



# Environment in Iraq: UNEP Progress Report

Geneva, 20 October 2003



*First published in Switzerland in 2003 by the United Nations Environment Programme.*

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*Design and Layout: Matija Potocnik  
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## Table of Contents

<b>1. Introduction</b>	<b>2</b>
<b>2. Environmental priority sites</b>	<b>4</b>
2.1 Overview .....	4
2.2 Industrial sites .....	5
2.3 Oil fires and spills .....	13
2.4 Shipwrecks .....	15
2.5 Waste management .....	16
2.6 Water and sanitation .....	18
2.7 Use of depleted uranium .....	20
<b>3. Mesopotamian Marshlands</b>	<b>22</b>
3.1 Overview .....	22
3.2 Recent developments in the Marshlands Region .....	24
3.3 Status of the Marsh Arabs .....	25
3.4 Transboundary issues .....	27
3.5 Stakeholder dialogue and coordination .....	27
<b>4. Institutional structures for environmental management</b>	<b>29</b>
4.1 Overview .....	29
4.2 Past institutional structures .....	29
4.3 Environmental Protection and Improvement Directorate .....	30
4.4 Ministry of Environment .....	30
4.5 Other national institutions with environmental authority .....	31
<b>5. The Joint Needs Assessment for Iraq Reconstruction</b>	<b>32</b>
5.1 Overview .....	32
5.2 The Joint Iraq Needs Assessment process .....	32
5.3 UNEP Synthesis of Environmental Needs and Priorities .....	32
<b>6. UNEP's Activities in Iraq</b>	<b>35</b>
6.1 Chronology of UNEP's Activities .....	35
6.2 Next Steps identified in the UNEP Desk Study .....	36
ANNEX 1: SCHEMATIC DIAGRAM FOR STORAGE AND CONTROL OF WATER IN IRAQ .....	37
ANNEX 2: REFERENCES .....	38

## 1. Introduction

As major military operations in Iraq were drawing towards an end in late April 2003, UNEP published its *Desk Study on the Environment in Iraq*, aimed at providing a timely overview of key environmental issues in the context of the recent conflict. Background materials used in the report's preparation relied on UNEP's earlier work in the region, including three studies it had carried out about the environmental impacts of the 1991 Gulf War, and the 2001 report on the demise of the Mesopotamian Marshlands. Due to the conflict situation, it was not possible to conduct field assessments and the study was rapidly compiled from published and on-line information sources as well as satellite data. Despite these limitations, the report sets out the general environmental context and provides guidance on the next steps for addressing key environmental challenges. UNEP's Desk Study was prepared as part of the overall 'UN Humanitarian Flash Appeal for Iraq', launched in March 2003.

This Progress Report should not be considered as a substitute for the Iraq Desk Study, but is intended to provide updated information about the evolving environmental situation in Iraq, with a view to highlighting priority areas for action. In addition to other sources, it draws its information from two fact-finding missions that UNEP was able to field to Iraq in July and August 2003. Unfortunately, however, the security front remains unstable, seriously curtailing the United Nations margin of manoeuvre in Iraq.

The Progress Report also makes use of background material collected for the United Nations Development Group (UNDG) / World Bank Joint Iraq Needs Assessment, which will be presented at the International Donors' Conference in Madrid on 24 October 2003. Within the UNGD process, UNEP has been mandated to identify and evaluate environmental concerns; one of the four cross-cutting sectors of the Iraq Needs Assessment. This has provided an opportunity for UNEP to actively link environmental activities with other relevant sectors such as agriculture, water and sanitation, energy, housing and institutions.

While, the occupying powers represented by the Coalition Provisional Authority (CPA) hold the dominant political role, the Iraqi people are currently represented by the Iraqi Governing Council, which named a cabinet of 25 ministers on 1 September 2003. In this cabinet, a new seat for an environment minister has been created for the first time. One of the areas where the international community can play a major role is to assist in building the capacity of this nascent environmental administration. In so doing, the enormous task of managing the environmental challenges in post-conflict Iraq can be addressed in a long-term and sustainable manner.

Based on the earlier *UNEP Desk Study on the Environment in Iraq*, the UNGD needs assessment, and this progress report on environment, UNEP concludes that there are a number of serious environmental problems in Iraq that require immediate attention. These include environmental contamination exacerbated by military actions as well as looting of sites holding nuclear and toxic materials. Iraq has also long-standing environmental problems, such as the destruction of the Mesopotamian Marshlands and pollution from the oil and chemical industries.

Since May 2003, UNEP has hosted five roundtable meetings on the environment in Iraq in Geneva, Switzerland. There has been wide participation in these meetings by different UN agencies, non-governmental organizations, scientific and academic institutions and development agencies. These roundtables have provided a forum for different stakeholders to coordinate their activities and to inform each other on the development and progress of different programmes and projects in Iraq.

With this progress report, UNEP's aim is to inform all stakeholders about recent environmental developments in Iraq. The report includes recent information and examples of industrial pollution 'hotspots' that need to be scientifically assessed and, depending on the results, cleaned up as quickly as possible. It also contains an



update on developments in the Mesopotamian Marshlands and describes the former and current environmental administration in Iraq, as well as the UNDG process. Next steps for action include strengthening national environmental institutions, promoting regional environmental cooperation and implementing environmental rehabilitation and clean-up projects.

## 2. Environmental priority sites

### 2.1 Overview

UNEP's Post Conflict Assessment Unit (PCAU) prepared a Desk Study of the environment in Iraq in April 2003, aimed at providing a rapid and timely overview of key environmental issues in the context of the current conflict. Attention was drawn to possible next steps, including urgent measures to minimize, mitigate and remediate immediate environment-related threats to human health. One important step is to identify the major polluted and contaminated areas that have the potential to threaten human health and the environment, and to provide recommendations for risk reduction and remediation. The Desk Study began this process by listing known sites where chemical weapon attacks occurred during the Iraq-Iran war, as well as military sites that were bombed during the 1991 Gulf War. It also drew attention to the need to collect further information on ammunition detonation sites as well as potential contamination from the use of depleted uranium ammunition.



Newly identified industrial sites and sectors of concern in Iraq

Since the publication of the Desk Study, UNEP has been identifying potentially contaminated sites on the basis of fact-finding missions undertaken in July and August 2003, desk research, satellite images, and information provided by Iraqi government officials and affiliated UN organizations. This section focuses on the new information that has been collected since April 2003 on potential industrial 'hotspots', oil contamination, pollution from shipwrecks, waste management, water and sanitation issues, and contamination from depleted uranium.

## 2.2 Contaminated industrial sites

Iraq's industry has suffered from a decade of economic sanctions and lack of investment. This has led to chronic environmental problems, such as discharges of untreated effluent to surface waters, spillages and discharges of chemicals to soils and groundwater, and widespread uncontrolled emission of particulates and gases from stacks. The recent war has undoubtedly exacerbated the chronic environmental stresses that have accumulated in Iraq over the past two decades. An important part of the environmental damage associated directly with the war arises from the looting and pillaging of key infrastructures and the ransacking of equipment and supplies, including hazardous and radioactive materials.

UNEP is currently identifying industrial sites that may pose significant risks to human health and lead to further environmental degradation. The site identification, review and prioritization process is ongoing and, hence, these initial priority sites described in this section may be subject to review and amendment. Several polluted industrial sites that need urgent clean-up measures are described and divided into specific *contaminated sites* and more general *industrial sectors with contaminated sites*.

### Contaminated sites

#### Al-Mishraq Sulphur State Company

The Al-Mishraq Sulphur State Company, located 30 km south of Mosul, conducts sulphur mining and comprises a sulphuric acid and an aluminium sulphate plant, as well as supporting infrastructure. Mining of sulphur began at Al-Mishraq in 1972 and by 1988 production capacity was about 1.25 million tonnes per year. The sulphur is mainly stored in loose stockpiles.

On 26 June 2003, it was reported that the Al-Mishraq sulphur plant was burning, emitting a huge plume of gas over Iraq and other Middle Eastern countries. It is not yet known whether this was an act of sabotage or caused by an accident in the production process. Although not confirmed by laboratory analysis it is likely that the visible plume was generated by the reaction of the primarily combustion product (sulphur dioxide) with sunlight, oxygen, dust particles and water in the air to form a mixture of sulphate ( $\text{SO}_4^{2-}$ ) aerosols (tiny particles and droplets), sulphuric acid ( $\text{H}_2\text{SO}_4$ ), and other oxidized sulphur by-products. On the basis of satellite images it is clearly indicated that the fire took place at the mining and milling area.

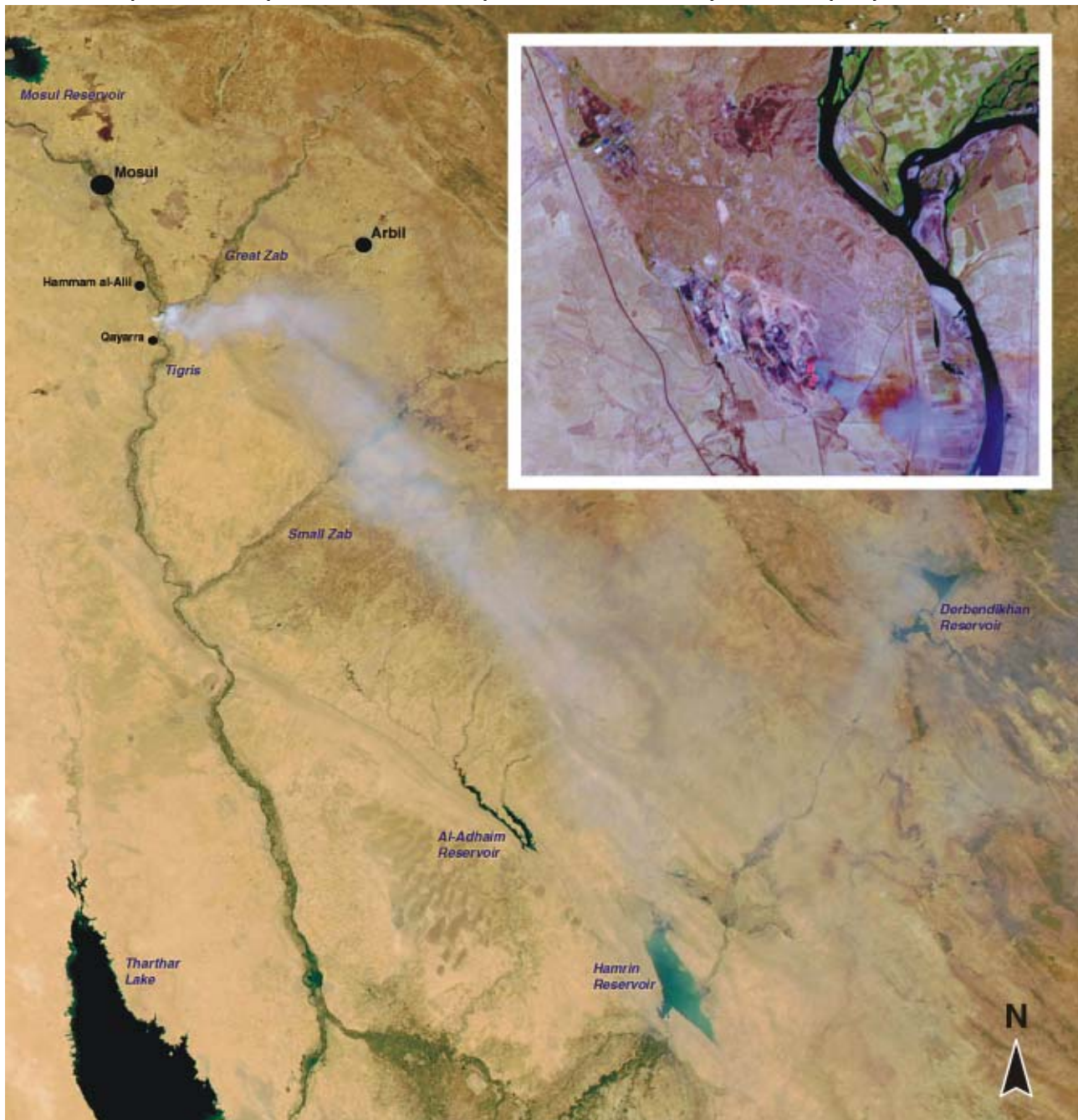
The extent of the plume appeared to peak between 29 June and 1 July, however, it was reported that the fire had been extinguished by 25 July using bulldozers, fire trucks and other fire fighting equipment. It was also reported that the mounds of elemental sulphur turned molten in the intensity of the fire and had threatened to impact the Tigris River.

