No.

JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF WATER AND IRRIGATION
THE HASHEMITE KINGDOM OF JORDAN

THE STUDY ON WATER RESOURCES MANAGEMENT IN THE HASHEMITE KINGDOM OF JORDAN

FINAL REPORT VOLUME VIII

SUPPORTING REPORT FOR

PART-A WATER RESOURCES MANAGEMENT MASTER PLAN

CHAPTER 11 VISUALIZATION OF WATER RESOURCES MANAGEMENT MASTER PLAN

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The Study on Water Resources Management in the Hashemite Kingdom of Jordan

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PART-A "WATER RESOURCES MANAGEMENT MASTER PLAN"

Chapter 11 Visualization of Water Resources Management Master Plan

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Data Visualization System Documentation

1. Introduction

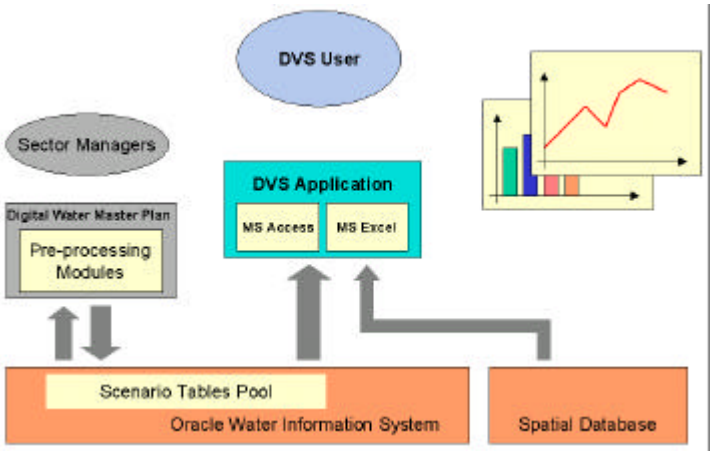
The Ministry of Water and Irrigation (MOWI) in Amman is dealing with a large volume of detailed data for the water sector. Water relevant data includes various different data types such as construction data on wells, pipelines, economic data, time series (monitoring) data and spatial data. Simulated or projected data for periods in the future make the list complete.

Fortunately the non-spatial data is almost exclusively stored in the Oracle WIS database in a consistent manner, so that the data management is transparent and the development of tools for further processing is possible. Visualizing this data can be done using the Oracle WIS software, standard MS Access database, MS Excel or ArcView. Unfortunately the data aggregation is very complex and the user needs to have expertise in SQL and one of the mentioned programs.

The spatial database is using the ESRI data formats, shapefiles and Arc/Info coverages. All water relevant spatial objects were digitized and stored in the database in vector format. The coding of the objects is the same consistend coding scheme as it is used in the Oracle WIS. Additionally, topographic information was added to the database for the compilation of maps. All spatial data is stored in the same co-ordinate projection JTM (Jordan Transverse Mercator). Exchanging spatial data with other organizations sometimes needs co-ordinate transformations as the Palestine Grid is a common projection in other agencies.

The project "Digital Water Master Plan" was launched to develop and implement computerized tools for the calculation of future water demand and availability of water resources. The tools enable the operators to develop the different scenarios. Based on the historical patterns and the different scenarios, demand and resources figures can be calculated for 8 planning horizons up to the year 2040. The output of these modules are stored in the scenario tables pool (STP) under the Oracle WIS database. 17 different result tables are available under Oracle. This projected data is important for future decision-making on the water sector of the Hashemite Kingdom of Jordan. Unfortunately Oracle does not provide easy-to-handle functions for post-processing, reporting and mapping the data.

The **Data Visualization System** enables the users to output the Oracle WIS data in a standardized format without the need of formulating SQL queries manually under ORACLE or MS Access. The DVS provides the users with functions of data aggregation with a graphical and tabular output. The DVS is easy to use and allows complex calculation on the rather detailed data of the WIS without any knowledge of the SQL database language, Oracle, MS Access or MS Excel. Thus it is a strong visualization tool but still easy to handle.

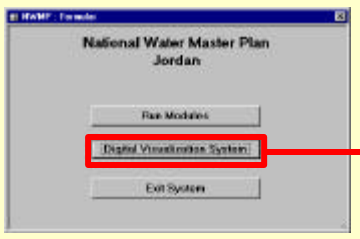


The DVS is using Oracle's strong functionality in data management and maintenance, a VBA programmed MS Access application as the command center for extraction and aggregation of the data from Oracle and MS Excel's functionalities for visualizing the data in charts and tables. As most of the data has a spatial context, the GIS data is integrated in the MS Access application as a GIS viewer using the software ESRI MapObject LT. The application was programmed using Microsoft Visual Basic for Applications (VBA) as programming language and the object library MapObjects LT. As the results are presented on common Excel spreadsheets, all the Excel functionality can be applied to modify the charts and tables for reporting. For every query result, a new Excel window is started, which can be saved or simply closed without saving after the data was viewed.

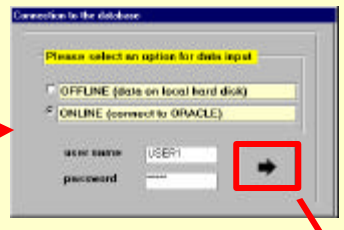
2. DVS Navigation

2.1. Navigation Chart

Enter DVS

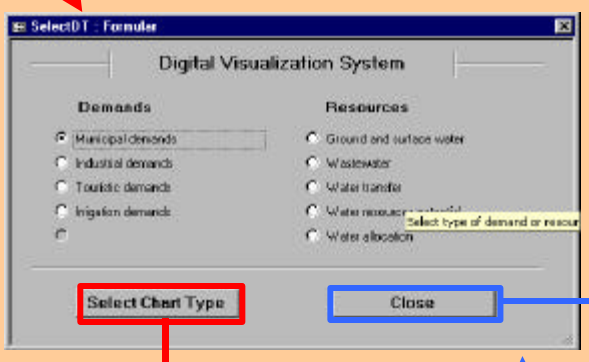


Step 1:
Start of Digital Visualization System



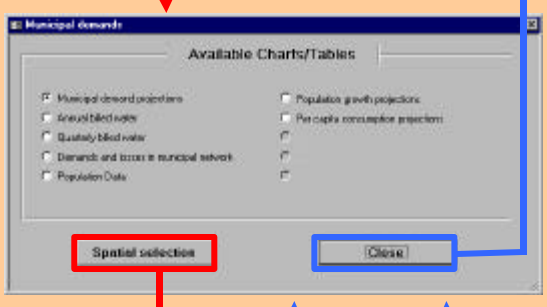
Step 2:
Offline: Working locally in an Access database
Online: Connect to Oracle WIS. You need to enter your user name and your password. You need read access to the tables you want to work with

Step 3:
Chose the data type for visualization.

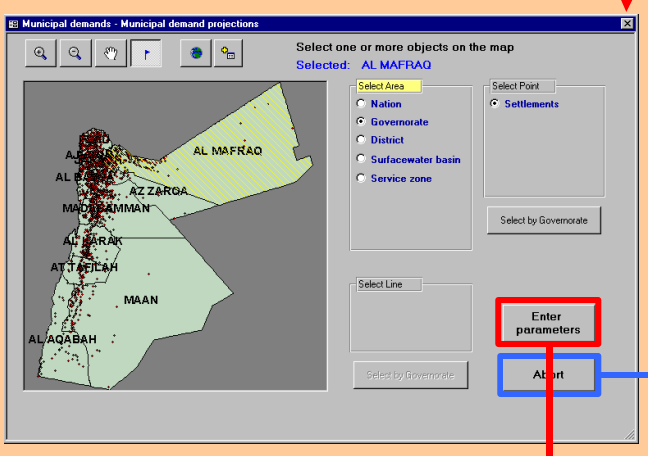


Exit DVS

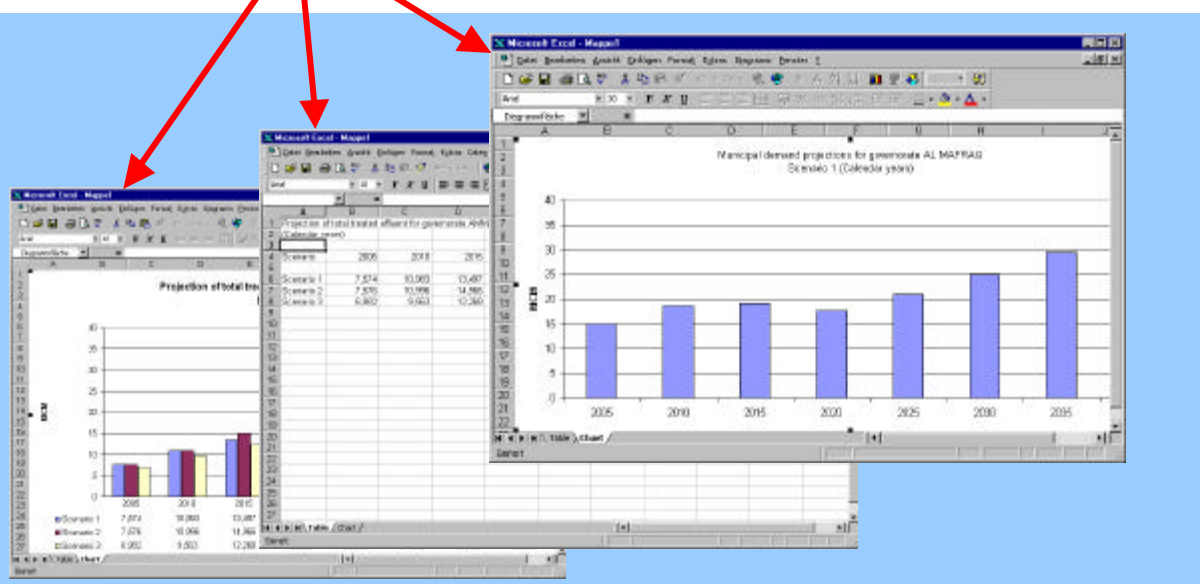
Step 4:
Chose the chart type for visualization.



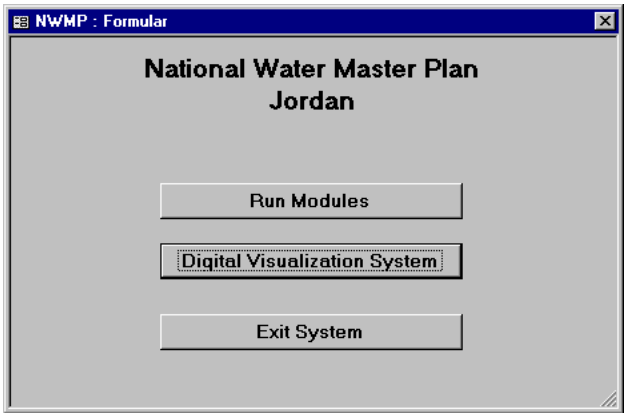
Step 5:
Chose the objects for visualization. You can visualize data for administrative units or for objects like settlements or treatment plants. The choice is given by the data type and chart type.



Step 6:
Choose the parameters for the visualization.



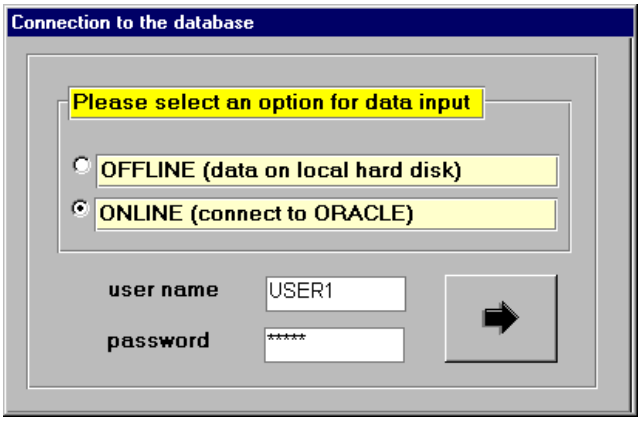
2.2. NWMP Window



After launching the application, the first window for the user is the NWMP window. From here the sector managers can start the pre-processing modules (if they are installed locally on the computer).

All other users use the Digital Visualization System –button to start the Digital Visualization System.

2.3. Database Connection Dialog



In principle, there are two different access modes to the data available: The direct link to the Oracle Wis database (ONLINE) and the access to a copy of the WIS which was stored locally on the disk (OFFLINE). The method of accessing the data is not only a question of speed, it also depends on the Oracle access rights of the users, the type of DVS installation and the availability of a network connection. The table below gives an overview of the advantages and disadvantages of both types of database access.

	ONLINE	OFFLINE
Additional installation requirements		the WIS MS Access database and the spatial data have to be installed on the computer.
Access rights	The user has to have access rights on the Oracle WIS tables he wants to use for visualization (see Oracle Access rights).	No access rights are necessary.
Processing speed	Visualizing online data can be very time-consumptive, dependent on the available network performance.	The processing speed is only limited by the computer system you are using (mainly processor speed and RAM).

