Report of the Special Committee on Environmental Cooperation for Iraq

March 2006

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Photo:Courtesy of Iraq Foundation

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Preface

Assisting in the postwar reconstruction of Iraq is an important task for the international community. Japan has pledged $5 billion in reconstruction assistance over the coming 4 years, and is pressing ahead with plans for its implementation. Postwar Iraq is also burdened with a wide range of environmental problems, including water supply and sanitation issues that require urgent attention owing to the risks they pose to human health and living environments, and issues calling for more mid- to long-term solutions such as desertification and ecosystem restoration.

The Special Committee on Environmental Cooperation for Iraq was established in FY2003 to examine how Japan could contribute to reconstruction in Iraq in the environmental field. Composed of 6 members and a secretariat appointed by request of the Ministry of the Environment, and a secretariat, the Special Committee was charged with the tasks of ascertaining the current status of Iraq's physical environment and related assistance needs, and formulating recommendations for the content and form of environmental assistance to be offered by Japan. In its first year of operation, the Special Committee devoted itself largely to the research of available documentation to pinpoint current environmental issues in Iraq and relevant activities being implemented by donor organizations of other countries. Based on the results of these investigations, in FY2004 the Special Committee gathered further information through diverse channels, including the deliberations of the Donor Committee of the International Reconstruction Fund Facility for Iraq in Jordan, and began to consider the form of environmental assistance that Japan should provide. In FY2005, the Special Committee continued to examine the potential for applying technologies possessed by Japan in helping with the reconstruction of Iraq and the form of Japan's environmental assistance, while also interviewing officials of the Iraqi Ministry of Environment and other Iraqi government agencies and personnel involved in such initiatives as Italy's New Eden Project to gather and analyze information on assistance needs.

From these discussions, the Committee has decided that even for projects such as the rehabilitation of Iraq's marshlands, priority should be put on restoring the living environment of the local inhabitants, and that Japan should accordingly focus on establishing a sustained dialog with local communities and formulate environmental assistance plans based on that dialog. It is also important for Japan to consider any potential contribution in the light of environmental assistance initiatives already being implemented by the UN or other donor countries. An example of the kind of initiative that should be considered is the application of Japanese technology to small-scale on-site water purification systems which would make a major contribution to the improvement of the living environments of local inhabitants. Under

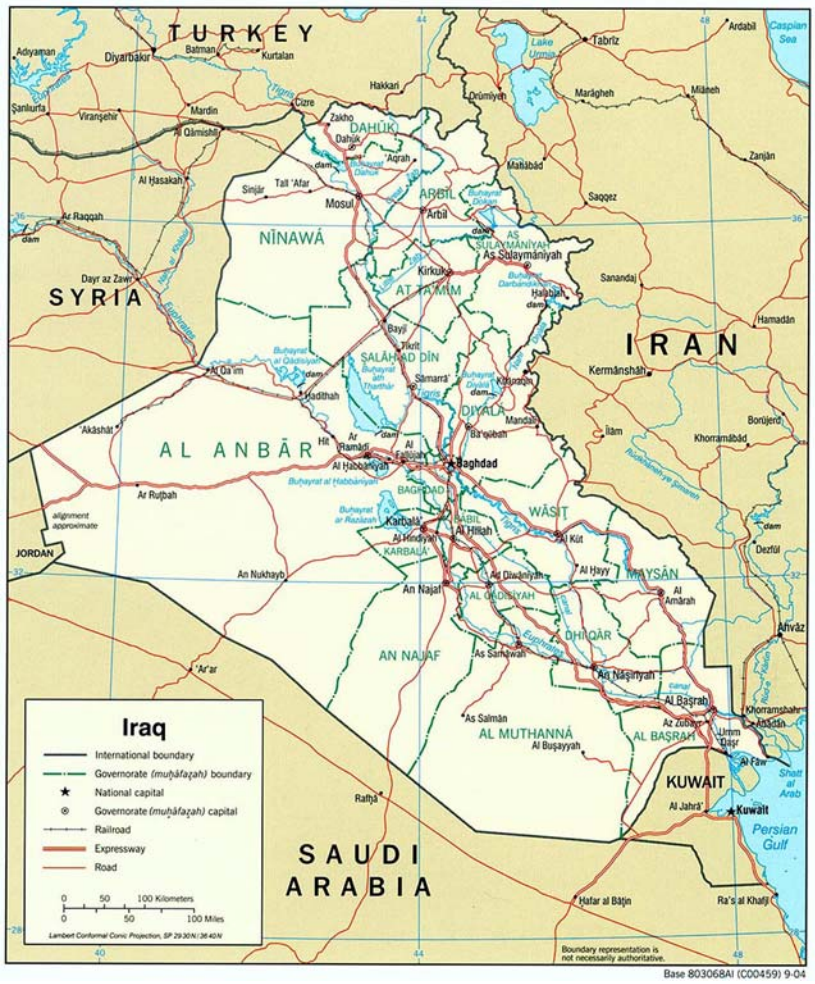
the current troubled conditions that make the provision of on-site technical assistance in Iraq difficult, the Committee feels that along with assistance in the form of funds and equipment for environmental restoration and improvement works, it is also important to focus resources on bringing Iraqi government personnel and engineers to Japan for training, etc.

This report was drafted on the basis of discussions held over a total of 10 meetings, some of which were also attended by Yuriko Koike, Minister of the Environment. Many other personnel, including representatives of the Ministry of Foreign Affairs, Ministry of Agriculture, Forestry and Fisheries, Japan International Cooperation Agency, Japan Bank for International Cooperation, United Nations Environment Programme, and private sector consultants also attended the meetings as observers. It is The Committee's fervent hope that those responsible for assistance to Iraq will put this report to good use as a basic reference for considering future environmental assistance to Iraq.

Kazuhiko Takeuchi

Chair, Special Committee on Environmental Cooperation for Iraq

March 2006

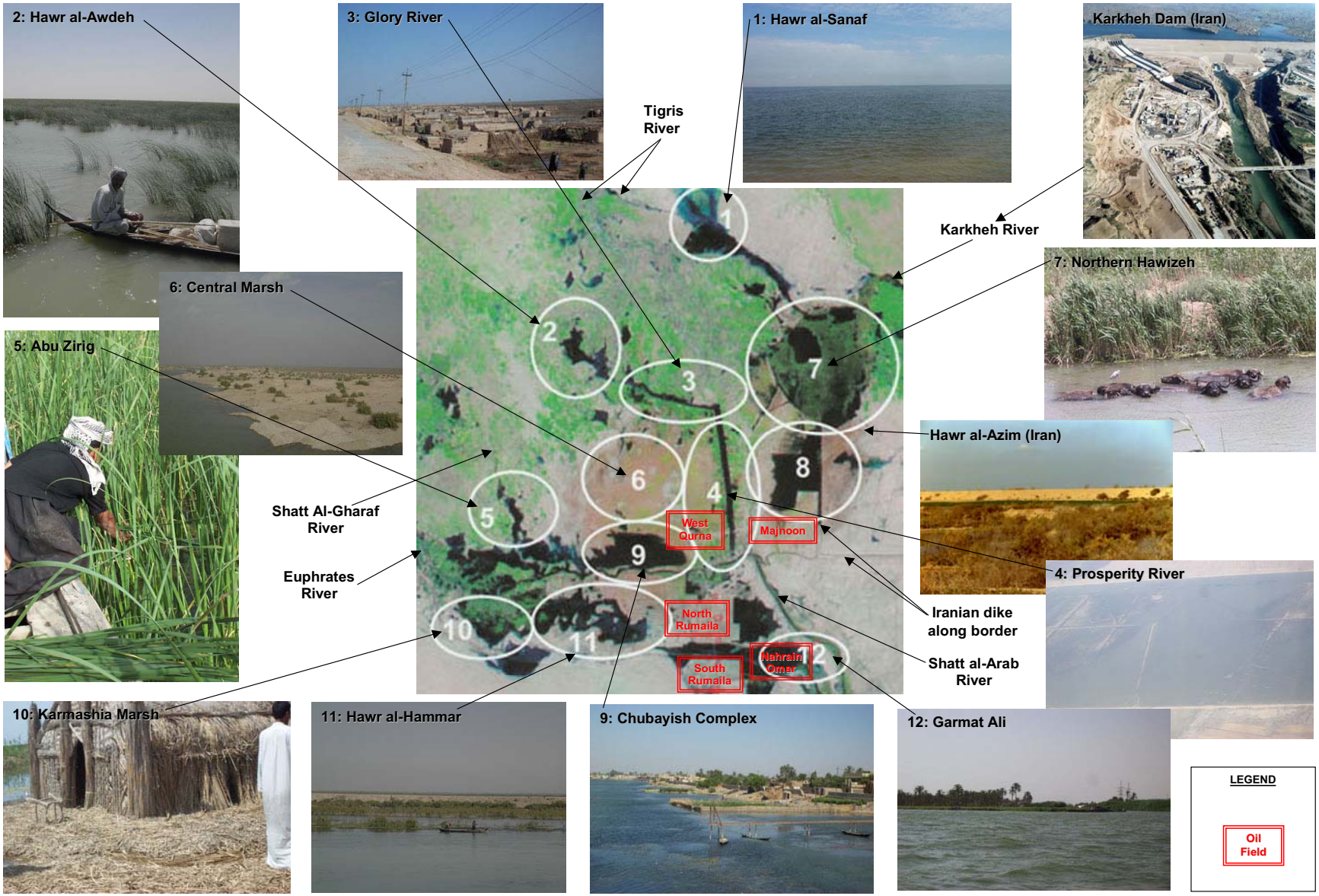


Frontispiece 1 Map of Iraq

Courtesy of the University of Texas Libraries, The University of Texas at Austin

Frontispiece 2 Map of the marshland region of southern Iraq

Courtesy of the University of Texas Libraries, The University of Texas at Austin



Frontispiece 3 The current appearance of marshland in southern Iraq[1]

Overview

(1) Background and objectives

Background to the consideration of environmental assistance for Iraq

Iraq used its rich oil reserves to fuel modernization, and thanks to its efforts in education, once boasted a relatively highly educated populace. However, as a result of the Iraq War and subsequent conflict, the country is in a state of increasing ruin, and is in urgent need of reconstruction assistance from the international community through international organizations and country-to-country cooperation. There are particularly high expectations for environmental assistance owing to its symbolic significance for Iraq's reconstruction, and the Ministry of the Environment is considering concrete methods of contributing to Iraq's reconstruction in the environmental field. While only limited information can be obtained until security begins to improve, Japan needs to examine areas in which it could contribute in the future, and formulate policies for meeting its responsibilities in accordance with its status in the international community.

The purpose and objectives of the Special Committee

Iraq suffers from a wide range of environmental problems, including environmental degradation stemming from ill-advised development under the former regime, delayed development or functional decline of environmental infrastructure due to lack of funds, and reckless exploitation of natural resources. Resolution of these problems requires that members of the international community cooperate to provide assistance in line with their respective capabilities. Japan should accordingly identify the fields in which its technology, resources, and frameworks can be used most effectively and efficiently. Insofar as Japan is expected to examine measures and concrete possibilities for providing assistance in the environmental field as an aspect of the reconstruction of Iraq, the purpose of the Special Committee is to investigate the current status of Iraq's environment and gather information on assistance initiatives in the environmental field being implemented by international organizations and other parties, and based on these investigations, consider the forms of environmental assistance that Japan could provide.

(2) Iraq's environmental problems and assistance needs

The destruction of Iraq's southern marshlands

Iraq's southern marshlands were once one of the greatest expanses of marshland in the western half of Eurasia and a valuable habitat for wildlife including some endangered species.

The area has also served an important role as a stopover site for migrating birds and as a constituent part of the Persian Gulf's fishing industry. However, Saddam Hussein's regime constructed dikes and canals to divert water from the marshes and drain them, causing 90% to dry up. The draining of the marshes has had a disastrous impact on the ecosystem, and has endangered the survival of a number of indigenous species. The marshlands also served as a spawning ground and nursery for marine life, and with the dramatic decline in these capabilities as a result of draining, the Gulf's fishing industry as a whole has suffered severely.

The process and challenges of rehabilitating the marshlands

Work began on destroying the dikes and reflooding the marshes almost as soon as the Iraq War ended, and about 40% were reflooded within a year. However, because of the haphazard way in which this reflooding was carried out, rehabilitation of the marshes has been patchy, with some localities showing rapid restoration of vegetation, while others have been slower to recover, and still others showing no signs of recovery whatsoever. The repopulation of reflooded marshlands by the Marsh Arabs has also begun, and this returnee population also faces many problems related to quality of life and public hygiene.

Impact of neighboring country watershed management on marshland rehabilitation

The aquatic environment of Iraq's southern region is fed by rivers whose uppermost reaches lie in Turkey, middle reaches in Syria, and lower reaches in Iraq. Turkey has constructed dams on both the Euphrates and Tigris Rivers, and Syria has constructed dams on the Euphrates and some of its tributaries. Iran too is exploiting water sources on its side of the marshes, significantly affecting the volume of water flowing into the Iraqi side.

Current status of household waste management

Up to the Iraq War, household refuse was collected by dustcarts in Baghdad and other major cities. Though quality declined after the Gulf War, this system was apparently still working relatively effectively; however since the Iraq War, this system has ceased to function, and urban household refuse is now dumped on roadsides. As for treatment, open dumping was the norm for urban domestic refuse; in rural areas where no collection systems existed, refuse was burned outdoors or dumped in the surrounding countryside. No hygienic final treatment systems currently exist in Iraq.

Problems related to special types of waste

Most hospitals in central Baghdad used to use incinerators to dispose of medical waste, but due to lack of funds, fuel and parts during and after the Iraq War, most have fallen into disuse, as a result of which large amounts of medical waste remain uncollected and abandoned. The War and subsequent plundering and other destructive acts have also generated large

amounts of construction and military waste. No progress has been made on the clearing up of destroyed and abandoned vehicles and vessels.

Current status of water supply

Before the Gulf War, Iraq's water supply system employed what was at the time up-to-date technology and functioned efficiently. However, with the imposition of economic sanctions, Iraq was unable to expand or update the system, resulting in extensive leaks throughout the network, and a steady decline in the volume and quality of water supply. This, combined with the growth of urban populations, has affected everyday life, with some areas receiving almost no water. Waterborne infectious diseases, which had been eradicated prior to sanctions, also spread again due to the impossibility of importing chlorine disinfectants.

Current status of household wastewater treatment

Metropolitan Baghdad's sewer system covered 80% of the city, while the national average was 28%. Similarly, the wastewater treatment rate was 55% for metropolitan Baghdad, and under 20% in the governorates. Wastewater from households not connected to sewers is treated on an individual basis, but outside metropolitan Baghdad, unsanitary disposal is not uncommon. Moreover, according to a survey conducted immediately after the end of the Iraq War, there were no functional treatment facilities, and untreated sewage and sludge was allowed to flow freely into rivers, water channels, and unoccupied land, causing environmental and health problems. Baghdad's wastewater flows into its only source of water, the Tigris River.

