- The shrinking of the green areas in the Kingdom, desertification of agricultural lands and the adverse impacts on the environment;

(two pie charts, the first showing the consumption of underground water in the Kingdom of Bahrain by sector; where green colour depicts the consumption of agriculture at 70.47 percent, the beige colour shows municipal and domestic consumption at 26.92 percent while the red colour depicts the industrial consumption which accounts for 2.61 percent of the total consumption.

The second pie chart shows the sources of water available in the Kingdom of Bahrain for the year 2001 in million [cubic] meters, where the beige colour reflects quantities of underground water at 64.3%, the purple colour shows quantities of desalinated water at 29.7%, the red colour depicts recycled treated water at 5.0% and the green colour reflects the quantities of recycled treated water).

Nabeh Saleh Island

1998

1954



Shrinkage of Agricultural Space in the Kingdom

National Strategy for Agricultural Development in the Kingdom of Bahrain

In 2000, the Agricultural Affairs Directorate, in cooperation with the United Nations' Food and Agriculture Organization (FAO), developed a national strategy for sustainable agricultural development through the year 2010, which focused on the intensification of agricultural and animal production to achieve self-sufficiency in local food production. The strategy also embodied a proposed package of production projects and incentive programs to propagate modern agriculture methods, promote agricultural research, besides development of the services extended to the agricultural sector.



The strategic vision

The strategic vision is based on the lack of economic and social viability of the lands used for purposes other than sustainable agriculture in the absence of some exorbitant costs. If the community is required to continue to support this sector; it is imperative that policies involving non conventional agriculture must be adopted in search for better alternatives in order to reduce the prohibitive economic, social and environmental cost of the agricultural sector. Such policy must cater for the following parameters:

- 1- Expanded use of treated sewage to replace the underground water used now for the irrigation.
- 2- Use of modern agricultural technologies, such as green houses to rationalize water consumption and prevailing traditional determinant factors of agriculture, namely the climate and soil so as to attain a reasonable degree of food self-sufficiency.
- 3- Integrated management of agricultural pests and chemicals
- 4- Increase of the green surfaces and agricultural cover.
- 5- Increasing the number of local young labour involved in the agricultural sector.
- 6- Undertaking studies and applied research, transfer modern agricultural technologies, and build the local capacities related to the agricultural sector.

One of the option addressed in many studies related to water and its use in the agricultural sector in the Kingdom of Bahrain is to diversify the local agricultural activities. Alternatively, the subsidy to the agricultural sector should be suspended or a tariff on underground water withdrawal be imposed. Other alternatives include the discontinuation of certain agricultural activities, which consume large quantities of water. This includes clover, whose consumption is in excess of the value added to the gross domestic product or aesthetic or environmental value to the Kingdom, based on the premise that the food security and food self-sufficiency is an issue that must be addressed on an Arab or regional domain.

The National Environmental Strategy

B- Other uses of land

Where other applications of land resources are involved, the accelerated demand for land sources to meet the ever-growing construction and to provide for urban lands, residential areas and industrial zones forms pressure on the natural environment of the Kingdom of Bahrain. The expansion has been achieved at the expense of land and coastal areas as well as of sea by dredging and reclamation. Since the Kingdom of Bahrain has limited mineral resources, the building and construction sector is facing the scarcity of the sand required for the operations and construction of modern roads, ports and bridges. Hence, the Kingdom resorted to the extracting marine sand, especially from the shallow regional waters of Bahrain. The annual average quantities of sand harvested from marine areas is estimated at about 2.5 million tons per annum. This exploitation has, no doubt, some substantial environmental impacts on both the marine ecology and the fishery resources on account of the destruction of the natural fishery habitats, removal of sea weeds, turbidity of the water column, veiling of the sun light from the coral reefs and blockage of fish gills. The impact on the coastal and marine environment also result from sand washing and re-discharging the wash water into the sea, especially in the Bay of Tubli and Sanad mangrove national park. This causes increased turbidity of the water and thickness of the sea bottom layer, which rendered it impossible for the seaweed to survive, apart from the pressure exerted on the roots of the mangrove plants.