Recency of data	The data comes directly from the Oracle database and is always up to date.	The data was transferred from the Oracle WIS to a MS Access database and was stored on the computer locally. It is a copy of the data this copy was made in the past. Updates made to the original data later are not reflected in the MS Access database, thus the visualization my give thus .
Network availability	The database is directly linked. Thus, a network connection is compulsory.	The database connection is not necessary, if also the spatial data was stored locally and the system was configured to use the local data sets.

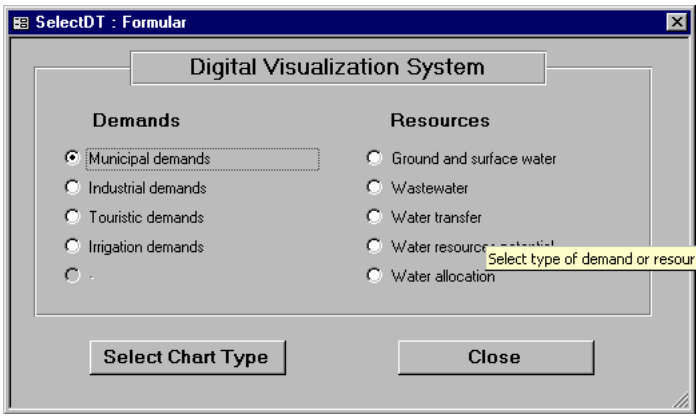
To continue to the DVS, you have to enter a user name and a password, if you work online. The minimum length of each string is three characters. Your user name and password have to be valid for the Oracle system (ask the Oracle administrator for assistance). If you work locally (OFFLINE), entering of user name and password is not necessary.

Click the  – button to continue to the Digital Visualization System.

The system will continue with the Date Type Selection dialog.

2.4. Data Type Selection Dialog

This dialog is the main window of the DVS. Closing this window, you quit the DVS and come back to the NWMP window. In the data type selection dialog, there are 4 different demand types and 4 different resources types to chose from. Additionally, transfer can be selected as a data type. You press the ***Select Chart Type***-button to continue to the Chart Type Selection Dialog. Depending on your choice of data type in this dialog, the set of possible chart types will vary.



2.5. The Chart Type Selection Dialog

The Chart Type Selection Dialog is a dynamic window. Depending on the data type chosen in the Data Type Selection Dialog, the set of available chart types is different. With selecting a chart type, the user chooses a specified format for the Excel output of the data. The data type "Municipal Demands", for instance, offers you 7 different chart types to choose.

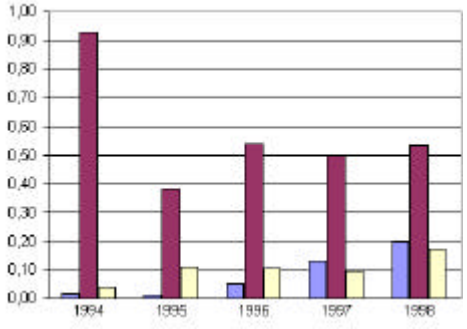
Choosing a certain chart type, you define which data you want to have visualized under MS Excel. The DVS module will formulate the SQL query which extracts exactly what you need to have presented and this query will be sent to the Oracle WIS (or the MS Access database in OFFLINE mode). The database work is done mainly by the ODBC driver and the database (Oracle or MS Access). The result table coming from the WIS will be rearranged by the DVS program and sent to MS Excel for further processing. You will find standardized charts and the underlying data tables. Of course, the Excel charts can be changed manually with a certain extent of Excel skills. Colors, sizes, texts can and sometimes should be edited using the common Excel functionality.

On the following pages, all available chart types are discussed one by one as the set of available charts is different for every data type. Sample result charts are shown for an easier understanding of the charting theory. Please be aware that the sample diagrams were not added to this report to give you exact numbers for the chosen data type. The time, these charts where created, the WIS database might still have been incomplete. Using the DVS to create these charts might give different results now, because some data in the database might have been changed, added or deleted.

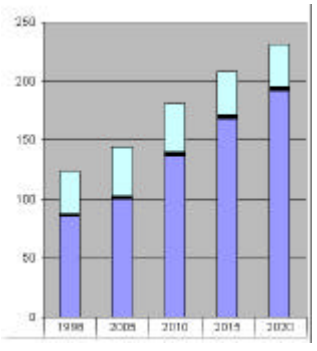
The philosophy of the DVS is to get an easy and standardized access to this data so that plotting and charting the content of the database can be done by any user by any time. The DVS was not developed only to be a kind of "digital report". It was developed to be used frequently to visualize the database as a tool for the decision makers as well as for the sector managers. It is an impressive and fast way to visualize the huge amount of detailed data in the WIS database.

Restrictions

MS Excel allows the plotting of two series in one chart. If you plot several years in a bar chart you still have one parameter to visualize if there is the need (clustered column and stacked column charts). This parameter can be the set of three scenarios, 3 types of year, three different salinity classes or simply a set of settlements, industries, governorates etc. (multiple spatial selection). You can visualize these two-dimensional series in Stacked Column or Clustered Column charts. But Excel does not allow the visualization of more series. In practice this means, the first series always is the series of several years and for the second series you can either make a multiple selection in the spatial selection window and then you are restricted to one scenario, one salinity class etc. or you select only one object spatially and then you have the freedom to visualize either 3 scenarios or several salinity classes etc. As every chart type allows different parameters to set, the restrictions, if there are any, are described in the according chapter. The program however has been implemented in a way that it guides you and does not allow any violation of these rules.



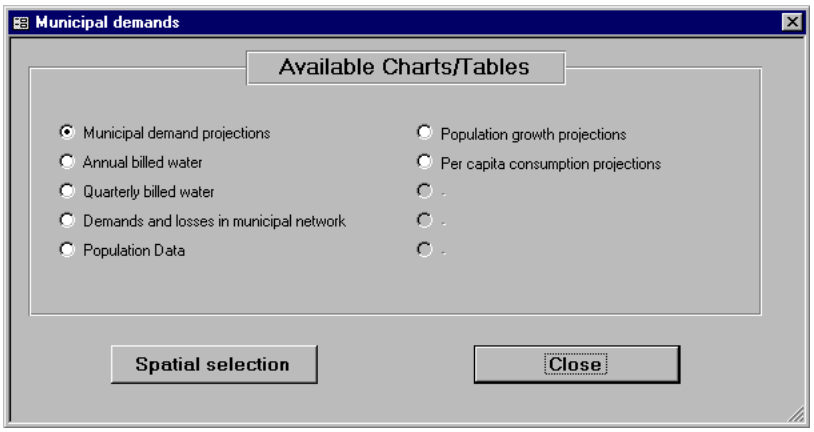
Excel's clustered column chart



Exel's stacked column chart

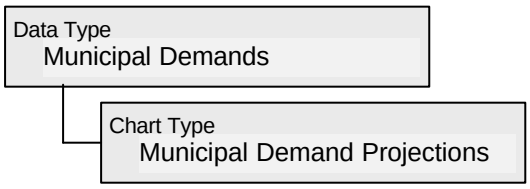
3. Data Types and Chart Types

3.1. Data Type: **Municipal Demands**



The municipal demands can be visualized in 7 different charts. You select a chart type and click on the ***spatial selection***-button to open the spatial selection window. After you have done your spatial selection, a parameter dialog opens where you are asked to make your settings. As the set of parameters is different depending on the chart type you have chosen, the parameter dialog will change accordingly.

3.1.1 Chart Type: **Municipal Demand Projections**

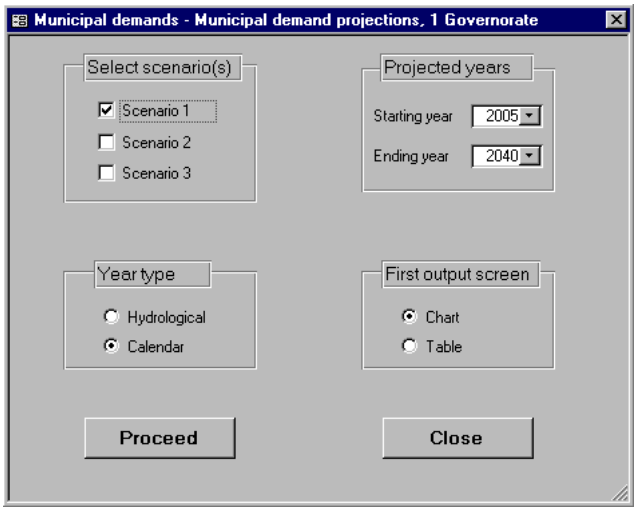


Oracle Access Rights for
`JORDAN.STP_MUNICIPAL`

The municipal demand projections are the future demand estimations calculated for every settlement by the sector managers by using the pre-processing modules. The values are stored in the Oracle WIS STP table JORDAN.STP_MUNICIPAL per settlement, scenario, year and month. A salinity class is added to each record as water quality information. The losses are not considered in this chart (see chart "demands and losses in municipal network").

The DVS can chart the projected demand in the following way:

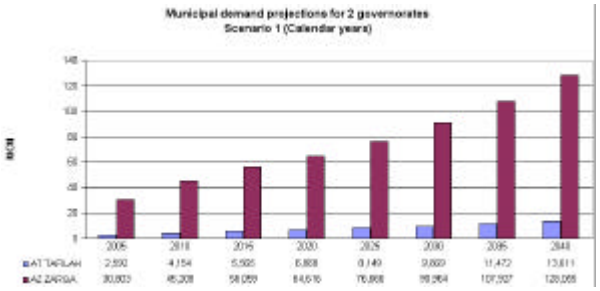
projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 scenarios	single settlement	• nation • governorates • districts • surface water basins • service zones



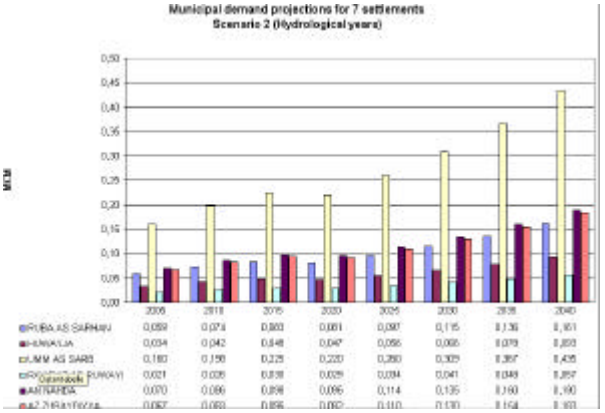
The "municipal demand projections"-parameter dialog enables the user to select a certain scenario. If only one settlement or one aggregation unit was selected, the three scenarios can be plotted in one chart.

Additionally the user chooses the years of interest, year type and first output screen for MS Excel (you can switch between table and chart view within MS Excel whenever you want).

Sample Results:



Municipal Demand Projections for the two governorates "At Tafilah" and "Az Zarqa"



Municipal Demand Projections for 7 selected settlements

3.1.2 Chart Type: **Annual Billed Water**

Data Type
Municipal Demands

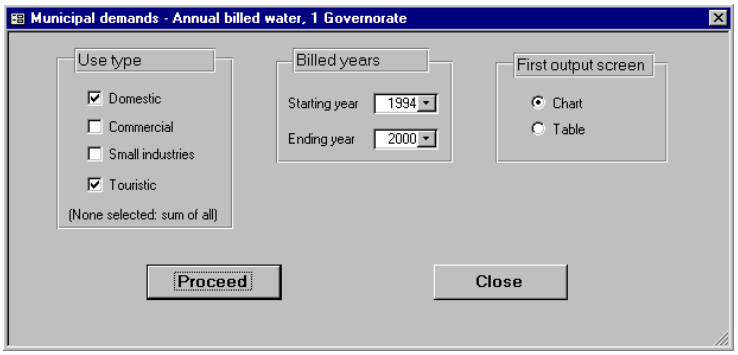
Chart Type
Annual billed water

Oracle Access Rights for
JORDAN.WATER_USE_BILLING
JORDAN.WATER_USE_BILL_CAT

The annual billed water volumes are historical values for actual billed water from the network. The 4 use types Domestic, Commercial, Small Industries and Touristic can be distinguished (classification of the billing system). The values are stored for historical years in the Oracle table JORDAN.WATER_USE_BILLING for every settlement as quarterly values for a specified year with a billing category. The table JORDAN.WATER_USE_BILL_CAT gives the relation from billing category to the use type. The DVS summarizes the quarterly volumes to annual volumes.