According to local media reports, the persistent plume has caused significant environmental impacts and health impacts, such as respiratory distress and skin irritations among the local population. The UNEP Fact Finding Mission of July 2003 confirmed the concerns of local people about the ongoing sulphur burning at the Al-Mishraq plant. Local experts estimated that in the region of 0.5 million tonnes of sulphur (0.5–1 million tonnes according to Ministry of Industry and Minerals) were destroyed during the approximately one month that the fire burned, affecting a wide area extending from Al-Sharqat to Mosul and Erbil. In addition, the impact of contaminated firewater and potential run-off into the Tigris has not been determined.



UN agencies were monitoring potential health and environmental concerns arising from the high concentrations of sulphur dioxide in the air. The major health concern associated with exposure to high concentrations of sulphur dioxide includes breathing problems, respiratory illnesses and alterations in pulmonary defences. Exposure causes eye, nose, throat and skin irritations and other ailments, especially for people with allergies. The impact that sulphur dioxide has on the surrounding environment is also of great concern. More than 40 percent of trees in a radius of 100 km from the sulphur plant have already lost their leaves. There is an urgent need to comprehensively assess the health and environmental impacts of this incident.

### Massive sulphur dioxide plume from a fire eruption at the Al-Mishraq State Company



MODIS image: Bands 4, 3, 1  
Date acquired: 27 June 2003

Image courtesy of UNEP/DEWA/GRID-Geneva

Insert (top right): Terra - ASTER image  
Date acquired: 14 July 2003

Insert: Image courtesy of NASA  
Source: <http://earthobservatory.nasa.gov/>

Toxic sulphur plume from the Al-Mishraq industrial facility drifts southeastward over northern and central Iraq and then eastwards into Iran. Sulphate aerosols within the plume produce the white smoke column, which has spread widely over the region reaching Syria, Iran, Turkey, Azerbaijan and the Persian Gulf. The high-resolution image (top right) of the industrial sulphur plant shows the fire (bright red) burning through the stored sulphur stockpiles, and generating bluish fumes.



## Al Qa Qaa Complex

The Al Qa Qaa Complex is located in Yousefiya 30-38 km South of Baghdad, near Iskandariya and has been used for the manufacture of explosives for decades. The huge complex (area of approximately 20 x 20 km) manufactures solid propellants, explosives and munitions and includes smaller facilities for the production of raw materials including nitric acid, sulphuric acid, sulphonic acid and solvents. In addition, the complex includes open and buried storage bunkers and waste landfills.

The chemicals complex has the potential to impact air emissions, soils and groundwater. Air emissions include the ongoing and former release of nitric oxides (NO<sub>x</sub>), sulphur oxides (SO<sub>x</sub>), solvents, acid aerosols and particulates. These emissions may have caused widespread surface soil contamination. In addition, leaks and deliberate spills of chemicals (acids and solvents) during looting will impact soils and, potentially, groundwater. Wastewater treatment plant failures have resulted in the discharge of acids, solvents and by-products into the rivers which may effect potable water sources further downstream. The status of the landfill sites and their potential environmental impacts is not known.

It is currently unknown if the Al Qa Qaa Complex has been subject to attack, collateral damage or sabotage during the 2003 conflict. However, it is known that it was partially attacked during the 1991 Gulf War. This site has represented a risk to human health and the environment for a long period of time and, therefore, there is an urgent need to assess the environmental situation at the Al Qa Qaa Complex and undertake risk reduction measures including clean-up of looted acids and solvents, repair to tanks, vessels and pipe-work and remediate the hazardous waste landfills.



Nitrogen Oxides (NO<sub>x</sub>) release in Al Qa Qaa

## Tuwaitha Nuclear Research Facility

Built in the 1960s, the Tuwaitha Nuclear Research Facility is a complex of more than 100 buildings spread over a 56 km<sup>2</sup> site located 18 km south-east of Baghdad. The Tuwaitha facility was the main site for the Iraqi nuclear programme. Activities included several research reactors, plutonium separation and waste processing, uranium metallurgy, neutron initiator development and work on a number of methods of uranium enrichment. All stocks of nuclear material at this site were removed under International Atomic Energy Agency (IAEA) monitoring since 1991, and equipment linked directly to the nuclear weapons programme was destroyed on site. All other radioactive materials, including uranium, remained in place and were stored in sealed barrels at the facility.

When Iraq came under the Coalition control in April 2003, the occupying forces failed to secure the Tuwaitha site and looting of nuclear materials took place, with the possible risk of radiological contamination of the surrounding areas. First reports about possible looting date back to April 2003, when the IAEA was informed

that seals on the drums containing uranium at the Tuwaiitha facility had been broken. High levels of radiation have been detected in several neighbourhoods as a result of looters carting off nuclear materials.

On 7 June 2003, a team of IAEA safeguard inspectors began taking an inventory and securing nuclear material at the Tuwaiitha complex. The nuclear material – 1.8 tonnes of low-enriched uranium and 500 tonnes of natural uranium – had been under IAEA seal since 1991. The inspection team found that since the nuclear materials in ‘Location C’ of the storage facility were last verified in December 2002, some safeguard seals had been removed, many containers were missing, many others had been emptied and a large area was covered by uranium compounds. The material on the floor was recovered and repackaged into new containers. The IAEA team estimated that at least 10 kg of uranium compounds could have been dispersed in the form of dust on the container walls or as material adhering to the bottom folds.

Although an estimated 20 percent of the containers which stored the uranium had been taken from the site, it appeared that looters had dumped the uranium before taking the barrels, many of which were used for house building and water and food storage. A US programme to buy back the barrels for US\$3 each had succeeded in acquiring about 100 of the 3,000 missing barrels by 21 June 2003. Greenpeace estimated that 150 barrels remained in circulation, held by people unwilling to part with their ‘new’ water cistern. On 28 June, Greenpeace began exchanging 100 clean barrels; the 12 barrels collected on the first day were found to be contaminated with traces of “yellow cake” (low-enriched uranium).

A Greenpeace radiation investigation team spent three weeks in June and July 2003 surveying the communities around Tuwaiitha. They reported uncovering radioactivity in a number of buildings, including one source measuring 10 000 times above normal background levels, and another, outside a 900-pupil primary school, measuring 3 000 times above normal background levels.



CHRIS HELGREN, REUTERS

IAEA inspectors at Tuwaiitha Nuclear Research Facility, 9 June



The Tuwaiitha nuclear complex is a major concern owing to the contamination of the surrounding environment and the risks posed to the health and safety of the people living near the site. Short-term health effects reported among local people are being investigated by Iraq's Ministry of Health and the newly established Ministry of Environment (Protection from Radiation Center) which has launched a survey of 5 000 residents near Tuwaiitha. Clean-up and remediation measures need to be undertaken where localized contamination can be measured. In addition, public awareness of the risks associated with contamination need to begin immediately.

### Midland (Al-Doura) Refinery Stores

The Al-Doura refinery warehouses, near Abu Gharraib, 35 km west of Baghdad, are one of the largest stores of chemicals in the country. The looting and ransacking of the refinery warehouses after the 2003 conflict

has caused a major environmental disaster: over 5 000 tonnes of chemicals, including highly hazardous materials, particularly tetra ethylene lead (TEL) and furfural, were spilled, burnt or stolen. Burning of the chemicals reportedly generated white toxic fumes affecting a radius of 2–3 km around the storage facility, with neighbouring villages reportedly affected.



The area is assumed to be heavily contaminated with a variety of hazardous chemicals and the risk of groundwater pollution is high, given the permeable nature of the sandy soils in the area. A detailed inventory of the chemicals and quantities destroyed and/or stolen has been made available to UNEP. Urgent remedial clean-up action is required, prior to the onset of the autumnal rains, to minimise the risk of contaminated surface water run-off and groundwater entering the Tigris River. An emergency task force has been set up by the Midland Refinery, however, it lacks immediate technical and financial support.



Midland storage facility prior to the outbreak of conflict (top left)  
Warehouses, containing highly hazardous chemicals, were completely destroyed by looting and arson

HASSAN PARTOW, UNEP/PCAU



HASSAN PARTOW, UNEP/PCAU

Chemical spill from burnt and damaged barrels

## Industrial sectors with contaminated sites

### Cement factories

Iraq's operational cement plants have an estimated production capacity of approximately 2 million tonnes per year. The majority of the facilities are located along the Euphrates River from Al Basrah to the Syrian border. The cement factories of Hammam Al-Alil, Al-Kufa, Al-Samawa and Al-Sadda are located near urban centres and may pose a serious risk to human health and the environment.

The main releases to air from the production of cement are from kiln exhaust gases, clinker cooler exhaust and any bypass gases. There may also be significant releases of kiln dust depending on the alkaline content of the raw materials used. The nature and scale of the releases are dependent on plant conditions, as well as the type of raw materials and fuel used. The air emissions from cement kilns include nitrous oxides, sulphur oxides, particulates, organic compounds (including the potential for dioxins), carbon oxides, metals/chlorine and ammonia (in some plants). The metals released include three types: refractory (barium, beryllium, chromium, arsenic, nickel, vanadium, aluminium, titanium, calcium, iron, manganese and copper); semi-volatile (antimony, cadmium, lead, selenium, zinc, potassium and sodium); and volatile (mercury and thallium).

A survey of the country's 15 cement kilns by the Iraqi Environmental Protection and Improvement Directorate (EPID) in 2000 indicated that, although the majority of the plants had been fitted with air emission abatement equipment, none of the equipment functioned efficiently. Hence, it can be expected that the cement kilns discharge large volumes of dust which potentially contains high concentrations of heavy metal. In addition to widespread surface soil contamination by particulates and heavy metals, cement kilns fuelled by petroleum hydrocarbons may also have impacted soils and groundwater as a result of spillages and accidental releases in transfer systems (tank farms, buried pipelines, etc.).

There is an urgent need to undertake environmental assessments at the Iraqi cement factories. These factories – lacking spare parts, filter units, etc. – may pose short- and long-term risks to the population and the environment.



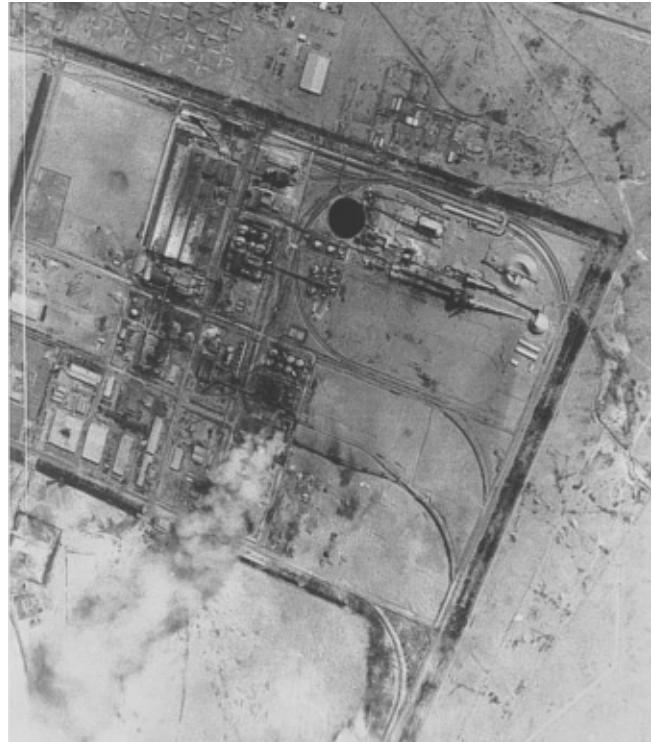
A cement factory in Iraq

### Fertilizer plants

Iraq was one of the world's largest exporters of fertilizer. Reports, however, indicate that production has not resumed since the end of the recent conflict. Iraq produced NPK (nitrogen, phosphorus and potassium) fertilizers, nitrogenous fertilisers and finally superphosphate fertilizers.

The fertiliser industry uses large amounts of raw materials (phosphate ore, acids, ammonia, potash, energy) and most sites include mining and milling operations. The chemical processes in the production of fertilizers involve acids and/or bases, mainly sulphuric acid, phosphoric acid, nitric acid, hydrofluoric acid and ammonia. Phosphate rich raw material (phosphate rock) is usually digested on-site followed by further specific processing. The main air pollutants associated with fertilizer production include: acids used in the process, nitric oxides ( $\text{NO}_x$ ), sulphur oxides ( $\text{SO}_x$ ), ammonia, ammonia aerosols, dusts of calcium fluoride, calcium sulphate, calcium oxides and hydroxides and finally fertilizers product itself. However, depending on the quality of the phosphate rock or feldspar processed fertilizer production can also emit heavy metals. In addition to air pollution, these sites also generate large quantities of wastewaters and solid waste.