Photograph of the mangrove plant in the Bay of Tubli, one of the natural safe havens in the Kingdom

Enforcement and application of the protection principles for the vital marine and coastal areas will contribute in assessing confronting the environmental damages at the right time before they are aggravated.



The strategic vision

- 1- Boosting the technical and technological human capabilities in the various aspects of management of land resources and building capacities and training on methods for cost calculation of the environmental resources;
- 2- Preparing detailed and comprehensive plans for the lands, which projects future expansions of the land area on one hand and growth in the available building and construction sector on the other hand;
- 3- Preparing detailed plan for all locations and areas according to type of utilization (residential, commercial, industrial, recreational, tourism, general, natural sanctuaries, sports fields, etc.), zoning of subject areas and application of the integrated management of coastal areas;
- 4- Reinforcing the principle of imposing fines on the polluters;

4- Marine and Coastal Environment

The marine and coastal environment occupies almost 92% of the Kingdom's area and about 90% of the total population is clustered around it. All drinking water desalination plants are located on the coast. This environment is characterized by great diversity in its ecological systems, ranging from coral reefs, to sea weed and grass environment which are considered a source of food and protection for many varieties of fish, especially during the spawning season. There are also moss, algae, clay, rocky and sandy surfaces, the mangrove and salty plants environment, and many others, which are also considered a landing station for both resident and migratory sea birds, such as the rare Hawar falcon or sooty falcon, Socotra cormorant, waders and other species. The regional waters of the Kingdom of Bahrain are also the habitat of some rare animals of international interest that are vulnerable to extinction, such as Dugong (sea cow) and marine turtles. These are listed in the Red Book of the International Union for the Conservation of Nature and Natural Resources (IUCN).

Such diversity in the environments, and by extension the sanctuaries, has rendered Bahrain



Caption: the fishery resource is an important nutrient

The National Environmental Strategy

rich in important marine resources, such as fish, crustaceans and Mollusca as well as a breeding, spawning and feeding ground for these sea creatures, thereby providing for self-sufficiency in local fish which amounts to 98% of annual consumption. The annual fish catch registered the highest was in the year 1996, amounting to 12,900 metric tons, valued at some 10.7 million Bahraini Dinars. The catch has diminished over the subsequent periods through the year 2002, where the local fish catch retreated to 69% in that year.

Key environmental issues

Local and external pressures represent the most important issues of the marine and coastal area environments.

The local pressures can be summarized as follows

- Degradation of the sanctuaries and decline in fish inventory;
- Concentration of the industrial parks in Bahrain on the eastern coast;
- Dumping of pollutants from the industrial and agricultural discharges and from desalination and sewage plants in the coastal areas;
- Dredging of marine sands in the shallow sea areas and washing and discharging the water in the Bay;
- Reclamation of the coastal areas to meet the demands of economic and housing development;
- Concentration of the modern tourist attractions on the coast;
- Retreat of the fishermen's income;

On the other hand, the external pressures can be summarized as follows

- The exposure of the Arabian Gulf as a whole to pollution as a result of ship and tanker heavy traffic, discharge of their ballast water, their loadings of invasive & non local species, coupled with the chances of disasters and accidents that the Gulf water had experienced over the past decades.
- The Kingdom of Bahrain is one of the small island states, which will inevitably be affected by the climate change phenomena and the anticipated subsequent rise in the sea level. Bahrain is also one of the countries with the least capacity to accommodate and deal with

In order to preserve the marine and coastal environment within the Kingdom of Bahrain and to protect it against improper human activities, the environmental authorities have declared certain territorial waters as national marine sanctuaries. Under Decrees and Ministerial Orders, Ras Sanad at the Bay of Tubli, the Bay of Tubli, Hawar Islands, Mashtan Island and the Bay of Arad have been declared as national marine sanctuaries. These national sanctuaries vary in their natural and ecological characteristics and in the objectives and purposes for which they have been declared.



the aftermath of these phenomena, which will yield greater pressures on this environment. It will accelerate its degradation and threaten the vital installations and infrastructure in the low lying coastal areas with the danger of submersion if the required precautionary actions, notably the planning, engineering and other considerations, are not taken to circumvent the damages and minimize the anticipated losses.

