

IRAQ WATCHING BRIEFS

WATER and ENVIRONMENTAL SANITATION

July 2003

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EXECUTIVE SUMMARY

Over the past two decades the water and sanitation sector in Iraq experienced a steady but devastating decline. Aging infrastructure, poorly maintained equipment; corroded, damaged and badly leaking water distribution networks and sewer systems; acute understaffing; low technical capacity and morale are some of the key combined causes to problems in the sector. For example, access to safe water supply in Baghdad had theoretically fallen by only 3 % from 95 to 92 % between 1991 and late 2002, or from 330 to 218 litres per person per day¹. However, in reality there were great disparities, the majority of people never got such large amounts of water, especially those at the end of leaking and damaged water distributions networks. In many places water flowed for only a few hours each day, and when it did the pressure was low and it was contaminated by raw sewage and other pathogens seeping into the leaking system. Additionally, water quantities were limited and many families received as little as 50 litres per person per day, with long queuing times for collection. In essence, the level of water supply services in Iraq had seriously diminished over the last two decades.

Theoretically sanitation coverage remained constant at 75% in urban areas, but again, the level of services sharply fell as sewage treatment plants and septic systems failed. A survey in 2000 indicated that 99.1 % and 77.8 % of the urban and rural populations respectively used a 'sanitary means of excreta disposal'². This perception of 'sanitary' at household level may have been directly related to the presence of in-house toilet facilities. In reality however, the vast majority of septic systems and sewerage treatment plants did not function properly resulting in overflows of raw effluent into the immediate or distant environments. Therefore, the term 'sanitary' should encompass a wider perspective, not just the immediate household environment. Furthermore, the alarming rise in vermin due to the inability to collect all solid-waste in urban areas poses serious health risks, for example about 1.7 million tonnes³ of solid-waste is currently awaiting to be removed from Baghdad streets alone.

Diseases associated with poor sanitation, unsafe water and unhygienic practices had also increased to alarming rates, contributing to a fast growing problem of malnutrition, morbidity and mortality of infants and under-five year old children. Poor sanitation and insufficient access to safe water, particularly at family level (for drinking, cooking, family and home hygiene) is a key underlying cause of diseases and malnutrition in Iraq. Globally, it is estimated that water and sanitation related diseases are responsible for about 19 %⁴ of all children's deaths, but in Iraq it may be as high as 25 %⁵. Diarrhoea and subsequent dehydration along with acute respiratory infections account for 70 % of child mortality in Iraq. In May 2000, a study highlighted that half of all children under five years of age suffered from diarrhoea within two weeks of the study, compared to 13.5 % in 1989⁶ and on average, every child suffers 14.4 bouts of diarrhoea per year. The dramatic rise in mortality rates of under five-year old children between 1984 and 1999 is an indication of how poor sanitation, unsafe water, unhygienic practices and unsanitary living conditions negatively impact their survival and development. Under-five mortality rates per 1,000 live births rose from 56 between 1984 and 1989, to 92 between 1989 and 1994 and as high as 131 during the 1994 to 1999 period. Additionally, infant mortality rates per 1,000 live births also increased from 47 between 1984 and 1989 to 79 between 1989 and 1994, and as high as 108 in the 1994 to 1999 period⁷. Similar negative trends were experienced in nutrition of children over the 1991 to 1996 period, but slight improvements did occur in the

following three years. Acute malnutrition rose from 3 % in 1991 to 11 % in 1996 and dropped to 7.8 % in 2000. Underweight prevalence rose from 9.2 % in 1991 to 23.4 % in 1996 and dropped to 19.6 % in 2000, and chronic malnutrition rose from 18.7 % in 1991 to 32.0 % in 1996 and dropped slightly to 30 % in 2000^{8, 9}.

Unsafe water, unsanitary conditions and unhygienic behaviours resulting in diseases, especially diarrhoea, have serious impacts on pregnant women by impeding their ability to optimally absorb protein and energy from food. This in turn contributes to malnutrition during pregnancy and resulting low birth-weight babies. For example, the percentage of children born weighing less than 2.5 kilograms was 4.5 % in 1996¹⁰ and unofficial reports by the Ministry of Health indicated that this figure may have risen to as high as 25 %¹¹ between 1994 and 1999. Likewise, unsafe water and unhygienic practices regarding the preparation of baby food and feeding put infants at high risk of diarrhoea, dehydration and death, especially recognising that only 13 % of all infants were exclusively breast-fed during the first 4 months of life in central and southern Iraq in 1997, compared to about 90 % in the 1980s¹². This is currently a growing challenge, following the increased use of bottle-feeding since 1997, when the Government of Iraq included infant formula on the Oil-for-Food Programme (OFFP) rations, against the advice of UNICEF and other international organisations¹³.

Coupled to all this is an acute lack of awareness at all levels, of the relationships between disease and poor sanitation, unsafe water and unhygienic practices, including the necessary life skills to prevent and protect against such diseases. This lack is particularly absent among illiterate mothers and child caregivers. For example, prior to the 1991 Gulf War the under five-year-old mortality rate was 2.5 times higher for illiterate mothers compared to literate mothers and this rose to 3.5 times¹⁴ during and after the 1991 Gulf war. Other diseases related to poor sanitation, unsafe water and unhygienic practices also rose¹⁵. For example, typhoid fever cases rose eight-fold between 1990 and 1996 to 15,238 and to 19,825 in 1998; Giardiasis also rose six-fold between 1990 and 1996 to 584,621 and dropped slightly to 509,621 in 1998. Likewise, malaria cases rose¹⁶ from 870 in 1995 to 16,296 in 1996 in the 3 northern Governorates alone.

The key causes to these problems are as follows:

- Over 50 % of water loss in water distribution networks due to old age and corrosion of pipes, illegal tapping of water and collateral damage from the recent war and looting. These leaks cause contaminants such as raw sewage to seep into the water supply, thus posing serious health risks. A recent rapid assessment of 177 water treatment plants in 14 central and southern Governorates revealed that only 19 % were good (functioning properly), 26 % were poor (not working well) and 55 % were unacceptable (in very poor working condition)
- Over 70 % of all sewage is not treated, resulting in over one million cubic metres of raw sewage being discharged into rivers each day. In addition to old age and corrosion of sewer pipes, numerous leaks, broken-down pumping stations and malfunctioning of various treatment mechanisms have resulted in clogging of sewers and back-flows of sewerage into streets, homes, hospitals and schools

- Power failure and shortages affect over 50 % of all water and sewage treatment plants by reducing their capacity by over 40 %, and power fluctuations and surges further damaged sensitive control mechanisms
- Unhygienic practices for early childhood care and feeding, unsanitary living environment and a poor understanding of the links between poor sanitation, and use of unsafe water and that of diseases, exacerbate the disease burden
- Insufficient focus on strategies that promote good sanitation, hygienic behaviours, management and conservation of water, especially at the family level
- Over 50 % of solid waste is not collected in most urban areas due to a lack of transportation, equipment and staff. Solid waste that is collected often contains dangerous medical and industrial waste and unexploded ordinance and much of this is dumped in unregulated, unsanitary sites close to cities and towns, thus posing a serious health and safety risk. For example, in 1987 over 18 tonnes of medical waste was deposited daily in local landfills in Baghdad alone, not including residue remaining from burning highly dangerous medical waste in hospital incinerators. Today, most hospital incinerators do not function due to over 12 years of poor maintenance and lack of spare parts and that most medical waste is being dumped in poorly managed and controlled landfills
- Almost 60 % of staff shortages at all levels in the sector, but capacity is particularly acute in operations and maintenance and management
- Inadequate budgets, salaries and poor working conditions leading to low staff morale and low productivity
- Insufficient attention given to collaboration and coordination with health and nutrition sector to combat disease and malnutrition
- Technology mismatches to the socio-cultural, economic, technical and environmental situation
- Inappropriate policies and non-conducive and vertical institutional arrangements
- Lack of a holistic integrated water resources management plan impedes efforts for wider inter sectoral and stakeholder collaboration addressing both immediate and longer-term challenges in the sector

The following points could be considered to address the above problems

1. **Undertake a comprehensive needs assessment** for the whole sector, including water for: basic needs, cities, food security, industry and energy and for maintaining ecosystems integrity.
2. **Immediately restore the water, sewage and solid waste services** to at least minimum acceptable standards. Including ensuring that each family receives

enough water, of safe quality, for domestic and family hygiene and cooking and drinking. Ensure that at least 75 % of urban and 40 % of rural populations have easy access to safe and sanitary means of excreta disposal and target areas of great disparities for urgent short-term interventions. Ensure that all solid waste is collected and properly managed in sanitary landfills.

3. **Repair the water distribution networks** to reduce huge water losses of over 50 % and ensure that safe water (free of pathogens) actually reaches family level. There is a need to give priority to this work over that of increasing water production. This may also require a full inspection and mapping of the network, including checking for illegal connections. Ensure that families get information on how to store and use water safely to avoid its contamination after collection.
4. **Integrate water, sanitation and health interventions** with strategies used in health, nutrition and childcare. These interventions should be dovetailed with ongoing programmes in Primary Health Care Centres, Community Child Care Units and Nutrition Rehabilitation Centres. More needs to be done to assess people's knowledge, attitudes and practices regarding hygiene, sanitation, water conservation and protection and to create awareness about diseases associated with unsafe water, unhygienic practices, and poor sanitation and environments. Greater emphasis needs to be given to early childhood caretaker practices, especially for illiterate mothers around hygiene (handling and disposal of faeces, hand-washing habits), feeding (food preparation and storage, hand and utensil hygiene) and living environment. These interventions will have a more significant impact on reducing the horrific toll of malnutrition and infant morbidity and mortality than just focusing on delivering large quantities of, often, unsafe water. Schools should also be targeted for integrated water, sanitation and health interventions, especially in education and training of life-skills for sanitation and hygiene improvement and for water conservation and protection. School children should be encouraged and facilitated to act as 'agents of change' to promote hygiene improvement and water conservation and protection in their families and communities.
5. **A paradigm shift in sanitation is urgently needed** to find appropriate solutions to sanitation that protects the environment and are cost-effective, locally sustainable and possibly income-generating. Technologies and processes such as using duckweed to treat sewage and trap valuable nutrients for food production, as well as ecological sanitation that protects both human health and the environment and contributes to income generation at the family level needs to be seriously considered. Baghdad, with an estimated population of over 5 million in 2003, poses the biggest challenge for sewage treatment in the country and therefore calls for innovative approaches using more appropriate and environmentally friendly technologies. It also calls for innovative management structures. Such approaches would help reduce the chronic environmental pollution problem caused by broken down sewerage and septic systems and could contribute to income generation through horticulture, forestry, food production and improvements in nutrition.
6. **Begin the process to develop an integrated water resources management plan** required to facilitate sustainable development in the sector. For this plan to be

meaningful and effective, all stakeholders need to buy into it and careful attention needs to be given to its planning and execution processes. This necessitates several steps in a comprehensive process. The first and most important step is to bring all key stakeholders together in a consultative forum to identify key problems and opportunities and a general framework to move forward. It also calls for a consensus on the rational use of water resources, beneficial development-oriented policies, legislation, regulatory framework and institutional arrangements. Additionally, it requires a set of guiding principles that fosters participation of all those with a vested interest in the sector, including women and guidance on technology choice to ensure that they match the local environment, technical, managerial capability, socio-economic and cultural conditions in Iraq.

7. **Build critical capacities**, particularly for operation and maintenance of water and sanitation facilities, water quality surveillance and control, particularly at the delivery end, to ensure that safe water actually reaches household level, and for hygiene and sanitation improvement at family level (especially for illiterate mothers) through primary health care, childcare and nutrition outreach services.
8. **Innovative management of solid waste is needed**, such as at source (or local) separation of organic matter and recyclables from actual waste. This will reduce the volume of current solid waste by more than half. It will also reduce transportation needs and management pressures and ultimately result in smaller sanitary landfills. Recycling can help protect the environment, generate employment, and reuse valuable nutrients from food waste and sewage for safe utilization in horticulture, aquaculture, forestry and food production. More needs to be done to ensure safe management of medical and industrial waste, as these pose a serious health hazard to those who work with waste and to children who play in unprotected landfills.
9. **Improve sector surveillance and monitoring indicators** for more effective results and impact oriented management, coverage (to ensure equity) as well as measuring attitudinal and behavioural change. To date, monitoring in Iraq had focused far too much on technical aspects such as water production, pumping efficiency, water loss and water quality, primarily at the production stage. More needs to be done to monitor disparities in water availability at the community and family levels, water quality and use in the home, as well as sanitation and hygiene practices. This will help design better and more focused interventions that address high diarrhoea, malnutrition, morbidity and mortality rates associated with poor water quality, unsanitary conditions and unhygienic practices. As well, more use can be made of monitoring for strategic planning and management of the sector at all levels.

Table of Contents

EXECUTIVE SUMMARY	I
1. INTRODUCTION	1
2. PRE ‘2003 WAR’ OVERVIEW OF WATER AND SANITATION SECTOR.....	2
2.1. HISTORIC SYNOPSIS OF WATER AND SANITATION SECTOR 1980S– MARCH 2003	2
2.2. HIGHLIGHTS OF POPULATION, GEOGRAPHY AND WATER RESOURCES	7
3. SECTOR OVERVIEW	7
3.1. SECTOR DEVELOPMENT IN THE 1980S	7
3.2. LEGISLATIVE AND POLICY FRAMEWORK	8
3.3. SECTOR FUNDING AND TARIFFS	8
3.4. IMPACT OF 1991 GULF WAR AND INTERNATIONAL SANCTIONS (1991 – 1995).....	8
3.5. POLICY INFLUENCE AND TECHNOLOGY CHOICE	9
3.6. PERSONNEL CAPACITY AND SUSTAINABILITY	10
3.7. DOMESTIC WATER PRODUCTION	11
3.8. URBAN AND RURAL SANITATION	11
3.9. SOLID WASTE MANAGEMENT.....	12
3.10. DISEASES RELATED TO POOR SANITATION, UNSAFE WATER AND UNHYGIENIC PRACTICES	12
3.11. INTEGRATED WATER RESOURCES USE AND MANAGEMENT	14
3.12. WATER QUALITY	15
4. THE OIL-FOR-FOOD PROGRAMME (OFFP 1995 – MARCH 2003).....	17
4.1. UNITED NATIONS SECURITY COUNCIL RESOLUTION 986	17
4.2. OIL-FOR-FOOD PROGRAMME BUDGET ALLOCATIONS	18
4.3. INSTITUTIONAL ARRANGEMENTS FOR OFFP.....	19
4.4. IMPACTS OF THE OIL FOR FOOD PROGRAMME.....	19
4.5. PROCEDURAL AND ADMINISTRATIVE CONSTRAINTS OF THE OFFP	20
4.6. REGIONAL DIFFERENCES IN WATER AND SANITATION OUTCOMES	21
4.7. HARDWARE AND INFRASTRUCTURE BIAS	22
4.8. INTER-SECTOR COORDINATION.....	23
4.9. INSUFFICIENT ATTENTION TO HEALTH AND HYGIENE PROMOTION	23
4.10. WATER PRODUCTION BIAS	23
4.11. LOST OPPORTUNITIES IN SANITATION AND SOLID WASTE MANAGEMENT	24
4.12. WEAK USER PARTICIPATION AND ATTENTION TO GENDER ISSUES	24
4.13. NEEDS TO REDUCE SUB-NATIONAL DISPARITIES.....	25
4.14. NEED TO ADAPT TECHNOLOGIES TO LOCAL CONDITIONS AND NEEDS	25
5. KEY LESSONS LEARNT FOR FUTURE PLANNING	26
6. POST-WAR ASSESSMENT AND FINDINGS.....	28
7. RECOMMENDED AREAS OF ACTION.....	30
8. AREAS REQUIRING MORE DETAILED ASSESSMENT.....	32
9. ANNEXES	34
9.1. ACRONYMS	34
9.2. CONTACT LIST: WATSAN CO-ORDINATION MEMBERS BAGHDAD	37
9.3. BIBLIOGRAPHY OF KEY REPORTS AND DOCUMENTS	39
9.4. REFERENCE TABLES AND CHARTS.....	41
9.5. INSTITUTIONAL FRAMEWORK FOR WATER AND SANITATION SECTOR.....	45
10. REFERENCES	64

1. Introduction

This external desk-review of the water and sanitation sector in Iraq is intended to provide technical background for the upcoming sector assessment mission being organized by the World Bank and the United Nations. This external desk-review is not complete, nor is it intended to serve as a comprehensive reference for the whole multifaceted sector and therefore needs to be complimented by other reports and documents, as well as information from people familiar with the numerous sub sectors in Iraq. The author unfortunately, could not visit Iraq due to travel restrictions and therefore had to rely on a variety of methods to gather information and assess the situation. Methodologies included reviewing of several periodic sector reports from the 1950s through 2003, including recent rapid assessments in Iraq since the March 2003-War. It also included interviewing key external informants who had work experience in Iraq during the Oil-for-Food programme (OFFP) and visitors to Iraq since the war.

The review is divided into eight sections as follows:

Section 1: Introduction

Section 2: A historic synopsis of the water and sanitation sector from the 1980s through March 2003

Section 3: A sector overview, which describes in more detail, what happened in the sector between 1991 and 1996

Section 4: The Oil-for-Food programme and its impact

Section 5: Provides a set of key lessons learned in the sector from 1991 through 2003 that can be used for future planning and programming

Section 6: Provides a post- March 2003 war update on the sector

Section 7: Provides recommended areas of action to address the post- March 2003 war situation

Section 8: Provides suggested areas requiring more detailed assessment to complete the picture for realistic planning of immediate and medium-term interventions

2. Pre '2003 War' Overview of Water and Sanitation Sector

2.1. HISTORIC SYNOPSIS OF WATER AND SANITATION SECTOR 1980S– MARCH 2003

Prior to the 1991 Gulf war, the population of Iraq enjoyed a relatively high level of water and sanitation services. Urban access to drinkable water supply was 95 % with an average of 330 litres per person per day in Baghdad, and 250-300 litres per person per day in other cities and towns. Rural water coverage was 75 % with an average supply of 180 litres per person per day.