The DVS can chart the projected demand in the following way:

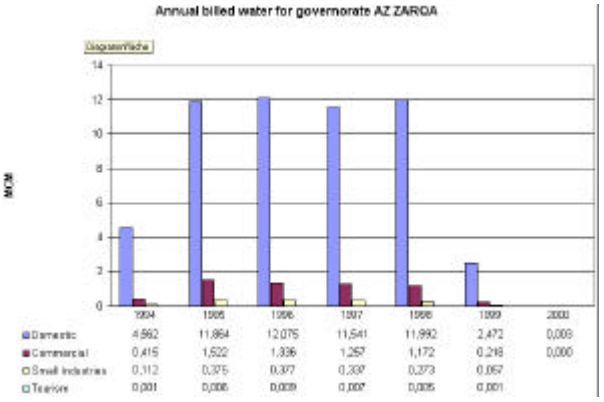
values for	detailed reference	aggregated for **one**
historical years. The data availability is depending on the selected settlements.	single settlement	• nation • governorate • district • surface water basin • service zone



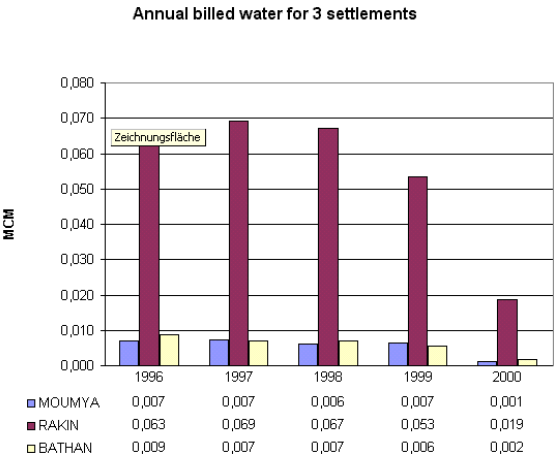
The "Annual billed water" parameter dialog offers a set of parameters to choose from. You can distinguish between 4 different types of water use and you can select a time span you are interested in. You should select a time period where data is available, otherwise your results might give wrong figures.

Restrictions: If you select more than one settlement or more than one aggregation unit, you cannot classify the use type (only one use type or the sum of all are shown). To plot the use types in a chart, select only one object or aggregation unit in the spatial selection.

Sample Results:



Annual billed water for governorate "Az Zarqa"



Annual billed water for three selected settlements.

3.1.3 Chart Type: **Quarterly Billed Water**

Data Type
Industrial Demands

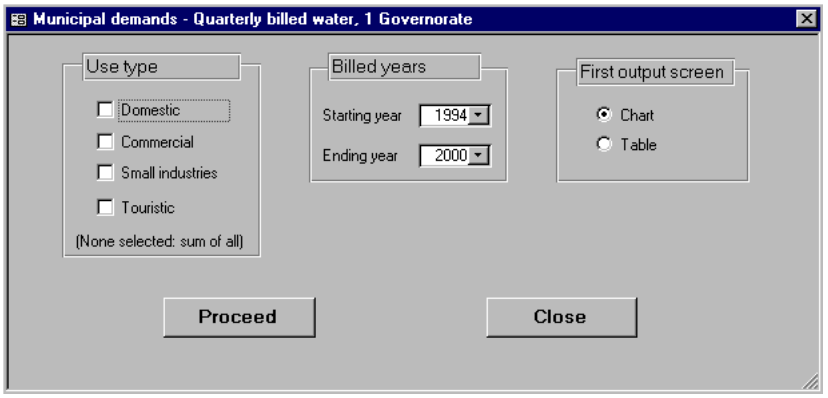
Chart Type
Quarterly billed water

Oracle Access Rights for
`JORDAN.WATER_USE_BILLING`
`JORDAN.WATER_USE_BILL_CAT`

The quarterly billed water volumes are historical values for actual billed water from the network. The 4 use types Domestic, Commercial, Small Industries and Touristic can be distinguished (classification of the billing system). The values are stored for historical years in the Oracle table JORDAN.WATER_ USE_BILLING for every settlement as quarterly values for a specified year with a billing category. The table JORDAN.WATER_USE_BILL_CAT gives the relation from billing category to use type.

The DVS can chart the projected quarterly demand in the following way:

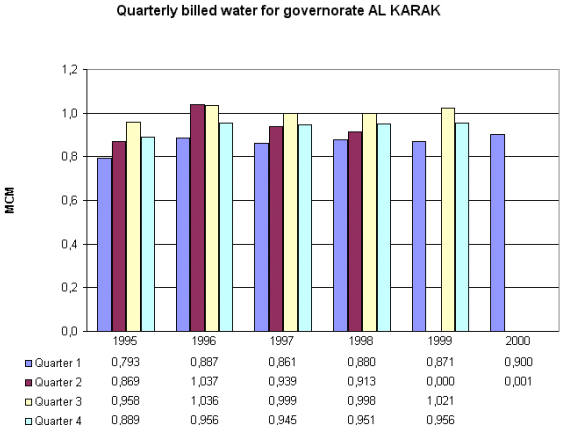
values for	detailed reference	aggregated for one
historical years. The data availability is depending on the selected settlements.	single settlement	• nation • governorate • district • surface water basin • service zone



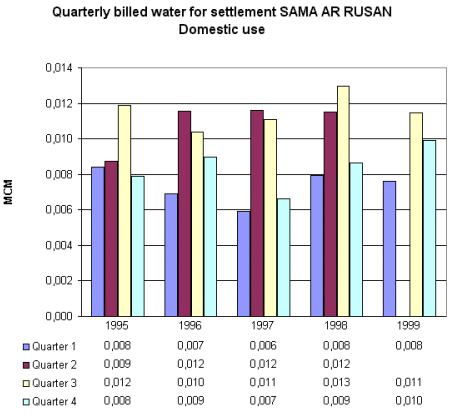
This Municipal Demands parameter dialog offers a set of parameters to choose from. You can distinguish between 4 different types of water use and you can select a time span you are interested in. You should select a time period where data is available, otherwise your results might give wrong figures.

Restrictions: Due to restrictions under MS Excel, it is not possible to select more than one settlement or aggregation polygon for the same chart. Also the selection of more than one use type is prohibited. If you do not check any use type, the DVS will return the sum of the water volumes

Sample results:



Quarterly billed water for governorate "Al Karak". For 1999 and 2000 some data is missing.



Quarterly billed water for settlement "Sama ar Rusan". Only the domestic use was considered

3.1.4 Chart Type: **Demands and Losses in Municipal Network**

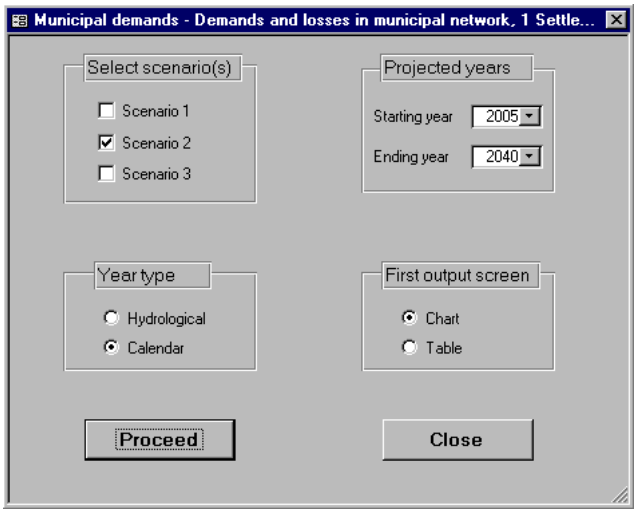
Data Type
Demands

Chart Type
Demands and losses in municipal network

Oracle Access Rights for
`JORDAN.STP_MUNICIPAL`
`JORDAN.STP_INDUSTRY`
`JORDAN.STP_TOURISTIC`
`JORDAN.STP_LOSSES`

This chart type allows the visualization of the touristic, industrial and municipal demand together with the network losses. The demands are shown in stacked column charts. The total demand of the selected object equals the total height of the bar for one planning horizon and one scenario (see sample charts).

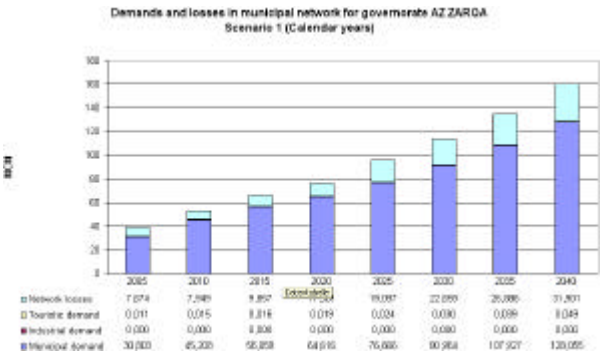
projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 scenarios	single settlement	• nation • governorates • districts • surface water basins • service zones



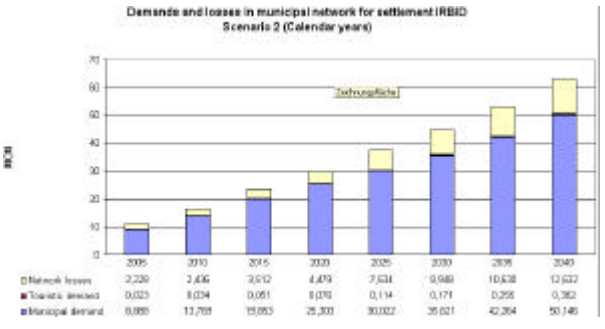
This parameter dialog asks for a specified scenario. Multiple selections are nor possible due to restrictions in MS Excel. You can choose start and end of the projected years, the year type and the first output screen.

Restrictions Excel is not capable to show the data for more than one object at the same time. Therefore, the spatial selection window does not allow multiple selections. You can select either one settlement or one spatial unit (governorate etc..: see below).

Sample results:



Demands and losses in municipal network for governorate AZ ZARQA



Demands and losses in municipal network for settlement IRBID

3.1.5 Chart Type: **Population Data**

Data Type
Municipal Demands

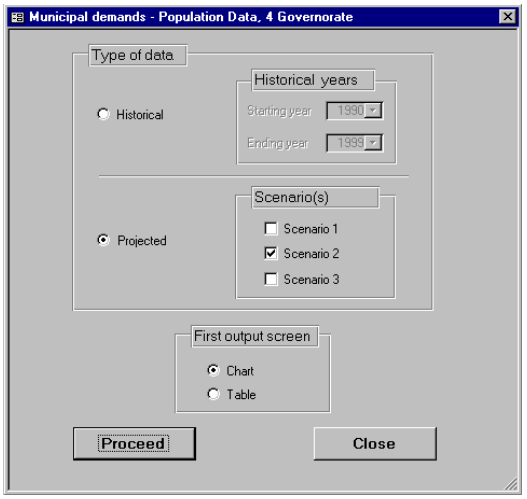
Chart Type
Population Data

Oracle Access Rights for
NONE

Data is coming from EXCEL sheet
Population.xls

This chart type allows the visualization of the historical population data on a governorate or national level. Additionally, projected population data for the planning horizons 2005 – 2020 can be shown. The values are shown in bar charts but they do not come from the Oracle WIS. These values are static values, stored on Excel sheets, aggregated by the DVS to show them for the specified objects and units.

values for	detailed reference	aggregated for
- historical values for 1990-1999 - projected values for: • 4 planning horizons • 3 scenarios	Excel-sheet	• nation • governorates



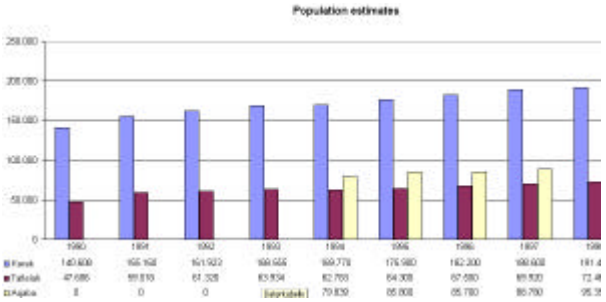
After the selection of the governorate(s) or the nation, this dialog pops up. Here the user indicates whether he wants historical values visualized or the pre-processed values, which have been prepared on Excel-sheets by JICA experts. Projected values automatically come for the 4 planning horizons 2005, 2010, 2015 and 2020.

Restrictions:

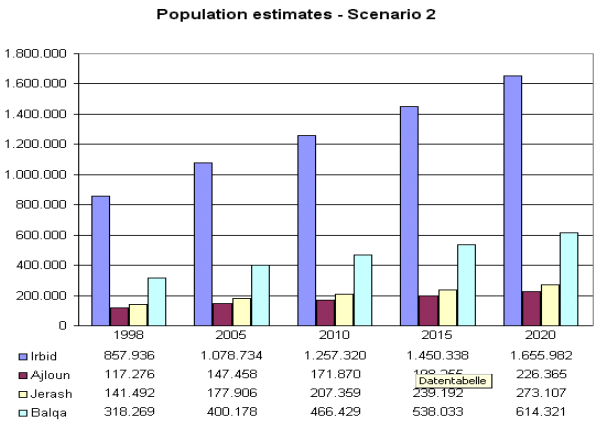
If you select more than one governorate, you can visualize only one scenario. You can plot three scenarios, if you select only one governorate or the Nation in the spatial selection dialog.