The strategic vision

The strategic vision of the marine and coastal environment sector aims at the sustainable exploitation of the coastal and marine resources owing to its close affinity with the public health, food security, its economic and social benefits, including the cultural values, and the traditional ways of living of a section of the Bahraini citizens. To this end, the strategy has no option but to associate all of the above with the protection of the marine environment, its resources and ecological systems against pollution and indiscriminate attrition, coupled with assurances to enhance the living conditions of the fishermen through the following actions:

- 1- Adoption of the integrated management policies for the coastal areas through national work program whose objectives are the protection of this environment, its natural resources and ecological systems against pollution and degradation as a result of the human pressures referred to above and at the same time guarantee the rights of all users of the coastal and marine environment and protect its sustainability for the future generations;
- 2- Identification of the economic, environmental, social, and cultural values of the marine and coastal resources, assessment of the environmental impacts secondary to the human activities and taking into consideration their long term and cumulative impacts on the environment;
- 3- Undertaking the environmental – public health studies on the impacts of pollutants in the food chain of the fishery resources health, especially the resources impacted by the industrial areas;
- 4- Updating and expansion of the coastal water surveillance network in the Kingdom of Bahrain, including the venue and time design, the pollutants to be measured and the provision of an early warning system to alert to the pollution affecting coastal water;
- 5- Encouraging and urging the private sector to modify its production systems and policies for a better environmental management and sustenance of its operations in the long run. On this front, the following aspects may be subject to the development:
 - Standards, systems and programs to award certificates of appreciation and recognition;
 - Environmental accountability and enforcement of the principle imposing fines on the polluter;
 - Environment managerial tools, such as the environmental management systems, assessment of the impacts on the environment and the best environmental and cleaner production practices;
- 6- Endorsement of an environmental strategy that takes into account the appropriate preventive precautions and procedures in anticipation of the global climate change and anticipated sea rise level and the consequences on the coastal environment, enterprises and infrastructures.



The National Environmental Strategy



Section Four:

Issues crosscutting with the
environment



The National Environmental Strategy

Tourism and Environment in Bahrain

Encouragement of tourism in Bahrain is looked at as a reflection of the policy espoused by the Kingdom for diversification of the sources of national revenues and minimization of total dependence and reliance on petroleum resources. This policy has been supported all the way by the availability of the various tourist attractions and



Photograph of Shaikh Salman bin Ahmed Fort, a tourist attraction.

components of historical and heritage monuments and biological diversity on one hand, coupled with availability of the infrastructure amenities and the various tourism services at varying prices which meet the needs of the various tourist categories on the other hand. Similarly, the changes in the external circumstances conducive to the encouragement of Arab tourism and particularly tourism within the region itself have considerably increased the number of tourists drifting towards the Kingdom of Bahrain over the past years, especially from the sisterly states of the Gulf. The number of tourists increased from 64,648 tourists in the year 1985 to some 3.64 million tourist in the year 2002 (or six folds the number of the population), thereby enhancing the tourism revenues in that year to 800 million US dollars. Tourism has contributed 16,000 direct employment opportunities in addition to more than 32,000 indirect jobs (70% expatriate).

Key Environmental Issues

The progressive increase in the number of tourists over the past years requires planning to contain the possibility of further growing numbers of tourists. The purpose is to avoid degradation of the Bahrain environment and to encourage preservation of its natural resources and historical and cultural values. Such planning will contribute to propelling the wheel of development by providing employment opportunities for the Bahraini nationals, enhancing the national income and diversifying its resources.