Industrial pollution

Iraq's industry has suffered severe impacts from economic sanctions and lack of investment, causing chronic environmental problems such as the discharge of untreated wastewater from factories, leakage of chemicals into soil and groundwater, and release of harmful exhaust gas and particulate matter into the atmosphere. Many facilities that handled harmful or dangerous substances, including factories, mines and ammunition storage facilities, also suffered war and other damage, and have been subsequently abandoned without the implementation of any appropriate environmental or health protection measures.

Pollution and other problems caused by the petroleum industry

Iraq is blessed with plentiful oil resources, boasting the world's second largest reserves (third according to some statistics). However, exploitation of those reserves has had major impacts on the environment, including the large-scale draining of the southern marshlands. Oil extraction also carries the risk of spilled oil contaminating aquatic environments, and the burning off of by-products such as natural gas generates NOx, SOx and greenhouse gases. Under the current circumstances of frequent power cuts causing people to secure energy by

economizing on food, an energy policy needs to be implemented, but that policy will need to employ environment-friendly technology.

Degradation of land and desertification

Drought and marshland drainage have exacerbated degradation of land and desertification. The passage of military vehicles is also thought to damage the fragile vegetation of arid zones and hasten wind erosion.

(3) Ongoing reconstruction initiatives

Japanese assistance for Iraq's reconstruction

Japan has pledged an initial $1.5 billion in grant aid and up to $3.5 billion in mainly yen loans as mid- to long-term assistance for Iraq's reconstruction. In addition to direct assistance, Japan is also channeling some of this money to reconstruction-related funds, and via NGOs to emergency aid projects, etc. The Government of Japan has already announced its intention to provide yen loans up to about 76 billion yen for port rehabilitation, irrigation sector support, and thermal power plant rehabilitation.

Environmental initiatives

As an environmental project of the Japan International Cooperation Agency (JICA), in March 2006, 13 trainees were brought to Japan to participate in a group training program on restoration of marshlands in Southern Iraq. JICA has also held third-country training programs in Jordan in areas such as waste management and in water supply, sewerage, and water quality analysis, and has recruited Iraqi trainees for existing group training programs in Japan. In 2004, to plan training programs in the environmental field, JICA researched capacity building needs. It proposed implementation of the following 8 types of training program: "Environmental Assessment and Environmental Impact Assessment (EIA)", "Environmental Research, Statistics and Study Approaches", "Environmental Monitoring", "Management of Protected Areas", "Conservation Biology", "Environmental Awareness", "Environmental Laws, Legislations, Regulations and Agreements", and "Solid Waste Management: Legislative and Technical Aspects". Through the International Reconstruction Fund Facility for Iraq, to which Japan is a donor, UNEP's International Environmental Technology Centre (IETC) has also held training and pilot programs, compiled and analyzed data, and provided coordination support related to marshland management. UNEP's Post Conflict Assessment Unit (PCAU) too has, in addition to providing relevant equipment, helped to nurture human resources in the environmental field in Iraq by providing Iraqi Ministry of Environment personnel with training in areas such as environmental legislation, environmental administration and environmental monitoring technology, and help in drafting environmental legislation and environmental

assessment reports. Other environment-related activities include the provision of refuse collection vehicles and other equipment through grant aid, grassroots-level assistance, donations to international agencies, assistance through NGOs, and the execution of studies for the formulation of reconstruction and rehabilitation projects in Iraq.

Environmental assistance from donors other than Japan

Other than Japan, the United Nations Assistance Mission for Iraq (UNAMI) is providing assistance in the environmental field throughout Iraq. Where the southern marshlands are concerned, various donor agencies are providing assistance according to the issues they have chosen to tackle, with the US Agency for International Development (USAID) focusing particularly on socioeconomic issues, while Italy's Ministry for the Environment and Territory (IMET) is helping on marshland water issues, and the Canadian International Development Agency (CIDA) on ecosystem rehabilitation. UNEP is implementing a pilot project that makes use of appropriate technology in the fields of water supply and sanitation.

(4) Potential for the provision of environmental assistance by Japan

Goals of assistance for rehabilitation of the southern marshlands

The ultimate goal of such assistance should be to ensure the survival of both the nature and human community of the region through returning the vegetation and ecosystem to its former state and rebuilding the foundations on which the Marsh Arabs structured their livelihoods. From the social viewpoint, this will require support for rehabilitating human communities and promoting wise use of the marshes; from the scientific viewpoint, it will require the effective use of endemic biological resources, and application of technology that can be easily sustained on limited funds, energy and chemical substances; and from the international viewpoint, it will require coordination with other countries in the Tigris and Euphrates drainage basins, and exchange of information and division of roles through international teamwork. Consideration also needs to be given to such matters as the sustainable use of biological resources, the coupling of the social system with marshland rehabilitation, the ranking of assistance priorities based on sound knowledge of current living standards, and the preservation of biodiversity through taking a cautious approach to the introduction of non-native species.

Goals of assistance in the fields of water supply, sanitation, and waste

Iraq's water supply is relatively well-developed, with urban areas being equipped with networks of water pipelines. However, because facilities have become rundown owing to maintenance issues, the short-term goal should be the rehabilitation of existing facilities and water supply pipelines, while the mid- to long-term goal should be to increase the water

supply capacity. Under the current circumstances of almost total lack of working water treatment facilities, large volumes of sewage are flowing into the Tigris and Euphrates river systems, particularly in Baghdad. Accordingly, there is an urgent need for initiatives to build sewage treatment facilities in major cities such as Baghdad and Basra and reduce the unsanitary disposal of sewage in other governorates and autonomous regions through the use of household sewage treatment systems. Where waste management is concerned, a large workforce recruited as a job creation strategy is already engaged in the task of refuse collection. As such, in addition to the provision of refuse collection equipment, Japan should also consider such assistance as the construction of sewage treatment plants and formulation of long-term waste management policy.

Goals of assistance in other environmental fields

Top priority must first be put on the restoration of basic living standards of the Iraqi people, after which it will be important to set staged targets and implement plans for raising the quality of life of inhabitants while protecting the environment in conjunction with economic development. Because atmospheric pollution and global warming are mutually connected, energy generation needs to be comprehensively handled with a view to long-term issues such as greenhouse gas reduction. An urgent task is the removal and detoxification of harmful and dangerous substances in environmental hotspots, followed by decontamination of soil and prevention of groundwater pollution by harmful substances in the locations concerned.

Assistance for raising environmental management capacity

As Iraq's political system undergoes major changes, the creation of legislation and building of institutions is a matter of maximum priority. Environmental statistics constitute fundamental data for considering environmental policy and standards, while monitoring and evaluation are important means for measuring the effectiveness of environmental policy. As such, there is an urgent need to improve the capabilities of the Iraqi Ministry of Environment in these fields, while in the mid- to long-term view, the nurturing of highly competent environmental specialists is also called for. Another need, in view of the fact that Iraq has, owing to its long isolation from the international community, not become a signatory to international conventions in the environmental sphere, is the acceptance of these conventions and the implementation of environmental management based on those treaties through international cooperation. Moreover, in view of the risk that a rush of aid for the reconstruction of Iraq could, depending on the way it is applied, lead to further environmental degradation, there is also a need to establish mechanisms, such as environmental assessment, for ensuring that sufficient attention is paid to the environmental and social aspects of development.

(5) Potential for future assistance in the environmental field

- **Cooperation that can be provided under the current circumstances**

The Committee recommends the following as forms of cooperation that can be provided under the current circumstances: (1) promotion of assistance projects that can be implemented under the current circumstances, (2) planning of projects to be implemented once the political situation stabilizes, (3) active participation in frameworks for donor coordination, and (4) promotion of teamwork between research institutes and universities.

1. Promotion of assistance projects that can be implemented under the current circumstances

Firstly, assistance projects that can be implemented outside Iraq, such as training or the investigation of needs by inviting relevant Iraqi personnel for hearings in foreign locations, could be effective, but these 2 elements should be combined so that trainees are at the same time used as information sources for the investigation of needs. Secondly, Japan should pursue projects that can be implemented without the on-site involvement of Japanese personnel, such as the provision of equipment through grant aid, and support for reconstruction activities being conducted mainly by Iraqis themselves. Thirdly, project preparations such as mid- to long-term infrastructural assistance to be financed by yen loans and other sources should be considering the guiding principles of the guidelines of the environmental and social considerations of Japan's ODA. Fourthly, continued support should be provided for implementation of the second stage of UNEP's marshland management project as an assistance initiative aimed at the rehabilitation of Iraq's southern marshlands.

2. Planning of projects to be implemented once the political situation stabilizes

The building of partnerships with local agencies capable of conducting activities within Iraq is of vital importance. This calls for consideration firstly of such policies as the promotion of supervisor-level exchanges through inviting supervisors to Japan as trainees, and the building of official government ties through high-level meetings and other means. Another measure would be to establish a structure outside Iraq for the on-site implementation of projects as soon as the political situation stabilizes sufficiently to allow entry, and use this structure to train Iraqi personnel while conducting research for the formulation of projects.

3. Active participation in frameworks for donor coordination

Japan should actively pursue opportunities for participation in donor gatherings to cultivate complementary and non-overlapping ties with other donors that secure a role for Japan. It is of vital importance for Japan to prepare for such meetings by drafting a list of priorities and negotiating for the allocation of roles, cooperation, etc. in accordance with these priorities.

Possibilities for Japan to contribute technologically to projects being implemented by both the UN and donor country agencies should also be considered.

4. Promotion of teamwork between research institutes and universities

Joint research by Japanese and Iraqi universities and research institutes on shared themes aimed at resolving Iraq's environmental problems should be promoted both for the role it could play in improving the capabilities of Iraqi researchers and its importance for identifying future assistance needs.

- **Mid- to long-term cooperation**

The Committee recommends the following as forms of mid- to long-term cooperation: (1) drafting of assistance plans for specific environmental fields; (2) formulation and implementation of cooperation projects; (3) support for participation in frameworks related to global environmental issues; and (4) support for the creation of structures aimed at preventing environmental degradation caused by reconstruction development.

1. Drafting of assistance plans for specific environmental fields

Assistance plans for specific environmental fields should be drafted in preparation for when law and order in Iraq is stable enough to permit their implementation. Such plans should clearly explain the distinctive features of Japanese assistance and its merits compared with that of other donors. This will require the drafting of strategic plans based on a sound examination of available Japanese environmental technologies to identify those that could be applied effectively to Iraq's geographical, social and economic circumstances.

2. Formulation and implementation of cooperation projects

Japan should identify feasible projects that utilize its strengths, such as personnel training and the localization of Japanese technology. A concrete example would be contribution to the rehabilitation of Iraq's southern marshlands from such perspectives as (1) rehabilitation of the marshland ecosystem that pays due consideration to the recycling of resources, (2) reconstruction of the foundations of everyday life of the marshland dwellers, and (3) activating mechanisms for the coordination of cross-border water resource management. Japan should also consider how it can team up with international organizations and other donors to provide efficient assistance.

3. Support for participation in frameworks related to global environmental issues

It is important for Japan to support Iraq's participation in frameworks related to global environmental issues being implemented by the international community. Because becoming a signatory to such conventions will impose international obligations whose fulfillment will

require the building of relevant capabilities within the organizations concerned, Japan should consider the planning of programs for the comprehensive raising of capacity from institutional, structural, and human resources-related perspectives. Japan should also consider assistance aimed at the sustained conservation of the southern marshlands after rehabilitation through arguing their international importance and the need to protect them internationally under the Ramsar Convention.

4. Support for the creation of structures aimed at preventing environmental degradation caused by reconstruction development

In view of the anticipated large-scale reconstruction development throughout Iraq, there is a need to support initiatives aimed at addressing the environmental issues expected to emerge from such development. Where projects implemented by Japan are concerned, there is a need to ensure that due consideration is paid to environmental and social concerns through establishing appropriate environmental assessments, environmental and social considerations, and other systems and implementation guidelines, and training required personnel. This in turn will require assistance from both legislative and human resources training perspectives to build institutions within the Iraqi government itself for addressing environmental and social considerations, and to improve its capacity for the implementation of plans, environmental monitoring, and compliance with laws and so forth.

Contents

Special Committee on Environmental Cooperation for Iraq: List of Members

	Name	Affiliation	Post
Chair	Kazuhiko Takeuchi	Graduate School of Agricultural and Life Sciences, University of Tokyo	Professor
Committee Members (in alphabetical order)	Saburo Matsui	Graduate School of Global Environmental Studies, Kyoto University	Professor
	Masahiro Murakami	Graduate School of Engineering, Kochi University of Technology	Professor
	Kazuo Takahashi	Faculty of Humanities, University of the Air	Associate Professor
	Kenichi Tanaka	Japan International Cooperation Agency (JICA)	Senior Advisor
	Isamu Yokota	Institute for Environmental Sciences, University of Shizuoka	Professor

List of Terms and Abbreviations

Term/Acronym	Official Name	Remarks
AMAR	Assisting Marsh Arabs and Refugees	NGO
ARDI	Agriculture Reconstruction and Development Program for Iraq	USA
ASEAN	Association of Southeast Asian Nations	
BOD	Biochemical oxygen demand	
CDM	Clean Development Mechanism	
CIDA	Canadian International Development Agency	Canada
CIMI	Canada–Iraq Marshland Initiative	Canada
CPA	Coalition Provisional Authority	
CRIM	Center for Restoration of the Iraqi Marshlands	Iraq
EPC	Environmental Protection Center	Iraq
EPIC	Environmental Protection and Improvement Council	Iraq
EPID	Environmental Protection and Improvement Directorate	Iraq
EST	Environmentally Sound Technology	
EU	European Union	
FAO	Food and Agriculture Organization	
FY	Fiscal year	
GAP	Southeastern Anatolian Project (Güneydogu Anadolu Projesi)	Turkey
GEC	Global Environment Centre Foundation	Japan
GIS	Geographic Information System	
IF	Free Iraq Foundation / Iraq Foundation	NGO
ILEC	International Lake Environment Committee	Japan
IMET	Italian Ministry for the Environment and Territory	Italy
IMF	International Monetary Fund	
IMRP	Iraq Marshlands Restoration Program	USA
IOM	International Organization for Migration	
JBIC	Japan Bank for International Cooperation	Japan
JICA	Japan International Cooperation Agency	Japan
MoMPW	Ministry of Municipalities and Public Works	Iraq
MoC	Ministry of Communication	Iraq
MoE	Ministry of Environment	Iraq
MoPDC	Ministry of Planning and Development Cooperation	Iraq
MoWR	Ministry of Water Resources	Iraq
NGO	Non-Governmental Organization	
ODA	Official Development Assistance	
RO	Reverse osmosis	
SOx	Sulfur oxides	
UNAMI	United Nations Assistance Mission for Iraq	
UNDG	United Nations Development Group	
UNDP	United Nations Development Programme	
UNEP/IETC	United Nations Environmental Programme, International Environmental Technology Centre	
UNEP/PCAU	United Nations Environmental Programme, Post-Conflict Assessment Unit	
UNESCO	United Nations Educational, Scientific and Cultural Organization	
USACE	US Army Corps of Engineers	USA
USAID	US Agency for International Development	USA
USEPA	US Environmental Protection Agency	USA
VOC	Volatile organic compounds	
WB	World Bank	
WHO	World Health Organization	
WWII	Second World War	

Chapter 1 Background and Objectives

1.1 Background to the Consideration of Environmental Assistance for Iraq

The region of the Middle East occupied by present-day Iraq prospered in ancient times as the hub of the Mesopotamian civilization, and Iraq's southern region, blessed with abundant water resources from 2 major rivers, the Tigris and Euphrates, is also thought to be the location of the biblical Garden of Eden.