Static values! The values does not come from the Oracle WIS. Data source is an Excel sheet!

Sample results:



Historical population figures for the three governorates "Karak","Tafilah" and "Aqaba". No values have been stored for Aqaba for the years 1990-1993.



Population estimates for the following 4 planning horizons for the 4 selected governorates. Historical year 1998 is visualized as a reference.

3.1.6 Chart Type: **Population growth projections**

Data Type
Municipal Demands

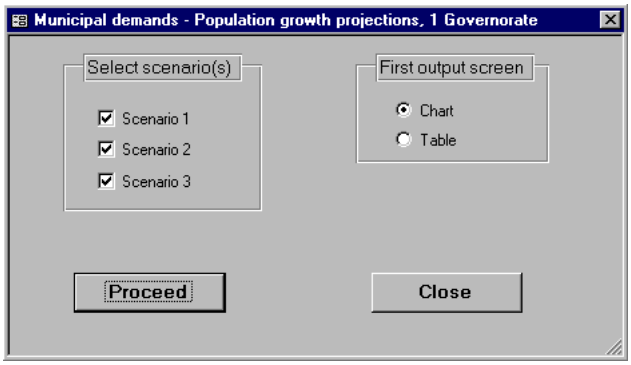
Chart Type
Population Growth Projections

Oracle Access Rights for
NONE

Data is coming from EXCEL sheet
Population_growth.xls

This chart type allows the visualization of the projected population growth for the whole nation. Three scenarios have been developed and stored in Excel sheets. The user indicates which scenarios to chart and the DVS reads the data into standardized Excel charts.

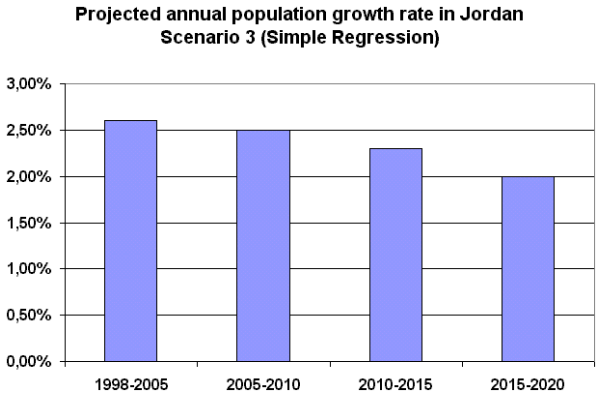
projected values for:	detailed reference	aggregated for
• 4 planning horizons • 3 scenarios	Excel-sheet	• nation



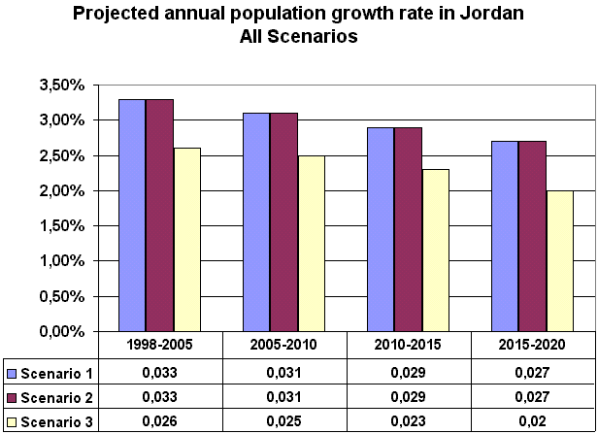
After the selection of the chart type "Population growth projections", this dialog pops up. No spatial selection is necessary as the growth projections are calculated on a national level only. In the dialog the user indicates whether he wants to have one specific scenario or all scenarios visualized in one chart.

Static Values! The values does not come from the Oracle WIS. Data source is an Excel sheet!

Sample results:



Population growth projections for the whole nation for the next 4 planning horizons, scenario 3.



Population growth projections for the whole nation for the next 4 planning horizons. All three scenarios are visualized.

3.1.7 Chart Type: **Per Capita Consumption Projections**

Data Type
Municipal Demands

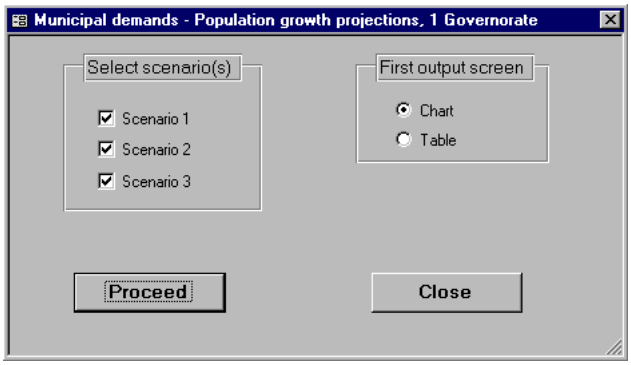
Chart Type
Per capita consumption Projections

Oracle Access Rights for
NONE

Data is coming from EXCEL sheet
Population_growth.xls

The total consumption gives the projected water consumption figures per capita for the years 2005, 2010, 2015 and 2020. The numbers are given in liters per capita per day. 3 Scenarios have been developed and the values were saved on Excel sheets. You select the spatial units (nation/governorates), you want to consider in the chart, the DVS will prepare the standardized output on Excel sheets..

projected values for:	detailed reference	aggregated for
• 4 planning horizons • 3 scenarios	Excel-sheet	• governorates • nation



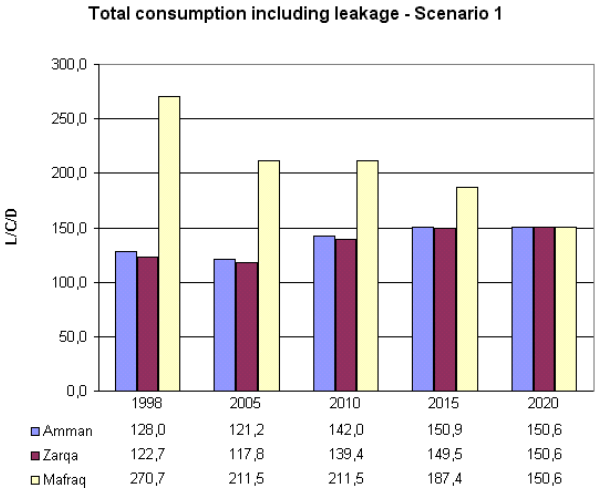
In this dialog you indicate which scenario you want to see.

Restrictions:

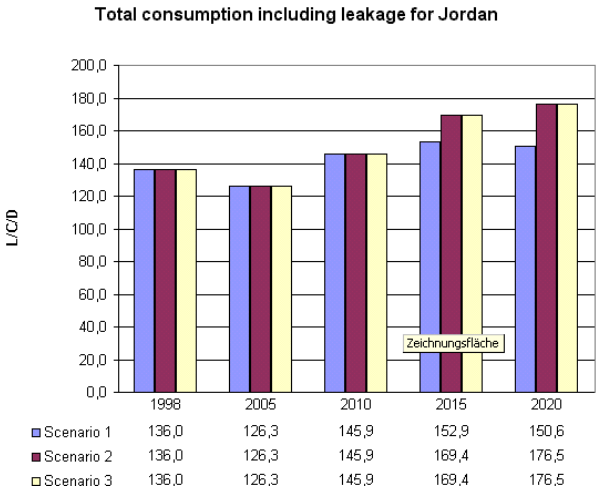
If you have chosen only one administrative unit (one governorate or the whole nation) you can select more than one scenario for one chart. If you want to compare several governorates, you can choose only one scenario at a time.

Static Values! The values does not come from the Oracle WIS. Data source is an Excel sheet!

Sample results:

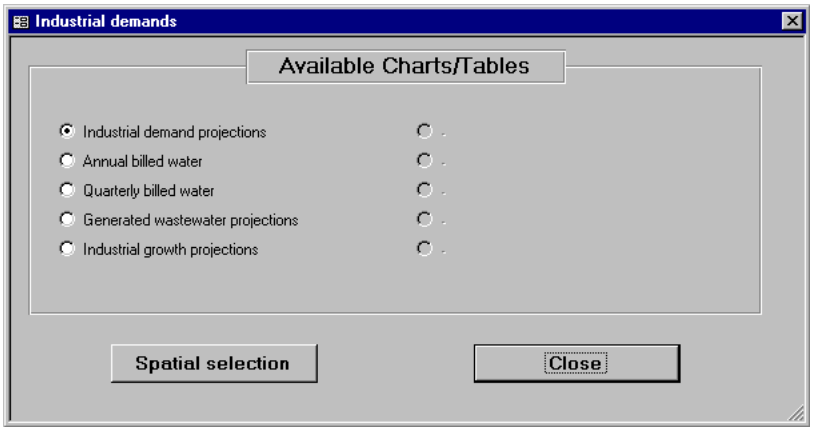


The total consumption per capita per day for three selected Governorates.



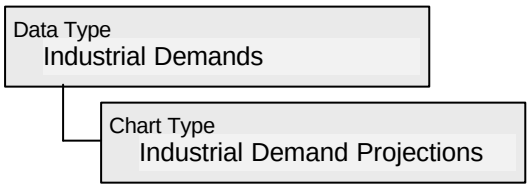
The total consumption per capita per day for whole Jordan. The three scenarios are plotted.

3.2. Data Type: **Industrial Demands**



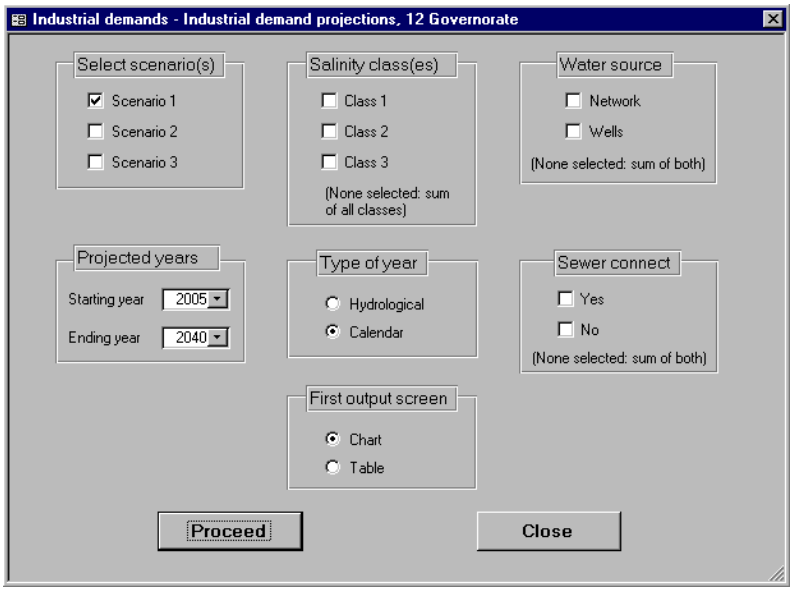
5 different chart types are available for the industrial demands.

3.2.1 Chart Type: **Industrial Demand Projections**



The industrial demand projections are the future demand estimations calculated by the sector managers by using the pre-processing modules. They are stored in the Oracle WIS STP table JORDAN.STP_INDUSTRY per facility ID, scenario, year and month. Additionally, the settlement ID is written to the STP table, the quality (salinity) parameters of the demand and the water source (network/local well). Besides common values like the industries name, type, implementation date and addresses, the facility master table JORDAN.FACILITIES stores information whether the facility is connected to a treatment plant or not.

projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 scenarios	single facility	• nation • governorates • districts • surface water basins • service zones

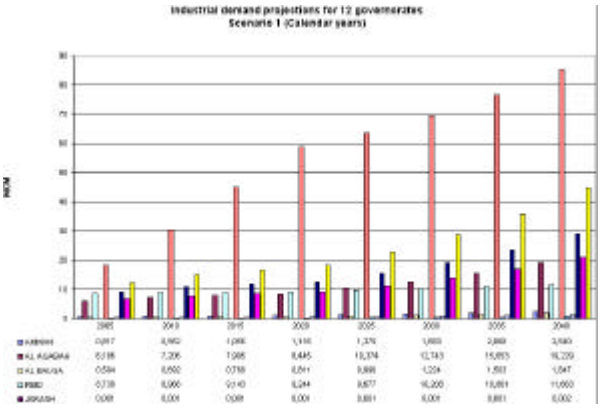


The Industrial Demands parameter dialog offers a set of parameters to choose from. You can select the scenarios, you can compile the results for specified salinity classes only, you can distinguish between the two types of water source (demand covered by local wells/demand covered from the network) and you can visualize only the water volumes of industrial demand, where the industries are connected to a sewer. You select the years of interest and the type of year. All in thousands of combinations are possible.