The strategic vision

Notwithstanding the positive returns of tourism on the national economy, the limited area of Bahrain and its natural resources, coupled with its fragile ecological systems, may all



contributing to the sustainability of tourism in Bahrain. All these factors call for the following actions:

- 1- Considering the environmental and social aspects in the establishment and development of tourism projects, in addition to the economical considerations, to ensure the sustainability of tourism in the Kingdom of Bahrain;
- 2- Selection of the tourism facilities locations in a way that would ensure conservation of the ecological systems;
- 3- Taking into consideration the factors, which yield the increase in the number of tourists, including growing demand on the energy and water resources, increasing generation of wastes and garbage, increased crowdedness and emissions from vehicular exhaust and a host of other problems;

Transportation and the Environment

The problem involving the growing numbers of vehicles in Bahrain and health, environmental, economical and social impacts has become one of the major concerns that confront both the residents and the decision makers. It is the result of the progressive growth in the income of individuals, the affordability of many people to acquire vehicles, as well as of the low cost of fuel, and the fact that vehicle drivers are not made to bear the actual and full cost of the decision to drive their vehicles. It is aggravated by the State's subsidies for a number of services associated with the use of private transportation. Furthermore, the lack of a compatible public transport service has also caused the number of private vehicles in the Kingdom of Bahrain to increase at an annual rate of 9%. Additionally, the fact that the Island is linked to the main land via King Fahd Causeway has introduced one more dimension in the scenario of the transportation and communication sector; increasing some 5,000 to 6,000 vehicles a day to the number of vehicles already on the roads of Bahrain.

Year	Number of vehicles	Increase percentage
1995	167,540	3.5
1996	173,118	3.3
1997	182,430	5.4
1998	196,586	7.8
1999	207,249	5.4
2000	214,651	3.6
2001	227,749	6.1
2002	249,523	9.5
2003	273,230	9.5

The percentage of annual increase in the number of vehicles

The percentage of annual increase in the number of vehicles

The National Environmental Strategy

The strategic vision

The strategic vision for the transportation sector and the environment lies in drawing up policies and mechanisms to minimize the annual increase in the number of vehicles and enhance the efficiency of transportation operations and consequently to minimize the damages to the environment and public health as well as to the national economy. The strategy will also envisage adoption of incentives to change the lifestyle, minimize the need to commute, reduce the commuting time through the following ways and means:

- 1- Planning of cities, complexes and other such facilities in a way that would minimize the demand to use vehicles;
- 2- Enhancing the means of public transport as a measure to reduce the number of vehicles, minimize traffic bottlenecks, and encourage utilization of public transportation system by assigning lanes and parking lots exclusively for the system;
- 3- Providing special monitoring privileges for high capacity load vehicles, which should be the preferred means of transportation. Application of this measure will give the passengers of the public transport system and car pooling the advantage of the time gained in comparison with the passengers of private vehicles;
- 4- Enhancing the efficiency of existing roads and linking the vehicle insurance premiums and registration fees to the number of kilometres driven during the year instead of the fixed rates of fees currently in use irrespective of the odometer reading;



Photograph caption: growing number of vehicles – the most important cause of traffic bottlenecks.



Waste Management

The increase in the number of population and the accompanying amelioration in the standards of living have lead to higher rates of consumption and, consequently, to growing volumes of all kinds of garbage and wastes. The quantity of municipal wastes increased from 272,238 tons in 1996 to some 536,820 tons in 2002. In addition, statistics indicate an increase in the rates of Health care wastes by up to 5%. On the other hand, the rate of increase in the industrial wastes cannot be quantified as certain companies often resort to disposing of their wastes through special programmes or due to inconsistency of some Industrial wastes with their corporate size and operations. Statistics also indicate that the average volume of solid wastes during the period 1996–1997 amounted to about 434,850 tons annually (i.e. the equivalent of 1.15 kg / person/year) for the year 2002. 52% of such solid waste were domestic, 32% commercial, 6% construction debris and the balance is in the form of non-hazardous agricultural and industrial wastes. The dead animals are buried in Askar landfill site. The industrial wastes are disposed at Hafeera landfill site. Agricultural wastes are usually incinerated or disposed at the municipal landfill site.