After WWII, Iraq used its abundant oil reserves to pursue modernization. The country has been governed by regimes that have been unusually secular for the Middle East, and the focus of those regimes on education created a populace with a high level of education. However, the disregard shown by past regimes for the importance of investment in public infrastructure has left the country in a state of dilapidation.[2]

This state of ruin has been further exacerbated by the economic sanctions imposed after the Gulf War, and by the Iraq War and subsequent conflict, creating an urgent need for reconstruction assistance through international organizations, direct country-to-country cooperation, and so forth. Japan has already declared its wish to assist in the reconstruction of Iraq, and is now engaged in the consideration of concrete assistance plans.

There are particularly high expectations for environmental assistance due to its symbolic significance for Iraq's reconstruction, and the Ministry of the Environment is considering concrete methods of contributing to Iraq's reconstruction in the environmental field. While only limited information can be obtained until security begins to improve, Japan needs to examine areas in which it could contribute in the future, and formulate policies for meeting its responsibilities in accordance with its status in the international community.

1.2 The Purpose and Objectives of the Special Committee

Iraq suffers from a wide range of environmental problems, including environmental degradation stemming from ill-advised development under the former regime, delayed development or functional decline of environmental infrastructure due to lack of funds, and reckless exploitation of natural resources. Resolution of these problems requires that members of the international community cooperate to provide assistance in line with their

respective capabilities. Japan should accordingly identify the fields in which its technology, resources and frameworks can be used most effectively and efficiently.

Insofar as Japan needs to examine measures and concrete possibilities for providing assistance in the environmental field as an aspect of the reconstruction of Iraq, the purpose of the Special Committee is to investigate the current status of Iraq's environment and gather information on assistance initiatives in the environmental field being implemented by international organizations and other parties, and based on these investigations, consider the forms of environmental assistance that Japan could provide.

1.3 Details Considered

1.3.1 Scope

(1) Iraq's political and social circumstances, and analysis of international situation

Any examination of the possibilities for providing environmental reconstruction assistance to Iraq needs to look at the environmental issues faced by Iraq from a broad perspective that encompasses the nature and cultures of surrounding countries and indeed the whole Middle East region. In addition to Iraq's relationships with surrounding countries such as Iran, Turkey, Syria, Jordan, Egypt, Israel and Palestine, sufficient understanding and analysis of its relationships with the USA, the EU nations, and international organizations are also vital. Organized below are the key points of the above relationships that should be taken into account in any consideration of the provision of environmental assistance to Iraq.

Iraq is currently building a democratic government, but its internal situation is still unstable. The restoration of public order is vital to the provision of essential reconstruction assistance, and the current level of safety is not sufficient to permit the immediate launch within Iraq of Japanese assistance initiatives. Examined here are the outlook for the establishment of new governmental institutions, the restoration of public order, and other general factors that are prerequisites for the provision of reconstruction assistance within Iraq.

(2) Iraq's environmental issues and assistance needs, and ongoing initiatives of other countries

Japan and other countries have, since almost immediately after the end of the Iraq War in May 2003, been implementing various initiatives for the reconstruction of Iraq. Provided here is a broad analysis of Iraq's environmental problems and assistance needs, and present an overview of the priority issues related to the provision of reconstruction assistance. Also

provided is a review the achievements of environmental initiatives undertaken so far and those currently being planned.

(3) Japanese knowledge assets that could contribute to Iraq's reconstruction

Japanese knowledge assets that the Committee considers could be useful to reconstruction assistance for Iraq in the environmental field are identified.

(4) Recommendations for Japanese environmental cooperation in Iraq

As well as making recommendations regarding policy for reconstruction assistance in the environmental field, specific projects that hold out possibilities are also proposed.

1.3.2 Methodology

The following methods were used to analyze the potential for providing environmental assistance to Iraq and to determine ways in which Japan could provide distinctive assistance that incorporates its strengths in the environmental field.

(1) Review of available reports and other data

Because of the difficulties involved in dispatching Japanese nationals to carry out research and implement technical assistance projects within Iraq under the worsening security situation, the Committee obtained and reviewed all relevant data available in Japan or from agencies engaged in the implementation of projects in Iraq as basic information for the planning of assistance projects. Information on postwar Iraq's environmental problems was gathered from existing reports, information published on the Internet, international conference presentations, and other materials issued by international organizations such as UNEP and the World Bank, assistance agencies of donor countries, and agencies in Iraq.

(2) Determination of the current situation through hearings of relevant personnel

the current situation and ongoing initiatives in Iraq were identified and analyzed through conducting interviews and making enquiries with relevant personnel in international agencies, donor country assistance agencies, and Iraq's Ministry of Environment.

(3) Examination of potential fields for contribution in the light of Japan's technological and knowledge assets

Based on an accurate assessment of Iraq's environmental problems, the mechanisms behind those problems and the measures required to resolve them are considered, and an attempt is made to identify technologies for implementing those measures in which Japan has

particular competence. The fields in which Japan can best provide assistance are then examined.

Chapter 2 Current Status of Iraq's Environment and Ongoing Reconstruction Initiatives

2.1 Iraq's Political Processes and Social Circumstances

2.1.1 Iraq's Political Processes

The domination of Iraq by a harsh one-party dictatorship began in 1968 when the Baath party took over the reins of government. After becoming the president of Iraq in 1979, Saddam Hussein involved the country in a period of almost constant war, starting in 1980 with the 8-year Iran–Iraq War, followed by Iraq's invasion of Kuwait in 1990, and the Gulf War of 1991. After its defeat at the hands of American and other troops of the multinational forces allied against it in the Gulf War, Iraq became isolated from both surrounding countries and the international community as a whole. The imposition of economic sanctions following Iraq's invasion of Kuwait had broad impacts on the inflow of vital commodities, and the populace suffered poverty as a result. It was against this backcloth that the USA and UK, fearful of the spread of weapons of mass destruction, invaded Iraq in March 2003, toppling Saddam Hussein's 24-year dictatorship in only 20 days.

After the fall of Saddam Hussein, Iraq was governed by the Coalition Provisional Authority (CPA) until authority was handed over to a transitional Iraqi government in June 2004. This was followed in January 2005 by the election of 275 representatives to the transitional Iraqi National Assembly, which then passed Iraq's new constitution in October 2005. A general election based on this constitution was held in December 2005, and a new parliament was elected, despite that fact that objections from various factions and parties caused confirmation of the election results to be delayed until February 2006.* According to the constitution, a president chosen by at least two-thirds of the parliament (184 representatives) is supposed to appoint the candidate proposed by the largest faction to the post of prime minister. However, negotiations between various parties have run into difficulties, with Ibrahim al-Jaafari, the former prime minister of the transitional government who was chosen by the Shiite faction, the largest faction, as its prime ministerial candidate, being rejected by Jalal Talabani, the former president of the same transitional government. The USA is also opposed to the appointment of al-Jaafari as prime minister. Rifts between political parties continue to create problems, with the parliament that gathered for its first session in March 2006 failing to agree on the selection of a speaker and the former foreign minister Adnan Pachachi, the eldest representative,

* Election results were as follows: Shiite faction 128 seats, Kurdistani Alliance 53 seats, Sunni faction (total for two factions) 55 seats, others 39 seats. Number of seats: 275. Term: 4 years

serving as provisional speaker. Moving forward, the parliament is to convene, and within 30 days select a president, who must within 15 days appoint a prime minister from the largest faction. The prime minister must then present his/her cabinet of ministers to the parliament within 30 days, and obtain its approval. A parliamentary committee for constitutional reform will deliberate on matters such as details of the federal system of government being demanded by the Shiite faction and the Kurds, with the resulting proposals being put first to parliament, and then to a national referendum.

Historically the Sunni faction, which accounts for no more than about 20% of the population of Iraq, has played a central role in the government of the region since the days of the Ottoman Empire. This trend continued even after the nation of Iraq was founded, with the Shiites and Kurds that make up the majority of the population being treated inequitably. As a result of the recent election, power has passed into the hands of non-Sunni factions, with the Shiites and Kurds gaining about 80% of the vote between them. As long as the government continues to be determined by election, non-Sunni factions look likely to retain power for a prolonged period, giving rise to concern about how the Sunnis who have ruled up to now will accept the current situation.

2.1.2 Social circumstances

Iraq became a middle-income country in the 1970s, with per capita income reaching $3600 by the beginning of the 1980s. Under the impact of economic sanctions, however, per capita income had declined to about $1000 by 2001, and has dropped even further since the Iraq War, as a result of which the populace has since 2003 come to depend on food rations. Iraq's education, public health and other government services, which once ranked among the highest level in the Middle East, have also declined to the lowest level in the region. Unemployment too is high, and much of the available employment being of an unstable, short-term nature.[2]

Public order in Iraq has shown no signs of improvement even by March 2006, 3 years after the conclusion of the Iraq War. Particularly as the political processes involved in creating the new government approached conclusion in late February 2006, the al-Askari Mosque (Sumarra, central Iraq), a sacred place to the Shiites, was blown up, sparking increasingly violent exchanges between Shiites and Sunnis throughout Iraq. With calls from Grand Ayatollah Ali al-Sistani, President Talabani and many other leaders for national reconciliation and a cessation of retaliatory attacks, the situation has improved somewhat, but is still very much in the balance, with a real danger of factional strife escalating into civil war. In the north, the Kurdish population that became the second largest parliamentary party is demanding

acceptance and expansion of autonomous rule, a move viewed with concern by Turkey and other neighboring countries harboring residents of Kurdish descent, because they fear the influence that such aspirations will have on their own Kurdish populations.

It is estimated that since the start of the Iraq War, over 30,000 Iraqi civilians at the very least have been killed or injured, and politicians and diplomats continue to be murdered. The US and British troops stationed in Iraq have also suffered a considerable number of deaths, and over 1600 injured, and are finding it difficult to replenish their ranks with new troops. Withdrawal of stationed troops depends on strengthening the capabilities of Iraqi military and police forces to a level at which they can maintain public order without the help of foreign forces. However, with many predicting that this will require several more years, and that armed conflict is likely to continue for over a decade, the future remains plagued with uncertainty.

Moreover, the goal of the insurgents is thought to be to spark a civil war, and it is doubtful that Iraqi military forces, even if strengthened, could function as a deterrent to civil war. It is thought that the loyalty of Iraqi troops lies not with the central government in Baghdad, but is rather split along factional or ethnic lines, with each unit pledging loyalty to the leaders of its respective affiliation—Shiite, Sunni, Kurd, and so forth. As such, there is serious concern that in the event of civil war, Iraqi forces would just disintegrate.

Insofar as it is the single biggest factor affecting Iraq's reconstruction, the situation as regards public order—currently still riddled with uncertainty and with chances of improving in the near future thought by most to be slim—needs to be watched with utmost care.

2.2 Iraq's Environmental Problems: Challenges and Assistance Needs

In the current situation with very limited possibilities for activities within Iraq itself, developing an accurate understanding of the current status of Iraq's environmental problems requires the piecing together and evaluation of fragmentary information from as many information sources as possible. The published reports and other documents of a wide array of agencies, interviews with Iraqi officials, press briefing records, and so forth were used as information sources.

The *Desk Study on the Environment* in Iraq issued by UNEP in 2003 is the single most comprehensive report on the current status of Iraq's environmental problems. The aim of this report was to speedily assess the overall situation with respect to Iraq's environment, and

identify the most pressing environmental issues faced by Iraq. The report provides an overview of Iraq, and explains the country's general environmental problems, and environmental impacts caused specifically by military activities. Following this Desk Study, UNEP conducted an on-site survey in July and August 2003, and issued a Progress Report in which it identifies reconstruction activities on which priority should be placed.

The UN and World Bank in 2003 issued the *UN/World Bank Iraq Needs Assessment*, a report that has been used by various countries and agencies involved in the provision of reconstruction assistance for Iraq as a basis for the consideration of assistance issues. It presents an assessment of the current situation in Iraq and its assistance needs in 14 sectors and 3 cross-cutting themes (Table 1).

Table 1: UN/World Bank Joint Iraq Needs Assessment—Scope of Report

Sectors	Cross-cutting themes
Education, Health, Employment creation, Water and sanitation, Transport and Telecommunications, Electricity, Housing and land management, Urban management, Agriculture, water resources, and food security, Financial sector, State-owned enterprises, Investment climate and trade, Mine action, Government institutions, rule of law, civil society, and media.	Human rights, Gender, Environment

Prior to these reports, UNEP in 2001 issued a technical report titled *The Mesopotamian Marshes: Demise of an Ecosystem* that used satellite images to warn the world of the fact that 90% of the southern marshland (Mesopotamian Marshes) had disappeared. In 2005 too, UNEP conducted an assessment of environmental hotspots.

Since the conclusion of the Iraq War, JICA too has conducted surveys on the rehabilitation of Iraq's infrastructure, and on human resource capacity building needs in the environmental field.

In addition, relevant personnel were interviewed to obtain details and the latest information on matters that were not fully covered in reports. Officials from Iraq's Ministry of Environment, Ministry of Water Resources, and other branches of the Iraqi government visiting Japan in August 2005 were interviewed to obtain information mostly on the southern marshlands. In September, a research team was dispatched to Italy to interview officials at Italy's Ministry of Land and Environment, and in March 2006, a meeting was held with Iraqi government officials visiting Japan on JICA training programs to exchange views. The Committee sought to obtain further information on Iraq's environmental problems in different environmental fields through using records of events such as meetings between donors of reconstruction assistance for Iraq, and press briefings held by Minister of the Environment Yuriko Koike and Nasreen Berwari Minister of Municipalities and Public Works in Iraq.

2.2.1 Iraq's Southern Marshlands

(1) Changes in Iraq's southern marshlands

It was in the marshlands in Iraq's southernmost region of Mesopotamia where, over 5000 years ago, the world's oldest urban civilization emerged. The same marshlands are said to be where the biblical Garden of Eden was located, and where the Great Flood, caused by 40 days and nights of unremitting rain, occurred. They also boast remains of the Sumer civilization, known for its invention of the wheel, and have since the first recorded history been inhabited by mankind in a sustained relationship with nature.

The Marsh Arabs revolted against the regime of Saddam Hussein after the Gulf War of 1991. As a measure designed also at rooting out rebellious elements using the marshes as a base, the government began to construct dikes and drainage channels with the goal of diverting water inflow and draining the marshes to develop them for agriculture, a project that led to the desiccation of over 90% of the marshes. It is said also that reed beds were burned and water intentionally poisoned.[3] It is estimated that over 500,000 Marsh Arabs were forced to find refuge in other parts of Iraq, or in Iran and other neighboring countries, and by January 2003, the marshes had been laid barren.

