

# **Indicator Report**

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## **Supply and Demand for Water in Jordan**

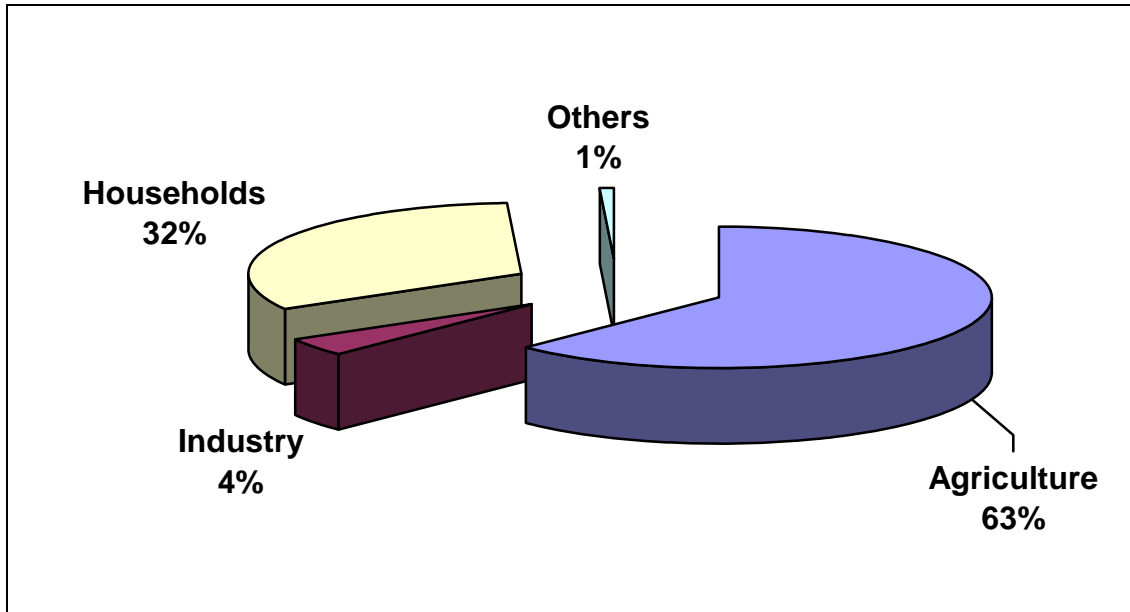
The renewable and obtainable quantity of water in the Arab World is estimated at 265 billion cubic meters annually. The annual per capita of water supply is 846 cubic meters which is below the water poverty line amounting to 1000 cubic meters. This proportion is expected to diminish to less than 500 cubic meters.

Meanwhile, the per capita of water supply in Jordan amounts to 148 cubic meters only, while it reaches 1028 m<sup>3</sup> in Syria and 2172 m<sup>3</sup> in Iraq. This shows the extent of water poverty in Jordan (ESCWA Report, Volume One 2006). The limited water resource in Jordan is one of the major problems facing the economic development, particularly the Agricultural Sector which is consuming the largest quantity of water. The volume of rainfall in 2005 was 9.30 billion cubic meters where the percentage of evaporation reaches 93.9%, therefore the quantity of renewable fresh water is estimated at 680 million cubic meters, while this figure reaches 10.000 million cubic meters in Syria.

Jordan has faced an increasing demand for water during the last years in all sectors accompanied by shortages in water resources which have been covered by underground water. Accordingly, the use of underground water has exceeded the safe limit in most of the years. The safe draw out amounted to 294 million cubic meters, while total draw outs for multiple uses in 2005 amounted to around 506 million cubic meters. This shows the extent of continuous underground water depletion which will lead to its exhaustion.