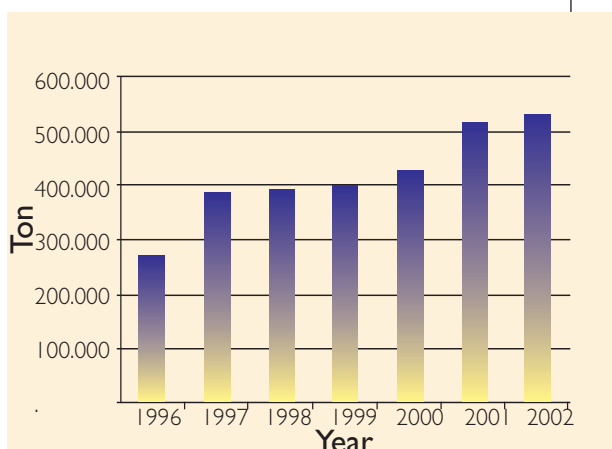


Chart caption: The trend in the growing quantity of municipal waste

Key Environmental Issues

Waste management is regarded as one of the key challenges facing Bahrain in the modern era for the following reasons:

- The progressive increase in the population, both residents and tourists, leading to generation of greater quantities of all kinds of wastes;

The National Environmental Strategy

- Scarcity of the suitable dump sites for disposal of wastes owing to the confined geographical area of Bahrain;
- Lack of state of the art, and suitable technology for environmentally sound treatment of municipal wastes and garbage;
- Absence of recycling and reclamation projects;

The strategic vision

The quantum increase in solid wastes generation in the Kingdom of Bahrain, in the light of the limited area and accelerated population growth and the ambitious economic developmental plans, requires that the following actions be taken:

1. Identification and knowledge of the types and quantities of wastes as well as their impacts on the public health, the ecology and natural resources;
2. Effective and proactive management which provides for safe disposal of all types of wastes to preserve public health and the environment;
3. Organization of awareness programs designed to rationalize consumption and consequently reduce and recycle wastes;




Photo caption: The Hafeera industrial landfill site for disposing industrial wastes, opened in 2001.



4. Adoption of the quality certificate concerned with the protection of the environment and safety (ISO 14000) in all sectors, especially in the part related to minimization of wastes;
5. Periodic surveillance of the monitoring wells around the wastes dumps to verify and ensure absence of pollution of underground water as well as monitoring of healthcare wastes incinerators, industrial wastes disposal sites and activation of the principle imposing fines on the polluter;
6. Support of wastes recycling projects;



The National Environmental Strategy



Conclusion

This booklet is an executive summary of the National Environmental Strategy, inclusive of all challenges, constraints and problems confronting our environment. It provides solutions and proposals that call for formulation of work plans in order to forge ahead in the charting of the sustainable development map in Bahrain.

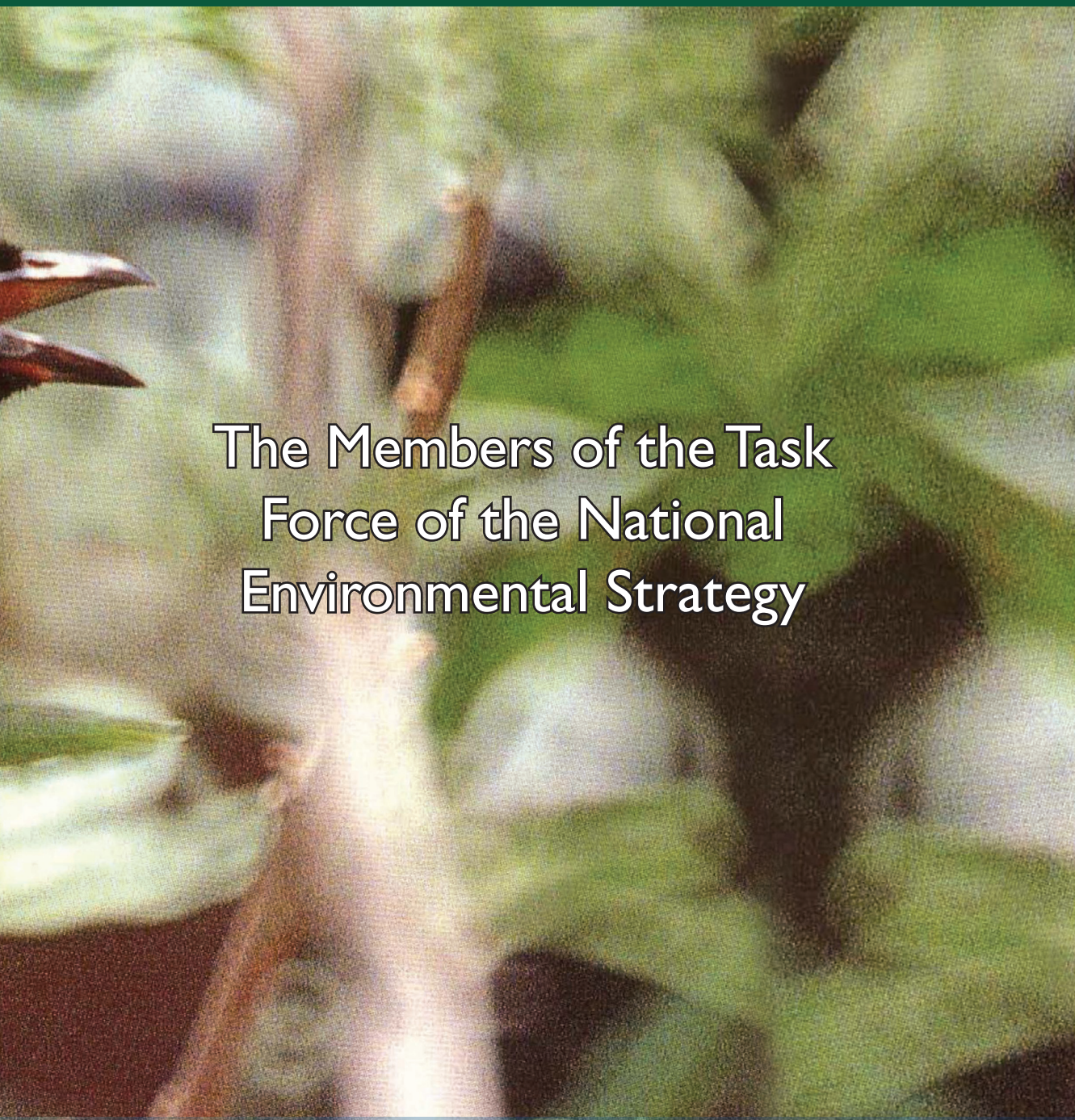
One of the most important issues that require prompt and decisive handling is strengthening the institutional and legislative framework of the environment in Bahrain (the General Directorate for the Protection of the Environment and Wildlife and the various other government bodies and organizations concerned with the environment) in the manner proposed in this document. It is important to bolster the role of the environmental control to enable it to ensure the reinforcement of the laws and orders related to the conservation of the environment, which will have visible impacts on the sustainable utilization of the environmental resources.

“There is no progress without development nor is there any development in the absence of sustainability and continuity”. This is the slogan, which will serve as an objective we must never lose sight of, to ensure a bright future and a good quality of life.

With the complement of the Task Force;



The Members of the Task Force of the National Environmental Strategy



The National Environmental Strategy

List of the Task Force Members of the National Environmental Strategy

Name	Position Title	Affiliation
Water Team		
Shawqi A. Al-Mannai	Head, Planning and Water Conservation Section	Ministry of Municipal & Agriculture Affairs
Prof. Walid Khalil Zubari	Head, Technological Studies Field	Arabian Gulf University
Mrs. Layla Rajab Zayid	Head of Projects	Central Information Directorate
A. Hameed A. Ghaffar	Head, Economic Strategic Planning	Economic Planning Directorate, Ministry of Finance
Abdulla Ali Abdulla	Head, Water Conservation Section	Water & Electricity Conservation Dept, Ministry of Electricity and Water
Mrs. Amal A. Majeed Al-Aradi	Head, Treatment Plant Operation Section	Ministry of Works and Housing
Marine and Coastal Environment Team		
Dr. Ibrahim A. Qadir A. Rahim	Researcher; Environment & Biology Research Program	Bahrain Centre for Studies and Research
Dr. Hashim A. Al- Sayed	Asst. Prof. Sea Biological Science	University of Bahrain
Dr. Adel Al-Zayani	Researcher	Bahrain Centre for Studies and Research
Dr. Khadijah Zainal	Asst. Prof. Marine Biology	University of Bahrain
Dr. Zahrah Al- Alawi	Sr. Specialist, marine biology	General Directorate of Marine Resources
Dr. A. Rahman Bu-Ali	Asst. Prof, Civil and Architecture Engineering Section	University of Bahrain
Mr. Isa Abulla Yateem	Marine Safety and Environment Protection	Customs and Ports Affairs
Mr. Dan Jansen	Expert, General Directorate, Marine Resources Protection	General Directorate of Marine Resources
Biological Diversity Team		
Mr. Zakariya A. Qadir Khunji	Manager; Public Relations & Environmental Information	Public Commission for the Protection of Marine Resources, Environment & Wildlife
Dr. Hashim Ahmed Al-Sayed	Asst. Prof, Marine Biological Science	University of Bahrain
Dr. Khadijah Zainal	Asst. Prof. Marine Biology	University of Bahrain
Dr. Zahra Al-Alawi	Sr. specialist, Marine Biology	General Directorate of Marine Resources
Mr. Ahmed Khalifa	Head, Agriculture Section	Flora Resources Directorate
Mr. Ibrahim Jaffer Ahmed	Soil Specialist, Flora Resources Directorate	Flora Resources Directorate
Mr. A. Qadir Said Khamis	Environmental Specialist	General Directorate, Protection of Environment & Wildlife
Air Environment Protection Team		
Mrs. Zahwa M. Al-Kawari	Director; Assessment and Planning Directorate	General Directorate for Protection of the Environment & Wildlife
Dr. Ahmed Yousuf Ali	Asst. Prof. Chemistry Department	University of Bahrain
Dr. Asma Ali Aba-Hussain	Director; Desert and Arid Land Science Program	Arabian Gulf University
Mr. Zakariya Ali Umran	Senior Environmental Specialist	General Directorate for Protection of the Environment & Wildlife
Abdul Hussain Al-Jazeera	Head, Operation and Maintenance	Ministry of Electricity and Water
Dr. Saeed Al-Alawi	Prof. Chemistry Department (Univ. of Bahrain)	Bahrain Chemists Society
Oil, Industry & Energy Team		
Mr. A. Rahman H. Darwih	Head, Hawar Electricity and Water Plant	Ministry of Electricity and Water
Prof. Shawqi Al-Dallal	Head, Physics Department	University of Bahrain
Mr. Mohammed R. Ghulam Hussain	Head, Planning, Studies and Production	Ministry of Electricity and Water
Mr. Mohammed Jaffer Al-Sayyad	Director; Economic Research Directorate	Ministry of Petroleum