Before the Saddam Hussein regime drained them, Iraq's southern marshlands were once the greatest expanse of marshland in the western half of Eurasia and a valuable habitat for wildlife including a number of endangered species. The area has also served an important role as a stopover site for migrating birds, and as a constituent part of the Persian Gulf's fishing industry. The draining of the marshes has had a disastrous impact on the ecosystem, and endangered the survival of a number of indigenous species. These impacts moreover extend beyond the marshes to affect the Shatt al Arab waterway and Persian Gulf as a whole. The marshlands, for example, served as a spawning ground and nursery for marine life of the whole Persian Gulf, and with the dramatic decline in these capabilities as a result of draining, the Gulf's fishing industry has suffered severely.

Work began on destroying the dikes and reflooding almost as soon as the Iraq War ended in May 2003, and by May 2004, the efforts of the Iraqi Ministry of Water Resources and the local population had resulted in the reflooding of about 40% of the marshes.[4] However, because of the haphazard way in which this reflooding was carried out, rehabilitation of the marshes has been patchy, with some localities showing rapid restoration of vegetation, while others have been slower to recover, and still others showing no signs of recovery whatsoever. The repopulation of reflooded marshlands by the Marsh Arabs has also begun, and by May

2004, over 40,000 inhabitants had resettled the marshes to take up their traditional way of life once more as part of the marshland ecosystem.[3] However, this returnee population also faces many problems related to public hygiene and to quality of life owing to the loss of the fisheries and other elements on which they formerly based their livelihoods.

The Iraqi Ministry of Water Resources has made the rehabilitation of the marshlands one of its top priorities, and has established a Center for Restoration of the Iraqi Marshlands (CRIM), which works with donor countries, international agencies, NGOs, etc., and plays a central role in planning the sustainable rehabilitation of the marshlands.

(2) Marshland features and current status

Iraq's southern marshlands can be divided roughly into the following 3 marshes: Hawizeh Marsh located on the border with Iran, Hammar Marsh fed by the Euphrates, and Central Marsh, positioned between the Hawizeh and Hammar Marshes. Hawizeh Marsh, which is fed by the Tigris to the north, and Karkheh River to the east, has suffered relatively less drainage and desiccation than the other 2 marshes, but Iran is carrying out big dam works on the upper reaches of the Karkheh River on its side, and it is feared that inflow to Hawizeh Marsh will decline as a result. Central Marsh is fed from the north by a multitude of tributaries branching out from the Tigris, and according to surveys carried out to date, the ecosystem of Abu Zirig Marsh, located on the western edge of Central Marsh, has shown greatest recovery so far.[5]

Iraq's southern marshlands thus comprise a diversity of aquatic environments, with individual marshes and lakes differing in their natural conditions and the nature and extent of development and other human impacts. There are also areas in which the salinity is so great that it is hindering the recovery of vegetation. However, considering that even the water flowing into the marshes from the Euphrates, which is more saline than that of the Tigris, does not exceed the WHO-designated permissible salinity of 1000 mg/L for drinking water, it seems unlikely that the inflow from rivers is the cause of the high salinity of such areas. The probable explanation is that these particular marshes are virtually semi-closed water areas that, due to an imbalance between water inflow, outflow, and evaporation, do not allow sufficient water circulation and become highly saline as a result.[6]

(3) International watershed management

The fact that the upper reaches of rivers feeding into the Mesopotamian marshlands lie in other countries complicates the water issues of this region. The aquatic environment of Iraq's southern region is fed by rivers whose uppermost reaches lie in Turkey, middle reaches in Syria, and lower reaches in Iraq. Claiming upstream nation privileges, Turkey in the 1970s launched the Southeastern Anatolian Project (GAP) for dam construction on both the

Euphrates and Tigris rivers, and has since 1981 built 12 dams (out of a planned 22) on the 2 rivers. Syria has also dammed the Euphrates and some of its tributaries, and Iran too is exploiting water sources on its side of the marshes, significantly affecting the volume of water flowing into the Iraqi side.[7]

(4) Current circumstances of the daily lives of the Marsh Arabs

There were still apparently at least 250,000 Marsh Arab refugees who had not returned to their homeland by 2005. The Marsh Arabs' traditional occupation is fishing, and currently about 90% of returnees to reflooded areas are engaged in the fishing industry. Iraq's coast is very short, and the freshwater fishing industry of the marshlands once accounted for two-thirds of Iraq's annual catch, but that share is now thought to stand below 10%.[8]

Almost all Iraqis are eager for the marshes to be restored to their former state. However, according to an opinion poll carried out by USAID on the specific hopes of the populace,[9] there appears to be something of a generational gap in aspirations regarding life and work in the southern marshlands. The survey showed that people in their forties or older who were born and raised there are eager for the restoration of the marshes, while the under-25 generation that has been involved largely in agriculture (in short, the generation that has no experience of the former marshland life and traditional fishing industry) is keen to see further agricultural development. The generation in between these 2 groups would like to see the marshlands restored, but also harbors hopes for agriculture as a means for earning a livelihood.

Marshland returnees face the problem of a total absence of the infrastructure required to support everyday life—lack of safe drinking water, power supply, refuse collection and sewage treatment facilities, schools, clinics, and other public facilities.

2.2.2 Water Supply and Sanitation

(1) Waste management

Waste management services are implemented by metropolitan Baghdad and branches of the Ministry of Municipalities and Public Works. Up to the Iraq War, household refuse was collected by dustcarts in Baghdad and other major cities. Though quality declined after the Gulf War, this system was apparently still working relatively effectively up to the Iraq War. As for treatment, open dumping was the norm for urban domestic refuse; in rural areas where no collection systems existed, refuse was burned outdoors or dumped in the surrounding countryside. Currently no sanitary final treatment facilities exist in Iraq. With the Iraq War, the

urban refuse collection system ceased to function, and refuse came to be dumped on roadsides. Baghdad has since been equipped with dustcarts and containers for refuse collection through assistance from various donor countries, but such equipment has not yet reached other cities in sufficient quantity.[10]

The War and subsequent plundering and other destructive acts have also generated large amounts of construction and military waste. No progress has been made on the clearing up of destroyed and abandoned vehicles and vessels.

According to a 2001 survey, most hospitals in central Baghdad used to use incinerators to dispose of medical waste, but due to lack of funds, fuel, and parts during the Iraq War, these fell into disuse, and according to an on-site survey carried out by UNEP after the War, large amounts of medical waste remained uncollected and abandoned.[10]

(2) Water resources

The Tigris and Euphrates Rivers are the source of most of Iraq's water. Due to dam construction on the upper reaches of these rivers by Turkey and Syria, the amount of water flowing into Iraq has declined in recent years. Water quality too has apparently declined due to lack of deployment of sufficient water treatment facilities and malfunctioning of existing facilities.

There are 2 sources of groundwater used for drinking water: the mountainous region of northern Iraq and the right bank of the Euphrates River. However, there are fears that these sources have been compromised by water contaminated with petroleum, or by harmful substances released through military activities.[8]

(3) Water supply

Before the Gulf War, Iraq's water supply system employed what was at the time up-to-date technology and functioned efficiently. However, with the imposition of economic sanctions, the system declined considerably. It is estimated that in 2000 Baghdad still boasted 100% water supply coverage, with the national average for urban areas being 91%, and for rural areas, 48%. However, Iraq was unable to expand or update the system, resulting in extensive leaks throughout the network and a steady decline in the volume and quality of water supply. This, combined with the growth of urban populations has affected everyday life, with some areas receiving almost no water. Waterborne infectious diseases, which had been eradicated prior to sanctions, also spread again due to the impossibility of importing chlorine disinfectants. Particularly in the middle and southern regions, mortality has doubled over the past decade under the combined impact of disease and malnutrition.[11]

Agricultural infrastructure (particularly irrigation canal networks) has not been managed properly, and both public and private sector agricultural facilities in the middle and southern regions have suffered damage from war and plunder.

(4) Sewage treatment

Metropolitan Baghdad's sewer system covered 80% of the city, while the national average was 28%. Similarly, sewage treatment rate was 55% for metropolitan Baghdad, and under 20% in the governorates. Sewage from households not connected to sewers is disposed of on an individual basis, and outside metropolitan Baghdad, unsanitary disposal is not uncommon.[11] Moreover, according to a survey conducted immediately after the end of the Iraq War, there were no functional treatment facilities, and untreated sewage and sludge was allowed to flow freely into rivers, water channels, and unoccupied land, causing environmental and health problems. Baghdad's sewage, which accounts for 75% of Iraq's total sewage volume, flows into its only source of water, the Tigris River.[2]

2.2.3 Industrial Pollution Sites

Iraq's industry has suffered severe impacts from economic sanctions and lack of investment, causing chronic environmental problems such as the discharge of untreated wastewater from factories, leakage of chemicals into soil and groundwater, and release of harmful exhaust gas and particulate matter into the atmosphere.[10]

Many facilities that handled harmful or dangerous substances, including factories, mines, and weapons storage facilities also suffered war and other damage, and have been subsequently abandoned without the implementation of any appropriate environmental or health protection measures. UNEP has surveyed these sites, and has designated 1 site in northern Iraq and 4 in the environs of Baghdad as environmental hotspots. UNEP reported that all of these hotspots had suffered damage from plunder, fire, or war, and were all in such a poor state environmentally that none could be used.[12]

Table 2: Hotspots designated by UNEP

Hotspot	Outline
Al Qadissiya metal plating factory complex	Demolished after suffering successive bombardment and plundering. Harmful waste products including high-purity cyanide compounds scattered around premises that the public can enter freely.
Al Suwaira pesticide warehouses	Harmful pesticides whose use is now banned have been looted, and are scattered around the warehouse interiors, making them unsafe even to enter.
Khan Dhari petrochemicals	Refined chemicals have been looted and destroyed by fire. Broken drums and spilled chemicals litter most of the premises.

warehouse site	
Al Mishraq sulfur mining complex	A fire in 2003 caused local atmospheric pollution and crop damage. Currently abandoned.
Ouireej military scrap yard	Contains unexploded bombs and harmful chemicals resulting from collection and processing of metal scrap from the Iraq War and postwar demolition of weapons storehouses.

There may also be problems such as contamination by pollutants from the attack and destruction of large-scale chemical, explosives, and arms manufacturing facilities such as the Al Qa Qaa Complex, Al Qaim Superphosphate Fertilizer Plant, and Al-Tarik State Company, Fallujah II plant. This requires more detailed on-site information gathering.[10]

2.2.4 Other Environmental Problems

(1) Pollution caused by the petroleum industry

Iraq is blessed with plentiful oil resources, boasting the world's second largest reserves (but third according to some statistics). Iraq's oil fields are concentrated in the north and south, with the development of Kirkuk in the north starting in 1934, while Rumaila in the south was brought into full production in the late 1960s, and Majnoon, also in the south, was discovered in 1977 (see frontispiece 3). However, exploitation of those reserves has had major impacts on the environment, the development of the southern oil fields being a prime example, resulting in large-scale draining of the southern marshlands due to the lack of slant drilling* technology in Iraq in the 1970s. Oil extraction also carries the risk of spilled oil contaminating aquatic environments, and the burning of by-products such as natural gas generates NOx, Sox, and greenhouse gases.[13]

(2) Deforestation and desertification

Drought and the draining of the marshes have fueled land degradation and desertification. An extremely severe drought in 1999 caused serious damage to 46% of Iraq's farmland. It is thought that the passage of military vehicles over arid land has also damaged the fragile vegetation found there, resulting in increased wind erosion.

Owing to its climate, Iraq boasts large areas of very sparsely wooded land, and a comparison of figures taken from FAO reports of 1970 and 2000 suggests that the area covered by this sparse woodland has declined considerably. In the 1980s and 1990s, 80% of the date plantations that constituted one of Iraq's export industries were destroyed.[13]

*Slant Drilling: technology for boring at a slant from a certain point, enabling boring over a wide area from one location, and reducing the number of boring and pipeline locations.

(3) Other problems

The current circumstances of a serious shortfall of energy supply and frequent power cuts is forcing people to secure energy sources by economizing on food.* Policies for improving the power supply infrastructure and so forth will no doubt be implemented to resolve such problems, but those policies will need to employ sustainable technology.

2.2.5 Organizations for Environmental Management

(1) Organizations involved in environmental management prior to the Iraq War

The management and protection of the environment was not a priority of Iraq's previous government, but even so, compared with other Middle Eastern countries, it had a reasonably good system of environmental management and monitoring. In 1972 a Human Environment Directorate was established within the Ministry of Health, followed in 1986 by the enactment of an Environment Law and the establishment of an Environment Protection Center (EPC). In 1997, the Environment Law was revised to create the Environmental Protection and Improvement Law, and the EPC changed into the Environmental Protection and Improvement Directorate (EPID). Another revision of the law in 2001 split the EPID from the Ministry of Health to make it an independent agency charged with handling a broader range of environmental problems. At the same time, EPID branches were established in each of Iraq's 15 governorates, and the Environmental Protection and Improvement Council (EPIC), a body made up of experts and representatives of government agencies and the private sector, was also created.

EPID's responsibility was to provide advice on all environmental matters and carry out environmental research and monitoring, reporting its results and views to EPIC. The latter body reviewed EPID reports and took decisions on advisable actions and projects, issuing instructions to relevant ministries and agencies on required measures. EPID had a workforce of over 600, most of them engineers, doctors and other technicians, and operated with an independent budget. However, EPIC ceased to function in the administrative vacuum following the Iraq War in 2003, and EPID was re-integrated with the Ministry of Health.[10]

(2) Ministry of Environment

In September 2003, the Iraqi Governing Council announced a cabinet of ministers that included a Minister of Environment. A proposal for the organization of a new Ministry of

* From the record of a meeting on October 26, 2005, between Japan's Minister of the Environment Yuriko Koike and Nasreen Berwari, Iraq's Minister of Municipalities and Public Works

Environment was then drawn up and approved by the provisional parliament. EPID occupied the core of the new Ministry, which began operations under 2 under-secretaries, 1 each for the Technical and Administrative Units.[10]

The main tasks of Iraq's Ministry of Environment are the drafting and revision of legislation related to environmental matters, implementation of environmental monitoring and identification of pollution sites, monitoring of water quality, formulation of national strategies for environmental protection, solid and hazardous waste management, desertification countermeasures, rehabilitation of the southern marshes, and so forth. As of 2005, it was made up of the 15 directorates given below (Table 3).[14]

Table 3: List of Directorates of the Ministry of Environment, Iraq

Financial Directorate, Administrative Directorate, Legal Affairs Directorate, Environmental Monitoring and Inspection Directorate (assessment, monitoring), Air Pollution and Noise Directorate, Water Directorate, Biological Diversity Directorate, Land Use Directorate, Protection from Chemical Pollutants Directorate, Protection from Radiations Directorate, Department of Solid Waste Management (solid waste, hazardous waste), Environmental Information and Awareness Directorate, Information Technology Directorate (GIS, etc.), Planning and Continual Development Directorate (international cooperation, etc.), Central Labs (laboratory)

Iraq's Ministry of Environment operates several water source water quality monitoring stations, and has regional branches in Baghdad, Basra, Dhi Qar, and Maysan.