Access to a sanitary means of excreta management and/or disposal ranged from 75 % coverage in urban areas comprising of 25 % having a connection to a sewerage treatment system and 50 % having an on-site septic tank system. The remaining 25 % of the urban population did not have any form of sanitation. However, rural sanitation coverage was low and estimated at 40 %, mostly latrines.

In the 1980s, the sector received an average annual budget allocation equivalent to US\$ 100 million, primarily covering staff salaries and operation and maintenance costs. Management was also strong with almost all posts filled by over 5,000 staff, including over: 1,100 administrators, 350 engineers, 1,400 operators, 500 technicians and, 1,700 unskilled labourers. At that time the sector relied heavily on the private sector, primarily foreign, for all major infrastructure development and routine repair and maintenance of all existing equipment and plant.

The Ministry of Interior was responsible for sector management in rural areas with the General Corporation for Water and Sewerage (GCWS) and Directorates of Municipalities responsible for services provision and management. Mayoralties were responsible in urban areas such as the Mayoralty of Baghdad in collaboration with the Baghdad Water Authority (BWA) and the Baghdad Sewage Authority (BSA) and Directorates for Municipalities.

Main technologies used in the 1980s included:

- 226 Conventional Water Treatment Plants (primarily in urban areas) accounting for over 80% of all water treatment needs in Iraq
- Over 900 Compact Water Treatment and Pumping Units (Compact Units) initially used for emergency supplementary water supply in urban areas, and for more permanent water supply in rural areas. Accounting for about 10% of all water treatment needs in Iraq
- Over 200 Deep Borehole wells primarily in north eastern Iraq
- Five Dams with a total designed storage capacity of 82.5 cubic kilometres
- Several other water storage devices such as artificial desert lakes and earth dams amounting for almost 90 cubic kilometres of water storage
- 20 Sewage Treatment Plants (STPs) comprising of 13 fixed conventional plants and seven compact sewage treatment units. Baghdad had two large fixed sewage treatment

plants. In total, all 20 STPs had a capacity to treat 883 million cubic metres of raw sewage per year.

The impact of the Gulf War and complications from the international sanctions, on the water and sanitation sector resulted in the following:

- 96% electricity power cuts due to damage of the national generating and grid system at the end of the bombing¹⁷, on which the water and sewerage treatment technologies heavily depended
- Water supply production fell by 40% (and many plants had to rely on stand-by generators which could only supply about 50 - 60% of power needs)
- Urban access to potable water fell from 95% to 92% and in Baghdad from 330 to 218 litres per person per day, and in other cities and towns from 250 to 171 per person per day
- Water losses rose to about 60% by 1996 due to old age and corrosion of pipes and illegal tapping of water
- Rural access to potable water fell from 75% to 30%, and from 180 to 91 litres per person per day
- All Sewerage Treatment Plants suffered major breakdowns, which resulted in over 500,000 cubic metres of raw sewage being discharged daily into rivers
- Solid waste collection and management almost collapsed due to breakdown of essential equipment and vehicles. For example, the number of waste collection vehicles fell from 6,500 in 1990 to 700 in 1996 (reduced in Baghdad from over 800 to about 80) and breakdowns to over 50% of heavy waste management equipment used in landfills. This resulted in about 50% of all waste left uncollected and a serious deterioration of landfill management, including dangerous medical and industrial waste
- 55% of the sector staff, mainly high-level managers and experienced engineers and high-level operation and maintenance staff fled Iraq and most of these vacant positions were never filled
- Government's annual average budget allocation to the sector (primarily for staff salaries and operations and maintenance) fell from over US\$ 100 million per year in the late 1980s to an average Government reported allocation, equivalent to about US\$ 8 million per year between 1991 and 1996 but in reality allocation was a fraction of this due to the devaluation of the Iraqi Dinar and nebulous reporting/accounting mechanisms
- Deaths of under five-year olds reported (by MoH) from diarrhoea had risen from 20.7% before the war to 38% during and following the war

- A three-fold increase in mortality among under five-year old children, or an estimated excess of almost 47,000 children died¹⁸ between January and August 1991

Iraq's average annual total renewable water resources are slightly over 96 cubic kilometres and over 98% of this is from surface supplies, mainly from the three main rivers that flow into the country, namely the Euphrates, Tigris and the Karun. Groundwater contributes to the remainder, of which most of it is generated in the north eastern mountainous part of the country. Of the above, Iraq withdraws 43 cubic kilometres per year and agriculture is allocated over 90 %, industry over 5 % and domestic needs over 3 %.

As mentioned earlier in the executive summary, there was a dramatic rise in mortality rates of under-five year old children between 1984 and 1999, with similar trends experienced regarding malnutrition in children, as well as a huge rise in other diseases such as typhoid fever, hepatitis, cholera and malaria.

The introduction of the Oil-for-Food programme (OFFP) began on 14th April 1995, when the United Nations Security Council passed Resolution 986. The OFFP was primarily designed to provide temporary essential humanitarian needs, to alleviate serious nutritional and health problems of the Iraqi people and was mainly food and supplies-oriented. On the 20th May 1996, the Government of Iraq signed the Memorandum of Understanding on Resolution 986, thus initiating the OFFP.

The implementation of the OFFP was divided into two separate parts: the Government of Iraq was responsible for its implementation in the 15 central and southern Governorates, with the UN's role as an observer, limited to verifying and establishing the quantities of OFFP supplies arriving in Iraq and their distribution and utilisation. The observer's role also included assessing of OFFP inputs regarding their adequacy, effectiveness, efficiency and equitable distribution. For the water and sanitation sector there were only 12 international observers supported by 5 nationals, this was a huge responsibility and almost an impossible task to cover such a massive programme. However in the three northern Governorates of Dohuk, Erbil and Sulaymaniyah (also referred to as the Autonomous Region in the North of Iraq – ARNI), the United Nations was responsible for the implementation of the OFFP on behalf of the Government of Iraq. The UN worked in close collaboration with local Government authorities in the ARNI and partnered with several International Non-Governmental Organisations. For the water and sanitation sector in the ARNI, UNICEF was appointed as the lead agency.

In late 1996, the first requisitions for supplies and equipment for water and sanitation were submitted through the 661 Committee (established to review all supplies to Iraq to ensure non dual use for developing weapons etc.) for their review and clearance and by late 1997 supplies began to trickle into Iraq. Between 1996 and early 2003 a total of slightly more than US\$ 3 billion was allocated to the water and sanitation sector under the OFFP. Of this, slightly over US\$ 1 billion actually reached Iraq by December 2002 and over 70% of it was utilised. However, the absorptive capacity of Iraq to optimally utilise these large amounts of hardware was critically constrained by the acute lack of technical and managerial capacity. At the outbreak of the March 2003 War, about US\$ 500 million worth of vital water and sanitation spare parts, equipment, treatment chemicals and vehicles in stock, were subsequently looted.

The impact of the OFFP could have been greater. Although the OFFP provided some relief for the water and sanitation sector in managing to just about keep it functioning, it only provided a quarter of the actual supply and equipment needs to restore water production, treatment, distribution networks and sewage treatment plants to acceptable levels. The biggest drawback of the OFFP was the lack of a 'cash-component' to cover local capacity development needs and for local civil, electrical and mechanical contractual works, this was particularly true for the central and southern Governorates. Yet, as well, the high allocation of the OFFP to supplies actually reinforced a supply-driven approach rather than needs-based approach. Although the 3 northern Governorates received a cash-component, this only covered about 1% of actual needs. The sector actually needed about one-fifth of the total monetary allocation of the OFFP to the sector in cash (i.e. about US\$ 200 million) to efficiently utilise supplies and build sufficient capacity for sustaining the sector.

Additionally, the OFFP had many constraints such as short planning timeframes of about six-month intervals (Phases); limited advanced information on budget allocations; bureaucratic processes in requisitioning and approving of supplies and equipment; difficulties with the synchronizing of repairs and rehabilitation works due to late and/or intermitting flows of supplies into the country; seriously low levels of staffing and technical capacity in the sector to efficiently utilize supplies and equipment once they did arrive; and, delays in approving sector contracts, for example: in October 2002, urgent contracts worth US\$ 396 million were on hold. Despite these many constraints, the OFFP managed to achieve a great deal under such difficult and trying circumstances. Overall, the major achievements of the OFFP were:

Major achievements in the Central and Southern Governorates included:

Emergency repairs, replacement and/or part rehabilitation, operation and maintenance of some of the water and sanitation facilities (however, some facilities never received any support from the OFFP): 1,200 compact units, 130 booster pumping stations, 20 sewage treatment plants, and 401 sewage pumping stations. As well as, the provision of 122 compact units for peri-urban and rural water supplies; provision of 622 water tankers to supply drinking water to populations not connected to water supply networks; the provision of 5 reverse osmosis water treatment plants to serve populations in areas of high water salinity; the provision of all major consumables such as chlorine gas and powder and aluminium sulphate for water treatment; reduction of water losses from about 60% in 1996 to about 30% in early 2003; and the development of a comprehensive monitoring and information management system for the whole sector. In Baghdad for example: 8 water treatment plants were rehabilitated, 44 compact units were installed, over 1,400 kilometres of pipes were procured for the rehabilitation of water and sewage networks, and by early 2003, 47% were utilised for water and 12% for sewage networks. Moreover, the urban solid waste backlog was reduced from over 50% to less than 30% per day.

Major achievements in the three Northern Governorates included:

The construction of over 1,500 new rural water systems; emergency repairs, replacement and/or part rehabilitation to over 500 water supply systems; construction of over 17,000 latrines; provision of water and sanitation facilities in over 150 schools; provision of all major consumables such as chlorine gas, powder and aluminium sulphate for water treatment; training of over 5,000 people in various critical areas such as water quality

control, operations and maintenance, planning and local level management of water and sanitation programmes; and training of over 900 villagers in sanitation and hygiene promotion.

2.2. HIGHLIGHTS OF POPULATION, GEOGRAPHY AND WATER RESOURCES

In 2002, the population of Iraq was estimated to be 27 million people comprising 67.5 % urban and 32.5 % rural, with an average annual growth rate of about 2.0 %. Iraq is situated between approximately 38 and 49 degrees east and 28 and 37 degrees north. Of its total landmass of 437,072 square kilometres, 0.2 % (924 square kilometres) is made up of inland waterways (rivers, lakes and canals), whilst 40 % consists of the vast desert areas in the south and west. Iraq borders six countries: Turkey to the north; Iran to the east; Kuwait to the south; Saudi Arabia to the south west; Jordan to the west and Syria to the north west. Most of Iraq is made up of the Great Mesopotamia Alluvial Plain of the Tigris and Euphrates rivers, and with mountains reaching altitudes of 3,550 meters in the north and north east. Average annual precipitation is 216 millimetres (mm) and ranges from less than 100 mm in the south or about 60 % of the country, to over 1,200 mm in the north east. Climate ranges from semi arid to subtropical in the centre and south, to a Mediterranean and continental climate in the north and north eastern mountainous areas.

Iraq's total renewable water resources on average are slightly over 96 cubic kilometres per year, of which surface water makes up around 98 % and groundwater sources provide the balance. Of this water, almost 43 cubic kilometres are extracted with over 90 % going to agriculture, over 5 % to industry and slightly over 3 % to domestic use. Iraq heavily relies on renewable river water entering the country via Turkey, Syria and Iran, which accounts for over 61 cubic kilometres, or slightly more than 60 %. Iraq's total meagre water resources profile and its high allocation to agriculture indicates an urgent immediate need for careful and integrated water use planning, management and preservation, including international trans-boundary agreements on managing rivers.

3. Sector Overview

3.1. SECTOR DEVELOPMENT IN THE 1980S

In the late 1970s and through the 1980s, the Government of Iraq embarked on an ambitious modernisation plan developing large urban and rural water supply systems primarily depending on surface water. Services were heavily subsidised, particularly water and sanitation, health, education and electricity. Although the 1980s was marred by the Iran-Iraq war and decreases in social sector spending, access to safe water and sanitation services peaked in the early 1990s at over 95 % in urban and 75 % in rural areas (with 250 to 300 litres and 180 litres per capita per day, respectively). Sanitation coverage was also high, particularly in urban areas where almost 75 % of the population had a sewer or septic tank connection. However, sanitation coverage in rural areas remained low, at most, covering less than 40 %.

By the early 1990s the water and sanitation sector in Iraq was comparatively well developed and modern for the time. The sector was well equipped with sophisticated western designed and dependent technologies that were efficiently managed and maintained, albeit through a high reliance on foreign experts. A vibrant oil-based economy and modern aspirations at that time, spurred sector growth with adequate funding and political support. This environment contributed to high levels of efficiency in water supply, sanitation and solid waste services although it was very centralised with limited scope for integrated planning and management or stakeholder participation. At the time, public health

indicators were also good with minimal water and sanitation related diseases and 97 % urban and 79 % rural populations had access to health care.

3.2. LEGISLATIVE AND POLICY FRAMEWORK

The water and sanitation sector is governed by the following legislation:

- Act Number 25 of 1967, relating to Water Resources Management criteria
- Act Number 2 of 1997, relating to Environmental Protection and Development
- Act Number 148 of 1999, relating to transforming of the General Establishment of Water and Sewerage into a state-owned corporation
- The charter of incorporation of the Baghdad Water Authority
- The charter of incorporation of the Baghdad Sewerage Authority
- The 1974 Drinking Water Quality Standards by the Ministry of Health
- The 1974 creation of the Autonomous Region in the North of Iraq (ARNI), but all laws enacted in Iraq also govern ARNI
- The 1980 Joint Technical Committee Agreement on Regional Waters created by Turkey and Iraq on the basis of a former protocol in 1946, governing the control and management of the Euphrates and Tigris rivers. Syria later joined this committee. (See Annex 5 for more details).

During this desk-review, it was not possible to obtain copies of the above laws and agreements to assess their appropriateness. It is therefore advisable that a more in-depth review be done as soon as possible, particularly before any new legislation, policies and strategies are developed or large resources injected into the sector.

3.3. SECTOR FUNDING AND TARIFFS

Before 1991, the average annual Government budget for water and sanitation services in Iraq was approximately US\$ 100 million. However, following the 1991 Gulf War, the average annual official budget fell to around US\$ 8 million (however, as mentioned earlier the actual value was a small fraction of this). Tariffs and collection mechanisms for water, sewage and solid waste are nebulous since only about 10 % of all buildings have water meters and it is not clear how liquid and solid waste charges are calculated. At that time, households connected to sewerage systems had to pay a 100 % surcharge on their water bills and every household was charged 100 Iraqi Dinars per month for garbage collection. Water tariffs were primarily calculated on consumption estimates. Rates varied for private dwellings to public institutions and commercial buildings. In 1999, private dwellings were charged on a sliding scale, rising in cost with higher consumption and ranging from 0.66 Iraqi Dinars per cubic metre of water consumed between 130 cubic meters per month, to 10 Iraqi Dinars per cubic metre for 90 cubic metres consumption and above. Public institutions and commercial buildings were charged 5 and 15 Dinars per cubic metre irrespective of consumption rates, respectively.

3.4. IMPACT OF 1991 GULF WAR AND INTERNATIONAL SANCTIONS (1991 – 1995)

The Gulf War caused almost 70 % cuts in electricity supply, which the water and sanitation sector heavily depended upon. To overcome this power shortfall, many water and sewage

plants fell back on stand-by generators, many of which subsequently became prime power sources even though they were not designed for such purposes. Power lines had to be dedicated to critical water treatment plants and sewage pumping stations, primarily for the larger towns and cities. The period between 1991 and 1995 witnessed a sharp fall of around 90 % in Government budgets, a more than 50 % “brain drain” of key technical and managerial expertise, acute shortages of spare parts and water treatment chemicals and further shortages of electric power supply.

Although the Ministry of Power made emergency repairs to essential power generating components and the national distribution grid, poor coordination of repair works with the water and sanitation utilities resulted in power being restored to many water and sanitation plants without notice thus causing huge power surges, overloading and fluctuations. This, subsequently further damaged sophisticated sensitive equipment in the water and sanitation sector such as switching apparatus, motors and automated control mechanisms critically essential to efficient management of these plants. Because these automated controls are so essential for precise water preparation, disinfections, balancing of production with demand, as well as for sewage treatment, meant that the remaining staff in the sector, most of whom were inexperienced or unqualified, had to manually control the systems as best they could. But because many of these automated controls regulated flows, dosing of chlorine and other functions over long distances in the water and sewage treatment networks, the manual work became very time consuming, labour intensive and extremely difficult to achieve accurately, and was exacerbated by staff shortages.

3.5. POLICY INFLUENCE AND TECHNOLOGY CHOICE

The 1991 Gulf War and twelve years of UN sanctions revealed inherent weaknesses in the water and sanitation sector policies and strategies. Over time, the policies and institutional arrangements made in the early 1980s became a “formula for failure”. Some of these technologies proved to be inappropriate and extremely difficult to sustain under the non-conducive political, economic and technical environment in Iraq. Past policy arrangements of contracting out periodic maintenance and repairs to mostly foreign private companies without having a sensible balance of local capacity, meant that that remaining staff in the sector were ill trained and equipped to maintain these high-maintenance dependent systems, once private companies withdrew. Likewise, the over-reliance on highly sophisticated, mobile, integrated and relatively small size but high-output water treatment technologies known as “Compact Units”, proved very difficult to sustain during the sanctions and because of limited technical capacities and other resources. During the Iran-Iraq war in the 1980’s, compact units were favoured over conventional water treatment plants that are more reliable, larger and fixed, because they could easily be put in place and made operational in a relatively short time. Following the Gulf War, the ensuing emergency situation and uncertainty regarding the length of time the international sanctions would be in place, made CUs a reasonable choice in meeting basic water needs. But this technology is not appropriate to long-term water supply needs.

In the 1980s, the Government had nearly completed civil works on more than ten new medium sized conventional water treatment plants (WTPs) around Iraq. However, following the Gulf War they were unable to finish them due to international sanctions which restricted the importation of key electrical and mechanical components and because most international contractors fled Iraq. For this reason, Government had little option but to

continue relying on compact units as primary water treatment plants, especially in rural areas. There were approximately 900 CUs, which accounted for about 11 % of all potential water production and treatment in Iraq. Many of these CUs also augmented the 226 conventional water treatment plants in urban areas (218 in the centre and south), which combined, accounted for approximately 87 % of total potential water production and treatment. The stand-alone smaller capacity CUs were deployed in rural areas, accounting for about 5 % of the total water production and treatment with over 500 groundwater wells and over 100 small water systems (mostly in the north) making up the balance. The size and capacity of CUs varied greatly, ranging in water production and treatment capacities from as low as 14 cubic metres per hour (used primarily in small rural settings), to units of 210 cubic metres per hour (mostly to augment conventional Water Treatment Plants in urban areas). Additionally, studies show that the efficiency of CUs varied greatly depending on where their location, for example stand-alone CUs in rural areas averaged about 40 % efficiency, whereas those augmenting WTPs had a higher efficiency of 65 %. Although the Government of Iraq recognized the technical limitations of CUs, without them, options were limited to address ever-increasing water production deficits.

However, compact units are designed primarily for emergency water supplies (or for supplementing supply production when there is sufficient technical capacity and availability of consumable spare parts). They are not intended for longer-term use because they depend on highly skilled operators, regular, sophisticated maintenance and are costly to run. Though capital investments for CUs is relatively cheap compared to the larger Water Treatment Plants (WTPs), their recurrent costs, lower life-expectancy and high maintenance make them more costly and less sustainable in the longer-term. This is particularly true in rural settings where there is limited technical expertise and resources to sustain them.

Furthermore, compact units are very sensitive to the composition of 'intake' raw water requiring it to be of low turbidity and organic matter content so that 'output' water can be efficiently and properly treated. In rural Iraq, many of these units draw water from rivers, irrigation canals and ditches that are often turbid and heavily contaminated by bacteria and chemicals. The end result was these expensive units did not properly treat water nor were they appropriately maintained. At best, they functioned as high volume pumps to transfer raw water from irrigation canals and rivers to drinking water networks.

3.6. PERSONNEL CAPACITY AND SUSTAINABILITY

The cumulative effect of this entire situation meant that water and sanitation systems barely managed to keep functioning during the post-Gulf War period and much of this was achieved through cannibalising parts from less critical equipment, for use in other more crucial areas. These effects, coupled with the non-standardisation of technologies and spare parts have left many systems so bastardised that no fully functional original system remains. Added to the mechanical and technical difficulties was a fast growing population that far outstripped the capacity of systems to deliver water and sanitation services. For example, the population of Baghdad grew by approximately half a million people between 1991 and 1996, whilst the capacity of water and sanitation services actually declined. The ageing and rapidly deteriorating technologies were not designed to meet such demands or last so long. Combined with low salaries, very constrained cash budgets, poor staff morale, limited access to up-to-date technical information and training, lack of equipment, tools and

spare parts have further crippled the operation and maintenance and ultimately the efficiency and quality of services.

The water and sanitation sector was also plagued by a chronic lack of technical capacity at all levels. Irrespective of categories, the number of vacancies far outnumbered positions filled. For example, in 1996 there were almost 70 % vacancies for administrators, managers and engineers, over 60 % for operators, almost 80 % for technicians and over 70 % for unskilled labourers. (Safege Report Annex 5)

3.7. DOMESTIC WATER PRODUCTION

In 1996, the daily production of drinking water in all 15 central and southern Governorates amounted to about 7.5 million cubic metres per day with a daily consumption of more than 19 tons of chlorine gas and 100 tonnes of aluminium sulphate. Baghdad accounted for approximately 2.3 million cubic metres of drinking water each day. In addition to poor water quality from high salinity in the southern governorates of Basrah, Missan and Thiqr necessitated the use of reverse osmosis for domestic water supply. However, the estimated efficiency of the existing drinking water production facilities at that time, ranged between 40 to 60 % of their design capacity and water losses amounted to more than 50 % of all water produced.

The three northern Governorates obtain their water from main sources, such as Mosul and Dohuk dams, high volume springs and boreholes. There were 21 water treatment plants, over 500 boreholes (more than 200 in Erbil city alone) and over 100 other water systems (mostly springs and gravity schemes) with water production efficiency rates in excess of 60 % of design capacity.

3.8. URBAN AND RURAL SANITATION

In the 15 central and southern Governorates there was a total of 20 sewage treatment plants with designed capacity to treat 883 million cubic metres of raw sewage per year. Plant capacities ranged from 10,000 to over 345,000 cubic metres per day. Of these 20 STPs, seventeen were in urgent need of major rehabilitation works. Of Baghdad's two largest sewage treatment plants in Rusafa and Karkh, over 1.8 million cubic metres of sewage was channelled through the systems via over 5,000 kilometres of sewer pipes each day. As well as, over 50 % of this sewerage did not go through all treatment stages and was therefore not fully treated before being discharged into the Tigris. The breakdown of critical equipment, especially components in many of the 1,250 pumping stations, as well as damage and corrosion of sewer pipes, especially in Baghdad, has contributed greatly to environmental pollution. For example, between 1991 and late 1996 sewer pipe breakages due to corrosion and old age had accounted for almost 18,000 repairs in comparison to only 18 between 1985 and 1990.

By 1996, the high reliance on sophisticated and hard-to-sustain sewerage treatment plants, lack of appropriate maintenance equipment, spare parts, service vehicles, technical capability and cash resulted in the failure of most sewage treatment plants. Additionally, most domestic septic systems did not function properly due to a shortage of de-sludging vehicles. These combined effects resulted in a daily discharge of over 500,000 cubic metres of raw sewage into river systems and frequent sewage spills into streets and homes. In turn,

this increased the difficulty and cost of treating and disinfecting raw water extracted from rivers.

Rural Sanitation, apart from coverage figures there is little information on sanitation in the Centre and South Governorates. In the 3 Northern Governorates success in rural sanitation was reported through shifting from community toilets to involving families in building and maintaining household latrines. However, more needs to be known about knowledge, attitudes and practices regarding rural sanitation and hygiene for future programming.

3.9. SOLID WASTE MANAGEMENT

The capacity of all municipalities to collect and safely manage solid waste was seriously eroded between 1991 and 1996. During this period the number of waste management vehicles fell from 6,500 to approximately 700 due to breakdowns and old age. The city of Baghdad had about 800 vehicles to collect over 1,700 tonnes of waste per day. By 1996 that number had fallen to around 80, not including other essential equipment such as compactors, bulldozers and other machinery for waste processing and managing landfills. Much of this waste, including dangerous medical and industrial waste ended up in open and unplanned areas outside of cities without proper management. This inability to collect all waste, resulted in almost 50 % of it remaining in streets, especially in the poorer areas of Baghdad, thus posing a major health risk.

In 1987 it was estimated that solid waste generated in Baghdad was approximately 0.5 kilograms per person per day. The composition of this waste included food (54.13%), paper (12.43%), plastic (8.76%), fabric/leather (4.8%), glass (3.93%), metal (3071%), dirt (7.7%) and garden waste (4.51%). Currently (July 2003), the weight and composition of solid waste is probably far less because people do not have as many leftovers and recyclables due to many years of economic hardship. It is estimated that the daily per capita waste generation is now in the range of 0.25 to 0.35 kilograms per person per day (which contradicts the MoH's unlikely 1996 figure of 1.5 kilograms). Therefore, Baghdad with its current estimated population of 5 million people would generate between 1,250 and 1,750 tonnes of solid waste each day. Thus, UNDP estimates that approximately 1.7 million tonnes of waste is waiting to be removed from the streets of Baghdad alone (22 June 2003).

Medical waste also poses a big challenge for Iraq. For example, in 1987 over 18 tonnes of medical waste was deposited daily in local landfills in Baghdad alone, not including residue remaining from burning highly dangerous medical waste in hospital incinerators. As of July 2003, it is understood that most hospital incinerators do not function due to over 12 years of poor maintenance and lack of spare parts. Therefore it is fair to assume that, much of the dangerous medical waste is being dumped in poorly managed and controlled landfills. This poses a serious health risk to those who work with waste, earn a living from it and to children who play in such sites.

3.10. DISEASES RELATED TO POOR SANITATION, UNSAFE WATER AND UNHYGIENIC PRACTICES

Diseases associated with poor sanitation, unsafe water and unhygienic practices had also increased to alarming rates, contributing to a fast growing problem of malnutrition, morbidity and mortality of infants and under-five year old children. Poor sanitation and insufficient access to safe water, particularly at family level (for drinking, cooking, family and home hygiene) is a key underlying cause of diseases and malnutrition in Iraq. Globally,

it is estimated that water and sanitation related diseases are responsible for about 19 % of all children's deaths, but in Iraq it may be as high as 25 %. Diarrhoea and subsequent dehydration along with acute respiratory infections account for 70 % of child mortality in Iraq. In May 2000, a study showed that half of all children under five years of age suffered from diarrhoea within two weeks of the study compared to 13.5 % in 1989 and on average, every child suffers 14.4 attacks of diarrhoea per year. The dramatic rise in mortality rates of under five-year old children between 1984 and 1999 is an indication of how poor sanitation, unsafe water, unhygienic practices and unsanitary living conditions negatively impact their survival and development. Under-five mortality rates per 1,000 live births rose from 56 between 1984 and 1989 to 92 between 1989 and 1994 and as high as 131 during the 1994 to 1999 period. Furthermore, infant mortality rates per 1,000 live births also increased from 47 between 1984 and 1989, to 79 between 1989 and 1994, and as high as 108 in the 1994 to 1999 period.

Similar negative trends were experienced in children's nutrition during the 1991 to 1996 period, but slight improvements occurred in the following three years. Acute malnutrition rose from 3 % in 1991 to 11 % in 1996 and dropped to 7.8 % in 2000. Underweight prevalence rose from 9.2 % in 1991 to 23.4 % in 1996 and dropped to 19.6 % in 2000, and chronic malnutrition rose from 18.7 % in 1991 to 32.0 % in 1996 and dropped slightly to 30 % in 2000.

Unsafe water, unsanitary conditions and unhygienic behaviours resulting in diseases, especially diarrhoea, have serious impacts on pregnant women by impeding their ability to optimally absorb protein and energy from food. This in turn contributes to malnutrition during pregnancy and resulting low birth-weight babies. For example, the percentage of children born weighing less than 2.5 kilograms was 4.5 % in 1996 and unofficial reports by the Ministry of Health indicated that this figure may have risen to as high as 25 % between 1994 and 1999. Likewise, unsafe water and unhygienic practices regarding the preparation of baby food and feeding placed infants at high risk of diarrhoea, dehydration and death, especially recognising that only 13 % of all infants were exclusively breast-fed during the first 4 months of life in central and southern Iraq in 1997, compared to about 90 % in the 1980s. This is currently a growing challenge following the increased use of bottle-feeding since 1997, when the Government of Iraq included infant formula in the OFFP rations, against the advice of UNICEF and other international organisations.

Coupled to all this is an acute lack of awareness at all levels, around the relationships between disease and poor sanitation, unsafe water and unhygienic practices, including the necessary life skills to prevent and protect against such diseases. This lack is particularly absent among illiterate mothers and child caregivers. For example, prior to the 1991 Gulf War the under five-year-old mortality rate was 2.5 times higher for illiterate mothers compared to literate mothers and this rose to 3.5 times during and after the 1991 Gulf war.

Other diseases related to poor sanitation, unsafe water and unhygienic practices also rose. For example, typhoid fever cases rose eight-fold between 1990 and 1996 to 15,238 and to 19,825 in 1998, Giardiasis also rose six-fold between 1990 and 1996 to 584,621 and dropped slightly to 509,621 in 1998. Likewise, malaria cases rose from 870 in 1995 to 16,296 in 1996 in the 3 northern Governorates alone.

3.11. INTEGRATED WATER RESOURCES USE AND MANAGEMENT

Three main rivers flow through Iraq, the Tigris, Euphrates and the Karun. The Euphrates and Tigris have their sources in Turkey and flow in a southerly direction for over 1,000 and 1,300 kilometres respectively before they converge at Al Qurnah. Downstream of the confluence, the Shatt Al-Arab River is formed and it continues its journey south for another 200 kilometres to the Persian Gulf. The Karun River originates in Iran and flows in a westerly direction until it joins the Shatt Al-Arab at Khorramshahr. Between them, all three rivers (and tributaries) contribute over 61 cubic kilometres of fresh water to Iraq. Of these 61 cubic kilometres of water, about 43 are withdrawn, with 90 % going to agriculture, 5 % going to industry and 3 % given to domestic needs.

To ensure that Iraq has enough water all year-round, it relies heavily on dams for water storage during low river flow periods and to control flooding during river surges. Until 1997, Iraq had a total dam storage capacity of slightly over 13.7 cubic kilometres of water, primarily on the Tigris. But in the 1980s, the Ministry of Irrigation (which is responsible for water resources development, irrigation, drainage and operation and maintenance of dams and water courses), accelerated its dam construction and other water storage efforts by building the following:

- Saddam dam on the Tigris with over 11 cubic kilometres storage
- Kadisiyya dam on the Euphrates with over 50 cubic kilometres storage
- Bakhma dam on the upper Zab (Tigris tributary) with over 17 cubic kilometres storage, this dam was later destroyed
- Al-Adom dam on the Tigris with almost 4 cubic kilometres storage
- Badush dam on the Tigris with about 0.5 cubic kilometre storage
- Several desert dams and artificial lakes were also constructed totalling almost 90 cubic kilometre storage.

The need to improve water resources management is vital to Iraq's future social and economic development, as well as sustaining ecosystem integrity. To date, insufficient attention has been given to ensure a holistic approach to water management, especially integrated and inter and intra sectoral planning, development and management of water in five key areas: water for basic needs, water for food security, water for cities, water for industry and energy, and water for maintaining ecosystem integrity. Future efforts for integrated water resource management will require improved governance to facilitate the participation of all those with a vested interest in water (and sanitation), including women, enabling them to contribute fully to both policy development and water management. This will necessitate a conducive water policy that takes into account all related sectoral needs: basic needs, agriculture, health, environment, industry, power and water security in drought prone areas of the centre and south. As well as, macroeconomics, privatisation, decentralisation, gender, cultural needs and safety net provisions for the poor and disadvantaged, marginalised segments of society. (See Annex 5 for more detail). Unfortunately, little information exists (or made available to this external desk-review) on:

- Recent past (or current) water withdrawals for agriculture, industry, power, cities, basic needs and maintenance of ecosystems
- Water tariffs in agriculture and industry and power
- Policies for agriculture, industry, power and the environment

- International agreements on management of shared water resources for the three main rivers: the Euphrates, Tigris and Karun
- Ministerial level coordination of the multifaceted and fragmented use, management, preservation and regulation of water resources
- Drought and flood management

3.12. WATER QUALITY

Iraq's Ministry of Health (MoH) has the overall mandate for water quality surveillance and regulation and direct responsibility for water quality control of small rural water systems. Water quality control of the conventional water production facilities (i.e. WTPs and CUs) is routinely done as part of the water production and treatment management process by entities such as the General Corporation for Water and Sewerage. Although there is a working arrangement between the MoH and the water production authority in water quality testing, untimely communication have often resulted in delays of reporting spot tests that fail to meet standards, especially on biological contamination. These delays have resulted utilities not being able to take timely corrective action to repair leaks that cause contamination in networks and have also contributed to wider outbreaks of diarrhoea diseases.

The General Corporation for Water and Sewerage is responsible for monitoring water quality in all WTPs in all Governorates except Baghdad. All Governorates have at least one water quality laboratory, usually located within a water treatment plant. Periodic testing of raw water, treated and distributed water is carried out for most water systems. Nationally, the central Water Quality Control Laboratory in Baghdad is responsible for water quality control of the WTPs and are responsible for:

- Overseeing all water quality control carried out at directorate levels
- Training of laboratory staff at Governorate levels
- Provision of laboratory equipment, chemicals and reagents
- Collecting and processing all sub-national water analysis results from WTPs and CUs

The quality of raw water from rivers and irrigation canals is rapidly deteriorating due to several factors such as, the direct discharge of raw sewage into rivers, excessive agricultural run-off due to poor irrigation techniques and industrial effluents that are not properly regulated. This makes it progressively more difficult to adequately treat water for human consumption. In addition, over 500,000 cubic metres of raw sewage are discharged into rivers each day, and the rapid increase in water salinity poses an urgent challenge. The total dissolved solids (TDS) in the Tigris river increases from 280 mg. per litre at its border crossing with Turkey to 1,500 mg per litre at Amara. The Euphrates River ranges from 600 mg per litre at the Syrian border to 3,000 mg per litre at Nassiriyah. And more worrying, the Shatt Al-Arab is so saline with over 3,500 mg per litre that it cannot be used to produce potable water, as such it is generally diluted before treating it. For example, in the 1970s, it was estimated that due to high salt content in irrigation water about half of all irrigated areas in central and southern Iraq were degraded by water logging and salinity problems. In the late 1980s, efforts to desalinate some of these areas cost up to US\$ 2,000 per hectare. In the late 1990's it was estimated that 4 % of irrigated land was severely saline, 50 % medium saline and 20 % slightly saline.

Prior to the introduction of the OFFP, the water and sanitation sector was almost in a state of collapse due to the combined affects of the above problems. It was also estimated that 70 % of water distribution networks around the country, amounting to about 40,000 kilometres of pipes, valves, spigots etc., needed replacement because of corrosion, damage and old age. Water production capacity also fell sharply and maintaining of water quality throughout the entire distribution network systems became almost impossible, primarily due to a lack of technical capacities at all levels. The ever growing problem of environmental pollution in rivers, irrigation canals and land from raw sewage effluent and poor solid waste management, together with poor hygiene practices all contributed to the fast deterioration of public health and well being.

4. The Oil-for-Food Programme (OFFP 1995 – March 2003)

4.1. UNITED NATIONS SECURITY COUNCIL RESOLUTION 986

The United Nations Security Council passed Resolution 986 on the 14th April 1995 to establish OFFP. It was primarily designed to temporarily provide essential humanitarian needs for the Iraqi people, especially to alleviate serious nutritional and health problems. On 20th May 1996, the Government of Iraq signed the Memorandum of Understanding (MoU) on Resolution 986. The Government of Iraq implemented the OFFP in the 15 central and southern Governorates covering around 85 % of the population, with the United Nations' role limited to that of an observer with no advisory or implementation function. This meant that the Government of Iraq had control over most decisions regarding how and where the OFFP resources would be used in the central and southern Governorates (albeit within the SCR 986 framework). Decisions regarding priority setting of intervention, geographic focus, types of spare parts, technologies and equipment to be procured, their quantities and the awarding of procurement contracts was primarily the responsibility of the Government. Subsequently these were scrutinized by the 661 Committee and its arrival, distribution and use in Iraq were reviewed by field-level UN observers.

In the three northern Governorates (Autonomous Region of North Iraq - ARNI), where about 15 % of Iraq's population resides, the UN undertook the implementation of the OFFP with local Government counterparts. This undertaking was done on behalf of the central Government. In the ARNI, the UN provided a small cash component through the OFFP to cover local expenditures of such activities as capacity development, whereas the central and southern Governorates did not receive such a contingency. UNICEF was appointed as the lead UN agency for water and sanitation in the ARNI and together with Local Government Authorities and sister UN organisations (including partner international non-Governmental organisations), jointly implemented water and sanitation sector activities. Conversely, decisions regarding the types of interventions, technologies, equipment, and contracting etc. for the ARNI were primarily the responsibility of the UN, in collaboration with local Government administration and partner organisations. Procurement and other contracting followed strict guidelines of the UN global bidding process that is Internationally recognised and externally audited. In essence, these decisions were participatory and minimised risks.

Following the signing of the MoU on SCR 986 by the Government of Iraq, water and sanitation supplies were called forward in late 1996 and in late 1997 supplies began to trickle into Iraq. Between 1996 and early 2003 a total of US \$3,012,984,613 was allocated to the water and sanitation sector, and by late December 2002 about US\$ 1.1 billion worth of spare parts and equipment had arrived in Iraq of which over 70 % had been utilised. However, the effectiveness of the OFFP in the centre and south was severely hindered by the lack of a cash component for critical capacity development needs and for paying of local contractors for civil, electrical and mechanical works.

4.2. OIL-FOR-FOOD PROGRAMME BUDGET ALLOCATIONS

Oil-for-Food Programme Allocations to Water and Sanitation Sector By Phase (1996 – March 2003)

Phase	Water and Sanitation	Comments
Phase-I	\$20,200,000	This represented about 20% of Government's budget allocation in the 1980s. The phase I allocation was received at a time when the sector actually needed about twenty-five times this amount for critical repairs to equipment and infrastructure and for technical training.
Phase-II	\$19,610,000	Same as Above
Phase-III	\$15,610,000	This serious budget deficit over the years contributed to the fast decline of expensive equipment and infrastructure.
Phase-IV	\$68,714,438	This increased allocation was primarily for spare parts and equipment at the expense of technical training and staff salary increases for critical operations such as maintenance of systems.
Phase-V	\$127,500,000	Although greater than the 1980s annual budget allocation to the sector, this increase was primarily to cover spare parts, equipment and consumables such as chlorine gas and aluminium sulphate. The critical lack of staffing, especially for operations and maintenance meant that the absorptive capacity for such budget increases could not be wisely spent.
Phase-VI	\$410,000,000	Although this huge increase was very welcome, again the large allocation and low absorptive technical capacity in Iraq meant that funds spent on equipment and spares would be difficult to implement without first ensuring that there was sufficient capacity at all levels and that synchronization of the arrival of critical complementary equipment and heavy lifting gear was effective. But long delays in approving urgent contracts for these further exacerbated delays in repairs and rehabilitation works.
Phase-VII	\$308,000,000	Same as Above
Phase-VIII	\$551,462,900	Same as Above
Phase-IX	\$348,500,000	Same as Above
Phase-X	\$287,000,000	Same as Above
Phase-XI	\$260,600,000	Same as Above
Phase-XII	\$361,795,775	Same as Above
Phase-XIII	\$233,991,500	Same as Above
Total	\$3,012,984,613	Although the OFFP provided an average annual sector budget of about four-times the annual Government budget allocation in the 1980s, it was nonetheless only about a quarter the actual needs due to the urgent need to replace broken-down and obsolete equipment and for operation and maintenance costs. It did not cover in any significant way, the needs in essential training and staffing of the sector. But more importantly, by March 2003, only \$1.1 billion (or one-third) of the allocation actually reached Iraq, thus, the OFFP managed to utilize 70% of it before the outbreak of the recent war. Additionally, it is estimated that about \$ 500 million worth of critical OFFP equipment, spare parts, vehicles and other materials were looted during and following the war.

4.3. INSTITUTIONAL ARRANGEMENTS FOR OFFP

Between 1991 and March 2003 the political structure in Iraq resulted in two main separate management arrangements for the water and sanitation sector, with one covering the central and southern Governorates and the other, the three northern autonomous Governorates of Dohuk, Erbil and Sulaymaniyah. Policies governing water and sanitation in these two dissimilar geo-political areas were governed by the same legislation for the whole country, but in reality there were subtle differences. However, meaningful coordination or collaboration between the two geo-political regions did not exist. Institutional arrangements for the two geographic areas were:

Central and Southern Governorates (15 Governorates, about 23.5 million people)

- The Mayoralty of Baghdad (BM) with the Baghdad Water Authority (BWA), the Baghdad Sewage Authority (BSA) and 9 Municipality Directorates responsible for the capital district of the Governorate of Baghdad
- Ministry of Interior with the General Corporation for Water and Sewerage (GCWS) / General Establishment for Water and Sewerage (GEWS) responsible for all other 15 Governorates, including the 15 Directorates for Municipalities (MD), except the capital, Baghdad

Three Northern Governorates (about 3.5 million people)

- The Autonomous Region in the North of Iraq (ARNI) covering an area of 7,878 square kilometres, created by law in 1974, responsible for the three governorates of Dohuk, Erbil and Sulaymaniyah. Of these, the administration of Dohuk and Erbil was common, whereas Sulaymaniyah had its own administration. Water and sanitation responsibilities were under several authorities within the ARNI, these included: Directorate of Water and Sewerage (DWS), Directorate of Reconstruction and Development (DRD), Office of Reconstruction and Development (ORD), Office of Municipalities and Tourism (OMT), Office of Works and Reconstruction (OWR) and Municipality Directorates (MD).

The fragmentation and complexity of institutional arrangements and roles and responsibilities regarding water and sanitation in Iraq is not much different than in other countries. Although the sector was always centrally controlled and managed, the relatively strong budgets in the 1980s enabled it to function without much difficulty. But following the 1991 Gulf War budgets sharply fell, many technical staff fled abroad, competition over resources grew among sectors and the capacity to plan and manage further weakened. On top of this, weaknesses in inter-sectoral coordination and collaboration, as well as the centrally planned, and relatively vertical structures in decision-making have diminished the potential for a holistic approach to integrated water resource management. (See Annex 5 for more details).

4.4. IMPACTS OF THE OIL FOR FOOD PROGRAMME

Although the OFFP provided some relief including several notable achievements in the water and sanitation sector, funding was mostly supply-orientated and only covered about a quarter of actual needs to restore water and sanitation systems to acceptable operational standards. As well there was no 'cash-component' allocated to the central and southern

Governorates and the small cash component allocated to the three northern Governorates only covered about one % of actual cash needs, this was a major obstacle to maintaining basic levels of water and sanitation services and made capacity development almost impossible. Thus, due to competing needs and priorities within various areas of the sector, initial priority was given to water production at the expense of water quality. Likewise, priorities in the treatment of sewage were primarily focused on pumping equipment; due to lengthy processes regarding UN sanctions approval mechanisms for vital sewage treatment equipment and long manufacturing and shipping lead-times. More importantly, the overall OFFP was doomed from the start because of serious biases towards high supply-oriented humanitarian relief. For the water and sanitation sector, this manifested itself in supply-oriented investments without enough cash for technical capacity development or the creation of beneficial development framework with principles and policies that guide it towards people-orientated sustainable development.

As a consequence, most water and sanitation services never functioned at optimal design capacities, except for some component parts like water production pumps, within the overall water treatment plant system. These impediments contributed to a rapid deterioration of the sector, especially of expensive infrastructure, but also newly replaced pumps and other equipment because they were installed into weak and critically understaffed management systems with limited capacity for operation and maintenance. However, there were also positive outcomes from the OFFP, which are mentioned later.

4.5. PROCEDURAL AND ADMINISTRATIVE CONSTRAINTS OF THE OFFP

Preceding the 2003 War, the impact of the OFFP and status of the water and sanitation sector varied greatly between Regions. Though the OFFP investment in water and sanitation was significant, it was nonetheless far short of what was actually required and the lack of a meaningful ‘cash component’ was a major impediment in optimally utilizing the OFFP supplies. Difficult choices had to be made such as, priority of one project or repair over another for example; water production in the earlier phases over repairing the distribution network or water quality. In subsequent phases, plans were made and equipment, vehicles and spare parts requisitioned to repair and rehabilitate the water distribution networks and improve water quality. Similar actions were taken for sewage treatment plants and for solid waste collection and management. However, great delays due to contracts on hold and slow arrival of critical supplies and equipment crippled planning, repairs and rehabilitation efforts. For example, on average, at any given time, more than half of all contracts were kept on hold for several months by the 661 Committee, thus seriously delaying implementation efforts in Iraq. In November 2002, critically important supplies and equipment on priority contracts worth over US\$ 25 million for sewage treatment plants in Balad, Nassriyah and Basrah and over US\$ 32 million for solid waste management and heavy lifting equipment to enable urgent repairs to water and sewage treatment plants around the country were kept on hold.

Additionally, tight planning timeframes in each phase of the OFFP, coupled with unknown advanced budget ceilings caused great delays and was exacerbated by OFFP bureaucracy, cumbersome rules on requisitioning of supplies, preparing of distribution plans for each six-month phase and subsequent cutbacks of supplies whenever approvals were not granted. Adding to this was the fact that a large amount of supplies for the central and southern governorates were split deliveries, which was further weakened by their poor capacity in

supply management and logistics, further crippled repair and rehabilitation efforts. Once in Iraq, supplies often ended up in wrong locations or some got lost in warehouses due to inadequate logistics and store management capacity.

Another key constraint was the difficulty in synchronizing repairs and rehabilitation works due to intermitting deliveries flows of complementary spare parts, equipment and long delays in approving essential heavy lifting equipment and vehicles critical to ensuring that heavy components such as generators, pumps and pipes could be safely and properly transported and positioned into their final working area. By the onset of the recent war in March 2003, most of these critical supplies and equipment for rehabilitation of the water and sewage networks had not arrived. The combination of the above and other complications mentioned earlier, meant that only US\$ 1.1 billion out of over \$ 3 billion actually reached Iraq prior to the 2003 War and of this, an estimated US \$ 500 million worth of spare parts and equipment, still in stock at the commencement of the war (due to the non arrival of complementary components which delayed their utilisation of this stock), were subsequently looted.

4.6. REGIONAL DIFFERENCES IN WATER AND SANITATION OUTCOMES

In the central and southern Governorates, sector staff managed to achieve a lot despite the many constraints mentioned earlier. Key results included emergency repairs, replacement and/or part rehabilitation and operation and maintenance of some of the water and sanitation facilities. However, some facilities never received any support from the OFFP.

Key results of the OFFP in the 15 Southern Governorates include:

- 218 water treatment plants
- 1,200 compact units
- 130 booster pumping stations
- 20 sewage treatment plants
- 401 sewage-pumping stations
- Provision of 122 compact units for peri-urban and rural water supplies
- Provision of 622 water tankers to supply drinking water to populations not connected to water supply networks
- Provision of 5 reverse osmosis water treatment plants to serve populations in areas of high water salinity
- Provision of all major consumables such as chlorine gas and powder and aluminium sulphate for water treatment
- Reduction of water losses from about 60% in 1996 to about 30% in early 2003
- Development of a comprehensive monitoring and information management system for the whole sector

In Baghdad for example, 8 water treatment plants were rehabilitated, 44 compact units were installed, almost 1,500 kilometres of pipes were procured for the rehabilitation of water and sewage networks, by early 2003, 47 % were utilised for water and 12 % for sewage networks. Additionally, the urban solid waste pile-up was reduced from over 50 % to less than 30 %.

The three northern Governorates fared much better because the UN and partner international NGOs worked directly with local communities, administrations and municipalities in a somewhat integrated manner. But more importantly, the availability of a cash-component in the north facilitated capacity building, the modification of non-standard supplies and equipment and the undertaking of local engineering works, which was not available in the central and southern Governorates. This meant a quick shift out of the emergency repair phase, into a longer-term development approach, resulting in better water and sanitation services in the three northern Governorates. Coverage increased to over 90 % and although limited, initial capacities of local communities and institutions were developed to potentially sustain services. However, it is clear that more capacity building is needed if local institutions and communities are to fully manage and maintain these services on their own. Key results of the OFFP in the 3 northern Governorates include:

- The construction of over 1,500 new rural water systems
- Emergency repairs, replacement and/or part rehabilitation to over 500 water supply systems
- Construction of over 17,000 latrines
- Provision of water and sanitation facilities in over 150 schools
- Provision of all major consumables such as chlorine gas and powder and aluminium sulphate for water treatment
- Training over 5,000 people in various critical areas such as water quality control, operations and maintenance, planning and local level management of water and sanitation programmes
- Training over 900 villagers in sanitation and hygiene promotion

4.7. HARDWARE AND INFRASTRUCTURE BIAS

As mentioned earlier, the OFFP was not intended to address economic development or broader human development needs because its focus was to temporarily address humanitarian needs and critical nutrition and health problems. However, the Government of Iraq could have put more of its own resources behind the balancing of hardware such as water technologies with software, particularly training of critical staff in operations and maintenance and for water quality control. This is also true, but to a lesser degree in the three northern Governorates where a ‘cash component’ was available for some limited software interventions. Regrettably, the overall OFFP did not pay sufficient attention to needs such as, integrated planning and management, promoting “best practices” in operations and maintenance, hygiene promotion, local level participatory methods, etc., critical to improving skills, management, behavioural change, health improvement and long-term sustainability.

Had sufficient attention been given, more could have been done to promote sanitation and hygiene improvement, especially at the family level to tackle underlying causes and contributing factors of high malnutrition and infant morbidity and mortality, especially in families of illiterate mothers where under five-year old mortality rates can be over 3.5 times more than in families with educated mothers. It is therefore no surprise, that despite improvements in water coverage, related diseases continued to be a problem due to poor water quality, low environmental sanitation and unhygienic behaviours.

Had the OFFP given greater attention to balancing hardware and software, more could have been done to build capacity for sustaining water and sanitation services and promoting good sanitation and hygiene behaviours leading to better health and nutritional outcomes. Unfortunately, there was far too much focus on technologies and infrastructure, especially for water production. More should have been done to ensure that families actually received safe water at the household level and that water distribution networks were properly repaired, managed and maintained. More could have been done to involve communities and families in key decision making regarding both water and sanitation issues, but especially for local management and maintenance of water services. Sanitation and hygiene improvement was largely neglected, especially in the central and southern Governorates, and in the north to a lesser degree.

4.8. INTER-SECTOR COORDINATION

It would appear that in the central and southern Governorates, inter-sector coordination and linkages of water and sanitation with other key sectors such as power, health, education, agriculture and the environment had not been conducive to integrated water resource management in the past, even though water and sanitation cuts across several sectors. For example, the Ministries of Agriculture and Irrigation are responsible for delivering bulk raw water, whilst the responsibility of delivering safe drinking water to rural communities is that of the Ministry of Interior who obtains the raw water primarily from irrigation canals and then treats it. Weak coordination, communication and collaboration have often left rural water treatment plants without bulk raw water deliveries for several hours and often days. At such times, it forced families to collect water from unsafe sources, and contributed to low, or negative, pressures in the delivery networks causing contaminants to leak into pipes. (See Annex 5 for more details).

4.9. INSUFFICIENT ATTENTION TO HEALTH AND HYGIENE PROMOTION

The general technical approach to addressing ‘water-borne’ diseases such as diarrhoea through primarily focusing on water quality alone was too narrow and did not address sanitation and hygiene behavioural issues. Additionally, weak inter-sectoral linkages and coordination in the area of public health coupled with a “cure” rather than “prevention” mind set exacerbated this problem. More should have been done to assess people’s knowledge, attitudes and practices regarding hygiene, sanitation, water conservation and protection and to create awareness around diseases associated with unsafe water, unhygienic practices, poor sanitation and environments. Greater emphasis should have been given to infant, early childhood and caretaker practices around hygiene (handling and disposal of faeces, hand-washing habits), feeding (food preparation and storage, hand and utensil hygiene) and living environment. These interventions would have done significantly more in reducing the horrific toll of malnutrition and infant morbidity and mortality than focusing solely on delivering large quantities of, very often, unsafe water.

4.10. WATER PRODUCTION BIAS

Generally, the emphasis throughout Iraq has been on increasing water production to compensate for huge water losses in the delivery networks. Access to water was therefore based on a theoretical figure by dividing the volume of water production, at its maximum efficiency, by the theoretical population served. In reality, only those populations close enough to the production side (or booster pumps) got enough water (i.e. 150 litres per

capita per day in Baghdad and 110 l/c/d in other urban areas and 65 l/c/d in rural communities). In fact, a huge proportion of the population got nothing near these large quantities of water and more could have been done to monitor and disaggregate water availability down to household level for better problem identification, planning and targeting of programmes. This would have resulted in several benefits:

- Less water production would have been necessary
- More attention would have been paid to repairing leaks in the water distribution network, thus minimising water losses and risk of pollution entering water pipes
- Better focus on capacity building especially for managing, operating and maintaining distribution systems, particularly at the community level
- Water quality would have been better maintained in the system
- Families would have been trained to render water safe for drinking, cooking etc. had they not been able to access potable water

4.11. LOST OPPORTUNITIES IN SANITATION AND SOLID WASTE MANAGEMENT

More innovative approaches to solid waste management could have been introduced, such as at-source (or local) separation of organic matter and recyclables from actual waste. This could have reduced the volume by more than half, reduced transportation needs and management pressures and generated smaller sanitary landfills. Approaches and technologies to enhance and protect the environment, enable recycling of valuable resources and nutrients (including for sewage), generate employment, income and food were never explored. This situation was caused by poor overall decision-making processes, as well as a lack of understanding of alternative technologies and approaches involving end-users on the part of engineers, managers and public health specialists and alternative technologies or approaches that involve people in problem-solving. For example, in 1987 it was estimated that solid waste generated in Baghdad was approximately 0.5 kilograms per person per day. The composition of this waste included food (54.13%), paper (12.43%), plastic (8.76%), fabric/leather (4.8%), glass (3.93%), metal (30.71%), dirt (7.7%) and garden waste (4.51%). Currently (July 2003), the weight and composition of solid waste is probably far less, because people do not have as many leftovers and recyclables due to many years of economic hardship. It is estimated that the daily per capita waste generation is now in the range of 0.25 to 0.35 kilograms per person per day (in contradiction to the MoH's unlikely 1996 figure of 1.5 kilograms). Therefore, Baghdad with its current estimated population of 5 million people would generate between 1,250 and 1,750 tonnes of solid waste each day.

4.12. WEAK USER PARTICIPATION AND ATTENTION TO GENDER ISSUES

The impact of centralized decision-making and paternalistic attitudes particularly in the central and southern Governorates did not facilitate meaningful participation of the general population in decisions regarding service levels and technologies, local management, tariffs, women's participation, etc.. Insufficient consideration was given to matching technologies and services to social, economic, gender and cultural needs, as well as water

conservation and environmental sustainability. This was largely due to Government, regarding the population as beneficiaries of free or subsidised services.

4.13. NEEDS TO REDUCE SUB-NATIONAL DISPARITIES

Much more needs to be done to identify the huge disparities that exist in Iraq regarding access to safe water and sanitation. Currently, at least 4.6 million people living in urban areas do not have access to a sanitary means of excretes disposal / management technologies and about 1.4 million people do not have access to safe water. Similarly, in rural areas 3.5 million people do not have access to a sanitary means of excreta disposal and 2.2 million do not have access to safe water. These disparities call for a greater focus on the unserved and underserved populations. It necessitates that monitoring indicators and methodologies be designed to identify where disparities exist and that policy, planning, priority setting and programmes address these inequities.

4.14. NEED TO ADAPT TECHNOLOGIES TO LOCAL CONDITIONS AND NEEDS

The experience and lessons learnt from adapting technologies to local conditions and needs, in the northern Governorates, should be carefully reviewed for adaptation and application in the central and southern governorates. More needs to be done to introduce small-scale, easy to maintain water pumping, treatment and distribution technologies. Slow sand filtration and simple dosing mechanisms for chlorinating water needs to be introduced, along with simple water quality testing that does not require highly trained laboratory technicians. Likewise, the use of elevated reservoirs is essential to maintaining pressure in distribution networks at all times.

Although technologies such as protected springs, gravity schemes and boreholes with hand pumps have limited application in the Centre and South, the experience from Northern Iraq in using simplified designs for water production and distribution systems may have major application in both rural and peri-urban areas. The experience of using local communities in the planning, implementation and managing of water and sanitation services needs to be recognized and replicated in the centre and south. Furthermore, the limitations of water Compact Units as discussed in section two of this report could be greatly improved by re-designing the water intake to improve primary filtration of raw water supply. This would reduce maintenance of sensitive filters built into the units and would greatly improve chlorination and also reduce running costs. Likewise, improving water storage in elevated reservoirs would reduce costs and the need for continuous pumping to keep distribution networks under constant pressure. These simple adaptations together with appropriate training of local communities in operations and maintenance, would significantly lower costs and improve the suitability of this technology in local physical, technical, cultural and economic environments.

5. Key Lessons Learnt for Future Planning

Past experience should feed into future planning in order to build on best practices and avoid repeating mistakes. Some of the key lessons learned between 1991 and 2003 were:

1. Despite the overall negative picture and the huge technical and managerial capacity gaps, lessons can be learnt from the Iraqi experience. Out of necessity, sector staff began changing its approaches to managing and operating utilities. This was especially noticeable in recycling and repairing existing equipment or adapting 'non-standard' spares to existing systems rather than the past practice of replacing broken-down components with new ones, proving that "necessity is the mother of invention". This was largely achieved through self-learning and hands-on practical experience by innovative staff and managers. Future work in the sector needs to tap into this experience to avoid returning to inappropriate attitudes and practices such as, "replace rather than repair" and "only sophisticated technologies are good enough for Iraq".
2. There is an urgent need to invest in technical capacity building at all levels, especially for O&M, but also for overall planning and management, including private sector involvement in these critical areas.
3. Water quality surveillance is critical to ensure safe water actually reaches family level, where it does not; families need training to make it safe.
4. There is an urgent need to rehabilitate water distribution networks and reduce the huge water loss problem, rather than wasting resources on water production.
5. Sanitation and hygiene promotion is vitally important, especially at the family level for maintaining good personal and domestic hygiene and for ensuring safe and hygienic practices for early childhood survival and development. School sanitation and hygiene promotion as well as water conservation and protection must be given greater priority in education. School children need to be facilitated for their involvement in local water, sanitation and environmental initiatives.
6. There is an urgent need to improve communication between the Ministry of Health, water quality monitoring teams and the water production utility operators to ensure timely corrective actions in water quality management.
7. There is a need to match technologies with the local economic, social, cultural, technical and environment situation, especially for sanitation and sewage in urban areas that are not yet connected to conventional sewage treatment systems. These technologies and approaches include the duckweed production and sewage treatment process and/or other ecological sanitation technologies and approaches such as urine diversion and desiccation of faecal matter to kill off pathogens, as well as the safe recycling of valuable nutrients for forestry, horticulture and food production.
8. There is a need to explore more innovative ways of managing solid waste, including using households and local communities or entrepreneurs in primary separation of waste, such as recyclables and organic matter from 'real' waste. This could contribute

to lesser volumes of waste, more recycling in the home, less transportation needs, smaller, more hygienic landfills and income-generation etc.

9. The participation of all stakeholders in critical decision-making processes at various levels is paramount and a pre-requisite to good planning and integrated water (and sanitation) resource management. Women are and should be important players in these processes.
10. There is a very urgent need to begin the process of developing an integrated water resources management plan, including beneficial guiding principles, policies and a legislative framework.
11. Water and sanitation tariffs need to be critically reviewed to ensure that sustaining current (and future) types of services are possible under the economic and technical environment in Iraq.
12. The need for a more effective intra- and inter-sectoral coordination, especially in Government institutions cannot be over emphasized. Because of the importance of safe water, good hygiene and sanitation to health and nutrition. It is paramount that these two sectors coordinate their efforts and collaborate in planning and targeting of interventions.
13. Sector monitoring needs be more impact and results oriented and used at all levels for strategic planning and adjustment of ongoing programmes.

Lastly, let us remind ourselves once again, of how war affects the most vulnerable: children and women. The conclusion of The Harvard Study Team in 1991 that focused on children's health and health services in post war Iraq stated that "The intrinsically chaotic nature of international and civil wars usually make it difficult to assess their affect on the health of civilian populations accurately, although there have been some exceptions to this rule. We found tragic proportions suffering. As is so often the case, the youngest and most vulnerable are paying the price for the actions of others. Children are dying of preventable diseases and starvation as a direct result of the Gulf crisis. The current conditions in Iraq reflect the cumulative effect of the military actions taken by Iraq, United Nations sanctions, allied bombing, civilian uprisings, and the subsequent suppression of these uprising by the Iraqi Government. Although it is difficult to measure the effects of each of these elements, the predominant factor contributing to epidemic waterborne diseases was clearly the destruction of the electrical infrastructure. Although the allied bombing may have caused relatively little direct damage to the civilian population, the destruction of the infrastructure has resulted in devastating long-term consequences for health. We normally consider civilian casualties to be only those that are a direct result of injury during war, but this definition deserves revision. With the changes in military technology and the strategy of warfare, including the capacity to target precisely and destroy a country's infrastructure, there may be many more indirect than direct injuries and deaths.' This conclusion was also reinforced by Doyle, B. et al, (Evaluation of UNICEF's Emergency Response in Iraq, March 1992 - unpublished) estimated that out of approximately 205,500 casualties of the Gulf war and post war turmoil, 150,000 were non-combatants and of these, 50 % were children and 30 % women. In the rush to restore core services and rehabilitate infrastructures, let us not lose sight of the most vulnerable and marginalised segments of society where the instruments of war and resistance takes its greatest toll on children and women, especially those in unserved and underserved areas.

6. Post-War Assessment and Findings

IMPACT OF THE 2003 WAR ON WES

At the time of writing this review report, the results of a nation-wide rapid assessment of the water and sanitation sector (by UNICEF and NGO partners) was not yet available. However, preliminary reports indicated that the impact of the 2003 War has resulted in almost half of all water and sewage treatment and pumping stations being put out of action due to acute power cuts, looting and general insecurity as well as collateral war-damage. Vibrations from heavy bombing and tank movement further disrupted the already fragile distribution networks for both water supply and sewer systems. Power failure is affecting between 30-40 % of all water and sewerage treatment and pumping plants and access to safe water has fallen to about half of pre-war quantities in Baghdad. Other cities and rural areas face similar problems.

It is estimated that over one million cubic metres of raw sewage is discharged daily into rivers, and/or spills into streets, schools, hospitals and homes and thousands of tons of putrid garbage piled up in the streets, causing grave public health and environmental risks. Morbidity, malnutrition and mortality rates have since risen to double pre-war figures and daily outbreaks of water borne and poor sanitation related diseases are common. Almost as disturbing as the human cost is the fact that over \$ 500 million worth of vital sector equipment, spare parts, water treatment chemicals and vehicles have been looted. Moreover, there has been millions of dollars worth of damage to water and sewage systems and their critical components such as electric motors, pumps and switchgear from looting, sabotage and bombing. In summary, the status of the sector in the aftermath of the war is as follows:

- Additional damages to 40% of the water networks from bombings and an acute shortage of water resulting in people breaking into the networks leading to over 50% water loss. For example, most of the networks are obsolete, 85% of cast iron pipes and 12.5% of mild steel pipes are over 35 years old, about 60% of essential machinery is over 30 years old, and, all other pipes, fittings and controls range in age from 2 to 20 years old
- Serious damage to key infrastructure of water and sewage treatment plants, including extensive looting and sabotage of mechanical and electrical supplies from water and sewage treatment facilities
- Extensive looting of office furniture, equipment, records etc. thus crippling management capacity and operational efficiencies of these plants
- Power outages, coupled with broken down generators and fuel shortages, particularly in the central and southern Governorates have resulted in over 50% reduction of operational time for water treatment, distribution and for pumping of sewage
- Acute water shortages and exponential increases in waterborne and sanitation related diseases in the already poorly served low-income slum and peri-urban areas of Baghdad, Kut, Nassriyah, Basrah, Samawah, Najaf and Karbala

- Power rationing in homes has resulted in drastic reduction of water availability for families not having the means to pump water from the mains to their homes
- The additional collapsing and clogging up of sewers have resulted in more spills and back siphoning into homes as sewage pumping stations fail to cope
- Looting (demolition and sabotage) of many water quality testing laboratories has destroyed the capacity to test and control drinking water quality
- Increased absence of staff due to insecurity and non-payment of salaries has resulted in many water and sewage treatment plants not being able to function. This situation is now being addressed by UNICEF, ICRC and the CPA
- More recent reports indicate a proliferation of water and sewage leaks in the various networks, particularly those close to the heavy bombing and movement of heavy military equipment. For example in Basrah over 300 were found in the water network alone in the space of one-week, about a ten-fold increase
- Illegal water tapping from the mains network is increasing at an alarming rate, while the CPA has not yet found a suitable deterrent to stop it. The problem has become so bad that coalition forces have agreed to deploy 7,000 former navy personnel from the Basrah river service to protect the water network in Basrah
- A recent report on water poisoning at the Nassriyah water treatment plant 40 kilometres north of the city has yet to be confirmed. If positive, it could affect the water supply serving about 50 % of Nassriyah city population.

7. Recommended Areas of Action

The current situation urgently necessitates the following short- and medium-term actions:

Immediately restore water, sewage and solid waste services to at least minimum acceptable standards. Ensuring that each family receives enough water, of safe quality, for domestic and family hygiene, cooking and drinking. Ensure that at least 75 % of urban and 40 % of rural populations have easy access to safe and sanitary means of excreta disposal and target areas of great disparities for urgent short-term interventions. Ensure that all solid waste is collected and properly managed in sanitary landfills.

Repair the water distribution networks to reduce huge water losses of over 50 % and ensure that safe water (free of pathogens and other harmful chemicals) actually reaches family levels. Give priority to this work over that of increasing water production. This may also require a full inspection and mapping of the network, including checking for illegal connections. Ensure that families have access to information on how to store and use water safely, so as to avoid contamination after it is collected.

Integrate water, sanitation and health interventions with strategies used in health and nutrition for primary health care, community child-care and nutrition. These interventions could dovetail with ongoing programmes in Primary Health Care Centres, Community Child Care Units and Nutrition Rehabilitation Centres. More needs to be done to assess people's knowledge, attitudes and practices regarding hygiene, sanitation, water conservation and protection and to create awareness about diseases associated with unsafe water, unhygienic practices, and poor sanitation and environments. Greater emphasis needs to be given to early childhood caretaker practices, especially for illiterate mothers around hygiene (handling and disposal of faeces, hand-washing habits), feeding (food preparation and storage, hand and utensil hygiene) and living environment. These interventions will have more significantly impact on reducing the horrific toll of malnutrition and infant morbidity and mortality than just focusing on delivering large quantities of, often, unsafe water. Schools should also be targeted for integrated water, sanitation and health interventions, especially in education and training of life-skills for sanitation and hygiene improvement and for water conservation and protection. School children should be encouraged/facilitated to act as 'agents for change' to promote hygiene improvement and water conservation/protection at family and community levels.

A paradigm shift in sanitation is urgently needed to find appropriate solutions to sanitation that protects the environment and is cost-effective, locally sustainable and possibly income-generating. Technologies and processes such as using duckweed to treat sewage and trap valuable nutrients for food production, as well as ecological sanitation that protects both human health and the environment and contributes to income generation at the family level needs to be seriously considered. Baghdad, with an estimated population of over 5 million in 2003, poses the biggest challenge for sewage treatment in the country and therefore calls for innovative approaches that use more appropriate and environmentally friendly technologies. It also calls for innovative management structures. Such approaches would help reduce the chronic environmental pollution problem caused by broken down sewerage and septic systems and could contribute to income generation through horticulture, forestry and food production and improvements in nutrition.

Begin process of developing an integrated water resource management plan required to facilitate sustainable development in the sector. For this plan to be meaningful and effective all stakeholders need to buy into it and careful attention needs to be given to its planning and execution processes. This necessitates several steps in a comprehensive process. The most important step is to bring all key stakeholders together in a consultative forum to identify key problems, opportunities and a general framework to move forward (for more detail, see outline in annex 5). It also calls for a consensus on the rational use of water resources, conducive development-oriented policies, legislation, regulatory framework and institutional arrangements. A set of guiding principles that fosters participation of all stakeholders in the sector, including women and guidance on choice of technology to ensure that they match the local environment, technical and managerial capability, socio-economic and cultural conditions in Iraq, is needed.

Innovative management of solid waste is needed such as at-source (or local) separation of organic matter and recyclables from actual waste. This will reduce the volume of current solid waste by more than half. It will also reduce transportation needs and management pressures and ultimately result in smaller sanitary landfills. Recycling can help protect the environment, generate employment, and reuse valuable nutrients from food-waste and sewage for safe utilisation in horticulture, aquaculture, forestry and food production. More needs to be done to ensure the safe management of medical and industrial waste as these pose a serious health hazard to those who work with waste and to children who play in unprotected landfills.

Build critical capacities, particularly for operation and maintenance of water and sanitation facilities, water quality surveillance and control at the delivery end to ensure that safe water actually reaches household level, and for hygiene and sanitation promotion and improvement, targeted at family level through the primary health care, childcare and nutrition outreach services.

Improve sector surveillance and monitoring indicators for more effective results and impact oriented management, coverage (to ensure equity), as well as for measuring attitudinal and behavioural change. To date, monitoring in Iraq focused far too much on technical aspects such as water production, pumping efficiency, water loss and water quality, primarily at the production stage. More needs to be done to monitor disparities in water availability at the community and family levels and water quality and use in the home, as well as sanitation and hygiene practices. This will help design better and more focused interventions that address the high diarrhoeal, malnutrition and morbidity and mortality rates associated with poor water quality, unsanitary conditions and unhygienic practices. In addition to monitoring for strategic sector planning and management, at all levels.

8. Areas Requiring More Detailed Assessment

For the upcoming inter-agency assessment mission on water and sanitation, it is recommended that the following areas be given more in-depth assessment. Especially as little information was available to this external desk-review:

- Recent past (or current) water withdrawals for agriculture, industry and power, cities, basic needs and maintenance of ecosystems
- Water tariffs in agriculture and industry and power
- Policies for agriculture, industry, power and the environment
- International agreements on management of shared water resources for the three main rivers: the Euphrates, Tigris and Karun
- Ministerial level coordination of the multifaceted and fragmented use, management, preservation and regulation of water resources
- Drought and flood management

Specific areas needing more in-depth assessment are:

1. Assess the new institutional arrangements for the water and sanitation sector to determine if they are beneficial to sustainable Integrated Water Resource Management and appropriate to sanitation and solid waste management challenges, especially recycling and sanitary landfill management.
2. Assess all legislation and policies governing the sector to determine their appropriateness under the new institutional arrangements, current and foreseeable economic and technical resources and potentials, socio-economic and cultural needs in Iraq.
3. Assess technologies and systems, particularly for sanitation and sewage treatment with the view to create awareness of global experiences in new and more appropriate ways in managing and re-using valuable nutrients from excreta that is helpful (and not harmful) to public health and the environment. Recommend how urban and rural sanitation coverage could be accelerated in a cost-effective, locally and environmentally sustainable manner.
4. Assess human resources in the sector at all levels, but especially in the areas of immediate critical needs to ensure optimal planning, management and operations and maintenance of water distribution networks, water quality control and the proper treatment of sewerage prior to the effluent being reused or discharged into river systems.
5. Assess the extent and characteristics of unserved and underserved populations regarding their access to safe water of sufficient quantities at the family level, particularly those in marginalised urban and rural areas.
6. Assess as soon as possible the potential for the development of an integrated water resource management plan through reviewing the major constraints and opportunities in the sector and interviewing key informants in the various sub-sectors and other important stakeholders (see recommended first step in annex 5).

7. Assess the potential role of the private sector, especially opportunities that quickly solve technical and human resources deficit problems, whilst building local capacity to sustain these services. But also, examine the work of the private sector to see if it follows internationally accepted development principles for the sustainable development of the sector.

9. Annexes

Annex 1

9.1. ACRONYMS

AFP	Acute Flaccid Paralysis
APC	Appointment and Placement Committee
ARI	Acute Respiratory Tract Infection
ARNI	The Autonomous Region in the North of Iraq
BCG	Bacillus Calmette Guerin vaccine
BSA	Baghdad Sewage Authority
BFHI	Baby Friendly Hospital Initiative
BM	Baghdad Mayoralty
CCCUs	Community Child Care Units
CDD	Control of Diarrhoeal Diseases
CEDAW	Convention on the Elimination of Discrimination Against Women
CMT	Country Management Team
COAG	Countrywide Observation Advisory Group
CPMP	Country Programme Management Plan
CRC	Convention on the Rights of the Child
CU	Compact Unit (for water treatment)
Cu/M	Cubic Metres
Cu/Km	Cubic Kilometres
CWC	Child Welfare Commission
DAT	Document Authorization Table (ProMS)
DHR	Division of Human Resources
DOE	Directorate of Education
DOH	Directorate of Health
DoMs	Directorate of Municipalities
DPT	Diphtheria/Pertussis/Tetanus vaccine
DRD	Directorate of Reconstruction and Development
DSA	Directorate of Social Affairs
DRD	Directorate of Reconstruction and Development
DWS	Directorate of Water and Sewerage
EFA	Education For All
EMOPS	Emergency Operations
EPI	Expanded Programme on Immunisation
FAO	Food and Agricultural Organization
FLS	Financial and Logistics System
GCWS	General Corporation for Water and Sewerage
GDP	Gross Domestic Product
GER	Gross Enrolment Rate
GEWS	General Establishment for water and Sewerage
GIS	Geographic Information System

GMT	Global Management Team
IMEP	Integrated Monitoring and Evaluation Plan
IMR	Infant Mortality Rate
IT	Information Technology
JCC	Joint Consultative Committee
KDP	Kurdish Democratic Party
LANs	Local Area Networks
l/p/d	Litres per person per day
MCU	Mother Child Unit
MD	Municipality Directorates
MICS	Multiple Indicator Cluster Survey
MIP	Medical Insurance Plan
MMR	Measles/Mumps/Rubella vaccine
MOE	Ministry of Education
MOH	Ministry of Health
NER	Net Enrolment Rate
NIDs	National Immunisation Days
NRCs	Nutrition Rehabilitation Centres
NYHQ	New York Headquarters
NGOs	Non-Governmental Organizations
OFFP	Oil For Food Programme
OIP	Office of Iraq Programme
OPV	Oral Polio Vaccine
OR	Other Resources
ORD	Office of Reconstruction and Development
ORS	Oral Rehydration Solutions
OWR	Office of Works and Reconstruction
PER	Performance Evaluation Report
PBR	Programme Budget Review
PHCs	Primary Health Centres
PKK	Party Krekarani Kurdistan (Kurdish Labour Party - Turkey)
PNIDs	Polio National Immunization Days
PO	Purchase Order
PPA	Project Plan of Action
ppm	Parts per million
ProMS	Programme Manager System
PSB	Property Survey Board
PUK	Patriotic Union of Kurdistan
RMT	Regional Management Team
RR	Regular Resources
SCR	Security Council Resolution
SNID	Supplementary National Immunization Day
SRQ	Supply Requisition
STDC	Staff Training and Development Committee
STP	Sewage Treatment Plant
TBA _s	Traditional Birth Attendants
TFT _s	Temporary Fix Terms
TM	Therapeutic Milk
TT	Tetanus Toxoid

U5	Under 5 years
U5MR	Under-Five Mortality Rate
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Family Planning Agency
UNICEF	United Nations Children's Fund
UNOHCI	United Nations Office of the Humanitarian Coordinator for Iraq
UNOPS	United Nations Office for Project Services-Iraq
US	United States of America
VC	<i>Vibrio Cholerae</i>
WatSan	Water and Environmental Sanitation
WES	Water and Environmental Sanitation
WFP	World Food Programme
WHO	World Health Organization
WTP	Water Treatment Plant

Annex 2

9.2. CONTACT LIST: WATSAN CO-ORDINATION MEMBERS BAGHDAD

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Annex 3

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Annex 4

9.4. REFERENCE TABLES AND CHARTS

Note: See list of additional tables and charts at end – not available in electronic form.

Table1: Comparison between Occupied and Vacant Positions

	Sewage Authority														
	Administrators			Managers and Engineers			Operators			Technicians			Unskilled Labourers		
	Occupied	Vacant	Total	Occupied	Vacant	Total	Occupied	Vacant	Total	Occupied	Vacant	Total	Occupied	Vacant	Total
Maqar SA¹	17	80	97	19	47	66	6	17	23	5	40	45	4	15	19
Anbar	10	94	104	6	18	24	26	123	149	7	75	82	5	86	91
Babil	32	39	71	9	11	20	31	33	64	3	17	20	52	60	112
Baghdad	8	51	59	4	12	16	16	59	75	6	36	42	5	36	41
Basrah	38	55	93	15	5	20	73	65	138	19	20	39	96	134	230
Diala	30	42	72	9	13	22	13	42	55	6	9	15	6	64	70
Kerbala	24	30	54	4	15	19	35	60	95	7	14	21	19	56	75
Missan	49	85	134	5	21	26	75	57	132	15	35	50	133	186	319
Muthana	7	30	37	4	8	12	26	71	97	2	16	18	5	60	65
Najaf	21	28	49	7	11	18	20	22	42	5	6	11	21	77	98
Ninevah	25	85	110	15	18	33	22	101	123	4	70	74	10	162	172
Qadisia	14	17	31	8	6	14	27	32	59	8	13	21	16	67	83
Salahelden	13	41	54	5	15	20	22	55	77	4	26	30	23	52	75
Tamem	6	18	24	3	9	12	14	29	43	2	10	12	2	55	57
Thiqar	26	29	55	8	9	17	71	85	156	12	9	21	48	80	128
Wasit	19	58	77	6	19	25	46	39	85	9	35	44	39	79	118
Grand Total	339	782	1121	127	237	364	523	890	1413	114	431	545	484	1269	1753

Source: Government of Iraq and UNICEF August 2002

Table2: Regional Authorities and Geographical Sector Management

Functions	Sector Administrative Structure			
	Baghdad City	Iraq excluding Capital	Autonomous Gov. of Erbil and Dohuk	Autonomous Gov. of Sulaymaniyah
Sector Management	Mayoralty of Baghdad	Min. of Interior	MMT and MRD	MMT and MWR
Water Supply and Sewerage Operation	BWA	GCWS	DWSE and DRD	DWSE and DWR
	BWSA			
Solid Waste Collection and Disposal	Deputy Mayor of Municipalities	General Directorate for Municipalities	MD	MD

Source: Government of Iraq and UNICEF August 2002

¹ May be Mosul Governorate

Table 3: Existing Sewage/Sanitation Coverage in Rural Areas

Governorate	On-site Sanitation Coverage		
	Septic Tank %	Pit Latrine %	Total %
Dohuk	100	0	100
Erbil	51	0	51
Sulaymaniyah	8	57	65

Source: Government of Iraq and UNICEF August 2002

Table 4: Average Water Supply Rates, Year 2000

Water Authority	UWSR l/c/d	RWSR l/c/d	Average l/c/d
Mayorality of Baghdad	224	86	223
Total GCWS	209	81	176
Total ARNI	74	-	55
National Averages	177	31	169

Source: Government of Iraq and UNICEF August 2002

Table 5: Features of Water Supply Utilities Year 2000

Parameter	Iraq (Excluding Capital)	Baghdad	ARNI	Units
Population served	11 161 172	4 769 072	2 939 296	
Including	26.2%	0.3%	25.7%	In rural areas
Number of service connections	1 400 000	567 551	232 590	Units
Including	92%	66%	91%	Domestic connections
Personnel	11044	1420	3 354	Employees
Including	14%	14%	NA	For Sanitation Services
Pipe network length (km)	25 503	7 750	1 775	Km
Average Diameter	176	213	214	Mm
Age of Pipes (years)	22	24	16	Years
Average production capacity	5 517 317	2 299 855	306 560	m ³ /d

Source: Government of Iraq and UNICEF August 2002

Table 6: Water Supply Coverage in Iraq - Year 2000

Water Authority	Urban Population SUP2000	Coverage in Urban Areas UWSC	Rural Population SRP2000	Coverage in Rural Areas RWSC
Mayorality of Baghdad	4 753 378	100%	15 694	100%
Total GCWS	8 234 575	88%	2 926 597	43%
Total ARNI	2 190 136	87%	749 160	78%
Total / Average	15 178 089	91%	3 691 452	48%

Source: Government of Iraq and UNICEF August 2002

Table7: Installed Production Capacity of Existing Facilities

Production Technology	No. of Water Projects	Urban Projects (m ³ /d)	Rural Projects (m ³ /d)	Total Production Capacity (m ³ /d)	Production per Unit (m ³ /d/unit)
Water Treatment Plants	226	6 524 999	621 067	7 146 066	31 620
Compact Units	1 205	508 123	389 633	897 761	745
Wells	88	64 405	15 500	79 905	908
Total	1 519	7 097 532	1 026 200	8 123 732	5 348

Source: from Government of Iraq and UNICEF August 2002

Table references from report: 'Assessment Project of the Water and Sanitation Sector', **August 2002** by SAFEGE Consulting Engineers (for the Government of Iraq and UNICEF).

These tables are not available in electronic format, but are available in hard-copy from UNICEF Iraq:

1. Chart 1. page vii, entitled Budget Planning Framework;
2. Table 10. page ix, Summary of Estimated Budgetary Allocations for 2001, for each Governorate in the Centre and South of Iraq;
3. Table 11. page x, Consolidated Investment Programs of Institutional Operators for both the Centre and South and Northern Governorates;
4. Chart 1-1. page 16 part 1, Water and Sanitation Organization, Mayorality of Baghdad;
5. Table 1-9, page 22, part 1, W and S Staffing Situation in the Mayorality of Baghdad;
6. Chart 1-2, page 26, part 1, General Organization of WES sector in Iraq (excluding Baghdad);
7. Chart 1-3, page 27, part 1, Organizational Chart of the General Corporation of Water and Sewerage (General Directorate);
8. Table 2-28, page 62, part 1, Installed capacity for Water Supply to Iraq DWS (m³/d), by Governorate Directorate;

9. Table 2-29, page 63, Characteristics of Pipe Materials in GCWS Water Networks, by Centre and South Governorates (except Baghdad);
10. Table 2-34, page 67, part 1, Storage Capacities in GCWS Water Systems, in Centre and South Governorates (except Baghdad);
11. Table 2-41, page 72, part 1, Efficiency of (Water) Production Units (for all Centre and South Governorates);
12. Table 2-42, page 73, part 1, Efficiency of Pipe Networks (for all Centre and South Governorates);
13. Table 2-43, page 73, part 1, Staff Management Efficiency (of Water Production Units for all Centre and South Governorates);
14. Table 2-44, page 75, part 1, Production Facilities (Water) in ARNI Production;
15. Table 2-41, page 77, part 1, Characteristics of Pipe Materials in ARNI;
16. Table 3-3, page 18, part 2, population Connected to (Sewerage) Treatment Systems (all of Iraq);
17. Table 3-4, page 19, part 2, Urban Population Served by On-site Sanitation (all of Iraq);
18. Table 3-22, page 45, part 2, Existing Sewage (sanitation) Disposal Coverage in Rural Areas – GCWS (for Centre and South Governorates);
19. Table 3-23, page 45, part 2, Existing Sewage (sanitation) Disposal Coverage in Urban Areas – GCWS (for Centre and South Governorates);
20. Table 3-26, page 47, part 2, Existing Sewerage Treatment Plants – GCWS (for Centre and South Governorates).

Annex 5

9.5. INSTITUTIONAL FRAMEWORK FOR WATER AND SANITATION SECTOR

ASSESSMENT PROJECT OF THE WATER AND SANITATION SECTOR IN IRAQ/FINAL REPORT

BY: SAFEGE

1. Institutional Framework of the Water and Sanitation Sector

1.1. General Overview

There are three main institutional frameworks for the water and environmental sanitation sector (WES) in Iraq, each corresponding to a different geographical region:

- Mayoralty of Baghdad (BM), with the nine main municipalities of the capital district of the Governorate of Baghdad.
- Iraq, excluding the capital, comprising a total of 15 governorates.
- Autonomous Region in the North of Iraq (ARNI), created by law on March 11, 1974, comprising three governorates. The autonomous administration of ARNI comprises two local authorities, one responsible for the Erbil and Dohuk governorates and the other for the Governorate of Sulaymaniyah.

The Government of Iraq (GOI) establishes sector performance policies and standards, sets tariffs and provides funding for capital expenditure. The three main regional authorities, i.e. the Mayoralty of Baghdad (BM), the General Corporation for Water and Sewerage (GCWS) covering the fifteen other Iraqi governorates, and the local authorities of the ARNI, are responsible, within the boundaries of the above mentioned geographic entities, for development planning, execution of public works, and operation of public utilities.

The boundaries of the three operational geographic units are shown hereafter in Map1. Geographic Organization of WES sector administration. *Ref.: Table 1-1: Regional Authorities and Geographical Sector Management Units*

This section describes the organisation of the WES sector within each geographical entity, and the institutional boundaries, financial features, staffing of the sector authorities and public operators.

In addition to the ministries that oversee the sector institutions directly, other Government institutions have indirect involvement in the sector:

- The Hydrology Department of the Ministry of Irrigation, responsible for monitoring water quality in rivers and lakes. Water resources are classified in four categories: (i) rivers, streams and their tributaries; (ii) canals; (iii) lakes and water bodies; and (iv) springs, wells and ground water. Water quality requirements are specified for each individual category. At the same time, effluent standards are defined according to four

categories of receiving bodies: (i) rivers (ii) sewer systems (iii) agricultural drainage system' (iv) marshes (Act N°25/ 1967)

- The Ministry of Health (MoH), responsible for monitoring the quality of drinking water in accordance with standards issued in 1974 based on WHO and other international standards. The Ministry of Health is also responsible for monitoring site selection and operation of sanitary landfills in accordance with 1980 specifications. Most landfills are poorly maintained however owing to a lack of equipment and staff and the limited number of dump sites suitable for sanitary landfills
- The Ministry of Industry, which monitors industrial effluents and solid waste discharges
- The national and provincial Centres for Environmental Protection and Development established under Act No 2 of 1997, which monitors the enforcement of environmental laws and regulations
- The main Non Governmental Organisations (NGOs) involved in the sector are:
 - The General Federation of Iraqi Women (GFIW), involved in advising women in the field of water supply and sanitation, particularly in rural areas.
 - The Iraqi Society for Environmental Protection and Improvement (ISEPI), involved in developing low cost technology for waste treatment and recycling

1.2. Population

The Central Statistics Office (CSO) provides population data derived from the last three censuses: 1977, 1987 and 1997. The CSO population data for 1997 are broken down into rural and urban populations per sub-district. *Ref.: Table 1-2: Historical Population Data*

The population in Year 2000 was extrapolated from 1997 Census records using average population growth rates (PGR) at governorate level, which were first assumed as the average PGRs for the periods 1977-1987 and 1977-1997 respectively.

The above population data in respect of the autonomous governorates (ARNI) are based on the population data provided by the local water authorities. According to urban and rural population records provided by the autonomous governorates (ARNI), the region experienced a considerable migratory influx: in 2000, the Dohuk authorities reported a population of 211 380 in rural areas and 398 150 in urban areas, corresponding to an average increase of 22% over the three-year period 1997-2000. This information was incorporated in the global PGR for Iraq as estimated by the CSO.

In the database, the Year 2000 population estimates are broken down into urban and rural population and distributed amongst the sub-districts maintaining the same distribution structure as in 1997. It is these Year 2000 estimates, which provide the basis for the sector assessment and the utility profiles. *Ref.: Table 1-3: Estimated Population by Late Year 2000*

1.3. Legal Framework

WES sector operation is governed by the following laws:

- Act N°25 of 1967, classifying water resources management criteria.
- Act No 2 of 1997, establishing the national and provincial Centres for Environmental Protection and Development.
- Act N°148 dated August 12, 1999, transforming the General Establishment of Water and Sewerage (GEWS) into a state-owned corporation (GCWS).
- The Charter of Incorporation of BWA.
- The Charter of Incorporation of BSA.
- Drinking water quality standards issued in 1974 by MoH.
- Act of March 11, 1974, creating the Autonomous Region in the North of Iraq.

1.4. Mayoralty of Baghdad (BM)

1.4.1 Institutional Boundaries and Organization

For the Mayoralty of Baghdad, the main sector institutions are:

- The Baghdad Water Authority (BWA), responsible for the main water intakes, treatment plants, transmission lines, storage reservoirs and water distribution network pipes of diameter 250 mm and above in Baghdad.
- The Baghdad Sewerage Authority (BSA), responsible for the main sewers, sewage treatment plants and sewage disposal in Baghdad.
- The Municipality Directorates (MD), established in each of the nine main municipalities that constitute Baghdad Mayoralty. Under the coordination of the Deputy Mayor for Municipalities, they are responsible for , among others, the operation and maintenance of the water supply distribution networks (pipes below 250 mm in diameter), service reservoirs, sewage networks and pumping stations, solid waste management and street cleaning. *Ref.: Chart 1-1: WES Organization in the Mayoralty of Baghdad.*

In addition to the sector management entities, the Mayoralty incorporates departments responsible for administration, assets, design, planning, pre-cast concrete construction, construction, nursery and entertainment, computer technology and graveyards.

The Baghdad Water Authority (BWA) and the Baghdad Sewerage Authority (BSA) are under the responsibility of a Deputy Mayor for Technical Affairs, whose role is to supervise these entities. The nine municipality directorates are under the responsibility of a Deputy Mayor for Municipalities and a Deputy Mayor for Administration and Finances. BWA and BSA were created respectively in 1921 and 1945 as Government owned entities composed entirely of Government officials. Their Charters of Incorporation were modified in 1995. Before 1995, the whole of the water supply system was under BWA and the whole of the sewerage system was under BSA. In 1995 the water distribution networks, sewer networks and all 586 sewage-pumping stations were transferred to the municipalities. The

institutional framework for the sector in the Mayoralty of Baghdad is shown in Chart 1-1. *Ref.: Table 1-4: Water and Sewerage Utility Profile in the Mayoralty of Baghdad.*

The estimate of a 314 Mm³ billed supply was provided by the commercial department of BWA, based on records for Year 2000. This figure should be compared to the total water supply which can be estimated at 389 Mm³, based on the efficiency indicator provided by UNICEF, the remaining 19% unbilled supply may reflect commercial losses representing 23% of total UFW.

In the above Table 1-4, the operating income refers to revenue generated by billing water and sewerage services to the users. This does not include land rental and other non-operating revenue, which are registered under accounting code N° 49.

Operating expenditure includes depreciation, but does not include expenses registered under accounting codes 38 and 29. In the nine BM municipality directorates, the main commercial streets are cleaned and solid waste is collected under contract with the private sector. Solid waste concessions are tendered and the contract awarded to the qualified contractor submitting the lowest bid. Commercial institutions are charged according to a pre-defined tariff. The Baghdad Mayoralty receives a fee from the solid waste concession holders. The main commercial streets are cleaner than other streets.

1.4.2 Financial Situation

The Government sets tariffs in keeping with the recommendations of the BWA and BSA. In principle the tariffs are the same as in GCWS. However, the new tariff increase scheduled for January 1,2000 was delayed pending the results of an analysis of water bills over the first semester of 2000, including an evaluation of illegal connections. The new tariffs were not made available for the purposes of the present study. *Ref.: Table 1-5: Summary of Service Connections Served by BWA in Baghdad City*

Only about 10% of the water bill charge is based on actual meter readings, since only about 58 688 service connections are metered out of a total 567,551 billed connections. According to the Commercial Department of BWA, the rate of collection of water and sewerage bills was only 55% to 60%.

In addition to drinking water supply revenues, BWA obtains raw water revenues for the delivery of untreated water to part of the city and for the provision of bulk water services to areas adjacent to the Governorate of Baghdad.

Subsidised interest-free loans are obtained from Government to finance capital expenditure. BWA transfers the proceeds of the sewerage surcharge to the BSA. A share of the revenue from the water and sewerage bills should normally be transferred to the directorates of municipalities to cover their O&M expenditure, but this measure is not properly implemented at present. The operating costs of the water distribution and sewerage systems, including operation of the pumping stations, are deemed to be financed by the municipalities, using BM budgetary allocations.

BWA's 1999 accounts showed that it effectively covered its operating costs, since, at ID 160 million, its net operation income (after deducting operating expenditure before

depreciation) represents 12% of its total operating income. The operating ratio, which expresses the operating expenditure before depreciation as a proportion of the operating income, was estimated at 88%, which is relatively high by international standards, since it is usually recommended to maintain this ratio below 70%.

It should be noted that the 1999 accounts had not yet been audited and this evaluation is based on BWA's best estimates. Reported revenues are estimated by BWA on an accrued basis, regardless of the true BM collection efficiency, they include all water revenues, though part of these revenues should normally be transferred to the municipality directorates, which are supposed to bear the maintenance costs of water distribution pipe network (Dia.<250mm) and the operation and maintenance costs of the sewerage collection and pumping systems. *Ref.: Table 1-6: Baghdad Water and Sewerage Authorities Income Statement for 1999.* BSA registered a net deficit of MID 113 in 1998, representing 22% of the Operating Income.

In 1999, BSA was able to cover its operating costs. It is worth noting however that 48% of the reported income is not recorded as an operating income related to service delivery. Applying the above criteria to BSA activities, the operating ratio would be 103%, which reflects the fact that BSA is subsidised from net water supply revenues and that the sewerage activities are generating enough financial resources to ensure the maintenance and renewal of the existing operating assets.

The consolidated accounts of both BWA and BSA operations were reported to register a Net Operating Income of MID 137.3 in 1999, representing 7% of operating revenue on an accrued basis, which corresponds to an operating ratio of 93%. However, it should be noted that these consolidated accounts do not include the operating expenditure borne by the municipalities, and that the acquisition of treatment chemicals through OFFP is not considered a s operating expenditure in the above statements.

Small capital expenditures are self-financed while larger capital expenditure is financed by grants from Government upon approval of the Planning Commission. In 1999, capital expenditure totalled MID 75 for water and MID 276 for sewerage. *Ref.: Table 1-7 Capital Expenditure of BWA and BSA, borne by BM in 1999 in Millions ID.*

In addition to the above capital expenditure (CAPEX) funded by Government budgetary allocation, the Government through the Oil-for-Food Programs (OFFP) made big investments. For the first seven OFFPs, BM received international goods and equipment for water sector, development for a total value of US\$ 103.4 million.

Capital investment in water works, sewers and pumps accounted for 57.3% of OFFP funded expenditure. Vehicles and other operating equipment represent 33.6% of imported goods. It is worth noting that 4.4% of the installed equipment consists of spare parts for maintenance works and 4.7% corresponds to operating expenditure (treatment chemicals). These costs should normally be entered in BWA and BSA financial statements, which would consequently show considerable operating losses.

According to Planning Commission information, for 2001 the GOI budgeted MID 700 for capital investment in the Mayoralty of Baghdad with the aim of funding rehabilitation works by implementing capital expenditure funded by OFFP allocations. By 1997-2000,

UNICEF had arranged financing for US\$ 2.4 million of rehabilitation works. *Ref.: Table 1-8- Summary of Expenditure Financed under OFFP up to December 2000(in US\$)*

Only a small number of auxiliary vehicles were effectively put into use. Excluding this item, we noted that only three-quarters of the imported equipment supplied to the Mayorality of Baghdad under the seven completed phases of OFFP were actually transferred to the operating units, and the latter had only put into use two-thirds of this equipment.

1.4.3 Manpower

In the Mayorality of Baghdad the number of vacancies represents as 54% of the approved positions, as shown in the following table. There are numerous vacancies to be filled in sewerage due to the low level of Government salaries and the unwillingness of Iraqi personnel to work in the sewerage sector. *Ref.: Table 1-9: Staffing Situation in the Mayorality of Baghdad.* The average annual salary of staff employed by the Baghdad water and sewerage authorities was estimated at ID 307 000 in 1999.

BWA and BSA recruit managerial and technical staff from universities and colleges. BM reported that 552 mayorality staff received in-house training in 1999, while 205 employees received training outside the Mayorality.

The staff from the municipality directorates clean residential streets. As in the other governorates of Iraq, since April 1st 2000, the water bill includes a garbage charge of ID 100 per household.

1.4.1. Institutional and Financial Management Issues

Separation of Water Supply and Sewerage into Two Different Institutions.

In Baghdad Mayorality, the division of responsibility for the water supply and sewerage systems between BWA/BSA for the off-site or large facilities on the one hand and the Municipality Directorates for the networks and pumping stations on the other hand, leads to a fragmentation of responsibility. This results in a lack of coordination, the potential for disputes and confusion in the minds of customers as to which entity is responsible for which service.

This issue will be critical to the efficient management of the UFW reduction programs, which will involve the distribution system as a whole.

Sanctions

The Sanctions slow down the importance of spare parts, treatment chemicals, reagents and transportation means, all required to provide safe water supply and effective sanitation services. They contribute to impoverishing state-owned institutions, civil servants and the population in general. This hinders the hiring and training of staff, the raising of water tariffs, the provision of adequate preventive maintenance and the undertaking of capital expenditure. The water supply and sanitation systems have been in a state of continuous deterioration over the last ten or fifteen years and require urgent rehabilitation. The lifting

of the Sanctions will concentrate sector development and planning functions within the Planning Commission.

Low Level of Metering

The percentage of metered connection, and consequently the percentage of water billed through metered consumption is steadily declining. A flat-water charge would not encourage consumers to save water and would lead to more water wastage, consequently, to over sizing infrastructure and capital expenditure. Flat rates also disadvantage low-consumption consumers. However, the drawbacks associated with increasing the level of water metering are:

- The relatively long time period needed to implement a full metering program. The increased cost arising from misunderstandings and service billing, may not be compensated by the increased revenues and lower material costs.
- The lack of incentive for water directorates to install meters when the household tariff is so low.

Difference Between Domestic and Non-Domestic Tariffs

The non-domestic customer pays more than 20 times more than the domestic customer for the cubic meter of water. Customers who do not clearly belong to either one of these categories are disadvantaged and opportunities are created for cheating. The higher flat-rate for the non-domestic customer, the greater the prejudice to the customer that consumes less. This strengthens the notion of public water supply being a duty of the GOI, domestic customers are entitled to receive water for a symbolic charge.

Cash Operating Deficits

The water revenues do not cover the true operating expenditure. The average water price is too low to cover all material supplies and imported treatment chemicals and spare parts are paid for by GOI.

Garbage Charge on Water Bill

Financing garbage collection through a surcharge on all water bills is not appropriate since the costs of garbage collection are unrelated to water consumption. Garbage collection costs would be better recovered through a special item on the local property tax, as is generally the practice in other countries.

Contracting out Garbage Collection

Only a few cases of formal contracting-out of garbage collection to the private sector have been identified. One example can be found in the Baghdad municipality Directorates. In view of the results achieved in this instance, this practice should be encouraged, with a view to its extension to all governorates.

1.5. Iraq (Excluding the Capital)

1.5.1. Sector Institutional Boundaries and Organisation

In the 15 governorates of Iraq outside the Capital, the provision of water supply and sewerage services in urban and rural areas is the responsibility of the General Corporation for Water and Sewerage (GCWS).

Within each governorate, solid waste management and street cleaning is under the responsibility of a municipality directorate for the capital city of the governorate, and of a separate municipalities directorate covering all the other municipalities of the governorate. The institutional framework in the 15-central and southern governorates is schematised in the following schematic:

The organisation of the water supply and sewerage services is heavily centralized. According to Act N°148 dated August 12, 1999, the former GEWS (General Establishment for Water and Sewerage) was transformed from a Government establishment into a state-owned corporation, with greater financial and administrative autonomy in managing water supply and sewerage. Its role is to provide water supply, sewerage and sanitation services in all of Iraq except the Capital. GCWS is placed under the Ministry of Interior. Its General Director reports to a Deputy Minister for Technical Affairs who oversees the institution. GCWS is entitled to levy user charges, to take out loans and to receive grants. GCWS headquarters are located north of Baghdad.

From headquarters the GCWS General Director oversees General Services and two separate directorates, one for urban and rural water supply, the other for sewerage (when such systems exist) and storm-water drainage, which often collects sewage more or less legally. Pursuant to Act N°148, both directorates are also legal entities. *Ref.: Chart 1-2: General Organization of WES Sector in Iraq excluding Capital.*

The organizational structure of a governorate directorate is the same in all governorates and reflects the structure of the corresponding directorate at Headquarters. All local managers at the district level report directly to the director of the directorate. The local manager at the sub-district level does not report to the district manager but directly to the director, because the district manager lacks administrative resources due to the shortage of staff. This creates a burden for the director of the directorate. *Ref.: Chart 1-3: GCWS Headquarters Organization Chart and Chart 1-4: Typical Organization of a DWS*

In each governorate, a municipality directorate (corresponding to the main city of the governorate) and a municipality's directorate (responsible for the other urban areas of the governorate) manage garbage collection and disposal. All report to a General directorate for Municipalities based in Baghdad, which in turn reports to the Deputy Minister for Technical Affairs in the Ministry of Interior. *Ref.: Table 1-10: Water and Sewerage Utility Profile in Iraq (excluding the Capital)*

1.5.2. Financial Situation

Tariff Setting

Water tariffs are established by the GOI. They are applicable in all the governorates supplied by the GCWS and in the Mayoralty of Baghdad.

Where water meters exist and function properly, water is charged every two months according to the volumes consumed and with the following block tariff structure for households. New rates were introduced in January 1,2000. Tariffs are very low, but service is very poor, since maintenance expenditure is delayed, spare parts are not available in the national market and their purchasing relies on OFFP procedures and frequent daytime power cuts impair operation. Raising tariffs will be difficult as long as there is no improvement in the level of service. *Ref.: Table 1-11: GCWS Water Tariffs for Households in 2000.* Offices are charged at the following tariff rates. *Ref.: Table 1-12: GCWS Non-Domestic Water Tariffs*

However, most of the connections are un-metered. The percentage of water charged through metering is unknown, but it is most probably low. In the Governorate of Nineveh for instance, the percentage of metered water is now about 20 to 25% while before the Sanctions it was more than 40%. In the same governorate, practically no new meters have been installed since the Sanctions. The directorates consider that the water tariffs are so low compared with the cost of metering that is not worthwhile.

In practice, consumption is estimated and billed by a commission according to the following rules: *Ref.: Table 1-13: Estimated Water Consumption of Iraqi Households. and Table 1-14: Estimated Water Consumption for Commerce and Institutions.*

As a result, commerce and institutions are charged far more than households.

Where households are connected to a sewerage system there is no surcharge on the water bill, expect for customers such as coffee-houses and restaurants, who are allowed to dispose of their washing effluents in the storm drainage system.

Starting January 1st, 2000, the DWSs are required to provide financial resources to the newly created sewerage directorates in the form of a monthly transfer, part of their water revenues. This should cover:

- Salaries and incentives for sewerage directorate staff
- Power bills related to the sewerage facilities
- 20% of the water revenues net of salaries, incentives and power cost for both water and sewerage operations

The sewerage directors indicate that the 20% transfer would cover the cost of only temporary labour, leaving little over for heavy maintenance.

The Government is currently examining a proposal to put a 50% or 100% surcharge on all water bills, irrespective of whether the building concerned is connected to the drainage system that would be transferred to the sewerage directorate to finance overdue drainage rehabilitation.

Solid Waste

A garbage fee of ID 100 per household was created on April 1st 2000. It is collected through a surcharge on the water bill rather than a surcharge on the local property tax. It is said that the proceeds of the new tax would be just sufficient to pay incentives to the solid waste staff.

Other Water and Sewerage Revenues

These consist of very moderate connection fees (ID 10 per connection), penalties for illegal connections and customer contributions for distribution pipes. Reconnection fees for customers that have been cut off for unpaid bills and ask to be re-connected have been determined but are rarely applied. Disconnection may occur, but the decision is at the governorate level. Other water revenues are generally low compared to water sales. For instance, in the Governorate of Diyala, other water revenues totalled only 10% of water sales.

The water directorates do not receive revenues for rural water supply since the local communities operate their rural water supply facilities themselves. The directorates do provide assistance however in the case of facilities breakdowns.

The proceeds of the sewerage surcharge are generally very low compared to water revenues (less than 10%) because sewerage systems are very rare.

Billing is prepared manually in the governorates. No bills are sent by post. Instead, bills are presented and payments collected directly by directorate collectors, a procedure which is considered to be faster and easier for the customer. To avoid possible collusion between collector and customer, collectors' rounds are rotated periodically. The collection rate for 1999 is good since it reaches about 92%, as calculated from the amount of unpaid bills.

Accounting

Accounts are computerised at headquarters, based on input data provided by the directorate at the governorate level. In 1999, there were no separate accounts for sewerage. Accounting is still in the transitional stage from Government cash accounting to commercial accounting and is still rudimentary. No cash-flow statements are prepared. The amounts shown in the accounts as water revenues are not the billed amounts but the billed amounts that have been effectively collected. Unpaid billings are not shown in the accounts, as water revenues are not the billed amounts but the billed amounts that have been effectively collected. Unpaid billings are not shown in the accounts but are recorded separately from the formal accounts. This does not allow the collection rate to be calculated from the accounts. Depreciation of assets is used but the assets are not periodically re-valued. Consequently, depreciation amounts are not sufficient to finance the replacement of assets. Finally, when imported assets (such as vehicles, excavators) are incorporated in the list of assets, their costs are entered using the official rate and the non re-evaluation of assets means that the asset values posted do not reflect the true situation.

Although a tentative commercial accounting system exists at Headquarters, the accounting performed in the directorates is cash accounting. No statement of revenues and

expenditures is prepared at governorate level. The water supply directorates transfer 10% of their revenues to the GCWS Headquarters' account. The remaining revenues are kept in a local account. Spares and equipment received from Headquarters through the Oil-for-Food Program are not recorded as expenditure at the governorate level. Directors aim to cover their operation costs by water revenues while depreciation on re-valued assets and materials provided free of at a subsidised cost by central Government subsidies. GCWS Headquarters usually makes up cash deficits of decentralised directorates whenever these occur.

Income Statements

In 1998 and 1999 GCWS had a net operating deficit of respectively US\$ 0.33 million and US\$ 0.45 million, equivalent to about 13% of total expenditure in each of these years. The 2001 budget is compared to 1998-99 accounting records in Table 1-15

To finance its 1998 and 1999 operating deficits, GCWS temporarily made use of Government funds allocated for new investments; by reducing the scope of budgeted projects it was able to re-allocate the resultant savings.

It is to be noted that most of the spare parts and chemical purchases are paid for under the OFFP and entered in GCWS financial statements at a highly subsidised rate of ID 0.3109 per US\$ compared to the ID 1 850/US\$ market price and even the ID 100/US\$ price under protocol arrangements with certain countries. This results in low depreciation costs for the directorates. *Ref.: Table 1-15: GCWS Income and Expenditures Statement and Budget in Current MID*

Capital Expenditure

Since 1996, most of the capital expenditure was financed by the Oil-for-Food Program under 6- consecutive months in the MOUs.

In 1999, the local capital expenditure cash component amounted to ID 2 954 million. This was financed under the Government investment budget prepared by the Planning Commission. Most of the expenditure was related to deferred maintenance.

In 1999, in the Governorate of Nineveh, the local capital expenditure cash component amounting to ID 230 million was actually allocated to replacement operations.

During the period 1997-2000, rehabilitation works amounting to US\$ 3.2 million were executed, funded by UNICEF and OFFP supplies.

In addition, US\$ 61.8 million were deployed by the water and sewerage directorates, including US\$ 6.8 million in treatment chemicals. This amount represents 82% of the total imported material distributed to on-going projects in the directorates under GCWS administration. Less than 30% of the sewerage pumps were installed in December 2000, while more than 90% of the other equipment was implemented.

It is to be noted that a large part of the equipment requiring transport and logistical support could not be delivered to operational units: 70 % of auxiliary vehicles, 69% of power generators, 75% of pipe networks, 74% of water spare parts were still awaiting delivery at the governorate level. *Ref.: Table 1-16: Summary of GCWS Expenditure financed under OFFP up to December 2000 in US\$*

Municipalities

The municipality directorates are financed through budgets channelled through the Ministry of Interior. Solid waste management in some cases accounts for a major part of the total directorate budget. However, where the municipality has a large number of parks and entertainment and tourist attractions, this may not be the case. Municipal revenues other than those derived from the Ministry of Interior budget are limited. Industry may be charged for removal of their waste.

Very little investment expenditure can be afforded and would require the approval of the Planning Commission. Limited machinery (such as garbage collectors, graders, sewage emptier to clean swamp areas) was received under the OFFP but goes little way towards meeting the needs.

1.5.3. Human Resources

GCWS is short of higher-level management staff. At governorate level, the staffing of the water supply directorate considerably outnumbers the staffing of the sewerage directorate. GCWS regional directorates have difficulty in recruiting staff at the governorate level, due to the low level of the Government salary scale and in the case of the sewerage directorate, due to the unwillingness to work in this sub-sector. *Ref.: Chart 1-5: Distribution of GCWS Personnel.*

GCWS employs 11 044 permanent staff, which represent 55% of the positions, created for the operation of the Corporation.

The average age of the staff is on the high side and the number of staff retiring is high. The vacant positions are relatively senior. The shortage is more keenly felt among the technicians and managerial categories. The directorates attempt to mitigate shortages of permanent staff by contracting out part of the maintenance work and by hiring temporary staff. The temporary staff, mainly in the labourer and technician categories, are paid rates above Government levels. *Ref.: Table 1-17: Staffing Structure of GCWS Head Office. As well as, Table 1-18: Staffing Structure of Regional DWS*

Monthly premiums are paid to staff as incentives but these are limited in value. For technicians, the premium was about ID 10 000/ month but was recently raised to ID 20 000/month. This reduces pay differences between permanent and temporary staff. *Ref.: Table 1-19: Staffing Structure of Regional Directorates of Sewerage*

Training

Since the 1991 war, GCWS staff only received limited training. The CARE International NGO, through UNICEF, provides three-day training courses in one of the small training centres shared between adjacent districts in each governorate. The courses focus on basic operating skills, such as the use of pumps and chlorinators. The training courses are very useful but quite inadequate compared to the needs.

In the municipalities, the staff responsible for solid waste management also perform street cleaning, since in the local context, the two activities are closely connected. The permanent

staff for both activities represents nearly 20% to 25% of the total local directorate staff. However, solid waste management and street cleaning activities require the hiring of daily labour that may triple the permanent staff assigned to the activity. Lack of equipment and low salary levels often make it difficult to ensure the task satisfactorily. In Diyala Municipalities Directorate, 80% of the machinery was reported to be out of order. The directorates may also contract out garbage collection and street cleaning to private contractors, with approval from the Governor. In addition, residents who can afford to do so tend to informally appoint third parties to clear away the garbage in front of their door.

1.5.4. Institutional and Financial Management Issues

Centralisation of the Water Supply and Sewerage Institutions in the Iraqi Governorates

In the Iraqi governorates, the management of water supply and sewerage institutions is highly centralised. International experience tends to demonstrate that local water supply and sewerage systems are better managed when they are operated by autonomous institutions overseen by local authorities. The disincentive against full-blown decentralisation is the economy of scale lost by not sharing qualified managerial and expert human resources.

A compromise might be to promote gradual decentralization by encouraging a few governorates to establish a common corporation for both water supply and sewerage. In Iraq, GCWS Headquarters might progressively be restructured into a sector regulator with responsibilities for sector planning, coordinating the implementation of sector policies and investment programs as long as these powers are retained by the Government.

The regional directorates are responsible for balancing operating expenditure and revenues in accordance with a national tariff structure. Their performance should therefore be evaluated with respect to their efficiency in operating and maintaining public facilities, whereas Headquarters are responsible for developing new infrastructure to meet countrywide service requirements. The compromise consisting of splitting up the sector institutions into regional agencies should therefore focus on the sector planning functions of Headquarters.

Storm Water System under GCWS

In the Iraqi governorates, having the urban storm water drainage systems under the responsibility of the GCWS may create problems. Storm water drainage is closely linked to road maintenance and construction has more in common with water sector activities. Sewage production is closely linked to the amount of water consumed and should be charged for accordingly, while drainage costs are normally recovered through local property taxes. It would be more appropriate to put the storm water system under the responsibility of the municipality directorates, who are already in charge of roads and solid waste management.

However, as long as the municipality directorates are not capable of performing drainage services, the GWSC will still be required to provide technical assistance and maintenance services.

Sanctions

The Sanctions slow down the importation of spare parts, treatment chemicals, reagents and the means of transportation required to provide satisfactory water supply and sanitation services. They contribute to impoverishing Government owned institutions, civil servants and the population in general. This hinders the hiring of staff, the raising of water tariffs, the provision of preventive maintenance and the undertaking of proper capital expenditure. The water supply and sanitation systems are thus generally in a state of deterioration.

Low Level of Metering

Since the imposition of the Sanctions, the percentage of metered connections, and consequently the percentage of water charged through metered consumption is steadily declining. A flat-water charge fails to encourage the consumer to save water, and leads to water wastage. The use of a flat rate also disadvantages low-consumption consumers. The argument against increasing the level of water metering is:

- The relatively long period of time needed to implement a full metering program
- The lack of incentive for water directorates to install meters, when the household tariff is so low

Difference between Domestic and Non-Domestic Tariffs

The non-domestic customer ends up paying 20 times more than the domestic customer for cubic meter of water. Customers who fail to fall clearly into either category are disadvantaged and opportunities are created for cheating. The higher the flat rate for the non-domestic customer, the greater the prejudice to the customer that consumes less.

Cash Operating Deficits

Water revenues do not cover the true operating expenditure. This is a matter of concern as long as chemicals supplies and spare parts are procured with Government subsidies (principally through OFFP arrangements). The local directorates are not motivated to spend money on improving efficiency by properly maintaining the existing facilities, it is worth noting that under the current management regulations, it is more cost-effective to replace equipment than to maintain the good condition of existing facilities. The average water tariff is usually too low to support maintenance costs.

Financing of the Sewerage Directorate

Asking water directorates to pay for salaries, incentives and power bills of the sewerage directorates does not motivate the latter to save costs on staff and power. It runs counter to the benefits obtained from the separation of water supply and sewerage. The proposal to finance the sewerage directorates, which are in fact involved mainly in storm water related activities, through a surcharge on all water bills is not appropriate since the cost of drainage is unrelated to water consumption. Drainage costs could be better recovered through a special item on the local property tax bill, as is generally the case in other countries.

However, as long as the municipal finances are unable to support drainage operation, it is worth noting that storm water flows usually remain very low and storm water drains act as an effective sewerage system where there is no separate system. In these cases, the maintenance of storm water systems should be placed under the responsibility of the sewerage directorates.

As sewerage services (operation and maintenance activities) are paid for by the water user, it is worth noting that customer management, including billing and revenue collection in compliance with the national tariff structure, should be centralised at the governorate level within the DWS. Sewerage services are closely linked to water supply activities, the separation of water supply and sewerage activities reflecting only a technical division of tasks. Both technical departments should be required to achieve specific levels of productivity in accordance with the national tariff structure.

Instead of creating two separate directorates at the governorate level for water supply and sewerage respectively, it might be advisable to merge these into single water and sewerage directorate with centralised administration and customer management services and two separate technical departments, with separate budgets and expenditure entry systems, specific performance and productivity targets.

Garbage Charge on Water Bill

Financing garbage collection through a surcharge on all water bills is not appropriate since the cost of garbage collection is unrelated to water consumption. Garbage collection costs would be better recovered through a special item on the local property tax bill, as is generally the case in other countries.

Contracting out Garbage Collection

Only a few cases of formal contracting out of garbage collection to the private sector have been identified. One example can be found in the Governorate of Diyala, at least for the main commercial streets. The good results achieved in this case should encourage the extension of this option to all governorates.

1.6. Autonomous Region in the North of Iraq (ARNI)

1.6.1. Sector Institutional Boundaries

The Autonomous Region in the North of Iraq, is administrated by two different authorities. The Erbil and Dohuk governorates are administrated by a local authority controlled by the PDKI party, while Sulaymaniyah Governorate is administrated by a separate local authority, controlled by the PUK party. Each local authority has its own organisational structure. There are therefore organisational differences in the water supply, sewerage and solid waste sectors run by the respective authorities.

In each of the autonomous governorates, urban water supply and sewerage are under the responsibility of a Directorate for Water and Sewerage (DWSE) placed under the supervision of the Office of Municipalities and Tourism. Rural water supply and sanitation is under the responsibility of a Directorate of Reconstruction and Development (DRD) under the Office of Reconstruction and Development (MRD) in the Erbil and Dohuk

governorates, and a Directorate of Works and Reconstruction (DWR) under the Office of Works and Reconstruction in Sulaymaniyah Governorate.

The municipality directorates control solid waste management and cesspit emptying. While in both Erbil and Dohuk governorates there are two-municipality directorates, one for the governorate capital and another for the other urban areas of the governorate-in Sulaymaniyah Governorate, the municipality directorate is responsible for all urban centres including the governorate capital. The institutional framework in the autonomous governorates is schematised in the charts hereafter.

The organisational charts of the water and sewerage directorates show two separate divisions, one responsible for revenue collection and the other for operating expenditure. Normally, the manager responsible for financial aspects should head both sections. This organizational structure reflects the lack of any correlation between water revenues, which are collected by local authorities through their tax offices, and expenditure, which depends on subsidies allocated by the local authorities. *Ref.: Chart 1-6: Organization of the Sector in Erbil and Dohuk Governorates*

Since only Sulaymaniyah City has any kind of sewerage system, most of the directorates' activities concern water supply to urban centres. Their involvement in sewerage is consequently very limited, particularly considering that even though some water customers may be illegally connected to the drainage system, they are not responsible for the municipal drainage system.

The directorates in charge of rural water supply and sanitation also have a responsibility for rural infrastructure including, schools, dispensaries, roads and bridges. They were created by decree in 1992. They do not have responsibility for rural water supply systems, which are operated by local communities. They do however, carry out repairs and the replacement of equipment as well as the responsibility for implementing new projects. Sanitation services consist mainly in the reconstruction of pit latrines. *Ref.: Table 1-20: Sector Utility Profile in the Autonomous Region in the North of Iraq*

In the rare cases where a rural water system serves several villages, there is no formal arrangement between villages for establishing a common operating entity. The municipal directorates responsible for solid waste management and cesspit emptying are also in charge of street cleaning, drainage systems, road maintenance, and in the main urban centres, parks, roads traffic engineering and slaughter houses. This organization differs from that of the 15 governorates of Iraq where municipal drainage systems are not under the municipality directorates but under a separate sewerage directorate. While in the main urban centres emptying of septic tanks and cesspits can be performed by private contractors, these are not available in semi-urban areas. Consequently, in the semi-urban areas the municipality directorate is the only entity involved in emptying septic tanks and cesspits.

1.6.2. Financial Situation

1.6.2.1 Water and Sewerage Tariffs

No water meters are used; the water supplied is generally billed every two months according to the surface area and number of taps in the house. There is no uniform tariff structure throughout the governorates. Tariffs are quite different to those found in the rest of Iraq, which is unsurprising since the Northern Iraqi Dinar (NID) is worth far more than the normal Iraqi Dinar (US\$ =18 Northern Iraqi = 2000 Iraqi Dinar in July 2000). Sewerage exists only in Sulaymaniyah where a sewerage surcharge of 100% is applied to those connected. Current water tariffs are given in the following table: *Ref.: Table 1-21: Water Tariffs in Urban Areas in the Autonomous Region in the North of Iraq*

1.6.2.2 DWSE Financial Management

Accounting

Accounts are kept in each governorate in accordance with the cash accounting procedure used by local authorities, but without any differentiation between operating and investment expenditure. However, it should be noted that beyond the projects implemented through the OFFP, there has been practically no capital expenditure over the last few years. The directorates do not keep records of the costs of materials and equipment received through the OFFP. The local authority sometimes pays electricity and fuel bills, though there is no proper recording of this in the directorate's accounts. In the Erbil Water Directorate, bills for electricity supplied by the rival local authority in Sulaymaniyah go unpaid. There is no depreciation on re-valued assets. This undervalues the true operating costs. Directors at the governorate level do not have proper accounting procedure to determine what extent operating expenses are covered by revenues.

The sector directorates have no financial autonomy. Contrary to the water supply directorates in the Iraqi governorates (Excluding the Capital), the water supply directorates in the autonomous governorates have no control on their revenues. Revenues are collected by the local authority treasury. In exchange, the directorates receive monthly allowances from the office of finances, free equipment from the OFFP and in some cases emergency funds for urgent works. The directorates for water supply and sewerage see no relation between the amounts they collect from water bills and the monthly allowance from the office. Accordingly, there is little motivation to bill and collect properly. At the end of the year, a supplemental allowance is sent by the office finances to cover all expenditure not covered by the monthly allowance. For instance, in Sulaymaniyah Governorate, water revenues for 1999 were only about 64% of the total operating expenditure of about 13.4 million northern ID.

1.6.2.3 Financial Rural Water and Sanitation

The directorates do not charge for services provided to the local communities. The consumers in the local communities share routine operating costs and the costs of staff placed under the control of the head of the village. The OFFP provided first materials and later full project construction assistance for new projects through UNICEF, WHO and UN-

HABITAT. Various local NGOs are also involved in rural water supply and sanitation. Annual expenditure for new projects is not recorded at the level of directorates.

The municipality directorates have very limited revenues of their own. These consist of fees from renting shops and for collecting solid waste from commerce and industry. These revenues are collected directly by the local authority Treasury and the directorates have no control over the allocation of their resources. For running expenses, the directorates receive a monthly allowance from the Municipality and Tourism Offices. Operating expenditures for solid waste management, including street cleaning, constitute the major part of total expenditures in the governorate capital city, and a lesser part in the directorates for semi-urban areas (see following table). This is because garbage is less in semi-urban than in the main cities. *Ref.: Table 1-22 Solid Waste Activity in Municipal Directorates*

For capital expenditure exceeding a certain threshold (NID 30 000 for Erbil Governorate), a special allowance obtained from the office of finances. Annual expenditure for new projects is not records at the level of the directorates.

Staff used by local communities to operate the rural water systems, receive very limited training but do not strictly belong to the sector or take their orders from sector professionals. This leads to poor maintenance of the facilities. Considering the numerous activities of the directorates and the fact that they are not involved in the operation of rural water systems, the percentage of their staff involved in the sector is relatively small. In Sulaymaniyah Governorate, sector staff account for 150 of a total staff of 1620, i.e. only about 9%.

The average age of the staff in directorates for water and sewerage is high (48 years on average). This is due to the high average age of the workers (50 years in the Dohuk and Sulaymaniyah Directorates). Training of staff in the three main governorates is highly inadequate, since it averages only 3.8 staff-weeks for 100 staff, as shown in the following table. *Ref.: Table 1-23: Directorates of Water and Sewerage. Staffing and Training*

The staff in charge of solid waste management cannot be separated from street cleaning activities since, in the local context; the two activities are closely linked. Although solid waste collection and disposal in uncontrolled landfills involves only a small percentage of the permanent staff of directorates, these activities generally require the hiring of a considerable number of temporary staff. Including temporary staff, solid waste management generally accounts for major percentage of total staff of directorate. For instance in the case of Erbil Municipalities Directorates, permanent solid waste staff number 78 i.e. 10% of a total permanent staff of 783, while temporary solid waste staff of a total of 5000. However, this pattern is not the case in the Sulaymaniyah Directorates where 99% of solid waste staff are permanent. The solid waste staff do not effectively receive training (two weeks of training for the Dohuk Municipality directorate)

1.6.3 Institutional and Financial Management Issues

Total financial dependence of water and sewerage Directorates in the Autonomous Governorates, prevents the directorates for water and sewerage from using the water revenues they collect to cover their expenditure and does not encourage them to sell more

water and to improve revenues collection. There is no incentive to control costs, leading to a situation, which is not conducive to gains in productivity

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