The environmental impact of fertilizer production depends on the raw materials, production processes and the status of the pollution control equipment. A lack of spare parts and maintenance of fertilizer plants in Iraq during international sanctions has resulted in environmental damage. For example, the discharge of wastewaters from the Al-Qa'im phosphate plant, which occupies an area of 2 square kilometres and located 380 km north-west of Baghdad, causes eutrophication in the Lake Quadisiyah reservoir and Euphrates River downstream. In addition, fertilizer plants at Baiji and Al Basrah cause environmental harm through emissions of process specific chemicals into the air, discharges into water, and storage and solid waste problems. Actions should be undertaken to minimize the emissions and to clean up spills and solid wastes.



WILLIAM M. ARKIN, WWW.GLOBALSECURITY.ORG

Al Qaim Superphosphate Fertilizer Plant

### Pesticides production sites and stores

The organization in charge of Iraq's internal production and formulation of pesticides is the Al-Tarik State Company. Al-Tarik State Company comprises the Fallujah II and Fallujah III production and formulation plants. Both sites, along with others such as Fallujah I and the Al Muthanna State Establishment, were part of the Iraqi chemical weapons programme. The three Fallujah sites and Al Muthanna were all targeted in the 1991 Gulf War.

Al-Tarik State Company also has agricultural chemical storage facilities, including the Suwaira and Abu Gharaib pesticide stores. Local people are worried about the condition of these stores, especially given that looting and ransacking of the sites is taking place. This may result in contamination of the surrounding area, leading to health risks for the local population. It has also been reported that these storage areas contain obsolete pesticides that were removed from the market years ago. In addition, old stocks of mercury treated seeds can still be found.



Entrance of the Fallujah II pesticide production facilities

It remains unclear as to whether the Fallujah II and Fallujah III sites were attacked during the recent war. Any attacks on Fallujah II could have resulted in a release of chlorine gas and other hazardous chemicals (e.g. phenol) into the environment. Attacks on Fallujah III could have caused dispersal of phosphorus laden pesticides and other hazardous chemicals. Such potential releases would be on top of already present soil and ground contamination from earlier pesticide and chemical pollution.

The risks of emissions of toxic substances to soil, water and air should be carefully assessed, along with the risks to workers, the local population and for groundwater supplies. Such assessments are urgently needed in order to ensure that precautionary and risk reduction steps are taken.



## Other potentially contaminated industrial sites

In addition to the aforementioned contaminated industrial sites, there are other industrial sites and sectors of environmental concern. Key information on these sites is currently lacking, as well as the risks that they might pose to the environment and human health. The following potential industrial contaminated sites need further research and investigation:

- Al-Rustamiyah Sewage Treatment Plant in Baghdad
- Al-Sadda chemical factory
- ARADET industrial facility
- Oil refineries at Bayji and Al Basrah
- Petrochemical factories in Al Basrah
- Aluminium production facilities
- Battery production factories
- Brick factories
- Iron and steel facilities



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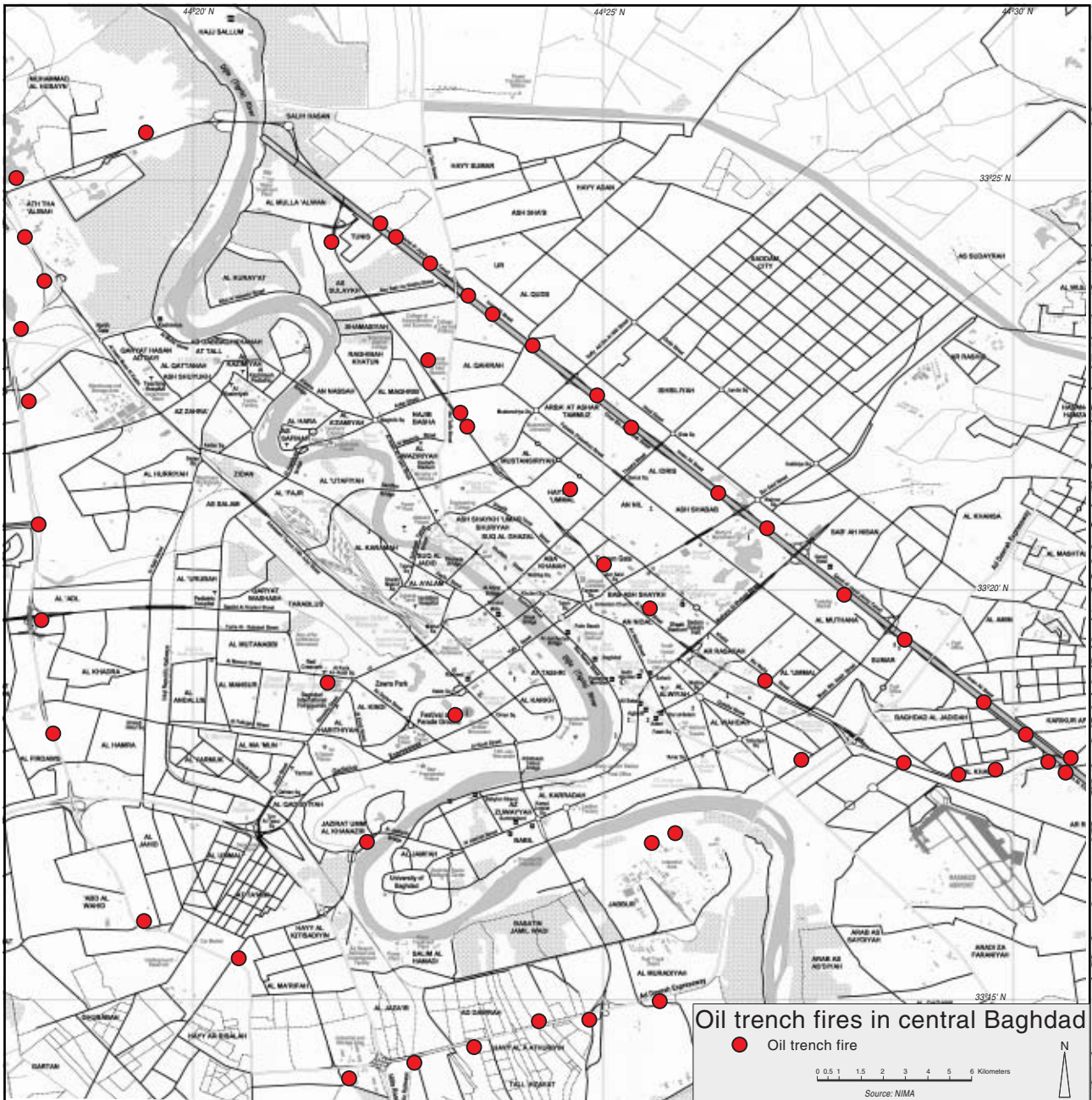
Heavy oil smoke billowing out from brick factories near Al-Kut



### 2.3 Oil fires and spills

The 2003 conflict resulted in minimal damage to oil wellheads, deliberate burning of oil in trenches in Baghdad and sabotage to oil pipelines. In contrast to the 1991 Gulf War, the recent conflict resulted in a total of 9 well-head fires in the southern Rumailah oil fields, with the last fire reportedly extinguished on 15 April 2003. Satellite images indicate that a minimum of 50 main oil fires were started in Baghdad in the period 27 March until 17 April 2003 in order to block effective targeting by laser-guided munitions. A compilation derived from satellite images of the locations of the burning oil trenches during this period is provided in the map below.

Uncontrolled burning of crude oil results in the emission of dense smoke containing particulates and gases including carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), hydrogen sulphide (H<sub>2</sub>S) acidic aerosols, and soot. In addition, the burning would result in widespread surface soil contamination by unburnt hydrocarbons and particulates, and soil contamination by oil seepage and/or contaminated firewater produced during fire fighting operations. These may also impact groundwater.



Oil trench fires locations in central Baghdad defined using satellite imagery

Some of the oil wells are functional again. However, the oil pipeline infrastructure has been sabotaged and the damage caused has resulted in temporary halts to oil exports and significant local environmental damage. A review of different information sources indicates that the oil pipeline system was subject to at least nine attacks between 12 June and 16 October 2003, resulting in further oil fires and spillages. The oil pipeline explosions identified include the following:

- 12 June, 15 km from Mosul, 2 blasts
- 21 June, same pipeline, near Hit, 140 km north-west of Baghdad
- 24 June, Barwanah, 250 km north-west of Baghdad
- 26 June, near Al-Fatha (near Tigris)
- 15 August, Kirkuk-Ceyhan pipeline (near Bayi)
- 17 August, 2 km from Kirkuk-Ceyhan pipeline (near Bayi)
- 30 August, Bayi
- 18 September, Kirkuk-Ceyhan pipeline, 9 km north of Bayi
- 16 October, near Al Hadithah, 200 km north-west of Baghdad.

In order to define the nature and scale of the environmental impact caused by the pipeline explosions the following characteristics should be established: exact location, crude oil composition, pipeline flow rate, length at the time before line isolation, combustion time and extinguishing methodology (sand damping, firewater).



FALEH KHEIBER, REUTERS



ARKO DATTA, REUTERS

Pipeline damage (top right) and oil fire (bottom) at the location near Bayi



## 2.4 Shipwrecks

The northern section of the Regional Organization for the Protection of the Marine Environment (ROPME) Sea Area contains numerous wrecks as a result of the three conflicts. The entrance to the main Iraqi port of Umm Qasr and the waterways of Khawr Al Zubayr and Shatt Al-Arab contain the wrecks of approximately 260 commercial, military and fishing vessels. Some of the vessels were sunk carrying hazardous cargo including chemicals, crude and refined oil, bunker oil, battery acids, asbestos, other chemicals, short-range missiles and unexploded ordinance.

Currently, the United Nations Development Programme (UNDP) has supported an operation to lift 19 wrecks to clear the navigation channels in the port of Umm Qasr, under an approximately US\$20 million wreck-removal and salvage contract funded by the Oil-for-Food Programme. The first phase of the operation will consist of a survey of the wrecks. A task force has been formed under the aegis of the ROPME Sea Area Secretariat. The main objectives of a meeting convened by the ROPME Secretariat on 18–19 August 2003 were to develop guidelines for the survey of the wrecks and to coordinate efforts for their removal. The initial survey results indicate that many of the vessels contain low or no hazardous materials due to either release (corrosion or damage to the hull and bulkheads at the time of sinking) or low initial volumes. The survey will indicate those wrecks that still represent a danger to shipping, those deemed too dangerous to lift and those that require pumping or cargo lifting prior to removal. In addition, an environmental assessment of both the wreck removal, including the impacts of re-suspending sediments, and disposal operations (salvage or deep water) will also be undertaken.

In addition, it was reported on 19 August 2003 that USAID's contractor (Bechtel) had removed 3.4 million m<sup>3</sup> of dredgings from the Umm Qasr port. It is understood that an environment assessment of dredging operations was not undertaken and, although photographs indicate that the dredgings were re-deposited close-by, there is a potential that the sensitive Persian Gulf ecosystem maybe impacted by potentially contaminated sediments.



POOL - STAFF PHOTOGRAPHER, REUTERS

Shipwrecks are a common site along the Shatt al-Arab

## 2.5 Waste management

Prior to the recent conflict, Iraq's main cities operated efficient waste collection systems, albeit at reduced capacities. However, these municipal wastes were deposited in uncontrolled landfills. Rural areas meanwhile, lacking collection systems, relied on the burning of wastes or deposition in local waste disposal sites or village dumps. The 2003 war has led to the uncontrolled and occasional dumping of municipal waste in the streets, due to the failure of collection systems, looting or restrictions. In addition, the conflict has generated large volumes of demolition waste from bomb-damaged buildings (potentially impacted by depleted uranium and asbestos) and military hardware (vehicles, unexploded ordnance, depleted uranium).

It was reported that emergency waste collection initiated by the Coalition Provisional Authority (CPA) in the period April to August 2003 resulted in the removal of in excess of 1 million m<sup>3</sup> of waste from the streets and neighbourhoods in Baghdad. The main Baghdad landfill (Al Amariy) is located in a shallow aquifer area and includes approximately 3 000 garbage pickers. The CPA commenced training the landfill engineer in pollution control techniques, and also identified and opened three new temporary landfills.