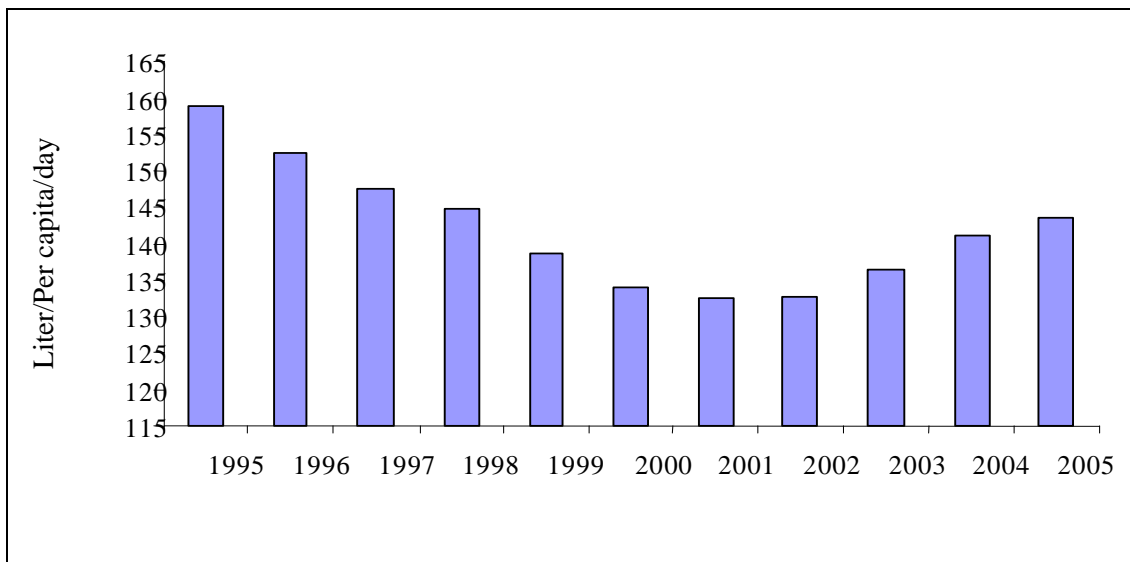
In the sphere of the water uses by sectors, the uses of water have increased by 36% from 639 in 1985 to 865.9 million cubic meters in 2004. The Agricultural Sector was the largest user at 62.4%, followed by the Municipal Sector (household uses) at 32.4%, while the share used by the Industrial Sector was 4.4% and other sectors including livestock raising was 0.8%.

Therefore, pressure on water resources and the need for water for various purposes should be accompanied by planning the resources for achieving and equilibrium between the current needs for resources and the sustenance of these resources for generations to come.



**Figure 1.1: Percentage of Used Water by Sectors, 2004**

The ever increasing population leads to an increase in pressure on the available drinking water resources, thus affecting the daily per capita of water supply. The results have shown that the quantity of water supply has decreased from 158.1 liter/ per capita/day in 1995 to 131.6 liter/ per capita/ day in 2001. The quantity of water supply has increased again to 143.5 liter/ per capita /day in 2005.



**Figure 1.2: Per Capita Water Supply, 1995-2005**

There is a continuous tendency towards using sewage water as a replacement to conventional resources in certain purposes and for reducing pressure on these resources. The use volume of treated sewage waters has increased

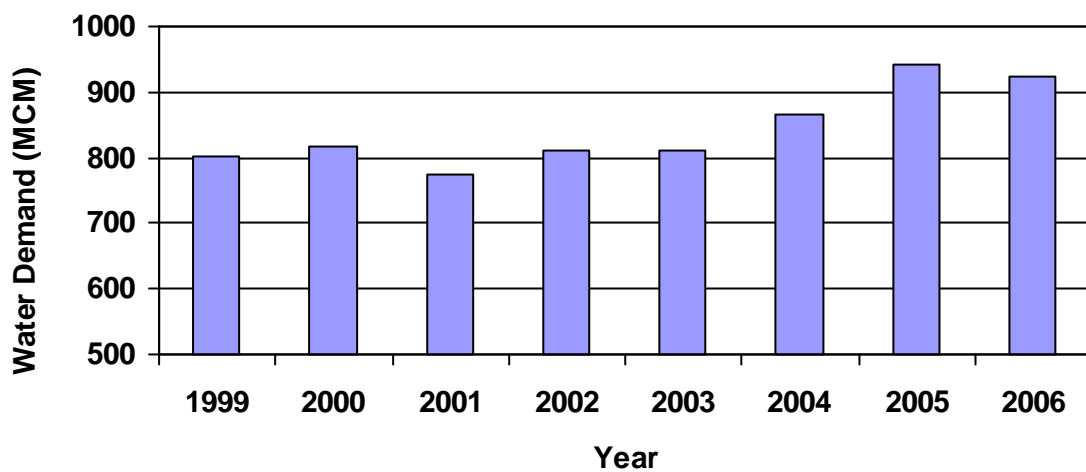
from 75.4 million cubic meters to 86.4 and 83.6 million cubic meters in 2004 and 2005 respectively. On the other hand, the continuous increase in population leads to increasing the pressure on the sewage treatment plants which has a negative effect on the quality of treated water, reducing its uses for irrigation purposes.

In view of the limited water resources in Jordan, care devoted to water quality is improving. In the year 2005, there was a considerable improvement in water quality control. The percentage of non-conforming samples (the germs wise) was 0.76% compared to 1994 where the percentage was 2.1%, which indicates the existence of control and follow up on the quality of used water. It is noted also that attention is paid to the chemical features of water more than the physical features.

Laboratory results have shown that most of the contradicting samples are concerning physical features of water such as color, turbidity and total water hardness.

### Overall demand for water

The demand for water is increasing for all purposes, resulting from the rise in the number of population over time and the vertical and horizontal expansion of the productive sectors in Jordan. Figure (1.3) shows that there is an increase in water supply for different purposes between 1999 and 2006, approximately by 108.07 MCM with a percentage change of 13%. The increase in demand for water has not been accompanied by the provision of alternative sources. Most of demand increase was met through depletion of available sources particularly groundwater, the redistribution of water among different sources, or the use of treated wastewater. For example, there has been recently a trend to use water of good quality for domestic purposes despite the costs of pumping to the targeted areas, while using lower quality under for agricultural purposes.



**Figure 1.3: Demand for Water by All Sectors (1999-2006).**

Source: Ministry of Water and Irrigation

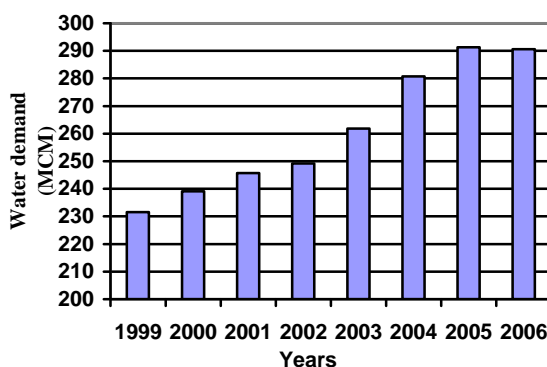
## Sectoral demand for water

The household sector is a priority sector in the provision of water in Jordan. Water demand in this sector is directly linked to the size of the population and expansion in services and tourism sectors in Jordan. Therefore, there is a steady increase in demand for water in this sector compared to other sectors (Figure 1.4). The increase in demand of the household sector exceeded 30 MCM since 1990. The percentage of increase reached about 25.5% in 2006 compared to 1999.

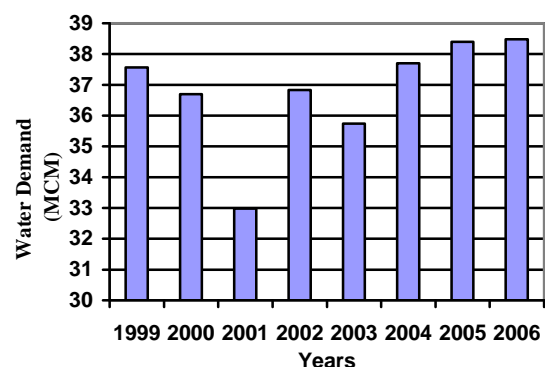
Data indicate more fluctuations in water demand in the industrial sector. As the difference between the lowest value of demand for water and the highest is nearly 5 MCM. This fluctuation is linked to the size of activity in a small number of industries that use large quantities of water in the mining industries. In addition, there is awareness of the issue of water scarcity in Jordan, inducing factories to treat the used water in industry to be reused for other purposes such as for forestation. Most of water used in the industrial sectors is extracted from ground water of private wells.

The highest demand for water among the various sectors in Jordan is by the agriculture sector. Data shows that there is a considerable fluctuation in the amount of water available for agriculture. The reason for this is the diversion of water for other uses especially the domestic uses. The difference between the lowest supply of water and the highest in the period 1999 to 2006 is 115.91 MCM.

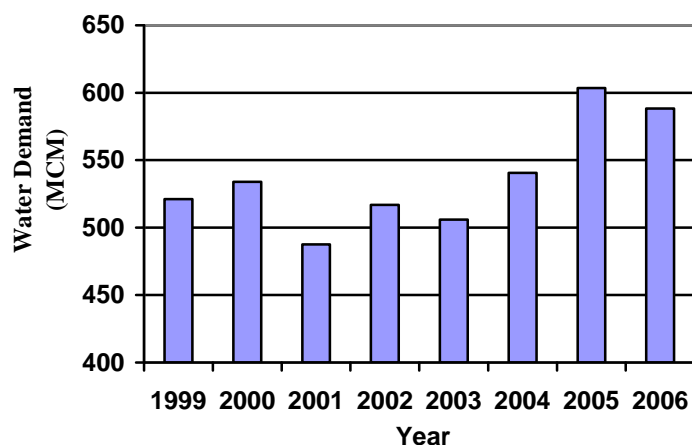
The gap between water supply and demand for the agriculture sector is very high, prompting search for untraditional sources of water to bridge the gap. In the recent years, the government started to mix the treated wastewater according to specific criteria with other freshwater to meet the increase of water demand in agriculture sector. Crop patterns application was one of the strategies implemented by the government to decrease the demand of water in the agriculture sector. Also decreasing the areas planted with high water requirement crops such as melon was another alternative to decrease water demand in the agriculture sector.



a. Household sector



b. Industrial sector



c. Agricultural sector

**Figure 1.4 Demand for Water by Type of Sector**

Source: Ministry of Water and Irrigation

**Table 1.1: Fresh Water Demand 1999-2006 (MCM).**

Year	Total Demand	Change Percentage
1999	801.44	--
2000	817.15	1.96
2001	774.07	-3.41
2002	809.77	1.04
2003	810.14	1.09
2004	865.90	8.04
2005	941.00	17.41
2006	925.22	15.45

Source: Ministry of Water and Irrigation

**Table 1.2: Fresh Water Demand for Domestic Uses 1999-2006 (MCM).**

Year	Total Demand	Change Percentage
1999	231.50	--
2000	239.04	3.26
2001	245.65	6.11
2002	249.23	7.66
2003	261.82	13.10
2004	280.80	21.30
2005	291.30	25.83
2006	290.58	25.52

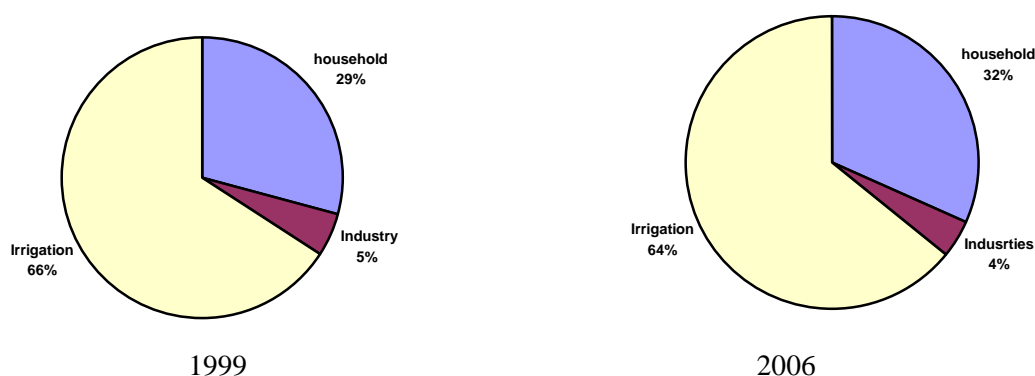
**Table 1.3: Fresh Water Demand for Industrial Uses 1999-2006 (MCM).**

Year	Total Demand	Change Percentage
1999	37.57	--
2000	36.70	-2.32
2001	32.98	-12.22
2002	36.83	-1.97
2003	35.74	-4.87
2004	37.70	0.35
2005	38.40	2.21
2006	38.48	2.42

**Table 1.4: Change of Demand for Fresh Water for Agricultural Uses 1999-2006 (MCM).**

Year	Total Demand	Change Percentage
1999	521.09	--
2000	534.00	2.48
2001	487.59	-6.43
2002	516.87	-0.81
2003	505.94	-2.91
2004	540.60	3.74
2005	603.50	15.81
2006	588.34	12.91

As for The share of the different sectors in overall water demand, changed slightly over years. In 1999, the percentage of water supply for the agriculture sector forms 66% of the total water supply, declining to 64% in 2006 to meet the shortages of water, while the supply for the household uses increases from 29% in 1999 to 32% in 2006. The share of the industrial sector decreased slightly from 5% in 1999 to 4% in 2006 (Figure 1.5). This indicates the usage of the good quality water sources for the household use as being one of the priority sectors compared to agriculture. Also, this indicates that the increase of demand of water by one sector is met partially through the redistribution of the available sources of water.

**Figure 1.5: The Distribution of Water Supply by Sector (1999-2006).**

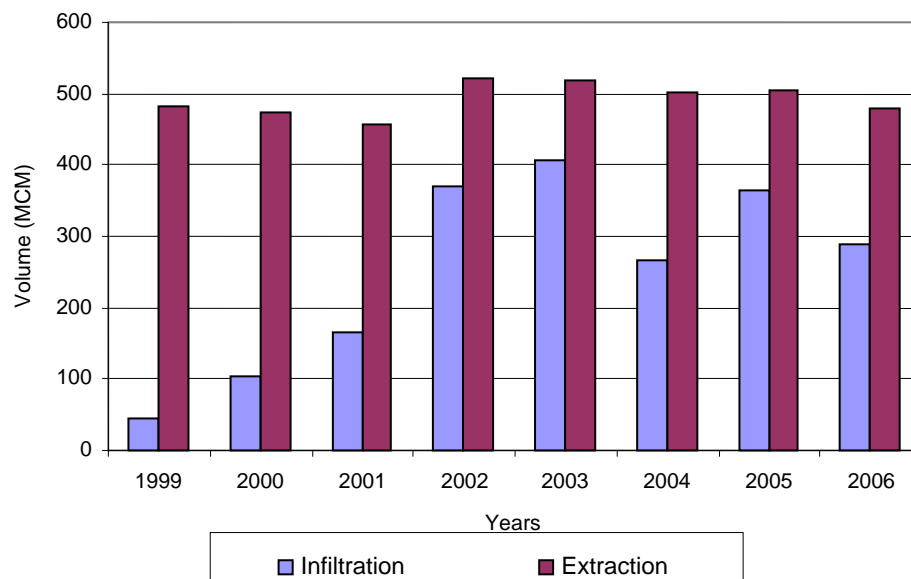
Source: Ministry of Water and Irrigation

## Pressures on water supply

The results of the comparative figures reveal that the supply of water does not match the effective demand for water by the different sectors. Despite the increase of water supply for the municipal sector, the amount of water per capita per day is below the international standards. Moreover, the supplied amount of water for agriculture sector does not meet the demand to plant the arable lands.

In Jordan, there are two types of groundwater; the renewable and the non-renewable groundwater. Extension pumping of groundwater is depleting water from this source. That is why the use of such a source should be subject to vigorous oversight in order to prevent its draining in a short period of time. In Addis water basin, which is a non-renewable ground water, high amounts pumped for agricultural purposes.

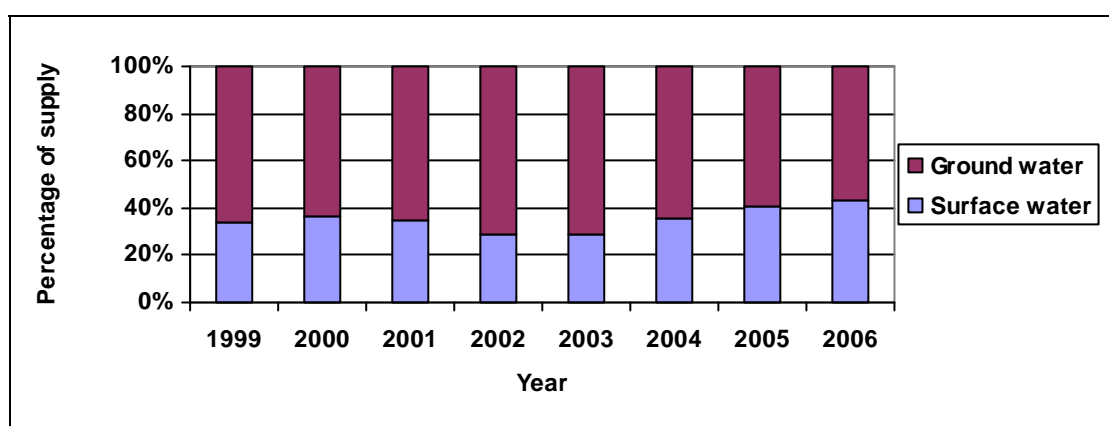
Data show that the volume of water infiltrated to the groundwater was less compared to the volume of extraction over years (Figure 1.6). In dry seasons, where the amount of infiltrated water to the groundwater is small, the percentage of depletion for the groundwater source is very high. In years 1999 through 2006, the amount of abstracted water exceeded the volume of groundwater feeding. The average percentage of abstraction to the volume of infiltration was 326.3% during 1999-2006. In the last years the percentage decreased to reach 140.8% in 2002 and 166.13% in 2006.. This indicates that in most areas, the usage of groundwater exceeds the safe yield. Such depletion of this source is a result of the increasing demand on water in the different sectors. This will also reduce the productivity of wells and decrease water quality. Therefore, the governmental policies related to groundwater should consider the infiltration volumes to determine the allowed quantities of abstraction to reserve sources and quality.



**Figure 1.6: Annual Recharge and Discharge of Groundwater (M.C.M).**

Source: Ministry of Water and Irrigation

The pressure on all water sources practiced is inevitable to meet the requirements of water demand. Figure 1.7 shows that the pressure on groundwater is very high compared to the pressure on surface water. It shows that the use of groundwater compared to surface water increased in the last years. The percentage of using groundwater to surface water increased from 41.2% in 2002 to 76.2% in 2006. Groundwater use decreases in the rainy seasons, where the surface water is more available. In dry seasons, the pressure on groundwater increases to meet the requirements of water demand. In general, the high pressure on groundwater and extensive abstraction led to poor groundwater quality in different areas. The pressure on groundwater is higher because many farms and different industries depend on their private wells to provide the required amounts of water to run their activities.



**Figure 1.7: The Pressure on Surface and Groundwater Sources to Meet the High Demand (1999-2006).**

### Household Expenditure on Mineral Water, Water and Sewage

Table 1.5 shows a significant rise in the average annual household expenditure on mineral water and water and Sewage by Place of Residence and Sex of Household Heads for 2003 and 2006..

**Table 1.5: The Average Annual Household Expenditure (in JDs) on Mineral Water, Water and Sewage by Place of Residence and Sex of the Headship, 2003 and 2006**

Place of Residence	Sex of Household Heads	2003		2006	
		Mineral Water	Water and Sewage	Mineral Water	Water and Sewage
Urban	Male	3.3	42.5	8.1	72.2
	Female	4.8	46.5	7.5	68.4
Rural	Male	0.9	47.9	1.4	75.6
	Female	0.7	46.4	2.4	68.2

\*Source: DoS Household Income and Expenditure Surveys 2003, 2006

It is noted that the average annual expenditure on mineral water between 2003 and 2006 has increased for the female headed households in urban areas from JD 4.8 to JD 7.5. Additionally, the average annual expenditure on mineral water has increased from JD 0.7 to JD 2.4 for the two years respectively in rural areas too. As for households headed by males in urban areas, the average annual expenditure on mineral water has increased in 2006 three times compared with 2003 while in rural areas, it has increased from JD 0.9 in 2003 to JD1.4 in 2006.

The reason for this increase in the average annual expenditure on mineral water is attributed to the increasing awareness of citizens and caring to the quality of available water. Furthermore, there is a steady increase in demand for mineral water in Jordan. This is due to the improvement in the level of expenditure patterns associated with the development of the economy and the increasing level of welfare of the society which in turn expand households consumption of non-basic goods after covering the basic needs at lower levels of income. It is a normal process experienced by societies in their development stages.

The data in the table 1.5 also shows that there was a substantial rise in average annual expenditure of female headed households of water and sewage in urban and rural areas between the two years, where this average has risen from JD 46.4 in 2003 to JD 68.2 in 2006. Also, there was a remarkable rise in the average consumption of water and sewage for the households headed by males in urban and rural areas between 2003 and 2006 where the average has risen from JD 42.5 to JD 72.2. In rural areas, the average has risen from JD 47.9 to JD 75.6 for the two years respectively. The reason for the remarkable increase in the average expenditure on water and sewage is attributed directly to the increase in population and expansion in services.