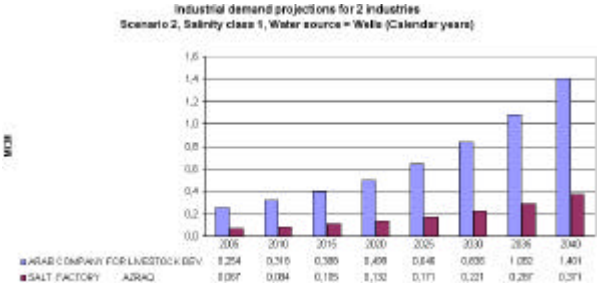
Restrictions: You can either plot different facilities, different scenarios, different salinity classes or different water sources in one chart. Due to restrictions in MS Excel it is not possible to chart more than one scenario or more than one salinity class or more than one water source class, if you have already selected more than one settlement or unit of aggregation in the spatial selection window. Only one of the 4 parameters [objects / scenarios(s) / salinity class / water source] is allowed to be a multiple selection.

	multiple facilities/ governorates	multiple scenarios	multiple salinity classes	multiple water source
facilities/ governorates	>1	1	1	1
scenarios	1	>1	1	1
salinity class	1 class or sum	1 class or sum	>1	1 class or sum
water source	1 class or sum	1 class or sum	1 class or sum	both classes

Sample results:



Industrial Demand Projections for all 12 governorates



Industrial Demand Projections for 2 selected industries. Only salinity class 1 was considered and water source=wells.

3.2.2 Chart Type: **Annual Billed Water**

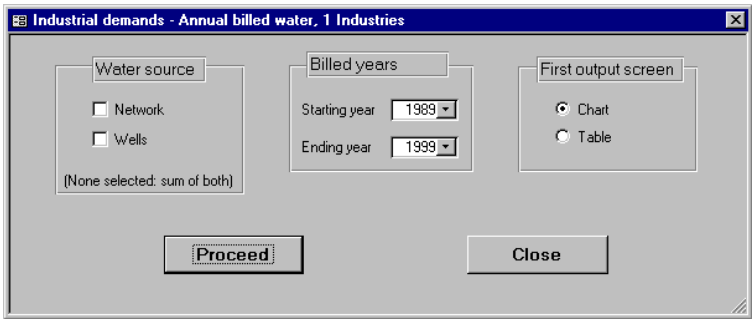
Data Type
Industrial Demands

Chart Type
Annual billed water

Oracle Access Rights for
`JORDAN.QURT_BILLED_INDUSTRY`

The annual billed water volumes are stored for historical years in the Oracle table JORDAN.QURT_BILLED_INDUSTRY as quarterly values per facility per year. Additionally, the water source (well/network) is stored in the table. The DVS will aggregate the quarterly volumes to annual values for the years the user specifies as years of interest.

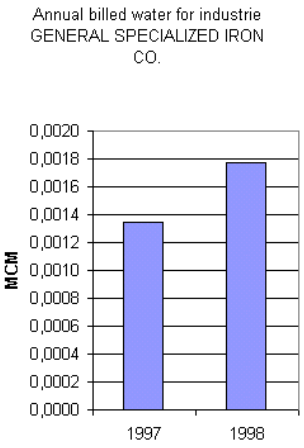
values for	detailed reference	aggregated for one
historical years. The data availability is depending on the selected facility/facilities.	single facility	• nation • governorate • district • surface water basin • service zone



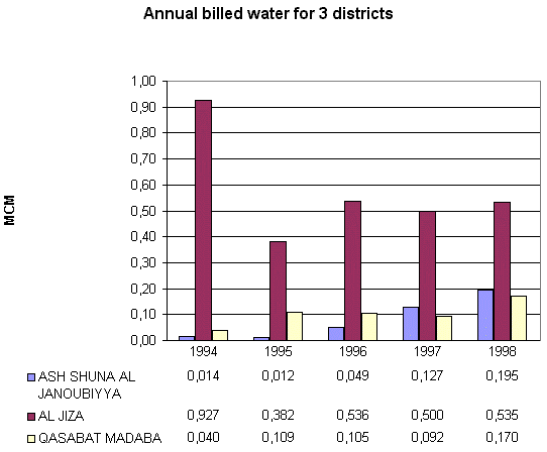
This Industrial Demands parameter dialog offers a set of parameters to choose from. You can distinguish between the two types of water source and you can select a time span you are interested in. You should select a time period where data is available, otherwise you might get wrong figures.

Restrictions: You can visualize the two types of water source in one chart, if you select one facility or one polygon of aggregation only. If you select several facilities or units (e.g. governorates) in the spatial selection, the dialog window will not allow the checking of the two boxes in the "Water Source" section.

Sample results:



The annual billed water for the industry "General Specialized Iron Co." If you select a wider time range but there is no data available, the program will reduce the chart to the appropriate period.



Comparing of the annual billed water from 1994 to 1998 for three selected districts.

3.2.3 Chart Type: **Quarterly Billed Water**

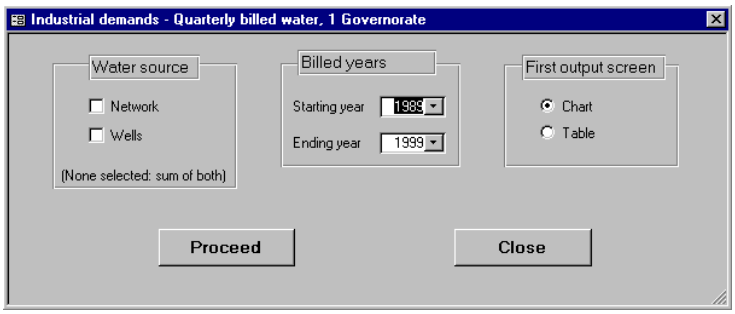
Data Type
Industrial Demands

Chart Type
Quarterly billed water

Oracle Access Rights for
`JORDAN.QURT_BILLED_INDUSTRY`

The quarterly billed water volumes are stored for historical years in the Oracle table JORDAN.QURT_BILLED_INDUSTRY as quarterly values per facility per year. Additionally, the water source (well/network) is stored in the table.

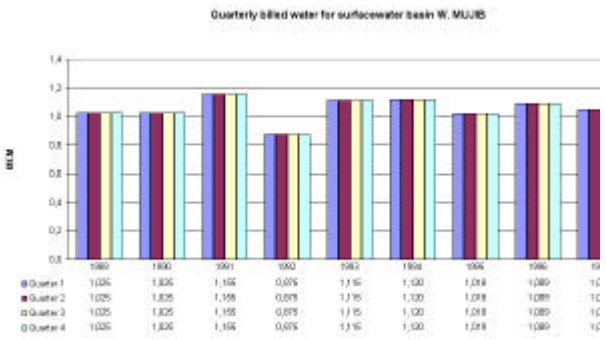
values for	detailed reference	aggregated for
quarters of historical years. The data availability is depending on the selected facility/facilities.	single facility	• nation • governorate • district • surface water basin • service zone



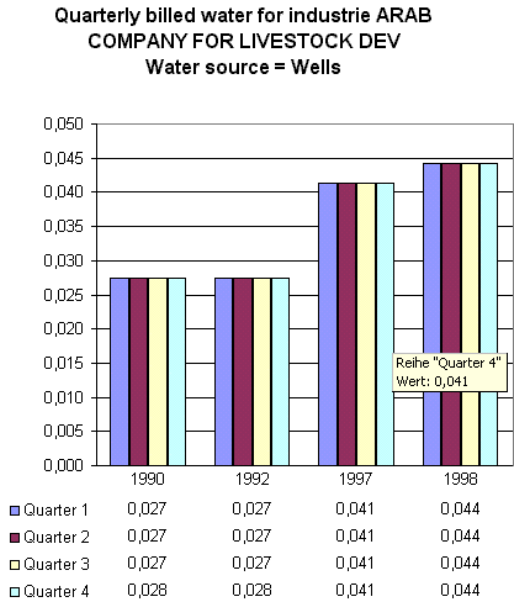
This Industrial Demands parameter dialog offers a set of parameters to choose from. You can distinguish between the two types of water source and you can select the time span you are interested in. You should select a time period where data is available, otherwise you might get wrong figures.

Restrictions: Due to restrictions in MS Excel the spatial selection window does not allow multiple selections. You cannot visualize the two types of water source in one chart. You can select one water source type, if you select none, the water type will not be considered.

Sample results:



Comparing of the quarterly billed water from 1989 to 1998 for the surface water basin Wadi Mujib.



The quarterly billed water for the industry "Arab Company For Livestock Dev." The years without data are not shown.

3.2.4 Chart Type: **Industrial Growth Projections**

Industrial Growth Projections

Data Type
Industrial Demands

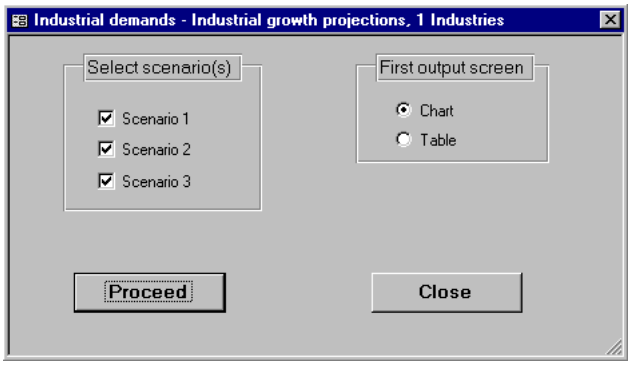
Chart Type
Industrial growth projections

Oracle Access Rights for
NONE

Data is coming from EXCEL sheet
Industrial_growth.xls

Three scenarios were developed, representing the average annual industrial growth for the next 20 years (2005, 2010, 2015, 2020) in Jordan. These figures were stored to Excel sheets. The user can select a certain scenario or a set of scenarios. The DVS extracts the data from the Excel sheets and rearranges them in order to visualize them in standardized charts using MS Excel.

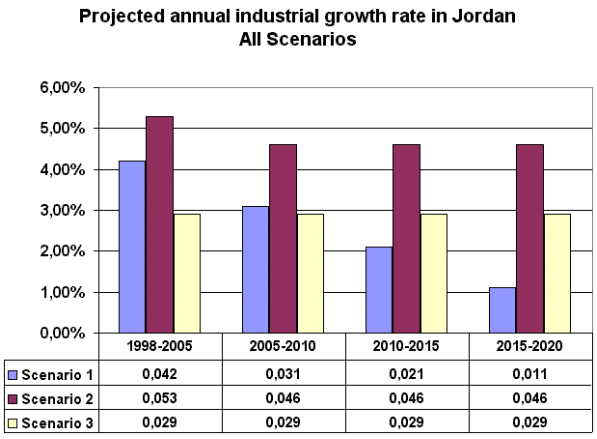
projected values for	detailed reference	aggregated for
the planning horizons 2005/2010/2015/2020	none	• nation



After the selection of the chart type "Industrial growth projections", this dialog pops up. No spatial selection is necessary as the growth projections are calculated on a national level only. In the dialog the user indicates whether he wants to have one specific scenario or all scenarios visualized in one chart. If you select Table as the first output screen, the Excel will show you the table first. You can switch between chart and table view within Excel as often as you want.

Static Values! The values does not come from the Oracle WIS. Data source is an Excel sheet!

Sample results:

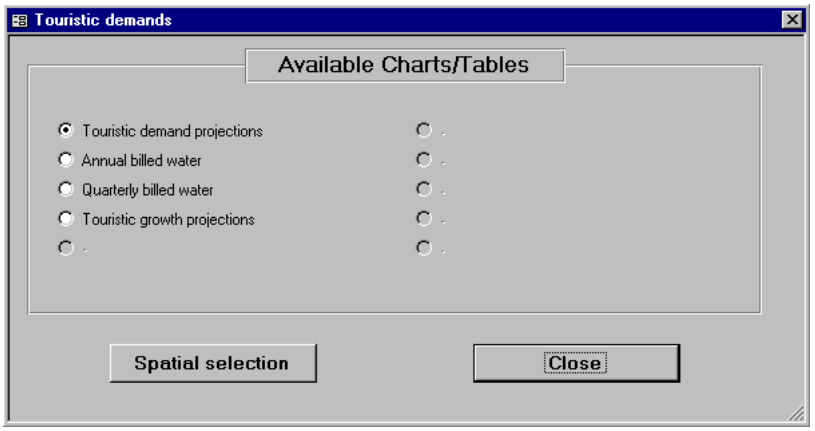


Annual industrial growth rates projected for the next 4 planning horizons.