In addition to preparing drafts of environmental protection legislation, the Ministry of Environment has established Councils of Environment Protection in each governorate, and is conducting water quality surveys covering the whole of Iraq. It has also allocated a budget of 16.5 billion dinars (about 1.3 billion yen) for the rehabilitation (and protection) of the southern marshes, and has started to restore 6 large sewage treatment plants as a measure for reducing the inflow of untreated sewage into the Tigris and Euphrates Rivers.[15]

Regarding the southern marshlands, the Ministry is monitoring air, water, and soil in Hawizeh Marsh, and is conducting on-site surveys of the Abu Zirig and Kurmashia Marshes. It is also a member of the CRIM Steering Committee.

The UNEP Progress Report of 2003 raised the point that the offices allocated to the new Ministry of Environment are cramped, and that this was having an adverse effect on the Ministry's work. The Baghdad laboratory had been looted, and the equipment of regional labs was outdated and necessary reagents in short supply. The report pointed to the need for strengthening the technical capacity of the Ministry through staff training, the drafting of rules and standards, and the provision of relevant equipment (both field and lab), buildings, computers, vehicles, funds, and so forth.[10] On the administrative side, there is also a need for

stronger environmental governance, improvement of environmental assessment capabilities, measures for the most polluted locations, the raising of public awareness, and the creation of environmental infrastructure through laws and regulations.[14]

(3) Ministry of Water Resources

Iraq's Ministry of Water Resources, which was established in 1969,* is responsible for handling all of Iraq's water issues and managing all surface water and groundwater. Key areas of responsibility include storage dam construction, flood control, water supply (agricultural water, drinking water, water for power generation and industry, environmental improvement, etc.), construction and management of irrigation facilities, and groundwater resources management. It is divided into the following directorates: Finance and Administrative Affairs (handling legal affairs, finance, evaluation, etc.), Planning and Engineering Designs (handling planning and research), Companies Affairs (handling irrigation throughout Iraq), and Construction and Maintenance (handling dam, reservoir and water resource development projects). The Ministry of Water Resources also established CRIM in 2003 to prioritize the rehabilitation of the southern marshes. CRIM coordinates domestic and international efforts to rehabilitate the marshlands, and reports directly to the Council of Ministers.[16]

In addition to irrigation and development projects, the dredging of waterways, dam construction and expansion of irrigation infrastructure in western Iraq, the Ministry of Water Resources is also endeavoring to boost skills through dispatching 381 of its personnel to 21 countries including Japan for training. The Ministry's budget for 2004 was $150 million (about 17 billion yen). Its activities in southern Iraq include the implementation of a drinking water project in Basra.[16,17]

(4) Ministry of Municipalities and Public Works

Iraq's Ministry of Municipalities exercises jurisdiction over all cities except Baghdad and the Kurdistan Autonomous Region, being responsible for water supply, sewage treatment, and local administration. It is currently working with the UN and other assistance agencies to re-launch public services and rehabilitate drinking water supply and sewage treatment facilities. Due to damage inflicted on water supply-related facilities by terror attacks, and general aging of water supply pipeline networks, only 14% of the population are served by the water supply system. Unlike water supply, the sewer system has not attracted much assistance from donors. Waste treatment equipment imported in the 1990s is low-level, and assistance in the form of vehicles and equipment is required.

* The precursor of the Ministry of Water Resources was the Ministry of Irrigation, established in 1918.

In the southern marshlands, work is proceeding on water supply, sewer systems, road networks and other infrastructure, but inhabitants are not returning in a planned fashion. Assistance for water supply, sewerage, and electric power (solar power generation, etc.) is needed.[18]

(5) Ministry of Planning

Iraq's Ministry of Planning is considering the establishment of a special agency for handling the rehabilitation of the southern marshlands. It also aims to further strengthen ties with Iraq's universities, research institutes, and other ministries and agencies, and make progress on negotiations with Iran, Turkey and other neighboring countries on water resource issues. The research institute that the Ministry of Planning is planning to establish will conduct research into vegetation, water, fish, birdlife and other aspects of the southern marshlands, designate special protection areas within the marshes, launch initiatives to boost the skills of technicians and other workers, and so forth.[19]

(6) Ministry of Agriculture

Iraq's Ministry of Agriculture has jurisdiction over farmland ownership, farmers, farmer unions, contracts with agro-businesses, and so forth. It has particular responsibility for supplying farmers with resources, and marketing their produce.[13]

For the southern marshlands, the Ministry of Agriculture has established a Marsh Rehabilitation Committee, which is deliberating on the following 5 plans: (1) development and protection of marshland fish resources; (2) improvement of technologies, including the raising of water buffalos; (3) increased rice production through the use of genetic technology; (4) education and skills training for farmers, women, and senior citizens; and (5) improvement of farmer skills, milk factories, feed factories, etc. Areas of specialist training for which the Ministry is seeking training providers include water buffalo rearing, rice cultivation, agricultural instruction, and fishing industry resource management.[18]

(7) Coordination mechanisms

Under Iraq's prewar administrative organization, almost all of its ministries—including Health, Irrigation, Agriculture, Industry and Mineral, Oil, Foreign Affairs, Education, Higher Education, Science and Technology, Planning—boasted an environmental section, and the heads of directorates within each ministry attended EPIC meetings. The environmental sections of the ministries were retained as they were, and now coordinate their activities with the new Ministry of Environment. At the regional level, each governorate has a Council of Environment Protection that works with the respective governorate's Health and Agriculture Directorates.

Representatives of ministries and agencies meet under the auspices of CRIM to discuss and implement policy related to rehabilitation of the southern marshlands, but each ministry or agency has also established its own section for implementing marshland-related policy. A proposal for the establishment of a dedicated Marshland Rehabilitation Ministry (or Agency) has been floated, but not acted upon.[19]

(8) Environmental initiatives of research organizations and NGOs, etc.

The University of Basra is conducting research into water and aquatic organisms, and is working with the Iraq Foundation (IF), an NGO, to survey the recovery status of ecosystems following reflooding of the southern marshlands. With funding from USAID, the university has also established a laboratory for water quality and soil analysis, and is raising juvenile fish in a fish farm within the marshlands. At the University of Baghdad, the Environmental Engineering and Biochemistry faculties are conducting sample and ecosystem surveys. The University of Mosul conducts research in arid zone agricultural production and arid land management.[13]

The IF is an NGO working for the establishment of democratic institutions and human rights in Iraq. In addition to running constitution assistance projects and human rights education projects, it is working with other NGOs and donor countries to implement the Eden Again Project for rehabilitation of the southern marshlands.[19] The University of Basra is working with the IF to survey the recovery status of ecosystems following reflooding of the marshlands. NGOs working with the IF on the Eden Again Project include Nature Iraq and the Arab Marshlands Forum. Assisting Marsh Arabs and Refugees (AMAR), an NGO providing the Marsh Arabs with humanitarian assistance, has been active in the southern marshlands since 1991, and has since 2003 been supporting the return of Marsh Arab refugees, and promoting healthcare, water, and sanitation projects.

2.3 Japanese Reconstruction Assistance for Iraq in the Environmental Field

2.3.1 Ongoing Japanese Assistance

At a meeting of countries wanting to help in the reconstruction of Iraq held in Madrid, Spain in October 2003, after the conclusion of the Iraq War, Japan offered an initial $1.5 billion in grant aid, with priority for its use to be put on the improvement of public order and reconstruction of the infrastructure supporting the everyday lives of the Iraqi people, including electric power, education, water supply and sanitation, healthcare, and employment. The specific uses to which all of these funds were to be put was decided by the end of 2005, the

breakdown being approximately $900 million in direct aid to Iraq, $120 million in UN-mediated aid, $490 million in donations to funds for the reconstruction of Iraq, $26 million in NGO-mediated aid, and $10 million for training programs. Japan is also making personnel contributions in the form of specialists dispatched to the UN/World Bank Joint Iraq Needs Assessment.

The Government of Japan will provide up to $3.5 billion mainly through concessionary loans (yen loans) to meet the mid-term reconstruction needs. So far, the Government of Japan announced its intention in March 2006 to provide up to 76,489 million yen at total (approximately $650 million) for the implementation of “Port Sector Development Project”, “Irrigation Sector Loan Program” and “Al-Mussaib Thermal Power Plant Rehabilitation Project”.

JICA is conducting research for both grant- and loan-based assistance to be provided by Japan, and is carrying out projects aimed at improving the administrative functions of the Iraqi government. It provided training in Japan for 2 Iraqi government employees in FY2003, 128 in 2004, and 166 in FY2005, and third-country training (in Egypt, Jordan, Syria, and Malaysia) for 100 in FY2003, 506 in FY2004, and 402 in FY2005. The fields covered by these training programs were medicine, electronics, statistics, water, water supply and sewerage systems, culture, education, roads and bridges, agriculture, and environment (waste management, etc.). JICA’s research for grant aid was directed at the drafting of emergency grants for electric power, water and sanitation, healthcare, education and other projects, while for loan-based assistance, it conducted research for the drafting of mid- to long-term infrastructure support programs. It is also providing follow-up cooperation aimed at utilizing the 1000-plus former trainees who have returned to Iraq.[20]

2.3.2 Plans and Achievements in the Environmental Field

(1) Training programs

In March 2006, JICA brought 13 trainees to Japan to participate in a group training program on the restoration of marshlands in Southern Iraq. Japan has also held third-country training programs in Jordan in areas such as waste management and in water supply, sewerage, and water quality analysis, and has recruited Iraqi trainees for existing group training programs in Japan. In 2004, to plan training programs in the environmental field, JICA also researched capacity building needs, and proposed implementation of the following 8 types of training program: “Environmental Assessment and Environmental Impact Assessment (EIA)”, “Environmental Research, Statistics and Study Approaches”, “Environmental Monitoring”,

“Management of Protected Areas”, “Conservation Biology”, “Environmental Awareness”, “Environmental Laws, Legislations, Regulations and Agreements”, and “Solid Waste Management: Legislative and Technical Aspects”.[14]

With funding from the International Reconstruction Fund Facility for Iraq, to which Japan is a donor, UNEP’s International Environmental Technology Centre (IETC) has also held training related to marshland environmental management in Japan and neighboring Arab countries. UNEP’s Post Conflict Assessment Unit (PCAU) too has helped to nurture human resources in the environmental field in Iraq by providing Iraqi Ministry of Environment personnel with training in areas such as environmental legislation, environmental administration, and environmental monitoring technology.

(2) Grant aid (provision of equipment, etc.)

In the water and sanitation fields, Japan has provided equipment such as prefabricated water purification plants, dustcarts, bulldozers for refuse landfill sites, vacuum trucks, and refuse containers. In the city of Samawa where the Japan Self-Defense Force personnel are based, Japan has provided 300 refuse containers, 12 dustcarts, and has funded the boring of water wells in 4 locations 200 km south of Samawa that lack a source of water. At the grassroots level, it has also provided water purifiers and helped to repair sewers, etc.

(3) Donations to international organizations

Through donations to the UN’s International Reconstruction Fund Facility for Iraq, Japan has helped to fund UNEP’s Southern Marshland Environmental Management Assistance Project and environmental training programs for Iraqi government personnel.

Japan has also donated funds to UNDP aimed at generating jobs for the local population through employing them for such work as repair of water supply systems, refuse collection, and cleanup projects.

(4) NGO-mediated assistance

Japan has provided assistance for sanitation improvement measures through funding NGOs under the Japan Platform to carry out emergency repairs on elementary school toilets and water supply pipelines and sewers in Baghdad.

(5) Preliminary study for the arrangement of emergency grant-based assistance

JICA has interviewed informed sources both within Iraq and elsewhere and otherwise gathered information to ascertain immediate emergency reconstruction demands and arrange corresponding assistance, and has issued its findings. Water and sanitation were among the areas investigated, and JICA interviewed personnel belonging to organizations such as Iraq’s

Ministry of Water Resources, metropolitan Baghdad, UNDP, and USAID. The following is a short list of emergency assistance targets relating to water and sanitation drawn up by JICA.[11]

Table 4: Water and sanitation assistance needs identified in a preliminary study of Iraq's reconstruction assistance needs

Item	Outline
Baghdad water purification equipment installation plan	Installation of 10 prefabricated water purification units within the city (compact units handling 4500 m^3/day)
Southern 4 governorates water purification and reverse osmosis (RO) equipment installation plan	Replacement of 35 prefabricated water purification units (compact units), and installation of 24 new reverse osmosis desalination units
Baghdad sewer pump renovation plan	Replacement of pumps, motors, valves, screens, panels, cables, etc.
Karkh Sewage Treatment Plant (Baghdad) expansion plan	Emergency construction of 200,000 t/day treatment facility to handle sewage currently being released into the Tigris River
Saba Nissan Water Purification Plant existing intake pumping station renovation plan	Repair of existing pumping station (42 m^3/min, 185 kW × 14 pumps)

(6) Basic study for reconstruction and rehabilitation of infrastructure

With the basic aim of ensuring a smooth transition from grant aid-based restoration and reconstruction assistance to more mid- to long-term development assistance, JICA has gathered and analyzed information for the formulation of infrastructure restoration and development assistance programs using Japanese ODA.

The sectors investigated are roads and bridges, railways, airports and harbors, telecommunications, water resources, electric power and energy, food and agriculture, health and medicine, education and job training. JICA has drafted a project long list[21] that takes account of the results of local inhabitant opinion polls and coordination with other donors, and will serve as a basis for reconstruction and development programs in each of these sectors.

2.4 Donor Environmental Aid and Frameworks for Coordination of Aid

2.4.1 Frameworks for International Coordination

(1) Donor meetings for the reconstruction of Iraq

The Madrid Conference on Reconstruction in Iraq held in October 2003 was attended by 73 countries and 20 international organizations and served as a forum for the discussion of the roles that each country could play in the 14 areas identified by the joint UN/World Bank Needs

Assessment survey. At this meeting, the establishment of the International Reconstruction Fund Facility for Iraq was decided, with a total of over $32 billion in assistance being pledged by the participating countries.[22]

Following the Madrid meeting, Iraq Reconstruction Fund Donors Meetings have been held in Abu Dhabi in February 2004, Doha in May 2004, and Tokyo in October 2004. At these meetings, donor countries reiterated their commitment to Iraq's reconstruction, and at the Tokyo meeting, Iraq's transitional government presented an integrated reconstruction strategy, and Iran and other countries joined the list of donors. The importance of elections was also reconfirmed, with various countries vowing their assistance for holding elections. At this point in time, donor countries had pledged the following sums: The USA $20.3 billion over 18 months from 2004; Japan $5 billion over 4 years from 2004; UK $930 million; EU member countries $825 million over 2 years from 2004, with an additional $860 million to be provided in humanitarian aid; Saudi Arabia $1 billion; Kuwait $500 million; Iran $300 million; Italy $235 million; United Arab Emirates $250 million; World Bank $3–5 billion over 5 years; and IMF $2.5–4.25 billion over 4 years from 2004

(2) Donor meetings for coordination of environmental assistance

With the aim of sharing information on Iraq's environmental problems among interested parties, and setting priorities, UNEP has since March 2003 held roundtable conferences in Geneva.[10]

With regard to the rehabilitation of the southern marshlands, meetings to coordinate the efforts of donor countries have been held since May 2003.[23] After the conclusion of the Iraq War, CRIM was established in the Iraqi Ministry of Water Resources as a local organ for coordination between the various parties involved, and a master plan for the rehabilitation of the marshes prepared. As shown in the diagram below, the 3 pillars of this master plan, which organizes the projects that donor countries and organizations had implemented of their own accord up to the October 2004 donor meeting, are (1) water, (2) ecosystem, and (3) society and economy. The master plan is aimed at coordinating efforts to rehabilitate the marshes through cooperation between donors and agencies in Iraq, so as to avoid duplication of efforts by donors and to clarify the assistance required in the future.