The newly developed Awarisch landfill in south-western Baghdad holds over 10 000 damaged/destroyed military vehicles (tanks, armoured personnel carriers, trucks, Scud launchers) and includes a small recycling facility. A recent photo-essay report by the International Rescue Committee (IRC) indicated that this landfill may not be secure, with children recycling aluminium and other valuable metals from the tanks.

In mid-August 2003, it was announced that the Municipality of Baghdad had commenced city-wide waste collection using 1 400 trucks (collecting 22 000 tonnes per week), together with a public-awareness campaign informing residents of collection routes and pick-up times. In addition, it was reported that the development of a controlled landfill with recycling facilities was being planned. At the same time, the CPA began a structural assessment and demolition/removal of bomb-damaged buildings in Baghdad.



HASSAN PARTOW, UNEP/PCAU

Uncontrolled dumping and burning of municipal and demolition waste in Baghdad





HASSAN PARTOW, UNEP/PCAU

Most medical incinerators in Iraq, such as this one in Baghdad's Kazimiyah Hospital, are not operational

In October 2003, the CPA announced that it was funding a waste management programme directly through the Iraqi Ministry of Works, which would temporarily employ 100 000 people to collect and remove waste from the streets and sewage network.

In addition to CPA initiatives, in May 2003 UNICEF supported the municipalities of Al Adhamiyah and Rusafah (with a combined population of 600 000 to 1 million people during the working day) in a month-long programme to remove waste stockpiles (covering approximately 38 percent of the total area of Baghdad), followed by supporting refuse collection (15 trucks per day) from high-risk areas in Baghdad. The humanitarian organisation CARE initiated an intensive rubbish collection and disposal programme in Hit (Al Anbar Governorate) and Muqadadiya (Diyala Governorate) on 27 September 2003. The IRC has contracted workers in Kirkuk to collect and transport 900 tonnes of waste per week from city roads, pavements, parks and squares, and to clear blocked sewage pipes.

Information reviewed indicates that the collection of clinical waste from hospitals and medical centres stopped during the recent conflict. Although a survey undertaken by the Environmental Protection and Improvement Directorate (EPID) in 2001 indicated that the majority of hospitals in Baghdad (129 out of a total of 141) had clinical waste incinerators, available information and UNEP field visit reports indicated that the incinerators were not functioning during the recent conflict, owing to a lack of resources (operatives, maintenance and fuel).

Hence, clinical wastes from activities such as immunizations, diagnostic tests, medical treatments and laboratory tests accumulated in large amounts. In the period 12–22 June 2003, the World Health Organisation (WHO) supported the removal of nearly 1 400 m<sup>3</sup> of clinical waste from hospitals in Baghdad. However, no information on the disposal method was available for review and it is assumed that clinical waste is being mixed with domestic waste and dumped in landfills.

It would appear that, although new landfills are planned, activities in the waste management sector have concentrated on waste collection and continued disposal in the old uncontrolled landfills or in new temporary landfills. No information on the collection and disposal of industrial or hazardous wastes, or the development of an Iraq waste management plan/strategy, has been made available for review. It is recommended that an urgent environmental review of the uncontrolled landfills and environmental impact assessment of the new proposed landfill is undertaken. In addition, an assessment of hazardous and industrial wastes (composition, volumes, disposal routes) should be carried out.

## 2.6 Water and sanitation

Prior to the 1991 Gulf War, the water and sanitation sector in Iraq was operating efficiently, using technology current at the time. However, international sanctions dramatically reduced capacities and efficiency in this sector. The introduction of the Oil-for-Food Programme in 1995 resulted in a marginal improvement in the sector, but the 2003 conflict has caused further deterioration.

In common with other industrial and municipal sectors, progress in restoring the water and sanitation sector continues to be inhibited by the security situation, with the water supply infrastructure itself becoming a target. The majority of water and sanitation works in Iraq are initiated and funded through the CPA, however other donors, such as the European Union (EU), are also active in the sector. The water and sanitation improvement works include a limited number of large infrastructure projects based in the main cities and a large number of small-scale, ad hoc emergency or short-term projects. Recent developments include the direct hiring of labour to clean canals and waterways and collect refuse from public areas around the newly formed government ministries.

The CPA has delegated management of the reconstruction of the water and sanitation sector to USAID, which in turn has divided the work between large municipal infrastructure projects (under the large US-based engineering company, Bechtel) and small, resource-limited emergency works (placed under various NGOs). USAID's mandate is "to rebuild infrastructure and public facilities and services in a post-war Iraq" and, hence, the majority of programmes focus on the initial restoration of water and sanitation systems to pre-conflict levels, followed by longer-term capacity building.

In April 2003, USAID signed a US\$680 million contract with the company Bechtel to restore water and sanitation systems in Baghdad and six other urban centres (Mosul, Al Diwaniyah, Al Hillah, Al Najaf, Karbala and Al Basrah), as well as undertake other major infrastructure projects (airports, power, railroads, roads and bridges, Umm Qasr seaport). The Bechtel projects range in size from the restoration of potable water to 40 000 residents of Safwan by September 2003, to longer-term efforts such as the Sabbah Nisan project in Baghdad which aims to increase the potable water supply by 220 million litres per day by May 2004. In addition, Bechtel is undertaking a Baghdad-wide sewage system refurbishment programme, co-funded by USAID and CPA, and a water supply refurbishment programme in Al Basrah which includes the cleaning, dredging and repair of the Sweet Water Canal, plus refurbishment of network pumping stations and treatment plants. The current Bechtel programme is due to end in December 2004. An update by USAID, dated 1 October 2003, indicated that rehabilitation work on Al Hillah and Al Diwaniyah sewage treatment plants and Al Najaf



HASSAN PARTOW, UNEP/PCAU

An estimated 300,000m<sup>3</sup>/day of untreated and partially treated sewage is released from Baghdad's Al-Rustamiyah Sewage Treatment Plant, heavily contaminating the Tigris River on its downstream course to the Persian Gulf





HASSAN PARTOW, UNEP/PCAUI

As a blast damaged one of Baghdad's major water pipelines, people make the best of the situation by swimming in flooded underpass

and Karbala's water treatment plants had started. In addition, in Baghdad, 70 out of a total of 90 sewage treatment works had been repaired and the dredging of the Sweet Water Canal – a 90-day project to remove 300,000 m<sup>3</sup> of sediment – was underway.

In addition to the large municipal water and sanitation projects, USAID has also contracted a number of inter-government and NGO implementing partners, including UNICEF, the International Committee of the Red Cross (ICRC), CARE International, Mercy Corps (MC), GOAL, Save-the-Children Fund (SCF), International Rescue Committee (IRC) and World Vision International (WVI). These organizations are mainly involved in undertaking special projects to address immediate or short-term critical needs.

UNICEF supported an assessment of Baghdad's water distribution network in May 2003, in which in excess of 500 separate breaks were identified. Following an attack on a major water pipeline in Baghdad in August 2003, which cut the water supply to 300 000 residents, UNICEF engineers repaired the pipeline within 24 hours. UNICEF has also partially completed the rehabilitation of sanitation and sewage facilities in the governorate of Dhiqar.

ICRC has undertaken emergency repairs to 20 water treatment sites in central Iraq (maintenance of generators, repairs of leakages and electrical connections) and four major projects at water facilities in Baghdad (Sabbah Nisan, Abu Nawas, Al Habibiya and Al Dora). In addition, ICRC engineers have repaired water treatment facilities and provided spare parts in the governorates of Babil, Wasit, Karbala, Qadisiya and Al Najaf, Al Basrah, Al Muthanna and Maysan, and have planned activities in the north (Arbil, Dohuk, Mosul and Kirkuk).

CARE International has undertaken emergency repairs to 50 water and sanitation facilities, including six major water treatment works, replacement of over 240 km of water pipeline, and training of operators and technicians of 45 water treatment plants in central and southern Iraq. In addition, the organization has also provided emergency water supplies to in excess of 100 primary health centres and 130 hospitals. On 10 September 2003, CARE commenced emergency repairs to two water boosting stations in Khalis and Diyala and the rehabilitation of a water treatment plant in the town of Manathera, Al Najaf Governorate, and completed the replacement of 9 km of water pipes for Hit in Al Anbar Governorate.

The Mercy Corps has supported water supply projects. These include rehabilitation, extension and construction of water treatment plants, testing of water quality and repair of water supply systems for 280 000 residents of Al Kut City and 250 000 residents of Al Diwaniyah City. In northern Iraq, the MC is supporting the

water department in the city of Kirkuk by providing water testing equipment, transportation, and spare parts for the supply of clean water to almost 500 000 residents. In the city of Khanaqin, the MC has provided generators and spare parts to several water departments to ensure clean water for 50 000 residents. In rural areas of Iraq, the organization is working to repair and restore water systems in 24 villages in Wasit, Diyala, and Qadisiyah Governates. In addition, through the Community Action Programme, the MC will be implementing over 30 water and sanitation projects in 30 communities.

The Irish-based organization GOAL has undertaken water and sewage projects in Al Nasiriyah, including the provision of chlorine for water disinfection. SCF, with support from USAID, has maintained one of Al Basrah's three main water pumping stations and connected several health centres to the water supply network. Meanwhile, IRC has completed rehabilitation on 40 water treatment plants (serving approximately 300 000 people), and WVI has provided water and sanitation to schools in Mosul, and Ninawa governorate, with the aim of completing projects at 79 schools by mid-September 2003.

Prior to the conflict, UNDP had partially completed an EU sanitation project for 5 million people in the Governorate of Baghdad.

The information reviewed by UNEP indicates that potable water supplies in the main urban areas are being restored to pre-conflict levels, with small-scale projects either restoring, or installing water services for the first time, to hospitals, health centres and schools. In addition, the large municipal water and sanitation projects will further increase the availability of clean water and sanitation in the main cities. However, it is unclear if an overall water and sanitation strategy – covering demand, supply, water balance, as well as institutional and policy changes – has been developed.

## 2.7 Use of depleted uranium

The 1991 Gulf War was the first conflict in which depleted uranium (DU) munitions were used extensively. A total of about 300 tonnes of DU were fired by the US and the UK during this war, with DU remaining in the environment as dust or small fragments.

The US Department of Defense and the UK Ministry of Defence have admitted that the American and British coalition forces also used ammunition made from DU in the 2003 Iraq War. British Challenger tanks, for example, expended 1.9 tonnes of DU munitions, approximately twice as much as UK troops used in the 1991 Gulf War. DU was used in tank battles, also involving UK troops, to the west and south-west of Al Basrah.

The UK Ministry of Defence has provided UNEP with details of British DU target locations and has offered to provide advice on carrying out risk assessments on DU within urban areas, and on long-term monitoring of DU in the environment, including water resources. According to the UK Ministry of Defence, target areas are likely to be at a maximum distance of 3 km from firing positions. In June 2003, scientists from the UK Ministry of Defence completed a preliminary technical assessment of some Iraqi tanks thought to have been struck by DU rounds. So far, the UK Ministry of Defence findings indicate very low levels of DU in the vicinity of these tanks. Most of the heavy military equipment has been moved, mainly by troops, from the battlegrounds to scrap areas. While this made it difficult for the UK scientists to find remaining tanks or other heavy military equipment in the actual areas of battle, the scientists noted that most of the tanks found showed low levels of radioactivity, and were clearly marked with paint indicating that they had been hit by DU ammunition.



DU penetrator in its original size

MARKUS ASTNER, SPIEZ LABORATORY / EDITED BY: MATJUA POTOCNIK, UNEP/PCAU



PETER BIRO, INTERNATIONAL RESCUE COMMITTEE

Ayad, 11, strips aluminium and other sellable metals from a tank potentially contaminated by DU

UNEP has not received information from the US on any environmental assessment or remediation of DU contamination in Iraq.

The quantities of DU expended in the US air operations, tank battles and ground operations are still unknown. The vehicles that usually carry DU munitions – Abrams tanks (M1A1, M1A2), Bradley Fighting Vehicles (M2) and Light Armoured Vehicles (LAV-25) – were involved in the fighting. There is currently no evidence that missiles or bombs used during the war – particularly the AGM-86D CALCM hard target penetrators (153 were used) or bunker-busting bombs – contain DU.

The media occasionally showed footage of scrap areas holding destroyed Iraqi vehicles. These pictures also made it evident that local people usually had free access to these areas and were extracting material such as iron plates. It can be expected that these areas contain vehicles hit by DU. Without delay, therefore, vehicles in these areas should be investigated, and those hit by DU should be removed to areas where access is strictly controlled.

According to a recent IAEA report, published in August 2003, depleted uranium from munitions used in the 1991 Gulf War does not pose a long-term radiological hazard to the people of Kuwait. The Kuwait government requested, in February 2002, the IAEA to assess possible long-term radiological impacts of DU residues at 11 locations in Kuwait. Although the findings of this report are not alarming, further policy action and additional research are needed to resolve the uncertainties regarding the use and effects of DU munitions in the Iraq wars. Based on available information, much of the DU expenditure used during the 2003 conflict appears to be in or near urban areas, where people live, work, draw water and grow food. Therefore, contaminated areas need to be identified and assessed, and the population should be tested and monitored. People generally are clearly unaware of the risks of exposure to DU. Urgent steps need to be taken to raise awareness of the potential risks and to introduce protection measures, including posting of warning signs and restricting access at contaminated locations and storage sites.

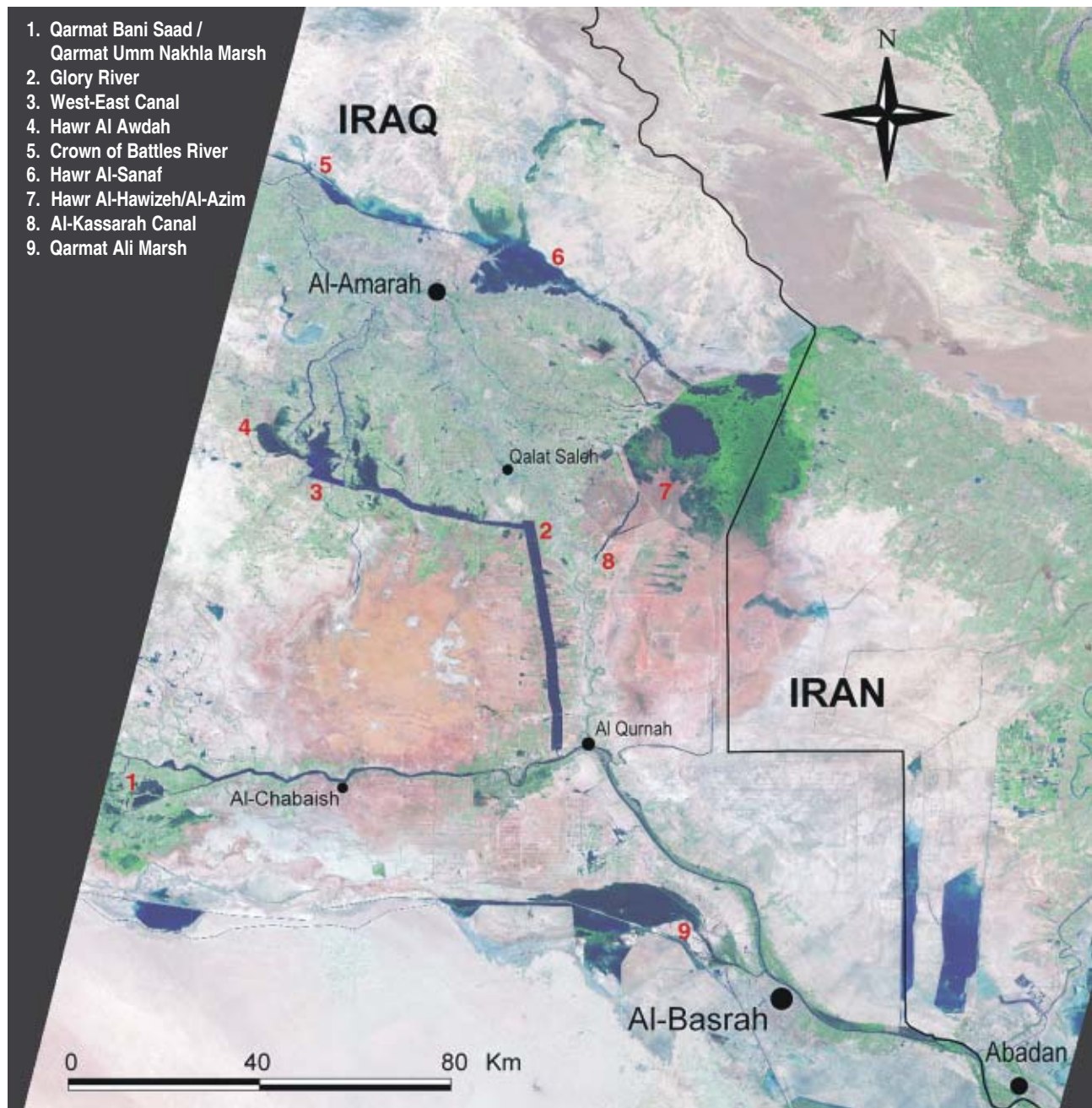


### 3. Mesopotamian Marshlands

#### 3.1 Overview

The Mesopotamian marshlands constitute the largest wetland ecosystem in the Middle East and Western Eurasia. They are a crucial part of intercontinental flyways for migratory birds, support endangered species, and sustain freshwater fisheries, as well as those of the Persian Gulf. In addition to their ecological importance and outstanding natural resources, these marshlands are unique from the global perspective of human heritage. They have been home to indigenous communities for millennia and are regarded as the site of the legendary 'Garden of Eden'.

#### Reflooded marshlands in Spring 2003

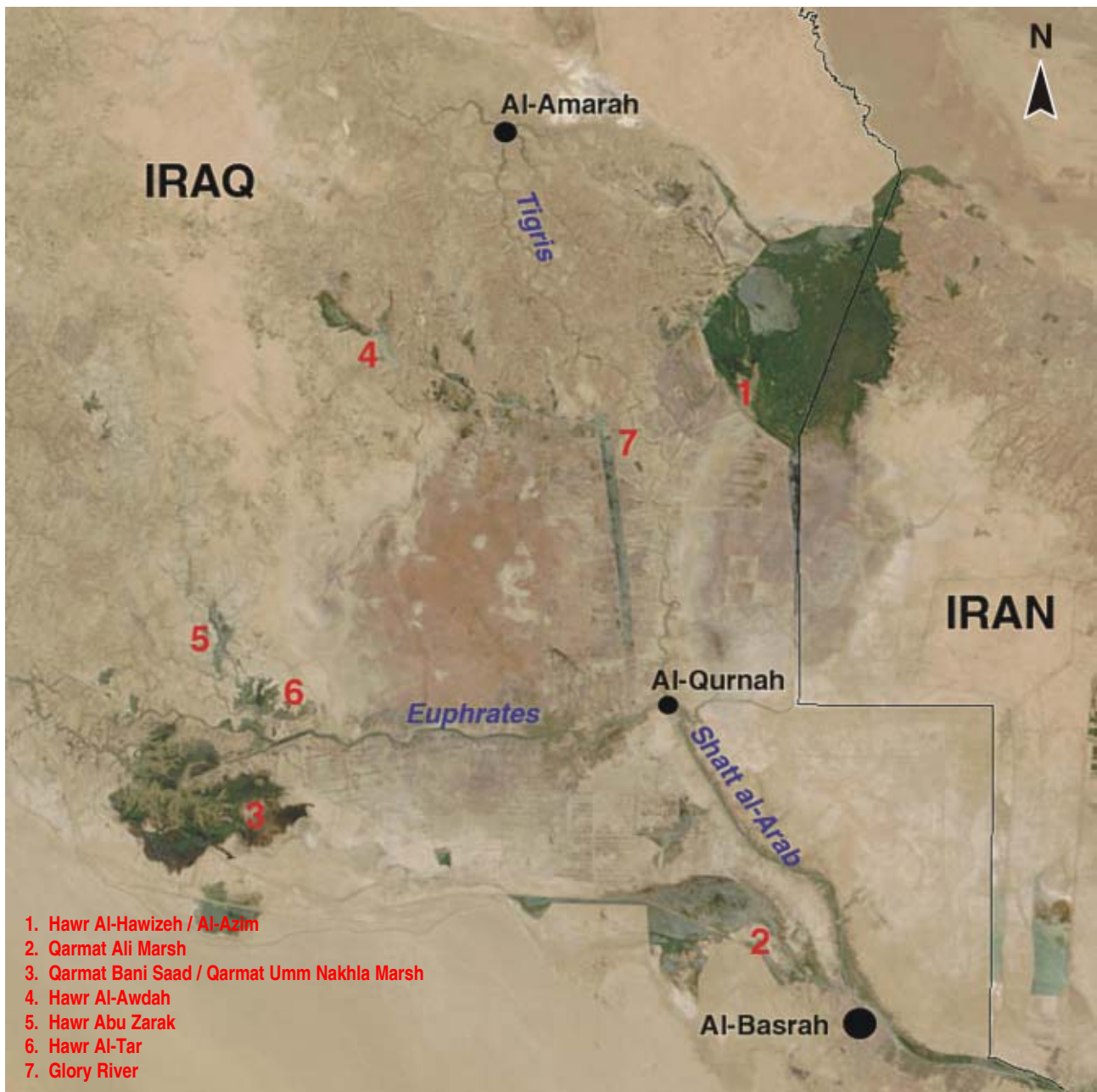


Landsat image: ETM+ Bands 7,4 and 2 and are false color composites  
 Date acquired: 6 May 2003

Images courtesy of UNEP/DEWA/GRID-Geneva

This image shows the main areas that were re-flooded following the spring snow melts and removal of drainage and hydraulic structures by local communities in May 2003. Flood swollen rivers and canals and re-inundated enclaves appear as dark blue patches.

### Reflooded marshlands in Summer 2003



MODIS image: Bands 4, 3, 1  
Date acquired: 17 August 2003

Images courtesy of UNEP/DEWA/GRID-Geneva

Despite the high evapotranspiration rates, the reflooded surface area remained largely unchanged over the summer period and actually expanded in certain regions, a positive sign in the marshland lifecycle.

The destruction of the Mesopotamian marshlands, and the consequent displacement of its indigenous Marsh Arab population, is one of the major humanitarian and environmental challenges facing Iraq, requiring both an immediate and long-term planning response. At the same time, the marshlands' central role in discussions on the sharing of transboundary water resources and oil development has placed the future of the marshland region among the priorities in Iraq's reconstruction agenda.

Located in the lower part of the Tigris-Euphrates basin, the marshlands were adversely affected in the late 20th century by upstream dam construction, diminishing water flows and eliminating the flood pulses that sustained wetlands in the lower basin (see Annex 1). It was the construction of extensive drainage works between 1991 and 1997, however, that was chiefly responsible for the accelerated pace and wholesale disappearance of large areas of the marshlands.

In the early 1970s, the marshlands, consisting of interconnected lakes, mudflats and wetlands, extended over 20 000 km<sup>2</sup> of Iraq and Iran. However, by 2000, over 90% of this vast area had dried out, largely transformed into a barren landscape of desert and salt flats. A further 30% of the remaining 1 084 km<sup>2</sup> of marshland, the trans-boundary Al-Hawizeh/Al-Azim marsh straddling the Iran-Iraq border, dried out between 2000 and early 2003, leaving just 7% of the original area. Based on this rapid rate of decline it was estimated that the marshlands are likely to completely disappear within the next few years.

### 3.2 Recent developments in the marshlands region

Positive signs of an environmental upturn in the marshlands started to emerge almost immediately following the end of the war in May 2003, as arid land was re-flooded for the first time in a decade. Two key aspects were responsible for the changes observed: 2003 was a 'good water year', with plentiful rainfall in the Tigris-Euphrates headwaters in Turkey, and above average precipitation in central and southern Iraq, marking the end of a four-year drought (1999–2002). The wetter conditions raised stream levels and substantially increased the amount of water entering the marshlands. (Data on actual river discharge and reservoir levels in Iraq, however, have not yet been made available for accurate hydrological modelling.) The vacuum created by the collapse of the Iraqi government left the centrally controlled hydraulic and irrigation drainage works without regular supervision. In the ensuing disorder, local communities were quick to take advantage of the breakdown in management authority, modifying earthworks and drainage structures and re-introducing water back into the marshlands.

The rapid changes taking place on the ground were captured by satellite images taken in May 2003. These showed streams and waterways swollen for the first time since the early 1990s, and large drainage canals reaching full capacity. Formerly dry areas had been inundated and substantial parts were under water throughout the summer period, despite the high evapotranspiration rates.

In most cases, it was the Marsh Arabs and local farming communities who took matters into their own hands, embarking on ad hoc, piecemeal interventions ranging from breaching embankments and dykes, to opening floodgates. To remedy the situation, the Ministry of Water Affairs (formerly the Ministry of Irrigation) shut down drainage pumping stations and closed sluice gates or flow regulators of drainage canals, often at the behest of local people.

The major physical changes which have taken place in the marshlands since the end of the conflict in May 2003 and up to October 2003 include the following:

- Water levels in the transboundary Al-Hawizeh/Al-Azim marshes almost reached their 2000 extent, expanding from 760 km<sup>2</sup> to 1 000 km<sup>2</sup>, a 30% increase in surface area. This is a significant development given the priority status of Al-Hawizeh/Al-Azim marshes as a biodiversity refuge that could provide the basis for efforts to restore plant and wildlife populations in the region.
- Flooding of the Qarmat Ali area (north of Al Basrah) by tidal action of the Shatt al-Arab estuary, following removal of defensive embankments. However, with seawater encroaching further upstream in the Shatt al-Arab waterway, the resulting marsh is characterized by saline conditions.
- A large swathe centred along the Euphrates distributaries of Qarmat Beni Saad and Qarmat Umm Nakhla, downstream of Suq al-Shyukh, is inundated. As there is no flow of fresh water between the area and the Euphrates River, the marsh is becoming increasingly saline, hindering re-growth of reeds.
- Hawr Al-Awdah marsh, located at the end of the Al-Muminah/Al-Butairah distributary on the western end of the West-East Canal in the Central marsh, is re-flooded. Recovery of marsh vegetation is reportedly very good.



- At Abu-Zarak marsh, northeast of Al-Nassiriyah, vegetation regeneration is slow and hampered by salt-tolerant species (e.g. *Tamrix aphylla*), due probably to low sub-soil moisture levels which will take time to recharge.
- At Al-Tar marsh, north of Al-Chabayish, reed (*Phragmites australis*) re-growth is reportedly very good.

Although the Marsh Arabs have a deep-seated knowledge of the marshland environment, and age-old skills in manipulating water flows and reshaping earthworks, a more orderly and coordinated water re-instatement plan is needed to ensure greater coherence and wise use of limited water resources. At the same time, structural reconfiguration of the drainage network is required for longer-term sustainability of rehabilitation efforts.

The period October 2003 to March 2004 will be critical for the future of the marshlands. These six months provide a 'window of opportunity' in which an initial water management plan can be drawn up to judiciously manipulate the timing, duration and re-hydration potential of snow-melt floodwaters which will reach the marshlands between April and June 2004. In this context, one of the key technical challenges is to reconnect marsh and riverine areas and re-establish flow-through to stem rising salinity levels and ensure an optimum depth of water for the re-establishment of vegetation and fisheries.

### 3.3 Status of the Marsh Arabs

Concurrent with the marshland drainage scheme, a major campaign by the former Iraqi government was launched in the early 1990s to forcibly displace the Marsh Arabs. No valid and reliable demographic census is available, but estimates of the Marsh Arab population range from 200,000–500,000. An estimated 100,00 to 200,000 Marsh Arabs are internally displaced within Iraq. A further 100,000 are thought to be



ALADIN ABDEL NABY, REUTERS

Marshes slowly reviving near Basrah, 14 September

living as refugees outside the country, with most (about 40,000) in Iran. Following the 2003 conflict, preliminary assessments reported that around 10,000 Marsh Arabs are currently residing within the remaining marshlands, and that of these only a small fraction (less than 10%) are able to lead a traditional subsistence existence. Initial results of an ongoing survey by the AMAR (Assisting Marsh Arabs and Refugees) Foundation indicate that approximately 85,000 Marsh Arabs are currently settled in proximity to the marshes. In addition, there are non-Marsh Arab communities living within the marshland region, utilizing marsh resources.



HASSAN PARTOW, UNEP/PCA

Displaced Marsh Arabs near Lake Al-Razzazah in central Iraq

Although tribal identity is an important factor in Marsh Arab society, they are linguistically and ethnically a homogenous group. Nevertheless, sub-groups have typically been distinguished based on settlement patterns (nomadic herders, settled agriculturalists, migrant labour) and economic occupation (cultivators, buffalo herders, fisherman, and mat-weavers). Marsh Arabs have responded differently to the displacement of the past decade, which is reflected in their adaptation responses. Some of the main settlement and livelihood patterns identified include:

- Marsh Arabs who have continued to live inside the marshlands, pursuing a traditional way of life;
- Displaced Marsh Arabs who have been resettled on dry land on the margins of the present marshes, with some practising a mixed economy of agriculture and marsh exploitation, and others involved only in farming;
- Marsh Arabs who have migrated to towns and cities.

Despite the physical and social upheaval experienced by the Marsh Arabs, a strong level of social continuity and cohesion persists as tribes or sub-tribes were typically resettled together in the same area. Tribal leaders continue to exercise a key leadership role, and reed guesthouses (*Mudhif*) are common in the area, with new ones being constructed. These guesthouses remain at the centre of the Marsh Arab socio-cultural system, providing a structure for social organization and local governance and a forum for tribal politics.

In mid-June 2003, a UN inter-agency team carried out a rapid assessment mission to determine the immediate humanitarian needs of Marsh Arab communities and to identify medium and long-term priorities. Among the key findings was a consistent message that they did not want to be treated separately from surrounding communities as this risked creating artificial divides and inciting local conflicts, which could hinder their integration into wider Iraqi society. Consequently, assistance to the Marsh Arabs and marshland restoration efforts should be integrated within a wider regional development framework for the reconstruction of southern Iraq. Secondly, there are substantial inter-generational differences in perceptions on the desirability of marshland re-flooding. The 'older generation' (those over 40) are generally in favour of reverting to their traditional way of life, while the younger generation (those aged 17–30) prefer to be provided with modern services and engage in commercial activities. These are complex social issues which require a more comprehensive assessment.

### 3.4 Transboundary issues

There have been indications from Iran of its interest to explore a transboundary approach to the conservation of the Al-Hawizeh/Al-Azim marshes straddling the Iran-Iraq border. Iran has also initiated a proposal to declare the remaining marshlands a wetland of international importance under the Ramsar Convention on Wetlands. This remaining marsh supports outstanding biodiversity, including endangered species, and will be critical for future restoration efforts. The international community has a key role to play in helping to catalyse bilateral dialogue between Iran and Iraq, as well as providing technical guidance on transboundary wetland management.

Given the impacts of marshland drainage on the quality of the marine environment of the Persian Gulf and coastal fisheries, member countries of the Regional Organisation for the Protection of the Marine Environment (ROPME) have indicated their interest in exploring with Iraq opportunities for marshland restoration. At the same time, Iraq has expressed its desire to reactivate its membership of ROPME, which was suspended following the 1991 war. This could provide the basis for joint regional consultation as soon as circumstances allow. Such regional talks could also be a starting point for broader discussions on cooperation at a river basin scale, involving representatives from all Tigris-Euphrates riparian countries.

### 3.5 Stakeholder dialogue and coordination

The complex and multifaceted dimensions of the marshland problem, ranging from issues of humanitarian relief and economic development to cultural heritage and ecological rehabilitation, underline the necessity of initiating a transparent and credible multi-stakeholder consultation process for marshland rehabilitation. The importance and difficulty of gaining the trust and engagement of all parties, however, should not be underestimated. Ultimately, consensus has to be achieved on a cross-sectoral and multi-stakeholder coordinating structure and implementation mechanism that effectively harnesses the diverse strengths of all the parties involved. Both local and national stakeholders within Iraq, as well as external international organizations and donor agencies, will need to be involved. For issues pertaining to long-term programme sustainability and national sovereignty, it is essential that an official Iraqi entity plays the lead role in programme design, direction and oversight.

Table 1 gives a provisional list of the key parties involved, as well as those who have signalled an interest in supporting and/or working in the marshlands. A description of the interests, objectives and plans of these key actors would provide a practical basis to help guide and frame the development of a common strategy on marshland rehabilitation. With the prevailing administrative vacuum and lack of clear communication channels, there is a very real risk that the restoration effort could plunge into disarray as the different organizations launch unilateral and potentially competing projects. This possibility further highlights the urgency of designating an Iraqi focal point to coordinate local actions and to interface with international and other partners.

Pursuant to requests from various parties, UNEP hosted a special round table on the Mesopotamian Marshlands meeting in Geneva in May 2003, bringing together scientists, aid and development officials and representatives of non-governmental organizations and UN agencies to share information and ideas on the marshlands' problems and their possible solutions. The meeting's main message emphasized the importance of collaboration and a coordinated approach to increase the likelihood of a successful marshlands programme that would support Iraq's capacity building efforts. UNEP stands ready to continue the round table process to help promote dialogue and achieve consensus on a common marshlands strategy among interested governments and organizations.

As part of its overall post-conflict environmental study of Iraq and in partnership with the Iraqi authorities, UNEP plans to assess environmental conditions in the marshlands and examine the ecological feasibility of rehabilitation. The field assessment, however, is dependent on an improved security situation allowing unhindered access to sites. Other important steps to be taken include local capacity building in wetland science and enhancing management of existing wetland areas.

**Table 1. Provisional list of key parties in restoring Mesopotamian Marshlands**

<b>Iraqi institutions</b>	
1.	Ministry of Water Resources (Centre for Marshland Restoration)
2.	Ministry of Agriculture
3.	Ministry of Environment
4.	Ministry of Health
5.	Ministry of Oil
6.	Ministry of Education
7.	Ministry of Housing and Construction
8.	Marine Science Centre, University of Basrah
9.	Department of Fisheries and Marine Resources, University of Basrah
<b>International donors</b>	
1.	United States International Development Agency (USAID)
2.	Canadian International Development Agency (CIDA)
3.	United Kingdom Department for International Development (DFID)
4.	Government of Italy (Ministry of Foreign Affairs/Ministry of Environment and Territory)
5.	Government of Australia (Commonwealth Scientific and Industrial Resource Organisation, CISRO)
<b>International organizations</b>	
1.	United Nations Office for the Humanitarian Coordinator in Iraq (UNOHCI)
2.	United Nations Development Programme (UNDP)
3.	United Nations Environment Programme (UNEP)
4.	Food and Agriculture Organisation (FAO)
5.	United Nations High Commission for Refugees (UNHCR)
6.	World Health Organisation (WHO)
7.	United Nations Children's Fund (UNICEF)
8.	International Organisation for Migration (IOM)
9.	United Nations Educational, Scientific and Cultural Organisation (UNESCO)
10.	United Nations Human Settlements Programme (UN-HABITAT)
11.	World Food Programme (WFP)
<b>Regional organizations</b>	
1.	Regional Organisation for the Protection of the Marine Environment (ROPME)
2.	Arab Centre for the Study of Arid and Drylands (ACSAD)
3.	Federation of Arab Scientific Research Councils
<b>Non-governmental organizations</b>	
1.	Assisting Marsh Arabs and Refugees International Charitable Foundation (AMAR ICF)
2.	Iraq Foundation (Eden Again Project)
3.	IUCN-The World Conservation Union
4.	Ramsar Convention on Wetlands
5.	WWF (World Wide Fund For Nature) International
6.	BirdLife International
7.	Wetlands International
8.	Danish Hydraulic Institute
9.	Basrah Society for Ecological Protection
10.	Centre for Sustainable Development and Environment (Iran)



## 4. Institutional structures for environmental management

### 4.1 Overview

Before Iraq's environmental problems can be properly addressed, the country's institutions for environmental governance at national, governorate and local levels must first be rebuilt.

The US-led Coalition Provisional Authority (CPA) is vested with "all executive, legislative and judicial authority necessary to achieve its objectives" until an elected government is established. As an initial step towards transferring responsibility for managing national affairs to Iraqis, the CPA created an interim Governing Council. On 1 September 2003, the new Council announced its cabinet, which included the appointment of a Minister of Environment. In developing the institutional structure of the new ministry, a clear strategy and approach to protecting the environment in Iraq is needed.

### 4.2 Past institutional structure for environment protection

Under the previous regime, environmental management and protection were not priority issues. Nevertheless, compared to other countries in the Middle East, Iraq had a well-developed system of environmental governance and monitoring. A Human Environment Directorate was established under the Ministry of Health in 1972, following the United Nations Conference on the Human Environment. This was followed in 1986 by the enactment of an environment law establishing an Environment Protection Centre (EPC), under the Health Ministry. Subsequently, with the introduction in 1997 of the Environment Protection and Improvement Law, the EPC was transformed into the Environment Protection and Improvement Directorate (EPID). The new law, which was amended in September 2001, extended the mandate and responsibilities of the EPID to address broader environmental issues. It was designated as an independent body and formally disassociated from the Ministry of Health.

Within the new institutional framework, an Environment Protection and Improvement Council (EPIC) was established with the following principal duties:

- Establish the overall environmental policy framework;
- Review EPID's plan of work both at national and governorate levels;
- Approve environmental quality standards;
- Serve as an intra-governmental coordination body;
- Deliver decisions, including penal sanctions for environmental offences;
- Formulate Iraq's position in regional and international environmental deliberations and consider accession to international agreements.

EPIC consisted of different governmental and non-governmental representatives and experts. Its decisions needed to be endorsed by the Cabinet (Council of Ministers), which was the ultimate political and legislative decision-maker on environmental matters.

The new law also allowed for the establishment of Environmental Councils and EPID branches in the 15 governorates under the control of the central government in Baghdad. (This does not include the Kurdish region, autonomous since 1991. In the three northern provinces of the Kurdistan Regional Government, environmental matters were dealt with by the Ministry of Health and Social Affairs.) Although EPID continued to receive administrative support from the Ministry of Health at both central and governorate level, the Environment Protection and Improvement Law established its budgetary and technical independence. Nonetheless, EPID was associated with and reported to the Minister of Health (not the Ministry of Health).

Despite these legislative and structural amendments, in reality EPID continued to operate under the aegis of the Ministry of Health, of which it was widely regarded to be an integral part. In the administrative vacuum

created by the 2003 conflict, and with the absence of a functional Environment Council, EPID was initially re-integrated (administratively and for budgetary purposes) under the Ministry of Health.

### 4.3 Environmental Protection and Improvement Directorate

The Environmental Protection Improvement Directorate (EPID) has an overall advisory, research, monitoring and reporting responsibility according to its mandate based on the 1997 and 2001 Laws. It does not have a mandate to implement environmental protection and rehabilitation projects and activities directly. It presents its findings to the Environment Protection and Improvement Council, which deliberates and decides on the course of action to be taken and directs sector ministries and the private sector to implement necessary measures. Its principal duties are to:

- develop the annual, medium and long-term plan for the Directorate;
- develop environmental guidelines and standards;
- identify environmental problems and threats and propose remedial solutions;
- carry out environmental impact assessments and monitor development projects;
- undertake laboratory analysis of environmental samples;
- monitor the state of the environment, including preparation of an annual state of the environment report;
- identify and carry out environmental research studies;
- carry out environmental awareness and outreach activities;
- follow up and propose to the Environment Council Iraq's participation in multilateral environmental agreements;
- designate protected areas in collaboration with relevant authorities;
- develop an environmental information system.

EPID is a sizable national institution with its own budget and is relatively well endowed in terms of human resources. With 656 employees allocated more or less equally between Baghdad and the 15 governorates, EPID is in terms of staffing equivalent to some existing ministries. Most of EPID's staff are technical experts, primarily engineers and medical doctors, a substantial proportion of whom are young professionals, many of them women. EPID is headed by a Director General and its organizational structure, including an administration and finance department, consists of three centres, five technical departments and one specialist section, as follows:

- Environmental Resources Protection Centre (EPRC)
- Protection from Radiation Centre (PRC)
- National Centre for Occupational Health and Safety (NCOHS)
- Department of Planning and Studies (DPS)
- Department of Environmental Monitoring and Inspection (DEMI)
- Department of Environmental Laboratories (DEL)
- Department of Environmental Relations and Awareness (DERA)
- Department of Council Affairs (DCA)
- Chemical Safety Section (CSS).

### 4.4 Ministry of Environment

On 1 September 2003, the Iraqi Governing Council announced its cabinet, which included the appointment of a Minister of Environment, Mr Abdul-Rahman Sidiq Kareem. A proposed institutional structure for the new Environment Ministry has since been developed and submitted for approval by the Governing Council.

Under the proposal, the existing Environment Protection and Improvement Directorate will form the core of the new ministry. With the exception of the National Centre for Occupational Health and Safety, which is to be reassigned to the Ministry of Labour and Social Affairs, all EPID departments and centres are to be



included. The minister will have two under-secretaries, responsible for the following technical and administrative portfolios respectively:

**Table 2. New Iraqi Ministry of Environment**

Technical Units	Administrative Units
<ul style="list-style-type: none"> <li>• Radiation</li> <li>• Solid and hazardous waste</li> <li>• Chemicals</li> <li>• Water</li> <li>• Air pollution</li> <li>• Environmental remediation</li> <li>• Compliance and enforcement</li> <li>• Biodiversity</li> <li>• Environmental laboratories</li> </ul>	<ul style="list-style-type: none"> <li>• Media</li> <li>• Security</li> <li>• Facilities</li> <li>• Personnel and finance</li> <li>• Information technology</li> <li>• Legal</li> <li>• International cooperation</li> <li>• Central and regional programmes</li> <li>• Research and development</li> </ul>

Recruitment of an additional 250 staff is planned in 2004, which will bring the total workforce to around 1 000. Although the role of the Environment Ministry is chiefly oriented towards policy development, environmental monitoring and cross-sectoral coordination, it also has an enforcement and implementation role. At the same time, other ministries have retained their individual environmental units, as was the case in the previous institutional set-up (see below under 4.5).

In mid-August 2003, EPID staff relocated in Baghdad from the Ministry of Health to the Department of Environmental Laboratories building. Its operations, however, have been seriously curtailed by the limited office space available. As a result, the new ministry's immediate concern is to identify or construct a new building. Moreover, the Directorate's capacity has been seriously degraded. Most laboratories in Baghdad were looted after the 2003 conflict. The remaining equipment throughout the country is old, and reagents are in short supply. There is an urgent need to rebuild Iraq's environmental monitoring capacity by reconstructing and re-equipping laboratories.

The Ministry of Finance recently opened a new account (both US dollar and Iraqi dinar) for the Environment Ministry, to which the EPID assets held under the Ministry of Health are to be transferred. In order for the new ministry to be an effective player in the reconstruction of Iraq, and to integrate environmental concerns into the development process, the technical and monitoring capacities of the ministry need to be strengthened. This means providing it with training, guidelines, equipment (portable and laboratory), hardware (building, computers, vehicles) and operating budgets. In this regard, the United Nations Development Group (UNDG) needs assessment process estimated the 2004 budgetary requirements of the new ministry at US\$38.5 million (excluding project costs).

#### 4.5 Other national institutions with environmental authority

A number of other government ministries and bodies also have environmental responsibilities. Under the 1997 law, environmental units were established in most sector ministries including:

- Health
- Irrigation
- Agriculture
- Industry and Minerals
- Oil
- Foreign Affairs
- Education
- Higher Education and Scientific Research
- Planning.

All these ministries were represented at Director General level in the monthly meetings of the former Environment Council. Under the new institutional structure, the many environmental units within the sector ministries will be maintained and will operate in close cooperation and coordination with the new Ministry of Environment.

## 5. Joint needs assessment for the reconstruction of Iraq

### 5.1 Overview

Following the launch of the revised Humanitarian Appeal for Iraq on 23 June 2003, which covered the country's emergency requirements until the end of the year, the focus of United Nations efforts shifted towards promoting an effective transition towards recovery and reconstruction. On 24 June 2003, the United Nations Development Group (UNDG), in cooperation with the World Bank Group, hosted a 'Technical Meeting on the Reconstruction of Iraq'. This was convened as a step towards implementation of the relevant provisions of Security Council Resolution 1483 (May 2003) concerning the role of the UN in assisting the people of Iraq and facilitating post-conflict reconstruction processes.

Based on discussions between the UN, the World Bank and the International Monetary Fund (IMF), deliberations during the Technical Meeting, and subsequent consultations with the CPA, 14 priority sectors were identified for the needs assessments. In addition, human rights, gender, environment and institutional capacity were identified as cross-cutting themes. UNEP was identified as the focal point for environment.

### 5.2 The joint Iraq needs assessment process

The 14 needs assessments were carried out by a team of UN/World Bank/IMF experts, often with the support of Iraqi and international consultants. The activities were conducted under the overall coordination of the Special Representative of the UN Secretary General for Iraq, in accordance with the provisions of paragraph 8 of Security Council Resolution 1483. The deadline for the completion of the first draft of each sectoral report was 31 August 2003.

A planned series of stakeholder workshops in Baghdad could not take place owing to the prevailing security situation, and primary data gathering was modest, many teams depending upon data available from their country teams and other, secondary sources. Despite this, all sectors managed to engage with various stakeholders (primarily the ministries) to ascertain their immediate concerns and resource needs. Needs assessment reports were developed for each of the 14 sectors, identifying the key needs and budgetary requirements for 2004.

At the beginning of September 2003, the needs assessments were reviewed by cross-sectoral teams to ensure that the cross-cutting themes of environment, gender, human rights and institutional capacity had been given adequate attention, including appropriate budgetary allocations. A UNDG drafting team, appointed to receive and incorporate the comments from the cross-sectoral review into the sectoral reports, consolidated the papers into a single draft synthesis report. This report was then discussed with Iraqi stakeholders, the World Bank and the CPA prior to its finalization. The final needs assessment document will be presented to a Donors Conference at 23–24 October 2003 in Madrid. The conference will seek funding from the donor community to address priority reconstruction and rehabilitation needs that are both urgent and medium-term, with a focus on sustainable development.

The assessment estimates that overall reconstruction needs for the period 2004–2007 in the 14 priority sectors is in the order of US\$36 billion. In addition, the CPA has estimated separately that some US\$20 billion is needed in critical sectors not covered by the World Bank/UN assessment, including security and oil.

### 5.3 UNEP synthesis of environmental needs and priorities

In the UNDG Needs Assessment process, UNEP identified five primary sectors as the priority areas for 2004 from an environmental point of view. These are:

- Health (primarily in relation to environment/health interactions, but also because the Environmental Protection and Improvement Department (EPID) lay administratively within the Ministry of Health)

- Agriculture, water resources and food security
- Water supply and sanitation
- Investment climate and state-owned enterprises
- Governance and the rule of law

UNEP also identified six secondary sectors where relevant inputs could be provided:

- Electricity
- Livelihoods and employment generation
- Housing
- Mine action
- Education
- Transport and telecommunications

For each of the above primary and secondary sectors, key environmental needs were identified and, wherever possible, detailed cost estimates for specific remedial/improvement actions were included. UNEP also reviewed all other sectoral papers and provided suggestions for incorporating environmental needs.

### Environmental priorities for 2004

In the UNDG Process, UNEP identified the following environmental priorities for the budget year 2004:

- **Strengthen environmental governance at national, governorate and local levels:** A new Ministry of Environment has been established, for which the existing Environmental Protection and Improvement Directorate (EPID) will form the core. Environmental units also exist in at least three other ministries (agriculture, industry, oil). During UNEP's interaction with the Iraqi environmental administration at the national and governorate level, it became clear that there exists a relatively sophisticated administrative structure and staffing to monitor and manage environmental issues. The challenge facing the Iraqi administration and the international community is to enhance the capacity and skills of the environmental administration by providing training on environmental best practices, necessary equipment, and operating budgets and guidelines to initiate environmental monitoring and clean-up, and to enable proactive environmental assessments and management.
- **Assess environmental threats to human health:** After two decades of conflict and inadequate environmental management, Iraq currently has a number of environmental hotspots that potentially pose grave risks to human and environmental health. These hotspots include areas chronically contaminated by pollution and toxic materials, areas targeted during the conflict, areas where looting and burning of industrial facilities has released hazardous materials, areas contaminated by illegal dumping of hazardous wastes and sewage, and areas impacted by depleted uranium and other munitions. An immediate assessment is needed to identify the location of hotspots and to provide recommendations for risk reduction and remediation.
- **Clean up environmental hotspots:** Several sites have been identified (and will continue to be identified) that pose such extreme health and environmental risks as to require emergency clean-up measures. An emergency clean-up fund should therefore be created in 2004 to provide for immediate risk reduction measures, including access restrictions, signs, monitoring, packaging of wastes, and clean-up. The fund would also be an important means of facilitating privatization of state-owned enterprises that have serious environmental problems.
- **Assess environmental threats to human livelihoods:** Iraq's natural resource base has been severely degraded through overexploitation and mismanagement during recent decades. As a result, serious degradation of waters, forests, soils, and biodiversity resources is threatening human livelihoods and ecosystem services. An immediate assessment is needed to identify existing levels of natural resource degradation and to provide recommendations for rehabilitation, recovery and sustainable use. There is a particularly urgent need to develop an integrated strategy for the environmental, economic and social recovery of the Mesopotamian Marshlands.



- **Carry out an interim environmental impact assessment:** In order to fully integrate environmental considerations into the reconstruction and development process, a strategic environmental assessment of the national development plan should be carried out. In addition, all proposed projects should be subject to environmental impact assessments (EIA), while all existing industrial locations, municipal facilities and waste disposal areas should undergo an EIA/environmental due diligence review. The EIA process should result in the issuing of an environmental permit for all activities, with follow-up monitoring conducted to ensure compliance.
- **Build environmental awareness:** Environmental awareness building is integral to ensuring sustainable improvements in environmental quality and in preventing immediate danger to human populations from possible exposure to hazardous materials and toxic contamination of air, soil and water. During 2004, awareness raising should be conducted through the use of television and radio campaigns/programmes, along with efforts to integrate environmental issues into educational curricula at national and local levels.
- **Promote national civil society organizations and engaging the international community:** Over the past 20 years, there has been limited activity by environmental civil society organizations, and participation in regional and international environmental fora and agreements has been sparse. During 2004, ground-work needs to be done to strengthen Iraqi civil society organizations working in the area of environment. Regional and international cooperation on environmental matters must also be revitalized, including the ratification and implementation of multilateral environmental agreements.

### Environmental priorities for 2005–2008

In the UNDG Process, UNEP identified the following environmental priorities for the budget years 2005-2008:

- **Establish modern environmental infrastructures:** Effective implementation of environmental regulations calls for the establishment of modern environmental infrastructures, such as national/regional hazardous waste management facilities, waste oil recycling plants and combined effluent treatment facilities for industrial complexes, in addition to facilitating cleaner production technologies, upgrading individual treatment units, and promoting recycling.
- **Promulgate environmental laws and procedures:** While the short-term objective of environmental laws will be to support reconstruction efforts, eliminate environmental threats to human health and avoid overexploitation of natural resources, the long-term objective of environmental management will be to promote sustainable development. This will require modern environmental laws which integrate social, environmental and economic aspects in the decision-making process, provide public access to environmental information, and make use of economic instruments. The country should embark on a strategy for the introduction of ISO 14001, life cycle analyses, environmental taxes, and differential fuel pricing, etc.
- **Develop environmental information systems:** Iraq lags behind its neighbours in terms of environmental information systems development and application of remote-sensing for integrated environmental management. Establishing a national databank of environmental information and creating in-country expertise for remote-sensing in environmental analyses are areas that need to be addressed in the medium term.
- **Access international environmental funding opportunities:** A number of international funding mechanisms have evolved in the past decade to support environmental projects. These include the Global Environmental Facility (GEF), and opportunities for carbon emissions trading and the Clean Development Mechanism under the Framework Convention on Climate Change/Kyoto Protocol. Efforts must be initiated, through these and other funding mechanisms, to generate the financial resources needed to aid Iraq's environmental recovery. These mechanisms will also be important sources of funding for Iraqi non-governmental organizations.

## 6. UNEP's activities in Iraq

### 6.1 Chronology of UNEP's Activities

UNEP's involvement in Iraq has included the following activities since 1991:

- **UNEP Post-Conflict Assessments:** Following the 1991 Gulf War, UNEP conducted a rapid technical assessment of the impacts of the conflict on the terrestrial environment in Iraq, Kuwait and Saudi Arabia. The three reports can be downloaded from the following link:  
<http://postconflict.unep.ch/iraqreading.htm>
- **UNEP Study on the Demise of the Mesopotamian Marshlands:** In 2001, UNEP used state-of-the-art satellite imagery to investigate and document the degradation of the Mesopotamian Marshlands during the period 1973 to 2000. UNEP has been monitoring the situation on an annual basis and providing regular updates. The report as well as updated information can be downloaded from the following link:  
<http://www.grid.unep.ch/activities/sustainable/tigris/marshlands/report.php>
- **UNEP Global Environment Outlook (GEO):** The GEO-project was initiated in response to the environmental reporting requirements of Agenda 21 and to a UNEP Governing Council decision of May 1995 which requested the production of a comprehensive global state of the environment report. So far, three reports have been published (GEO-1, GEO-2000 and GEO-3), which addresses the environmental problems in Iraq and its region as well. The GEO-reports can be downloaded from the following link:  
<http://www.unep.org/GEO/>
- **UNEP Desk Study on the Environment in Iraq:** In April 2003 UNEP published the Desk Study on the Environment in Iraq. The report outlined the environmental vulnerabilities in Iraq resulting from years of conflict, the low priority attached to environment by the previous regime, and the unintended effects of the sanctions in the 1990s. The UNEP Desk Study can be downloaded from the following link:  
[http://postconflict.unep.ch/publications/iraq\\_DS.pdf](http://postconflict.unep.ch/publications/iraq_DS.pdf)
- **Environmental Roundtable Meetings:** UNEP has held five environmental roundtable meetings in Geneva on 28 March, 29 April, 23 May, 29 August and 20 October 2003. The purpose of the meetings was to bring key environmental stakeholders together to share information on environmental issues in Iraq and to identify priorities.
- **Special roundtable on the Mesopotamian Marshlands:** UNEP hosted a roundtable on 23 May 2003 for scientists, aid and development officials and representatives of non-governmental organizations to share ideas and information on the Marshland's problems and their possible solutions.
- **OCHA Flash Appeal for Iraq:** UNEP's post-conflict assessment activities were included in the original United Nations OCHA Flash Appeal for Iraq, published on 28 March 2003, and also in the revised version published in New York on 23 June 2003. The budget line for UNEP in the Appeal for year 2003 is US\$ 850,000. The OCHA Flash Appeal can be downloaded from the following link:  
<http://www.reliefweb.int/appeals/2003/files/iraq03flash.pdf>
- **UNEP's participation in the first Iraq Technical Reconstruction Meeting:** UNEP participated in the UNDG convened informal Technical Reconstruction Meeting on Iraq at UN headquarters in New York on 24 June 2003 with CPA representatives, multilateral agencies and interested governments.
- **United Nations Development Group (UNDG) Needs Assessment:** UNEP was identified as the lead agency for the cross-cutting issue of environment in the UNDG Needs Assessment. Within this context, UNEP worked to ensure environmental considerations and costs were incorporated into each of the 14 needs assessment sectors. To exercise this responsibility, UNEP nominated a team of experts to review sector reports and provide inputs on environmental issues and priorities. The Needs Assessment will be made public at the Donors Conference on Reconstruction in Iraq in Madrid on 23 and 24 October 2003.

- **Fact-Finding Field Missions:** UNEP sent two fact-finding missions to Iraq. The first mission, held from 8-28 July, visited Baghdad, while the second mission, held from 8-27 August, visited both Baghdad and Basra. The field missions established institutional contacts with the Iraqi environmental administration, the private sector, UN agencies, NGO's, scientific institutions and the CPA. The missions also collected information to support the UNDG needs assessment process, assessed current institutional structures for environmental management, identified key environmental needs for 2004, and recruited national experts for future technical missions.
- **UNEP's participation in the Donors Conference on Reconstruction in Iraq:** UNEP will participate in the Conference on 23 and 24 October 2003 in Madrid, which will launch the multilateral effort to support the rehabilitation and reconstruction of Iraq and seek indicative pledges from donors for the period until the end of 2004.

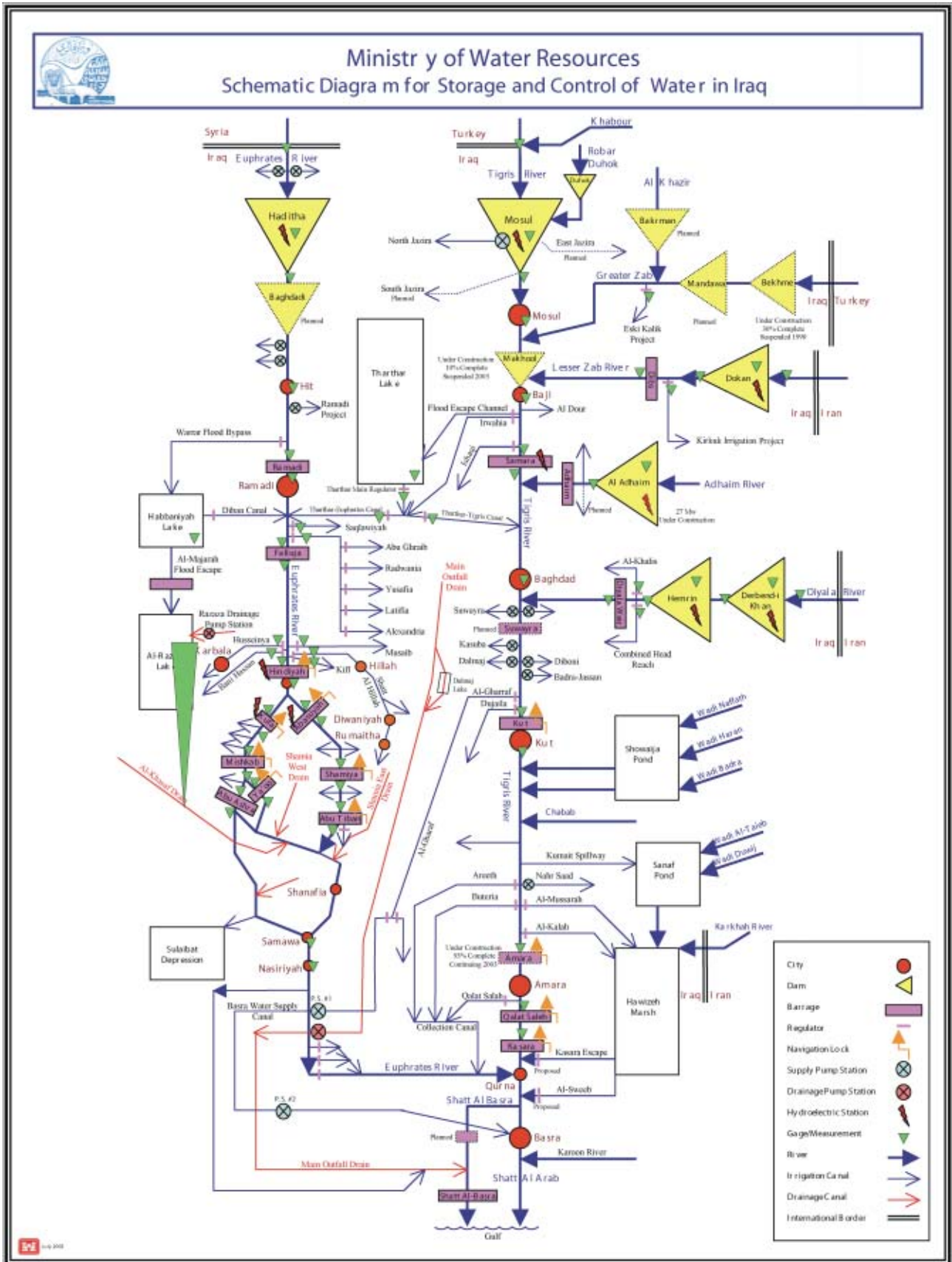
## 6.2 Next Steps identified in the UNEP Desk Study

The UNEP Desk Study on the Environment in Iraq of April 2003 highlighted the environmental risks and vulnerabilities confronting Iraq. In this Study, UNEP identified steps for action in the immediate post-conflict period. The next steps are divided in two categories: step 1 and 2 address environmental concerns that pose risks for human health and further environmental degradation, step 3, 4 and 5 set the longer-term measures needed to strengthen environmental management, to build effective environmental institutions and ultimately to restore the country's life support system.

- Step 1.** Assess the situation on the ground and identify technical priorities for mobilizing environmental assistance
- Step 2.** Relieve environmental threats to human health and wellbeing
- Step 3.** Integrate environmental protection into wider post-conflict reconstruction process
- Step 4.** Create the knowledge base for addressing the chronic environmental problems confronting Iraq
- Step 5.** Action to build strong national institutions and capacities for long-term sustainable management of the environment



# ANNEX 1: SCHEMATIC DIAGRAM FOR STORAGE AND CONTROL OF WATER IN IRAQ



SOURCE: [HTTP://WWW.CPA-IRAQ.ORG/MINISTRIES/WATER\\_RESOURCES.HTML](http://www.cpa-iraq.org/ministries/water_resources.html)

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### ***Further information***

*Further technical information may be obtained from the UNEP Post-Conflict Assessment Unit website at:*  
**<http://postconflict.unep.ch>**