	A	B	C	D	E
1	Regular Annual Industrial Growth Rate by Scenario				
2	Scenario	1998-2005	2005-2010	2010-2015	2015-2020
3	Scenario 1 (World Bank)	4,20%	3,10%	2,10%	1,10%
4	Scenario 2 (Log. Regression)	5,30%	4,60%	4,60%	4,60%
5	Scenario 3 (Questionnaire Results)	2,90%	2,90%	2,90%	2,90%

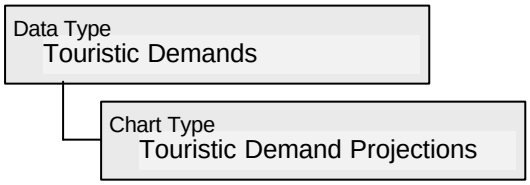
Annual industrial growth rates shown in a table

3.3. Data Type: **Touristic Demands**



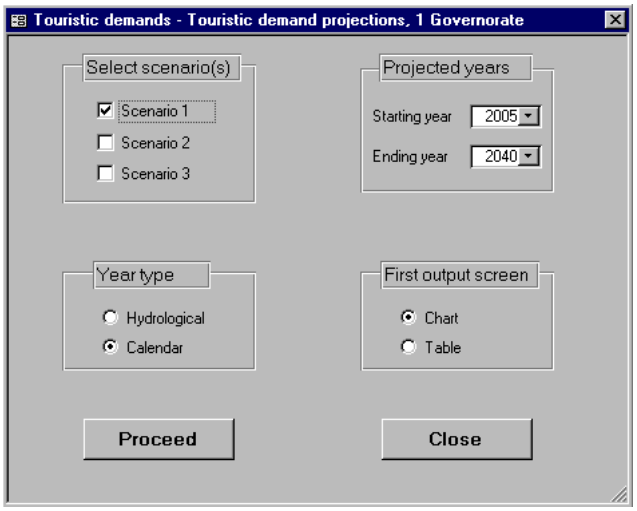
4 different chart types are available for the touristic demands.

3.3.1 Chart Type: **Touristic Demand Projections**



The touristic demand projections are the future demand estimations calculated by the sector managers by using the pre-processing modules. They are stored in the Oracle WIS STP table JORDAN.STP_TOURISTIC per settlement ID, scenario, year and month. Additionally, the quality (salinity) parameters of the demand is written to this table. Although most of the settlements do not have any touristic demand at all, they are plotted on the map for spatial selection. The user selects some settlements or some spatial units, in the following parameter dialog he will be asked to set some parameters. The DVS extracts the values from the WIS and arranges them in order to visualize the touristic demand in standardized Excel charts.

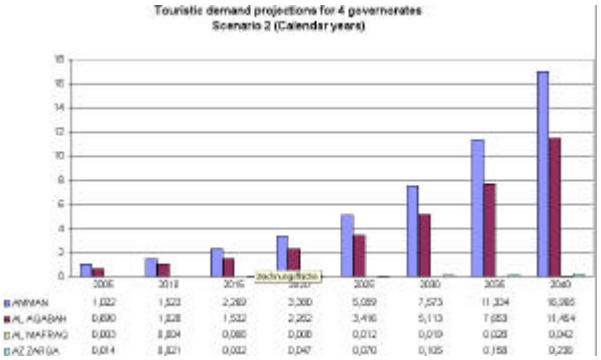
projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 scenarios	single settlement	• nation • governorates • districts • surface water basins • service zones



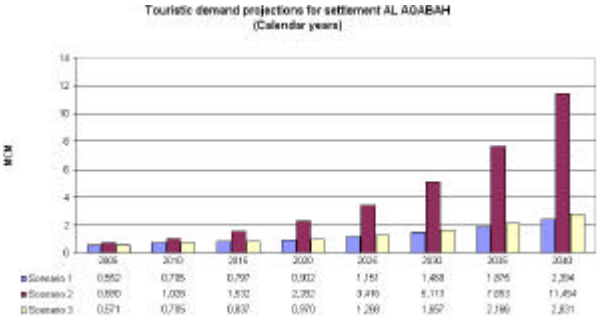
The Touristic Demands parameter dialog offers a set of parameters to choose from. You can compile the results for specified salinity classes only, you can distinguish between the two types of water source and you can visualize only the water volumes of industrial demand, where the industries are connected to a sewer.

Restrictions: If you want to plot more than one scenario in a chart, you cannot select more than one settlement or aggregation unit in the spatial selection window. If you select two or more settlements (or units of aggregation e.g. governorates), the parameter dialog will not allow multiple selections in the scenario section.

Sample results:



Comparing the touristic demand projections for 4 different governorates.



Comparing the 3 scenarios of the touristic demand projections for the town of Al Aqabah.

3.3.2 Chart Type: **Annual Billed Water**

Data Type
Touristic Demands

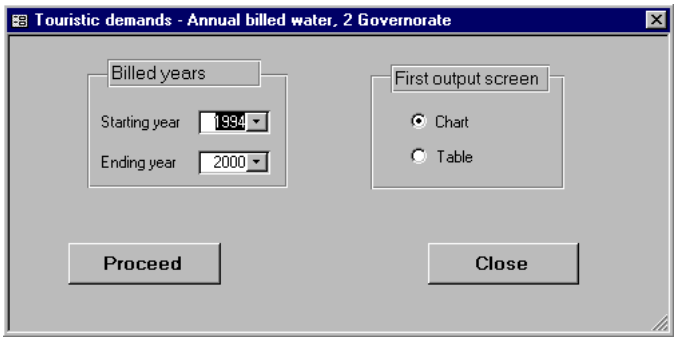
Chart Type
Annual billed water

Oracle Access Rights for
`JORDAN.WATER_USE_BILLING`
`JORDAN.WATER_USE_BILL_CAT`

The annual billed water volumes are historical values for actual billed water from the network. The values are stored for historical years in the Oracle table JORDAN.WATER_USE_BILLING for every settlement as quarterly values for a specified year with a billing category. The table JORDAN.WATER_USE_BILL_CAT gives the relation from billing category to use type. The SQL will consider only those billing categories, which belong to the touristic sector. The DVS summarizes the quarterly volumes to annual volumes.

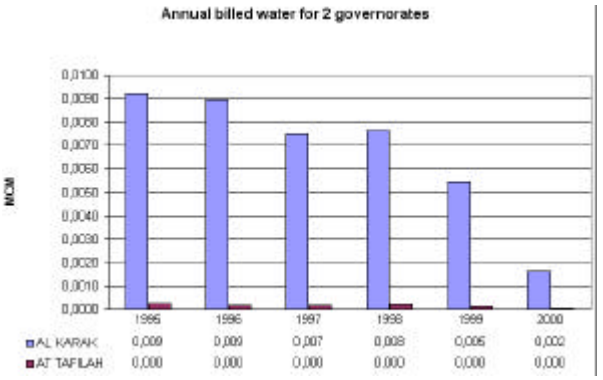
The DVS can chart the projected demand in the following way:

values for	detailed reference	aggregated for one
historical years. The data availability is depending on the selected settlement (Only a few settlements have touristic demand).	single settlement	• nation • governorate • district • surface water basin • service zone

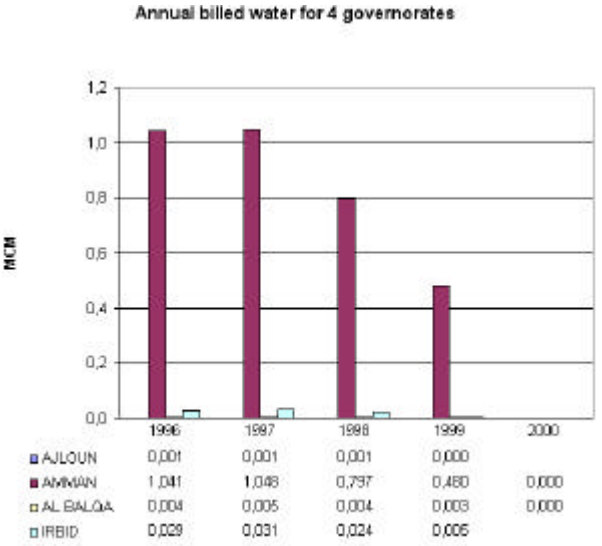


This Touristic Demands parameter dialog enables you to chose a time period for the visualization. You should chose Only years where data is available. Otherwise your results may be wrong. You can plot several settlements or aggregation units in one chart.

Sample results:



The annual billed water for the two selected governorates "Al Karak" and "At Tafilah".



Annual billed water for 4 governorates

3.3.3 Chart Type: **Quarterly Billed Water**

Oracle Access Rights for
`JORDAN.WATER_USE_BILLING`
`JORDAN.WATER_USE_BILL_CAT`

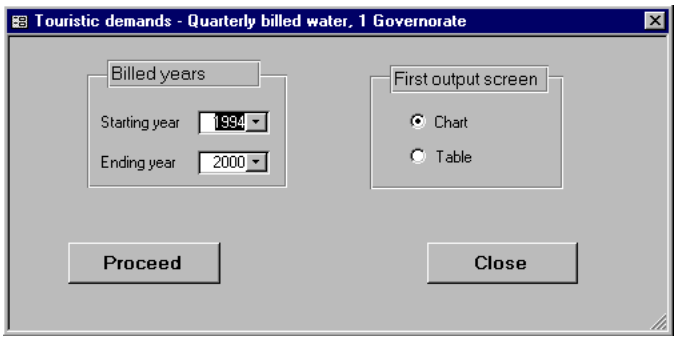
Data Type
Touristic Demands

Chart Type
Quarterly billed water

The quarterly billed water volumes are historical values for actual billed water from the network. The values are stored for historical years in the Oracle table JORDAN.WATER_USE_BILLING for every settlement as quarterly values for a specified year with a billing category. The table JORDAN.WATER_USE_BILL_CAT gives the relation from billing category to use type. The SQL will consider only those billing categories, which belong to the touristic sector.

The DVS can chart the projected demand in the following way:

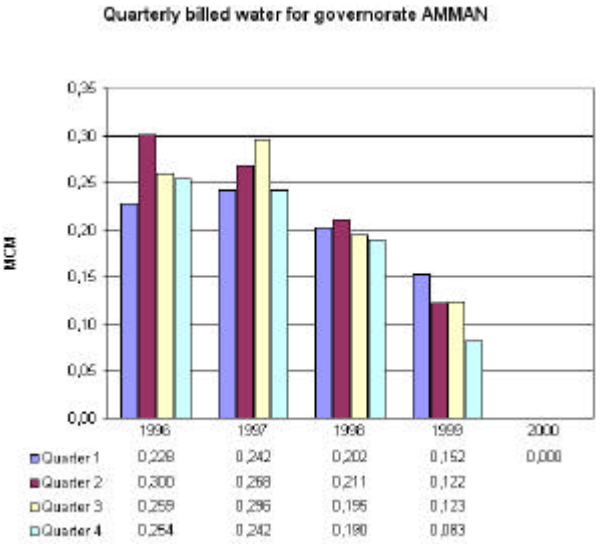
values for	detailed reference	aggregated for
quarters of historical years. The data availability is depending on the selected settlement. Only a small number of settlements have touristic demand.	single facility	• nation • governorate • district • surface water basin • service zone



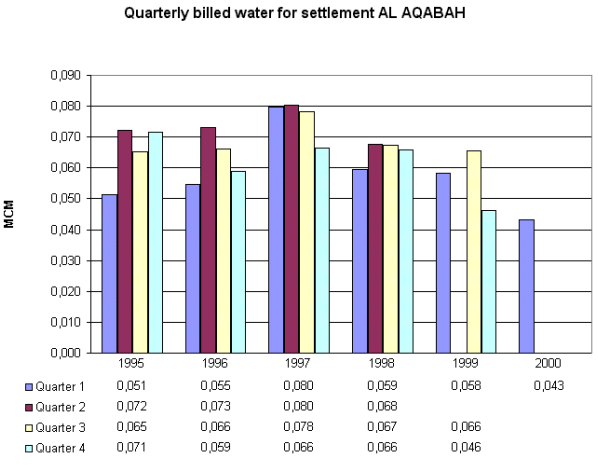
This Touristic Demands parameter dialog enables you to chose a time period for the visualization. You should chose Only years where data is available. Otherwise your results may be confusing.

Restrictions : You cannot plot the quarterly volumes for more than one settlement or aggregation unit in one chart. This is why the spatial selection does not allow multiple selections.

Sample results:



Comparing of the quarterly billed water from 1996 to 2000 for the governorate Amman.



The quarterly billed water for the town of Al Aqabah.

3.3.4 Chart Type: **Touristic Growth Projections**

Data Type
Touristic demands

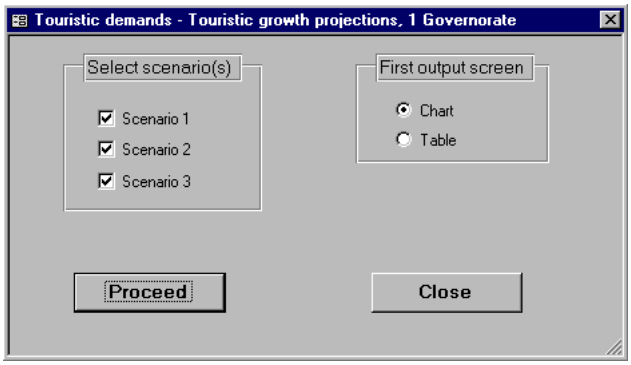
Chart Type
Touristic growth projections

Oracle Access Rights for
NONE

Data is coming from EXCEL sheet
Touristic_growth.xls

Three scenarios were developed, representing the average touristic growth rate for the next 20 years (2005, 2010, 2015, 2020) in Jordan. These figures were stored to Excel sheets. The user can select a certain scenario or a set of scenarios. The DVS extracts the data from the Excel sheets and rearranges them in order to visualize it in standardized charts using MS Excel.