Mr. Jamal M. Al-Saffar	Director, Information and Marketing Directorate	Ministry of Petroleum
Mr. Issam M. Auda	Senior Engineer	Ministry of Finance
Mr. Ahmed Al-Quran	Environment Affairs Officer	Bahrain Petroleum Company (BAPCO)
Mr. Mu'in A. Hussain Mohammed	Head, Wastes Department	Aluminium (ALBA)
Mr. Adnan S. Al-Mukhriq	Senior Petroleum Engineer	Ministry of Petroleum
Environmental Education and Awareness Team		
Mrs. Lulwa Khalifa Al-Khalifa	Director, Curricula Directorate	Ministry of Education
Mrs. Madina H. Taha	Senior Specialist, Science Curricula, Secondary Education	Ministry of Education
Dr. Fatima Matter	Director General, Quantum Establishment	National Environmental Society
Mr. Ahmed Al-Qa'ud	Head, Variety Shows	Ministry of Information
Mr. Fawzi Al-Jafen	Head, Community Services	Ministry of Information and Media
Mr. Ali Abdulla Al-Jabal	Librarian; Training and PR coordinator	General Directorate of Protection of Marine Resources
Mrs. Faridah Y. Hassan	Health Educationalist	Ministry of Health
Mrs. Fathiya M. Al-Majid	Social worker	General Organization for Youth & Sport (GOYS)
Mrs. Muna I. Ahmed	Data Entry Technician	Ministry of Education
Environment Health Team		
Dr. A. Amir A. Al-Laith	Asst. Prof. Life Sciences Department	University of Bahrain
Mr. A. Karim H. Rashid	Sr. Environmentalist	General Directorate for Protection of the Environment & wildlife
Mr. Mirza S. Khalaf	Head, Pollution Control Section	General Directorate for Protection of the Environment & wildlife
Mr. Ali J. Al-Anjawi	Head, Environment Health Section	Ministry of Health
Dr. Abdulla A. Rasool Abdulla	Asst. Prof. Life Sciences Department	University of Bahrain
Dr. Awatif M. Hassan	Asst. Prof. Chemistry Department	University of Bahrain
Mrs. Halal A. Rahman Engineer	Engineer, Posford Haskoning Gulf - Environment	National Environment Committee
Tourism & Heritage Team		
Dr. Fawziah Y. Al-Jeeb	Head, Tourism Licensing Section	Ministry of Information
Dr. Habis Al-Samawi	Media, Tourism, and Art, Faculty of Arts	University of Bahrain
Dr. Husam Riffaei	Media, Tourism, and Art, Faculty of Arts	University of Bahrain
Dr. Suhail Al-Masri	Asst. Prof., Media Department	University of Bahrain
Dr. Saeed Abulla Mohammed	Asst. Prof., Environment	Arabian Gulf University
Mr. Ali Al-Hessabi	Head, Environmental Assessment Section	General Directorate for Protection of the Environment & wildlife
Mrs. Muna H. Muhanna	Tourism Licensing Specialist	Ministry of Information
Mrs. Aydah Janahi	Secretary to the Head of the Tourism Department	University of Bahrain
Agriculture & Land Utilization Team		
Mr. Ahmed H. Al-Madani	Agro Engineer	Ministry of Municipality & Agricultural Affairs
Dr. Asma Ali Aba-Hussain	Director, Desert and Arid Land Sciences Program	Arabian Gulf University
Dr. Qahir Mandeel	Asst. Prof. Life Sciences Department	University of Bahrain
Dr. Thurayya Al-Mansouri	Asst. Prof. Life Sciences Department	University of Bahrain

General Directorate for Protection of Environment & Wildlife

Tel: 17 - 875102

Fax: 17 – 784934

P. O. Box 32657

Isa Town - Kingdom of Bahrain

Email: environment@bahrain.gov.bh

www.environment.com.bh