IRAQI COUNCIL OF MINISTERS

IRAQ MoWR - CRIM; MoE; MoMPW; MoC; Others	Project Advisory Committee	DONORS UNEP, WB, UK, USA, Japan, Italy, Canada, Others

LIAISON OFFICER – UNEP

Task and Task Management Group	Water		Ecology		Socio-economy		
	Marsh land hydraulics	Water asset	Human impact management	Ecosystem management	Land planning	Infrastructure and services (agro, health, education, tourism, etc.)	Culture and anthropology
Activity	MoWR, IMET, USAID, Others	MMPW, IMET, USAID, UNEP, Others	MoE, UNEP, Others	MoE, CIDA, World Bank, Others	MMPW, Others	MMPW, USAID, UN Cluster, Others	MoC, Others
Data collection and survey							
Monitoring							
Modeling/ analysis							
↓							

Figure 1: Master plan for the rehabilitation of Iraq's southern marshes

2.4.2 Overview of Environmental Projects of International Organizations and Donor Countries

Table 5 below lists the areas of assistance activities and main projects being implemented on January 2006 by respective countries and organizations for the reconstruction of Iraq.

Table 5: Reconstruction assistance projects being implemented by respective countries and organizations

Country, organization	Activity areas	Main projects
UNAMI[24]	• Agriculture, food safety, environment, resource management • Education, culture • Governance, human resource development • Health and nutrition • Rehabilitation of infrastructure • Refugees, internal refugees	Various agencies of the UN (UNDG) are implementing a wide range of projects.[25] Those of an environmental nature are: • Strengthening of environmental governance (UNEP) • Assistance for use of environmentally sound technology (EST) in the marshes (UNEP) • Capacity building of agencies involved in water issues (UNESCO) • Rehabilitation of water supply and public hygiene systems in southern Iraq (UNICEF) • Water quality control and monitoring (WHO) UNDP's Web site also lists the following projects: • Measures against Shatt al Arab drainage (prospective) • Emergency drinking water supply in Baghdad • Rehabilitation of Baghdad's sewage treatment systems
World Bank[26]	• Rehabilitation of community infrastructure • Urban water supply and public hygiene • Baghdad water supply	
League of Arab States[27]	• Pledged $2.8 billion at donor meeting (in addition to which Saudi Arabia has also pledged $1 billion, Kuwait $500 million, and Iran $300 million).	
USA* USAID[28]	• Agriculture	• Food security (wheat) • Development of private sector (agricultural equipment repair and maintenance capabilities) • Poverty reduction (introduction of high-value crops, improved livestock rearing, etc.) • Irrigation (integrated soil, water and crop management, assistance for the drafting of a national water strategy)
	• Water supply and public hygiene	• Rehabilitation of sewage treatment plants (Baghdad and southern cities, etc.) • Construction of water purification plants, and repair and improvement of waterways (Baghdad, Basra, Najaf, etc.)

The following table lists the goals, activity details and locations of projects being carried out by respective countries and organizations specifically in Iraq's southern marshlands.

* According to its Web site, USAID is providing assistance to various Iraqi government agencies for the drafting of a national water strategy that covers water allocation management, water storage capacity management, dam management, and flood control.

Table 6: Southern marshland rehabilitation projects implemented by respective donors

Project name		Iraq Marshlands Restoration Program[29]	Eden Again[30]	New Eden[30]	CIMI (Canada Iraq Marshlands Initiative)[31]	UNEP Marshlands Management Project
Donor agency		USAID	US State Department	IMET	CIDA	Japan (provision of funds)
Contracted agency		Private sector consultants (DAI)	IF	Private sector consultants (SGI)	Waterloo University	UNEP/IETC, UNEP/PCAU
Project period		October 2003 – September 2005	2002 - 2003	From 2003	From May 2004	August 2004 – March 2006
Partner agencies	**Within Iraq**	Iraqi Ministries: Water Resources, Agriculture, Environment Governorates: Maysan, Nasiriyah, Basra University of Basra Marine Science Center (MSC), IF, AMAR	Ministry of Water Resources, CRIM, Ministry of Environment, NGOs (AMAR, IF, Nature Iraq)		Ministry of Environment, Ministry of Water Resources, CRIM, etc. Marshlands University Consortium, IF, Nature Iraq, Iraq Nature Conservation Society	Researchers from Ministries of Environment, Water Resources, Municipalities and Public Works, Science and Technology, the 3 southern governorates, and educational institutions
	Others	Advisors from other agencies (Iraq, USA, UK, Jordan, Australia, Czech Republic	UNEP, USAID, USACE, USEPA, IOM, WHO, etc.		Birdlife International offices in UK and Jordan, etc.	

(1) Overview of US marshland-related assistance

The US Agency for International Development (USAID) has provided assistance focused on the socioeconomic aspects of marshland rehabilitation through the implementation of its Iraq Marshlands Restoration Program (IMRP) with a budget of $4 million. The program lasted from October 2003 to September 2005. Under IMRP, USAID provided the following national level assistance: (1) development of a hydrological model for the Tigris and Euphrates watersheds (undertaken by the US Army Corps of Engineering—USACE); (2) water quality and soil lab provisioning; (3) implementation of overseas training tours and drafting of training courses; and (4) assistance for the drafting of CRIM strategy, etc. Local marshland level IMRP activities included: (1) drafting of an integrated marshland management plan; (2) assistance for agricultural production and related businesses; (3) livestock and dairy industry rehabilitation; (4) assistance for fishing industry and fish farms; (5) expansion of primary healthcare; and (6)

community-level artificial marsh design. These activities are thought to be bringing benefits both by improving the capabilities of the Iraqi government and by improving income, work opportunities, and living standards of over 500,000 Marsh Arabs.

The October 2004 working session held in Amman, Jordan, was one of the most noteworthy national-level IMRP activities. This working session looked into the quality of data and improvement of field research for the benefit of field research teams from the University of Basra and the Iraq Foundation (IF), and representatives of the Ministries of Water Resources and Environment. It also provided field training in the use of monitoring equipment on nearby rivers, and looked at the analysis processes used by Water Authority Jordan.

One of the notable marshland-level assistance activities was monitoring carried out in Hawizeh and Hammar Marshes from March 2004. A database was also created, and the final report regarding this monitoring is due to be submitted to the Iraqi government shortly.

Following the completion of IMRP in September 2005, the majority of the activities carried out under it were taken over by the Agriculture Reconstruction and Development Program for Iraq (ARDI) which has been running since October 2003 with a budget of $7.2 million. Continued marshland monitoring and the construction of artificial marshes (slated to start in 2006) are among the inherited activities. Evaluation of the increased load on the environment from agricultural development is also likely to be carried out under future programs.[32]

(2) Overview of Italian marshland-related assistance

Italy's Ministry for the Environment and Territory (IMET) is providing assistance for marshland rehabilitation focused on water issues, including an Abu Zirig marsh rehabilitation project, feasibility studies related to water and energy, and help in drafting master plan for the rehabilitation of Iraq's southern marshlands. The Abu Zirig project involves monitoring to gather data, develop hydraulic models, and draft and test rehabilitation scenarios, while the water and energy feasibility studies are concerned with the consideration of desalination projects that make use of natural gas currently released into the atmosphere as flare gas in the southern oilfields. The data obtained from these activities is being entered into a GIS database to be used in simulations. Italy is also providing assistance in the area of public hygiene by surveying the current status of water supply and sewerage facilities. Moving forward, Italy plans to focus on the Green Village concept based on CRIM proposals.[33]

The Green Village concept proposes the creation of the following 3 types of village communities that incorporate the wishes of all of the returnees to the marshes: (1) villages whose life is based on the fishing industries of islands within the marshes; (2) villages that incorporate agriculture; and (3) villages with road access that incorporate modern lifestyles.

This concept is based on the prevalence among the generation that grew up to depend on agriculture after the draining of the marshes of a desire to continue to lead a farming-based life, and on the time required for that generation to acquire the knowledge and skills of the fishing industry. The Green Village concept also includes a proposal to retrieve and supply the aforementioned flare gas to village households. IMET will first carry out a pilot Green Village project in the Abu Sabat area on the banks of the Euphrates River, expanding the project in time to encompass about 50 locations.[34]

(3) Overview of Canadian marshland-related assistance

Canada's marshland rehabilitation assistance is focused in particular on ecosystem rehabilitation. In specific terms, Canada is providing assistance in the following 3 fields: (1) surveying and reporting on key biodiversity areas (monitoring of the ecosystem of Abu Zirig Marsh; (2) assistance for training and improvement of organizational capabilities; and (3) assistance for international initiatives (assistance for Ramsar Convention designation/registration, and promotion of dialog between Iraq and Iran on marshlands. Canada aims to extend its current activities to eventually cover the whole of Iraq.[34]

(4) Overview of UNEP's marshland-related assistance

With support from the International Reconstruction Fund Facility for Iraq, UNEP is providing assistance aimed at rehabilitating the southern marshland environment and providing the people inhabiting the marshes and surrounding areas with clean water and sanitation. If all the people who left this area return, their population is predicted to reach 500,000. Based on this estimate, UNEP is providing assistance in the form of pilot projects for the provision of 6 water and sanitation facilities that employ environmentally sound technology (EST), and various other components.[24]

This project was launched in 2004 by UNEP's International Environment Technology Center (IETC) with a budget of $11 million, and was made up of the 5 components given in the table below. The training courses included in this project were provided in Japan and countries near Iraq. Those in Japan were a program on water quality control organized with the help of the International Lake Environment Committee (ILEC), a program on sustainable sanitation and sewage treatment systems organized with the help of the Global Environment Centre Foundation (GEC), and a program on EST for drinking water supply. Trainees were also provided with secondary training at Iraqi educational facilities and government agencies on returning to Iraq.

UNEP is planning to use a new budget allocation from 2006 to implement initiatives to maintain pilot projects for provision of materials for the extension and enlargement of water supply pipelines, and to prepare new materials for raising awareness of environmental issues.

Table 7: UNEP southern marshland project

Component	Outline
Formulation of strategy and support for coordination	Holding of roundtable meetings on the southern marshlands, coordination of donor country marshland rehabilitation projects, maintenance of dialog and exchange of information with responsible Iraqi government officials, Iraq-based coordinators, and local community leaders, etc.
Basic data collection and analysis	Development of the Marshland Information Network, and its operation in both English and Arabic, collection and analysis of basic data including water quality data obtained through on-site testing, and remote sensing analysis
Capacity building	Capacity building through marshland management and EST deployment training using a “train the trainers” approach, and support for secondary training in Iraq
Implementation of pilot projects	Implementation of pilot projects that apply EST to deliver safe drinking water, sanitation, and water quality control to 6 marshland communities, and support for community-level projects
Raising awareness and follow-up activities	Holding of international open conferences, issue of pamphlets and periodicals, publicity activities, etc.

Chapter 3 Potential for Environmental Assistance by Japan

3.1 Assistance for the Rehabilitation of Iraq's Southern Marshlands

3.1.1 Identification of Issues and Assistance Goals

Iraq's southern marshlands were up to the 1970s the greatest expanse of marshland in the western half of Eurasia, and were an ecosystem of global importance as a major stopover site for migrating birds and a spawning ground for fish species of the Persian Gulf. However, the development of water resources on the upper reaches of the Tigris and Euphrates Rivers combined with the draining and desiccation of the marshlands under Saddam Hussein's regime has had a disastrous impact on the ecosystem.[34] Demolition of water channel and dikes by the Marsh Arabs immediately after the collapse of Saddam Hussein's regime, and the opening up of floodgates by the Ministry of Water Resources has subsequently resulted in a reflooding of 30%–40% of the marshlands as they were in the 1970s.

Reflooding the marshes and returning the vegetation and ecosystem to their former state is of great importance, but the ultimate goal of marshland rehabilitation efforts should be to go beyond mere regeneration of the natural environment to rebuild the foundations on which the Marsh Arabs structured their livelihoods, and ensure the maintenance of a harmonious balance between the human community and nature of the marshlands over the long term.

The destruction of the southern marshlands and the expulsion of the Marsh Arabs from their homeland is one of Iraq's most pressing environmental and humanitarian problems. The marshlands are also significantly affected by international water resource division issues and the problems caused by oilfield development in the former marshland area; their rehabilitation is a key priority in the reconstruction of Iraq. The Marsh Arabs began to reflood the marshes from immediately after the Iraq War in 2003, but this has had some adverse effects on the recovery of the ecosystem, such as salt accumulation.

From the perspective outlined above, one can conclude that the rehabilitation of Iraq's southern marshlands requires the restoration both of the marshland ecosystem—one of the most important in the Middle East—and of the human community that was once a vital part of that ecosystem, in a way that rebuilds the balanced relationship between the human

population and natural environment that had existed from ancient times, but was all too quickly lost.

3.1.2 Required Approach to Marshland Rehabilitation

Any examination of marshland rehabilitation requires the consideration of the following points.

(1) Social perspective

Rehabilitation of human communities, wise use of the marshes

During the process of marshland rehabilitation, competition and contradiction frequently arise between, on the one hand, restoration of the marshland ecosystem and biological diversity, and on the other, restoration of agriculture, livestock, fishing and other industries on which human livelihoods depend. Surmounting such competition and contradiction to rehabilitate the marshes in a way that guarantees the protection of both the natural environment and human livelihoods requires the drafting of a rational land-use plan that includes zoning based on the principle of wise use.* The Committee also recommends that possibilities for introducing ecotourism and other initiatives with minimum competing consequences also be considered.

Local development efforts

Now that the marshes are being reflooded and the ecosystem is slowly recovering, local industries need to be restored. It is up to Iraq to decide how exactly the marshlands are rehabilitated, but because reinstating fishing as the mainstay of the local human population will require the teaching of fishing techniques to the younger generation, restoration of the marshes will likely need to be carried out in stages. Industries other than fishing currently being carried out in the marshlands include dairy cattle-based dairy product manufacturing and fish canning.

(2) Scientific and technological perspective

Water resource issues and water quality management

Declining water inflow and rising salinity are having an adverse impact on agriculture, drinking water, and ecological balance in Iraq's southern marshlands. However, the marshlands are a diverse aquatic environment made up of a multitude of marshes and bodies of water, and in terms of salinity alone, for example, two locations may differ by a factor of 10

* A Ramsar Convention concept that stipulates the sustainable use of marshes by humankind in a way that does not change the natural characteristics of the ecosystem.

or more. As such, the peculiarities of each marsh or body of water in terms of natural and social environments first need to be investigated and tabulated before issues are analyzed and priorities considered.

Effective use of local biological resources and low-cost, low-energy, low-chemical, easily maintained technology

Low-cost, environment-friendly technologies that consume little energy and use few chemicals would be the most effective for marshland rehabilitation. Such technologies should be examined to identify, combine, and deploy those that could be most easily used and maintained by the local population in the current local environment, and a flexible approach based on the principles of adaptive management* should be applied to the deployment of the technologies chosen.

(3) International perspective

Coordination with other countries in the Tigris and Euphrates watersheds

Any examination of the rehabilitation of Iraq's marshland would be remiss if it fails to consider the relationship between the marshes and upstream use of water resources and the marshes located in neighboring Iran. There is a need to consider cooperation from the viewpoint of cross-border water resource management and marshland rehabilitation, and this urgently requires an objective evaluation of the current status of the whole Tigris and Euphrates watersheds of which Iraq's southern marshlands are a part, including the impact of canals and other structures built during the tenure of the former regime. In the past, Iraq and Iran had a committee for discussing watershed issues, and Iraq also discussed water volume with Turkey, but such discussions have not been held for a long time. Within Iraq too, there are issues related to the distribution of water in northern, middle, and southern regions, and there is also a need for an overall management system for handling agricultural water and wastewater.

International teamwork for the exchange of information and division of roles

The cooperation organizations working on the rehabilitation of Iraq's marshlands should team up to drive the independent efforts being made by the Iraqi government and local inhabitants to rehabilitate the marshes. They should establish a common platform for promoting education and raising awareness among the younger generations in particular and for enabling the sharing of information, division of roles, and integration of initiatives.

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* An outcome-based management approach or system designed for areas of scientific uncertainty that is applied in particular to wildlife and ecosystem conservation. The possibility that early predictions may be mistaken is incorporated from the outset into the management system, and actions are modified according to the results of constant monitoring of ongoing processes.

3.1.3 Points to Consider in Marshland Rehabilitation

Sustainable use of biological resources

Building a sustainable foundation for supporting human communities that is in tune with the natural environment requires that attention be paid to such issues as livelihoods, living facilities, and healthcare. Where protection of the environment is concerned, it is particularly important to consider how the sewage and waste generated by human communities is handled. The deployment of systems for recycling such waste as a resource would help to bring benefits to both the human communities and the natural environment. Plans for the deployment of such systems for the recycling and reuse of resources should address recycling and reuse at large district, local community, and household levels. Deployment in specific areas would also require estimates for demand from local agriculture, and so the required approach is one that starts with research and progresses to verification.

Matching marshland rehabilitation with the social system

In determining the lifestyles of the Marsh Arabs, consideration should be paid both to the views of the returnee population and to mechanisms whereby marshland rehabilitation contributes to the improvement of living standards. The returnee population includes both those wanting to return to their former way of life and those aspiring to new lifestyles. Moreover, water resource restrictions and development in the former marshland area (oil field development) make the 100% restoration of the marshes an unrealistic target, and initiatives to build a sustainable social system need to take into account such real-life constraints.

Setting priorities based on knowledge of current living standards

In rebuilding the foundations of everyday life of the Marsh Arabs, a to-do list should be prepared which separates items into those related to basic needs and those related to the improvement of living standards. In the event that basic needs such as livelihood (poverty measures), sanitation (health issues), housing (security), and primary education are not being met, addressing these needs should take top priority. Once basic needs have to a certain extent been addressed, attention should be directed to the improvement of living standards such as industry and economy, skills and occupations, infrastructure (power, water, roads), and environmental protection.

Showing consideration for biological diversity by exercising caution in the introduction of non-native species

Careless introduction of non-native species in the name of industrial development can not only disturb biological diversity and the ecosystem, but can also threaten the livelihoods of people who have traditionally used native species as a biological resource. For such reasons,

caution should be exercised in the introduction of non-native species and priority placed first on the effective use of the existing local biological resources.

Responding to long-term impacts of climate change on the marshlands

With the aim of forecasting climate change on a global scale, Japan's Meteorological Research Institute has used 15 types of combined atmospheric/oceanographic models to forecast temperatures up to the year 2100. Results have shown that the region covering the Middle East and Central Asia is likely to experience a conspicuous decline in rainfall and river water volume during this period. Fluctuations in weather patterns are also forecast to intensify, with sudden droughts and flooding. These results point to a need to also consider measures that take account not only of past and present trends, but also of mid- to long-term climate change.

3.1.4 Japanese Knowledge and Technology for Assistance

Japan should apply the knowledge, technology, and experience at its disposal to rehabilitation of the marshlands. The following are areas of potentially useful knowledge, technology, and experience that Japan could offer.

(1) Marshland monitoring

Broad research and development of applications in the field of environmental monitoring through remote sensing is being carried out in the following areas: (1) marshland eutrophication monitoring (chlorophyll *a* concentration, etc.), (2) water quality monitoring (temperature, turbidity, conductivity, etc.), (3) estimation of ground surface temperature and soil moisture, and (4) vegetation distribution in the environs of desert oases.

Not that much marshland research using remote sensing has been carried out in Japan, but existing research includes mapping marshland vegetation distribution, mapping the Kushiro Marshes (identification of marsh types: raised marsh, low marsh, marsh woodland (alders), and water bodies), and estimation of biomass in the Kushiro Marshes. By combining remote sensing data with field observation data, it should be possible to develop a picture of the characteristics of each of the individual marshes, said to number about 1000, in southern Iraq.

(2) River basin hydrological simulation

Regarding marshland rehabilitation, there is a need to forecast the impacts of the reflooding process on the water balance and so forth of the Tigris and Euphrates Rivers. This could be effectively carried out by running simulations based on sufficiently detailed hydrological models that factor in such influences as the status of dams used by Iraq, Turkey, Iran and

other watershed countries, agricultural development and irrigation, water resource management, and future development plans of relevant countries.

(3) Kushiro Marshes Rehabilitation Program

The Kushiro Marshes are one of Japan's most noteworthy natural environments, and are an important wildlife habitat. The marshes are also of significant value to people by holding and purifying water, helping to control flooding through serving as a drainage basin, and mitigating local climate fluctuations. As such, the Kushiro Marshes are a precious asset that should be protected for future generations. However in recent years the area of the marshes has shrunk dramatically in the face of increasing economic exploitation of the river basin, and the vegetation too has changed rapidly from communities of reeds and sedges to alder woodland. Concrete efforts including practical surveys and experiments are being made to conserve the marshes and restore them to their former state.

In 2003, the Nature Regeneration Promotion Law was enacted, and a Kushiro Marshes Nature Regeneration Committee was established to implement initiatives for the rehabilitation of the Kushiro Marshes in line with this law. The Committee is taking actions to achieve the following goals: (1) qualitative and quantitative recovery of the marshland ecosystem, (2) rehabilitation of the circulatory processes supporting the marshland ecosystem, and (3) community building for sustained involvement in the marshes. The committee has also drafted 6 policies for achieving its goals and methods for assessing each of these policies.

The rehabilitation of the Kushiro Marshes is the largest and most comprehensive initiative of its kind ever undertaken in Japan, and the Committee feels that Japan could provide a great deal of knowledge that could be applied to assistance for the rehabilitation of Iraq's southern marshlands.[35]

(4) Knowledge and technology related to primary industry (agriculture and fisheries)

As a salt damage countermeasure, leaching technology is being studied and applied to decide irrigation levels and methods appropriate to the relationship between water volume and salt concentration. Research is also being carried out to select salt-tolerant crops capable of growth even in high salt concentrations and in the use of plants that absorb and store salt within their cells to mitigate salt concentration in croplands.

Development of the fishing industry requires the selection of fish species with high economic value, but the introduction of non-native species poses the risk of disturbing the ecosystem if stock were to escape. As such, consideration should be given to fishing industry development that takes into account both economic and environmental considerations.

Going beyond improvement of primary industry product harvests and quality, there are also possibilities for providing guidance in appropriate agricultural and fisheries management, including distribution and market price movements, and for applying Japanese expertise in such fields as fish farming.

(5) JICA research and technical assistance for marshland conservation

JICA has carried out the following 2 wetland conservation projects: The Study on Integrated Management for Ecosystem Conservation of the Anzali Wetland in the Islamic Republic of Iran, a development study in Iran, and Coastal Wetland Conservation in Yucatan Peninsula, a technical assistance project in Mexico. In view of the current situation in Iraq, implementing such full-scale studies and projects is for the time being unfeasible, but the Committee feels that there is nevertheless potential for using environmental assistance projects currently in progress in surrounding countries to provide technical assistance to wetland conservation in Iraq. Examples of such projects in the environmental management and monitoring technology field include technical assistance projects currently being carried out in Syria and Egypt, respectively titled Capacity Development of Environmental Monitoring at Directorates for Environmental Affairs in Governorates (December 2004 – February 2008) and Environmental Monitoring Training Project (November 2005 – March 2009). The Committee feels that such projects hold out possibilities for providing concrete assistance for the rehabilitation of Iraq's southern marshlands through the possibilities they offer for training in water quality analysis and monitoring technology.

3.2 Assistance for Water Supply and Sanitation (including Waste Management)

3.2.1 Assistance Goals

Iraq boasts relatively highly developed water supply infrastructure and sewer networks in its cities. However, facilities have become dilapidated due to maintenance problems, and so the short-term goal is to rehabilitate existing facilities and pipelines, with expansion of capacity as a longer-term goal. Under the current circumstances of almost total lack of working water treatment facilities, large volumes of sewage are flowing into the Tigris and Euphrates river system, particularly in Baghdad. Therefore, there is an urgent need for initiatives to build sewage treatment facilities in major cities such as Baghdad and Basra and to reduce the unsanitary disposal of sewage in other governorates and autonomous regions through means such as the use of household sewage treatment systems.

Where waste management is concerned, a large workforce recruited as a job creation strategy is already engaged in the task of refuse collection. Refuse collection and other equipment provided in the 1990s is antiquated, and there is a need for assistance in the form both of new collection equipment and of sewage treatment plant construction, together with the training of personnel capable of formulating long-term waste management policy.

3.2.2 Potential for Application of Japanese Knowledge and Technology

(1) Sewage treatment technology

In the field of sewage treatment, Japan can offer original non-permeation technology for storing and collecting sewage, the sanitary treatment of which would help to prevent waterborne disease. Homegrown Japanese sewage treatment systems made a major contribution to the improvement of postwar Japan's public hygiene. Research is also being carried out on the use of artificial wetlands as a low-cost and easy-to-run sewage treatment solution that is particularly effective in hot regions with high plant productivity.

As for domestic wastewater treatment, Japan can offer homegrown technology in the form of combined Johkasou tanks.* These tanks function as mini-sewage treatment plants, and are designed for stable operation in response to fluctuating intake and so forth. Even more importantly, they have made a big contribution to the growth of Japan's Johkasou industry in terms of standardization, mass production, maintenance, cleaning and inspection. In Japan, the fact that a system already existed for collecting sewage for treatment in sewage treatment plants played a major role in the spread of these combined Johkasou tanks. In a country like Iraq with no such history, it will be difficult to popularize the use of such Johkasou tanks rapidly, but the deployment of mid-scale community plants should be able to contribute to the treatment of domestic wastewater in the suburbs of large cities and in smaller cities, towns, and rural communities.

(2) Waste management technology

Unlike water issues, waste management is more of a human issue (i.e. training of personnel) rather than just a matter of improving infrastructure. There is also the issue of raising awareness among the general public. Japanese knowledge could be applied to the creation of management systems through investigating the current situation in communities and building collection systems based on an overall consideration of factors such as the

* Under Japan's Johkasou Law, these tanks are defined as equipment other that night soil treatment plants that purifies both sewage and domestic wastewater, releasing purified water back into the environment rather than into public sewers.

potential for sorting and recycling, including the difficulties of sorting, and recycling industries, and to ways of securing funds for operating such systems.

For developing countries in which open dumping is still the main waste disposal method, Japan can also offer the Fukuoka Method,* a relatively low-cost and sanitary semi-aerobic landfill technology that can prevent the scattering of refuse and groundwater pollution, and has already been applied successfully in China, Malaysia, Iran, and other countries.

(3) Wastewater reuse and non-potable water supply

Water resources are particularly valuable in arid regions, and there are high expectations for available resources to be used in the most effective way possible. From the perspective of effective use, Japan already possesses technology for treating sewage to create a non-potable water supply for agricultural and other uses. This technology could be utilized to curb the amount of water that requires treating to potable water levels, thus reducing overall water treatment costs. Particularly where membrane technology is concerned, Japan possesses world-class technology.

(4) Water quality monitoring

Appropriate monitoring is necessary also to guarantee compliance with environmental standards for water quality, and makes it possible to judge whether sustainable water resource management is being practiced or not. In Japan, telemetry systems have been developed for monitoring compliance with environmental standards, and are being used by local governments. Sensor technology for enabling online measurement of various parameters is an important aspect of such systems, and various advances have been made, such as the application of biotechnology to develop BOD sensors that enable the online analysis of organic contamination. Portable analysis equipment for the speedy on-site analysis of water quality parameters is also commercially available now. These technologies have the potential to contribute to improving environmental management capacity through the use of standard protocols setting forth items to be monitored, frequency of monitoring, and so forth.

* A semi-aerobic landfill technology developed in the 1970s by the city of Fukuoka and Fukuoka University. It involves equipping the base of the landfill site with a perforated pipe system for leaching wastewater from refuse rather than allowing it permeate into layers below. Fresh air in the pipes causes microorganisms around them to flourish, promoting aerobic respiration that results in the emission of carbon dioxide rather than methane.

3.3 Other Environmental Assistance (Sustainable Energy Usage, etc.)

3.3.1 Assistance Goals

Putting top priority on the restoration of basic living standards of the Iraqi people, it is important to set staged targets and implement plans for raising the quality of life of inhabitants while protecting the environment in conjunction with economic development. Atmospheric pollution and global warming are intertwined, and energy generation needs to be handled in tandem with long-term issues such as greenhouse gas reduction policy. An urgent task is the removal and detoxification of harmful and dangerous substances in environmental hotspots, followed by decontamination of soil and prevention of groundwater pollution by harmful substances in the locations concerned.

3.3.2 Potential for Application of Japanese Knowledge and Technology

(1) Solar power generation systems

Japan is a leader in solar panel manufacturing technology, accounting for about half of worldwide solar panel production.* Solar power is being put to practical use to power wireless network relay stations located away from power supply lines and in locations lacking both power lines and means of delivering fuel easily. In Iraq, solar power could be put to good use particularly in the southern marshlands as a simple power source for scattered community facilities and households. Because solar power modules have an expected life of over 30 years and no moving parts, they are in principal maintenance-free. However, lead–acid car batteries are the main means of storing the electricity generated, and as such, care must be taken to ensure that used batteries are disposed of appropriately. Car batteries have a life of about 3 to 5 years, but there are now solar power systems being developed that use lead-free batteries that last as long as 10 years, and these could well be deployed in Iraq.[36] However, because the operating temperature range of such batteries is limited, consideration needs to be paid to ensure that they can be used in the marshland climate.

(2) Atmospheric monitoring

In Japan, local governments operate ambient air pollution monitoring stations and car exhaust gas monitoring stations for round-the-clock monitoring of NOx, suspended particulate matter, photochemical oxidants, SO_2, CO, hydrocarbons, and so forth. The speedy

* Japan manufactured about 600 MW of the 1.2 GW of worldwide solar panel production volume for 2004.

compilation of data from such stations and the building of networks to implement appropriate actions are as important as the actual monitoring of atmospheric pollution.

(3) Exhaust Gas Desulfurization equipment

Japan began to deploy exhaust gas desulfurization equipment in the 1960s to reduce SOx emissions, and the use of such equipment has now spread to many developing countries. Although it removes only 60% to 80% of SOx, simple and cost-effective desulfurization technology is also being developed and transferred to China, ASEAN countries, and other developing countries under Japan's Green Aid program.

As oil production in Iraq is maintained and increased, the construction and restoration of oil refineries and thermal power stations is like to proceed apace. Japanese exhaust gas desulfurization technology could be effective in preventing atmospheric pollution by SOx that would otherwise be emitted by such facilities.

(4) Climate change countermeasures

In oil-producing countries like Iraq, fugitive methane emissions from oil pipelines are very common, and clean development mechanism (CDM) methodologies for recovering and burning these emissions are already recognized. Japanese knowledge and technologies for recovering methane released during oil drilling, sequestering CO_2, implementing cleaner production in heavy industries, and so forth might also be able to make a significant contribution as Iraq begins to participate in frameworks for the prevention of global warming.

(5) Soil decontamination technology

It is likely that Iraq suffers from localized soil contamination derived from spillages from oil-related facilities, former chemical plants, war waste, waste fluid from mines, and so forth. While decontamination technologies differ according to the type of contaminant—VOCs, heavy metals, etc.—available methods include on-site decontamination, the pumping up of contaminated groundwater, and the excavation and removal of contaminated soil.

3.4 Assistance for Improvement of Environmental Management Capacity

(1) Improving environmental management systems

As Iraq's political system undergoes major changes, the creation of legislation and building of institutions is a matter of maximum priority. Because EPID, the body that became the core of the current Iraqi Ministry of Environment, was mainly an organization for research and

monitoring, it almost certainly requires assistance for the improvement of its capacity to formulate policy and implement initiatives. Environmental statistics constitute fundamental data for the consideration of national environmental policy and standards, while monitoring and evaluation are important means for measuring the effectiveness of environmental policy. As such, there is an urgent need to improve the capabilities of the Iraqi Ministry of Environment in these fields.[14]

In the mid- to long-term view, the nurturing of highly competent environmental specialists is also called for. The scant attention paid by the former regime to research in environmental fields drove researchers overseas and starved those that remained of journals carrying the latest research. As a result, there is a dire lack of capable researchers in Iraq.

(2) Participation in international frameworks

Another need, in view of the fact that Iraq has, owing to its long isolation from the international community, not become a signatory to international conventions in the environmental sphere, is the acceptance of these conventions and the implementation of environmental management based on those treaties through international cooperation.

If Iraq becomes a signatory nation to the existing Framework Convention on Climate Change, it will be required to submit regular reports on its GHG emissions, and if CDM projects based on the Kyoto Protocol are carried out, it will need to set up an agency to authorize those projects.

The Convention to Combat Desertification obliges signatories to identify the factors causing desertification and draft a national plan to resolve the underlying causes. This requires not only the collection and analysis of scientific data, but also consideration of the building of early warning systems for desertification, the securing of livelihoods of local inhabitants, and funding mechanisms. Japan is playing a leading role in research and development related to the Convention, and could provide technical assistance.

Under the Convention on Biological Diversity, data based on the reports filed by member countries is compiled on the efforts being made by each country and the impact of those efforts. Through these reports, agencies involved in preserving biodiversity are being provided with assistance in the drafting and implementation of policy.

(3) Environmental and social considerations arising from reconstruction development

In view of the risk that a rush of aid for the reconstruction of Iraq could lead to further environmental degradation, there is a need to establish mechanisms such as environmental

assessment for ensuring that sufficient attention is paid to the environmental and social aspects of development. There are still no Ramsar or World Natural Heritage designated sites in Iraq, and still not enough information on valuable natural environments warranting international conservation. Efforts are being made to list Iraq's southern marshlands as a Ramsar site, but the capabilities of the relevant Iraqi government agencies are limited. There is accordingly a need to develop knowledge of such environmental assets and launch efforts to prevent their degradation. The Iraqi Ministry of Environment's ability to carry out environmental assessments and subsequent monitoring is limited, and its capabilities need to be strengthened.

(4) Planning and implementation of capacity building programs

Japan has held training programs in healthcare, elections, law enforcement, electric power, telecommunications, and other fields since 2003 as part of its reconstruction assistance for Iraq, but there is a need to actively solicit the participation of Iraqi personnel in environmental training programs held in Japan. For example, JICA has run, or is currently running group training programs such as "Conservation of Wetland Ecosystems and their Biological Diversity", "Conservation, Restoration and Wise Use of Wetland Eco-systems and their Biological Diversity", and "Management of Eco-tourism and Sustainable use of Natural Parks". JICA has also held many training courses on environmental management and water quality monitoring. JICA is considering having its Water Resources Management in Arid Regions group training program for 2006 focus exclusively on Africa and the Middle East and doubling capacity for participation. Such training opportunities focused on the Middle East should be made use of to develop the capacities of Iraqi personnel.

In addition to participation in existing training programs, training programs specifically aimed at training Iraqi personnel and improving Iraqi environmental management capacity could also be organized. Efforts should be made to organize training in the 8 fields proposed in JICA's survey of capacity development needs: "Environmental Assessment and Environmental Impact Assessment (EIA)", "Environmental Research, Statistics and Study Approaches", "Environmental Monitoring", "Management of Protected Areas", "Conservation Biology", "Environmental Awareness", "Environmental Laws, Legislations, Regulations and Agreements", and "Solid Waste Management: Legislative and Technical Aspects". Training programs for government officials aimed at nurturing the skills of Iraqi government officials in areas such as the drafting of environmental standards could be held in Japan.

3.5 Common Perspectives on Environmental Assistance Project Planning

(1) Compliance with guidelines for environmental and social considerations

In the event that Japanese assistance includes development projects, efforts need to be made to ensure that such projects comply with the guidelines established by agencies such as JBIC and JICA for the confirmation of the consideration of environmental and social impacts of Japanese ODA projects. Japan needs to make sure that its assistance contributes to the reconstruction of Iraq and the rehabilitation of the livelihoods of the Iraqi people without adversely affecting the natural environment.

(2) Support for South–South cooperation

Japan encourages South–South cooperation whereby developing countries share their technology. Alongside third country training programs using Egypt's Environmental Monitoring Training Center, forms of cooperation such as the dispatch of specialists from other Arabic-speaking countries with a higher level of technology (e.g. Egypt, Jordan, and Tunisia) could also be considered.

(3) Use of intermediate (appropriate) technology

The Committee recommends the use also of appropriate technology as simple and sturdy technology that does not impose economic burdens. There are technologies that may not be effective in Japan, but could well prove useful in the context of Iraq's local culture and customs.

(4) Participation-based (process-focused) development

Under the kind of compartmentalized, field-specific cooperation regimes that have dominated up to now, assistance providers have tended to base their assistance on preconceptions that are not always in line with local needs. Participation-based initiatives are important to identifying local needs and accommodating them as far as possible.

(5) Environmental promotions

Much has been said about the need for environmental education, but even if education is effective in nurturing awareness among children who are still in their formative years, changing the habits and lifestyles of adults is not always easy. Environmental promotions offer a means of driving environmental protection through providing an economic incentive. In addition to ecotourism and other green businesses, practical benefits such as the prevention of endemic diseases can drive environmental protection. Environmental promotions that push

comfort as an incentive can also be effective. The Cool Biz* campaign run by Japan's Ministry of the Environment in the summer of 2005 could be described as a successful example of such environmental promotions.

* Casual business attire for summer that enables people to work comfortably and effectively at 28°C, so that office air conditioners can be set to this temperature during summer to contribute to the prevention of climate change.

Chapter 4 Future Focus of Assistance in the Environmental Field

Iraq is attempting to overcome adversity and make progress with democratization, but it will likely require considerable time for the political and social situation to stabilize. As such, the Committee has categorized its recommendations into cooperation initiatives that could be launched under the current unstable circumstances and those that should be implemented with a more mid- to long-term perspective when stability is attained.

4.1 Cooperation Initiatives Possible under the Current Circumstances

(1) Assistance projects that could be implemented under the current circumstances

The Committee feels that assistance projects that can be implemented outside Iraq, such as training or the investigation of needs by inviting relevant Iraqi personnel for hearings in Japan or third country locations, would be effective. Particular efforts should be made to boost the environmental management capacity of the Iraqi Ministry of Environment. For example, exploiting Japanese expertise to train government officials would open the way to the drafting of environmental standards and the transfer of methodology and technology for other environmental management and monitoring. In its report, JICA has proposed training programs for improving environmental management capacity,[14] and it should be possible now to provide assistance for creating curriculums, selecting instructors, and ensuring that the training programs are effective. Training should moreover be combined with investigation of needs, with trainees serving at the same time as information sources.

Japan should also pursue projects that can be implemented without the on-site involvement of Japanese personnel, such as the provision of equipment through grant aid, and support for reconstruction activities being conducted mainly by Iraqis themselves. The initial $1.5 billion pledged by Japan has already been spoken for, and further grant aid is unlikely to be of such a large scale, but Japan should respond flexibly to address new needs emerging as reconstruction proceeds.

Project preparations such as mid- to long-term infrastructural assistance to be financed by yen loans and other sources should be considering the guiding principles of the guidelines of the environmental and social considerations of Japan's ODA.

Another important area is the provision of support for efforts by international agencies to rehabilitate the southern marshlands. The first stage of UNEP's marshland management project will be completed in FY2005, but a second stage is being planned, and Japan should continue to support such activities.

(2) Planning of projects to be implemented once the political situation stabilizes

The building of partnerships with local agencies capable of conducting activities within Iraq is important. The Iraqi Ministry of Environment is Japan's primary counterpart where environmental assistance is concerned, but CRIM should also be included as a cooperation partner for southern marshland projects. Partnership building calls for consideration firstly of such policies as the promotion of supervisor-level exchanges through inviting supervisors to Japan as trainees, and the building of official government ties through high-level meetings and other means.

Another measure would be to establish a structure outside Iraq for the on-site implementation of projects as soon as political situation stabilizes sufficiently to allow entry, and for the training of Iraqi personnel while conducting research for the formulation of projects. As a neighboring country, Jordan would be a convenient location outside Iraq. Egypt too has a partnership program agreement with Japan for joint implementation of assistance for nearby countries, and Egypt's Environmental Monitoring Training Center could be used for South–South cooperation to develop the capacity of Iraqi government personnel.

(3) Active participation in frameworks for donor coordination

Japan should actively pursue opportunities for participation in donor gatherings to cultivate complementary and non-overlapping ties with other donors that secure a role for Japan (including information sharing and joint investigation and research). It is of vital importance for Japan to prepare for such meetings by drafting a list of priorities and negotiating for allocation of roles and cooperation, etc. in accordance with these priorities.

Possibilities for Japan to contribute technologically not only to projects being implemented by the UN but also to other donor country agencies should be considered. For example, thought could be given to ways of tying Japanese projects into Italy's southern marshland project.

(4) Promotion of teamwork between research institutes and universities

Joint research by Japanese and Iraqi universities and research institutes on shared themes aimed at resolution of Iraq's environmental problems should be promoted both for the role it could play in improving the capabilities of Iraqi researchers and its importance for identifying future assistance needs. Japan has a grant program for supporting overseas students aimed at assisting efforts by the governments of developing countries to nurture human resources, and this program could be used to provide Iraqi students with opportunities for study in Japan.

4.2 Cooperation to Be Provided From the Mid- To Long-Term Perspective

(1) Drafting of assistance plans for specific environmental fields

Field-specific assistance plans for respective environmental fields should be drafted in preparation for when Iraq's public order has been restored sufficiently to permit their implementation. Such plans should clearly explain the distinctive features of Japanese assistance and their superiority compared with other donors. This will require the drafting of strategic plans based on a sound examination of available Japanese environmental technologies for those that could be applied effectively to Iraq's geographical, social, and economic circumstances.

(2) Formulation and implementation of cooperation projects

Japan should identify feasible projects that utilize its strengths, such as personnel training and the localization of Japanese technology. Another important approach would be to consider the dispatch of a joint public/private sector mission for joint identification of projects, and to contribute from both public and private sectors to the building of systems in Iraq including the adoption of Japanese technology and the building of structures for supporting that technology.

A concrete example would be contribution to the rehabilitation of Iraq's southern marshlands from the following perspectives:

- Rehabilitation of the marshland ecosystem that pays due consideration to the recycling of resources
- Reconstruction of the foundations of everyday life of the marshland dwellers
- Activating mechanisms for the coordination of cross-border water resource management

Japan must also consider how it can team up with international organizations and other donors to provide effective assistance. Coordinating efforts would be one way of avoiding duplication of aid projects and boosting the efficiency of assistance provided.

(3) Support for participation in frameworks related to global environmental issues

It is important for Japan to support Iraq's participation in frameworks related to global environmental issues being implemented by the international community. Iraq is a signatory to almost no international conventions in the environmental field, and Japan could almost certainly contribute to the process of Iraq's participation in the United Nations Framework Convention on Climate Change and the United Nations Convention to Combat Desertification, and to the establishment of structures within Iraq for the implementation of these conventions. Because acceptance of such conventions imposes international obligations whose fulfillment will require the building of relevant capabilities within the organizations concerned, Japan should consider the planning of programs for the comprehensive raising of capabilities from institutional, structural, and personnel-related perspectives.

Japan should also consider assistance for the listing of the southern marshlands as a Ramsar Convention site. Listing the marshes in their present state of degradation is difficult, but Japan could argue for their international importance and once they have been rehabilitated, provide support for their listing under the Ramsar Convention to protect them internationally and ensure their sustained conservation.

(4) Support for the creation of structures aimed at preventing environmental degradation caused by reconstruction development

In view of anticipated large-scale reconstruction development throughout Iraq, there is a need to support initiatives aimed at coping with the environmental issues expected to emerge from such development. Where projects implemented by Japan are concerned, there is a need to ensure that due consideration is paid to environmental and social concerns, and Japan could also provide support for the appropriate implementation of projects of other donors.

There is a particularly urgent need to establish systems for environmental assessment and for addressing other environmental and social considerations, along with structures for their implementation, and to train required personnel. It will require assistance from both legislative and human resource training perspectives in order to build institutions within the Iraqi government itself for addressing environmental and social concerns and to improve its capabilities for implementation of plans, environmental monitoring, and compliance with laws and so forth. In more specific terms, Japan could consider cooperation that bundles a number

of different items such as the development of human resources through training, supply of monitoring equipment, and the dispatch of legal system experts.

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