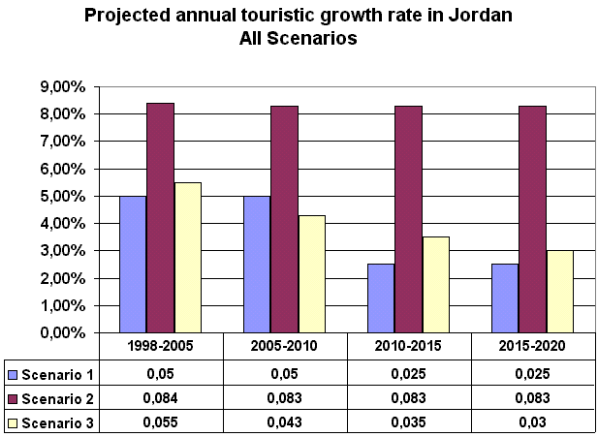
projected values for	detailed reference	aggregated for
the planning horizons 2005/2010/2015/2020	none	• nation



This dialog allows the selection of three scenarios. If you select Table as the first output screen, the Excel will show you the table first. You can switch between chart and table view within Excel as often as you want.

Static Values! The values does not come from the Oracle WIS. Data source is an Excel sheet!

Sample results:

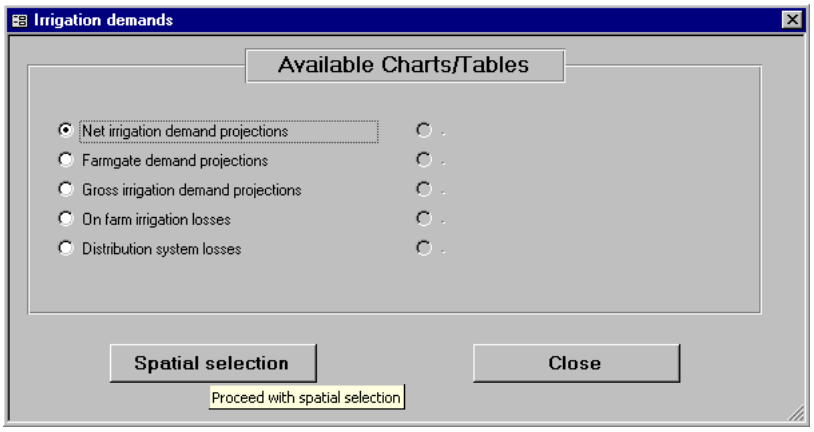


Annual touristic growth rates for Jordan projected for the next 4 planning horizons.

	A	B	C	D	E
1	Regular Annual Touristic Growth Rate by Scenario				
2	Scenario	1998-2005	2005-2010	2010-2015	2015-2020
3	Scenario 1 (World Bank)	5,00%	5,00%	2,50%	2,50%
4	Scenario 2 (Log. Regression)	8,40%	8,30%	8,30%	8,30%
5	Scenario 3 Simple Regression)	5,50%	4,30%	3,50%	3,00%

Annual touristic growth rates shown in a table

3.4. Data Type: **Irrigation Demands**



5 different chart types are available for the irrigation demands.

3.4.1 Chart Type: **Net Irrigation Demand Projections**

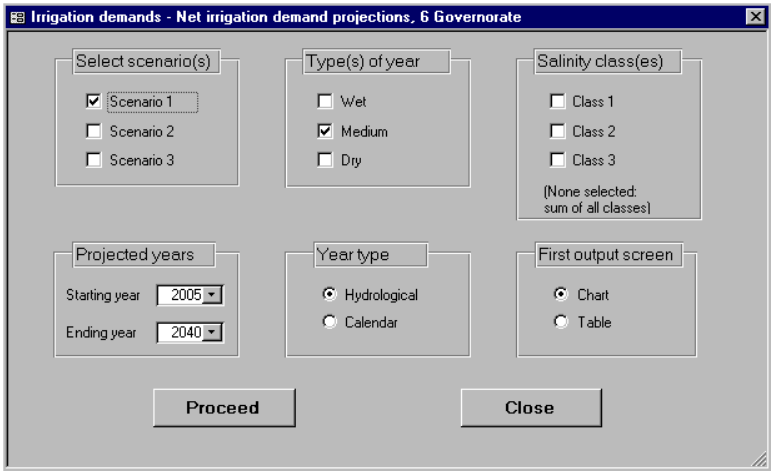
Data Type
Irrigation demands

Chart Type
Net irrigation demand Projections

Oracle Access Rights for
`JORDAN.STP_AGRICULTURE`

The irrigation demand projections are the future demand estimations calculated by the sector managers by using the pre-processing modules. They are stored in the Oracle WIS STP table JORDAN.STP_AGRICULTURE per settlement ID, scenario, type of year, year and month. The type of year indicates whether dry, medium or wet conditions are expected. Additionally, the quality (salinity) parameters of the demand is written to this table. Although a settlement does not necessarily have an irrigation demand, the spatial selection offers all settlements to choose. .

projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 types of year • 3 scenarios	irrigation center (single settlement)	• nation • governorates • districts • surface water basins • service zones • agro-climatic zones • groundwater basins

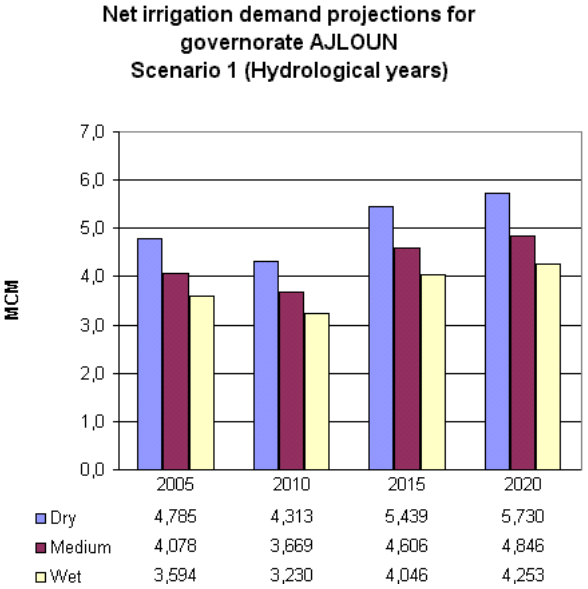


The Irrigation Demands parameter dialog offers a set of parameters to choose from. You can visualize the values for irrigation centers or several spatial units (e.g. governorates). You can draw three scenarios in one chart or the three types of year. You can distinguish between the different salinity classes by selecting the boxes. The Excel chart will show you the water volumes for every salinity class.

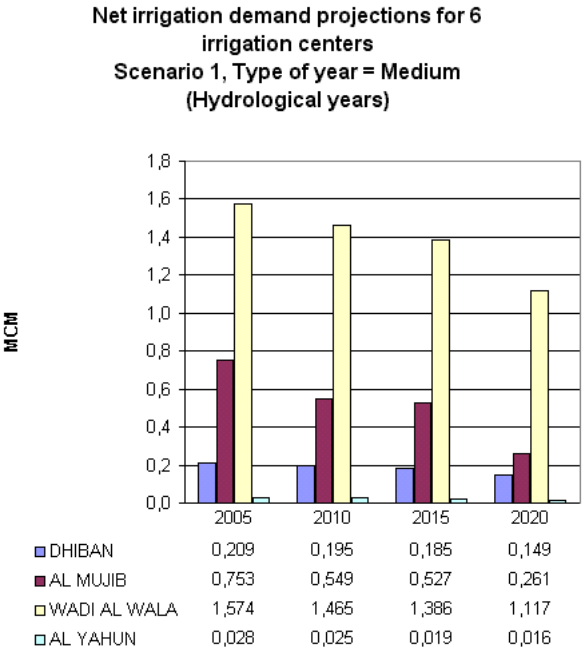
Restrictions: You can either plot different irrigation centers or different scenarios or different types of year or different salinity classes in one chart. Due to restrictions in MS Excel it is not possible to chart more than one scenario or more than one type of year or more than one salinity class, if you have already selected more than one settlement or unit of aggregation in the spatial selection window. Only one of the 4 parameters [objects / scenarios(s) / type(s) of year / salinity class] is allowed to be a multiple selection.

	multiple governorates	multiple scenarios	multiple types of year	multiple salinity classes
governorates	>1	1	1	1
scenarios	1	>1	1	1
type(s) of year	1	1	>1	1
salinity class	1 class or sum	1 class or sum	1 class or sum	> 1 class

Sample results:

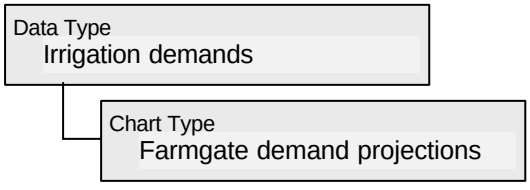


The net irrigation demand projections for the next 4 planning horizons for governorate Ajloun



The net irrigation demand projections for the next 4 planning horizons: Comparison of 4 irrigation centers

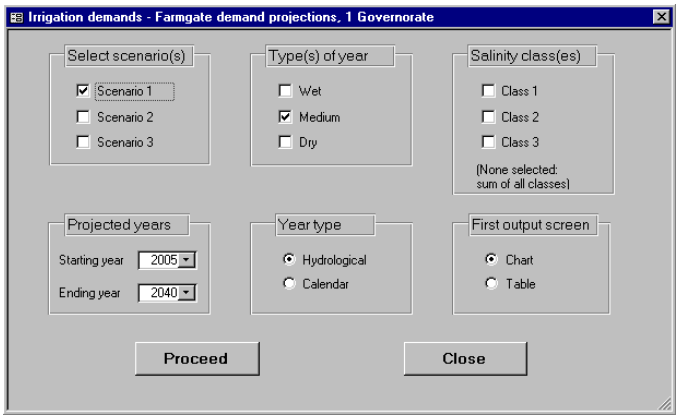
3.4.2 Chart Type: **Farmgate Demand Projections**



Oracle Access Rights for
`JORDAN.STP_AGRICULTURE`
`JORDAN.STP_LOSSES_ONFARM`

The farmgate demand projections are the future estimations of the demand which occurs at the farmgate, thus includes the on farm losses. These values were calculated by the sector managers by using the pre-processing modules. They are stored in the Oracle WIS STP table JORDAN.STP_AGRICULTURE and JORDAN.STP_LOSSES_ONFARM per settlement ID, scenario, type of year, year and month. The type of year indicates whether dry, medium or wet conditions are expected. Additionally, the quality (salinity) parameters of the demand is written to this table.

projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 types of year • 3 scenarios	irrigation center (single settlement)	• nation • governorates • districts • surface water basins • service zones • agro-climatic zones • groundwater basins

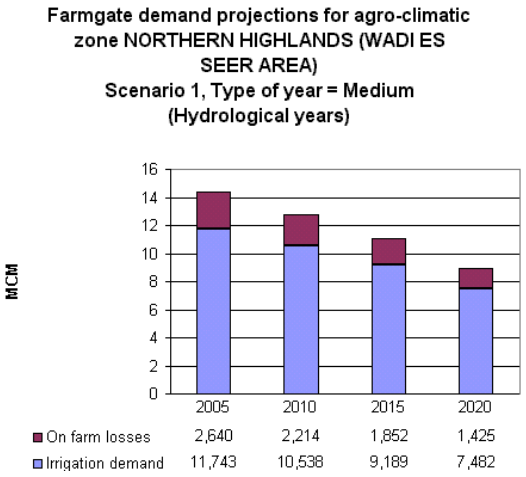


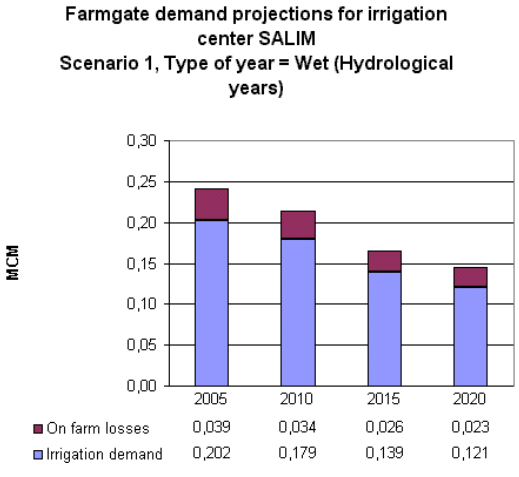
The Farmgate Demand Projections parameter dialog offers a set of parameters to choose from. You can visualize the values for irrigation centers or several spatial units (e.g. governorates). You can draw three scenarios in one chart or the three types of year. You can distinguish between the different salinity classes by selecting the boxes. The Excel chart will show you the water volumes for every salinity class.

Restrictions: You can either plot different irrigation centers or different scenarios or different types of year or different salinity classes in one chart. Due to restrictions in MS Excel it is not possible to chart more than one scenario or more than one type of year or more than one salinity class , if you have already selected more than one settlement or unit of aggregation in the spatial selection window. Only one of the 4 parameters [objects / scenarios(s) / type(s) of year / salinity class] is allowed to be a multiple selection.

	multiple governorates	multiple scenarios	multiple types of year	multiple salinity classes
governorates	>1	1	1	1
scenarios	1	>1	1	1
type(s) of year	1	1	>1	1
salinity class	1 class or sum	1 class or sum	1 class or sum	> 1 class

Sample results:





3.4.3 Chart Type: **Gross Irrigation Demand Projections**

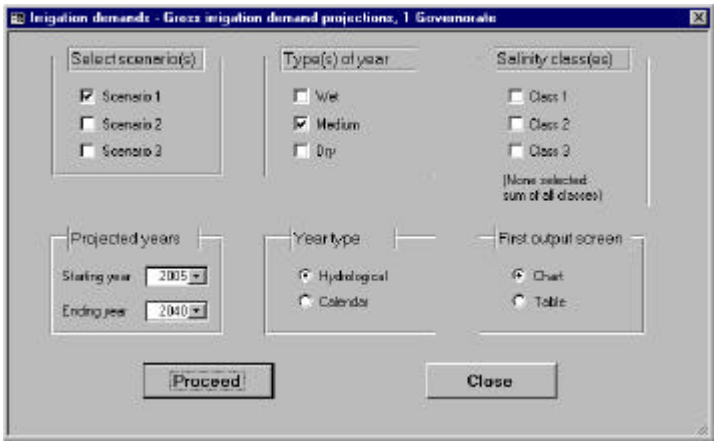
Data Type
Irrigation demands

Chart Type
Gross irrigation demand projections

Oracle Access Rights for
JORDAN.STP_AGRICULTURE
JORDAN.STP_LOSSES_ONFARM
JORDAN.STP_LOSSES_AGRODISTRIB

The gross irrigation demand projections are the future estimations of the total irrigation which includes the irrigation demand, the on farm losses and the distribution losses. They are stored in the Oracle WIS STP tables JORDAN.STP_AGRICULTURE, JORDAN.STP_LOSSES_ONFARM and JORDAN. STP_LOSSES_AGRODISTRIB per settlement ID, scenario, type of year, year and month. The type of year indicates whether dry, medium or wet conditions are expected. Additionally, the quality (salinity) parameters of the demand is written to this table.

projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 types of year • 3 scenarios	irrigation center (single settlement)	• nation • governorates • districts • surface water basins • service zones • agro-climatic zones • groundwater basins

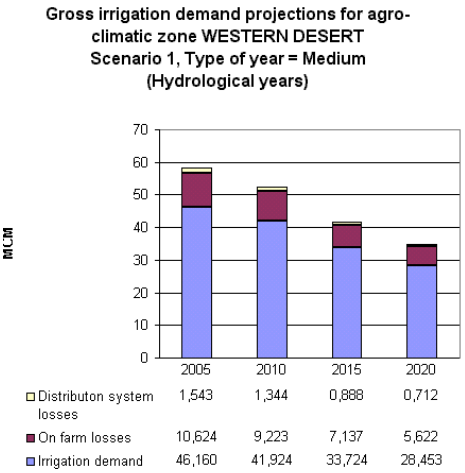


The Gross Irrigation Demand parameter dialog offers a set of parameters to choose from. You can visualize the values for irrigation centers or several spatial units (e.g. governorates). You can draw three scenarios in one chart or the three types of year. You can distinguish between the different salinity classes by selecting the boxes. The Excel chart will show you the water volumes for every salinity class.

Restrictions: You can either plot different irrigation centers or different scenarios or different types of year or different salinity classes in one chart. Due to restrictions in MS Excel it is not possible to chart more than one scenario or more than one type of year or more than one salinity class , if you have already selected more than one settlement or unit of aggregation in the spatial selection window. Only one of the 4 parameters [objects / scenarios(s) / type(s) of year / salinity class] is allowed to be a multiple selection.

	multiple governorates	multiple scenarios	multiple types of year	multiple salinity classes
governorates	>1	1	1	1
scenarios	1	>1	1	1
type(s) of year	1	1	>1	1
salinity class	1 class or sum	1 class or sum	1 class or sum	> 1 class

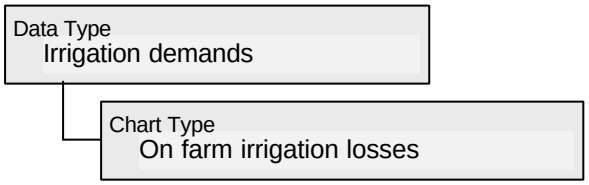
Results:



	A	B	C	D	E
1	Gross irrigation demand projections for agro-climatic zone WESTERN DESERT				
2	Scenario 1, Type of year = Medium (Hydrological years)				
3					
4	Demand type	2005	2010	2015	2020
5					
6	Irrigation demand	46,160	41,924	33,724	28,453
7	On farm losses	10,624	9,223	7,137	5,622
8	Distributon system losses	1,543	1,344	0,888	0,712
9					
10	Total	58,328	52,491	41,748	34,787

Table view of the demand projections

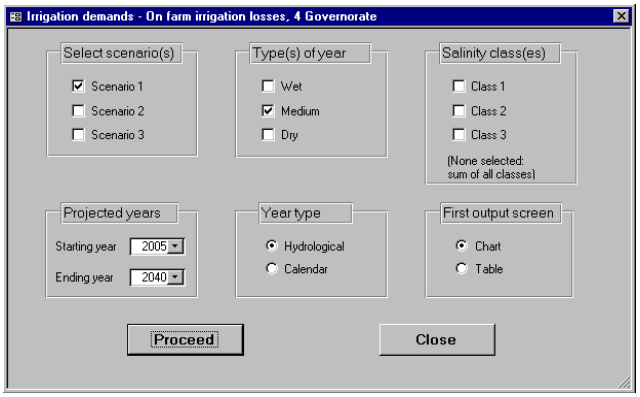
3.4.4 Chart Type: **On Farm Irrigation Losses**



Oracle Access Rights for
`JORDAN.STP_LOSSES_ONFARM`

The on farm irrigation losses are the future demand estimations for the losses occurring on the farms. These volumes are calculated by the sector managers by using the pre-processing modules. They are stored in the Oracle WIS STP table JORDAN.STP_LOSSES_ONFARM per settlement ID, scenario, type of year, year and month. The type of year indicates whether dry, medium or wet conditions are expected. Additionally, the quality (salinity) parameters of the demand is written to this table.

projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 types of year • 3 scenarios	irrigation center (single settlement)	• nation • governorates • districts • surface water basins • service zones • agro-climatic zones • groundwater basins

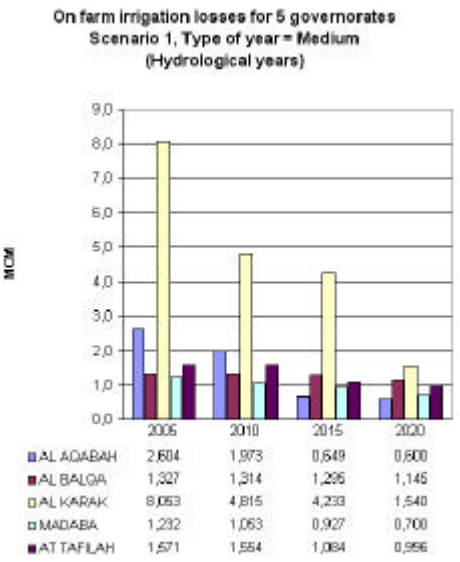


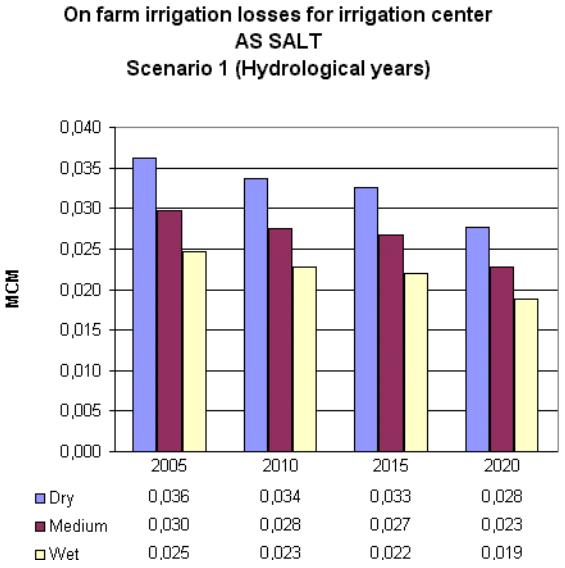
The On farm Irrigation Losses parameter dialog offers a set of parameters to choose from. You can visualize the values for irrigation centers or several spatial units (e.g. governorates). You can draw three scenarios in one chart or the three types of year. You can distinguish between the different salinity classes by selecting the boxes. The Excel chart will show you the water volumes for every salinity class.

Restrictions: You can either plot different irrigation centers or different scenarios or different types of year or different salinity classes in one chart. Due to restrictions in MS Excel it is not possible to chart more than one scenario or more than one type of year or more than one salinity class , if you have already selected more than one settlement or unit of aggregation in the spatial selection window. Only one of the 4 parameters [objects / scenarios(s) / type(s) of year / salinity class] is allowed to be a multiple selection.

	multiple governorates	multiple scenarios	multiple types of year	multiple salinity classes
governorates	>1	1	1	1
scenarios	1	>1	1	1
type(s) of year	1	1	>1	1
salinity class	1 class or sum	1 class or sum	1 class or sum	> 1 class

Sample results:





3.4.5 Chart Type: **Distribution System Losses**

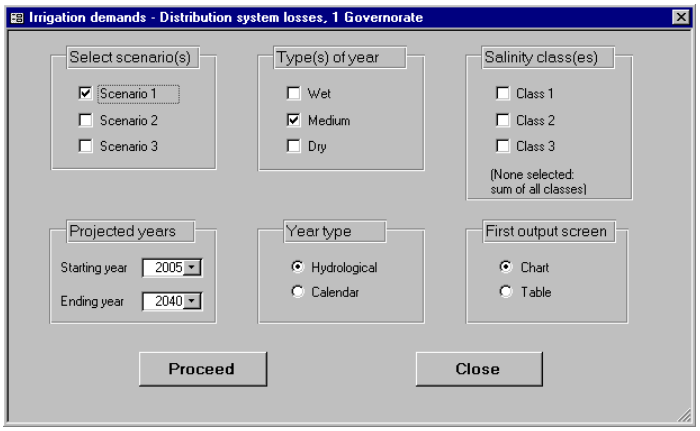
Data Type
Irrigation demands

Chart Type
Distribution system losses

Oracle Access Rights for
`JORDAN.STP_LOSSES_AGRODISTRIB`

The distribution system losses are the future demand estimations calculated for the losses in the distribution system (without the on farm losses). These values are calculated by the sector managers by using the pre-processing modules. They are stored in the Oracle WIS STP table JORDAN.STP_AGRODISTRIB per settlement ID, scenario, type of year, year and month. The type of year indicates whether dry, medium or wet conditions are expected. Additionally, the quality (salinity) parameters of the demand is written to this table (usually salinity class 2).

projections for	detailed reference	aggregated for
• 15 months • 8 planning horizons • 3 types of year • 3 scenarios	irrigation center (single settlement)	• nation • governorates • districts • surface water basins • service zones • agro-climatic zones • groundwater basins



The Distribution system losses parameter dialog offers a set of parameters to choose from. You can visualize the values for irrigation centers or several spatial units (e.g. governorates). You can draw three scenarios in one chart or the three types of year. You can distinguish between the different salinity classes by selecting the boxes. If you do so, the Excel chart will show you the water volumes for every salinity class.

Restrictions: You can either plot different irrigation centers or different scenarios or different types of year or different salinity classes in one chart. Due to restrictions in MS Excel it is not possible to chart more than one scenario or more than one type of year or more than one salinity class , if you have already selected more than one settlement or unit of aggregation in the spatial selection window. Only one of the 4 parameters [objects / scenarios(s) / type(s) of year / salinity class] is allowed to be a multiple selection.

	multiple governorates	multiple scenarios	multiple types of year	multiple salinity classes
governorates	>1	1	1	1
scenarios	1	>1	1	1
type(s) of year	1	1	>1	1
salinity class	1 class or sum	1 class or sum	1 class or sum	> 1 class

Sample results: