Transboundary NGO Master Plan for the Lower Part of the Jordan River Basin

Lower Jordan River Basin

Royal HaskoningDHV in partnership with:
MASAR Jordan
CORE Associates
DHVMED

Eco Peace Middle East
SIWI - Stockholm International Water Institute
GNF - Global Nature Fund
EU - SWIMP, February 2015

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"Protecting the Environment" means to change our global perception: to change from a culture (and policy) that enables and even encourages excess consumerism that creates more and more system-wide problems and consumes natural resources, to a culture (and policy) based on wise consumption and maximum efficiency, that will improve the quality of life of the consumers and not only the volume of consumption. This applies especially to the policy regarding the water resource in our region that must be managed in a sustainable manner for current and future generations.

Lower Jordan River Basin

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EU - SWIMP, 24 February 2015

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PREFACE

The Lower Jordan River originates at the Lake of Tiberias, intercepts with the Yarmouk River and next meanders along 200 km through the Jordan Valley down to the Dead Sea. Its basin, although small in size, is shared by Jordan, Israel and Palestine and is renowned around the world for its remarkable geographic features, its ancient civilizations and its religious relevance. The environmental and ecological values of the basin have declined drastically during the last sixty years: its water has been diverted; its ecological systems crimpled and its natural absorption capacities have been pushed to the limits. Large flows of untreated wastewater and saline water are discharged directly into the basin and substantial parts of the basin are no longer accessible for the inhabitants who live here.

Water and Environment Development Organization under the umbrella of Eco Peace Middle East in partnership with the Stockholm International Water Institute (SIWI) and the Global Nature Fund (GNF) have assigned Royal HaskoningDHV and its partner MASAR in Jordan, Core Associates in Palestine and DHVM ED in Israel to develop this transboundary NGO Master Plan for the Lower Jordan River basin. . The aim of the plan is to identify feasible interventions that will restore the basin's environmental and ecological values within a realistic financial and economic framework, in which a future State of Palestine will be recognized as one of the three riparians to the Jordan River Basin, side by side with Israel and Jordan with all three nations entitled to an equitable share of the basin's resources. The plan assumes furthermore free access to the basin for all people within appropriate and negotiated security arrangements. This plan will be used as an advocacy tool towards Jordanian, Israeli and Palestinian decision makers and the international community for the implementation of the proposed interventions.

An estimated 500,000 Jordanians, 49.000 Israeli's and 56.000 Palestinians live today on both sides of the Jordan River. This Master Plan provides first a summary of the current status of the basin in terms of its land use and its natural and cultural resources; next it describes the people living in the basin, including their socio-economic circumstances and the different economic sectors and related water demands; and it describes the current governance of the basin. Next, this Master Plan shows projected population and economic figures for the years 2025 and 2050 and related land and water requirements, and it identifies the major challenges to be addressed.

Next, it presents a series of strategic objectives for the basin including related interventions that aim at restoring the basin's water, environmental and ecological challenges within a realistic financial and economic framework, leading to a sustainable and economic prosperous region within a safe and politically stable environment, and a healthy and lively Jordan River. Finally it described the organizational, financial and planning aspects related to these interventions.

This Master Plan has been developed in close co-operation with a number of important stakeholders in the basin. During a series of workshops, these stakeholders have been consulted and participated in discussions to identify the major problems in the basin and to formulate and prioritize the appropriate interventions to address these problems.

LIST OF ABBREVIATION

AMWA	Afikey Maim Water Association
CA	Current Accounts (WEAP)
DOA	Department of Agriculture (Jordan)
dunum	Surface area unit: 0.1 ha
ET	Evapotranspiration
FMS	Frequent Maximum Salinity
EXACT-ME	Executive Action Team - Middle East
Eco Peace	Friend s of the Earth Middle East
GDP	Gross Domestic Product
GoJ	Government of Jordan
HEIA	High External Inputs Agriculture
IWA	Israeli Water Authority
IWRM	Integrated Water Resources Management
JD	Jordanian Dinar
JRV	Jordan River Valley
JVA	Jordan Valley Authority (Jordan)
JVWA	Jordan Valley Water Association (Israel)
KAC	King Abdullah Canal (Jordan)
kWh	Kilowatt Hour
LEISA	Low External Input Sustainable Agriculture
LJR	Lower Jordan River
LJRB	Lower Jordan River Basin
L/s	Liter per second
m3/s	cubic meter per second
MCM	Million Cubic Meters
mg/L	milligram per liter
MoA	Ministry of Agriculture (Israel)
MSL	Mean Sea Level
NGO	Non-governmental Organization
NIS	New Israeli Shekel
NPA	Nature and Parks Authority (Israel)
NWC	National Water Carrier (Israel)
PCBS	Palestinian Central Bureau of Statistics
ppm	Parts per Million
PWA	Palestinian Water Authority
RS	Reintroduced Scenario (WEAP)
Lake Tiberius	Sea of Galilee
SWC	Saline Water Carrier
SPNI	Society for the Protection of Nature in Israel
SWM	Solid Waste Management
THS	Tiberius Hot Springs
UJR	Upper Jordan River
WBWD	West Bank Water Department (Palestine)
WEAP	Water Evaluation and Planning System
WW	Wastewater

WWTP	Wastewater Treatment Plant
ZS	Zero Scenario (WEAP)

1 INTRODUCTION

1.1 This Transboundary Master Plan

ECO PEACE Middle East assigned Royal HaskoningDHV / DHV B.V. on the 27th of August 2012 to develop national NGO Master Plans for the Lower Jordan River (LJR) basin for Jordan and Palestine, and one integrated NGO Master Plan for the whole Lower Jordan Basin, located between the Lake of Tiberius and the Dead Sea. WEDO / Eco Peace will publish this final Master Plan and will use it as an advocacy tool with national stakeholders and the international community for the fully or partly adoption of the proposed interventions.

The future scenarios and strategic objectives for the Lower Jordan Master Plan presented in this report reflects the vision of Eco Peace Middle East, and does not necessarily reflect the opinion of the financiers or the individual consultants and their sub-consultants.

This Trans boundary Master Plan describes the current land and water related issues in the Lower Jordan River Basin, and the projections in the basin for the years 2025 and 2050. It presents the major challenges in the basin towards creating sustainable development conditions, including environmental flows provided through its natural resources; a healthy eco-system; equitable sharing of water resources, and it present a list of prioritized interventions that will restore the basin's environmental and ecological values within a realistic financial and economic framework. The Lower Jordan Basin is part of the wider Jordan Basin, which includes catchment areas in Lebanon and Syria as well. The upper Jordan Basin is connected to the Lower Basin through Lake Tiberius and the Yarmouk River. This study does not address analysis of the wider Jordan basin as a whole, but assumes the hydrological characteristics of Lake Tiberius and the Yarmouk as boundary conditions for this study.

An extensive baseline report of the trans-boundary Lower Jordan Valley has been prepared by the Consultant in March 2014, which provides the base for this Master Plan.

1.2 The Consultants

Royal HaskoningDHV B.V. is Eco Peace's main contractor for this study, and has established sub-contacts with CORE Associates in Palestine, MASAR Center from Jordan and DHVMED from Israel. Key experts from these organizations form together the core study team, headed by DHV's project manager. The study team represents an excellent track record in the areas of development of river basin master plans around the world, as well as in water and environmental management projects in Jordan, Israel and Palestine. They have provided a wide range of services, from strategy and policy development, feasibility studies to designs and construction supervision in the Middle East and in different river basins around the world.

RHDHV BV from the Netherlands is part of Royal HaskoningDHV, which is one of the largest independent consultancy groups, employing currently around 8000 employees world-wide. The firm is a merger between DHV Group and Royal Haskoning Group established on the 1st of July 2012. DHV was founded in 1917 and has gained a world-wide reputation from many projects in a wide range of sectors implemented in more than 70 countries, including river basin and water resources management. Royal HaskoningDHV

is registered with the major Financial Institutions and International Agencies, and regularly carries out projects financed by them. See also www.royalhaskoningdhv.com

CORE Associates is a specialized provider of high-end professional services in Economic and Trade Policy, International Trade, Planning and Business Development Services with its headquarters in Ramallah. CORE provides timely, pragmatic and cost-efficient advice and training in the context of economic, and trade policy and negotiations, the formulation and implementation of national policy and private sector development. CORE's clients include governments, international governmental organizations as well as NGOs, trade associations and private businesses. See also www.core.ps

MASAR has been established since 1994 as a regional Non government, not-for-profit organization focusing on training projects involving about 12 countries from the MENA region and Europe. MASAR implemented projects in the fields of environment, democracy education, peace and conflict resolution, human rights, gender, interfaith dialogue, youth employment and entrepreneurship. Besides projects in these fields, Masar has also been engaged in providing consulting and expertise to local, regional and international beneficiaries on matters related to Euro-Med cooperation.
See also www.masarcenter.org

DHVMED from Israel was founded at 1996 as a subsidiary of DHV Group. The company in Israel practice consulting engineering services in water, environment and related infrastructure and counts 30 professional staff. DHV MED specialized in master planning, overall engineering from concept through feasibility studies and up to general and detailed design. The company provides consulting , design and to the industrial and public sectors such as the Ministry of Environment, WTP (water treatment plants), WWTP (wastewater treatment plants), in the areas of river basin management, air emission treatment, alternative energy, solid waste management, polluted soil treatment and more. See also www.dhvmed.com

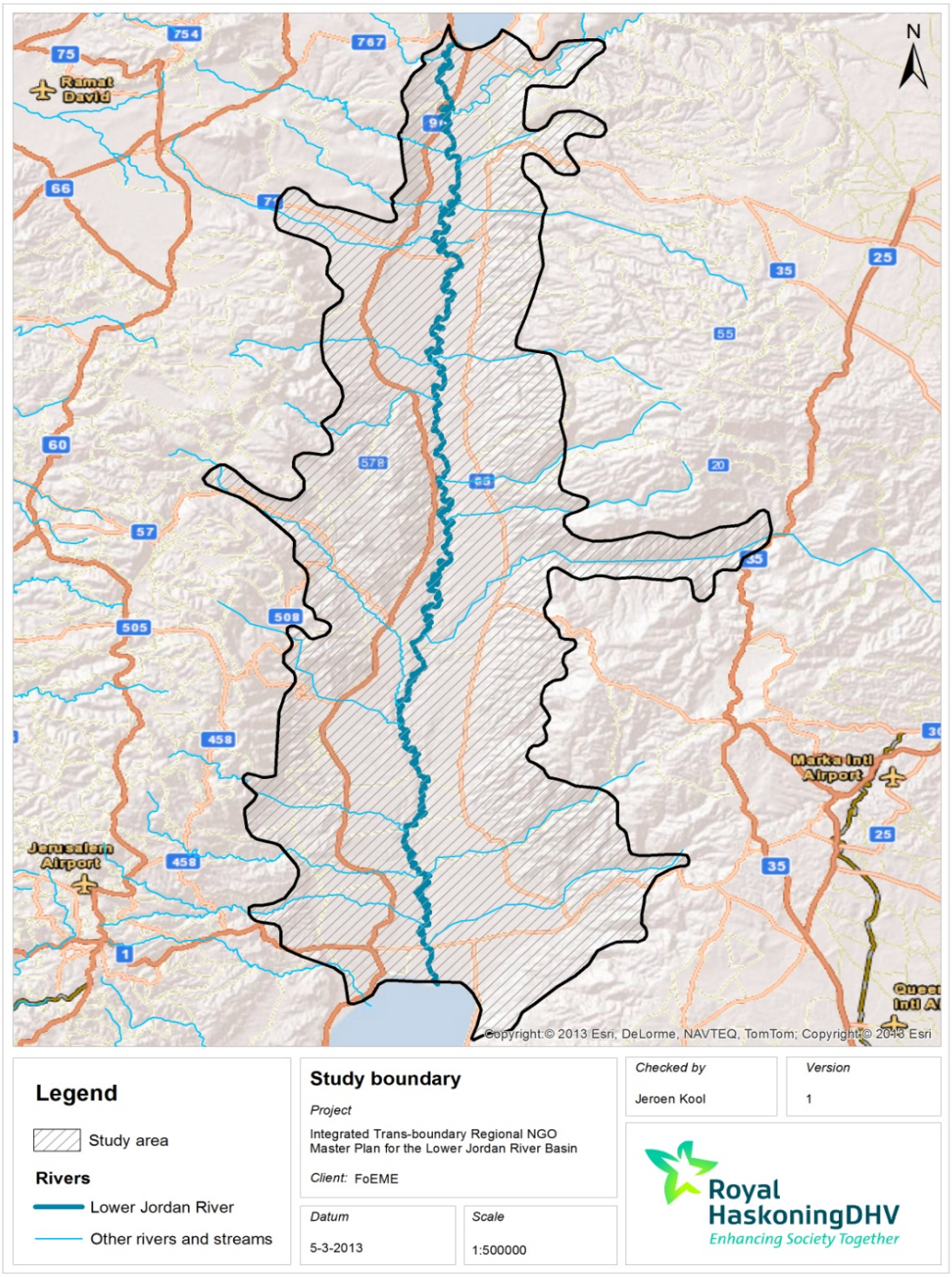


Figure 1 – Lower Jordan Valley

1.3 The Project Team

This technical analysis for this Master Plan has been performed by an international team of renowned Jordanian and Dutch experts, who have dedicatedly co-operated with the staff of Eco Peace to prepare this transboundary NGO Master Plan for the Lower Jordan River Basin as presented in this report.

Consultant's Team

Al KHATIB, Saad, Economist

AL MASRI, Dr. Mohammad, GIS expert

AL SHEIKH, Banan, Environmental Expert

BAMYA, Saeb, Geo-political Expert and Palestinian Team Leader

DE GROOT, Mark, Pollution Control Expert

ELRON, Eldad, Ecological Expert and Israeli Team Leader

HARTVELD, Dr. Aard, sociologist

HUNTJENS, Dr. Patrick, governance expert

JAYYOUSI, Anan, water management expert

KAPLAN, Moti, land use expert

KOOL, Jeroen, project manager

KWAKKEL, Jeroen, information management support

MALHAS, Haidar, agricultural expert

SAFIER, Gilad, Water Modeling expert

SHARIF, Dr. Walid, archeological expert

TALOZI, Dr. Samer, water management expert and Jordanian team leader

Eco Peace Staff

Mrs. Yana Abu Taleb	Eco Peace Amman	Assistant Director Projects
Munqeth Mehyar	Eco Peace Amman	Director Eco Peace Jordan
Adnan Budieri	Eco Peace Amman	Assistant Director Amman
Mrs. Nancy Haddaden	Eco Peace Amman	Assistant Projects Manager
Mrs. Samiramis Kutlo	Eco Peace Bethlehem	PR officer Eco Peace Bethlehem
Nader Khateeb	Eco Peace Bethlehem	Director Eco Peace Palestine
Nassar Abu Jalal	Eco Peace Bethlehem	LJR project director
Mrs. Elizabeth Ya'ari	Eco Peace Tel Aviv	Israel Project coordinator
Gidon Bromberg	Eco Peace Tel Aviv	Director Eco Peace Israel

2 THE LOWER JORDAN RIVER BASIN

2.1 Introduction

In March 2014 a Baseline Report has been prepared and published by Eco Peace Middle East on their website, describing the current situation in the Lower Jordan River Basin, including the physical and environmental characteristics of the basin, the population living in the basin and their socio-economic status and the governance structures in the basin. This report concluded with the major challenges that the basin faces, both from national perspectives and in terms of trans-boundary challenges. This section here provides a summary of this baseline report.

2.2 The Basin

2.2.1 Land Use

The Jordan Valley (Arabic: الغور ,Al-Ghor ;Hebrewעמק : הירדן ,Hayarden Emek) forms part of the larger Jordan Rift Valley. The internationally recognized World Heritage values of the Jordan Valley are strongly related to its unique historic, religious, cultural, economic and environmental values, not at least due to its typical rift valley topography. The Lower Jordan River (LJR) originates at the Sea of Galilee and meanders along 200 km down to the Dead Sea through the Jordan Valley. About 600,000 people living in the study area on both sides of the Lower Jordan River, including about 55,000 Israelis (49,000 in Israel and 6,000 settlers in the West Bank), 62,000 Palestinians, 247,000 registered Jordanians and an estimated 250,000 foreign workers in Jordan originating mainly from Egypt, Iraq and recently from Syria.

The rehabilitation of the Lower Jordan River has been a central aim of Eco Peace's work since its establishment in 1994. Through education and advocacy campaigns, major research and regional rehabilitation efforts, some real changes have already been made. For instance, new sewage treatment plants have been constructed or planned in Jordan, Israel and Palestine, which will enable treatment of polluted wastewater flowing currently into the river. Earlier research conducted for Eco Peace concludes that the Lower Jordan River will require 400 - 600 MCM of fresh water per year to reach an acceptable rehabilitation level.

The topographic nature of the area has the typical rift valley characteristic with drastic drop in elevations over short distances from the edges of the valley, and a more gently decline closer towards the Jordan River. Alongside the axe of the valley, the elevation drops from north to south. In the northern part of the LJR basin the drop is almost 375 m over a distance of 10 km. In the middle part of the valley this drop in elevation exceeds 500 m over a distance of 9 km. In the very south, this drop reduces to 100 m over a distance of 8 km. An overview of the topography of the Lower Jordan Valley is provided in Figure 4.

The study area has a total surface area of 2508 square km, most of which (61.5%) consists of uncultivated land. A total of 803 km2 (32%) is used for agriculture and 89.6 km2 (3.6%) as built up area. An overview is provided hereafter.

Table 1 – Land use in the study area

Land use	Surface area in km2	%
Agriculture	803,1	32,0
built area	89,6	3,6
fish farming	22,6	0,9
Natural/Uncultivated area	1.543,5	61,5
Reservoirs	6,4	0,3
Wadi's	43,2	1,7
Grand Total	2.508,4	100

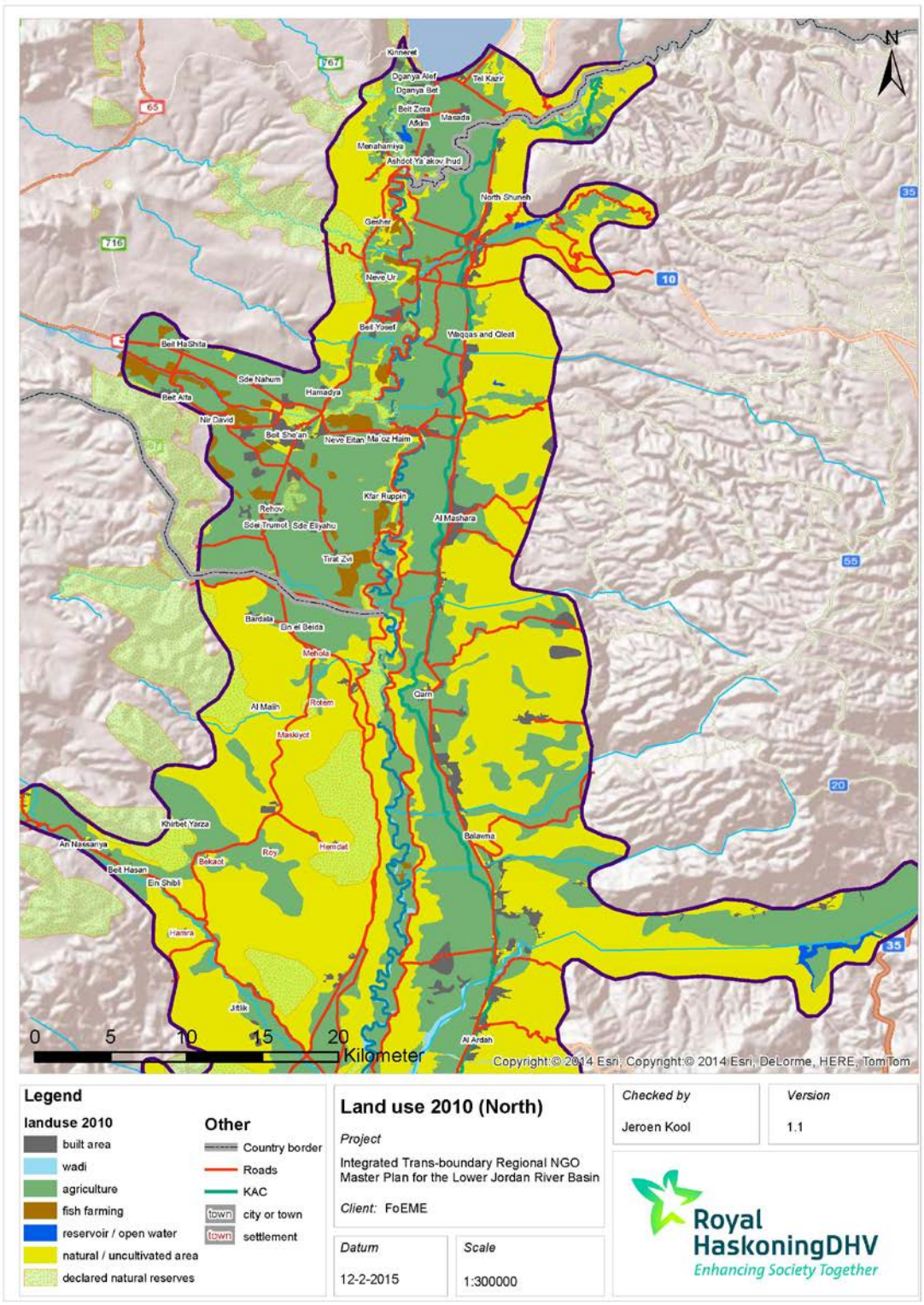


Figure 2 – Current Land use of the Northern Part of the Lower Jordan Valley

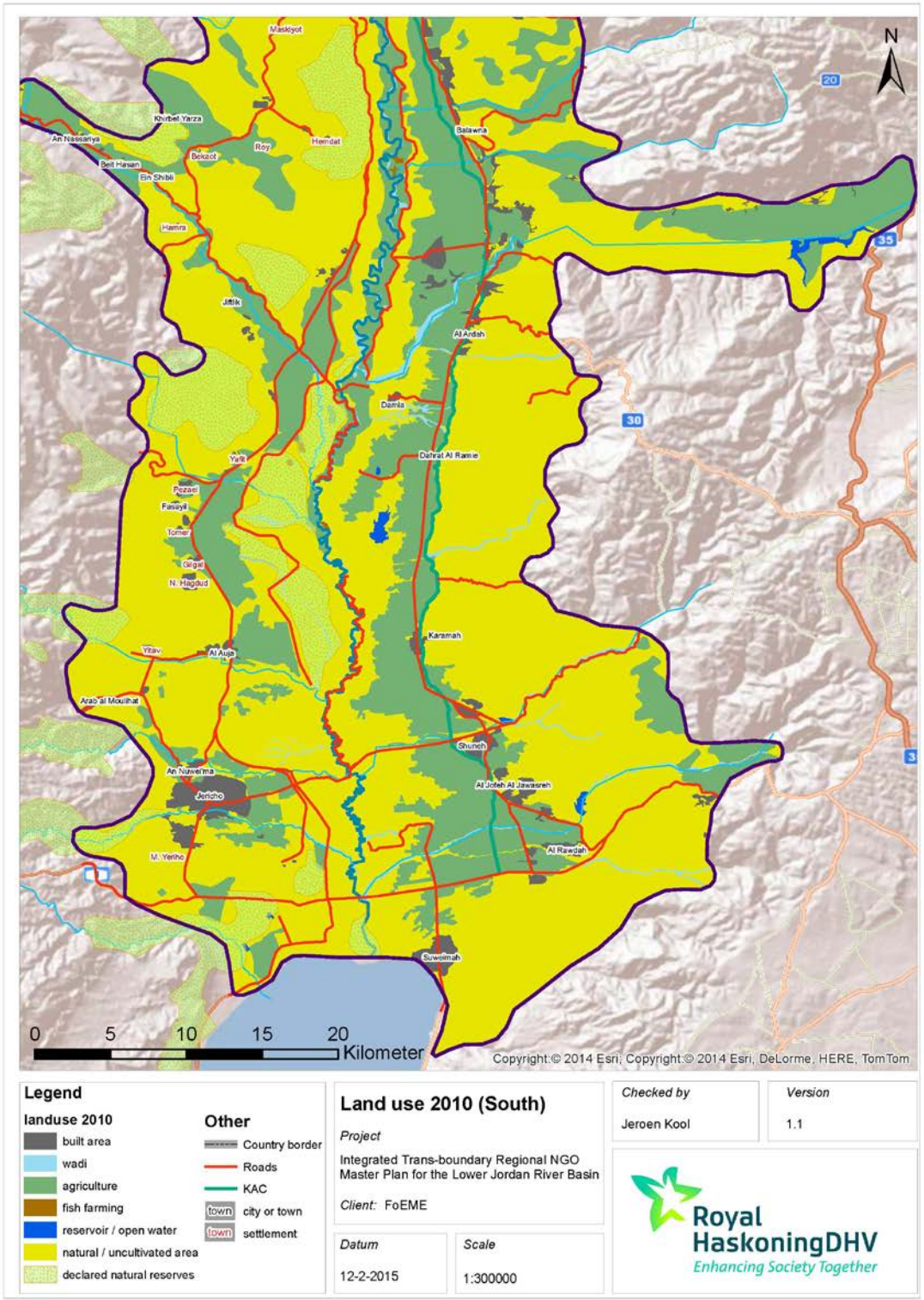


Figure 3 – Current Land use of Southern Part of the Lower Jordan Valley South

The dominant soil types in the area are regosols, rendzinas and serozems, which are mainly tertiary deposits, and to a lesser extend lithosols, all of them generally fertile. As a result, the majority of land in the area that can be provided with water is used for agriculture and horticulture.

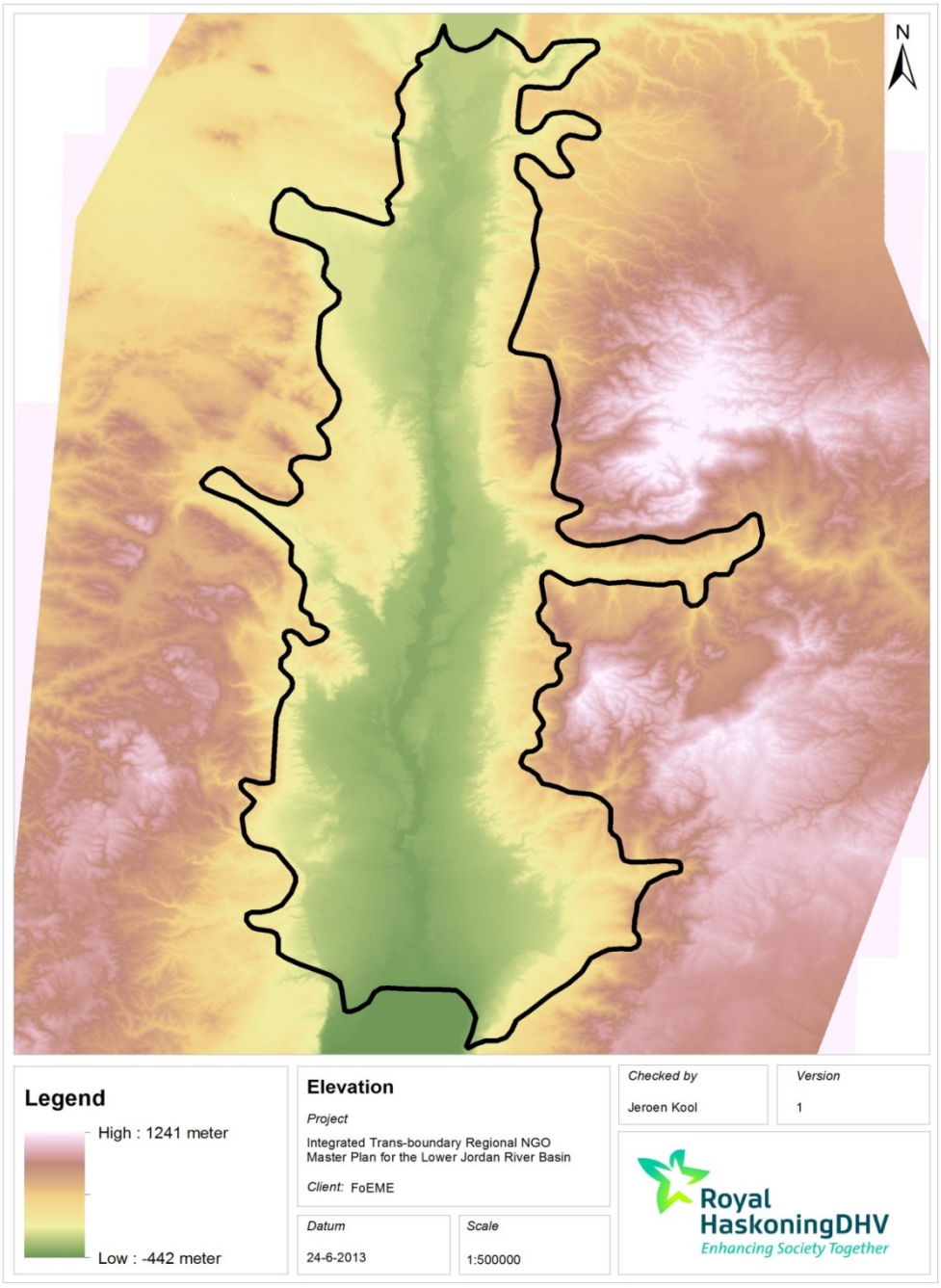
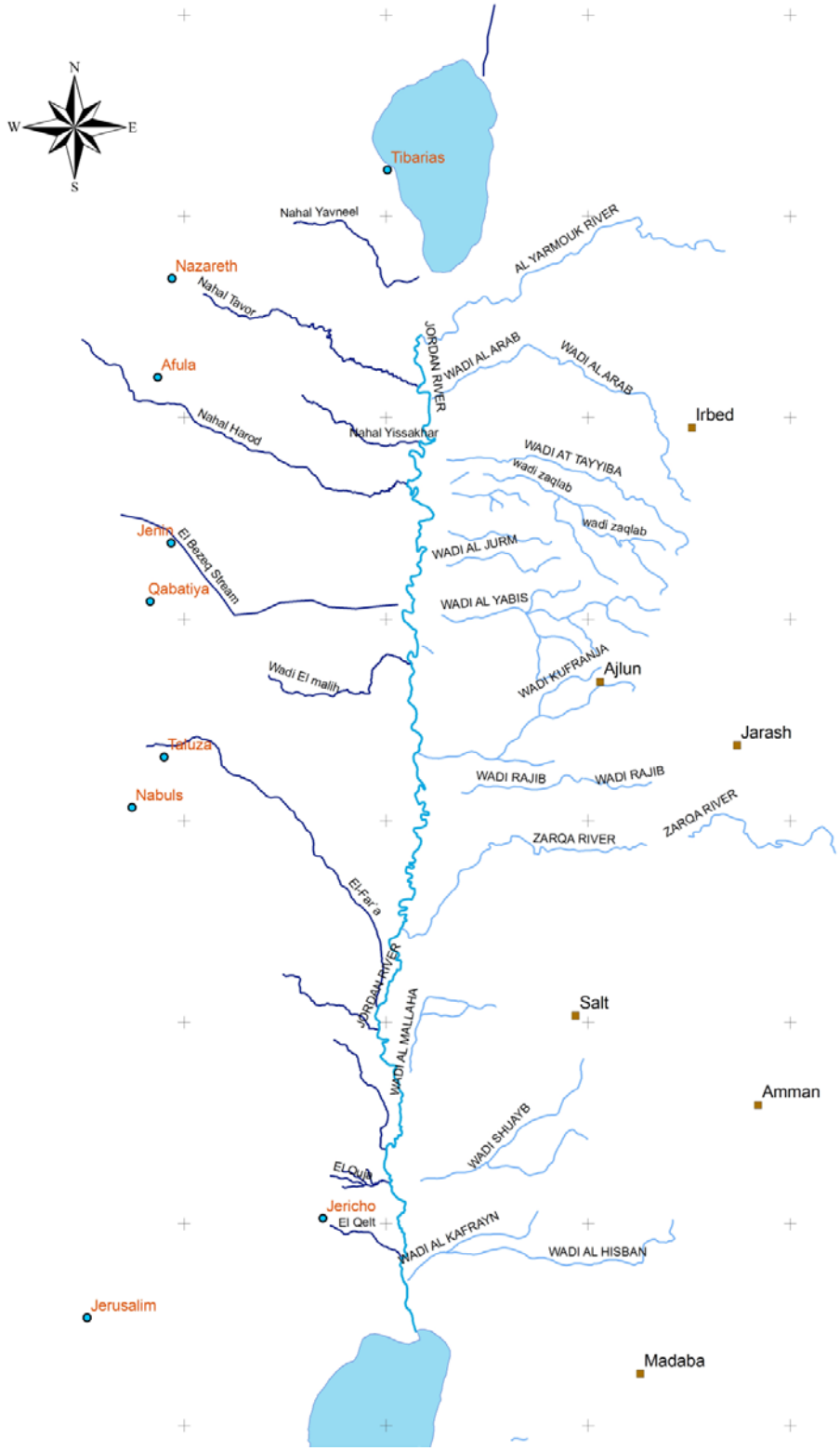


Figure 4 – Topography of the Lower Jordan Valley

2.2.2 Water


N
W
E
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Tibarias
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AL YARMOUK RIVER
Nazareth
Nahal Tavor
JORDAN RIVER
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Irbed
Nahal Harod
Nahal Yissakhar
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Jenin
El Bezeq Stream
WADI AL JURM
Qabatiya
WADI AL YABIS
WADI KUFRANJA
Ajlun
Wadi El malih
Jarash
Taluza
WADI RAJIB
WADI RAJIB
Nabuls
ZARQA RIVER
ZARQA RIVER
El Far'a
JORDAN RIVER
Salt
WADI AL MALLAHA
Amman
WADI SHUAYB
ELQUJA
Jericho
El Qelt
WADI AL KAFRAYN
WADI AL HISBAN
Jerusalim
Madaba

Figure 5 – Lower Jordan River and its main tributaries

The Lower Jordan River originates at the Sea of Galilee and meanders along 200 km down to the Dead Sea through the Jordan Valley. The average annual rainfall in the study area and the wider region is schematized below. It varies from over 500 mm per year in the north to less than 100 mm in the south close to the Dead Sea. With high temperatures and average dry conditions; the average annual evaporation is high, varying from 2150 to 2350 mm per year.

Figure 6 – The Jordan River

Historically the Lower Jordan River received about 600 MCM / yr from Lake Tiberius in the north and about 470 MCM / yr from the Yarmouk River in the north-east. With some addition inflow from the Zarqa River and nine other streams from the East Bank, the Lower Jordan River had an outflow into the Dead Sea of about 1200 – 1300 MCM / year.

Since the 1950s the water from the river has been increasingly diverted by Israel and Jordan for domestic water supply and the developed of the agricultural sector in both countries. The water is diverted mainly by the Israeli National Water Carrier taking water from Lake Tiberius, and through the development of various dams and canals in Jordan, including the Unity Dam in the Yarmouk river on the border between Jordan and Syria, the King Talal Dam in the Zarqa Basin, and the King Abdullah Canal running east and parallel to the river. Today the outflow into the Dead Sea is about 100 MCM per year or less.

The northern most section of the river is regulated in Israel by the Deganiya Dam at the Lake Tiberius, and the Alumot Dam, about 2 km further downstream. During the last 50 years, no fresh water was discharged into the LJR, other than during flood years. In 2013 a new Israeli policy was implemented by which increased fresh water levels would be released, starting with 9 MCM / yr and growing to 20 MCM / yr in 2014. During the winter season, the river may occasionally contain flood waters after heavy rainfall in the upper catchment of the Jordan Valley, as happened during the early months on 2013.

The Jordan River has become polluted due to inflow of untreated wastewater and saline water which is diverting into the river from springs west of Lake Tiberias through the Saline Water Carrier. On the

Jordanian side, most of the wastewater locally generated is not treated and discharged directly into the Wadi's and eventually in the Jordan River. This is also the case for most of the wastewater generated by the Palestinians and Israeli Settlements in the West Bank part of the basin, be it that the population here is considerably smaller than in the East Bank. Finally, the Jordan River is polluted by flushing of fishponds in Israel, about twice a year. This water is polluted by fish excrements and anti-biotic components usually added to these fish ponds.

The groundwater system in the Lower Jordan Valley consists of a shallow aquifer system from the Plio-Pleistocene ages, which overlays the upper sub-aquifer system of the Upper Cenomamian and Turonian ages and the deep confined aquifer of the Lower Cenomamian age. The groundwater resources are particularly important for supply of the West Bank and the southern parts of the East Bank. However, the aquifers are subject to increasing salinity levels, particularly in the south mainly as result of over exploitation and up coning of deep brines that flow through the Jordan Rift Fault system; and from contamination of agricultural return flows and sewage effluents. An overview of the main groundwater aquifer systems in the region is given in the next figure.

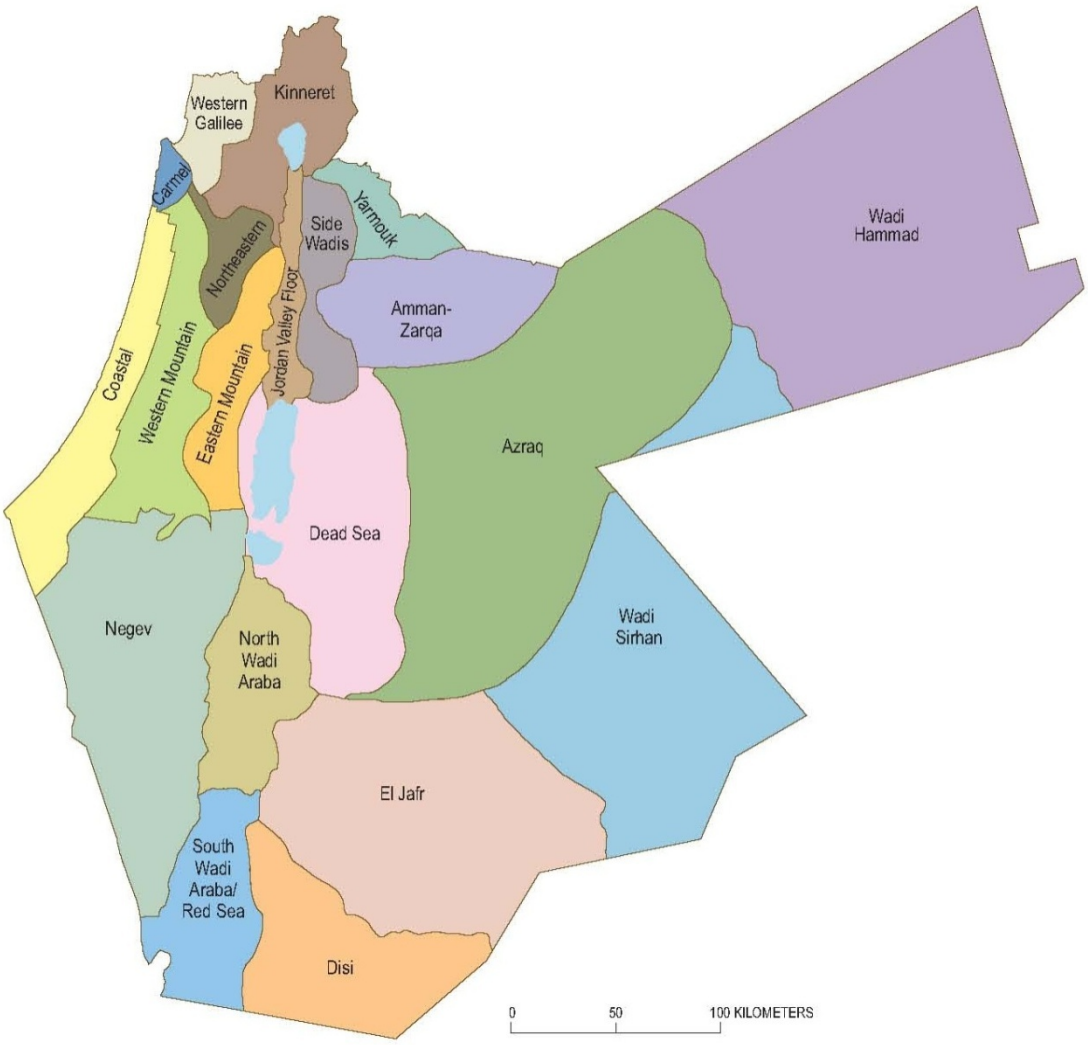

Figure 7 – Groundwater Aquifer Systems in the Region [ref: EXACT-ME]

The current low flow levels and bad water quality of the Lower Jordan River have severe impacts on the area's unique ecosystem and to the approximate 500 million migratory birds that migrate through the Jordan basin twice a year.

Figure 8 – Arab Dam

The King Abdullah Canal (KAC), on the east side parallel to the Lower Jordan River, was built in three phases between 1957 and 1966. It captures mainly runoff from the Yarmouk River, the Mukheibeh Wells and several wadis. The canal plays a central role in Jordan's agricultural development as it supplies irrigation water via pumping stations to farmers in an area of 400-500 ha. In addition, Amman receives about 50 MCM /of water per year from KAC. This transfer constitutes around one-third of water supplied to Amman and also corresponds to one third of the water diverted to KAC.

2.2.3 Climate Change

Climatically, the Jordan Valley is characterized by hot dry summers and mild wet winters, becoming progressively drier moving southward through the valley towards the Dead Sea. Climate change impacts are likely to intensify the water supply related problems in the Lower Jordan Valley. The next table provides an overview of the climate characteristics of the Jordan Valley

Table 2 – Climate Characteristics relevant for the Lower Jordan River Basin

Climate Characteristic	Type 11 (north)	Type 9 (middle)	Type 8 (south)
Annual Temperature	18 - 20^{o} C	18 - 20^{o} C	18 - 20^{o} C
Summer Temperature	21 - 27^{o} C	21 - 27^{o} C	21 - 27^{o} C
Winter Temperature	10 - 12^{o} C	10 - 12^{o} C	10 - 12^{o} C
Annual Precipitation	> 600 mm	70 - 100 mm	< 70 mm
Summer Precipitation	< 10 mm	10-30 mm	< 10 mm
Winter Precipitation	> 300 mm	< 30 mm	< 30 mm

Analysis of the impacts of climate change has been made for the wider Middle East Region such as by GLOWA (2008). Overall, these impacts include a foreseen reduction in local annual water resources with a maximum of 20% by 2050 and increasing temperatures and related surface water evaporation rates. A summary of the related impacts is proved below.

Table 3 – Climate Change related Impacts to the Lower Jordan River Basin

LJR Basin regions	Annual Precipitation	Summer Precipitation	Winter Precipitation
Jordan (North)	substantial reduction of annual rainfall in the coming decades from historically more than 600 mm to less than 100 mm	Slight increase of summer rainfall from less than 10 mm historically to maximum 30 mm	substantial reduction of winter rainfall in the coming decades from historically more than 300 mm to about less than 30 mm
Jordan (South)	8-9 Slightly increase of annual rainfall from historically less than 70 mm to about 70 – 100 mm	Slightly increase of summer rainfall from less than 10 mm historically to maximum 30 mm	No change in winter rainfall, which remains to be less than 30-70 mm
Israel	No change in average annual rainfall, which remains more than 600 mm	No change in summer rainfall, which remains to be less than 10 mm	No change in winter rainfall, which remains more than 300 to 600 mm
Palestine	Gradual shift southwards of more annual rainfall (from less than 70 to more than 600 m, with exception of the Jordan Valley itself, which remains very dry	No change in summer rainfall, which remains to be less than 10 mm	Gradual shift southwards of more winter rainfall (from less than 30-70 more than 300 - 600 m) with exception of the Jordan Valley itself, which remains very dry

The northern part of the East Bank of the LJR Basin in Jordan will be impacted most negatively by climate change, with a foreseen substantial reduction of annual and winter rainfall, although the summer rainfall will increase slightly. The southern part of the East Bank will see a slight improvement of rainfall conditions, both annually as during the summer.

2.2.4 Ecosystems

Below figure provides the “Normalized Difference Vegetation Index” for the Lower Jordan River Basin.. This index has been calculated on the basis of Satellite images, wherein the green(er) parts represent high(er) vegetation densities, or higher concentrations of natural photosynthesis processes.

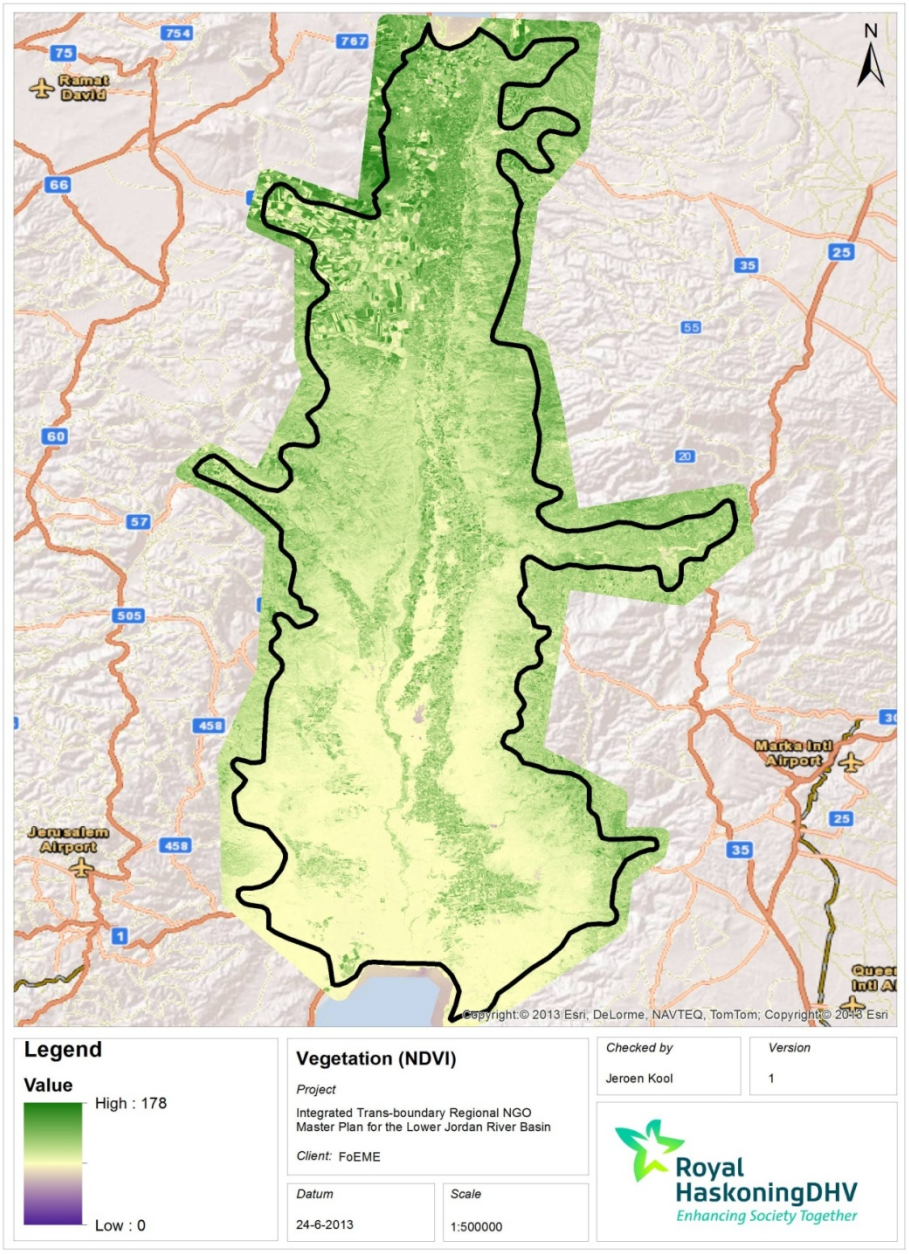

Figure 9 – Vegetation Index

The Lower Jordan Valley is characterized by a wide range of bio-climatological and physical conditions and its location at the crossroads of climatic and botanic regions endows the area with a rich variety of plant and animal life. For example, a total of 20 species of large mammals belonging to six orders have been recorded in the Valley. Among them four species are considered at risk according to the IUCN Red List of Threatened Species. Moreover, 18 bat species were found along the Jordan Valley, two of them are considered endangered or threatened *on* a global scale.

The area around the southern end of Lake Tiberius is characterized as a Mediterranean zone. On the Jordanian side of the Jordan Valley, the Mediterranean zone stretches about 150 km further south than on the western counter part in Israel. Mediterranean vegetation is typical for those areas of the mountain range which received an annual precipitation of 350 mm or more. These areas have been intensively managed by mankind since historical times and large areas are cultivated fields or orchards. Southward, down to the northern limit of the southern Jordan Valley, the environment is Irano-Turanian. Rainfall gradually decreases here from an average of 400 mm to the north to about 200 mm at the southern end. In Jordan this zone is often a transition between the Mediterranean and the desert areas.

Around spring and autumn the Jordan Valley serves as an important migration route for some 500 migrant species, flying between Eastern Europe, Western Asia and Africa. Some of these species are currently considered threatened on a global scale by the IUCN and Birdlife International. Most important, large portions, or even entire bird populations, pass through the Jordan Valley, as it serves as a bottleneck for bird migration. A good example is the White Stork, some 500,000 of which pass through the region twice yearly. This quantity amounts to almost the entire Eastern European population.

A total of 15 native freshwater fish species exists in streams and springs in the Lower Jordan Valley. In addition, some 12-13 native freshwater fish can be found in the Yarmouk River systems. Furthermore several alien species were introduced in to the water systems in Lower Jordan River Basin.

During the last century the area has undergone major developmental processes with substantial impacts on the local nature and ecology. Those processes include establishment of new communities and infrastructure, industrial facilities and transformation of natural land into agriculture land. Excessive pumping caused groundwater depletion, as well as flow reductions in natural springs.

The Lower Jordan River has undergone severe alternation due to diversion of freshwater and inflow of polluted water. Moreover, floods were once part of the natural flow regime in the Lower Jordan River until the construction of Degania Dam in 1932, and essential in shaping the river meanders, flushing fine sediment and creating healthy functioning ecosystem. As a result aquatic habitats have deteriorated, accompanied by decrease in macro-invertebrate, fish populations and vegetation diversity. Today the river vegetation is dominated by halophytic plants rather than the natural vegetation that disappeared over large areas.

An analysis of the environmental flow requirements for the Lower Jordan River indicates that the physical characteristics of the flow are the most important ecological factor for enabling macro-invertebrates. Less water in the LJR caused changes to the stream channel, resulting in a narrower and more canalized river ecosystem. Less water has also resulted in much slower velocities, reducing the habitats depending of flows, such as falls, cascades and rapids. Less water in the river also means less dilution with inflowing polluted water, such as brackish (ground) water or wastewater. This leads to higher pollution concentrations in the river stream. As a result, the ecology of the river is now reduced to pockets of high resistant and medium to slow velocity habitats.

Reduction in water flows, but also dams in the river and its tributaries, resulted also in smaller river's sediment loads. Slower velocities carry far less sediment with smaller grain sizes. The formation of streamside water bodies, such as deserted meanders, has stopped, and related habitats have disappeared from the river's ecosystem, resulting in the loss of unique community compositions of both plant and animal species specifically adapted to these habitats. If healthy freshwater ecosystems are to be restored, it is important to address the natural flows around which flora and fauna can develop. Critical parameters in this respect are: the quality of the water; the magnitude of the flow; the seasonable fluctuation of the flow; the frequency, duration and variability of floods and droughts.

The Yarmouk and Jordan River are also important for hosting many mammals in the vicinities of their river banks. Despite the deterioration of their natural habitat, many carnivores and other mammalian species have managed to survive because access to the area has been limited due to military restrictions. However, the number of species in the Jordan River has diminished and needs further research. It might be possible, after thorough research, that some of the species could be reintroduced if conditions would again be appropriate.

Figure 10 - Water Snake in the Lower Jordan River

The main ecological threats and their causes that have been identified in the Jordan River Basin are presented in the next table.

Table 4 - Current threats of ecosystems of the Lower Jordan River and their causes

No	Threat	Root Cause
1	Fragmentation of habitats	• Agricultural encroachment • No applied land use strategies • No guideline policies on conservation with development agencies • Unregulated urban and infrastructure expansion • No clearly mandated management agency
2	Inappropriate agricultural development	• Lack of comprehensive land use strategy • No conservation-orientated policies or extension services • Weak coordination between farmers and government agencies and local NGOs • High water demanding crops
3	Water pollution	• Excessive agrochemical use • Inadequate guidelines on use of agrochemicals • Minimal sewage treatment • Inadequate controls on industrial effluent
4	Air pollution	• Inadequate controls on industrial emissions
5	Solid waste	• Lack of treatment infrastructure
6	Excessive hunting pressure	• Inadequate enforcement of laws • · Declining bird populations
7	Excessive grazing Pressure	• Inadequate enforcement of • regulations • Lack of grazing land • Limited alternative livelihoods
8	Tree cutting	• Inadequate enforcement of regulations • Limited fuel supplies for subsistence communities • Lack of alternative livelihoods
9	Unregulated tourism Development	• · Inadequate planning and enforcement of regulations
10	Over-extraction of water	• Lack of coordinated strategy between government and users • Weak enforcement of regulations (EIAs) • Lack of water conservation technologies • High water demanding crops • No coordination between supply and demand

The challenges to ecosystems and biodiversity protection in the Lower Jordan River are particularly to create a stronger legal, management and information framework that enables adequate allocation, management and enforcement of nature protection.

Freshwater is the major environmental and socio-economic resource in the Jordan River Basin (JRB), directly supporting all human activity, vegetation, and wildlife habitats and their associated productivity, with considerable inter-country variability. Freshwater sources are also the natural resource component

most at risk since there is no economic substitute for the basin's watercourses and associated aquifers, which are also the final repository of human waste.

Despite past impacts, the Jordan River still provides important wildlife and fish habitat. This lowland riparian habitat has been identified by many national and international environmental agencies as the single most important habitat type in the region for avian species.

Nature Reserves

In the Western part of the Lower Jordan River Basin a total of 44 natural reserves and national parks have been assigned by Israel from Lake Tiberius to the Dead Sea. A total of 28 of these nature reserves are entirely located inside the project boundaries, while the areas of the rest are crossed by the project's boundaries. The total protected areas north of Bezeq stream is 61 square km, while the total protected areas south of the Bezeq Stream as defined by Israel amount to 117.5 square km. The areas of the natural reserves and national parks north of Bezeq stream tend to be smaller than those in the Palestinian West Bank. It should be noted that in the West Bank the Israeli civil administration unilaterally announces areas to become protected Nature Reserves without consultation with Palestinians.

From a biological and wildlife diversity perspective the most important nature reserves are the Valley's lower plain (the Zor), the Jordan Valley inland salt flats (sabkhas) and Wadi Auja. The two largest salt flats in the Valley contain rare plant species that are exclusive and need these extreme conditions to their life cycle. Other important nature reserves include Wadi al-Fasayil and Umm Zuka ridge, Wadi El Maliah, Wadi Far'a, Wadi el-Fasayil and Wadi Qelt. Some of these wadis are of seasonal nature and others are partially perennial. From an ecological point of view the most spectacular stream is Wadi Qelt.

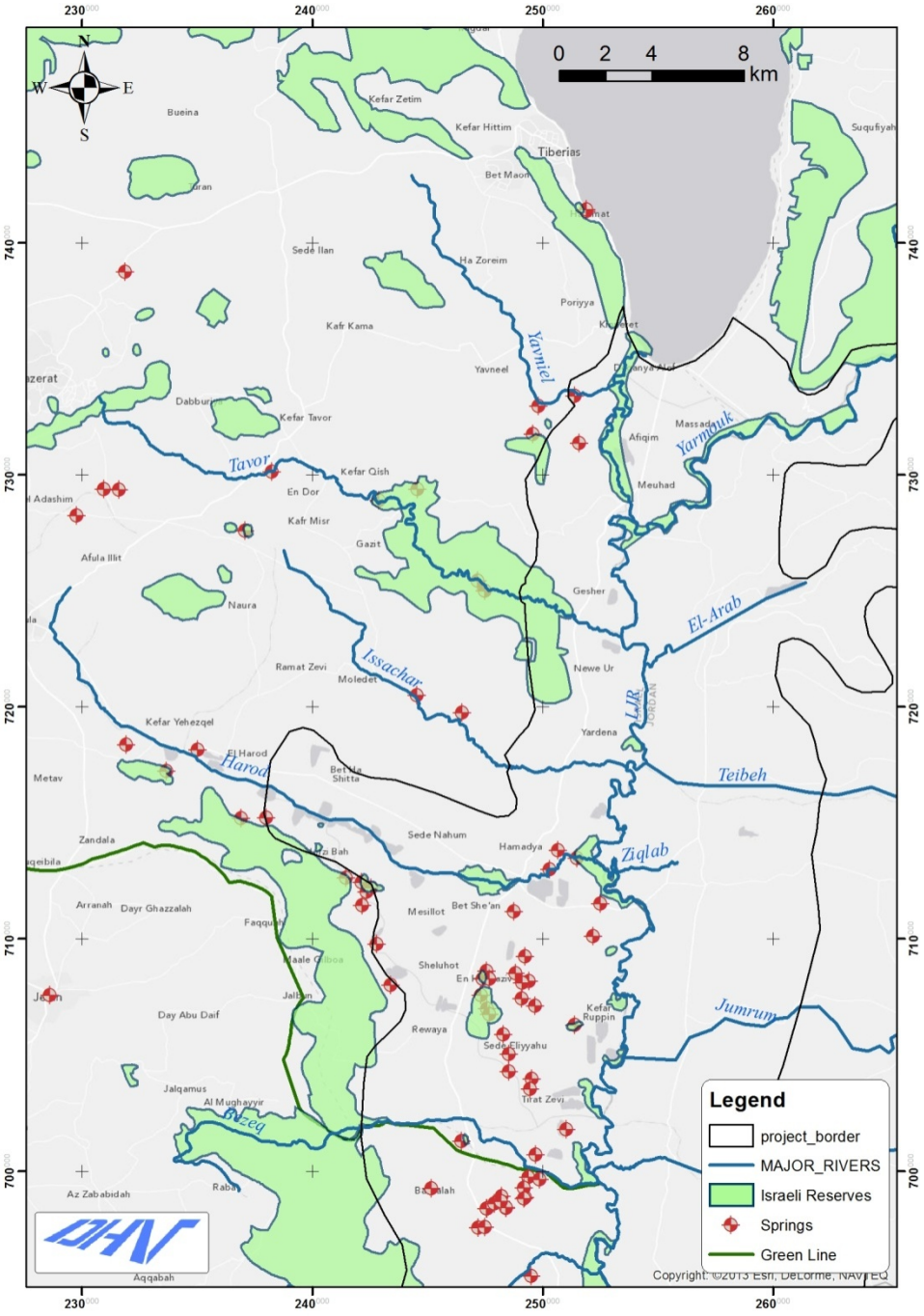

Figure 11 - Parks in the north part of the Lower Jordan

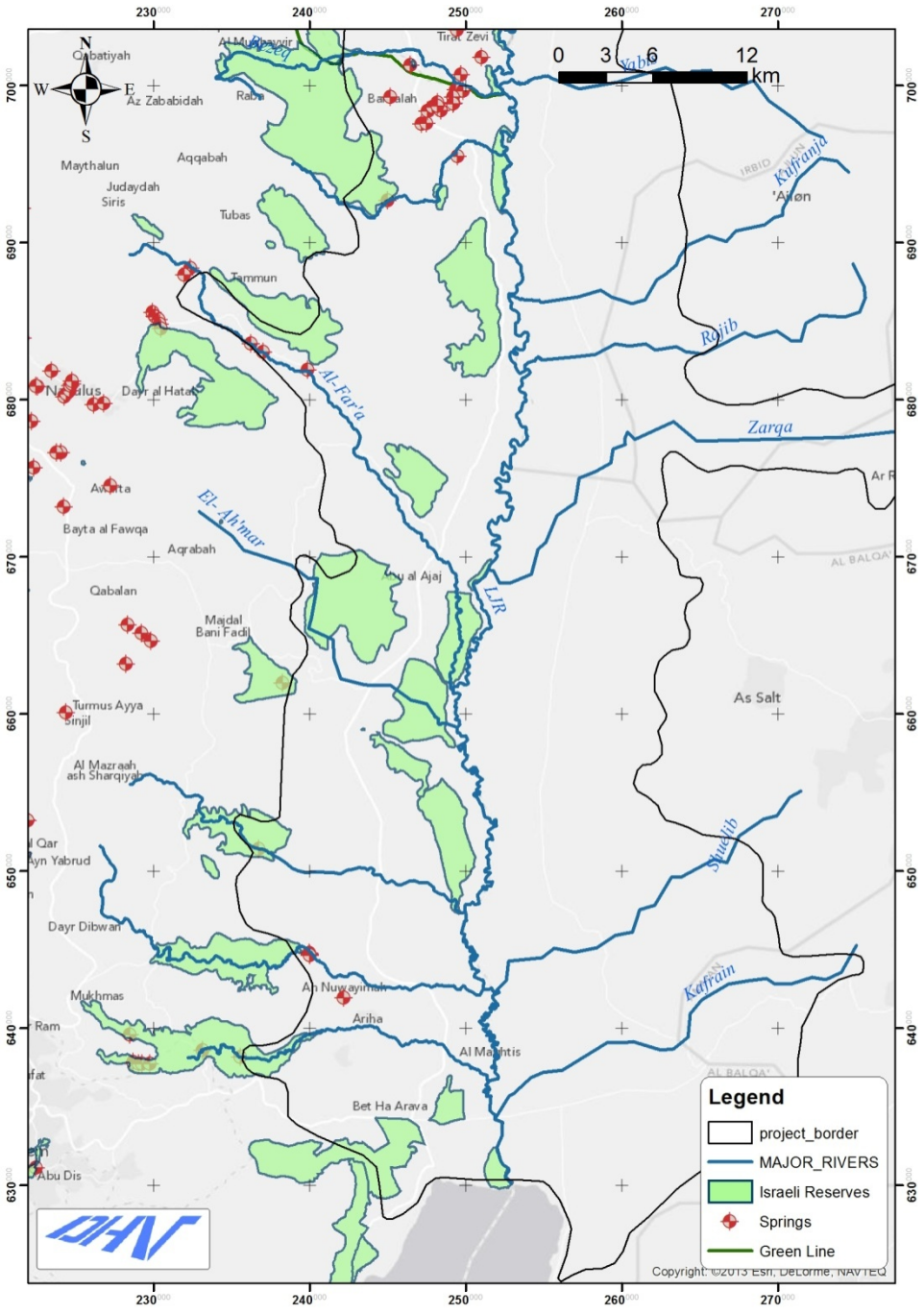

Figure 12 - Nature reserves and national parks in the southern part of the LJV (West Bank)

The part of the Yarmouk River valley, where it borders with Israel, has been left largely undisturbed due to its strategic political location. As a result of this it supports a wide variety of plant and animal communities typical of intact and unpolluted river systems. It is proposed to allocate this area as a dedicated protection site (around 30 Km^2), because the area includes important woodlands and wildlife.

2.2.5 Pollution Sources

The major sources of pollution on the Lower Jordan River Basin include untreated wastewater and diversion of saline water into the basin, solid waste dumping and pollution from agriculture, husbandry and fishponds.

Wastewater

Untreated sewage water flowing in the Jordan River Basin is one of the major pollution sources in the study area. The Lower Jordan River downstream of the Alumot Dam contains high concentrations of Fecal Coliforms, indicating large sewage spills into the river system. Many communities in Israel, Jordan and Palestine discharge their untreated or poorly treated sewage water directly or indirectly (through groundwater seepage) into the basin.

In Jordan there are two wastewater treatment plants in operation: the Tal Al Mantah WWTP located to the west of Deir Alla, which started operations in 2005. This WWTP receives the waste water from the Deir Alla and South Shouneh regions. Its maximum capacity is 400 m^3/day and it receives in 2013 about 320 m^3/day (365 m^3/day in 2012). These two small treatment plants treat only a fraction of all generated wastewater in the basin. In Jericho a treatment plant and sewage collection network for the whole city is under construction. The majority of Jordanian and Palestinian towns and villages are presently left with no sanitation solution.

The *Beit Shean regional WWTP* is a primary and secondary treatment facility, which has been taken in operation in October 2009. The Beit Shean WWTP is currently treating 3,8 million m^3 of wastewater year and its effluent is reused for agricultural purposes. Its influent originates from most of Beit Shean (1,2 million m^3/year), from twelve communities in the Valley of Spring Regional Council (800.000 m^3/year), from the Beit Shean industrial area (1,2 million m^3/year) and from some tourist resorts (600.000 m^3/year). In the near future the wastewater of Gilboa regional council will also be treated here.

A new desalination plant has also been scheduled in Bitaniya to treat saline water from the Saline Water Carrier (SWC). The desalinated water is schedules to be diluted with the effluents from the new WWTP, and will next be used to agriculture. As such, local agriculture will receive high quality effluents, which will reduce the pressure on fresh water resources from the Jordan River. However, the final treatment and destination of the brine generated by the new desalination plant is still under discussion.

Wastewater collection and treatment in the Palestinian part of the study area was neglected for a long time, since higher priorities are given to safe water supply and protecting reliable resources for domestic use. In the study area, all the Palestinian communities lack wastewater collection networks and reply on cesspits for the disposal of wastewater, with the exception of Jericho that has a central wastewater treatment plant, which was recently constructed with finance from Japan. Wadi Fara'a (Tirza stream), the largest stream in the West Bank, is partially polluted because of sewage water coming from the east part of Nablus. Most of this water is used for agriculture, infiltrated in the soil or evaporated before it reaches the Jordan River. Also a lot of waste and litter ends up in this Wadi. In the rainy season the pollution may be transported further downwards into the Jordan River Basin.

The Israeli settlements in the West Bank use mainly oxidation ponds or cesspits to dispose of their wastewater. The larger settlements are obliged by Israel to develop full scale wastewater treatment plants, and two related plants are foreseen for the settlements Fazael - Netiv HaGdud and Shdemot Mehola.

Solid waste

Apart from the Israeli section of the study area there is a lack of adequate sanitary waste disposal or treatment, both for domestic waste as well as industrial waste. Recycling and reuse of waste takes place in only very limited amounts. It is estimated that approximately 162.000 tons of municipal waste per year is generated in the Lower Jordan River Basin, including 120.000 tons in Jordan, 24,000 tons in Israel and 18,000 tons in Palestine. Land filling is the most common waste treatment technique within the study area and apart from Israel this is mainly done without adequate soil and environmental protection measures. It is estimated that less than 10% of the waste, or 16,000 tons per year is physically transported out of the basin area to be disposed off elsewhere.

Waste collection, transportation and disposal in Jordan are handled by local municipalities. Sometimes, smaller municipalities combine forces into a Common Services Council. In the study area the municipalities in the north co-operate within the Northern Joint Services Council. The Ministry of Municipal Affairs is responsible of providing municipalities and Common Services Councils with finance to provide these municipal services. The Ministry of Environment is responsible for policies and planning of the waste sector, and is currently (2014) in the process of developing a national waste management strategy based on principles of maximized recovery, reuse, and recycle, with disposed as final solution, as we ll as on the proximity principle. Solid waste collection fees today vary between about 14 to 20 JOD per year per household.

Collected waste in the Jordan Valley is brought to the Deir Alla dumpsite. This dumpsite is located 1 km from the Jordan River to the west of Deir Alla. The dumpsite is badly sited, because the location is close to a community and a groundwater reservoir which is used for drinking water. The dumpsite doesn't have any facilities like lining or percolate collection. Percolation water goes directly to groundwater and the Jordan River.

Figure 13 - Deir Alla landfill

The Hagal landfill, north of Gesher, is the only authorized landfill in the Israeli part of the master plan project area. As an authorized landfill it has all the required infrastructure and operations of a sanitary landfill, including lining system, percolation water collection and treatment, landfill gas collection an energy production. The landfill is owned by the private Israeli engineering firm TAHAL, and started operations in 1999. The total landfill volume is 3.5 million m^3.

The Palestinian waste is often dumped just outside the communities in the surrounding area. Luckily, as result of the very dry conditions, the waste material will dry out very quickly, so that leachate problem or nuisance of smell and pollution will be limited. However, the plastics waste remains, and this forms a visual nuisance as well as a threat to animals. In the wet season, the littered waste causes a larger problem in terms of leachate, migration and pollution. During floods, waste may end up in the Jordan River Basin itself, even including waste originating from the Eastern part of Nablus through Wadi Fara'a.

The only sanitary landfill in the Palestinian project area is the Tovlan landfill site, operated by the Israeli settlements. It is managed by the settlements belonging to the Bik'at Hayarden Regional Council. It receives waste from municipalities in Israel and from Israeli settlements in the West Bank. In the past it also received waste from some Palestinian communities, including Nablus city (80 tons/day), but this is not the case anymore. In addition, plans have been developed for a sanitary landfill for Jericho. Today there is a controlled dumpsite on the east side of Jericho. The dumpsite is not lined and its capacity is reaching its limits.

This all has a direct impact on public heath, groundwater quality and eventually the water quality in the Jordan River. It is expected that less than 10% of the waste, or 16,000 tons per year is physically transported out of the study area to be disposed off elsewhere.

Agricultural pollution

Large parts of the study area are used for agriculture. Water is diverted from the Jordan River and its tributaries for irrigation, and return flows end up in the LJR Basin groundwater or surface water. The agricultural return flows are generally polluted with phosphates, salt, nitrates, pesticides and chemical fertilizers. Plant tissue and plastics used in agriculture contribute to the total quantity of solid waste produced in the study area, potentially causing pollution to the Jordan River and Jordan Valley. Furthermore remainders of unused pesticides and fertilizers may act as potential sources of pollution as well. Animal husbandry generates pollution sources in terms of manure (solid and fluid) and animal carcasses, which are potential threats for the environmental and public health.

Plastic waste in agriculture is generated from plastic covers of greenhouses, plastic mulch covers used for sol protection and plastic pipes used in the fields and the greenhouses used for irrigation. Most of the plastic is collected and sold to plastic recycling factories, located mainly outside the Jordan Valley.

Fish Ponds

The fish farms are major water consumers in the Israeli part of our project area in the Jordan Valley. The total surface area of the fish farms is ponds in the region totals to approximately 2.000 ha. More than 90 % of the fish ponds are concentrated around Harod Stream and in the Valley of springs. The main fish ponds in the Israeli part of the study area are: the Gesher Fish Ponds, about 560 dunum in size; the Never Ur & Hamadia Fish Ponds, about 1100 dunum in total; and the Emek Hamaayanot Fish Ponds, about 10,000 dunum in total. The fish ponds are operated by AMWA, Gesher, Harod and Neve ur & Hamadia.

The Afikim fishponds will soon terminate its operations, and will be turned into a reservoir to store water from the new desalination plant to be built in Bitaniya for the water from the Saline Water Carrier, and for the effluent of Bitaniya WWTP. The brine which remains after desalination might be used in some of the fish farms. However, this would have a negative impact on the quality Jordan River.

Figure 14 - Gesher fish farm

On average a fish pond requires an inflow of water of 50.000 to 60.000 m^3/ha. This results in a total consumption of about 100 MCM per year. These amounts have a large influence on the water balance in this part of the Jordan Valley. The water consumption is facilitated by a range of water reservoirs, which both serve as water storage and as fish cultivation capacity. Each reservoir is designated for a specific waste quality, making distinction between fresh water (< 500 mg Chlorine/l), treated waste water and saline water coming from, or mixed with local springs (> 500 mg Cl / l). In this manner the fish farm can make an optimal mix for their production.

Evaporation in the ponds increases the salinity of the water in the ponds. The discharged effluent water may have chloride concentrations varying between 2.000 and 4.000 mg/l depending on the concentrations in the inflow and the differences in operation. About 75 % of the effluent is discharged between October and December; the rest of the effluent is discharged as late as February.

Fish farms consist of numerous small ponds often differing in age, depth, lining etc. The water in the ponds is circulated several times between the ponds until it is discharged. The water may be recirculated for a period of 3 years before discharge. Since most of the ponds in the area were constructed without lining (90 %), water losses by percolation are estimated at 20-50% of the inflow. Most of this water finds its way to the Jordan River by means of the groundwater. Another 40-50% is lost to evaporation and the rest is discharged back to the river as saline polluted effluent. This means that 10 to 40 % of the inflow (so about 10 – 40 MCM per year) directly flows to the Jordan River as waste water.

Land Mines

The Hashemite Kingdom of Jordan ratified the Mine Ban Treaty in 1999. In accordance with its obligations under this international legal standard, Jordan has destroyed its stockpile of antipersonnel mines and has made steady progress to complete demining for its side of the entire Lower Jordan Valley.

In the West Bank over 2.000 ha of land in the West Bank has been fenced by the Israeli military due to landmines related risks. Some of the mine fields were laid by Jordan prior to 1967, along the 1949 Armistice border with Israel and surrounding old military bases. Other minefields were laid by Israel after 1967, around its own military bases and the current border with Jordan. Parts of agricultural and grazing land in the West Bank may still contain landmines as well. This causes risk of injury or death for civilians.

The marking and fencing of the landmine zones is poorly maintained and mine risk education is almost non-existent. Most of the casualties have been children. Only around the Baptism site in the West Bank the land mines have been actively removed.

2.2.6 Cultural Heritage

The internationally recognized World Heritage values of the Lower Jordan River basin are strongly related to its unique geographic features and its historic, religious, cultural and archeological values. This section provides a short summary of the major cultural heritage sites in the Lower Jordan River Basin. A full assessment is provided in the Baseline Report (March 2014).

Figure 15 – Ancient Hisham Palace in Jericho

The Jordan Valley area attracted human habitation for thousands of years and is referred to as the most ancient inhabited area of human history. Archaeological sites date back to the pre-historic era. The remains of more than 20 successive human inhabited areas were found in Jericho, the first of which is Tel Es-sultan, located at the north west of the city, and dates back 10,000 years (8000 BC) and is known as the “oldest city in the world”. Remains in archeological sites are concentrated mainly in the western sector of the city of Jericho, but there also a lot of other sites distributed in the Lower Jordan Valley. These sites are the result of the different eras of history, from the Pre-Pottery Neolithic age, the Bronze age, the Hyksos period, the Canaanite period, the Persian, Hellenistic and Roman periods, and the Byzantine and Ottoman periods.

Around 100,000 years ago the Red Sea extended north to the area of Lake Tiberius. Then a combination of geological uplifts and a declining rainfall caused this inland gulf of water to retreat. 20,000 years ago a 220 kilometer-long lake named Lisan (‘tongue’ in Arabic) extended from Lake Tiberius to the Wadi ‘Aruba. The increasingly arid climate caused the level of the lake to fall until, by 12-10,000 years ago, the Dead Sea and Lake Tiberius, as seen today were formed. Linking them is the 104 kilometer-long Jordan River Valley with a width ranging from 5 to 20 kilometers. The Valley has two levels: the valley floor, or Ghor in Arabic, and the river floodplain, or Zor in Arabic. It was this Zor zone with its thick belt of trees and bushes,

which is referred to in the Bible as “the jungle of the Jordan” or “the pride of the Jordan” (Jeremiah 12: 5; Zachariah 11:3). The Jordan River flowed into the Dead Sea, and was fed by many wadis (small rivers in Arabic) from the west and east, created by perennial fresh water springs. These springs were part of the natural ground water system until they were exposed in deep chasms produced by the creation of the Rift Valley. These fresh water sources have enabled a rich environment of plant and animal life to flourish as well as attracting a burgeoning human population.

Due to its greater rainfall there are more springs on the eastern side of the Jordan Valley then on the western side. This relative abundance of water allowed the earliest-known communities to be established over 10,000 years ago, two of which are Pella and Drah. When compared to the harsher and more arid conditions of Jordan’s eastern plateau and to the Negev and Sinai deserts, one can readily imagine that the Jordan Rift Valley was indeed the lush well-watered land referred to in the Bible as the “garden of God” (Genesis 13:10-11).

Early expeditions in the Lower Jordan Valley were characterized by massive excavations on major archaeological sites (tells). This started in the late 19th century and continued through the first half of the 20th century, mainly conducted by British and German scholars. They managed to identify a few important sites that are partially related to biblical history of the region, as well as the Hellenistic-Roman and Byzantine periods. In the first half of the 20th century, archeologists made some important discoveries that go back to the prehistoric periods. Still, it is believed that many remains of various prehistoric periods are still resting untouched below the ground surface, and new findings and additional sites may be uncovered in the years ahead.

Eco Peace is bringing attention to the cultural heritage and environmental values and challenges of the Lower Jordan River Basin to faith-based communities that reside in and visit the valley. As the river is emphasized as a symbol in Christianity, Judaism, and Islam, and hundreds of thousands of pilgrims visit the river each year, Eco Peace is working with faith-based communities to firmly tie the river’s religious significance to the importance of its environmental preservation. To advance awareness and understanding of the problems and the potential rehabilitation of the Lower Jordan River, Eco Peace has developed faith-based tool kits to launch campaigns that are geared toward congregations from each of the three world religions. The Jordan River Peace Park, the Auja Eco Center and the Sharhabil Ben Hasnah EcoPark (SHE) play a crucial role in this work. Here, local students and faith-based groups visiting the basin are encouraged to discuss the river’s current state and potential rehabilitation.

Jericho

Jericho is considered to be the oldest continuously inhabited city in the world; it has been home to human beings for 10,000 years. During the Roman rule (63 BC-423 AD), Mark Anthony gave the city as a present to his beloved Cleopatra. After her suicide, it reverted to Augustus Caesar, who himself gave it to Herod. From this time, Jericho became a centre of Christianity and continued to be an important city throughout the Byzantine Period.

Figure 16 – Walls of Ancient Jericho

Al Maghtas - Baptism Site

The Baptism Site, “Bethany Beyond the Jordan (Al-Maghtas) Protected Area is located in the Southern Jordan Valley on the east side of the Jordan River around 9 km north of the Dead Sea and is part of the District of South Shunah in the Governorate of Al-Balqaa. The site is located a few kilometers to the east of the oasis and ancient site of Jericho and ca. 50 km west of Amman, the capital of Jordan. The site covers an area of 533.7 hectares where five archaeological sites dating back to the Roman and Byzantine periods have been discovered. The precise limits of the archaeological remains are undetermined, although all identifiable cultural traces are included in the protected area. Several modern villages are located in the vicinity of the property. These include Al-Kufrein, Al-Ramah, Al-Jofah, Al-Rawdah, Sweimeh, New Shunah, Al-Karamah, Al-Nahdah, Al-Jawasreh, Nimrin Al-Gharbi and Nimrin Al-Sharqi.

abaqat Fahl \ Pella

Ancient Pella at Tabaqat Fahl is one of the most important archaeological sites in the Jordan Valley. Its central location in the land of biblical ‘Gilead’ on the most strategic east-west trade route to the Mediterranean coast was the key to its prosperity. The city is referred to almost a hundred times in various historical texts including the Old Testament which names this city ‘Penuel’ and records that it was here that Jacob wrestled with God who was in the form of an angel (Genesis 32: 22-30). The famous Amarna letters from ancient Egypt names Mut-Baalu as the ruler of Pella in the 14th century BC. During the Bronze and Iron Ages Pella had the largest known ‘migdol’ type temple in the entire region. The base of this massive multi-storied structure measures 32 x 24 meters with two fortification towers and was dedicated to the Canaanite God Baal. In the fourth century BC, Pella was established as a Hellenistic city and was later included in the Roman Decapolis league. Some of the first Christian converts were known to have taken refuge from Roman persecution here in around 70 AD [lit 90]. The city thrived during the Byzantine period having three basilical churches. It is intriguing that a thirteenth to fifteenth century mosque was built on the same site as the Bronze Age Migdol temple of Baal.

Figure 17 – Tell Deir' Alla

Tell Deir 'Alla

Strategically located at the mouth of the river Jabbok/Wadi Zarqa, Deir 'Alla is the Old Testament site of Succoth (Genesis 33: 17; Joshua 13: 27; 1 Kings 7: 46; 2 Chronicles 4: 17; Psalms 60: 6; and 108: 7) which was purported to have been fortified by Jeroboam and visited by Gideon as he pursued the eastward retreating Midnights (1 Kings 12: 25; Judges 8: 5-17). Succoth means 'small structures' which may have derived from the ancient town's function as a central market place for the Gilead region during the Late Bronze and Iron Ages. To this day it remains a trading centre for the Jordan Valley. Archaeological excavations have also revealed an important sanctuary here where many items bought in the town may have been donated as offerings. By this practice the town may have acquired its present name of Deir 'Alla, "the house, or place, of God". The rare discovery of an Aramaic inscription here proclaiming "Balsam the son of Boor, the visionary of the gods", attests to the use of the site as an ancient holy place dating back to the ninth century BC. Balsam is also referred to in the Old Testament (Numbers 22-24).

The Tomb of Abut 'Ubaydah (north of Deir Alla)

Abut 'Ubaydah 'Amr ibn Algeria was a relative and one of the 'Blessed Ten' companions of the Prophet Mohammed who were assured a place in heaven. During the Battle of Uhud he broke his front tooth whilst pulling a link of chain mail from the Prophet's cheek and because of this act the Prophet personally named him as an Ameen (trusted guardian) of the Nation of Islam. Abut 'Ubaydah led the Northern Army of Muslims after the Prophet's death, and also contributed to the writing of the Holy Qua'ran. He died during a plague in the central Jordan Valley where he is buried. An impressive modern mosque complex has now been built over Abut 'Ubaydah's tomb which serves as the principle Islamic centre in the Jordan Valley.

Figure 18 - The Tomb of Abut 'Ubaydah

The Hydroelectric power station at Bakoura / Naharyim

In 1927, Pinchas Rutenberg, a Russian immigrant and founder of the Palestine Electric Company (PEC), reached a unique agreement with HM King Abdullah I of Jordan to build the company's main hydroelectric power station. To this aim, canals and dams were built, creating a manmade island that harnessed the flow of the two rivers to produce electricity. By 1932 the hydroelectric power plant began supplying electricity on both sides of the river and continued to do so until it ceased operations as a result of the Israeli Arab hostilities of 1948. In 1994, with the signing of the Peace Treaty by Jordan and Israel, the island was returned to Jordan but was leased with special usage and visitation status to Israeli and international tourists. Today a tour is offered from the Israeli entrance at Naharayim, where one can cross to the island, catch a glimpse of the river beneath and see the remnants of the power station. Military personnel schedule and coordinate opening of the fences on both sides, allowing tens of thousands of visitors per year to enter the island without the need for a visa. The Municipalities at both sides, support by Eco Peace, intend to expand this area into a trans-boundary park, the Jordan River Peace Park, reaching 2 to 3 kilometers down the meandering river to the Jeser Al Majama / Gesher site.

The castle of Karak

The castle of Karak, close to the Jordan Valley, was only in Crusader hands for 46 years. It had been threatened by Saladin's armies several times but finally, surrendered in 1188, after a siege that lasted more than a year. Saladin's younger brother, Al-Adil was governor of the district until becoming ruler of Egypt and Syria in 1199. The castle played an important role as a place of exile and a power base several times during the Mamluk Sultanate. Its significance lay in its control over the caravan route between Damascus and Egypt and the pilgrimage route between Damascus and Mecca. In the thirteenth century the Mamluk ruler Baibars used it as a stepping stone on his climb to power.

Figure 19 – Castle of Karak

Tel Rehov

Tel Rehov is an important Bronze and Iron Age archaeological site approximately five kilometers south of Beit She'an and three kilometers west of the Jordan River. The site represents one of the largest ancient city mounds in Israel, its surface area comprising 120,000 m² in size, divided into an "Upper City" (40,000 m²) and a "Lower City" (80,000 m²). Archaeological excavations have been conducted at Rehov since 1997, under the directorship of Amihai Mazar. The excavations revealed successive occupational layers from the Late Bronze Age and Iron Age. In September 2007, 30 intact old beehives, made of straw and unbaked clay, dated to the mid-10th to early 9th century BCE were found, evidence of an advanced honey-producing beekeeping industry 3000 years ago in the city, then thought to have a population of around 2000. Also found alongside the hives was an altar decorated with fertility figurines.

Tel Ubeidiya

Tel Ubeidiya, located some 3 km south of SoG is another archaeological site of the Pleistocene, ca. 1.5 million years ago, preserving traces of the earliest migration of *Homo erectus* out of Africa. The site yielded hand axes of the Acheulean type. Tel Ubeidiya is located between the village Menahemia and Kibbutz Beit Zera, one kilometer northwest of the kibbutz Beit Zera. Prehistoric remains were found northwest of the Tel, starting from about 1.7 million years were discovered in the excavations, including human bones and remains of ancient animals. The site also features rock surfaces in which the Prehistoric man lived during the Pleistocene period. As a result of geologic breakage and foldage activity, the rock surfaces are now inclined at an angle of 70 degrees. It is thought that the area used to feature a pristine lake along which Homo erectus lived after his exodus from Africa.

As-Sinnabra

As-Sinnabra, or Sinn en-Nabra, is a historic site on the southern shore of the Sea of Galilee. The hill upon which al-Sinnabra was situated, Khirbet Kerak of Beit Yerah, is one of the largest tells in the area, spanning an area of over 50 acres. Beit Yerah was in the Hellenistic era a twin-city of al-Sinnabra, located at the same tell. The city was inhabited in the Hellenistic, Roman-Byzantine, and early Islamic periods. Later, an Arabic “qasr” was located here known as as-Sinnabra and served as a winter resort for the Umayyad from 650-704 AD. During the Crusader period, a bridge was made here, called the "Crusader Bridge of Sennabris", constructed over the Jordan River, which at the time ran to the immediate north of the village.

Belvoir Fortress

Belvoir Fortress is a crusader fortress, located on a hill 20 kilometers south of the Sea of Galilee. It construction began in 1168, and is currently located in Belvoir National Park. It is the best-preserved Crusader fortress in Israel. Standing 500 meters above the Jordan Valley, the plateau commanded the route from Gilead into Israel. and a nearby Jordan river crossing, and as such dominated the surrounding area. It has been know to have served as a major obstacle to the Muslim goal of invading the Crusader “Kingdom of Jerusalem” It withstood an attack by Muslim forces in 1180, but eventually was conquered during the campaign of 1182 in the Battle of Belvoir Castle by Saladin.

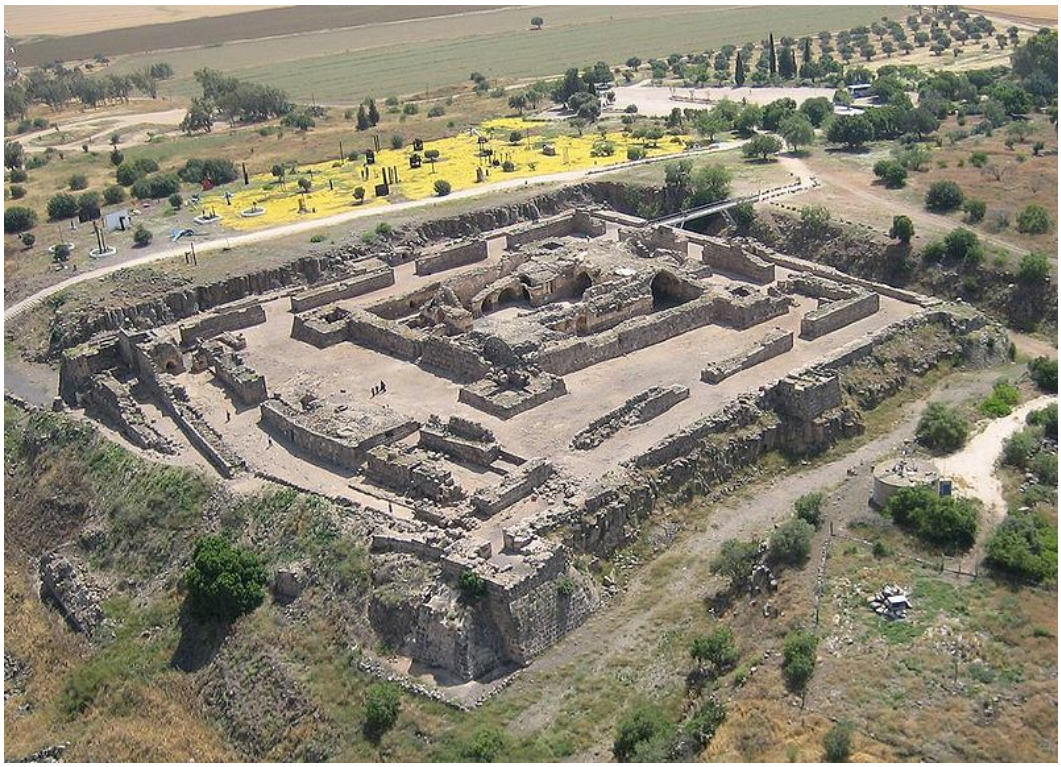

Figure 20 – Belvoir Fortress

Beit Alpha

Beit Alpha is a sixth-century synagogue, located at the foot of the northern slopes of the Gilboa mountains near Beit She'an It is now part of Bet Alfa Synagogue National Park and managed by the Israel Nature and Parks Authority. Architectural remains from the Beth Alpha synagogue indicate that the synagogue once stood as two-story basilic building and contained a courtyard, vestibule, and prayer hall. The first floor of the prayer hall consisted of a central nave measuring 5.4 meters wide, the apse, which served as the resting place for the Torah Ark, the bema, the raised platform upon which the Torah would have been read, and benches. The Torah Ark within the apse was aligned southwest, in the direction of Jerusalem.

Hamadia

Hamadia is a kibbutz just north of Beit Shean. It belongs to the Valley of Springs Regional Council, and is situated on a terrace of ancient Lake Beisan, 200 meters below sea level. Tel Hamadia is a single layer archaeological site of about 100 m^2 , first reported and excavated at Hamadia by Tzori in 1958. It contains ovens, pits and fireplaces with Yarmukian pottery. Large saw elements indicated possible earlier Neolithic occupation as well.

Moaz Haim Synagogue

The Maoz Haim Synagogue was originally constructed in the 3rd century as a simple Byzantine-era type basilica building, later apsidical, in the Beit She'an region. Discovered in February 1974 by Mr. A. Ya'aqobi, it stands out as an unusual archeological find that contains a record of synagogue development from a time of otherwise sparse historiography. The synagogue was located amongst a large settlement in which it served as a center of worship for Jews there from its beginning up through its final destruction by

fire sometime in the early 7th century. The initial layout began as a fourteen by twelve and a half meter square room with two rows of five columns with benches lining the walls, although none remained standing.

2.2.7 Infrastructure

Main bridges over the Jordan River

The Jordan Valley is connecting Israel with Jordan though the Sheikh Hussein Bridge in the north, and Palestine with Jordan through the King Hussein (Allenby) Bridge. The King Hussein Bride is located just outside Jericho city and is the only connection between the Palestinian West Bank and Jordan. The West Bank side of the King Hussein / Allenby Bridge is considered a border entry point by the Israeli Authorities. The Jordanian authorities recognize the bridge as an international border entry point, but in contrast to other border crossings with Israel, do not grant entry visas to foreign passport holders at this crossing. Palestinians traveling abroad must use this bridge to exit the West Bank into Jordan and then use the Queen Alia International Airport in Amman to fly abroad, because they are not permitted to use Ben Gurion Airport near Tel Aviv. Travel permits from both Israeli and Jordanian authorities are required, with varied stringency depending on the political situation. Israeli citizens are not permitted to use the terminal. Tourists who wish to travel to Jordan must be in possession of a visa from Jordan in advance. Those who leave Jordan via the King Hussein Bridge may return by showing the exit visa. Tourists and inhabitants of East Jerusalem may travel directly to an Israeli terminal, although Palestinians from the West Bank have to start the departure procedure at the special Palestinian border terminal in Jericho city.

Road Network in Jordan

The Dead Sea Highway (Route 65) is the major regional highway in Jordan that crosses the LJR Basin from north to south along the western Jordanian border and Dead Sea shoreline. All other roads leading to and leaving from the LJR Basin connect to this road. The road passes through some heavily populated urban areas where it is widened to four-lane divided with shops and buildings on both sides of the road.

This road is heavily used for local traffic as well as regional transportation. The traffic along Route 65 is dense, consisting of slow moving trucks carrying agricultural produce, farm vehicles, and local traffic. The road is heavily intersected by minor roads used by farmers. Most intersections with major roads are signalized. The Dead Sea Highway along the LJR Basin is poorly serviced for major sections, and there is a need for maintenance and improvements, particularly pavement, marking and signage. There are plans for upgrade the road into four divided lanes, or to construct a new highway parallel to the existing one.

Traffic Safety

Although no detailed information is available on traffic accidents in the Jordan Valley, the number of traffic deaths in Jordan as a whole is relatively high with 12 to 14 deaths per 100,000 inhabitants (ref. Jordan Traffic Institute, 2011). In 2010 Jordan had a total of about 1 million registered vehicles; including 770,000 4-wheeled light vehicles and 100,000 buses. Extrapolating the traffic accident percentages to the current population in the Jordan Valley would imply 25 – 30 traffic deaths on average in the Lower Jordan Valley. Statistics show that 63% of these casualties are among drivers and passengers of 4- wheeled cars and light vehicles, 33% among pedestrians and 4% among buses and heavy trucks. Improving road safety conditions along Route 65, including street lightning and separate protected pedestrian lanes and cross-overs will likely reduce the annual number of deathly traffic accidents considerable.

The government is considering to either upgrade the Route 65, or to construct a new parallel highway though the LJR Valley. The argument for constructing a new highway is currently stronger than that of

upgrading the existing road, as upgrading entails demolition of existing village buildings and farms. In addition, increased traffic will increase noise, pollution and accidents in urban areas. Also the large number of intersections makes the existing highway unsuitable for international (through) traffic [lit 33].

The Amman - Naur - Dead Sea (Route 40) is the main entrance in Jordan to the LJR Basin. It is a well engineered four-lane divided expressway, but there are steep inclines that slow down heavy trucks. The last segment of this road from Al Rama intersection to Al Quds intersection with Route 65 has been upgraded to a four-lane divided highway.

The Al Ardah – Al Salt Road (Route 24) connects with Route 65 approximately 32 km north of South Shuneh. This road is a rural two-lane two-way road of approximately 8 m wide carriageway that climbs along the wadi up to Al Salt for approximately 23 km. The intersection with Route 65 (Muthallath Al Arada) is a signalized “T” Intersection. The road at the intersection is widened to four-lanes, with shops and buildings on both sides. The road has some very sharp reverse and broken back curves and steep grades. The surface of the road needs some rehabilitation work to repair pavement cracks and pot holes. In addition, some protection from falling rocks and drainage works are needed.

Continuing north (approximately 15 km) along Route 65 from Muthallath Al Arada intersection is the intersection of the Kufranja – Ajloun Road. This is a two-lane, two-way undivided rural road that runs for about 24 km to Kufranja and Ajloun. This road has approximately 6 m of paved width. The road climbs up the hills and mountains towards Ajloun.

The Qalat ar Rabad – Ajloun Road climbs along Wadi Al Yabis passing Qalat (Castle) ar Rabad on to Ajloun (approximately 40 km). The road intersects Route 65 approximately 12 km north of Kufranja – Ajloun Road. This two-lane road features approximately a 7 m wide paved carriage way. Further north (approximately 16 km) along Route 65 is the intersection with Abu Saeed – Irbid Road. This two-lane, two-way road climbs about 34 km up to Irbid city. The Ash Shuneh (North) – Irbid (Route 16) two-lane two-way road has been upgraded to a four-lane divided rural highway with shoulders.

Infrastructure network in Israel and Palestine
On the western side of the LJ River the main road from north to south in route 90. This road runs all the way from Metula in the north of Israel to Eilat in the south. The section between the Sea of Galilee and the Dead Sea is called Gandhi’s Road, named after a former minister of Tourism. Where the road enters and leaves the West Bank, two checkpoints have been erected: the northern one near the Bezeq Stream and Sdei Trumot, and the southern one along the Dead Sea just north of Ein Gedi. Palestinians living in the West Bank are not allowed to pass these checkpoints unless permits from the Israeli Authorities were obtained.

Other major roads that cross the region are Routes 505 and 508, known as the Alon Road. Just north of the Dead Sea at the Beit Ha Arava junction, Route 90 crosses Route 1, leading to the West through the West Bank towards Bethlehem, Jerusalem and Tel Aviv. Highway 90 bypasses Jericho from the east, and the entrance road to Jericho was recently opened – allowing both a north and south entrance. Driving north from Ein Gedi, Israel, you pass an Israeli military checkpoint as you cross into the West.

A secondary level network connects Jericho to the other Governorates, mainly branching from Road 90 to Nablus (Road 505) and Ramallah, and to Jerusalem (Road 1). Four accesses link Jericho city to its surroundings: two in the northern part towards Al Auja, Nablus and northern part of the Jordan Valley, one towards east Jordan, one to the south-west towards Ramallah and Jerusalem. The region of Jericho is connected to the other urban centers by public transport, mainly mini-van buses. Jericho city is the main

hub toward the surrounding villages and houses the main national bus stations (Nablus for the northern regions, Ramallah for all Palestine, Bethlehem for the southern regions). In addition to that, the main cities of Palestine are linked to the border station (Esteraha) by a bus service.

On the western side road 90 along the valley is a major tourism artery connecting Jerusalem and then Jericho with the SoG. Almost all foreign tourists take this journey along road 90 which presents real opportunity for further development in the valley. The main tourism route in Jordan is Amman – Jerash and south to Petra. Jordan would therefore benefit most if border crossings were easier for tourists capturing the road 90 market on the west side.

Public Transport

The main public transport in the Jordan Valley in Jordan is by minibus. These buses travel generally frequently, but generally without fixed schedules, depending on the number of passengers being picked up. Minibuses generally stop anywhere at request. For many destinations in the Jordan Valley, the minibus is the only other public transport option. Some large air-conditioned bus companies are operating in Jordan as well, although mainly along the main routes such as from Amman to Aqaba or Amman to Petra. There is no information that the bus routes pass through the Jordan Valley. The system of shared taxis is also applied in Jordan, Like the minibuses, they pick up passengers and generally depart to specific destinations when full.

In Israel public buses are the main form of public transport in the Jordan Valley. Within Israel a total of 16 different companies operated buses for public transport, with Egged being the largest bus company, operating routes throughout the country. Buses travel frequently from Beit She'an to Afula, Haifa and to Jerusalem. Smaller carriers, operated by companies liked Dan Bus Company offer alternative public transport services. In addition, shared taxi services, often as yellow minivans, are available a well, run by private companies, in addition to regular taxicab services. The shared taxis allow passengers generally to get in and leave anywhere along the path of travel. During Shabbat normal buses services cease their operations.

A new train line from Haifa to Bet She'an is expected to be completed and running in 2016. The train will have two stations in Bet She'an.

For most cities in Palestine, taxis are widely available, but blue and green license plates are generally not permitted to enter Jerusalem. Jericho is well connected to other Palestinian cities by service taxis / minivans. These are usually minivans which operate on a fixed route for a fixed price, similar to a bus.

Energy

The Jordanian national interconnected grid transmits electricity from the power stations to the distribution substations and transformer substations in the Jordan Valley via 400-kV and 132-kV power lines. The grid has a clearly identifiable north-south axis. The national 400-kV power line runs outside the Jordan Valley from Aqaba via Amman and up to the Syrian border. In the north, the power grid is connected to the Syrian grid by means of a 230-kV and a 400-kV power line. In the south, there is a 400-kV connection to the Egyptian grid. The interconnected grid feeds the local distribution systems via which almost the entire population of Jordan, including in the Jordan Valley receives its electricity [lit 159].

The Israel Electric Corporation (IEC) is the sole integrated electric utility in Israel and generates and transmits substantially all of the electricity used in the country, including in the Jordan Valley. Like most countries in Europe, the Middle East, and Asia, the electricity in Israel is rated at 220V (220V - 240V) and 50Hz.

The framework for the electricity power supply varies in Palestine between the Jordan Valley and the rest of Palestine. The Jordan Valley has two different sources: the first is Israeli, which is also connected to the Palestinian. This network serves Israel well, but provides insufficient capacity to serve all Palestinian adequately as well. The solution is expected from Palestinian interconnection with Jordan: PNA and Jordan have agreed on connecting the Palestinian power grid to the Jordanian with a 33kV transmission line through King Abdullah Bridge, with a capacity of 20MW. A transformer substation is built in the south of the Jericho City and connected to the existing network. The other Palestinian communities get the electricity from JDECO (Jerusalem District Electricity Company), or from the Israeli company Qutria.

The Jordan Valley is a strategic location that functions as a west – east corridor from the Mediterranean Sea, Israel and Palestine to Jordan and other neighboring countries. It has also been a North-South transport corridor. The Jordan Valley opens up many opportunities for regional continuity. This includes establishing land transport, energy and communications connections between the parties in the region, as well as logistic facilities to serve both regional and international economic activities which will enable more diverse and efficient routing options for the flow of goods and people, both regionally and internationally. A major component of the economic development of the Palestinian Jordan Valley would be the upgrading of west – east transportation routes.

2.3 It's People

2.3.1 Population

The Lower Jordan River Basin houses a population of about 605,000 people. The information with regard to the population numbers in the study area have been obtained through the Jordanian Department of Statistics (DOS), the Central Bureau of Statistics in Israel, and the Palestinian Central Bureau of Statistics. For the Jordan and Israeli parts of the study area there has been an organic growth of the population. This contrasts with the Palestinians, for which the economic opportunities in the region have been much more limited since the late 1960s. Palestinian youth has often been commuting or migrated to other regions in and outside the West Bank looking for opportunities in the labor markets.

The population growth rates for the Jordan and Israeli sections of the study area are estimated at respectively 2.2 and 1.87%. For Jordan the growth rate during the period 1994-2004 was calculated at 2.6% and decreased to 2.2% during the period 2004-2010. A slightly further decline of the birth rate in Jordan is expected, however the communities in the Jordan Valley follows the national trends with some years delay and therefore the birth rate for the period 2011 to 2020 is estimated at 2.2%.

Separate from the registered Jordanian population, the Lower Jordan River Basin houses large number of informal foreign workers originating mainly from Egypt and Iraq, and lately including some refugees from Syria. It is estimated that a total of about 250,000 informal people live in the Lower Jordan Valley today, many of them employed as temporary workers in the agricultural sector.

In addition, the United Nations had registered 619,000 official refugees from Syria in Jordan in August 2014, with over 80,000 registered in the refugee camp Za'atri, located close to the Syrian border, just outside the study area. However, the impact of these refugees on the population in the Lower Jordan Valley is limited, due to strict travel restrictions for Syrian refugees, enforced through checkpoints on the roads towards the Jordan Valley.

For Israel the current population growth rate is about 1.87% and no further decline is expected for the study area. This has to do with a large percentage of the population living in rural communities, where birth rates are commonly higher than in urban communities. Various studies show that Palestinians in the occupied West Bank C areas, including the Jordan Valley, have declined drastically over the last years, mainly as result of migration of Palestinians to areas A, where the economic perspectives and public services, such as water, sanitation and electricity are much better.

An estimated total of 6245 people live in about 26 Israeli Settlements within the West Bank part of the study area, divided over Cluster North, including the settlements of Mehola, Shadmot, Maskoit and Rotem; Cluster Central, including a total of 18 small settlements, and Cluster South, including the settlements of Vered Yeriho, Beit Harava, Almog and Kalia.

Below table provides an overview of the population figures.

Table 5 - Estimated population in the Study area (2010)

Jordan LJR Population		**Population 2010**
	Agwhar Shamaliyah	108.943
	Deir al Alla / Balqa	67.925
	Shoonah / Janoobiyah	70.294
	Informal population (according to JVA)	*247.000*
	TOTAL, incl information population	**494.162**
	Total formal population	247.162

Israel LJR Population		**Population 2010**
	Emek Hayarden	11.000
	Emek Hamaayanot	11.000
	Beit She'an	17.000
	Hagilboa	10.000
	TOTAL	**49.000**

West Bank LJR Population		**Population 2010**
Palestinians		
	Bardala Cluster MD	5.259
	Al-Bassariya Cluster MD	4.564
	Al-Jiftlik Cluster MD	6.499
	Fasayil Cluster MD	1.157
	Al-Auja Cluster MD	4.423
	Jericho MD	34.112
	Subtotal Palestinian	56.014
Settlements		
	Cluster North MD	1.425
	Cluster Central MD	3.960
	Cluster South MD	860
	Subtotal Israeli Settlers	6.245
	TOTAL	**62.259**

TOTAL Population Lower Jordan River Basin	**605.421**

2.3.2 Socio-economic Situation

The native inhabitants of the Jordan Valley in the early 19th century are known as Al Ghawarna or Ghorani (meaning people of Al Ghor), who were involved in mixed farms that covered crop and livestock production systems. Semi-nomadic Bedouins also lived in the Lower Jordan Valley and used the lands as grazing ground for their sheep and goats during the winter months because of its warm climate and available fodder for their animals. However they moved their flocks up into the hills during the summer to avoid the intense heat.

Today, agriculture still dominates the socio-economic landscape of study area, although there is significant inequality between the riparian states. The Israeli part of the basin is economically the most advanced zone, with a living standard comparable to some European countries. The World Bank classified Jordan as an "upper middle income country" however with significant economic inequalities: in the Jordan Valley there a small group of wealthy agricultural entrepreneurs, next to a large group of laborers who close to the poverty line of JD 32.6 per person per month. The Palestinian part of the basin, excluding the Israeli settlements, have a standard of living comparable to that in Jordan, be it that the remaining population living under occupation is small and are often subject to stringent Israeli traveling regulations.

The importance of agriculture is expected to decrease in the valley for all three riparian states. In Israel the proportion of the population engaged in the agricultural sector started to decline already in the 1970s when the industrial and service sectors achieved higher growth levels compared to the agricultural sector. Also gave a higher priority to agricultural development was given to regions where tensions between different water users were less prominent (e.g. Negev Region). For Jordan and Palestine this shift from agriculture to service sector started during the 1990s and continues until today. It is expected that once a final peace settlement is in place, the Palestinians will see a further boost of the socio-economic perspectives.

Below table provides an overview of some socio-economic parameters in the study area. These figures have been obtained from literature, from the Jordanian Department of Statistics (DOS), the Central Bureau of Statistics in Israel, and the Palestinian Central Bureau of Statistics, supported by data from indexmundi.com These data reflect the status in the wider region around the Lower Jordan River Basin: this study did not include specific field data surveys in the Jordan Valley itself, and below data should therefore be considered indicatively.

Table 6 - Socio-economic parameters

Socio-economic Statistics (2011)	Jordan		Israel		Palestine	
Parameter	**Amount**	**Unit**	**Amount**	**Unit**	**Amount**	**Unit**
Average Household size	6	pers	3,3	pers	6	pers
Average Monthly Household Expenditures	701	JD	14460	NIS	1058,4	JD
Average Monthly Per Capita Expenditures	117	JD	4382	NIS	188,1	JD
Average Monthly Income per household	704	JD	14629	NIS	1100,0	JD
Illiteracy rate for persons aged >15 years					4,1	%
Males	*5*	*%*	*1,5*	*%*		
Females	*12,6*	*%*	*4,1*	*%*		
Gender Ratio (= males / females in %)	106,4	%	102,7	%	103,2	%
Labor Force Participation >15 years						
Males	*63,4*	*%*	*68,6*	*%*	*69,1*	*%*
Females	*17,8*	*%*	*61,3*	*%*	*17,4*	*%*
Poverty rates	12.5	%	22.5	%	23.7	%
Unemployment > 15 years						
Males	*11*	*%*	*5,6*	*%*	*17,3*	*%*
Females	*21,2*	*%*	*20,2*	*%*	*25,3*	*%*
Employment per sector (%)						
Agriculture, fishing, forestry	*20*	*%*	*1,6*	*%*	*33,3*	*%*
Mining, quarrying and manufacturing	*9,5*	*%*	*11,5*	*%*	*7,6*	*%*
Construction	*15*	*%*	*5*	*%*	*6,2*	*%*
Commerce, restaurants, hotels	*20*	*%*	*19,5*	*%*	*13,3*	*%*
Transportation	*6,5*	*%*	*3,8*	*%*	*5,1*	*%*
Services, others	*29*	*%*	*58,6*	*%*	*34,5*	*%*
Basic Education (%)						
Males	*51,3*	*%*	*100*	*%*		
Females	*48,7*	*%*	*97,7*	*%*		
Population Growth	*2.2*	*%*	*1.87*	*%*	*Negative/ migration*	

Within the study area, the size of households in Jordan and Palestine are similar, about 6 persons per household, which is comparable to the wider Middle East region, while Israel has about 3.3 persons per household, which more resembles the situation for instance in Europe.

The differences in expenditures show slightly different pattern. Household and per capita expenditures in Jordan are resp. 701 JD and 117 JD (€ 728 and € 121). In Palestine these are about 50% higher: 1058 JD and 188 JD (€ 1098 and € 195). In Israel, the household and per capita expenditures are about 5 times higher: 14460 NIS and 4382 NIS (€ 3.051 and € 924). However, the Consumer Price Index for Jordan is about 65,55 against 92,24 for Israel and Palestine, meaning that Jordanians can buy about 40% more consumptions goods for their money than the Israeli's and Palestinians.

Unemployment rates (percentages of the labor force without a job) are relatively high for the region, with an exception of the male unemployment rate in Israel, which was 5.6% in 2011. Among the male population Palestine has the highest unemployment rate with 17.3%, followed by Jordan with 11%. Under the female population, unemployment is again highest in Palestine (25.3%), followed by Jordan (21.2%) and next Israel (20.2%).

In all three countries there are considerable income disparities between the upper and lower strata of the

societies. In the three riparian states a substantial proportion of the households are living below the poverty line: Jordan 12.5%, Palestine 23.7% and Israel 22.5%. It should be noted that the three countries apply different poverty definitions, and that in absolute income terms the poverty in Palestine is much more severe than in Israel. Nevertheless, the Gini Coefficient of Jordan and Israel confirms that large income disparities exist between the top 20% and the bottom 20% of the income earners, and the expectation is that a similar pattern can be observed in Palestine.

Employment rates per economic sector show that Palestine has a relative high portion of people working in the agricultural sector (33.3%), while in Jordan this is estimated to be around 20%, and only 1.6% of the Israeli working force is employed in the agricultural sector. Although detailed information on agricultural employment rates in the Lower Jordan Valley are not available, it may be expected that agriculture is more important here than at national levels.

Figure 21 – Jericho City Center

A different pattern can be seen in the construction sector, with 15% for Jordan and 6.2% for Palestine, against 5% in Israel. Sectors such as mining, manufacturing, commerce, restaurants and hotels and transportation employ percentages which are more or less similar for the three countries. Finally the Service sector, including research and government, is best developed in Israel, employing 58.6 % of the work force, against 39.8% in Jordan and 34.5% in Palestine. These differences may explain to some extend the income differences in the three countries, since the agriculture and construction sectors generate generally lower wages than the service sector.

The agricultural activities of the settlements in the Palestinian study area generate about 500 Million NIS of revenues. The total agricultural area in the West Bank part of the study area that is under control of Israel is approximately 60,000 dunum, including 4.470 dunum in Cluster North; 46.360 dunum in Cluster Central and 10.128 dunum in cluster South. Main crops are dates, vegetables, fruit trees and field crops. About one third of the Israeli settlement population is involved in agricultural activities, and another one third is engaged in agro-business related activities. The final one third of the working population is involved in industrial activities and services. In addition, an estimate 6,000 Palestinian workers are employed on a temporary basis on the agricultural settlements.

The industrial activities of the settlements in the Palestinian study area include exports of dried fruits, dates, herbs and nuts; infrastructure contracting; packaging of grapes, figs, peppers, tomatoes and herbs,

nylon bags production; metal works, rubber, plastics and sealing production; arts and crafts, marketing and investment in pesticides, fertilizers and packaging materials for farmers, manufacturing cosmetic products from Dead Sea minerals.

The gender ratio in the Lower Jordan River Basin (number of males compared to number of females) is highest in Jordan (106.4%), and similar in Israel and Palestine (102.7% and 103.2%). Illiteracy rates in all three countries are relatively low: below 5%, be it that females in Jordan are an exception with an average illiteracy ratio of 12.6%. Labor force participation for the male population is also similar in all three countries: 63.4% in Jordan, 68.6% in Israel and 69.1% in Palestine. Differences are larger for the female population: 17.8% and 17.4% of women participate in the labor market in Jordan and Palestine, while 61.3% of the adult female work force participates in the labor market in Israel.

The gender issue in Jordan is influenced both by national socio-economic conditions as well as by tribal traditions. In some rural areas, local Shari'a courts have some jurisdiction over matters related to marriage, divorce and inheritance. The Jordanian National Commission for Women (JNCW) has established a network called Sham'a ("candle"), which aims to combat violence against women by coordinating the efforts of both governmental and non-governmental organizations. In 2009, the JNCW established a Women's Complaints Office to receive complaints of discrimination and violence against women in private and public life and to raise awareness of these issues and provide legal aid, among other services. This work is carried out in collaboration with governmental and non-governmental organizations. There are also several NGOs that provide services to women, and a national register on violence against women has been established. In 2007, the Ministry of Social Development created the "Family Reconciliation Centre" for victims of domestic violence.

In 2012, Israel ranked eleventh out of 59 developed nations for participation of women in the workplace. In the same survey, Israel was ranked 24th for the proportion of women serving in executive positions. Israeli law prohibits discrimination based on gender in employment and wages; nonetheless, there are still complaints of significant wage disparities between men and women in Israel, as well as significant social disparities particularly in orthodox communities. On the other hand, Israel was the third country in the world to be led by a female prime minister, Golda Meir, and in 2010, women's parliamentary representation in Israel was 18%, compared to about 6% in Palestine and Jordan, and to 40% for instance in the Scandinavian countries.

In Palestine the position of women is positive relative to most other Arab countries, be it that external conditions such as limited economic perspectives and traveling restriction imposed by the Israeli authorities are serious constraints for improving the position of women in the Palestinian society. In addition, Palestinian women still face some discrimination within Palestinian society itself. Despite high levels of education and activity within civil society, women remain underrepresented in public life, in part due to the societal norms that place pressure on women to conform to traditional gender roles. It has been difficult for Palestinian women during the previous decades to have their voices heard within a society that struggles with the occupation, putting justice for women to a secondary issue on the national agenda. However, the 2010 UNFPA report mentions that there is a gradual improvement in gender roles and relations, leading towards greater equality in Palestine.

2.3.3 Agriculture

The Jordan Valley is divided into three distinct agricultural zones, because of different agro-climatic and ecological conditions. The northern zones on the West and East Banks receive more rainfall; have lower temperature and better soils. These conditions enabled the farming communities to cultivate field crops and tree crops under rain fed conditions. The middle and southern zones receive marginal rainfall; have poorer soils and higher temperatures and therefore higher evaporations. These zones are unsuitable for rain fed agriculture and Bedouin nomadic communities used to rear their goats and sheep flocks there. The altitude, climate, soil types, and water resources are different and unique for each of the agricultural zones.

Figure 22 – Old Farm House in the Southern Part the Jordan Valley

The communities that farmed in the Lower Jordan Valley had a reputation for the export of agricultural product to regional urban centers. The Arab-Palestinian communities, who are locally known as Al Ghawarna, were initially engaged in subsistence activities like herding, gathering and later cultivating cereals. Later they involved in the cultivation of wheat, barley, maize and vegetables, eventually irrigating these crops from water they obtained from rivers, streams, springs and wells inside the Jordan Valley and its side-wadis. In ancient documents the Al Ghawarna communities were praised for their irrigation practices and their capacities to export agricultural produce to urban centers in the region (Khouri 1981). Bedouins traditionally used the valley during winter months to forage their sheep and goats and then moved them to the fresher High Lands during the summer months.

Table 7 - Main features of the three agricultural zones of the Jordan River Valley

Characteristics	Zone 1	Zone 2	Zone 3
Elevation below sea level (m)	205 – 235	235 – 315	315 – 395
Name	Northern JV	Middle JV	Southern JV
Administrative centre East Bank	North Shuna	Deir Ala'a	South Shuna
Administrative centre West Bank	Beit Shean	Tubas	Jericho
Total degree of aridity	Semi arid	Semi arid-Arid	Arid–severely arid
Percent area of soil class-A East Bank[1]	43	29	18
Percent area of soil class-B East Bank	41	27	17
Percent area of soil class-C East Bank	13	12	7
Percent area of soil class-D East Bank	3	32	58

Source: Jordan Valley Authority [lit 103].

In the 1950ies the riparian states developed a strong interest in irrigation development to expand the agricultural output of the Lower Jordan River Basin. The Government of Jordan started the construction of the East Ghor Canal in the late 1950s, which later got known as the King Abdullah Canal. This main canal flows on the East Banks and takes its water from the Yarmouk River and the streams flowing from the side-wadis of the Lower Jordan River. The King Abdullah Canal supplies irrigation water to a series of irrigation schemes on the East Bank and to drinking water processing plants of urban centers in the High Lands of Jordan. The Government of Israel made major investments in irrigation development and the Carrier Canal enabled even irrigation development outside the LJRB.

Table 8 - Cultivated and irrigated land (ha) in the Jordan valley per zone in 2009/2010

Zones	Administrative Units	Cultivated land Ha	Irrigated land ha
Northern East Bank *2	Northern Shouneh District	11.574	11.332
Northern West Bank *3	Beit Shean District	17.820	10.430
Middle East Bank *2	Dair Al Alla District	9.718	9.718
Middle West Bank *1	Tubas-Nablus Governorates	5.682	2.722
Southern East Bank *2[2]	Southern Shouneh and (Ghor Safi) districts	6.412 (4611)	6.412 (4611)
Southern West Bank*1	Jericho & Al Aghwar Governorate	3.627	3.428
TOTAL		32.319	32.073

Sources

1. PCBS Agricultural census 2010 – Table 10 of Tubas/Nablus and Jericho and Al-Aghwar Governorates
2. DOS Agricultural census 2011- Al-Aghwar region
3. ARC: 2002: Table 3-3 and 3-4

[1] Class-A soil is deep and level and has good permeability, low salinity, and no clay (Marl). This type of soil is suitable for all types of crop. Class-B soil is similar to Class A but is shallower, less permeable, and slightly more saline. Class-C and class D soils are shallow and have high salinity and low permeability, as a result of the impediment offered by its clay layers.

[2] The agricultural enterprises in the Ghor Safi District are located outside the study area but inside the service area of the King Abdullah Canal. Therefore data on irrigated agriculture is included into this baseline report.

The development of a hydraulic revolution during the 1960s and 1970s has caused what El musa (1994) called a "Super Green Revolution" in the Israeli and Jordanian zones of the Lower Jordan River Basin. The expansion of the irrigated area and the successful application of Green Revolution technologies cause a boom to the production of high value crops like fruits and vegetables, which proved to be commercially highly profitable when exported to the regional and European markets. Due to political and economic conditions the Palestinian West Bank has missed out on large-scale irrigation development initiatives and continued to rely of small-scale irrigation initiatives around communal owned springs and privately owned wells.

The riparian states applied very different policy and organizational concepts for the development and management of irrigated agriculture. On the East Bank the Government of Jordan established the Jordan Valley Authority (JVA) that obtained the mandate to develop and manage the public owned irrigation systems and to carry out a land reform inside the command areas of the irrigation schemes. The JVA established a family farm model of 3.5 ha for the production of irrigated fruits and vegetables. The semi-public JVA organization allocated about 6,800 farm units inside the LJRB study area to families of the indigenous Al Ghawarna and Bedouin farming communities and to investors from outside the valley, who were considered capable of developing and managing these resources intensive farms. A network of public and private sector irrigation and agricultural support service providers was established to assist these farming families to develop and manage on-farm irrigation systems, and to produce high value fruits and vegetables crops using the Green Revolution packages.

Irrigated agriculture in the Beit Shean agricultural-water zone developed through close collaboration between the public water agency, the cooperative farming enterprises (Kibbutzim) and the agricultural and irrigation support service providers of the public and private sector. Cooperative and family farms are the two main organization forms that are involved in primary agricultural production in the Beit Shean zone. Leaders of the Kibbutz movement were the driving force behind irrigation development in the Beit Shean zone because their farms controlled the land and water resources, and they had the vision, the technical and financial capacities and the required connections with the public water agency.

Table 9 - Agricultural land use in the agricultural-water zones of the LJRB study area in 2011

Agricultural land use	Shouneh North *1	Beit Shean *3	Deir Al Alla *1	Tubas/ Nablus *2	Jericho-Al Aghwar *2	Shouneh South*1	Ghor Safi *1
*Fodder crops	182,8	4.700	91,1	485,5	43	55,6	
*Field crops	967,3	2.790	224,5	1.894	254,1	563,7	46,6
*Vegetables		8.160		1.782,9	2.630		
-Open field	2.763,3		3.463,4			3.301,5	4.537,8
-Green houses	918,7	(20)	2.124,6			682,8	281
*Fruit crops	6.698,2	2.150	1.592,3	397,7	700,7	2.135,4	479,1
*Fish ponds		1.050					
*Fallow	1.447,7		2.611,6			351,1	133,6
*Others[3]	105		147,7			152,8	6,5
TOTAL	13.068	18.850	10.255,2	4.560,1	3.627,8	7.242,9	5.484,7

Sources

*1 DOS 2011 Agricultural Census 2010 - Table 5.1.1

[3] The category others covers for example nurseries.

*2 PCBS Agricultural Census 2010 – Table 10 Tubas, Nablus and Jericho & Al Aghwar Governorates
*3 ARC 2002- Table 3-4

The Kibbutzim made substantial investments in research to develop the appropriate crops and cultivation techniques adapted for the specific physical and climatic conditions of the valley, and to cope with the increasingly stringent environmental and social standards of the export markets. With the agricultural sector investing in technical and commercial capacities to manage irrigation schemes and to practice irrigated farming, the public water agency could focus on the development and management of the main irrigation infrastructures and bulk water supply to organized agricultural water users.

Individual farmers were the driving force for the development of irrigated agriculture in the Palestinian zones. They manage the communal springs for their family or community groups and their private irrigation systems in case they controlled a well. The agricultural support service providers of the public and private sector are their knowledge partners. However the commercial farmers increasingly depended on the Israeli private service providers and the peasants on NGOs and their own experiments for agricultural development initiatives. The majority of farming households lacked irrigation facilities and on their smallholdings can only practice rain fed-agriculture and extensive livestock production.

Irrigated agriculture in the LJRB focuses on the production of irrigated high value fruit crops and vegetables for the export markets. The growers have to meet the stringent standards of the export agencies, with a stress upon completely bug-free crops, controlled usage of chemicals and strict requirements for packing-houses and refrigeration. In the Israeli section of the study area the growers collaborated with national knowledge partners to develop appropriate cultivation techniques for the crops and livestock production systems. There is growing collaboration between the Israeli agribusinesses and the Palestinian commercial farmers for the production, processing and marketing of agricultural export products (Levy 2011). In the Jordan section of the valley the commercial farmers increasingly relied on the experts of the international agro-industries to deal with irrigated crop production technologies and the quality standards of export markets.

The livestock production systems play an important role in the mixed farming systems in the valley especially in the Israeli and Palestinian sections. The Kibbutzim and Moshavim in the Israeli zone of the study area were recorded to rear 9.500 cattle for dairy and beef production in 2002. The majority of the Palestinian farmers are involved in livestock production systems either in the mixed farming systems or their semi-nomadic livestock farming systems. In Jordan section of the valley livestock production is also considered economically relevance given the production of fodder crops (clover trefoil) and dairy products but not statistical data is collected concerning livestock production systems.

Table 10 - Livestock in the Western Lower Jordan River Basin

Animals	Beit Shean	Tubas	Jericho
Dairy Cattle	3,600	640	1,030
Other Cattle	5,900	535	1,072
Goat and Sheep	1,000	14,000	67,000
Chicken	1,000,000	240,000	940,000
Other (horse and donkey)		20	320

Source ARC 2002: Table 3-14.

In the baseline report a distinction has been introduced between farming systems using high external inputs and low external inputs farming styles. The High External Inputs Agriculture or HEIA farming style applies the Green Revolution technologies, like chemical fertilizers, chemical control of weeds and pests, and genetically modified seeds. These inputs are produced externally to the farms by agro-chemical industries. LEISA farming style covers a series of practices that serve to reinforce ecological principles that are in line with local ecosystems[4]. The Low External Inputs Sustainable Agriculture (LEISA) farming styles apply inputs that preferably are prepared internally of their farms or partners' farms like manure and seeds and planting materials. The farmers use biological rather than chemical pest control techniques and mechanical weed control rather than herbicides. In Palestine LEISA production methods by family farms is dominant.

For this socio-economic baseline a classification matrix is applied that uses a farming style and a farm organization dimension. For farming styles the distinction between HEIA and LEISA technology is applies and for the farm organization the distinction is made between entrepreneurial, cooperative and family farms.

In Jordan, industrial farming is being developed by entrepreneurs and large groups of family farms specifically in the Middle Section of the LJV. Other farmers face the problem that their farm units are fragmented and their turn over is generally too limited to effort and apply extensive technologies.

In Palestine industrial farming is mainly done by Israeli settlement and Palestinian entrepreneurs. The entrepreneurial, cooperative and family farms are distinguished on the ownership structure, the economic purpose of the farm and the labor recruitment strategy applied. The entrepreneurial farm is private property of the shareholders and its purpose is profit-making usually only in on-farm activities[5]. Therefore these farms are engaged in commodity production on the basis of commercial principles. The cooperative farm is communal property of its members and its purpose is income generation for its members through on-farm and non-farm activities. The family farm is private property usually of the family members in which social, economic, cultural and financial functions are combined. The purpose of the family farms is secured subsistence/income for the family members and therefore they can be engaged both in subsistence and commodity production[6] through on-farm and non-farm activities. Professional farm managers are in charge of the entrepreneurial and cooperative farms and they recruit laborers for the farm operations respectively through labor markets, and from the cooperative's members. They have to or try to pay market conform wages. However, the family farms recruit their labor from its members, who do not receive wages but subsistence security on the basis of solidarity within the family network.

[4] Low External Input Sustainable Agriculture (LEISA) is receiving increased attention of scientists and policy makers, both as a sustainable alternative to Green Revolution-technologies that make intensive use of internally produced inputs, and as a strategy of sustainable agriculture in resource-poor environments where no or very few external inputs are used. In areas with a high production potential, LEISA is considered to simultaneously improve ecological sustainability, food quality and farmers' socioeconomic conditions by minimal application of chemical inputs to reduce pollution of soil and water resources, chemical residuals in food, and financial incentives to increase labor production and ignore non-commercial functions of the agricultural sector. LEISA cover different set of agricultural practices that have different names (organic, ecological, bio-dynamic, and conservation agriculture (http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/3143.pdf).

[5] Profitability is considered an achievement or success criteria for the managed enterprise.

[6] Subsistence production deals with the production of use values, which are consumed by the producers themselves, while commodity production deals with the production of exchange values or products that are exchanged through market forces.

Table 11 - Classification matrix of farm organizations and farming styles in the Jordan Valley

Farming style Farm organization	High External Input Agriculture (HEIA)	Low External Input Sustainable Agriculture (LEISA)
Entrepreneurial farm	Capital intensive farms controlling moderate to large holdings where specialized crop and livestock production systems are practiced using hiring specialized farm managers and wage laborers	No information available yet
Cooperative farm	Capital intensive farms controlling large holdings specialized in intensive crop and livestock production systems using the management and labor capacities of the cooperative's members	No information available yet
Family farm	Widespread in family farms practicing specialized irrigated crop productions for which they depend on external upstream and downstream flow of commodities. These farmers had to take loans and engaged in production and marketing contracts to minimize risks are commonly called 'farmer'.	Widespread in family farms practicing mixed and subsistence farming and who want to control the internal resource base and to avoid risks of commercial loans. The farmers that focus on subsistence food production are commonly called 'peasants'.

The HEIA and LEISA farming styles have beside distinct capital intensity level also different socio-technical-commercial networks that serve them. The farms applying HEIA farming style have made high investments in intensive irrigated crops or livestock production systems. The HEIA farms get their technical and commercial support from upstream and downstream mainly private service providers and they often have production and marketing contracts for integrated service packages with agro-business companies or supermarket chains. The farmers applying the LEISA farming style use internally produced inputs and therefore are weakly connected with the external input suppliers: the agri-businesses and bio-technology companies. The peasants miss connections with the product markets, however the commercial family farms are connected to processors and market for environmentally and animal friendly produced food. In many countries public sector has established regulations and organizations, to supervise the trade and application of chemical inputs, which focus on the HEIA farming style. Usually LEISA farmers voluntarily abandon the use of chemical inputs and have consultation platforms with consumers/environmental organizations and knowledge partners where the stakeholders decide jointly on guidelines and standards and supervision and labeling procedures of LEISA farming products.

Figure 23 - Greenhouses in the Lower Jordan Valley

Export of Agricultural products

The Jordan Valley is the major agricultural production region for Jordan. On a national scale Jordan's agricultural export accounts for about 550 Million JOD (2014), mainly to the United Kingdom, The Netherlands, Canada, Germany and France, and to a lesser extend to Saudi Arabia and the Gulf States. The export increased by 12% compared to 2013, and includes 888,000 tons of fruits and vegetables. About 85% of the export relates to vegetables, particularly tomatoes. In addition, Jordan exported 613,000 heads of cattle in 2014, mainly to the Gulf Region.

Israel is a major exporter of agricultural products as well as agricultural technologies. The Jordan Valley plays a minor role in the agricultural production, since the bulk is produced in the central and western regions of the country. Israel's agricultural exports account for about 2.2 Billion USD, or 4.2% of the total export. Vegetables account for about 24% of the total agricultural production. In addition, Israel produces about 690,000 tons of fruits, including 190,000 tons of citrus fruits for export, as well as wheat, barley, corn and cotton. Supporting services, including post harvesting, scientific research and agro-industry are highly developed in Israel.

The total annual Palestinian exports account for about 900 Million USD in 2013. The agricultural sector contributes today to about 4.5% of Palestine's GDP, compared to 13% in 1993, with the Jordan Valley playing a very modest role. This decline largely relates to increasing transport restrictions, agricultural land confiscations and limited control over most of the agricultural lands situated in the areas C. Most of the agricultural production is for domestic consumption and local markets, and only limited amounts are exported. About 5.3 Million USD of fruits and 5.9 Million USD of meat products were exported in 2013. More than half goes to Jordan, followed by Europe, Algeria and the United States.

In addition, Israel produces 95% of its own food requirements, supplementing this with imports of grain, oilseeds, meat, coffee, cocoa and sugar.

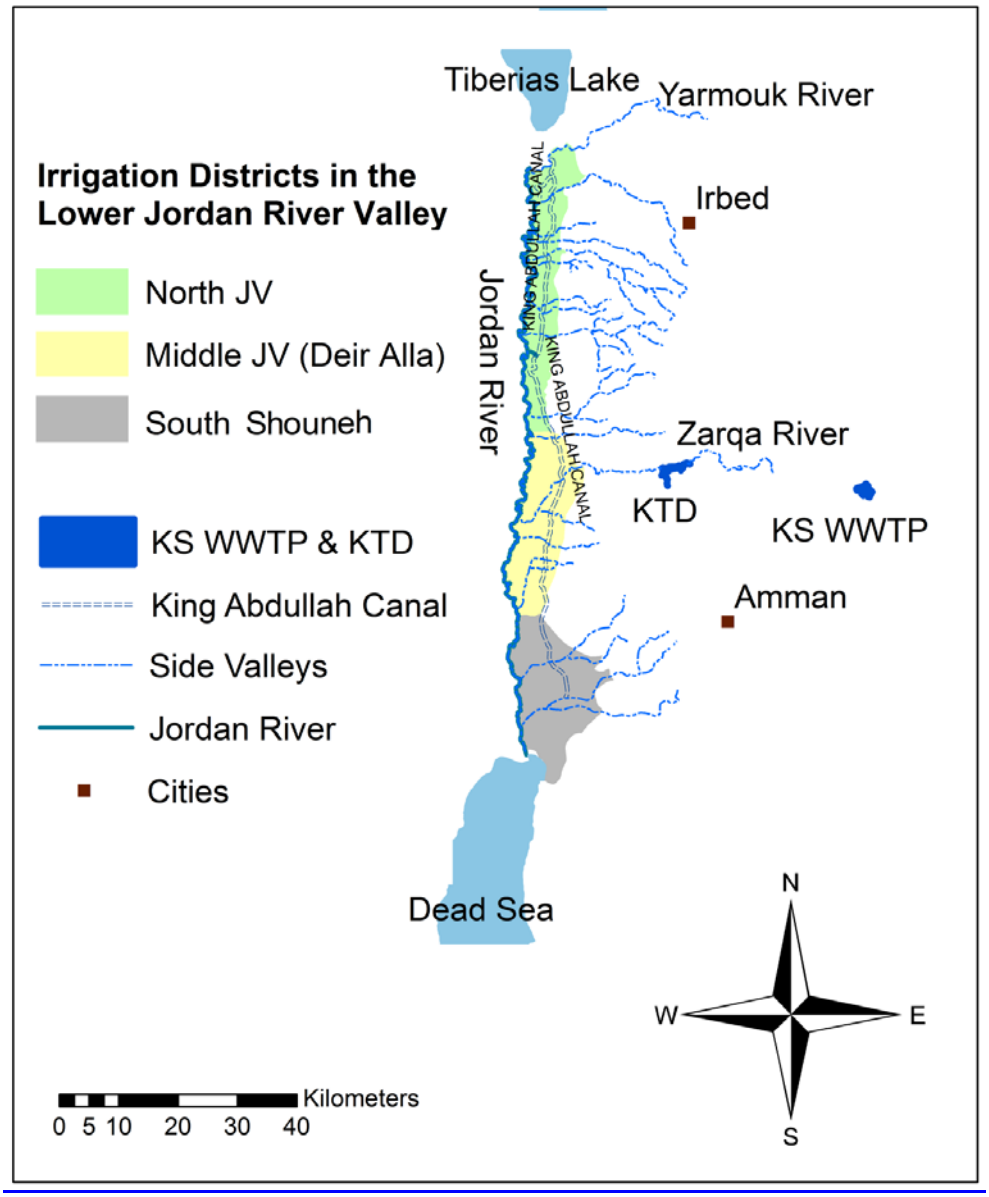

Figure 24 – Agricultural Zones in the Lower Jordan Valley (Jordan)

2.3.4 Tourism

The Lower Jordan River Basin has considerable tourism potential and offers numerous historical, scenic and religious attractions. Tourism contributes between 7 and 14% to the economy of the three riparian countries. Tourism in the Lower Jordan Valley is strongly linked to the unique geographic features and its historic, religious, cultural and archeological features in the valley. Tourist destinations include health/spa tourism, nature areas, and cultural heritage (including religious) sites. Many international tourists combine

a day trip to the Jordan Valley as part of their overall vacation itinerary. In addition, nationals of the three countries see the Jordan Valley as a popular trip destination during weekends or holidays.

However, tourism facilities are still relatively undeveloped in the Lower Jordan Valley. The potentials in terms of recreation, thematic site visits and touristic tours are huge. The Lower Jordan River Basin is the home of a unique combination of tourist attractions. The archaeological and biblical sites have been described earlier in this report. The Jordan River is one of the sacred places, both historically and symbolically, for Moslems, Jews and Christians throughout the world. In addition, the flora and fauna inside the valley are very diverse as a consequence of the area's particular geological and climatic conditions. Potentials to be further developed could include hiking or biking along the Jordan River and Dead Sea Trails, camping, rock climbing and boating in dam waters along the LJR or in the Jordan River itself. Other potentials could be religious tours such as a Pilgrims Path of the Companion of the Prophets (Islamic tour), the Hajj Trail (regional tour), a journey in the Footsteps of Moses, John, and Jesus in the Land of Moab, and many others [lit 167]. In addition, there could be potentials for deepening the linkages between established tourism accommodations and rural communities, such as organizing excursions and traditional meals in Arab and Bedouin communities, guided tours to nature reserves and bird watching, and horse and camel riding in the desert.

Further the Jordan River feeds the Dead Sea, which has no outlet and has the geographical reputation as "the lowest point on earth," lying almost 400 meters below sea level. This results in high evaporation and in extremely high contents of salt and other minerals. Swimming in the Dead Sea water is beside a special experience also considered to have curative effects for skin and respiratory diseases. Finally huge numbers of migratory birds fly yearly twice through the Jordan Valley moving from their breeding grounds in North and West Europe and their wintering grounds in South and East Africa. This diversity of tourist attractions gives the Lower Jordan River Basin the potentials to become one of the main tourist destinations in the Middle East Region.

However for developing these potentials the riparian states will have to create a supportive policy environment through constructive collaboration. The tourism sector is very sensitive to political tensions in the region and the number of tourists decline sharply when disputes escalated. Although tourists become more adventure-oriented, they avoid destinations where they consider that their safety is at risk. The socio-political developments in Middle East with its growing encounters between political and religious fractions and alliances had negative effects on the Jordan Valley's reputation as a diverse and safe tourist destination.

Below table provides an indication of the main tourism indicators in the Jordan Valley. These figures are based on information from the Jordanian Ministry of Tourism & Antiquities (2010), the Israeli Ministry of Tourism and Antiquities (2012) and the Palestinian Ministry of Tourism and Antiquities (2011), supported with data from the national central bureaus of statistics and some assumptions.

Table 12 – Lower Jordan Valley Tourism Indicators (2010)

Indicator	Jordan (2010)		Israel (2012)		Palestine (2011)	
	Nation	*JV**	*Nation*	*JV**	*Nation / West Bank*	*JV**
Foreign Visitors per Year	3,644,267	491,000	3,500,000	588,700	2,200,000	250,000
Local Visitors per Year	451,444	8.638	500,000	50,000	2,700,000	10,000
Number of Hotels available	487	28	340	53	93	12
Number of Beds available	46.141	2.496	*95,800*	1,235	2,167	280
Number of Hotel Guests					264,000	34,000
Bed Nights – foreigners	4.557.024	24,651	10,000,000	80,000	220,000	30,000
Bed Nights – nationals	?	?	12,000,000	40,000		
Same Day Visitors (for + nat)	3.690.112	387,215		620,000		216,000
Revenues from Tourism	1.01 B JD	11.1 M JD	9 B USD	12 M USD	250 M USD	5 M USD
Employees in Tourism sector	41.900	2266	105,000	100	10,000	200
Main Tourism Season	July, August, Sept	July, August, Sept	July, August, Sept	July, August, Sept	July, August, Sept	July, August, Sept

* JV = in the Jordan Valley, excluding Dead Sea

Italic = best estimate

In addition to the data from above mentioned sources the following assumptions have been made in this table:

- In Israel, 29% of foreign tourists, about 58% of them being people with a Christian background, define their trip as a pilgrimage, which most likely include a trip to the Baptism site along the Jordan River. This is a total of approximately 588,700 visits to the Lower Jordan River Basin, mostly on day trip basis.

- The Baptism site in Jordan is visited about by about 80,000 foreign tourists per year, while Mount Nebo, along the boundary of the Lower Jordan River Basin is visited by 394,993 foreign visitors and 1566 Jordanian nationals per year. The Dead Sea in Jordan is visited by 16,873 foreign visitors and 7,072 local visitors per year. Based on these figures it has been assumed that a total of about 491,000 foreign tourist visit the Jordanian study area on an annual basis.

- Jericho, which is the main urban center in the Palestinian part of the study area with about 34,000 inhabitants, welcomes around 34,000 hotel guests per year. Assuming that the tourist sector in Jericho counts for about 14% of the Gross Domestic Product, as for the rest of Palestine in the West Bank, and taking into account a per capita GDP of 1,036 USD, this leads to an estimated revenues for the tourist sector in the Palestinian study area of around 5 M USD per year.

As indicated in this table, the Lower Jordan Valley between the Sea of Galilee and the Dead Sea is visited annually by about 1,33 million foreign visitors on an annual basis, including 491,000 foreign visitors in the Jordanian part of the study area; 588,000 foreign visitors in the Israeli part of the study area, and

approximately 250,000 foreign visitors in the West Bank part of the study area. In addition, it is estimated that a total of 70,000 local nationals visit the study area for recreational purposes on an annual basis.

Most visitors come to the area on a one-day basis. Only about 1% of foreign visitors stay overnight in the study area during their trip, leading to approximately 134,000 Bed Nights per year in the study area. Most of the international tourists have night accommodation in other parts of the region, mostly in Amman, Jerusalem and Tel Aviv.

The revenues from tourism in the study region cannot be separated sharply from the national tourist revenues. Direct revenues in the region include hotel and restaurant costs, local travel costs, purchase of goods and souvenirs and admission fees to various sites and attractions. Indirect revenues relate international flights, day trips to wider parts of the region, and the theoretical percentage of tourists that decide to come to the one of the three countries for reasons directly related to touristic sites in the Lower Jordan Valley.

It is estimated that approximately 1% of the total tourism revenues within Jordan is directly earned in the study area, or about 11 million Jordanian Dinars out of approximately a total tourism related national revenue of 1 billion JD. The tourism sector in Israel is the largest of the region, with 9 billioln USD of revenues per year (2013). The portion earned directly in the study area is only a fraction of this. It is estimated that 12 million USD, or 0.1% is directly earned from tourism in the study area.

For the Palestinian part of the study area the situation is more complicated, since the Palestinians have no access to the major portions of the West Bank, and many visitors to for instance the Baptism Site in the West Bank are served by tourist operators from elsewhere in Israel. It is the Consultant's estimated that the direct Palestinian earnings from tourism in the study area is about 5 million USD, against a total Palestinian income from the tourist sector in the West Bank of about 250 million USD [ref. Ministry of Tourism and Antiquities]. It should be notes though, that since the beginning of 2013, Israel has forbidden tourists from the United States and other countries to enter the territories under Palestinian Authority control without a military entry permit – without explaining the related application process. This will probably have additional negative impacts on tourism visits particularly to Jericho.

2.3.5 Industry

With the exception of the Israeli zone, the industrial sector is weakly developed in the Lower Jordan Basin. In Jordan agriculture related services include industries supplying greenhouses, on-farm water management equipment and agricultural inputs. An initiative was taken to develop a fruits processing plant; however it failed in the opinion of many farmers.

In the Palestinian zones of the study area the agro-industrial linkages are also weak. The HEIA farms have connections with the agro-industries in Israel that provide irrigation equipment and external inputs. The forward linkages are weak, because the products are directly sold to the consumers or the suppliers in the urban environment that have processing capacities.

The agricultural sector in Israel has established strong backward and forward linkages through the Kibbutzim's organization structures. The economic scales of the kibbutz farms enabled mechanization of the farm operations and investing in processing capacities for its main products through clusters of Kibbutzim. Kibbutzim alone or jointly could invest in technical and managerial capacities needed for

backward industrial services, like the production and installation of drip irrigation systems, or in forward industrial services like the processing and marketing of milk or fruit products. The cooperative structure enabled the Kibbutzim organization to invest in agro-industrial initiatives that had synergies with their farm activities through the valorization of its products and for making more efficient use of the labor resources of its members during the off-season of the on-farm activities.

The Jordanian section of the Lower Jordan Valley houses a number of mainly small industrial operations, including:

- the Wadi Rayyan Free Zone, between Pella and Karamah, including a gold and jewel factory.
- the AMPC Tomato Paste Factory.
- the Pella Trading Gypsum Board plant;
- the Indian Jordanian Chemical Company;
- Insustrong Polystyrene Factory south of El Arda;
- A small polystyrene factory between Sleikhat and Karn;
- the Jordan Plastics Factory at Facku Rama;
- and the Jordan Fertilizer Company north of Arda; and
- the Travertine Company Ltd. (TRAVCO) located in the Middle Jordan Valley at Fanoush - Ghor Damia.

Figure 25 : Stone cutting workshop and car workshop near Moath Bin Jabal

Agricultural developments in the LJRB had strong links with the service sector but contributed marginal to industrial development. Sophisticated water management equipment is imported from Israel, India, and European countries that have a comparative advantage with water saving and treatment of wastewater. Jordan has an advanced position in the production of phosphate and potash fertilizers but the plants are in Aqaba because of the transport advantages. USA and European agri-business companies dominate the markets for agricultural seeds and chemical inputs. Many of these international companies have their headquarters in Amman and one sales and service office in the valley.

Agriculture processing industries have a poor base in the LJRB. Fruits and vegetables production is focused on fresh products that are directly sold to the Jordanian consumers or exported. During the 1980s the Jordanian Government invested in the establishment of a processing plant for fruits and vegetables

with support of the European Union. The processing plant was established in Dair Al Alla, and the Department of Industries and a local organization of commercial farmers jointly managed it for the production of tomato paste. The farmers liked the plant since it enables them to process their low-grade tomatoes or to sell their products when prices dropped too much. Farmer leaders have the opinion that management of the plant deteriorated after the Jordanian Government ousted the farmer representatives from the management and sold the plant to a foreign private investor, who was interested in its assets. The remaining agro-industries are small-scale family enterprises for the processing of minor agricultural products like grains, olives and dates.

The backward linked industries in the East bank consist predominantly of small industries for construction the construction sector and package industry. There are several quarries that produce materials for the construction of buildings and infrastructures in the north-eastern governorates of Jordan. Some quarries even export marble. There are also several metal processing plants in the central and southern part of the East Bank that produce metal frameworks of greenhouses and install these for commercial farmers that invest green houses. These small plants spread over the East Bank that produce wooden and plastic crates and boxes for the commercial farmers, for packing their produce in accordance with the demands of the export markets.

At the southern end of the Dead Sea, outside the study area, the Arab Potash Company has built a potash processing plant with vast evaporation ponds. The plant is located at Katak in the Ghor Safi District and the ponds cover over 10,000 hectares along the shore of the Dead Sea to evaporate and extract potash from the mineral-rich waters. The total production for the year 2011 was 2.26 million tons of which 77.2% was exported via the Aqaba Port mainly to Arab and Asian countries. The remaining 22.8% were sold to local users and inland processing industries in Aqaba, like the Arab Fertilizers and Chemicals Industries (KEMAPCO), the Nippon-Jordan Fertilizers Company (NJFC) and the Jordan Bromine Company. The Arab Potash Company has developed into one of the world's leading potash exporters.

Other industrial sites in the study area include small stone quarries, cement production, pumps, tubes, pipes, textiles, leather, furniture, paper, printing, chemicals, metals, mechanical and electrical equipment, and transport.

In Israel, Beit Shean is a regional centre of cotton-growing, fish-farming and fruit trees cultivation. Many residents of the Beit Shean district are members and employees of Kibbutzim that initially focused on farming activities but have diversified during the past decennia in backward and forward linked industries for to their farming activities. The industrial non-farm activities of these cooperatives cover production and installation of water management equipment (e.g. rain water collection and drip irrigation), fish processing and marketing capacities, processing and marketing of fruits and dairy products.

Two private companies have invested in a cotton ginnery and a garment factory in the Beit Shean municipality.

In November 2013, Israel and Jordan agreed on construction of a multimillion-dollar joint industrial zone on the border between Israel and Jordan near Beit She'an. This is considered to be the first large-scale economic co-operation project since the peace treaty was signed in 1994. It is foreseen that the Israeli section of the park will include offices, warehouses, export and trade-related activities, while the Jordanian section will include various large scale industrial production complexes.

The park will consist of two parallel industrial and employment zones that will be connected by a bridge spanning the Jordan River. From both sides, only authorized personnel and visitors will be allowed to enter

the industrial park, while Israeli law will apply to the Israeli side and Jordanian law to the Jordanian side. A new governmental body called the Jordan Gateway Authority will be created to oversee activity on the Israeli side of the park. Movement of employees from both nationalities within the Park limits will not be restricted.

However, there are serious environmental concerns related to this project because of its chosen location on pristine land on the banks of the River Jordan. FoEME proposes that the site location be reconsidered and moved to land adjacent to the existing crossing point at Sheikh Hussein Bridge.

In Palestine, the key existing industrial activities are located in Jericho: aluminum windows and doors, bricks, clothes, iron products, meat processing, metal windows and doors, plastic packing materials, tiles, Tannery, and wooden furniture. Furthermore there are well advanced plans for the realization of the Jericho Agro-Industrial Park (JAIP), including common solar power supply, waste supply and wastewater treatment facilities. The area will have a size of 11.5 hectare and will be operated as a Public-private enterprise. Palestinian companies, mainly small- and medium-sized business, are offered financial concessions, including tax cuts, to lease plots of land in the park to process agricultural products that can be sold in the West Bank and abroad. All investors will have access to risk insurance from the Multilateral Investment Guarantee Agency, set up by the World Bank to protect them against negative impacts of conflict situation with the Israelis. The project is coordinated by the Palestinian Industrial Estates and Free Zones Authority (Piefza), based in Ramallah, backed by a grant of about $47.7m from the Japan International Co-operation Agency (JICA), which is paying for the solar power system, the installation of a sewerage and water system in the park, plus support from Japanese engineers. PRICO has been appointed as park developer, and so far around 20 businesses – from Palestine and Jordan, and one Arab-Israeli company – have expressed interest in setting up business on the Park. The park's objective is to eventually generate as much as $41.6m turnover per year and create more than 3,700 jobs.

2.3.6 Human Water Demands and Supply

The human water demands in the study area have been divided into two categories: domestic/industrial and agricultural water demands. The calculated domestic/urban demands include all household, industrial, institutional, commercial and tourism water demands. An assessment has been made of the current domestic/industrial water demands based on the available population data in the year 2010, and per capita water requirements. For the sake of uniformity these per capita water requirements have been set throughout the basin at 90 m3 per capita per year.

Agricultural water demands in the basin have been assessed on the basis of agricultural land use, current cropping patterns and crop water requirements. Particularly for Jordan, which is by far the largest agricultural water consumer in the study area, a distinction has been made between vegetables in de open field; vegetables in green houses, fruit trees and field crops. The agricultural water demands have been defined on the basis of currently utilized agricultural lands, and do not include potential agricultural lands that have not been developed so far.

Water demands for livestock, fish farming and industrial activities have been made on the basis an assessment of their current size and extension in the study area, in combination with data from earlier work done by the Austrian Research Centre in their water resources management study for the Lower Jordan Valley [lit 118, 119].

The total water demands are not fully met by actual water supply figures. In general the basin experiences a gap between the required water demands and the actual water supply, as elaborated below as well.

Figure 26 - King Abdullah Canal

Below table provides a summary of the total human water demands in the Lower Jordan River Basin in 2010.

Table 13 - Assessment of the human water demand in the Lower Jordan River Basin in 2010

Total Domestic Water Demands Jordan		**2010**
	Agwhar Shamaliyah	6.536.580
	Deir al Alla / Balqa	4.075.500
	Shoonah / Janoobiyah	4.217.640
	Informal population (according to JVA)	*7.410.000*
	to Amman	60.000.000
	TOTAL	82.239.720

Total Agricultural Water Demands Jordan		**2010**
	Zone 1 (115,300 dunum)	103.596.865
	Zone 2 (74,959 dunum)	107.169.170
	Zone 3 (120,835 dunum)	65.492.271
	TOTAL	276.258.306

Total Domestic Water Demands Israel		**2010**
	Emek Hayarden	990.000
	Emek Hamaayanot	990.000
	Beit She'an	1.530.000
	Hagilboa	900.000
	TOTAL	4.410.000

Total Agricultural Water Demands Israel		**2010**
	Jordan Valley WA	21.237.000
	Afikey Main WA	52.015.000
	Harod WA	22.000.000
	Fish ponds	100.000.000
	TOTAL	195.252.000

Total Domestic Water Demands (CM / yr) Palestine		2010
Palestinians		
	Bardala Cluster MD	315.540
	Al-Bassariya Cluster MD	273.840
	Al-Jiftlik Cluster MD	389.940
	Fasayil Cluster MD	69.420
	Al-Auja Cluster MD	265.380
	Jericho MD	2.046.720
	Subtotal Palestinian	3.360.840
Settlements		
	Cluster North MD	128.250
	Cluster Central MD	356.400
	Cluster South MD	77.400
	Subtotal Israeli Settlers	562.050
	TOTAL	3.922.890

Total Agricultural Water Demands (CM/yr) Palestine		2010
Palestinians		
PAD 1	Bardala Cluster	10.558.755
PAD 2	Al-Bassariya Cluster	5.240.855
PAD 3	Al-Jiftlik Cluster	5.400.437
PAD 4	Fasayil Cluster	1.173.919
PAD 5	Al-AujA Cluster	3.991.597
PAD 6	Jericho	11.082.381
Settlements		
IAD 1	Cluster North AD	3.100.095
IAD 2	Cluster Central AD	36.621.768
IAD 3	Cluster South AD	8.000.662
	TOTAL	85.170.469

GRAND TOTAL WATER DEMANDS LJR BASIN (CM / yr)	647.253.385

The estimated total human water demands in the study area are 647 MCM per year (base year 2010), including 60 MCM per year diverted to Amman. This is approximately 72% of the total annual water resources available in the LJR Basin, although it should be noted that the majority of Israeli water

demands are provided directly from the Sea of Galilee, and should therefore be added to annual water resources available in the LJR basin.

Domestic Water Demand

The domestic water demand has been calculated using the assessment of the current valley population and the regional domestic water use per capita presented in the tables below. The per capita domestic water demands are very variable between the three riparian states and between the urban and rural populations. For the assessment of the current domestic water no differentiation has been made between the lower per-capita water consumption in rural villages and the higher consumption in urban agglomerations, and all in annual per-capita water demand is assessed at 90 m3 per person per day.

Industrial Water Demand

There are few industrial activities in the valley. Only one location has been established in Beit Shean municipality and two locations have been planned inside the valley. One location is planned on the East Bank near the Sheik Hussein Crossing and another near Jericho. No information about type of industries and their water demands can be made yet because the private sector considers investments too risky in the current hostile political and economic environments. The water demand from industry is low and the ARC and its partners estimated the industrial water usage as less than 1 MCM/year in the valley, with most of it being used in the Beit Shean region (ARC 2003).

Agricultural Water Demand

For agricultural water demand a distinction is made between the water requirements of the crops, animal husbandry, fishery production systems that form integral components of the farming systems in the valley. Crop production systems dominate the farming systems in the Lower Jordan Valley. However, the combination of crop and livestock production systems is prominent in the farming systems both in the Israeli and Palestinian section of the West Bank. Processing facilities inside the farming systems are only relevant in the Israeli section of the study area and their water demands are considered under industrial water demands.

The calculation of irrigation water demands for crop production depends on many factors such as climatic conditions and soil types, crop-specific requirements, the efficiency of irrigation systems and the operation system applied by the irrigation managers. As the Lower Jordan Valley has different transitional climates with different precipitation and evaporation rates for the northern and southern zones of the valley. Accordingly also the crops grown in the different zones have also differentiated water requirement parameters. However the irrigation systems are managed on demand-basis during the winter season when supplementary irrigation is practices and on supply-basis during the summer season when the available water resources dictate how these should be most efficiently. This sub-section only introduces the human water demand issues since the results of the water resources management scenario and modeling exercise will be presented in a separate report.

Statistical data for irrigated crops production have been provided for the study area by the organizations managing or supervising the management of water resources. The project partners provided data about the monthly crop water demands in the different agricultural zones. See table below/

Fish Ponds Water Demands

Fishponds are pivotal to understanding the local consumption and water balance in the LJR. On average, a fishpond requires 3-6 MCM / yr per km2. Since most of the ponds in the area were constructed without lining, water losses by percolation are estimated at 20-50% of the water put in the ponds, most, if not all finds its way to the LJR. Another 40-50% is lost to evaporation and the rest is discharged back to the river as saline polluted effluent.

Israel operates the majority of the fish ponds in the study area. The surface area of fishponds in the region totals to about 20.000 dunums, which means a combined consumption of approximately 120 MCM/Yr. Most of the fishponds – 16.8 km2, are concentrated around Harod Stream and in Emeq Hamaayanot. Fish cultivation is periodical with most of the effluent being discharged in October-December. In Emeq Hamaayanot there is also some discharge in January-February. These fish ponds are supplied with water from a series of reservoirs. The reservoirs serve a dual purpose of operational storage and fish cultivation. Each reservoir is designated for a specific water quality. For example, the AMWA maintains a total storage capacity of 32 MCM as follows: 5 MCM for fresh water (under 500 mg/L Chlorine), 2 MCM for treated wastewater (WW) – namely from the newly built WWTP of Beit Shean, which produces 0.7 MCM/Yr; 25 MCM for saline water that come from local springs. The main fish ponds in the Israeli part of the study area are:

- Gesher Fish Ponds, about 560 dunum, consuming about 2 MCM / yr of water taken from the LJ River
- Never Ur & Hamadia Fish Ponds, about 1100 dunum in total, consuming about 16.9 MCM / yr from the LJ River. These ponds are rather old, with high percolation rates towards the groundwater.
- Emek Hamaayanot Fish Ponds, about 10,000 dunum in total, consuming 50 MCM / yr. These ponds also serve as reservoirs for saline water irrigation

Demand versus Supply

Whereas the water demands are based on estimated requirements on the basis of the current population, economic activities and existing agricultural areas, the water supply figures represent an assessment of the actual 2010 water supply throughout the basin. The difference between the two represents water shortages for the various (current) water users in the basin.

The combined domestic and industrial water demands have been set at 90 m3 per person per year throughout the basin. This is based on the actual water demands in the basin in Israel and Palestine. It has been assumed that actual water demands in Jordan would be of a similar level, assuming that water availability would be adequate. The agricultural water demands have been calculated on the basis of current agricultural land use and crop water requirements on a monthly basis.

The actual water supply figures are based on the information obtained from the major water supply authorities and associations in the basin, notably the Jordan Valley Authority (JVA) and Water Authority of Jordan (WAJ); the Israeli Jordan Valley Water Association, the Afikey Maim Water Association; the Harod Water Association, Mekorot, and the Palestinian Water Authority.

Specifically the water use of Israeli settlements in the Palestinian study area represents sensitive information that generates a lot of discussions. The UNOCHA for instance claims that the settlements consumption of water in the West Bank is about four times higher than the Palestinians water consumption. In below table the Consultant has been an estimate of various water uses in the study area,

based on total population numbers, agriculture field areas and crop water requirements within the study area. An overview of the total water demands versus supply in the basin is provided in the below table.

Table 14 – Water Demands versus Supply in the Lower Jordan River Basin (2010)

Country	Region in LJR Basin	Number	Unit	Demand Type	Demand (CM)	Actual Supply (CM)	Deficit (CM)
Jordan	Agwhar Shamaliyah	108.943	population	domestic	9.804.870	7.342.007	-2.462.863
	Deir al Alla / Balqa	67.925	population	domestic	6.113.250	4.577.677	-1.535.573
	Shooneh	61.424	population	domestic	5.528.160	4.139.554	-1.388.606
	Janoobiyah	8.870	population	domestic	798.300	597.777	-200.523
	To Amman					60.000.000	60.000.000
	Shooneh North	115.303	dunum	agriculture	116.823.380	81.192.451	-35.630.929
	Deir al Alla	74.959	dunum	agriculture	61.386.872	42.663.982	-18.722.890
	Shooneh South	67.390	dunum	agriculture	58.056.150	40.349.124	-17.707.025
	Ghor Safi	53.445	dunum	agriculture	39.991.904	27.794.442	-12.197.462
Jordan	***Total***				***298.502.886***	***268.657.014***	***-29.845.872***
Israel	Emek Hayarden	11.000	population	domestic	990.000	990.000	0
	Emek Hamaayanot	11.000	population	domestic	990.000	990.000	0
	Beit She'an	17.000	population	domestic	1.530.000	1.530.000	0
	Hagilbo'a	10.000	population	domestic	900.000	900.000	0
	Jordan Valley WA	24.980	dunum	agriculture	21.237.000	21.237.000	0
	Afikey Main WA	87.300	dunum	agriculture	52.015.000	52.015.000	0
	Harod WA	36.000	dunum	agriculture	22.000.000	22.000.000	0
	Fish ponds	20.000	dunum	fish ponds	120.000.000	120.000.000	0
Israel	***Total***				***219.662.000***	***219.662.000***	0
Palestine							
Palestinians	Bardala Cluster	5.259	population	domestic	473.310	209.000	-264.310
	Al-Bassariya Cluster	4.564	population	domestic	410.760	149.000	-261.760
	Al-Jiftlik Cluster	6.499	population	domestic	584.910	500.000	-84.910
	Fasayil Cluster	1.157	population	domestic	104.130	169.000	64.870
	Al-Auja Cluster	4.423	population	domestic	398.070	1.830.000	1.431.930
	Jericho	34.112	population	domestic	3.070.080	1.830.000	-1.240.080
	Bardala Cluster	19.575	dunum	agriculture	10.558.755	4.627.000	-5.931.755
	Al-Bassariya Cluster	7.652	dunum	agriculture	5.240.855	1.342.000	-3.898.855
	Al-Jiftlik Cluster	7.885	dunum	agriculture	5.400.437	5.334.000	-66.437
	Fasayil Cluster	1.714	dunum	agriculture	1.173.919	789.000	-384.919
	Al-AujA Cluster	5.828	dunum	agriculture	3.991.597	2.825.000	-1.166.597
	Jericho	18.854	dunum	agriculture	11.082.381	14.134.000	3.051.619
Palestinians	*Total*				*42.489.203*	*33.738.000*	*-8.751.203*
Israeli	Cluster North	1.425	population	domestic	128.250	128.250	0
Settlements	Cluster Central	3.960	population	domestic	356.400	356.400	0
	Cluster South	860	population	domestic	77.400	77.400	0
	Cluster North AD	4.470	dunum	agriculture	3.100.095	3.100.095	0
	Cluster Central AD	46.360	dunum	agriculture	36.621.768	36.621.768	0
	Cluster South AD	10.128	dunum	agriculture	8.000.662	8.000.662	0
Settlements	*Total*				*48.284.576*	*48.284.576*	*0*
Palestine	***Total***				***90.773.779***	***82.022.576***	***-8.751.203***
GRAND TOTAL LJR Basin				**CM per year**	**608.938.665**	**570.341.590**	**-38.597.075**

The total water supply in Jordan from the Lower Jordan River Basin has been estimated to be approximately 269 MCM per year (2010). It should be noted that the water supply includes conveyance of 60 MCM of water per year from the King Abdullah Canal to Amman through the Deir Alla Diversion, leading to an actual water supply within the basin of 209 MCM per year, compared to 299 MCM of total water demands within the basin. This implies that approximately 70% of the total water demands are actually supplied.

Based on the information obtained, the water demands within the study area in Israel, the water demands in Israel are fully met in terms of actual water supply. This means that the current population, economic activities and existing agricultural areas in this area are fully supplied with the water they need. Again, this is based on the current water users in the basin, and does not include potential water demands related to new economic, agricultural or urban development ambitions that there may be.

Domestic water supply to the Palestinians in the study area is derived from the groundwater aquifer systems, a series of springs that emanate from the aquifers, and minor amounts of surface runoff in addition to purchased water from Mekorot and from cisterns. The estimated unaccountant for water, defined as water that is either lost through leakages of is not paid for, is estimated to be about 25%.. Irrigated agriculture takes mainly place in Wadi Fara'a in and in Jericho region. The rest of the Palestinian agricultural lands depend on rain-fed agriculture.

Most of the water resources in the Palestinian part of the study area are utilized for water supply purposes. Runoff into the Jordan River is limited to some storm water runoff from Wadi Fara'a, which is estimated to be about 6.4 MCM per year, mainly as a peak flow sometime during the months of January or February.

The total water supply in the Palestinian part of the LJR Basin study has been estimated to be approximately 82 MCM per year (2010). This includes 34 MCM per year for the Palestinians and 48 MCM for the Israeli settlements in the Palestinian study area. The water demands of the Israeli settlements are reasonably supposed to be supplied fully. The Palestinian water demands have been estimated to be 42 MCM. This implies that approximately 80% of the total Palestinian water demands are actually supplied. This is based on the current population numbers and utilized agricultural lands. This does not include potential agricultural lands that are structurally not utilized due to the limited water resources.

2.3.7 WEAP Model for the Lower Jordan River Basin

WEAP is based on the principle of closing the water balance in a basin, in order to understand the balance between the total water resources on the one hand, and the total water consumption on the other hand, leading to a model for the monthly and annual flows in the Lower Jordan River, as well as the salinity levels in the river. The hydrological year taken in this study starts at October 1st until September 30th of the next year, with monthly model steps in between. The model strives to describe the current situation (current accounts) of one average year, which is this WEAP model runs from October 1st 2009 until September 30th 2010. Runoff is defined here as surface water flow that reached the LJR, which is the direct result of a rain event. Salinity is the only indicator of water quality.

Direct contribution of groundwater to the LJR from Israel (north of Bezeq Stream) was calculated according to Holtzman, who quantified groundwater in two segments of the LJR, between the Yarmouk and Harod Stream. The model simulates groundwater contribution, by adding groundwater inflow in two reaches: below the Yarmouk and below Issachar. The annual contribution of groundwater into the LJR was

estimated to be 18 MCM, with an average salinity of 1150 mg/L. In the West Bank (south to Bezeq stream) direct information on the connection between the groundwater system in the Jordan Valley and the Lower Jordan River itself has been described in some studies [lit 174]. In the current WEAP model it has been assumed that groundwater inflow is constant throughout the year and is based on flow measures performed at Qaser El Yahood (5-6 MCM/month).

In the East Bank, the shallow groundwater system consists of lacustrine sediments and Clastic fluvial components. The aquifer has been developed largely since the 1960ies, and many shallow wells have been drilled, largely for irrigation purposes. Consequently, groundwater levels have dropped and salinity levels increased substantially. Where historically groundwater flow in the Eastern Jordanian valley area had a westwards direction, today more water is abstracted that recharged naturally. In this model it has therefore been assumed that there is no annual contribution of groundwater into the LJR from the Jordanian side.

The current accounts run of the WEAP model for the hydrological year 2010 confirms that within the limits of the currently available water resources, the Lower Jordan River Basin is subject to structural water shortages. This is particularly the case for the agricultural water users in Jordan and Palestine and to a lesser extend for Israel.

Jordan
As outlined in above table, the total Jordanian water demands in the study area have been assessed at 298 MCM per year, of which 268 MCM is supplied through the various sources described above. Particularly the agricultural sector suffers from shortages, whereas these shortages become more severe along the southernmost stretches of the King Abdullah Canal. These shortages are closely linked to the overall water balance in Jordan, and the increasing demands from other parts of the country, particularly the urban area of Amman. Currently Amman receives already 60 MCM of water per year from the sources of the Lower Jordan River Basin. This situation puts a clear cap on future agricultural and economic aspirations in the Jordan Valley. It will be required to find solutions that require less water, or reducing unaccountant for water percentages against higher benefits per unit of production.

Israel
The Israeli water demands, as well as supplies, have been assessed in the study area at 220 MCM per year. Similarly, there seems not much room for further expansion of water depending economic or agricultural activities. It should be noted that fish ponds use a large portion of the available water resources, about 120 MCM per year. Finding methods to reducing this share, and meanwhile reducing their environmental impacts on the Lower Jordan River, seems to be one of the major challenges for the coming years. Recent developments such as releasing more water from the Sea of Galilee into the LJR as result of the growing Israeli reliance on desalinated coastal water may provide an outlook to the direction where solution could be found to relieve the water stress in the Lower Jordan Valley in the future.

Palestine
The Palestinians have limited control over their lands and water resources in the West Bank, except for Area A around the city of Jericho. The water demands of the Palestinians that currently live in the study area have been assessed at 42 MCM per year of which 34 MCM is actually supplied. In addition about 48 MCM of water is supplied from the locally available water resources to the Israeli settlements that live here. These figures show clearly the development limitation for the relative small number of about 56 thousand Palestinians that still live in the area, set aside any larger economic or agricultural ambitions that the Palestinians may have. Solutions for the Palestinian water stress lay largely in the political arena and the current Peace Negotiations with Israel, and should include securing the comprehensive Palestinian

control and management of their water resources, including the ground and surface water originating inside Palestine, in addition to respecting the riparian rights of the Palestinians as equal partners in the Lower Jordan River Basin.

Lower Jordan River

The current account run of the WEAP model clearly shows the impacts of these water demands on the Lower Jordan River itself. Below tables show the calculated monthly and annual water flows along different spots in the river, and their related salt concentrations for the hydrological year of 2010: The annual flow in the northern section of the LJR is only 22 MCM at the point where the Saline Water Carrier enters the river, and consequently the salinity levels are high with 2,409 mg/L salt. Near the Bezeq Stream the flow slightly increases to about 80.5 MCM per year with 1,448 mg/L of salt. When it finally meets the Dead Sea the flow has reached a maximum with about 102.5 MCM per year. Clearly, these values don't meet any of the criteria for lifting the river to a healthy ecological status, and concise interventions will be needed starting with reducing the salt and pollution content in the river, and thus mitigating their polluting sources, and eventually finding sustainable and sensible solutions for a steady increase of the river's baseflow.

2.4 It's Governance

2.4.1 Stakeholders in the basin

Stakeholders can be identified furthermore on various criteria: power, support, influence and importance. There is a correlation between the stakeholders' interest in the consultation issue and their support or lack of support for the project initiative. The stakeholders' interest in the consultation issue can change during the consultation process and a stakeholder can become more or less supportive towards the initiative. Balancing between economic and environmental interests of various stakeholders is a sensitive process. Therefore the identification and selection of the stakeholders is a critical step that influences the constituencies of the Master Plan that will be developed.

Irrigated agriculture is a core economic activity in the LJRB and therefore stakeholders are distinguished for the agricultural, the water and the environmental sectors. Concerning Integrated Water Resources Management the stakeholders representing the agricultural and environmental interests take very divergent opinions and it is hoped that through interactions they start to take more convergent positions. Exclusion or inclusion of stakeholders for the consultations can have far-reaching consequences on the discussions and the compromises reached through the negotiations, but also for the constituency of the plans. For the identification of the stakeholders a distinction will be made between public, private and voluntary organizations, keeping in mind that these are the three societal pillars of effective water governance systems. Special attention will be given to potential stakeholders, who are expected to have a positive influence on the consultations through the formulation of compromises based on common needs of stakeholders with perceived antagonist's interests.

Jordan

For the water sector in Jordan the Ministry of Water and Irrigation, the Jordan Valley Authority and the Jordan Water Authority are recommended to represent the public sector. Representatives of the Water Users Associations, the Southern Shouneh Chambers of Commerce are recommended to represent respectively the agricultural and industrial water users in the consultations. Of the NGOs in Jordan the Friends of Earth Middle East has developed various water related initiative in the Valley and therefore is recommended to represent the voluntary sector. A decision needs to be taken about the involvement of the Jordan Valley Water Forum. Potentially the four WUA representatives in the Forum's Steering Committee could be entitled to represent all WUAs in the consultation of LJRB NGO Master Plan. In addition, one organization needs to be identified that could represent the residential water users, which potentially could be a local or regional councils or an active women organization in the LJRB.

Table 15 - Stakeholders to represent the Jordanian Water Sector

Sectors	Formal organizations that are identified to represent a stakeholders group	Groupings whose involvement is recommended for the LJRB NGO master plan initiatives
Public sector	-Ministry of Water and Irrigation -Jordan Valley Authority -Jordan Water Authority	(MoWI and WUAs participate in the Jordan Valley Water Forum that the World Bank Institute facilitates)
Private sector	-Water users Associations -Irbid Chamber of Industry	
Voluntary sector	-Friends of Earth Middle East Jordan Valley network	Women organization that represents the women as stakeholder in water and environmental services in the residential areas of the Jordan Valley

For the agricultural stakeholders in Jordan the Ministry of Agriculture, NCARE and ACC are recommended to represent the public sector. The Jordan Farmers Unions, the Irbid and Southern Shouneh Chambers of Commerce and the Fruits and Vegetables Association are recommended to represent the private sector organizations. Of the environmental NGOs, the Jordan Environmental Society is working on tensions between economic and environmental issues in relation to irrigated agriculture. In the agricultural sector of the Jordan Valley representatives of the three major tribal clans have to be involved to obtain a critical mass among farmers. Unfortunately there is not yet a farmer's organization for the promotion of LEISA production techniques that can represent the interests of this sub-group of farmers, which the HEIA farmers might not allow the Jordan Farmers Union to do.

Table 16 - Stakeholders to represent the Jordanian Agriculture Sector

Sector	Formal organizations that are identified to represent a stakeholders group	Groupings whose involvement is recommended for the LJRB NGO Master Plan initiative
Public sector	-Ministry of Agriculture -National Centre for Agricultural Research and Extension -Agricultural Credit Corporation	
Private sector	-Jordan Farmers Union -Irbid and Southern Shouneh Chambers of Commerce -Fruits- and Vegetables Exporters Association	Representatives of El Wakid, El Ghezawi and El Adwan clans representing the Al Ghawarna family farmers
Voluntary sector	-Jordan Environmental Society Jordan Valley Branch Office	Grouping of LEISA family farms that has as objective to promote environment-friendly agriculture production technologies in the LJRB

Table 17 - Stakeholders to represent the Jordanian Recreation and Environmental Sectors

Sector	Formal organizations that are identified to represent a stakeholders group
Public sector	Ministry of Tourism -Ministry of Environment
Private sector	-Southern Shouneh Chamber of Commerce -Dead Sea Tourism Board
Voluntary sector	-Jordan Hashemite Fund for Human Development (JOHUD) -Royal Society for the Conservation of Nature -Jordan Environmental Society Jordan Valley branch

The Southern Shouneh Chamber of Commerce and the Dead Sea Tourist Board are recommended to represent the private sector organizations. Of the environmental NGOs, the Royal Society for the Conservation of Nature and the Jordan Environmental Society are both involved in the discussions about sustainable development and natural resources management initiatives.

For the agricultural stakeholders in Jordan the Ministry of Agriculture, NCARE and ACC are recommended to represent the public sector. The Jordan Farmers Unions, the Irbid and Southern Shouneh Chambers of Commerce and the Fruits and Vegetables Association are recommended to represent the private sector organizations. Of the environmental NGOs, the Jordan Environmental Society is working on tensions between economic and environmental issues in relation to irrigated agriculture. In the agricultural sector of the Jordan Valley representatives of the three major tribal clans have to be involved to obtain a critical mass among farmers. Unfortunately there is not yet a farmer's organization for the promotion of LEISA production techniques that can represent the interests of this sub-group of farmers, which the HEIA farmers might not allow the Jordan Farmers Union to do.

Israel

For the water sector in Israel the Ministry of Energy and Water Resources, the Israeli Water Authority on a local scale, and the Jordan Valley Water Association, the Afikay Maim Water Association and the Harod Water Association, as well as the Kinneret Drainage Authority and Lower Jordan Drainage Authority (Israel) represent the public sector in the study area. The environmental sector at governmental level are represented by the Ministry of Environmental Protection, the Israel Nature and Parks Authority INPA. The tourism sector is represented by the Ministry of Tourism and Antiquities.

The local communities are best represented by the Jordan Vallet Regional Council and the Valley of Springs Regional Council, who provide various municipal services in the region, as well as Beit Sh'ean Municipality of one of the major cities in the study area.

Table 18 - Stakeholders to represent Israel

Sectors	Formal organizations that are identified to represent a stakeholders group	Groupings whose involvement is recommended for the LJRB NGO master plan initiatives
Public sector	Ministry of Energy and Water Resources Israeli Water Authority Jordan Valley Water Association Afikay Maim Water Association Harod Water Association Kinneret Drainage Authority Lower Jordan Drainage Authority Ministry of Environmental Protection Israel Nature and Parks Authority Ministry of Tourism and Antiquities. Ministry of Agriculture Ministry of Planning Israel Land Authority Ministry of Defence Border Control	Representatives of authorities and users groups with respect to land, water, environment
Local Communities	Valley of Springs Regional Council Jordan Valley Regional Council Beit She'an Municipality	
Private sector	Water users Associations Chamber of Industry	
Voluntary sector	FoEME Society of Protection of Nature of Israel Zalul Jewish National Fund	Women organization that represents the women as stakeholder in water and environmental services in the residential areas of the Jordan Valley

The civil society could be represented, in addition to FoEME as major NGO in the region and the client of the current study, by the Society of Protection of Nature of Israel, Zalul, an NGO focusing on river conservation in Israel and possibly the Jewish National Fund focusing among others on nature protection and development.

Palestine

The main public sector stakeholders involved Integrated Water Resources Management in the Palestinian zones are the National Water Council the Palestinian Water Authority, the Ministry of Agriculture and the Ministry of Environmental Affairs. In the National Water Council all main public and private sector organizations, which have a stake in the water sector, are represented. The NWC provides policy guidance to the Palestinian Water Authority and supervises the Boards of Directors of the regional drinking water and wastewater services providers. The Palestinian Water Authority (PWA) acts as regulatory authority,

responsible for water resource management and the development of an enabling policy environment and legislation in the sector. Local Government Organizations (e.g. municipalities and village councils) are responsible for drinking water supply and sanitation services and when economic of scale are involved they collaborate in Joint Councils, which have their own governance body that can decide about the management organization of their joint facility.

The PWA shares responsibility for irrigation development with the Directorate of Soil and Water Management in the Ministry of Agriculture (MoA) and the Environmental Protection Section of the Environment Quality Authority (EQA). These public organizations are expected to provide irrigation support services to individual farmers and community-based groups who own and manage the local irrigation system. The community-based groups are encouraged to organize themselves into water users associations to enhance technical and managerial capacities and to clarify land and water rights and management responsibilities for efficient user's provision of irrigation services.

Table 19 - Stakeholders to represent the Palestinian Water Sector

Sector	Formal organizations that are identified to represent a stakeholders group	Groupings whose involvement is recommended for the LJRB NGO master plan initiatives
Public sector	-National Water Council -Palestinian Water Authority -Jericho Municipality	
Private sector	-Water users Associations -Jericho Chamber of Industry	
Voluntary sector	-Friends of Earth Middle East-Bethlehem office -	Women organization that represents the women as stakeholder in water and environmental services in the residential areas of the Jordan Valley

The Directorates of Agricultural Services and Soil and Water Management of the Ministry of Agriculture are the main public service providers for irrigated agriculture. The Directorate of Agricultural Services is responsible for agricultural research and agricultural extension Services. The National Agricultural Research Centre (NARC) coordinates the research stations, which are linked to 17 Agricultural Extension Centers that coordinate the frontline staffs of the public agricultural support services.

There is not yet an umbrella organization of Water Users Organizations that can represent the interests of the water user organizations at supra-local and national level. The General Union of Palestinian Peasants and Cooperatives and the Palestinian Farmers Union are representing the user organizations in the policy dialogue platforms and take an advocacy function for users groups involved in local irrigation and drainage development initiatives. For the representation of potential investors in the upgrading or establishment of agro-industries, the involvement of the Jericho Chamber of Commerce and Industry needs to be considered.

Table 20 - Stakeholders to represent the Palestinian Agriculture Sector

Sector	Formal organizations that are identified to represent a stakeholders group	Groupings whose involvement is recommended for the constituency of LJRB NGO Master Plan initiative
Public sector	-Ministry of Agriculture -National Agricultural Research Centre (NARC) -Agricultural Extension Centers,	
Private sector	-General Union of Palestinian Peasants and Cooperatives -Palestinian Farmers Union -Chamber of Commerce and Industry	Representatives of leading clans in the farming communities need to be represented in the peasants and farmers unions or in the Chamber of Commerce and Industries
Voluntary sector	-Rural Women Development Society -Palestinian Agricultural Relief Committees (PARC) -Palestine Environmental NGO Network (PENGON)	Grouping of LEISA farms that has as objective to promote LEISA farming styles in the Jordanian zone of the LJRB

The Palestinian Agricultural Relief Committees (PARC) were established in the early 1980s as a response to the lack of agricultural extension service during the Israeli occupation. The NGOs adopted a dynamic development process where the focus of the committees shifted from voluntarism (1983-87) to development and expansion (1988-92), and via institutionalization (1993-99) it ended in a network organization structure (2000-present). At the current networking stage the organization of beneficiaries are considered as a mean to make extension services more demand-driven and to build democratic and outward-oriented organizations in farming communities.

Rural Women's Development Society (RWDS) is a women's non-governmental organization that works in rural areas in Palestine aiming at empowering rural women. RWDS was initially a women committee within PARC, and in 2001 it was officially registered as an independent NGO. The RWDS has focused on rural livelihood issues and established 65 women's clubs that represent more than 4300 members and beneficiaries and the number is still increasing. RWDS believes in gender equality in all life aspects and it works at ensuring women's involvement in rural development and capacity building initiatives.

2.4.2 Governance of the LJR Basin

This section provides an overview of the governance structure and major governmental organizations and their responsibilities in the Lower Jordan river Basin.

Jordan

Ministry of Planning and International Cooperation (MOP)
MOP's role is to channel funds from international donors. MOP is also carrying out programs that are contributing to small scale enterprise development.

Jordan Valley Authority (JVA) under the Ministry of Water and Irrigation (MWI)
JVA is the most influential organization in the Lower Jordan River Basin. Its mandate area stretches throughout the valley (Ghor) areas, up to the 300 m contour line north of the Dead Sea and up to the 500 m contour line south of the Dead Sea. JVA was created to take up development in the Jordan Valley, with an emphasis on irrigation development, tourism and industrial development. All technical ministries are represented in its management board. At present, JVA operates largely as a regulatory body rather than as a planning organization due to the fact that many plans have been developed during the previous years. It controls all new development initiatives and approves on these on the basis of the Land Use Master Plan, prepared in 2004.

Water Authority of Jordan (WAJ)
The tasks of JVA and the WAJ are not precisely delineated. Both are dealing with water resources development. JVA focuses on water to be used in the Jordan Valley, especially for irrigation, WAJ focuses on water for domestic and industrial use. Consequently, JVA's activities are not all confined to its mandate area, depending on the sources of water.

Ministry of Environment (MOE)
The Ministry of Environment (MOE) was created in 2003 and is still in the process of institutional development and internal capacity building, and of preparation of its legislation. MOE is responsible for environmental protection as a whole, including nature conservation. RSCN is assisting MOE in environmental legislation (for example regulation on protected area designation) based on more profound experiences in this field. The Ministry of Environment delegated the RSCN to manage the natural reserve under the supervision of the Ministry through a memorandum of understanding (MoU). Through this MoU both work on preparing management plans for natural reserves. Also, based on this MoU both have cooperated together in issues related to biodiversity conservation such as international conventions. In addition to that the MOE is responsible of declaring new natural reserves base

Ministry of Tourism & Antiquities (MOTA)
The Ministry of Tourism & Antiquities (MOTA) is responsible for management of the tourist sector and the antiquities in the LJR Basin.

Ministry of Agriculture (MOA)
The Ministry of Agriculture (MOA) supports the agricultural sector and governs the natural forests in Jordan, based on the Provisional Law of Agriculture No. 44 (2002), which describes the responsibility for achieving the objective of "sustainable use of the natural agricultural resources without harming the environment", and for "combating desertification and conserve biodiversity" [lit161]. The Agricultural Law focuses on plant production and protection and on animal production and health, and also includes a number of articles concerning forests/ forest lands and rangelands and fishery. Desertification control and biodiversity conservation are also vested in the law. Biodiversity is given explicit attention in articles on protection of wild birds and wild animals in the Law of Agriculture. Important activities are Forestry, Rangelands and Agricultural production support, promotion of integrated pest management and biological farming, Plant Protection, Extension services. Furthermore it houses the National Centre for Agricultural Research and Technology Transfer (NCARTT).

Ministry of Municipal Affairs (MOMA)
The Ministry of Municipal Affairs (MOMA) may play a role through municipalities as a focal point for local level and alternative livelihood development.

Ministry of Transport (MOT)

The Ministry of Transport (MOT) has the overall statutory authority for transport planning in Jordan.

of Land and Surveys (DLS), Ministry of Interior
The Department of Land and Surveys (DLS) is responsible for land management and registration.

Natural Resources Authority (NRA)
The Natural Resources Authority (NRA) is responsible for mineral exploration. In its latest map (2005) of potential mining areas, sites are depicted both inside and outside protected areas.

Jordan Army Forces (JAF)
The Jordan Army Forces (JAF) is important, since is manages the security zones along the western and northern borders in the LJR Basin. JAF has reportedly expressed its willingness to allow access to the areas for ecological surveys and other project activities.

Geographic Centre
The Geographic Centre is the traditional source for topographic maps and some thematic maps.

Department of Statistics (DOS)
The Department of Statistics is responsible for managing and dissemination of statistical information about Jordan for a wide variety of sectors.

Israel

Ministry of Energy and Water Resources
The MEWR is in charge of securing a supply of energy at a level of reliability, availability, efficiency and quality needed for a highly developed, modern national economy, at an optimal economic, social and environmental cost. The Ministry of Energy and Water Resources is also responsible for the energy economies and national resources of the State of Israel: electricity, fuel, cooking gas, natural gas, energy conservation, water, sewer mains, oil exploration, ores, scientific research of soil and the sea and more. The Ministry supervises the public and private entities involved in these fields and acts to ensure an adequate solution to the changing energy and infrastructure needs of the national economy, today and in the future, while regulating the market and protecting the consumer and the environment.

Israeli Water Authority
Israeli Water Authority (IWA) is the government's executive branch in charge of Israel's water economy, it is responsible for the administration, operation and development of the Israeli water economy, including the preservation and restoration of natural water resources, the development new water resources and the oversight of water consumers and producers, so as to allow high quality water and sewage services of optimal reliability, while increasing the sustainable welfare of Israeli citizens.

Mekorot
Mekorot, Israel's national water company, operates under the supervision of the Minister of Energy and Water Resources, and is responsible for supplying the Israeli population with water. Mekorot's water supply system unites most regional water plants, the National Water Carrier System and the Yarkon Negev Facility. One of its tasks is to integrate waters from the Kinneret, the shore and mountain aquifers, drilling waters, sea water and desalinated waters in its overall water supply strategy.

Ministry of Agriculture and Rural Development (MOAG)

Ministry of Agriculture and Rural Development (MOAG) is responsible for agriculture, land preservation and veterinary services. MARD is also planning the development of rural areas in terms of public and private service institutions, development of physical rural infrastructures, conservation and prevention of environmental nuisances, rural soil preservation and drainage.

Ministry of Environmental Protection (MEP)
The Ministry of Environmental Protection is responsible for protection of the environment and ecosystems, as well as sustainable development. MEP operates nationally, regionally and locally. Among other things, the ministry is responsible for formulating and implementing a national environmental protection policy, enforcing environmental legislation in local authorities and serving as an advisory body to municipalities. With regard to river rehabilitation the Ministry supports and promotes removal of pollution components and sources; assurance of permanent sources of water at the required quality to the river; conservation of open spaces and ecosystems in the vicinity of the river, establishment of tourist and recreation centers based on nature and cultural assets in the environs of the river, promotion of public awareness of the condition of the streams and their importance to the landscape and open space.

Israeli Meteorological Service (IMS)
The Israel Meteorological Service (IMS) provides a variety of meteorological, climatic and supplementary services. Services include forecasting, monitoring, analyzing and interpreting the weather and climate the region, while maintaining national and international cooperation and conforming to national and international standards.

Israel Nature and Parks Authority (INPA)
Israel Nature and Parks Authority (INPA) protects nature and heritage sites, and educates the public accordingly. Its assets, nature reserves and national parks are public properties. Services include protecting nature, making sites accessible to the public , conserving and reconstructing heritage, planning and development.

Lower Jordan River Drainage Authority
The Jordan River Drainage Authority was established in October 2009 in order to promote and coordinate conservation activities, rehabilitation and development in the river area. The activities of the river authority are coordinated by the drainage authority. Members of the river authority are the ministry for regional development; the Ministry of environmental protection; the Ministry of agriculture & rural development, the Ministry of interior; the Ministry of tourism; the Ministry of Defense; the Ministry of foreign affairs; the Israel Water authority; the South Jordan drainage authority; the Jewish National Fund; the Springs Valley Regional Council; the Israel Nature and Parks Authority; representative of various Israeli green NGOs; the Israel land administration, the Israel antiquities authority and the Regional Water provider- *Afikey maim*
The Lower Jordan River Drainage Authority is responsible for drainage and water management in the Lower Jordan River Basin from Naharyim to the Bezeq Stream. Its plans are aligned with other national and regional plans, such as the below Kinneret Drainage Authority, responsible for the area from the Deganiya Dam (where the Lower Jordan exits the Sea of Galilee) to Naharyim.

Kinneret Drainage Authority
The Kinneret Drainage Authority is responsible for the section of the Lower Jordan River Basin from the Kinneret/ Sea of Galilee to Naharyim. It is responsible for drainage and water management and for approval of land distribution and use.

Ministry of Tourism

The Ministry of Tourism is responsible for the tourism industry in Israel, which is the employer of 60,000 people throughout the country.

Ministry of Economy and Trade
The Ministry of Economy and Trade in governing local and foreign investments by offering a wide range of incentives and benefits to investors in industry, tourism and real estate. It is in charge of the promotion of economic growth in Israel.

Ministry of Regional Co-operation
The Ministry of Regional Cooperation deals with facilitating cross border cooperation projects with Jordan and the Palestinian Authority in terms of economic co-operation and infrastructure development.

Ministry for Development of the Negev and the Galilee
The Ministry for Development of the Negev and the Galilee is responsible for advancing and promotion of the Negev and the Galilee regions and place them at the top of the government's list of priorities. It deals with infrastructure, industry and employment, settlement and housing as well as education and culture.

Ministry of Finance
The Finance Ministry overlooks all national budgetary decisions.

Ministry of Interior
The Interior Ministry overseeing Israel's urban planning agencies and municipal affairs.

Ministry of Defense
The Ministry of Defense holds control over Israel's military, and is the supreme agency in charge of governing the Jordan River Basin from the Bezeq Stream to the Dead Sea in accordance with the Oslo Agreements.

The Antiquities Authority
Israel antiquities authority is in charge of the country's antiquities and antiquity sites, their excavation, preservation, conservation, study and publication thereof, as well as the country's antiquity treasures.

Beit Shean Municipality

Jordan Valley Regional Council

The Valley of Springs Regional Council
The Valley of Springs Regional Council is the regulator of municipal services for the villages within its territory.

Israeli Settlements in the West Bank
Related regional councils in the West Bank are Gush Etzion, Har Hebron (Mount Hebron), Matte Binyamin, Megilot, Shomron Regional Council (West Bank), Bik'at Hayarden (Jordan valley).
Municipal services for the settlements in the West Bank are the responsibility of both the Israeli Prime Minister and Israeli Defense Minister, and include all settlement activities, including planning, in the West Bank. Authority for planning and construction is held by the Israel Defense Forces Civil Administration. The settlements are governed through four cities, thirteen local councils and six regional councils.

Palestine

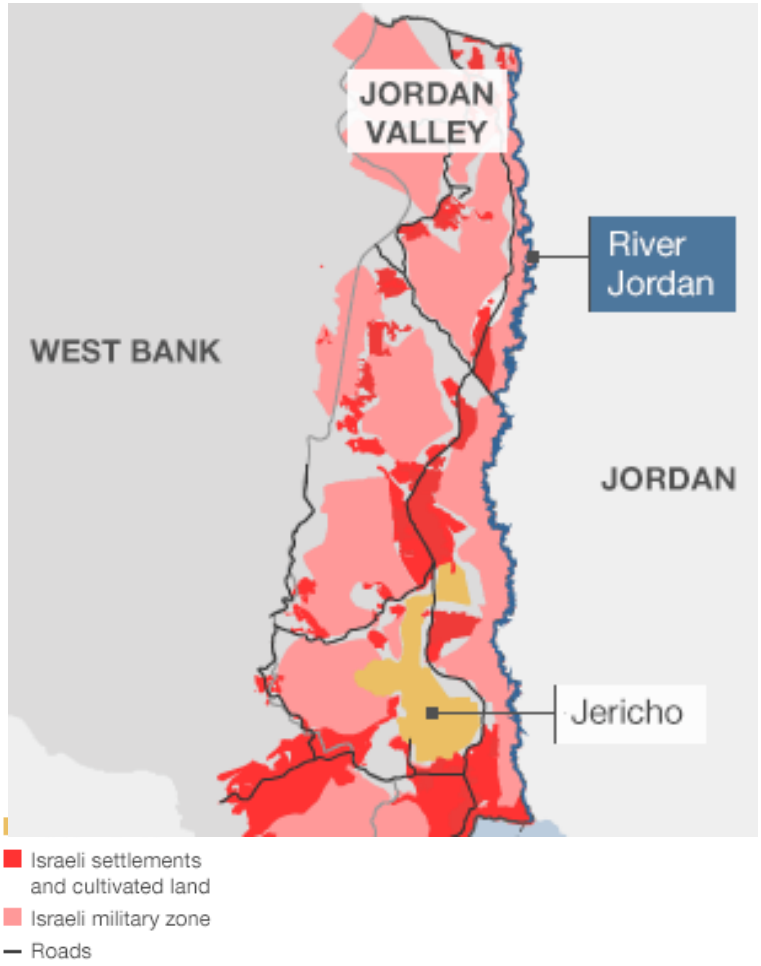

Figure 27 - Palestinian versus Israeli control in the Jordan Valley

The Palestinian Authority governs the areas A and B in the West Bank study area through the following governmental organizations: Office of the Prime Minister; Ministry of Finance; Ministry of National Economy; Ministry of Agriculture; Ministry of Environmental Affairs; Ministry of Local Governorates and Municipalities; Ministry of Health; Palestinian Water Authority.

But despite being a riparian to the Jordan River, the Palestinian Authority (PA) has de facto no direct control over the Lower Jordan River itself and little over the surrounding riparian zone. As a result of the Interim (Oslo I and II) Agreements, and the agreement on the handover of responsibilities between the Palestine Liberation Organization and the government of Israel, the Jordan Valley was divided to 3 different categories of land, security and civil administration (A, B and C).

This division has resulted in a serious problem for the enforcement of laws and Palestinian development potential in the Jordan Valley, whereby any establishment that is to be created (whether residential or commercial) must receive its licensing and building permits from the Israeli Ministry of Defense's Civil Administration. This does not function in accordance with the PA's development plans, and causes tremendous delays and costs to development plans. Furthermore, access to the river by Palestinians is limited, and thus, there is little domestic Palestinian tourism or other use of the river. In 2003, the Water Law has been issued by the Palestinian Authority.

Palestinian Water Authority (PWA)
In 2003, the Water Law has been issued by the Palestinian Authority. The Palestinian Water Law stipulates establishment of the Palestinian Water Authority and assigns to it the responsibility for the management/regulation of water, drainage and sewage affairs. Also, the law stipulates that a draft Water, Drainage and Sewage Plan to be prepared by the Planning Department of the Palestinian Water Authority. Although the law transfers the licensing jurisdiction to the PWA and requires the detailed water registry, the ownership of the water resources is not transferred to the Palestinian Authority. The Palestinian Water Authority (PWA) has prepared a draft of National Water Strategy in 2012 which defines how the water resources in the occupied Palestinian territory will be managed in an integrated manner outlining the massive investment program of projects and activities needed for water sector development in the occupied Palestinian territory from 2012 till 2015.

Palestinian Ministry of Environment
The Palestinian Ministry of Environment is responsible for implementation of the environmental law of 1999, with the objectives to protect of the environment against all forms and types of pollution; to protect Public health and welfare; to insert environmental protection in social and economic Palestinian development plans; to encourage sustainable development of vital resources in a manner that preserves the rights of future generations; to protect bio-diversity and environmentally sensitive areas, as well as improvement of environmentally harmed areas; and to encourage collection and publication of environment-related information to raise public awareness of environmental problems.

Ministry of Tourism and Antiquities (MOTA)
MOTA is responsible for governing the tourist sector and the antiquities in Palestine. The basic law of 1968 is currently being updated to adapt to current challenges and needs. The new law will identify the variety of accommodations and agents, restaurants and other facilities. It will also indicate a general structure for the public private joint leading council that will carry responsibilities in marketing and development. A new hotel classification system is underway and expected to have all hotel in Palestine classified between 1-5 stars by end of 2013. An ad-hoc joint committee was established for this purpose. Other initiatives are also underway on the level of tourism signage, tourism education, and rehabilitation of archeological sites and other antiquities. Enforcement of the aforementioned laws in the Jordan Valley is of the utmost importance.

2.4.3 International Agreements and Co-operation Issues

The international legal agreements applicable to the Lower Jordan Valley include the following:

The Helsinki Rules

The Helsinki Rules, on the Uses of the Waters of International Rivers, adopted by the International Law Association in 1966 and the 1997 UN Convention on the Law of the Non-Navigational Uses of International

Watercourses are two of the most referenced and developed of international legal agreements on the uses of transboundary watercourses. The latter, provides principles of water rights, and exist for the equitable and reasonable allocation of freshwater resources between riparians in a river basin. Such legal agreements could provide a framework in which freshwater is shared between Israel and Palestine in an equitable manner, and which takes into consideration environmental concerns and future water needs [lit 13, 14, 16].

The current restrictions on Palestinian water use do not meet the criteria for equitable sharing between riparian partners of the Jordan River basin. Agreement on the available water quantities to be distributed on an equitable basis is thus needed in order to provide a basis for sustained management of these limited water resources.

The UNESCO Convention

The UNESCO Convention concerns the Protection of the World Cultural and Natural Heritage of 1972. Palestine became a state party to the agreement in 2011. The Jordan valley falls under the protection of this agreement as a cultural heritage area. Thus, the agreement binds Palestine and other state parties to the agreement, the riparian countries Israel and Jordan, as responsible states to protect and develop the Jordan Valley under the principles of the agreement based on the needs of the area.

Other international agreements that are applicable to the Jordan River are:

i. The Seoul Rules on International Groundwaters (Adopted by the International Law Association at the Sixty-Second Conference Held at Seoul in 1986)
ii. The Berlin rules 2004 (an update of the Helsinki rules that are already added in the international legal agreements section).
iii. United Nations Convention on Biological diversity (1992) and Cartagena Protocol on Biosafety;
iv. Convention on International Trade in Endangered Species (CITES);
v. Ramsar Convention (Wetlands);
vi. Bonn Convention on Migratory Species;
vii. World Heritage Convention (indirectly by protecting biodiversity habitats)
viii. The Hague conventions and fourth Geneva convention : international Humanitarian law / international customary law on prohibition of pillage of dead sea (unlawful exploitation of natural resources and appropriation of Palestinian lands)

Bi-lateral Agreements

The *Declaration of Principles* is the first Bi-lateral Agreement between the PA and Israel signed on 13 September 1993. According to this agreement, water issues were to discussed by the Permanent Palestinian Israeli Committee for Economic Co-operation. It was agreed to prepare plans for water rights, and equitable use of water for the shared resources. However, this agreement did not identify the water right for each party.

The *Gaza Jericho First Agreement* is the temporary Agreement regarding autonomous rule of the Palestinian Authority in Jericho and the Gaza Strip, signed on 4 May, 1994. Article 2 paragraph 31 deals with the water issues in the two regions. A limited authority on water uses was transferred to the Palestinian Authority.

Bi-lateral water and wastewater Agreements

The water and wastewater sectors in Palestine are governed by two agreements with the Israeli side:

The Palestinian-Israeli Interim Agreement on the West Bank and Gaza Strip, Washington, D.C, September 28, 1995; Annex III, Protocol Concerning Civil Affairs, Article 40, Water and Sewerage. Essentially Article 40:
The agreement was based on Israel's recognition of Palestinian water rights in, at that time, the West Bank, as part of Palestine. It sets governance arrangements for a five year interim period, notably a Joint Water Committee (JWC) to oversee management of the aquifers, with decisions to be based on consensus between the two parties. It allocates to either party specific quantities of the three West Bank aquifers underlying both territories - the share allocated to the Palestinian West Bank was about one quarter of the allocation to Israel and the settlements. It provides for interim extra supplies from new wells and from Mekorot as immediate needs- an extra 28.6. MCM was to be allocated to Palestinian needs. Finally the agreement estimates needs for the interim period for the Palestinian West Bank at 70-80 MCM .

The Memorandum of Understanding (MOU) on Guidelines and Technical Criteria for Sewerage Projects, signed on December 31, 2003, Israeli-Palestinian "Joint Water Committee".
The MOU sets out agreements for the collection systems, wastewater treatment, sludge treatment, effluent reuse and disposal, sludge reuse and disposal and cooperation between the two sides. The very high standards in this MOU restrict donors' involvement and makes implementation costly and very difficult for Palestinians even though a phased implementation approach to meeting requirements has been agreed upon.

The MOU version 2 is the most recent document that governs wastewater treatment and reuse standards and will consequently drive the treatment technology and reuse strategies that will be used in Palestine. The interim water and wastewater Agreement "Article 40" of Oslo 2 will be used as the basis for water sector planning and project implementation during the "interim period" and until a final status agreement is reached. These are to be negotiated and settled in the Permanent Status Agreement relating to the various water resources. (4)

Paris Protocol bilateral trade agreement

Additionally, Palestine and Israel are bilaterally bound by the Paris Protocol. However, the agreement is partially and ineffectively implemented. The Paris Protocol (PP) was signed in 1994 as an interim economic agreement to maintain the free movement of goods and labor between Palestine and Israel within the framework of customs union. The Palestinians viewed that, with international aid and support, the Paris Protocol provides the basis for sustainable growth of the Palestinian economy. However, facts are in sharp contrast with this vision. The Israeli restrictions of movement of goods and people, and closure of roads and areas, resulted in one sided decision making of the Israeli power, and a weakness in the Palestinian economy. The latter created a dependency on the Israeli market for goods and labor and in a huge structural economic imbalance between the two economies. The implementation of the Paris Protocol in accordance with its basic rules of free movement of labor and good, would have encouraged fair trade between the Palestine and Israel and supported the development of a viable Palestinian economy. Unfortunately, due to the violation of the PP, the Palestinian economy is unable to utilize funds required for the establishment of an independent economy.

Security Arrangements along the Jordan River

Since 1967, the Jordan River has been under the control of the Israeli and Jordanian military, which operate checkpoints and bases on both sides. The area contains covert listening stations, radar sweeps and thermal- and night-vision cameras. On the mountain tops that rise steeply from the valley floor, Israel maintains a series of early-warning stations. Troops are on constant patrol along the river and the passes, and on both sides of the river a key strip of land is inaccessible for the general public.

On the Israeli side of the river, more than 1.000 hectares of have been mined, including both antipersonnel and antitank mines. Mined areas are also located near villages such as Kfar Ruppin and include parts of nature reserves such as the East Gilboa Reserve. They also include former Syrian minefields. In the late 90's the Israeli Ministry of Tourism initiated activities to remove former Syrian mines in certain areas along the Jordan River suspected of containing Syrian antipersonnel mines, such as around Kibbutz Gesher. Along the river, Israeli and Jordanian mine fields are still part of the overall security framework.

Israel and Jordan are connected though the Sheikh Hussein Bridge in the north, and Palestine (West Bank) with Jordan through the King Hussein (Allenby) Bridge. These bridges are subject to strict security measures in terms of trans-passing person and goods. The King Hussein Bride is located just outside Jericho city and is the only connection between the Palestinian West Bank and Jordan. The West Bank side of the King Hussein / Allenby Bridge is considered a border entry point by the Israeli Authorities. The Jordanian authorities recognize the bridge as an international border entry point, but in contrast to other border crossings with Israel, do not grant entry visas to foreign passport holders at this crossing. Palestinians from the West Bank traveling abroad use this bridge to exit the West Bank into Jordan, since they are not permitted to use Ben Gurion Airport near Tel Aviv. Travel permits from both Israeli and Jordanian authorities are required, with varied stringency depending on the political and security situation. Israeli citizens are not permitted to use the terminal.

During the 2013 and 2014 Peace Negotiations between the Palestinians and Israeli's, the security arrangements in the Jordan Valley as part of any final settlement between the two parties were one of the key issues of dispute. According to Palestinians and in line with his Master Plan the Lower Jordan River Basin should be an integrated part of the independent Palestinian State, with eventually full control by the Palestinian Authorities, or as President Mahmoud Abbas recently stated: "Palestine should be clean of occupation".

According to the Israeli's, the Jordan Valley forms the closest border to the heartland of Israel, and is considered by many as the only realistic eastern topographically defendable border against potential aggression from the east. The political upheaval in the Middle and the violence in Syria and Iraq have already caused the large stream of a great variety of refugees entering Jordan. Israel fears that some of these refugees may attempt to infiltrate into Israel. This, together with the radical forces active in these countries and the fear that extremists with advanced weapons will be smuggled into the West Bank underlines the notion that a well defended eastern border is essential for the security of the Israeli people, including secure road access from the west. In 1996, after signing of the Oslo Accords, then-PM Yitzhak Rabin already declared that the eastern security of Israel will be located in the Jordan Valley. Today, PM Netanyahu ordered recently for a construction of a major robust upgrade of the existing security fence along the Jordanian border, including the West Bank.

At the offset of the recent peace talks, the Palestinian position on this subject recognized the need for a transition period in which Israel would retain some military presence in the Jordan Valley, say up to about 5

years. After this period the Palestinians would agree on the deployment of international forces, such as UN forces of NATO along the Jordan River as a way to ensure security and allay Israeli fears, be it without any Israeli soldier left behind.

The Israeli position on this subject welcomes cooperative security arrangements with the Palestinians and Jordan under a final settlement, but rejects the idea that at a certain date international forces, such as UN or NATO, would fully replace Israeli troops, since this would undermine Israel's ability to act effectively against terrorist infiltration and weapons smuggling, or to provide a first line of defense against any other future threat from the east.

During the recent peace negotiations, the United States attempted to bridge this gap by drawing on U.S. security experiences in Afghanistan, and proposing the use of high level U.S. provided intelligence and technology, such as advanced sensors; drones and high-tech fences. It has been proposed that during the transitional period, there will remain some Israeli military presence in the Jordan Valley at roughly about 200 – 500 troops plus a number of civilian Israeli security personnel at the border crossings co-operating closely with Palestinian and Jordanian security forces. During this period the security structure would shift towards higher security technology (e.g., scanners, sensors, sniffers, remote sensors etc.), while progressively handing over certain security responsibilities to the Palestinians and Jordan. In the post-transition period, whether defined in advance by specific criteria as Israel demands, or by a set time schedule as the Palestinians demand, Israel would keep a small deployment of "invisible" monitors at border crossings, for instance operating behind two-way mirrors or watching video monitors in adjacent rooms, in combination with a small number of Israeli troops patrolling in collaboration with Jordanians and Palestinians forces a corridor along the Jordan River to provide a joint buffer against infiltration and terrorist activity.

Although both parties seem to have been sympathetic to elements of these ideas, eventually Israel seem to have classified them as too much reliance on technology as a substitute for essential military people. The Palestinians on the other hand seem to have rejected this concept, since they rule out any kind of enduring Israeli presence in the Palestinian State once the transition period has concluded.

However, similar challenges have been faced in the past. For instance, during the negotiations for the 1979 peace treaty between Israel and Egypt, both parties repeatedly rejected mutual security proposals, whereas today the situation has evolved into a generally acceptable security framework, including a set of strict security regulations and a framework for mutually tolerated ad hoc interventions when needed. Within the framework of this Master Plan it is believed that continuing the joint Palestinian – Israeli security negotiations on a factual and security-technical basis will eventually lead to a joint security solution for both the transition period and beyond, doing justice to the legitimate rights of the Palestinians for a free and independent state, and the legitimate security rights of the Israeli people.

Trans-boundary Water Management Issues among Israel and Jordan

The Israel – Jordan Treaty of Peace, sometimes referred to as the Wadi Araba Treaty, was signed by the State of Israel and the Hashemite Kingdom of Jordan in December 1994. With regard to water related matters the following elements of particular importance within the context of the current study.

Water Allocation from the Yarmouk River

The agreement stipulates that during the summer period from 15 May to 15 October of each year, Israel shall receive 12 MCM and Jordan is to remain the rest of the Yarmouk water flow. During the winter period, from 16 October to 14 May of each year, Israel is entitled to receive 13 MCM and Jordan is to keep the

rest of the flow. Furthermore, Israel is entitled to borrow an additional 20 MCM during the winter period, to be transferred back to Jordan during the next summer. With regard to excess flood waters from the Yarmouk that would otherwise flow into the Lower Jordan River, it was agreed that both Jordan and Israel are allowed to utilize this water in equal portions for their own purposes.

Water Resources from the LJR
The agreement stipulates that during the summer period of each year, Jordan shall receive 20 MCM from the Lower Jordan River upstream of the Yarmouk from Israel. During the winter period Jordan shall receive an additional 20 MCM from Israel from the LJR south of the Yarmouk. With regard to remaining water flows in the LJR south of the Yarmouk it was agreed that both Jordan and Israel are allowed utilize this water in equal shares for their own purposes, provided that neither party would harm the water quality of the LJR. A Joint Jordanian – Israeli Water Committee has been established to monitor the actual water flows and water allocations.

Saline Springs and additional water resources
Furthermore the agreement stipulates that Jordan is entitled to receive 10 MCM of desalinated water from Israel, originating from the saline springs near the Sea of Galilee, provided that this is financially feasible. If so, it has been agreed not to discharge the brine into the LJR basin. Currently, this saline water is conveyed from these springs directly to the LJR through the Saline Water Carrier by Israel. The agreement confirms that Israel will explore the possibility of financing the operation and maintenance cost of supplying this desalinated water to Jordan, while Jordan will explore the possibilities to finance the required capital expenditures. Finally the agreement includes the intension to jointly develop an additional 50 MCM of drinkable water, without yet specifying its source, for the benefit of Jordan.

Operations and Maintenance
From an operational point of view, the agreement states that Israel accepts responsibility for operating, supplying and maintaining systems on Israeli territory that supply water to Jordan. Under this set-up Jordan is allowed to choose the related Operator, provided these operations only serve Jordan (so not Israel at the same time). Israel guarantees easy access for the involved operations personnel and equipment.

Water Storage
Both parties agree to co-operate in the development of a new water storage dam in the Yarmouk river, downstream of the Adassiya Diversion, and of a storage facility in the LJR south of the Yarmouk confluence and north of the Bezeq stream.

Water Quality
Both parties agree to protect the Jordan and Yarmouk Rivers and related groundwater systems and water supply systems against pollution, contamination, harm and unauthorized withdrawals of each other's allocations. They agree to jointly monitor the quality of water along their border, using jointly (to be) established monitoring stations under the Joint Water Committee. This includes treatment of municipal and industrial wastewater to agricultural standards before discharging it into the Yarmouk and the Jordan Rivers. It also includes trans-boundary supply of water under this agreement against the national quality standards.

Groundwater
Under this agreement Israel is entitled to retain the previous use of groundwater wells now under Jordanian sovereignty as detailed by 31 December 1994. Meanwhile Jordan agrees to enable repair or replacement of any failing well by Israel, connect it to the Israeli electricity and water systems and treat it,

and Israel agrees to supply Jordan with related well logs and technical information. Furthermore, if the Joint Water Committee decides this is hydro-geologically feasible and not harming Jordan's interests, Israel may increase the extraction rate from these Jordanian wells up to 10 MCM per year above the 1994 yields. Such an increase had to be carried out within five years from signing of the agreement.

Information and Notification
The agreement stipulates that the Joint Water Committee is the official body through which relevant data on water resources is to be exchanged from one party to the other. The JWC can assign sub-committees to perform technical tasks, such as a northern sub-committee and a southern sub-committee. Furthermore, deliberate changes in the Jordan and Yarmouk Rivers require prior mutual agreement. In particular, both parties agreed to six months advance notice of projects likely to change the quality or flow of either river along their common boundary via the Joint Water Committee. Also, planning for increasing water supplies and improving efficiency is to be done in a co-operative manner within the context of bilateral, regional or international cooperation agreements.

Trans-boundary Water Management Issues among Israel and Palestine

An Israel – Palestinian Treaty of Peace is not in place. With regard to water related matters the following information is of particular importance within the context of this situation.

Water Resources
Prior to 1967, Israel had developed the water resources to which it had access and established the National Water Carrier to supply for agricultural, municipal and industrial water demands. Since 1967 Israel also took control of water resources in the West Bank as well, together with water supply networks serving Israeli settlements in the West Bank. At the same time Palestinian water rights in Palestine were abrogated, including from the Jordan River. The amount that Mekorot supplies to the settlements is estimated at some 75 MCM, of which 44 MCM is produced from wells controlled by Israel or settlers within the West Bank.

Currently, the economic disparity between Palestine and Israel is large, and the water resources availability in the two neighbors is likewise far apart, with fresh water per capita in Israel much higher than that of Palestine. Whereas Israel has been able to develop an efficient water infrastructure and management, the Palestinians are still struggling to attain the most basic level of infrastructure and services of a low income country. Furthermore, the Palestinian water infrastructure systematically suffers from lack of development because of Israeli restrictions and obstacles.

The Israeli side's recognition of Palestinian water rights in the Oslo II agreement (Article 40) was an important turning point. However, by keeping this recognition only on paper, the continued Israeli control over Palestinian water sources, the lack of just and equitable allocation of shared water sources, including in the Jordan River Basin, the complications in the work of the "Joint Water Committee" and in implementing projects in Area (C), and the inability to access water sources for utilization and development, represent the main challenges and obstacles in building, developing, rehabilitating and managing the infrastructure necessary to provide water and wastewater services in Palestine and the West Bank, particularly in the study area.

Water Development Constraints
Palestine is among the countries with the scarcest renewable water resources per capita due to both natural and artificial constraints, amounting to around 70 cubic meters per capita per year for all purposes. This is far below the per capita water resources available in other countries in the Middle East and the

World. Meanwhile the gap between water supply and water demand is growing due to population growth, a higher standard of living, and the need to expand irrigated Palestinian agriculture and industrialization.

Water supply and demand management along with access to water resources as well as wastewater treatment and reuse in Palestine are negatively affected by the Israeli occupation and by limited hands-on experience of the Palestinians. This practice has resulted in limited rural development and poor, if not negative, economic growth, resulting in an increase in poverty, poor health and sanitation conditions, physical and environmental deterioration.

At present, and mainly due to political constraints and population growth, Palestinian water needs exceed far the available water supply, emphasizing the need for the adoption of the integrated water resources management approach and the mobilization of any additional conventional and non-conventional water resources, thus helping to solve part of the existing problems of the water sector.

Better Management Requirements
Better management of the water and wastewater sector could reduce total water demand, reduce the pressure on the water supply system, and address health and environmental issues. The Palestinian Water Authority is increasingly keen to act, especially given the predicted increase in population and the fact that water is a highly sensitive political issue. Improving wastewater treatment and reuse in Palestine is a high priority because these are highly water-stressed areas. Water quality suffers from pollution and over-abstraction. Wastewater treatment plants, which currently exist, are either not functioning properly, or are overloaded, so some wastewater is discharged without treatment. Within the study area in the West Bank no wastewater treatment plants have been constructed yet. Also, the Palestinian institutional and legal reforms in the water sector form a vital step for the implementation of the integrated water resources management approach.

Above all, a just settlement between Israel and Palestine is a prerequisite to real improvements and achieving effective water governance in Palestine, including the current study area. FoEME's proposal for an Agreement to Share Water between Israeli and Palestinians (March 2012) might serve as an example on how to adopt a joint water management structure for Israel and the future State of Palestine. The proposed structure allows for ongoing resolution of issues concerning fresh water by de-nationalizing and de-securitizing water uses. FoEME proposes to share water by rules that are designed to protect the ecosystem for everyone's benefit, and to deliver water to all parties in ways that meet their needs and allow for their development within an appropriate regional security framework

3 PROJECTIONS AND OBJECTIVES

3.1 Basin Projections for 2025 and 2050

Based on the population projections made by the Jordanian, Palestinian and Israeli Departments of Statistics, an assessment has been made of the total population in the basin in the years 2025 and 2050. This includes natural growth of the autonomous population to 0.92% in 2050. In addition, this basin plan assumes that in Jordan the high number of foreign inhabitants in the basin will gradually decline as a result of assumed improving economic conditions in their countries of origin, including Syria, Iraq and Egypt. It is assumed that all Israeli settlements in the Palestinian part of the Lower Jordan River Basin will be removed, and that the Independent Palestinian State created will see a growth towards an estimated 500,000 people living in the Palestinian section of the Lower Jordan Valley by 2050. It assumes natural population growth under strong economic development conditions in Israel. These assumptions lead to a total projected population in 2050 of 1.048 Million people living in the Lower Jordan Basin, from the southern tip of the Sea of Galilee to the northern edge of the Dead Sea as presented below.

The per capita water demands are expected to grow in Jordan and Palestine as a result of better economic circumstances, while in Israel per capita water demand will continue to decrease due to increased efficiencies. A domestic per capita water demand of 80 CM is assumed for all residents of the valley, be they Palestinian, Jordanian and Israeli.

Table 21 – Projected Population Numbers

Jordan LJR Population		Population		
		2010	2025	2050
			137,42%	240,00%
JMD 1	Agwhar Shamaliyah	108.943	149.713	261.463
JMD 2	Deir al Alla / Balqa	67.925	93.345	163.020
JMD 3	Shoonah / Janoobiyah	70.294	96.600	168.706
JMD 4	*Foreign population*	*247.000*	*200.000*	*150.000*
	TOTAL, incl foreign population	494.162	539.658	743.189
	Total Jordanian nationals	247.162	339.658	593.189

Israel LJR Population		Population		
		2010	2025	2050
		growth	124,80%	180,00%
	Emek Hayarden	11.000	13.728	19.800
	Emek Hamaayanot	11.000	13.728	19.800
	Beit She'an	17.000	21.216	30.600
	Hagilboa	10.000	12.480	18.000
	TOTAL	49.000	61.152	88.200

West Bank LJR Population		Population		
		2010	2025	2050
		Automous growth	140,47%	195,27%
Palestinians		Immigration	112,00%	700,00%
			62.736	392.098
PMD 1	Bardala Cluster MD	5.259	16.923	70.619
PMD 2	Al-Bassariya Cluster MD	4.564	15.787	68.380
PMD 3	Al-Jiftlik Cluster MD	6.499	18.948	74.615
PMD 4	Fasayil Cluster MD	1.157	10.223	57.401
PMD 5	Al-Auja Cluster MD	4.423	15.557	67.925
PMD 6	Jericho MD	34.112	64.048	163.591
	Subtotal Palestinian	56.014	141.485	502.531
Settlements				
IMD 1	Cluster North MD	1.425	0	0
IMD 2	Cluster Central MD	3.960	0	0
IMD 3	Cluster South MD	860	0	0
	Subtotal Israeli Settlers	6.245	0	0
	TOTAL	62.259	141.485	502.531

Table 22 – Projected Per Capita Urban Water Demands

Per Capita Water Demands in Jordan		2010	2025	2050
			117,00%	133,33%
JMD 1	Agwhar Shamaliyah	60	70	80
JMD 2	Deir al Alla / Balqa	60	70	80
JMD 3	Shoonah / Janoobiyah	60	70	80
JMD 4	*Foreign population*	*30*	*30*	*30*

Per Capita Water Demands in Israel		2010	2025	2050
			94,44%	88,89%
	All water users	90	85	80

Per Capita Water Demands in Palestine		2010	2025	2050
			116,67%	133,33%
	Palestinians	60	70	80
	Settlements	90	0	0

The total Domestic Water Demands within the Jordan Basin for 2050 are 99 MCM / yr. This has been calculated as the total population times their per capita water demands. Local industrial and commercial water demands are considered to be included in these total estimates.In addition 100 MCM / yr is expected to be transferred from the basin to supply Amman and the Northern Jordanian Governorates.

The agricultural water demands in the Lower Jordan River Basin are about 553 MCM in 2050. In this Master Plan it is assumed that the total agricultural water demands will not increase for Jordan and Israel, and that the Palestinian agricultural water demands will grow with 40 MCM per year to accommodate for the under developed status in 2010, and that the agricultural water currently consumed by the settlements in the LJRB will also used by the Palestinians once the independent state has been established. See table below. In addition it is suggested that highly treated wastewater from Jordan (70 MCM / yr) and Jerusalem / West Bank (50 MCM /yr) will be diverted to the Lower Jordan Valley for Agricultural purposes.

Table 23 – Projected Urban Water Demands

Total Domestic Water Demands Jordan (CM / yr)		2010	2025	2050
JMD 1	Agwhar Shamaliyah	6.536.580	10.509.846	20.917.056
JMD 2	Deir al Alla / Balqa	4.075.500	6.552.796	13.041.600
JMD 3	Shoonah / Janoobiyah	4.217.640	6.781.336	13.496.448
JMD 4	*Foreign Population*	*7.410.000*	*6.000.000*	*4.500.000*
JMD 5	from LJR Basin to Amman (and northern Gov)	60.000.000	80.000.000	100.000.000
	TOTAL	82.239.720	109.843.979	151.955.104

Total Domestic Water Demands Israel (CM / yr)		2010	2025	2050
	Emek Hayarden	990.000	1.166.880	1.584.000
	Emek Hamaayanot	990.000	1.166.880	1.584.000
	Beit She'an	1.530.000	1.803.360	2.448.000
	Hagilboa	900.000	1.060.800	1.440.000
	TOTAL	4.410.000	5.197.920	7.056.000

Total Domestic Water Demands Palestine (CM / yr)		2010	2025	2050
Palestinians				
PMD 1	Bardala Cluster MD	315.540	1.099.962	5.649.520
PMD 2	Al-Bassariya Cluster MD	273.840	1.026.155	5.470.400
PMD 3	Al-Jiftlik Cluster MD	389.940	1.231.587	5.969.200
PMD 4	Fasayil Cluster MD	69.420	664.462	4.592.080
PMD 5	Al-Auja Cluster MD	265.380	1.011.205	5.434.000
PMD 6	Jericho MD	2.046.720	4.163.119	13.087.280
	Subtotal Palestinian	3.360.840	9.196.490	40.202.480
Settlements				
IMD 1	Cluster North MD	128.250	0	0
IMD 2	Cluster Central MD	356.400	0	0
IMD 3	Cluster South MD	77.400	0	0
	Subtotal Israeli Settlers	562.050	0	0
	TOTAL	3.922.890	9.196.490	40.202.480

Table 24 – Total Agricultural Water Demands (including brackish water)

Total Agricultural Water Demands Jordan		CM / yr		
		2010	2025	2050
JAD1-4	Zone 1 (115,300 dunum)	103.596.865	103.596.865	103.596.865
JAD5-8	Zone 2 (74,959 dunum)	107.169.170	107.169.170	107.169.170
JAD9-16	Zone 3 (120,835 dunum)	65.492.271	65.492.271	65.492.271
	TOTAL	276.258.306	276.258.306	276.258.306

Total Agricultural Water Demands Israel		CM / yr		
		2010	2025	2050
	Jordan Valley WA	21.237.000	21.237.000	21.237.000
	Afikey Main WA	52.015.000	52.015.000	52.015.000
	Harod WA	22.000.000	22.000.000	22.000.000
	Fish ponds	56.400.000	56.400.000	56.400.000
	TOTAL	151.652.000	151.652.000	151.652.000

Total Agricultural Water Demands Palestine			CM / yr	
		2010	2025	2050
Palestinians				
PAD 1	Bardala Cluster	10.558.755	13.658.850	13.658.850
PAD 2	Al-Bassariya Cluster	5.240.855	14.396.297	14.396.297
PAD 3	Al-Jiftlik Cluster	5.400.437	24.555.879	24.555.879
PAD 4	Fasayil Cluster	1.173.919	20.329.361	20.329.361
PAD 5	Al-AujA Cluster	3.991.597	23.147.039	23.147.039
PAD 6	Jericho	11.082.381	29.083.044	29.083.044
Settlements				
IAD 1	Cluster North AD	3.100.095	0	0
IAD 2	Cluster Central AD	36.621.768	0	0
IAD 3	Cluster South AD	8.000.662	0	0
	TOTAL	85.170.469	125.170.470	125.170.470

In this Master Plan it is assumed that the agricultural efficiencies will increase substantially, particular for Jordan and Palestine, ensuring that with the available water resources higher financial returns will be realized.

The total amount of wastewater that will be generated in the basin directly relates to the domestic water consumption. In this Master Plan it is assumed that 80% of the total domestic water demands will return to the system as wastewater. Within this Master Plan interventions are proposed to treat and reuse the wastewater generated locally to the maximum extend. It is assumed that by 2050 again 80% of all generated wastewater in the basin (or 64% of all urban water supply, or about 63 MCM / yr) will be reused

for agricultural purposes. In addition it is assumed that about 44.8 MCM / yr of the total 100 MCM supplied to Amman and the Northern Governorates will return again to the Jordan Valley for agricultural reuse purposes. This figure is based on the assumptions that 80% of all supplied water is returned as wastewater, that 70% of this wastewater will be made available in Jordan Valley and 30% will remain in the high lands, and that 80% of the wastewater in the Jordan Valley can be made available on the fields for reuse purposes. See below table. If fully reused for agricultural purposes, this water is sufficient to supply water to 30.000 to 50.000 dunum of agricultural land. It is also suggested that highly treated wastewater from Jerusalem / West Bank (50 MCM /yr) will be diverted to the Lower Jordan Valley for Agricultural purposes.

In terms of solid waste generation, this Master Plan assumes that the per capita waste generation will increase from 400 kg per person today to 475 kg in 2025 and to 600 kg per person per day in 2050. These assumptions are based on expected economic growth and related growing waste generation per capita similar to Western European averages. This Master Plan proposes interventions that will process and treat these waste streams in a fully sanitary fashion, based on a maximum of reuse and recycling, and including the use of sanitary landfills.

Assuming that in 2050 about 50% of the domestic waste stream consists of organic waste, this leads to about 400.000 tons of organic waste being generated in 2050 in the basin. Regional experience shows that a maximum of 50% of the organic waste stream could be physically separated, leading to 200,000 tons of organic waste being separated in 2050. If fully processed into compost, this leads to a compost production in 2050 of 200,000 tons per year, which is sufficient to support about 120.000 to 200.000 dunum of agricultural land in the Lower Jordan Valley.

The remaining waste fraction is to be treated (50%) and recycled separately (50%). Eventually this might be done through incineration or sanitary landfilling. Assuming that sanitary landfilling is the preferred treatment technology in the Lower Jordan River Basin, this leads to a total required landfilling capacity until 2050 of about 7 MCM of waste. Assuming average sanitary landfills with a height of 15 meters, this will require sanitary landfill surface area of about 500 dunum until 2050, excluding related infrastructure.

Table 25 - Wastewater Reuse Projections

Jordan Valley (Jordan) **Wastewater Reuse for LJRB Agricultural**			**CM / yr**	
		2010	**2025**	**2050**
	Reuse Targets	0%	50,00%	80,00%
JMD 1	Agwhar Shamaliyah	0	4.203.938	13.386.916
JMD 2	Deir al Alla / Balqa	0	2.621.119	8.346.624
JMD 3	Shoonah / Janoobiyah	0	2.712.535	8.637.727
JMD 4	*Foreign population*	0	2.400.000	2.880.000
JMD 5	*Return flow to LJRB from Amman / Northern GV*	0	22.400.000	44.800.000
	TOTAL	0	34.337.591	78.051.267

Jordan Valley (Israel) Local Wastewater Reuse for Agricultural			CM / yr	
		2010	2025	2050
	Reuse Targets	80%	80,00%	80,00%
	Emek Hayarden	633.600	746.803	1.013.760
	Emek Hamaayanot	633.600	746.803	1.013.760
	Beit She'an	979.200	1.154.150	1.566.720
	Hagilboa	576.000	678.912	921.600
	TOTAL	2.822.400	3.326.669	4.515.840

Jordan Valley (Palestine) Local Wastewater Reuse for Agricultural			CM / yr	
		2010	2025	2050
	Reuse Targets	0%	50,00%	80,00%
Palestinians				
PMD 1	Bardala Cluster MD	0	473.830	3.615.693
PMD 2	Al-Bassariya Cluster MD	0	442.036	3.501.056
PMD 3	Al-Jiftlik Cluster MD	0	530.530	3.820.288
PMD 4	Fasayil Cluster MD	0	286.230	2.938.931
PMD 5	Al-Auja Cluster MD	0	435.596	3.477.760
PMD 6	Jericho MD	0	1.793.344	8.375.859
	Subtotal Palestinian	0	3.961.566	25.729.587
Settlements				
IMD 1	Cluster North MD	0	0	0
IMD 2	Cluster Central MD	0	0	0
IMD 3	Cluster South MD	0	0	0
	Subtotal Israeli Settlers	0	0	0
	TOTAL	0	3.961.566	25.729.587

Table 26 – Solid Waste Generation Projections

Jordan Total Waste Generation			tons / year	
		2010	2025	2050
JMD 1	Agwhar Shamaliyah	43.577	71.114	156.878
JMD 2	Deir al Alla / Balqa	27.170	44.339	97.812
JMD 3	Shoonah / Janoobiyah	28.118	45.885	101.223
	Foreign Population	98.832	107.932	148.638
	TOTAL	197.697	269.269	504.551

Israel Total Waste Generation			tons / year	
		2010	2025	2050
	Emek Hayarden	6.600	8.237	11.880
	Emek Hamaayanot	6.600	8.237	11.880
	Beit She'an	10.200	12.730	18.360
	Hagilboa	6.000	7.488	10.800
	TOTAL	29.400	36.691	52.920

Palestine Total Waste Generation			tons / year	
		2010	2025	2050
Palestinians				
PMD 1	Bardala Cluster MD	2.104	8.038	42.371
PMD 2	Al-Bassariya Cluster MD	1.826	7.499	41.028
PMD 3	Al-Jiftlik Cluster MD	2.600	9.000	44.769
PMD 4	Fasayil Cluster MD	463	4.856	34.441
PMD 5	Al-Auja Cluster MD	1.769	7.390	40.755
PMD 6	Jericho MD	13.645	30.423	98.155
	Subtotal Palestinian	22.406	67.205	301.519
Settlements				
IMD 1	Cluster North MD	855	0	0
IMD 2	Cluster Central MD	2.376	0	0
IMD 3	Cluster South MD	516	0	0
	Subtotal Israeli Settlers	3.747	0	0
	TOTAL	26.153	67.205	301.519

3.2 Strategic Planning Objectives

3.2.1 Introduction

The key challenge facing the NGO Master Plan is to strike the right developmental balance between a healthy economic developmental path for the valley and its people on the one hand, and a Jordan River with sufficient environmental flows to sustain a healthy eco-system on the other hand. To meet this objective there is a need to ensure that the river serves as a natural water conveyor and source for water supply for residents in and outside the Basin. Creative solutions are therefore needed to provide sufficient water to supply the projected water requirements of both people and nature for 2025 and 2050. A prerequisite for peace and prosperity is the equitable sharing of water resources and public access to lands and the riverbanks for all riparian nationalities within an appropriate security framework.

Sustainable development is seen as a catalyst to peace building between Israel and Palestine and the deepening of cooperation between Jordan, Palestine and Israel as a means to achieve prosperity for their

residents in the valley. A key condition for meeting this challenge is that Palestine is recognized as a full riparian to the Jordan River, entitled to have access to its fair share of water resources and sovereignty over its lands in the valley. This planning document has made no attempt to quantify equitable water rights from the Jordan River. All water allocations identified to each side are based on the needs of each side within the valley, with the assumption that the equitable water rights will be negotiated between the parties directly and might supply additional water resources to populations outside the valley. The terms Lower Jordan River Basin or Lower Part of the Jordan River Basin are interchangeable in this document.

In an earlier document researched and published by EcoPeace Middle East, the target environmental flow for the river was identified as an estimated 400 MCM per annum, with the target return flow of 220 mcm, 100 MCM and 90 MCM identified for Israel, Syria and Jordan respectively. Given both the political situation in Syria and that there is no possibility for a Syrian team to be party to this NGO planning effort, there is therefore no attempt to determine in any detail from where and how the 100 MCM requirements from Syria would flow into the river by 2050, other than stating that it would lead to an additional 100 MCM flow from the Yarmouk River into the Jordan River. Therefore the 100 MCM annual contribution is not part of the WEAP model developed below and the model therefore speaks of a 300 MCM annual flow to the Dead Sea.

The key strategic planning objectives that would promote sustainable development for the trans-boundary NGO Master Plan for the Lower Jordan River Basin have been identified below:

3.2.2 Pollution Control

The objective in terms of pollution control is to eliminate all sources of environmental pollution in the Lower Jordan River Basin by 2025. This requires full and adequate treatment and reuse of all wastewater flows in the basin and to embark on fully integrated solid waste management, including:

- (separate) waste collection,
- transportation;
- transfer;
- reuse and recycling of solid waste streams;
- selection, planning, design and construction of a sanitary landfill;
- closing of existing non-sanitary dump sites;
- development of composting facilities;
- based on the polluter – pays – principle and progressive taxation for heavy consumers.

In terms of environmental management, the challenge will be to implement integrated environmental management systems throughout the basin, including monitoring, enforcement and public awareness on wastewater and solid waste management, also focused on non-pollution sources; groundwater protection; water quality management; soil quality and air quality. Land preservation, groundwater protection zoning and problems related to overgrazing are to be addressed adequately.

Sustainable environmental management also requires adequate tools, such as dedicated impact assessment tools and Strategic Environmental Assessments to test new policies and strategies related to the LJR Basin. In addition, environmental management in the basin requires enhancing water and environmental awareness of all communities, schools and municipalities in the valley, and implementing environmental standards instance according to the ISO norms 14000 and 14001. In terms of agricultural environmental management the challenge is to assist farmers in applying sustainable agronomic practices,

including regulation of the use of pesticides and fertilizers and promotion of environmentally sustainable substances. This will support farmers in reaching international agricultural export and import standards.

3.2.3 Sustainable Water Management and River Rehabilitation

In terms of sustainable water management the key challenge clearly is to overcoming the water scarcity related problems in the Lower Jordan Valley. This means creating a sustainable water supply system that meets that current and future domestic and agricultural water demands; and at the same time preserves the water resources for future generations and for the environment. This requires an Integrated Water Resources Management regime for the whole (Lower) Jordan River, based on international co-operation among Israel, Jordan and Palestine, supported with adequate water management tools (like WEAP) to ensure sustainable water supply and an increase of the baseflow and rehabilitation of the ecological values of the Jordan River.

One of the related key challenges is to achieve full treatment of wastewater generated in the study area and full reuse for agricultural purposes. This will both reduce public health related risks and strengthen the agricultural sector. This requires development of a detailed technical and financial plan, including designs and tender documents, for full scale collection, treatment and reuse of the locally generated wastewater flows, including domestic, industrial (mainly olive oil wastewater in Jordan) and manure management.

Another key challenge is to restore the function of the Lower Jordan River as a natural river and water conveyor in the valley for supply purposes, by keeping its flow as long as possible in the river. Rehabilitating the river will include actions in terms of realizing at least one minor flood (c.a. 20-50 m3/sec) per year. In order to bring back the original habitats of the river, also the flow bed of the river are to be widened to about 50-70 m in the north and at least 30 m in the south, with flood plains on both sides.

The salinity of the Jordan River has a natural tendency to increase downstream. This is caused by natural drainage of brackish groundwater into the river, particularly in the southern part of the valley near the Dead Sea. The key challenge is to prevent any inflow of salt or brackish surface water into the river above the point where the river would still be fresh, i.e. above the confluent with Wadi Qelt. This implies bypassing the salt water from the Israeli Saline Water Carrier (SWC), the brackish water from the Israeli Fish Ponds, and the brine from the Abu Zeighan desalination plant to a new outflow located south of the river's confluent with Wadi Qelt, close to the Dead Sea. If this will be done, the river will be able to provide water of good quality for different user functions. In terms of chloride concentrations this means a maximum of 400 mg/l for drinking water purposes; 600 mg/l for fresh water irrigation; and 1500 mg/l for irrigation of date palms.

Another key challenge is to maintain total agricultural water demands at the same level as today, with the exception of Palestine which is currently heavily underdeveloped in terms of agriculture. To achieve a sustainable water balance within the basin and sufficient flows in the river it will furthermore be required that sometime before 2050 Israel will cease pumping water out of the basin from the Sea of Galilee through the National Water Carrier (NWC), meanwhile maintaining its present agricultural consumption at the basin of the Sea of Galilee; that the Sea of Galilee will be kept on a medium water level between the top and bottom red lines ("green line" as defined by the Israeli Water Authority); and that by 2050 Jordan will stop diverting water from the Yarmouk and other tributaries to the Kind Abdullah Canal (KAC) to the extent possible, and instead will use the Jordan River as main conveyor for its irrigation supply purposes. In addition, by 2050 Palestine would also use the Jordan River as its main water conveyor, meaning that the planned development of the West Ghor Canal will not be built.

These challenges require a series of related interventions, including adequate water data monitoring and modeling; promotion of water saving and water demand management measures in all sectors; provision of related training and institutional strengthening support services; improved regulations and enforcement on groundwater abstractions to stop groundwater depletion and salination; and implementation of efficient water pricing policies and related enforcement.

In terms of water governance, the challenge will be to strengthen the authorities, including JVA, PWA, in their role as regulator of the water sector in the Jordan Valley. This includes skills with regard to water data collection and management; water resources planning; efficient operations of the water storage and supply system; and strengthening the co-operation with the local water user associations. It also includes monitoring, regulations and enforcement of surface water and groundwater abstractions; protection of sensitive shallow aquifers, efficient tariff policies, and monitoring reduction of agricultural pollution loads.

3.2.4 Sustainable Agriculture

Sustainable Agriculture Development is one of the most important pillar of the lower Jordan River Basin Plan as it provides livelihood and prosperity for the whole people in the valley. The strategic agricultural objective for the study area is improving water use and irrigation efficiencies and economic outputs per unit of water used, and meanwhile stabilize, or even reduce the total water demands for the agricultural sector in the Jordan Valley. This will require adequate tariff policies on water used for irrigation, including enforcement, to stimulate more efficient use of water through for instance green house drip irrigation. These are challenges specifically relevant for Jordan and Palestine.

Greenhouses are a very effective manner to improve water efficiencies and economic outputs in the agricultural sector, using greenhouses reduce the production related risks, provide for better quality crops and provide wider options for crop diversification. Finally, evapotranspiration from greenhouses is substantially less than from open field agriculture (and it does not cause soil salinity). However, greenhouses decrease open spaces, with negative visual impacts to rural landscapes and to wildlife corridors. Hence greenhouse development needs to be carefully planned and many farmers would require adequate and reliable micro-credits in order to invest in greenhouses.

Drip irrigation is another effective manner to improve water efficiencies in the open fields. The challenge is to set up sustainable drip irrigation systems in the Lower Jordan Valley, including appropriate operations and maintenance and monitoring systems. This requires also financial facilities for farmers to invest, standardization of designs and manufacturing and provision of technical support services.
A related challenge is to maximize the reuse of treated wastewater, efficient use of pesticides and fertilizers, introduction or expansion of growing high yield crops, and improving extension services and post harvesting support to the farmers to enable them to create higher economic returns.

The main agricultural challenge in Israel is to address the negative environmental impacts associated with the fish farms. These farms consume substantial amounts of water, due to high evaporation rates, which may be as much as 1-2 meter of water per year. In addition the ponds are flushed once or twice per year, releasing water into the Jordan River, which is polluted with excrements from the fishes, and anti-biotic medications that have to be added to the fish ponds. Due to the evaporation, the effluent is usually brackish as well. Consequently, discharging this wastewater into the environment has substantial impacts to surface water and groundwater quality. Mitigating these impacts would require investments in

wastewater treatment facilities, which are today often too expensive for the fish farmers to pay for. Without resolving these issues the future of this industry in the valley must be in doubt, despite any ecological benefits that the fish farms present for bird migration and associated tourism related to bird watching.

A related challenge will be to strengthen the Extension Services for the farmers in the Lower Jordan Valley. These services might be provided through the existing water user associations. In terms of rural economics, an important challenge is to improve the post-harvesting and marketing potentials of the farmers in the Jordan Basin, including setting up product organizations, better information about markets (nationally and internationally) and related product requirements and creating better access to export markets, with particular focus on eco-friendly and sustainable production techniques, regional labeling and fair-trade related markets.

3.2.5 Lower Jordan Basin Governance

Institutional Strengthening
The institutional challenge will be to strengthen responsible land and water authorities, including JVA, WAJ and PWA, municipalities and related authorities in their role as authority and regulator of the Jordan Valley. Improvements are required in areas such as water data collection and management; water planning; water storage and distribution operations, including IT and wireless data transfer, economic and land use planning and related support services. This will also require improved coordination and cooperation between various stakeholders involved in water management, to enable to more efficient and beneficial water economy. The subsidiarity principle is here recommended where decision making and empowerment should take place at the level of authority closest to the resident for the issue concerned. In Jordan and Palestine this would result in considerable investment in municipal authorities.

Advocacy and Local Community Empowerment
Development of the Lower Jordan River Basin requires that local communities will fully participate in identifying their needs and in implementing the interventions for addressing these needs. This requires that local communities are educated and empowered; and that the general public awareness on the current problems and possible solutions in terms of sustainable development is raised. This requires support from local media as well as local governments and municipalities, as well as support from the responsible authorities.

Social Responsibility
Sustainable development and governance of the Lower Jordan River Basin shall also include social responsibilities, including fair payment of wages, inclusion of social security, safe and healthy working conditions, training of employees and equal gender opportunities.

International Co-operation and security issues
Maximizing the economic and environmental development perspectives in the Lower Jordan Basin requires that trans-boundary co-operation will be strengthened, particularly among Jordan, Israel and Palestine. This may include preparing for a joint Lower Jordan Basin Organization; updating the Jordanian – Israeli Water Agreements taking into account the increased water stress in Jordan and a new water division based on proportional distribution of water (percentages instead of fixed flows); joint restoration of the Lower Jordan River; and development of joint economic initiatives. In the (very) long run the challenge might be to work towards an integrated Jordan Basin Commission for all riparian countries, including Israel, Jordan, Palestine, Syria and Lebanon. In the interim a Lower Jordan Basin Commission between Jordan, Palestine and Israel should be advanced.

3.2.6 Ecological Rehabilitation

One of the key challenges in the Lower Jordan River Basin is to restore the good ecological status of the Lower Jordan River Basin, and the role of the Jordan River as a strategic water conveyor (Green Infrastructure), in line with earlier recommendations of EcoPeace's Environmental Flow Study. This also includes restoration of the flood plain and the ecological (flora, fauna) status of the river, based on environmental flows and good water quality; design and implementation of dedicated ecological restoration projects and eco-parks along the borders of the Jordan River; expansion of currently assigned nature reserves, based on important flora, fauna and bird areas, also in accordance with the Ramsar Convention; and design and develop dedicated nature recreational areas for the urban population.

3.2.7 Sustainable Tourism and Cultural Heritage Development

Development of the tourism sector and the cultural heritage in the Lower Jordan Basin is a major challenge for saving the intrinsic cultural heritage values in the Basin, as well as for boosting the economy and create jobs in the area. This requires investment planning for major sites such as the Pella, the Bakoura National Park, Jericho and Old Gesher and the Na'arayim sites. It also includes development of tourism trails around various themes including nature protection, faith based experiences and rural sceneries, and cross border tourism attractions and trails such as new access sites along the Jordan River, a free tourism area at the northern head of the Dead Sea between Jordan and Palestine; and the Jordan River Peace Park between Jordan and Israel. It may also include linking the Baptism Sites to other tourism sites and trails in the valley, and creating synergies and stronger economic development opportunities. Finally this will include strengthening rural tourism accommodations, such as bed and breakfast, local restaurants, support of woman's center and community centers. In developing tourism facilities, the challenge will also be to fulfill environmental standards and eco-labels, similar to the EU Ecolabel or the Green Globe Ecolabel, and may also include bio-climatic design practices and use of renewable building materials. Border crossings need to be eased, allowing for foot crossing rather than shuttle buses as presently required and visa and fee requirement should be reevaluated in order to promote regional cross border tourism.

3.2.8 Urban and Infrastructure Development

To facilitate the anticipated population and economic growth in the Lower Jordan Valley, it will be crucial to develop sufficient urban housing and infrastructure facilities in the basin, and meanwhile increase traffic safety and public transport capacities. This is specifically relevant for the new State of Palestine and for Jordan. This may include improvement of main north-south roads through the valley, including bypass roads around major urban areas; improving traffic safety through traffic lights, lining and public signs; establishment of sidewalks and bicycle trails; prepare for urban planning and housing projects to accommodate the foreseen growing population and its welfare, and development of trans-boundary infrastructure facilities, such as opening up of the Damya Bridge and the Abdullah Bridge over the Jordan River.

Sustainable Economic Development
In order to further boost sustainable economic development in the Lower Jordan River Basin and related living standards for its population, additional economic development and private sector initiatives have to be supported, including community development projects; agro-industry and tourism development and specific economic initiatives providing high outputs against low water requirements. Sustainable economic development also requires promotion of the use of renewable energy sources, such as biogas; waste-to-energy; small scale solar energy and wind energy potentials in the basin, as well as promotion of better vocational education facilities in the region.

4 MEETING THE STRATEGIC PLANNING OBJECTIVES

4.1 The Interventions

A Long list of interventions for Jordan and Palestine and regionally has been identified by the consultants in co-operation with the key stakeholders in the region, aiming at addressing the strategic planning objectives adequately. The full set of interventions is presented in annex 1 and grouped around the various strategic planning objectives. Interventions have been distinguished in terms of Palestinian, Jordanian or Regional interventions. The interventions related to pollution control and water management have an impact of the basin at large, as well as on the Jordan River. Most of the non water / environmental related interventions have an impact on the basin only.

Within the context of this Master Plan also Israeli interventions have been identified particularly by the Lower Jordan Drainage Authority and the Jordan Valley Regional Council as part of their governmental planning cycles. These interventions are also listed in annex 1. These include:

- W01 ISR – Yarmouk River Dredging and Cliff Protection Project
- W02 ISR – Western Drainage Basins Flood Management
- W03 ISR – Northern Sewerage Expansion Project
- W04 ISR – Fish Ponds Short Term Improved Water Management Project
- W05 ISR – Springs Rehabilitation Project
- W06 ISR – Springs Rehabilitation Project
- C01 ISR – Naharaym – Gesher – Harod Tourism Development Program
- E01 ISR – Ecological Restoration Project
- P01 ISR – Mine Fields Removal Project.
- A01 ISR – Edden Regional Agricultural Research and Training Center
- P02 ISR – Sustainable Fish Farming in the Jordan Valley
- P02 ISR – Betanya Tertiary Wastewater Treatment
- P03 ISR – Betanya Desalination Plant and Avikim Reservoir Development Project

In addition, the Roadmap for Rehabilitation of the Jordan River (Eco Peace, 2009) presents a series of NGO proposed interventions for Israel have been identified with a total costs (including lost revenues) of 3.4 Billion NIS. These are the following:

1. Ceasing pumping from the Lower Yarmouk to the Lake Tiberius if the water level in the Lake Tiberius is above the Red Line. This will save pumping costs, and does not negatively influence the Lake Tiberius water levels
2. Transfer the brine of the Salt Water Carrier directly to the Dead Sea, using a 83 km long gravitational pipeline
3. Transferring effluent from Kishon to AMWA and Harod, which requires a 15 km long pipeline
4. Further and faster decreasing pumping to the National Water Carrier (NWC). In the current Master Plan it is assumed that by 2050 Israel will have largely ceased pumping water from the Sea of Galilee out of the basin through the National Water Carrier, and will have replaced this by other resources, such as desalinated seawater. However, it is assumed that Israel will maintain supplying its domestic and agricultural water needs within the Lower Jordan River Basin from the Sea of Galilee and local water resources.

5. Changing 50% of the fish ponds by field crops and alfalfa, which will provide a direct economic benefit for 35 MCM of water / year, and this will reduce the reduce salinity levels in the Jordan River
6. Discharge effluents from the Kishon to the Harod River to reduce salinity levels
7. Desalinate 1,5 MCM / yr of brackish water from the Salt Water Carrier for local water supply

The proposed pollution control related interventions focus on eliminating all sources of environmental pollution in terms of wastewater and solid waste in the Lower Jordan River Basin by 2025. This includes full and adequate treatment and reuse of all wastewater flows in the basin and to fully integrated solid waste management. Proposals have been made to include waste collection, transportation; transfer; reuse and recycling of solid waste streams; sanitary landfilling and closing of existing non-sanitary dump sites.

The sustainable water management related interventions focus on establishing efficient domestic and agricultural water supply within a basin wide water balance. It also includes an Integrated Water Resources Management approach for the whole (Lower) Jordan River, based on international co-operation among Israel, Jordan and Palestine, supported with adequate water management tools (like WEAP) to ensure sustainable water supply and an increase of the baseflow and rehabilitation of the ecological values of the Jordan River.

The agricultural related interventions focus on improving water use and irrigation efficiencies and the economic outputs per unit of agricultural water used. It is assumed that the total water demands for the agricultural sector in the Jordan Valley will remain stable and that adequate tariff policies on water used for irrigation will be implemented, including enforcement, to stimulate more efficient use of water through for instance green house drip irrigation.

The governance related interventions include setting up a Palestinian Basin Authority, strengthening the Jordan Valley Authority and establishing a trans-national Jordan River Basin Organization that will address water management related issues from the basin perspective to the benefit of all stakeholders and inhabitants in the basin.

The ecological interventions focus on restoring the good ecological status of the Lower Jordan River Basin in general and the Jordan River particularly. This includes restoration of the flood plain and the ecological (flora, fauna) status of the river, based on environmental flows and good water quality; design and implementation of dedicated ecological restoration projects and eco-parks along the borders of the Jordan River; expansion of currently assigned nature reserves.

The proposed interventions in terms of tourism and cultural heritage focus on restoration and saving the intrinsic cultural heritage sites in the Basin, as well as for boosting the tourism economy in the area, including parks, hotel facilities, museums and touristic routes through the valley, as well as tourism branding and promotion. The interventions aim at creating basin wide synergies and stronger economic development opportunities for the basin as a whole.

The proposed interventions in terms of urban and infrastructure development focus on developing sufficient urban housing and infrastructure facilities in the basin towards the year 2050, and meanwhile increase traffic safety and public transport capacities.

The interventions, including foreseen planning and related investment costs are presented below for each strategic objective.

Table 27 – The Interventions

(annual investments are mentioned in units x 100,000 USD)

ID		Project (USD)	Subtotal (MUSD)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
P01	JOR	Solid Waste Management	30.033.000		9,2	9,2	56,4	56,4	70,5	70,5	28,2																												
P02	JOR	Environmental Management and Public Awareness Program	4.371.000		7,1	7,1	9,9	9,9	9,9																														
P03	JOR	Agricultural Pollution Control Project	2.115.000		7,1	7,1	7,1	0,0	21,2																														
P04	JOR	Separate waste collection and reuse pilots	423.000		4,2																																
P01	PAL	Solid and Hazardous Waste Management Plan	12.200.000		10,0	10,0	50,0	52,0																													
P02	PAL	Enviromental Management Project	1.000.000		4,0	3,0	3,0																														
P03	PAL	Wastewater collection and treatment	45.000.000		5,0	5,0	150,0	150,0	140,0																														
P04	PAL	Fish farm Pollution control project	550.000		1,8	2,5	1,3																														
P05	PAL	Land and Water quality Protection Project	200.000		0,5	1,5																															
P06	PAL	Remediation of Military Bases and Mine Fields	10.300.000							3,0	50,0	50,0																										
		TOTAL POLLUTION CONTROL	**106.192.000**																																		
ID		**Project (USD)**	**Subtotal (MUSD)**																																		
W01	REG	Jordan Valley Water Demands Management Project	1.500.000							7,5	7,5																										
W01	JOR	Improved Lower Jordan River Basin Management Project	2.397.000			12,0	12,0																														
W02	JOR	Wastewater collection, treatment and reuse project	42.582.000			2,8	105,8	105,8	105,8	105,8																												
W03	JOR	Emergency Wastewater Management Project	22.701.000			1,4	56,4	70,5	70,5	28,2																												
W04	JOR	Waste water reuse pilot projects	1.551.000			1,4	7,1	7,1																													
W01	PAL	Wells Rehabilitation and drilling of new well in the jordan valley	2.450.000							6,9	8,8	8,8																										
W02	PAL	Rehabiitation and Protection of Springs	2.790.000			2,2	8,6	8,6	8,6																													
W03	PAL	Rehabilitation and construction of Domestic water networks	3.700.000				14,5	22,5																													
W04	PAL	Desalination of Brackish wells	750.000			4,0	3,5																														
W05	PAL	Rehabilitation of Al Auja Springs	750.000			4,0	3,5																														
W06	PAL	Development of Water Traficc structure	100.000			1,0																															
W07	PAL	Utilization off Al-Fashkha Spring	5.200.000			2,0	15,0	15,0	20,0																													
W08	PAL	Development of a water conveyance system	12.500.000							5,0	60,0	60,0																										
W09	PAL	Utilization of Jordan River	29.500.000							59,0	59,0	59,0	59,0	59,0																								
W10	PAL	Artificial Recharge Scheme	11.000.000			10,0	20,0	20,0	20,0	20,0	20,0																											
W11	PAL	Construction of Water networks	31.250.000			6,3	6,3	37,5	37,5	37,5	37,5	30,0	30,0	30,0	30,0	30,0																							
W12	PAL	Hydro-Geological Assessment of the study Areas	1.000.000			10,0																															
		TOTAL WATER MANAGEMENT	171.721.000																																		

ID		Project (USD)	Subtotal (MUSD)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
A01	REG	Jordan Valley Agricultural Water Efficiency	1.500.000							7,5	7,5																												
A01	JOR	Jordan Valley Greenhouses Expansion Project	3.243.000				1,4	7,8	7,8	7,8	7,8																												
A02	JOR	Jordan Valley Extension Services Improvement Project	2.171.400				1,4	5,1	5,1	5,1	5,1																												
A03	JOR	Jordan Valley Drip Irrigation Improvement Project	12.690.000				0,0	14,1	22,6	22,6	22,6	45,1																											
A04	JOR	Jordan Valley Post Harvesting Support Project	2.326.500				0,0	1,4	4,4	4,4	4,4	8,7																											
A05	JOR	Jordan Valley Irrigation Efficiency Improvement Project	3.877.500				0,0	0,0	7,1	6,3	6,3	19,0																											
A06	JOR	Jordan Valley Authority Support Project	3.102.000				1,4	14,8	14,8																													
A01	PAL	Shifting in Cropping Patterns	800.000							3,0	5,0																												
A02	PAL	Rehabilitation and upgrading of water systems	17.000.000							7,0	81,5	81,5																											
A03	PAL	Water Right Policies and Regulation	150.000			1,5																																
A04	PAL	Operate and expand the Agro-Industrial Park	2.000.000							2,0	18,0	0,0																											
A05	PAL	construction of Agricultural Roads	1.000.000							4,0	6,0																												
A06	PAL	enhancement of Palm Production`	1.600.000							6,0	10,0																												
A07	PAL	Development and Support livestock Sector	3.995.000							1,5	19,3	19,3																											
A08	PAL	Support to Women organizations and Bedouin Communities	650.000			2,6	3,9																															
A09	PAL	Land Rehabilitation	152.000.000							20,0	300,0	400,0	400,0	400,0																									
A10	PAL	Strengthening of Extension Services	100.000			1,0																																
A11	PAL	Pomotions of Farmers Cooperative	500.000			1,0	2,0	2,0																														
A12	PAL	Jordan valley Credit Program	1.098.000			1,5	1,6	1,6	1,6	1,6	1,6	1,6																											
A13	PAL	LEISA Reseach certification	525.000			0,8	2,3	2,3																														
A14	PAL	Establish an Agro-Industrial Zone in the Northern JV	12.000.000							2,5	2,5	57,5	57,5																										
A15	PAL	Hand over of Settlements Agricultural Lands	16.000.000							10,0	75,0	75,0																											
		Total Sustainable Agriculture	**238.328.400**																																			
IC01	REG	Jordan River Basin Organization (JORBO)	2.000.000							5,0	5,0	5,0	5,0																										
IC01	PAL	Jordan Valley Authority Development Program	1.000.000							6,6	3,4																												
		Total Lower Jordan Basin Governance	**3.000.000**																																			
ID		**Project (USD)**	**Subtotal (MUSD)**																																			
E01	REG	Jordan River Environmental Flows Project	5.000.000							5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0																			
E02	REG	Jordan River Ecological Restoration Project	30.500.000							5,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0																		
E03	REG	Jordan River Fisk Stock Restoration Project	5.500.000							5,0	10,0	10,0	10,0	10,0	10,0																								
E04	REG	Nature Protection Areas and Management Plan	5.500.000							5,0	10,0	10,0	10,0	10,0	10,0																								
E05	REG	International Accreditation of the Lower Jordan River Valley	1.500.000					5,0	5,0	5,0																												
E01	JOR	Ecological Corridors around Valleys and Dams	5.500.000		5,0	10,0	10,0	10,0	10,0	10,0																												
E02	JOR	Wetlands and Aquatic Fauna Restoration Project	1.500.000			5,0	5,0	5,0																														
E03	JOR	Ecological Monitroing and Management Project	2.500.000		5,0	5,0	5,0	5,0	5,0																													
E04	JOR	Jordanian Eco-parks and Projected Areas Project	20.500.000							5,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0																		
		Total Ecological Rehabilitation	**78.000.000**																																			
ID		**Project (USD)**	**Subtotal (MUSD)**																																			
C01	REG	Jordan River Mouth Tourism Information Center	2.000.000							5,0	5,0	5,0	5,0																										
C02	REG	Jordan River Baptism Site Improvement Project	4.000.000							10,0	10,0	10,0	10,0																										
C03	REG	Jordan River Peace Park Improvement Project	4.000.000							10,0	10,0	10,0	10,0																										
C04	REG	Jordan River Regional Routes	2.000.000							5,0	5,0	5,0	5,0																										
C05	REG	Cultural and Historic Museum for the Lower Jordan Valley	3.000.000							7,5	7,5	7,5	7,5																										
C01	JOR	Pella Tabaqat Fahl Site Improvement Project	3.102.000			2,8	14,1	14,1																														
C02	JOR	Abu Ubaydah Tomb Improvement Project	775.500			0,7	3,5	3,5																														
C03	JOR	Cultural and Historic Museum for the Lower Jordan Valley	3.080.850							0,3	0,2	30,3																										
C04	JOR	Archaeological Landmarks Development Project	4.935.000							12,3	12,3	12,3	12,3																										

ID		Project (USD)	Subtotal (MUSD)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
C01	PAL	Cultural Heritage Protection and Management Plan	1.700.000		2,0	6,0	6,0	3,0																															
C02	PAL	Tourism Branding and Promotion	500.000		5,0																																		
C03	PAL	Museum of Natural and Cultural History of the Rift valley	42.750.000							27,5	100,0	100,0	100,0	100,0																									
C04	PAL	Rehablitation of the Catchment of Ancient Jericho	12.600.000		6,0	30,0	30,0	30,0	30,0																														
C05	PAL	Rehabilitation of salt industry sites, Rusheideyeh	4.300.000		3,0	10,0	10,0	10,0	10,0																														
C06	PAL	Rehabilitation of Antient Jericho	4.300.000		3,0	10,0	10,0	10,0	10,0																														
C07	PAL	Rehabilitation of Hisham's Palace	3.700.000			1,0	12,0	12,0	12,0																														
C08	PAL	Rehabilitation of Tel Abu El Alayek	4.733.333			4,3	4,3	4,3	4,3	10,0	10,0	10,0																											
C09	PAL	Rehabilitation of Khirbet El biyadat or Tel Ouja	5.800.000			3,0	11,0	11,0	11,0	11,0	11,0																												
C10	PAL	Rehabilitation of Khirbet El Makhroug	5.800.000			3,0	11,0	11,0	11,0	11,0	11,0																												
C11	PAL	Rehabilitation of Tel El Hamma	5.300.000				3,0	10,0	10,0	10,0	10,0	10,0																											
C12	PAL	Archaeological Landmark Features	1.500.000				3,0	6,0	6,0																														
C13	PAL	Spa, Thalasso therpy and Balneo therapy Center	3.300.000				3,0	7,5	7,5	7,5	7,5																												
C14	PAL	Jesus Village	3.500.000				2,0	7,0	7,0	7,0	6,0	6,0																											
C15	PAL	Hiking trail Development	2.000.000							4,0	4,0	4,0	4,0	4,0																									
C16	PAL	Sport and Adventure Center	18.000.000							10,0	10,0	32,0	32,0	32,0	32,0	32,0																							
C17	PAL	Travelers Centers	5.200.000							7,0	15,0	15,0	15,0																										
C18	PAL	Hotel Rooms 4 Stars (Resort)	80.000.000							15,0	85,0	100,0	150,0	150,0	150,0	150,0																							
C19	PAL	The Mud Brick Youth Village	5.100.000							1,0	10,0	10,0	10,0	10,0	10,0																								
C20	PAL	Youth and Guest houses	4.200.000								2,0	10,0	10,0	10,0	10,0																								
		TOTAL Sustainable Tourism and CH Development	241.176.683																																				
ID		**Project (USD)**	**Subtotal (MUSD)**																																				
U01	REG	Non-fossil, Renewable Energy Development Project	3.000.000							6,0	6,0	6,0	6,0	6,0																									
U02	REG	Adam / Damia Bridge Rehabilitation Project	90.000.000										10,0	50,0	240,0	300,0	300,0																						
U03	REG	King Abdullah Bridge Rehabilitation Project	30.000.000										10,0	50,0	240,0																								
U04	REG	Efficient Border Bridges Crossings	10.000.000							3,0	47,0	50,0																											
U01	JOR	Infrastructure Development Project	267.900.000									30,0	69,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	180,0													
U02	JOR	Urban and Infrastructure development Master Plan	1.424.100.000									10,0	550,0	650,0	750,0	750,0	581,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	550,0	520,0	480,0	350,0	250,0	
U03	JOR	Higher Education and Vocational Development Project	35.250.000							13,5	39,0	100,0	200,0																										
U04	JOR	Non-fossil, Renewable Energy Development Project	262.260.000									30,0	12,6	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	180,0													
U01	PAL	Urban and Infrastructure development Master Plan	1.009.900.000						9,0	190,0	250,0	300,0	350,0	400,0	650,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	500,0	350,0	150,0	50,0					
U02	PAL	Educational and Vocational Needs Assessment	250.000						2,5																													
U03	PAL	School building Program	4.900.000						10,0	19,0	20,0																												
U04	PAL	Higher Education and vocational Training Program	10.300.000						3,0	20,0	20,0	20,0	20,0	20,0																									
U05	PAL	Health Care services Development Project	11.000.000						11,0	30,0	30,0	30,0																											
U06	PAL	Electricity and Telecommunicaions Development Project	202.000.000						20,0	50,0	70,0	90,0	110,0	120,0	210,0	200,0	200,0	200,0	200,0	190,0	160,0	100,0	60,0	40,0														
U07	PAL	Develop Renewable Energy Resources	22.000.000						20,0	50,0	50,0	50,0	50,0																									
U08	PAL	Import and Export Logistics Center	2.000.000					5,0	15,0																													
		TOTAL Urban and Infrastructure Development	3.354.860.000																																				
		GRAND TOTAL, all investments	4.164.353.083	0	67,7	181,5	667,0	753,6	781,4	1094,7	1786,4	2084,7	2380,9	2562,0	2722,0	2362,0	1981,0	1650,0	1650,0	1640,0	1610,0	1550,0	1510,0	1490,0	1450,0	1410,0	1050,0	1050,0	1050,0	1050,0	900,0	700,0	600,0	550,0	520,0	480,0	350,0	250,0	0,0

4.1.1 Pollution Control

The pollution control related interventions have been designed to eliminating all sources of environmental pollution in the Lower Jordan River Basin by 2025. The following interventions are foreseen:

Table 28 – Pollution Control related interventions

P01	JOR	Solid Waste Management
P02	JOR	Environmental Management and Public Awareness Program
P03	JOR	Agricultural Pollution Control Project
P04	JOR	Separate waste collection and reuse pilots
P01	PAL	Solid and Hazardous Waste Management Plan
P02	PAL	Enviromental Management Project
P03	PAL	Wastewater collection and treatment
P04	PAL	Fish farm Pollution control project
P05	PAL	Land and Water quality Protection Project
P06	PAL	Remediation of Military Bases and Mine Fields

The proposed Jordanian Solid Waste Management intervention is in line with the National Solid Waste Management Plan that is currently (2014) prepared by the Ministry of Environment and new legislation currently being prepared for the municipalities. The project includes an integrated planning section dedicated to the Lower Jordan River Basin, cross boarder waste transfer; transfer of the landfill in North Shuneh into a transfer station, focusing on composting organic waste for composting, including household organic waste, agricultural waste of solid waste generated by olive mills and PPPs. However, the National SWM strategy will be elaborated on the levels of governorates, which overlaps parts of the area of the Lower Jordan River Basin. This proposed interventions under this Master Plan focused explicitly on the Lower Jordan River Basin, without waste management plans for other regions, such as the Syrian refugee camps currently located close to the border. Additional elements to be addressed are way of financing; increasing public and governmental awareness and participation; private sector involvement; source separation, and following environmental and social procedures for the preparation of landfills.

The proposed Jordanian integrated environmental monitoring, enforcement and public awareness program for the Lower Jordan River Basin includes monitoring of wastewater and solid waste major pollution sources, fish farms; ambient surface and groundwater quality; soil quality and air quality. The purpose of this program is to enabling JVA and related authorities to establish the environmental baseline of the LJR Basin; to increase public awareness on environmental protection and water demands; and to monitor the impacts of pollution control measures, such as solid waste management and wastewater management interventions. The project will also include development of dedicated impact assessment tools for JVA, such as Strategic Environmental Assessments to be used to test new policies and strategies related to the LJR Basin.

The Jordanian agricultural pollution control project aims to assist farmers and their organizations in applying sustainable agronomic practices, including minimized use of pesticides and fertilizers; regulation and distribution and types of pesticides on regional or national levels, and promotion of environmentally sustainable substances; stimulation of the reuse of organic agricultural waste as compost; improve the management of agricultural waste; improvement of the environmental performance of fish farms.

The Jordanian separate waste collection and reuse pilots aim to stimulate the reuse of resources/waste streams and limit the amount of waste to be land filled, in line with the National SWM Strategy that is currently being prepared. This includes research to investigate the possibilities and bottlenecks for separate collection and reuse of certain waste streams.

The Palestinian SWM project aims at full collection and sanitary treatment of all solid waste streams and maximized reuse and recycling of waste streams, including waste to energy. And at the same time stimulate the reuse of resources/waste streams and limit the amount of waste to be land filled. The intervention includes construction of a central sanitary landfill for the area.

The Palestinian proposed integrated environmental management plan aim to Improvement of urban and environmental planning capacities and enhance environmental data collection, improvement of enforcement. It proposes to make one organization responsible for environmental issues in the Jordan Valley, to empower this organization and improve the public environmental awareness in the Valley.

The Palestinian wastewater collection and treatment project focuses on full scale, adequate and safe collection of waste water for all the communities in the study area by constructing wastewater collection networks, to treat the generated wastewater from the different communities and lay the ground for safe reuse of wastewater for agricultural purposes from the constructed wastewater treatment plant. This includes expansion of the sewer system in Jericho covering the whole city and connecting the system to the recently completed WWTP, and covering the remainder of the communities with adequate networks and treatment facilities.

The Palestinian fish farm pollution control project focused on the current pilot fish farm and potential future fish farms in the LJR basin. The current four pilot fish farms in Jericho are not well lined against leakage. This project will assess the technical state of the fish farms and prepare for adequate lining and groundwater protection. The project will also focus on options for reusing the wastewater of the fish farms and on developing environmental standards for the management of current and future fish farms

The Land and Water quality management project aims at studying the vulnerability of the LJR Basin against groundwater, soil and surface water contamination, to prepare vulnerability maps for the study area and to assign and restrict rank land use according to this vulnerability assessment.

Remediation of Military Bases and Mine fields will be required once Palestine has been established as an independent state. The aim of this intervention is to clean all mine fields and remediate the by then former Israeli military bases within the Palestinian areas. This will include soil, waste and groundwater pollution assessment, remediation planning and implementation.

4.1.2 Sustainable Water Management and River Rehabilitation

The interventions related to sustainable water management focus on overcoming the water scarcity related problems in the Lower Jordan Valley, meeting the current and future domestic and agricultural water demands, preserving the water resources for future generations and for the environment, and establishing a clean Jordan river system that sustains a healthy ecosystem and the basin economy (see also annex 2 – Environmental Flows).

The total projected human water demands in the basin will have increased from about 694 MCM per year in 2010 to about 849 MCM / yr in the year 2050. However, the suggestions interventions in this basin plan will allow for full supply of these demands in 2050. Details are provided in section 5.3. “Water Demands and Supply Balance in 2050”.

The four strategic elements underlying this 2050 water balance are:

1. Allocation of the basin water resources to user functions within the basin itself. This implies that by 2050 some 238 MCM / yr of water will have to be released by Israel into the Jordan River from the Sea of Galilee. This implies that Israel will reduce pumping water from the Sea of Galilee into the National Water Carrier, and will have replaced this by other resources, such as desalinated seawater. However, it is assumed that Israel will maintain supplying its domestic and agricultural water needs in the basin from the Sea of Galilee and local water resources

2. Full treatment and reuse of generated wastewater within the basin for agricultural purposes, including 26 MCM / yr on the Jordanian side; 18 MCM / yr on the Israeli side and 26 MCM / yr on the Palestinian side by 2050

3. Maintaining future 2050 agricultural water use at the 2010 levels, with the exception of Palestine, which will be allowed a modest growth: 276 MCM / yr on the Jordanian side; 152 MCM / yr on the Israeli side and 125 MCM / yr on the Palestinian side by 2050

4. Developing the Lower Jordan River as a clean and multi-functional river system with a baseflow of 300 MCM / yr in the middle section, catering for nature conservation and environmental flows, supporting economic and tourism development in the basin, and using the river as the natural water supply conveyor from north to south. Using the river as conveyor for agricultural and urban water supply requires strict pollution, but will also require pumping stations and pre-treatment facilities to prepare drinking water quality.

This Master Plan believes these strategic elements can be implemented fully, assuming that by 2050 the three states will have established effective joint coordination mechanisms for management of water resources and the environment, as well as for managing security issues and regional economic development. The following interventions are foreseen:

Table 29 – Water Management related interventions

W01	REG	Jordan Valley Water Demands Management Project
W01	JOR	Improved Lower Jordan River Basin Management Project
W02	JOR	Wastewater collection, treatment and reuse project
W03	JOR	Emergency Wastewater Management Project
W04	JOR	Waste water reuse pilot projects
W01	PAL	Wells Rehabilitation and drilling of new well in the Jordan Valley
W02	PAL	Rehabilitation and Protection of Springs
W03	PAL	Rehabilitation and construction of Domestic water networks
W04	PAL	Desalination of brackish wells
W05	PAL	Rehabilitation of Al Auja Springs
W06	PAL	Development of Water Traffic structure
W07	PAL	Utilization off Al-Fashkha Spring

W08	PAL	Development of a West Ghor water conveyance system
W09	PAL	Utilization of Jordan River
W10	PAL	Artificial Recharge Scheme
W11	PAL	Construction of Water networks
W12	PAL	Hydro-Geological Assessment of the study Areas

The Jordanian interventions W01 – W04 shall be considered as one package, starting with the emergency and pilot projects W03 and W04, followed by W01 and W02. These projects shall furthermore be linked to existing infrastructure and national wastewater (reuse) policies, and be performed in an economically and ecologically sound manner under the proximity principle.

The aim of the Jordan Valley Water Demands Management Project is set up a system for instituting, regulating and monitoring of water demands and water use efficiencies for the Domestic and Tourism Sectors in the Lower Jordan River Basin. The Jordanian improved Lower Jordan River Basin Management project aims to improve the basin water management in terms of operational and information management of the Jordan Basin, and to prepare for full collection, treatment and reuse of locally generated wastewater in the basin. This includes investment planning and a pilot wastewater collection and reuse scheme, to demonstrate to the inhabitants in the basin the advantages of reusing treated wastewater for agricultural purposes.

The proposed Jordanian wastewater collection, treatment and reuse project focuses on realizing adequate and safe collection of wastewater from all the communities in the study area by constructing wastewater collection networks for 540,000 people in 2025 and 607,000 people in 2050; and to treat the generated wastewater from the different communities, including full scale reuse of treated wastewater in the Lower Jordan Valley: 25 MCM per year in 2025 and 33 MCM in 2050. Specific attention shall be given to treatment of wastewater originating from olive mills, which contain high BOD concentration and cannot be treated by regular domestic wastewater treatment plants.

Currently most wastewater in the Jordan Valley is collected in cesspits, which are partly in bad condition or irregularly emptied. This poses immediate threats for the public health and the environment. The aim of the Jordanian Emergency Wastewater Management Project is to make an assessment of the scope and extend of the current problems; to plan for a basin wide cesspits rehabilitation program; to increase capacities for emptying cesspits; to purchase additional tanker trucks for wastewater collection; to plan for related organization and operational aspects; and to implement these short term emergency measures.

In order to prepare for full scale reuse, a Jordanian pilot wastewater reuse project in the Lower Jordan River Basin is proposed as well, to serve as an example for the wider water and agricultural sector and as core for further expansion of local wastewater reuse throughout the basin. The pilot project shall be linked to collection and treatment of wastewater from existing cesspits in the Jordan Basin.

The Palestinian Well rehabilitation project aims at increasing the water resources availability and enhancing water efficiency from 30 wells in the Jordan Valley, and drilling of new well in order to increase water supply for different purposes from these 30 wells. In addition it is proposed to increase water resource efficiency and reduce losses through leakage and evaporation from the springs and the main channels.

The Palestinian project for rehabilitation and construction of domestic water networks focuses on 30 km of water networks of different diameters. It includes installation of filling points, distribution of 1.5 m^3 plastic

tanks and mobile water tankers with a variety of capacities, and rehabilitation of rainwater harvesting cisterns in marginalized communities.

The interventions related to desalination of Palestinian brackish wells aims at installation of small desalination units at 10 brackish water wells in the area, and rehabilitation of the related water network leading from these wells. The proposed rehabilitation of the Al Auja Spring includes rehabilitation of the main source of the spring and lining the 1 km stream from the source to prevent seepage of water into the subsurface.

The intervention related to the Palestinian water tariff structure focusing on developing a unified tariff structure for both domestic and agricultural water uses that will be used for the different water supply provides, and includes related framework for inspection, enforcement and incentives. This activity shall be developed in close coordination with the Palestinian Water Regulatory Council.

The aim of the proposed Al-Fashka Spring project is to establish a conveyor for 10 MCM of water from Al Fashkha spring through a 15 km long 36" diameter pipe and the construction of a 5,000 m^3 reservoir to cultivate about 10 thousand dunums of agricultural land at the southern entrance of Jericho City.

The West Ghor water conveyance system aims to develop a temporary solution for conveying water from north to south through the West Bank area in the Jordan Valley to strategic water distribution. Under this Master Plan this intervention will be required until the three countries have developed a regional and peaceful basin water management framework, in which eventually the Jordan River will be used as the main strategic water conveyor through the Lower Jordan Valley, and will at that stage replace under the vision of this Master Plan both this West Ghor water conveyor as well as the east Ghor / Kind Abdullah Canal. This final solution will require pumping stations on the River and the development of the necessary conveyance system to link to river to the main water demands in Palestine and Jordan. This temporary West Ghor water conveyor encompasses a water pipeline (20 inch diameter) about 60 km pipeline that goes from North to south through the Palestinian Jordan Valley.

The artificial recharge scheme is proposed to replenish the groundwater aquifers with access water during the rainy season, which will enhance and increase the safe yield of the aquifer in addition to improving water quality and reduce desalinization rates and finally to mitigate any future impact from climate change. In addition, the construction of water networks is proposed to facilitate the future urban extension areas in Palestine.

Finally, it is proposed to develop a hydro geological study for groundwater in the Palestinian part of the Jordan Valley to better understand the behaviour and development options of the aquifer system.

4.1.3 Sustainable Agriculture

The interventions related to the sustainable agriculture focus on improving water use and irrigation efficiencies and economic outputs in the Lower Jordan Valley, meanwhile limiting the agricultural water use in Israel and Jordan to the 2010 levels.

Increasing the agricultural value which is the focus of interventions which implies people making more money and water use is most efficient. This requires access to land and tenure security, access to water, and access to markets. The private sector is to play an important role in promoting these improved

investments in agriculture, while the role of the government is to provide an enabling policy environment, including effectively monitor and force regulations with respect to water use and pollution prevention and support family farms that are focusing on the LEISA agriculture.

In Jordan, the focus is on irrigation efficiency and economic output per unit of the crop per drop per water and on reuse of treated waste water. In the Palestinian, further development of irrigation is suggested allowed for four thousand hectares and six thousand hectares currently irrigated by settlers will be transferred over to Palestinians.

Furthermore commitment from all three countries will be required to successfully implement the proposed agricultural investments. The objective is that eventually there will be an integration and coordination of the three countries whereby each country uses its comparative advantage in terms of agricultural products.

The following interventions are foreseen:

Table 30 – Sustainable Agriculture related interventions

A01	REG	Jordan Valley Agricultural Water Efficiency
A01	JOR	Jordan Valley Greenhouses Expansion Project
A02	JOR	Jordan Valley Extension Services Improvement Project
A03	JOR	Jordan Valley Drip Irrigation Improvement Project
A04	JOR	Jordan Valley Post Harvesting Support Project
A05	JOR	Jordan Valley Irrigation Efficiency Improvement Project
A06	JOR	Jordan Valley Authority Support Project
A01	PAL	Shifting in Cropping Patterns
A02	PAL	Rehabilitation and upgrading of water systems
A03	PAL	Water Right Policies and Regulation
A04	PAL	Operate and expand the Agro-Industrial Park
A05	PAL	construction of Agricultural Roads
A06	PAL	enhancement of Palm Production`
A07	PAL	Development and Support livestock Sector
A08	PAL	Support to Women organizations and Bedouin Communities
A09	PAL	Land Rehabilitation
A10	PAL	Strengthening of Extension Services
A11	PAL	Pomotions of Farmers Cooperative
A12	PAL	Jordan valley Credit Program
A13	PAL	LEISA Reseach certification
A14	PAL	Establish an Agro-Industrial Zone in the Northern JV
A15	PAL	Handing over of Settlements Agricultural Lands

Improving the agricultural water use efficiencies is an important goal under this strategic objective. This will require setting up a system for organizing, regulating and monitoring the water efficiencies in agriculture, based on the EcoPeace Foot Print approach and international best practices. This requires assessment and analysis of current extension services and related flaws, based on field visits and interviews; provision of improved extension services to better manage and monitor water use and distribution; setting up a training center in the Jordan Valley- special focus on agricultural water efficiencies and water-related themes; and provision of services to optimize agriculture field water efficient crops.

Further it will be required to expand the number of greenhouses in the LJR to increase agricultural production and revenues, particular in Jordanian agricultural areas PS 41 and PS 55, and to expand the use of drip irrigation in the northern part of the Jordan Valley and to increase the operations and efficiencies of drip irrigation of the southern part of the Jordan Valley.

In addition, this plan proposes to increase the quality of extension services to all Palestinian and Jordanian farmers in the LJRB, and linking these services to the existing 26 WUAs in the Jordanian part of the basin. Palestinian WUAs or farmer organizations have not yet been established. It is proposed to facilitate groups of Palestinian family farms to invest jointly in user self-provision of irrigation, processing and/or marketing services for high value export crops.

This also requires that credits will become available to the farmer, which requires setting up a credit program focusing on semi-subsistence family farms, to overcome financial bottlenecks they face in adapting GAP and LEISA agricultural practices, and investing in drip irrigation and green houses. This also requires research activities, such as for obtain LEIA certifications.

In order to raise the economic outputs of the agricultural sector, it will be required to improve the post-harvesting and marketing potentials of the farmers in the Jordan Basin. This requires organizing farmers within the Jordan Valley in product organizations; providing them with relevant local and international market information; related product quality requirements, prices and logistic requirements; assisting the farmers with development of good business models and information of product processing and agro-industry, marketing approaches and access to export markets. Finally it is proposed to assisting the farmers with implementing joint pilot export initiatives for certain products.

Currently some large Jordanian farmers outsource their irrigation operations to specialized (private) operating organizations. These specialized firms apply computerized operating system linked to weather stations and dedicated operating software. It is proposed to expand these services to other farmers in the Jordan Valley as well.

This plan furthermore proposes to strengthen the capabilities of the Jordan Valley Authority in its role as authority and regulator of agricultural water supply in the Jordan Valley. This includes strengthening their water data collection and management and water sector planning capacities; improving the SCADA system and the operations of water storage and distribution networks in the Jordan Valley, and strengthening the role of JVA towards supervising the WUAs in the Jordan Valley.

For the Palestinian farmers it will be required to reduce their per dunum agricultural water demands through the adaptation of cropping pattern, and at the same time to increase their water availability by enhancing enhance water efficiency from wells and pond in the Jordan Valley. This will also require that policies, regulations and enforcement are developed to better organize agricultural water rights. Furthermore it is proposed to establish 100 dunums of male Palm trees farms and provide them with reproduction seeds, in addition to the construction of 1000 ton capacity packaging and storage centre

Since 2014 an agro-industrial park is under construction near the city of Jericho. This will contribute to strengthening the agricultural economic outputs considerably. The benefits of the agro-industrial park are to be maximized and expanded where possible, including development of a similar agro-industrial zone in Northern Part of the LJV.
It is proposed to support and strengthen the Palestinian livestock sector through providing buildings, tools, scissors, milking machines, by improving health safety through the introduction of new yoghurt processing

units and related measures. It is furthermore proposed to strengthen the Palestinian women organization programs, enhancing the economic conditions for women, including in the Bedouin communities.

The Palestinian agricultural sector is relatively small in size. It is therefore proposed to increase the irrigable Palestinian land by 40,0000 dunums, enhancing the agricultural production and increasing the food security in Palestine. Better and more agricultural roads need to be constructed to increase the accessibility to the different Palestinian agricultural areas, and upon independency of the Palestinian state the 60,000 dunums currently being irrigated by the Israeli settlers in the study area are to be handed over to the Palestinian.

4.1.4 Lower Jordan Basin Governance

Better coordination will be required to improve management of the basin's joint land and water resources, including water quality.

This Master Plan proposes establishing a trans-national Jordan River Basin Organization and creating a Palestinian Jordan Valley Authority.

In preparation for a final peace agreement in the LJR Basin, it is proposed to assess the feasibility and institutional set-up of a transboundary river basin organization (RBO) in line with the UN Watercourses Convention. The RBO's key objective is to ensure coordinated water resources and quality management between riparian countries Jordan, Israel and Palestine on a shared Jordan River Basin, while addressing the legitimate social and economic needs of each of the riparian states, and to enable joint development and management of water resources infrastructure between the riparians. The Organization may act as a coordinating body for the riparian countries of the LJR, fostering co-operation over water resources through a coordinated, transparent and democratic process.

The organization may be support by a technical support team, responsible for managing and exchange of trans boundary water quantity and quality information, and development of a shared water databank among the three countries. As reference earlier programs under EXACT – Water Data Banks Program can be looked at.

In addition, it is suggested establish a single Palestinian entity that is responsible for development planning and regulation of the Jordan Valley, similar to the JVA on the Jordanian side. This authority shall also address political, economic and environmental sustainability management issues.

4.1.5 Ecological Rehabilitation

The Lower Jordan River used to flow freely for thousands of years from the Sea of Galilee to the Dead Sea creating a lush wetland ecosystem, rich in biodiversity. The proposed interventions focus on restoring the good ecological status of the Lower Jordan River and its Basin. This will benefit the environment, and will improve the level of eco-services to the people in the basin. The eco-services that the rehabilitation river system will provide, typically include: access to the river for recreation and tourism reasons; water conveyance and supply and minerals (from Dead Sea)

The ecological restoration interventions proposed below depend however on the condition that first the pollution sources are to be removed from the basin, as discussed before. The following projects are proposed:

Table 31 – Ecological Restoration related interventions

E01	REG	Jordan River Environmental Flows Project
E02	REG	Jordan River Ecological Restoration Project
E03	REG	Jordan River Fisk Stock Restoration Project
E04	REG	Nature Protection Areas and Management Plan
E05	REG	International Accreditation of the Lower Jordan River Valley
E01	JOR	Ecological Corridors around Valleys and Dams
E02	JOR	Wetlands and Aquatic Fauna Restoration Project
E03	JOR	Ecological Monitroing and Management Project
E04	JOR	Jordanian Eco-parks and Projected Areas Project

The aim of the Jordan River Environmental Flows Project is to restore the rehabilitate the Lower Jordan River by increasing the water flow level in the river to an environmental efficient level that will aid in supporting not only the river riparian ecosystem services and biodiversity, but also the biodiversity of the basin in general. This project will depend on the gradual improvement of water quality, water supply and environmental flow into the river, and will include design and implementation of dedicated ecological restoration projects. The realization of this intervention is the corner stone for the success of most of the rest of interventions within this category.

The aim of the Ecological Restoration Project for the Lower Jordan River is to restore the green character of the river again – supporting not only the own riparian ecosystem services and biodiversity, but also the biodiversity of the region in general. This project will depend on the gradual improvement of water quality, water supply and environmental flow into the river, and will include design and implementation of dedicated ecological restoration projects and eco-parks along its borders, as well as detailed surface water quality and ecological protection and monitoring projects. One of these projects may relate to assigning “nitrate” vulnerability zones along the river, to prevent emissions of nitrate from farmer practices into the river system.

Such an important project shall contain various components, such as ddesignate specific sections with valuable habitats along the river as “no-touch” zones; performing the ecological rehabilitation for several years while constantly monitoring the changes; expanding the river flood zone, including side wadis, rehabilitation of river banks; dredging the flow channel where needed, and protecting buffer zones between the cultivated agricultural lands and the habitat along the stream.

This project will also require enriching the diversity of natural vegetation with the expected improvement in water quality; treating and removal invasive species and restoring diverse original (native) habitats to increase biological diversity in accordance with their suitability and the expected flow regime of the river. It furthermore requires preserving the stream meanders, including river bank protection and vegetation management.

Other requirements include landscaping and vegetation rehabilitation in river areas where fragmented, to enable continuous eco-zones, managing the environmental flow regimes in accordance with water availability, including regulated floods for the encouragement of vegetation development in riparian buffer zone and river maintenance in the first period after planting to prevent the overrun by common reed.

It is expected that maintenance and water quality monitoring can be reduced to a minimum after the vegetation is established. This project will be required to create sequences of ecological corridors along the stream including the possibility for the migration of fish upstream to the Yarmouk, development of specific touristic and hiking routes along the river and setting up a tri-partial river management structure for implementation and monitoring. Finally the project will preferably start with a pilot restoration project, such as in Wadi Ziglab.

The aim of the Jordan River Fisk Stock Restoration Project is to restore and protect the natural fish stock of the river and to recreate the aquatic structure, meeting the future quantity and quality standards of the water flow in the river.

The aim of the proposed Nature Protection Planning project is to make a detailed assessment of the nature and ecological status through the LJR Basin, including the nature areas designated earlier by the Israeli Military Authorities in the West Bank, and will lead to defining plans and policies for nature preservation and protection areas, including grazing lands and parks, under Palestinian, Jordanian and Israeli Law, and development of ecological protection plans beyond.

The aim of the obtaining international accreditation for the Lower Jordan River Basin with international organizations such as UNESCO World Heritage, Ramsar and IUCN Protected Areas is to draw substantially more international attention to the Jordan Valley and to create related ecological protection and economic growth opportunities. However, such accreditation will likely depend on a final peace settlement between Israel and Palestine, and appropriate integrated management structures for the basin.

The aim of the Jordanian Ecological Corridors project around Valleys and Dams is to restore the natural vegetation in areas surrounding dams in the eastern Lower Jordan River basin. This includes also restoration activities in areas surrounding the valleys that flow into the Lower Jordan River. This intervention is designed to support riparian areas ecosystem services and biodiversity, which will have far reaching positive impacts on the biodiversity of the region in general. In addition, work on this intervention will include the improvement of side valleys channel systems and discharge channels; and the reintroduction to these areas the natural plants and forest species as part of a systematical ecological restoration of the eastern Lower Jordan River basin.

The aim of the Jordanian Wetlands and Aquatic Fauna Restoration Project is to recreate the wetland and aquatic structure of the valleys flowing into the Lower Jordan and Yarmouk rives. This intervention is intended to create a balanced ecological system in which wildlife and aquatic fauna is re-introduced in all relevant elements of the Lower Jordan River basin. In particular, this intervention targets a select number of endemic dragonflies, reptiles, endangered and rare species of relevance to the Lower Jordan River basin. In-directly, this intervention will have a positive impact on the aquatic life and ecosystem services of the Lower Jordan River as well.

The aim of the Jordanian Ecological Monitoring and Management Project is to protect and regularly monitor the reservoirs of the Arab, Ziglab, Shueib and Kafrein dams from pollution; to create a water management plan for the dams in order to stabilize the populations of natural fish, Bat, Fresh water turtle, Common Otter Egyptian fruit bat; and to declare areas around the Yarmouk and Jordan river as protected national rangeland or forest reserves: including Wadi Damiya, Wadi Al Kharar, and King Hussein Bridge surrounding areas.

Finally, the Jordanian Eco parks and Protected Areas Project envisages protection of a number ecological parks and carefully selected special zones including a number of bird observation sites. These include

designating the Bakoura area, unique for its natural and cultural values, as a National Park; designating the area of the Al Hujaija Tree as a National Natural Monument; designate the Karama dam area as a National Park; setting a bird monitoring center at the Bakoura Park, Karama dam area, and the Jordan River, and expanding the SHE ecological park in the westerly direction until reaching the Jordan River.

4.1.6 Sustainable Tourism and Cultural Heritage Development

Sustainable tourism and cultural heritage development are key strategic objectives for saving the intrinsic cultural heritage and local culture values in the Basin, as well as for boosting the economy and create jobs. This will require investments in regional and national projects of various kinds by both the public and private sector. In addition it will be essential that the administrative procedures for obtaining visa for various nationalities will be simplified, that the reputation of the valley as a safe and pleasant destination will be established, and that the infrastructure, transportation means and accessibility of the valley will be improved.

The following interventions are proposed:

Table 32 – Sustainable Tourism and Cultural Heritage related interventions

C01	REG	Jordan River Mouth Tourism Information Center
C02	REG	Jordan River Baptism Site Improvement Project
C03	REG	Jordan River Peace Park Improvement Project
C04	REG	Jordan River Regional Routes
C05	REG	Cultural and Historic Museums network for the Lower Jordan Valley
C01	JOR	Pella Tabaqat Fahl Site Improvement Project
C02	JOR	Abu Ubaydah Tomb Improvement Project
C03	JOR	Cultural and Historic Museum for the Lower Jordan Valley
C04	JOR	Archaeological Landmarks Development Project
C01	PAL	Cultural Heritage Protection and Management Plan
C02	PAL	Tourism Branding and Promotion
C03	PAL	Museum of Natural and Cultural History of the Rift valley
C04	PAL	Rehablitation of the Catchment of Ancient Jericho
C05	PAL	Rehabilitation of salt industry sites, Rusheideyeh
C06	PAL	Rehabilitation of Ancient Jericho
C07	PAL	Rehabilitation of Hisham's Palace
C08	PAL	Rehabilitation of Tel Abu El Alayek
C09	PAL	Rehabilitation of Khirbet El biyadat or Tel Ouja
C10	PAL	Rehabilitation of Khirbet El Makhrouq
C11	PAL	Rehabilitation of Tel El Hamma
C12	PAL	Archaeological Landmark Features
C13	PAL	Spa, Thalasso therpy and Balneo therapy Center
C14	PAL	Jesus Village
C15	PAL	Hiking trail Development
C16	PAL	Sport and Adventure Center
C17	PAL	Travelers Centers
C18	PAL	Hotel Rooms 4 Stars (Resort)
C19	PAL	The Mud Brick Youth Village
C20	PAL	Youth and Guest houses

The proposed regional projects include development of a regional Southern tourism center at the meeting point of the Jordan River with the Dead Sea, aiming at providing information and guidance to tourists and visitors to the Lower Jordan Valley. The centre shall be linked to the main tourism related websites for Jordan, Israel and Palestine, and shall be linked to the main tourism support centres in Palestine, Jericho, Amman, Jerash; Petra, Wadi Rum and Aqaba. It also includes improving the tourism facilities at the Baptism site along the River Jordan, particularly with regard to establishing a good restaurant, a rest house, a bookshop and souvenirs shop on the Jordanian site, and a river walk, and integrating the Jordanian and Israeli / Palestinian site into one concept.

Furthermore it is proposed to combine two eco-parks on both side of the river: Al Bakoora and Naharayim into one Jordan River Peace Park'. Here already a small island was created at the junction of the Jordan and Yarmouk Rivers, and the Jeser Al Majama / Gesher site, known as the historical crossing point of the Jordan River Valley. This intervention aims at improving the nature facilities at the park along both sides of the River Jordan, particularly with regard to establishing a good restaurant, a rest house, a bookshop and souvenirs shop, and nature and river walks.

Finally it is proposed to establish a coordinated authentic network of museums in the three countries on a regional level, each one complementing the other, and to provide information on the natural, historic and cultural history of the valley from different perspectives, including specific information on the pre-historic importance of sites throughout the valley and key natural and cultural heritage objects and artefacts. This network will support growth of the tourism sector in the valley.

The Jordanian interventions include improving the tourism facilities at Pella and at Abu Ubaydah, particularly with regard to establishing motels, good restaurants, rest houses, bookshops and souvenirs shops, and link the sites to to the 20 Decapolis cities. Furthermore it is proposed to develop a Jordanian Cultural and Historic Museum linked to the proposed basin wide network, including information on the natural, historic and cultural history of the valley; specific information on the pre-historic importance of Deir Alla and presentations of key natural and cultural heritage objects and artefacts. Finally it is proposed to develop a series of important archaeological “Tell’ landmarks in the Lower Jordan Valley. This shall include visiting facilities, provision of touristic and historic back ground information. Finally it is proposed to linking the various sites by touring tracks for pedestrians and bicyclers, linking sites like Tell El Hammar; Tell Es Saidiyeh; Tell Es Sakhneh; Tell Kreinah; Tell North Shuna and Tell Umm Hammad.

The proposed Palestinian interventions include developing a cultural heritage protection and management plan focused on authentic tourism attractions that represent the value of the JV, including site development plans and a Cultural and Natural Heritage Preservation Center (CNHPC). Next it is proposed to promote and brand the Palestinian tourism sector internationally, to stimulate private enterprise growth and investments. Furthermore it is proposed to develop a Palestinian Natural and Cultural Museum linked to the basin wide network, including information on the natural, historic and cultural history of the valley; specific information on the pre-historic sites in the region and presentations of key natural and cultural heritage objects and artefacts.

In addition it is proposed to perform eight particular Palestinian cultural heritage rehabilitation projects, including Ancient Jericho and its surroundings; the salt industry sites at Rusheideyeh; the Hisham's Palace in Jericho Municipality; Tel Abu El Alayek; Khirbet El biyadat; Khirbet El Makhrouq and Tel El Hamma, as well as a series of valuable Water Mills, Water Sugar Mills, Water Aqueducts, Water Reservoirs and Watch Towers in the region. Furthermore it is proposed to develop a Jesus Village near Jericho and rehabilitate the Spa Thalassotherapy and Balneotherapy Centers into attractive religious and tourism destinations.

Furthermore it is proposed to develop attractive Palestinian hiking trails for tourists and for local people, particularly between Hezme and Jericho; Kofor Malek and Auja; Nabuls and Jiftlik; Toubas Tayseer and Ein el Beida, and to develop a travel center and a Sports and Adventure Center for local, regional and international tourist, including camping facilities and recreation facilities for family based tourism.

In anticipation of the growing number of tourists, it will be required to expand the volume of hotels with an additional 1550 rooms in the region as well. In addition it is proposed to develop traditional mud brick compounds to provide for an authentic stay in a traditional JV village environment, and youth and guest houses to facilitate for low-budget travellers in the region.

4.1.7 Urban and Infrastructure Development

The interventions related to urban and infrastructure aim at developing sufficient and affordable urban housing and roads, energy and telecom infrastructure and public facilities in the basin until 2050.

Table 33 – Urban and Infrastructure related interventions

U01	REG	Non-fossil, Renewable Energy Development Project
U02	REG	Adam / Damia Bridge Rehabilitation Project
U03	REG	King Abdullah Bridge Rehabilitation Project
U04	REG	Efficient Border Bridges Crossings
U01	JOR	Infrastructure Development Project
U02	JOR	Urban and Infrastructure development Master Plan
U03	JOR	Higher Education and Vocational Development Project
U04	JOR	Non-fossil, Renewable Energy Development Project
U01	PAL	Urban and Infrastructure development Master Plan
U02	PAL	Educational and Vocational Needs Assessment
U03	PAL	School building Program
U04	PAL	Higher Education and vocational Training Program
U05	PAL	Health Care services Development Project
U06	PAL	Electricity and Telecommunicaions Development Project
U07	PAL	Develop Renewable Energy Resources
U08	PAL	Import and Export Logistics Center

The regional energy development projects aims at creating renewable energy generation schemes in the Lower Jordan River Basin, leading towards a 50% renewable non-fossil energy share throughout the basin by 2050. Furthermore it is proposed to rehabilitate and open the Adam Bridge and Abdullah Bridge for agricultural goods and commercial traffic, as an additional outlet for imports and exports to or through Jordan; and to create more efficient border crossing regulations and procedures for all nationalities at the existing Allenby / King Hussein Crossing and Sheikh Hussein Crossing.

The current route 65 in Jordan is the main north south road through the Jordan Valley, and crosses all major villages in the valley. However, traffic along the road is dense and relative dangerous, and intersected by many minor roads and used by pedestrians, slow traffic and heavy traffic alike. It is proposed to supports the plans of the Ministry of Transportation, who is responsible for Infrastructure, to rehabilitate this road for local traffic purposes only, including safe pedestrian sideways, signs and lighting,

and safe crossings, bypasses, green corridors, related parks, and meanwhile constructing a new parallel North-South highway for heavy traffic that bypasses the urban centres.

The aim of the suggested Jordanian and Palestinian urban and infrastructure master plans is to develop detailed urban, infrastructure and physical land use plans for the LJV, taking into account the foreseen population and economic projections of the Lower Jordan River Basin, and considering to foreseen growth of the population to over 600,000 people in Jordan and 500,000 people in Palestine. This requires about numerous housing or apartment units in 2050, including related infrastructure, transport, water, sanitation, electricity and IT related utilities, public services, schools and recreational areas and facilities.

This Jordanian and Palestinian schools and higher education and vocational development projects aims at establishing primary, secondary and university level education facilities in the Lower Jordan Valley to accommodate (future) residents and to utilize hands on education and training to meet the developmental needs and the growing population, including agricultural and environmental research. Addition projects in Palestine are development of healthcare services, including centres and ambulances, and a dedicated import and export center.

4.2 Priority Setting

The sequence and timing of implementing these interventions as presented above depends on various factors. First, those interventions that are based on full co-operation among the three riparian countries will be implemented upon establishment of Palestine as an independent state, which for the sake of this NGO Master Plan has been set on 2020.

Secondly, some interventions have a logical sequence, where the initiation of one intervention depends on the result of others. For instance, rehabilitation of the ecosystems in the Lower Jordan River depends first on a successful removal of inflow of polluting substances into the river.

In the third place, the sequence of the interventions depends on the sense of urgency felt by the key stakeholders, considering the limited financial resources and absorption capacities of implementing organizations. In this context, the project organized a series of stakeholder meetings, where the long list of interventions were presented, discussed and prioritized in accordance with a pre-set list of evaluation criteria.

These criteria were based on criteria developed by SIWI for prioritizing the interventions. SIWI suggests a quantifiable, cross-cutting approach that scores interventions according to how they contribute to EcoPeace's vision for the Lower Jordan River Basin. These include Prosperity: Interventions should create opportunities to lift residents off poverty and contribute to the region's economic development; Peace: Interventions should have a peace-dividend, contributing to the wider integration of the river basin and create space for constructive cooperation between the three riparians; Sustainability: Each intervention should aim to maintain a positive impact on the environment and avoid degradation of existing resources, maintain a positive impact on society and become self-sufficient financially within a specified period of time.

The stakeholders were asked to evaluate the interventions against the following considerations:

- To what extend does the increase water availability, including drinking water and sanitation?

- To what extend does the project generate positive socio-economic impacts including peace prospects?
- To what extend does the project eliminates vector born diseases and other health impacts?
- To what extend does the project improve habitats and ecosystems?
- To what extend does the project improve water quality?
- To what extend is the project technical sound (e.g. ease of implementation, redundancy and robustness of the solution, flexibility to changing conditions, durability)?
- To what extend is the project compatibility to existing plans and policies?
- To what extend are the required investments costly?
- To what extend does the project receive political support?

4.2.1 Short Term versus Long Term Interventions

As presented above, the interventions have been prioritized and grouped into: (1) Short term interventions and (2) Long term interventions. Short term interventions are defined here as interventions that can be implemented before 2020, the suggested year of the establishment of an independent Palestinian State. Long term interventions are defined here as interventions that depend on the outcome of others, or on the prior establishment of the Palestinian State. They can be implemented after 2020.

All proposed pollution control related interventions received high priorities, and can be implemented in the shortest possible notice. These interventions will have direct positive impacts in terms of environment, ecology and public health, and will pave the way for other interventions, such as restoration of the ecology in the basin and maximized reuse of treated wastewater. The sequence and timing of the pollution control related interventions next depend on the financial resources and absorption capacities of implementing organizations. An exception is the suggested intervention related to remediation of mine fields and Israeli military basis, which depends on reaching a peace agreement between Israel and Palestine and should therefore be considered a Long Term intervention.

The proposed water management and river rehabilitation related interventions include both short term and long term interventions. The short terms interventions include all projects related to wastewater treatment and reuse and rehabilitation of springs and wells. The long term interventions are those that depend on regional co-operation or Palestinian access to area C, such as the development of the Jordan River as the natural conveyance systems, drilling new wells in area C and projects directly related to joint ecological and economic water management of the Jordan River.

The proposed agricultural interventions also received high priorities, since they have direct positive impacts in terms of water use efficiencies and increasing agricultural economic outputs. Most of the Jordanian interventions can be implemented in the shortest possible notice, with the exception of wastewater reuse actions, which depend on the realization of full collection and treatment of generated wastewater in the basin. The Palestinian agricultural interventions largely assume Palestinian control over area C, and are therefore mostly to be considered as Long Term Interventions. Some exceptions are policies and capacity strengthening related interventions, such as supporting communities and organizations, promotion of farmer associations and strengthening the extension services in the basin.

The proposed basin governance interventions are by definition long term interventions, since they depend on either full accessibility of the Palestinian Authority over the areas C, or on the establishment of Palestine as an equitable riparian partner. The proposed ecological rehabilitation interventions are long

term as well, since they depend on either on a successful removal of inflow of polluting substances into the river, or on full accessibility of the Palestinian Authority over the areas C.

Some of the interventions on sustainable tourism and cultural heritage can be implemented in the short term, while others have a long term perspective. All Jordanian site specific interventions can be implemented in short term, and so can the proposed Palestinian site specific interventions in areas A. All projects with a regional component, such as establishment of a network of cultural and natural museums or regional tourism information centers, or project located in area C are considered to be long term interventions.

The proposed investments in Urban and Infrastructure Development assume a supportive economic development perspective, which goes hand in hand with the realization of the above mentioned types of interventions. Also considering the fact that they are costly and require donor, public and private finance, these interventions are all considered to be long term, although preparatory work might well advance before 2020.

4.3 Disbursement and Finance

As presented in table 27, the totally required investments are 4.23. Billion US Dollars until the year 2050, excluding operation costs. The annually required disbursement schedule is shown below.

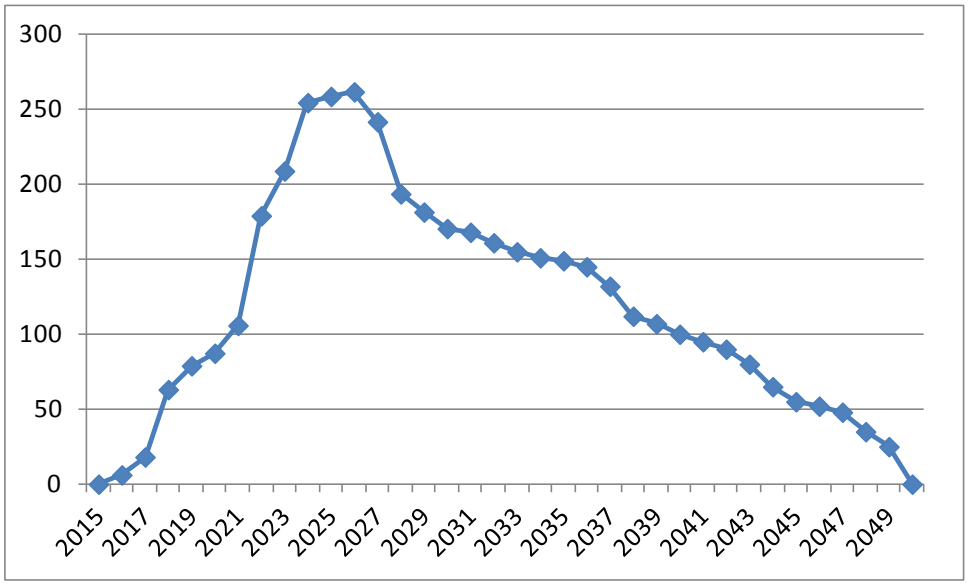

Figure 28 – Disbursement Requirements in MUSD per year

As shown above, the annual investment requirements gradually increase until the year 2025 and then gradually decline until the end of the planning period in 2050. During the short term period until 2020 the investment are still relatively modest, and mainly focus on pollution control, water management, agriculture and the tourism sector. The bulk in the investment will be required in the Long Term from 2020 onwards and include urban and transportation development investments. The annual investments will reach its

maximum in 2025, when about 260 MUSD of investments will be required, of which 91% relates to urban development and infrastructure investments.

This Transboundary NGO Master Plan for the Lower Jordan River Basin does not provide a detailed financing model for the required investments. The philosophy of this Master Plan predicts that the investments proposed here will gradually increase the economy of the region in a sustainable manner that will benefit the people, including related tax revenues, private savings, and eventually investment power; as well as the environment and the ecological status of the Lower Jordan River itself. This will particularly be the case if regional co-operation among the three riparian countries will flourish in a peaceful and safe living environment, which will also lead to higher number of international tourists visiting the region.

The type of financing required relates to the type of interventions, and will strongly depend, particularly during the initial 5 to 10 years of this Master Plan, on international donor funds. During this phase promotion and dissemination of this Master Plan and related investment plans will remain important to gain support from the international donor community. Particularly the NGO sector, including EcoPeace / EcoPeace may play a key role during this period.

It is expected that gradually the local and national governments will gain finance strength as a result of economic growth and higher tax revenues, leading to a higher public sector participation in the required investments. The private sector will also become increasingly important in contributing to the required investments, particularly for those projects that lead to healthy revenues against acceptable internal rates of return (IRR). Examples may be the proposed water reuse projects; agricultural improvement projects, urban development projects and tourism – cultural heritage related investments. Also the farmers will be able to pay more "realistic" water prices once the basin economy grows and agricultural outputs improve. Combination may also be possible, such as Public – Private Partnership in which the government and the private sector join forces in those cases where this leads to win-win situations for both

In this Master Plan it is assumed that the required investments in the Lower Jordan Basin, particularly in Jordan and Palestine will depend on international donor funds at least until 2030, reaching its peak by 2023 with about 150 MUSD donor investment requirements for that year. It is assumed that gradually national public investments and later on private investment will catch up due to increasing economic opportunities in the basin. This leads to the following investment scheme for the total package of interventions that have been proposed and listed in table 27, separated for donor funds, public investments and private investments.

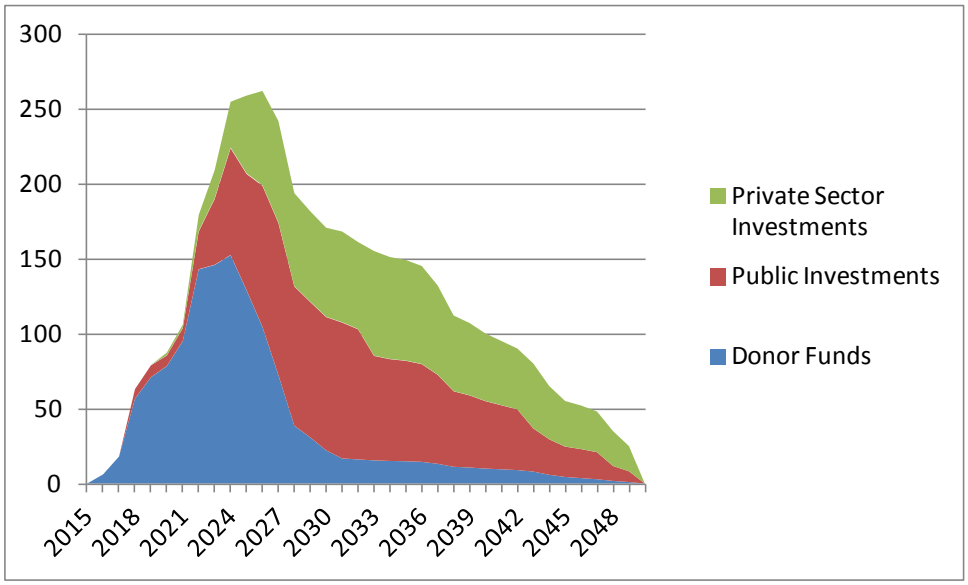

Figure 29 – Funding Model for the Lower Jordan River Basin in MUSD per year

4.4 Institutional and Governance Aspects

The aim of the proposed interventions in this Integrated Master Plan for the Lower Jordan River Basin is to use it as an advocacy tool with national stakeholders, international financiers and various actors of the international community to increase political will for the adoption in full or in part of the proposed interventions. The interventions that have been described in annex 1 include a suggested institutional setting for each. Financing for the proposed interventions has yet to be secured, and will require additional preparation and design activities, including elaboration of the proposed institutional and governance aspects, also depending on the specific requirements of the financiers, either nationally or internationally. However, it is foreseen that the national authorities will play the major role in implementation of most of the interventions, since its main task is the development, protection and improvement of the water and environment in the Jordan Valley.

The Municipalities and the civil community have to play an important role in the further preparation and implementation of the suggested interventions, since they represent the local population living in the basin, and they play a key role in providing services to these inhabitants in terms of water, wastewater collection and solid waste management. The subsidiary principle is again here relevant. In addition, proper Environmental and Social Impact Assessments, including stakeholder participation and if needed Resettlement Action Plans shall be part of all infrastructure preparation works.

Finally Eco Peace Middle East is foreseen to play a key role in most of the interventions as one of the major NGO's active in the Lower Jordan River Basin, particularly with regard to organizing grass root environmental protection activities, and engaging and organizing the local stakeholders in the further preparation and implementation of the proposed interventions. Furthermore, Eco Peace as a unique organization at the forefront of the environmental peacemaking movement, is therefore very well equipped to help promote trans-boundary co-operation and dissemination components of the proposed interventions.

5 THE YEAR 2050

5.1 The Basin Economy in 2050

Under the scenario and strategy described in this Trans-boundary Master Plan, by 2050 the Lower Jordan Valley will be a co-operative, confident and peaceful region with a healthy economy and strong development perspectives for the people living here. They will experience a clean and healthy environment and sufficient flows in the Jordan River to sustain healthy eco-systems. At the same time the river will act as natural water conveyor and source for water supply in the Jordan Basin. Water will be equitably shared among the three riparian countries and the basin will be freely accessible for all nationalities within an appropriate security framework. Local, private and foreign investments will be encouraged due to the stability in the region. In short, there will be an investment climate resulting from the reforms in general, and a conductive regulatory business environment that promotes sustainable development.

In 2050 the basin will house around 750,000 people in Jordan, 500,000 people in Palestine and 90,000 people in Israel, who will enjoy their living environment in terms of living, working and recreational conditions. They will live in a comfortable and sustainable urban setting with an average of about 3.5 people per household. There will be about 370,000 household units in the basin, compared to about 65,000 today. This will be the result of substantial investments in urban and infrastructure projects in the range of 3 Billion US Dollar until 2050, with relative smaller housing units than existing today. Meanwhile the roads and infrastructure have been upgrade with adequate traffic safety measures, including efficient public transport, bypasses around urban centers, pedestrian and bicycle sideway capacities and more.

Due to investments in tourism, sustainable agriculture and agri-business, as well as in housing, infrastructure, higher education and public services the people in the basin will enjoy attractive job opportunities. The economy will become more service and high added value oriented, with a higher percentage of people being employed in the service sector. The average income will have risen substantially to about 14,000 USD per person or about 50,000 USD per household in Jordan and Palestine and to about 72,000 USD per person in Israel.

In 2050 the Palestinian economy will experience substantial growth, unrestricted by land use or access and sufficient water resources to meet their demands as described before. This will have synergetic positive impacts on the basin economy at large, due to growth of export and import of goods and knowledge both from Israel and Jordan.

The basin economy in 2050 will strongly benefit from the expanding construction and real estate sector, responsible for the realization of the additionally required infrastructure and urban housing units. This in turn will have an economic spin of to related sectors, such as the stone and marble industries, public utilities, commercial sectors, telecommunication and more. In addition it is expected that land prices rises will contribute substantially to the overall economic growth. This will particularly be the case for the Palestinian land prices in (previous) area C. For instance the World Bank's economic analysis of area C and its future economy (Orhan Niksic et al, 2014) indicates that current cost per dunum in area C is around USD 80,000 compared to USD 250,000 per dunum in area B. These differences will gradually disappear in a future independent Palestine. , leading to an increase of average land prices.

The tourism industry will be one of the cornerstones of the basin's economy in 2050 and will largely benefit for the full co-operation among the three riparian partners that is foreseen by then. Up to 5 – 10 Million of national, regional and international tourists per year will visit the cities, nature parks, the cultural and religious sites and a wide variety of museums established in the basin, leading to an economic growth in the range of 5 – 10 Billion USD per year. In additional, the expanded urban centers will provide wide variety commercial services. This leads to an estimated 6,000 people in Israel being employed in the tourism and commerce sectors, 40,000 people in Jordan and 33,000 people in Palestine.

Table 34 – Economic Parameters Lower Jordan River Basin by 2050

2050	Jordan	Israel	Palestine
Average Household size (persons)	3,5	3,3	3,5
Average Income pppy, USD	14.000	72.339	14.000
Employment Agriculture (%)	5,00%	1,60%	5,00%
Employment Manufacturing / Constr	17,00%	16,50%	17,00%
Employment Tourism / Commerce	20,00%	19,50%	20,00%
Employment Transportation	3,80%	3,80%	3,80%
Employment Services / others	54,20%	58,60%	54,20%
GDP per person, USD	42.000	100.000	42.000
Total national Inhabitants	593.189	88.200	502.531
Total foreign population	150.000	0	0
Number of households	199.483	26.727	143.580
Buit up area requirements (km2)	107,0	35,7	78,8
Total Income (Billion USD / year)	9,35	6,38	7,04
Employees Agriculture	9.886	470	8.376
Employees Manufacturing / Constr	33.614	4.851	28.477
Employees Tourism / Commerce	39.546	5.733	33.502
Employees Transportation	7.514	1.117	6.365
Employees Services / others	107.170	17.228	90.791
GDP Jordan Valley (Billion / year)	29,9	20,4	22,5

By 2050, security related issues in the basin will be managed by a Security Coordination Body, representing key security officials of Israel, Palestine and Jordan. This body will assess and manage the security issues in the basin objectively and professionally, doing justice to the legitimate mobility rights of all people living in the basin, and the legitimate security rights of the people of Israel, Palestine and Jordan.

By 2050 agriculture in the basin has developed into a sustainable and agri-business oriented sector, making efficient use of the valuable water resources and generating high economic revenues as result of efficient extension services, high quality agricultural products and good access to regional and international markets. Due to efficiency measures, about 5% of the working force will be directly employed in agriculture.

The 2050 fiscal benefits for the riparian partners related to the projected economic growth, will be substantial, including VAT, income and corporate profits related taxes. This will lead to about 10 Billion of tax revenues within the basin. As described earlier in section 4.3, part of these public revenues will be re-invested in public domain infrastructure, public utilities and buildings, education, health care and more. As a result of this, the required annual investment packages identified in this Master Plan will be provided

fully by governmental budgets, replacing fully the international donor funds sometime between 2025 and 2030, following later by substantial private sector investments as well.

Finally, in 2050 the three riparian countries will have established in efficient transboundary River Basin Organization, which ensures coordinated water resources management between Jordan, Israel and Palestine on a shared Jordan River Basin, addressing the legitimate social and economic needs of each of the riparian states, to enable joint development and management of water resources infrastructure among the riparians. It will act as a coordinating water management body for the riparian countries of the LJR, fostering economic co-operation over water resources through a coordinated, transparent and democratic process. Projections of the main economic parameters for 2050 in the basin are presented in above table. The total combined basin economy will reach 73 Billion USD by 2050, compared to only around 5 Billion USD in 2010.

These economic projections are subject to a series of assumptions that are made as part of the 2050 Vision for the Lower Jordan River Basin, and require realization of the full co-operation scenario presented in this Master Plan, and full implementation of the suggested short term (or no regret) and long term interventions. If this scenario and strategy will not materialize, for instance due to continues dreadlock of the peace process, this will have substantial negative impact of all three national economies in the Jordan River Basin. The basic economic parameters in 2010 will likely to remain at the same level or even further reduce. The economic activities, including the construction, services and tourism sectors will not grow to the extent presented here, or may even shrink further. The total basin economy, depending on which negative scenarios will be adopted, will be stuck likely somewhere between 5 – 20 Billion USD in 2050, instead of the foreseen 73 Billion USD economy under this Master Plan. Moreover, the Palestinian economy and partly the Jordanian economy a well remain largely dependent on the international financial donor community for many years to come.

5.2 Land Use in 2050

The 2050 Land use plans have been developed on the basis of existing governmental land use allocation plans in Jordan and Israel, including the Israeli governmental northern district outline plan; and the Jordanian Jordan Valley Land Use Plan developed by JVA with support from the US Agency for International Development. Next, these plans have been modified on the basis of the 2050 population projections and related land additional land requirements. In Palestine no land use plans have yet been developed, and future plans have been developed after careful evaluation of current land use and various discussions with key stakeholders, including the Governorate and Municipality of Jericho.

Table 35 – Projected Land Use (km2)

Area (km2)	Israel	Jordan	Palestine	Total
2010				
Uncultivated / nature reserves	61.9	810.3	671.3	1,543.5
Agriculture	178.3	451.8	173.0	803.1
Built up area	19.6	44.6	25.3	89.6
Fish Farms	21.5	0.7	0.3	22.6
Water reservoirs	0.61	5.55	0.26	6.43
Wadis	5.3	24.2	13.8	43.24
TOTAL	**287.2**	**1,337.2**	**884.0**	**2,508.4**
2050				
Uncultivated / nature reserves	45.8	747.9	575.1	1,368.8
Agriculture	199.8	451.8	215.7	845.9
Built up area	35.7	107.0	78.8	221.5
Fish Farms	0	0.7	0.3	22.6
Water reservoirs	0.61	5.55	0.26	6.43
Wadis	5.3	24.2	13.8	43.24
TOTAL	**287.2**	**1,337.2**	**884.0**	**2,508.4**

Within this study, the following land types have been distinguished:

Uncultivated lands and nature reserves
These lands have not been developed, and part is controlled and protected as nature reserves. In addition, these lands are important for reasons of groundwater infiltration, as pastures, for sustaining nature and wild life, for recreation purposes and natural landscapes values, and as archaeological potential areas.

For 2050 it is assumed that the nature reserves remain to be protected, in addition an extra 1 km zone on both sides of the Jordan River. This zone will serve as new aquatic eco-zone and flood plain connected to the rehabilitated Jordan River. In addition, part of the non-protected uncultivated area will be developed in 2050 for urban expansion and infrastructure purposes as indicated in table 35. Furthermore, an additional 43 km3 of uncultivated land in Palestine will be developed for agricultural purposes by 2050.

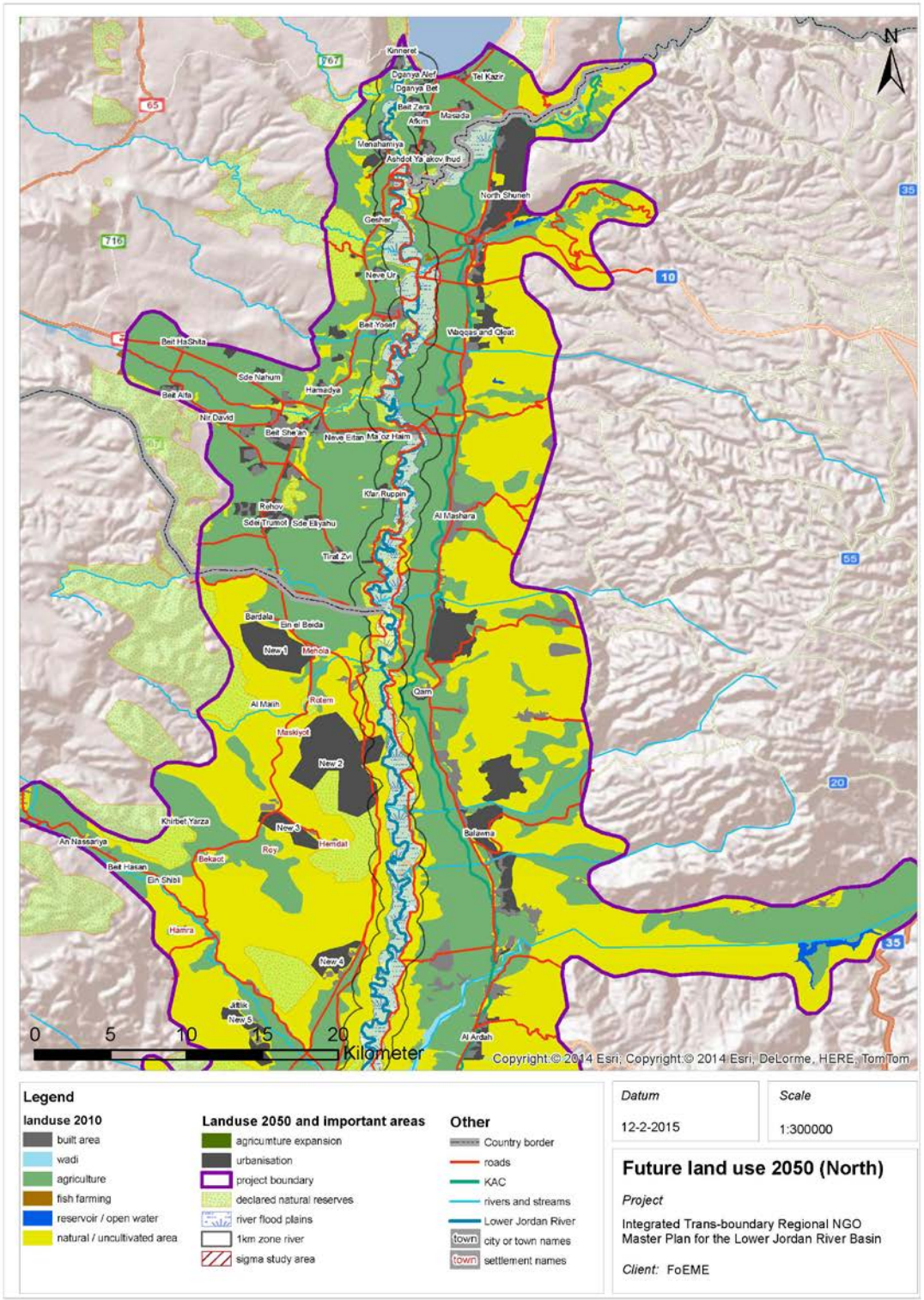

Figure 30 – Land Use Map 2050 for the Northern Part of the Lower Jordan River Basin

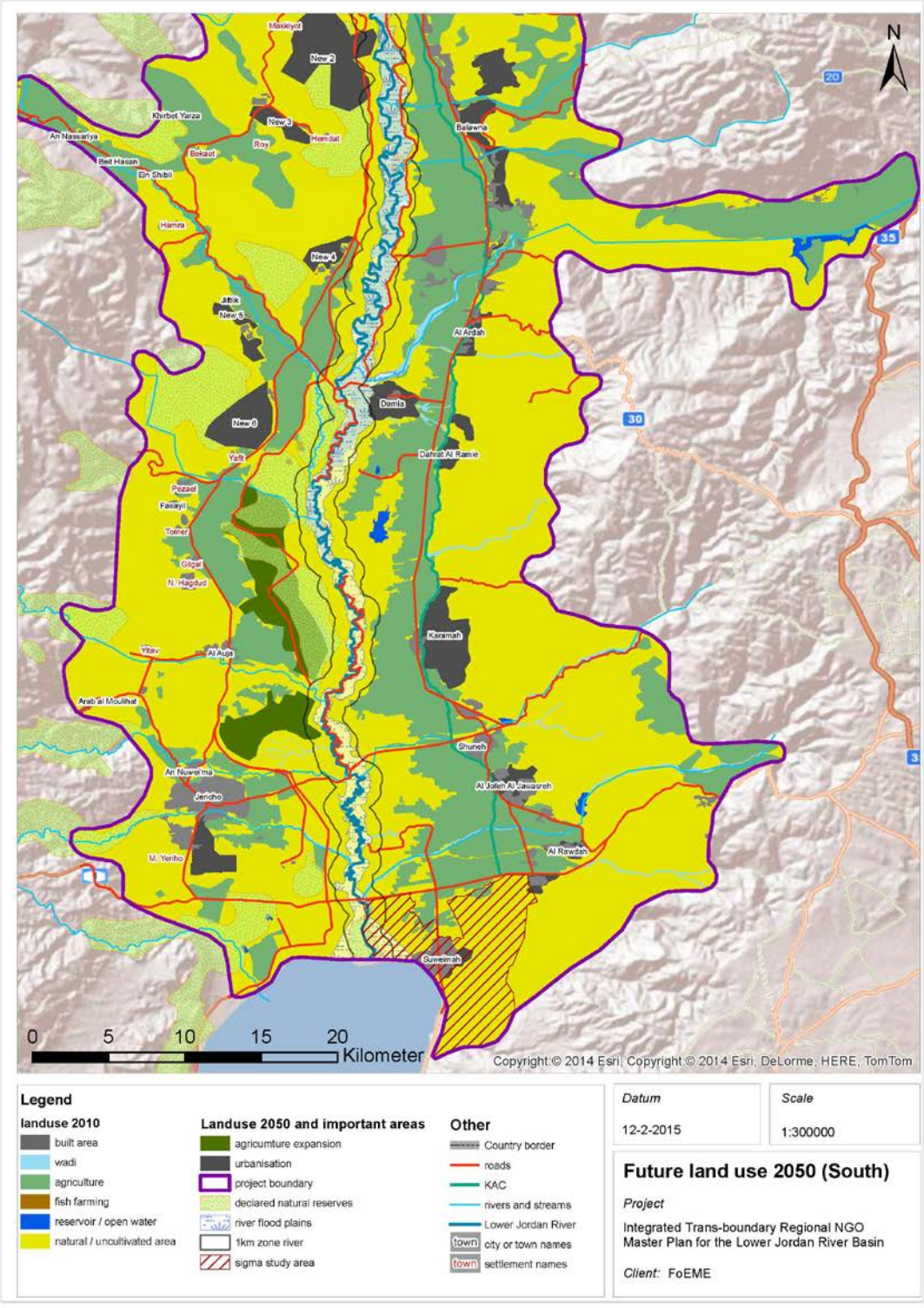

Figure 31 – Land Use Map 2050 for the Southern Part of the Lower Jordan River Basin

Agriculture

The lands currently used for agriculture have since long been used for reasons of soil fertility and water availability. However, some of the palm plantations have been developed only recently and irrigated with slightly brackish water. In this master plan it is assumed that this agricultural land will also in 2050 remain available for this purpose, and that no additional land in Israel and Jordan has been developed for agriculture, be it that it is assumed that the Israeli fish farms have turned into other types of agriculture with less negative environmental impacts. The agricultural lands however will apply more efficient water usage and generate higher economic outputs per km2 in 2050.

In Palestine, an additional 42.7 km2 of uncultivated land will be added to the agricultural area, and will be supplied with water from the Jordan River in 2050 mainly for palm plantations. The agricultural areas will next be protected in accordance with the following categorization: cat 1: highest value agricultural land with a slope of less than 5%; cat 2 valued agricultural land with a slope between 5% and 20%; cat 3 valued agricultural land with a slope of more than 20%.

Built up area

The built up area is defined here as space required for infrastructure and urban areas. The requirements for built up land will grow substantially until 2050 to facilitate a population growth close to 750,000 people in Jordan and 500,000 people in Palestine. As mentioned earlier, it is assumed that the Israeli population will grow from 49,000 today to about 88,000 is the year 2050. See also table 21 above.

The proposed allocation of built-up area proposed in the 2050 land use plans are fully based on earlier developed land use plans by the responsible Jordanian and Israeli authorities. In Jordan, for instance, substantial urban expansion is foreseen in North Shuneh, near Waqqas and in the middle and southern regions near Qarn, Balawna and Karamah. In addition a new economic development zone, called the Sigma Study Area has been planned in near the Dead Sea. The total built-up area in Jordan will grow from 44.6 km2 today to about 107 km2 in 2050. In Israel the built up area will grow from about 20 km32 to about 35 km2 in 2050.These plans include expansion of secondary and primary roads, and linkage to national highway system and public transport requirements.

In Palestine no regional land use plans have been developed that facilitate a population growth up to 500,000 by 2050. However, the “Jericho Master Plan – A Model for Sustainable Development”, was developed in 2014 with support from the Italian Government. This urban master plan aims at preservation the unique historic and cultural tangible and intangible heritage of Jericho; preserve the cultural landscape of the oasis and of the natural landscape of the desert; enhance the role of Palestinian Gate towards Jordan and the rest of the world; reinforce sustainable development and develop sustainable tourism in Jericho.

After careful evaluation of these existing plans, current land use and various discussions with key stakeholders, including the Governorate and Municipality of Jericho, it has been decided to locate the new urban areas in the Northern part of the West Bank. See figure 30 the cities called “New 1; New 2 and New 3”. Furthermore three areas in the Middle section have been allocated for urban expansion, called “New 4, New 5 and New 6”. Finally the area south of Jericho has been allocated for urban growth. This area is already subject to land development projects, such as the Jericho Gate project and the agro-industrial park being developed here. Totally, the Palestinian built up area will grow from about 25.3 today (including settlements) to 78.8 km2 in 2050 (no more settlements).

Fish Farms

The foreseen land use by 2050 in Israeli part of the Lower Jordan Valley is based on Israel's governmental northern district outline plan. This plan does not include extensive fish ponds anymore, since it is assumed that some turned into intensive sustainable ponds with elimination of all pollution related problems, and some will have developed alternative agricultural activities instead.

Water reservoirs, wadi's

In the proposed 2050 land use maps the lands allocated today for water reservoirs and wadi's will remain to be used for these purposes in 2050.

5.3 Water Related Impacts in 2050

This section provides a description of the water model that has been developed for the Lower Jordan River Basin under this study. The model has been constructed using the "Water Evaluation and Planning" (WEAP) software. This model WEAP has been built upon earlier models that have been developed for the area, including the WEAP model for the Roadmap for the Rehabilitation of the Lower Jordan River, the Harmonized Water Database for the Lower Jordan Valley, the Model for Water Supply and Demand for Effective Water Management Allocation in the Jordan Valley, and the WEAP Model for an Integrated Approach to Sustainable Management of the Jordanian Water Resources under Global Change by Glowa.

WEAP is based on the principle of closing the water balance in a basin, in order to understand the balance between the total water resources on the one hand, and the total water consumption on the other hand, leading to a model for the monthly and annual flows in the Lower Jordan River, as well as the salinity levels in the river. A preliminary step to devising future planning alternatives is creating a model of the present state, or current account..

General issues relate to the river modeling, including the timeframe, salinity, direct contact between groundwater and the LJR, runoff, and evapotranspiration from the LJR.

Time Frame

The hydrological year taken in evaluation is the year 2050, from October 1st 2049 until September 30th 2050 of the next year, with monthly model steps in between. The hydrological data include the projections of available water resources against protected climate impacts, including reduction in rainfall and increased evaporation rates.

Projected Water Demands

The projected water demands that have been considered within basin are presented in the next table. Details of these demands have been presented before.

Table 36 – Total Water Demands in the LJ Basin

Total Domestic Water Demands LJRB (CM)	2010	2025	2050
Jordan Domestic	22.239.720	29.843.979	51.955.104
From LJR Basin To Amman , North Gov.	60.000.000	80.000.000	100.000.000
Israel Domestic	4.410.000	5.197.920	7.056.000
Palestine Domestic	3.922.890	9.903.915	40.202.480
TOTAL	90.572.610	124.945.814	199.213.584
Total Agricultural Water Demands LJRB (CM)	**2010**	**2025**	**2050**
Jordan Agriculture	276.258.306	276.258.306	276.258.306
Israel Agriculture	151.652.000	151.652.000	151.652.000
Palestine Agriculture	85.170.469	125.170.470	125.170.470
TOTAL	513.080.775	553.080.776	553.080.776
TOTAL WATER DEMANDS LJR BASIN	603.653.385	678.026.589	752.294.360
Total Water Resources (MCM / yr)	506,18	658,67	744,34
Total Deficit (MCM / yr)	97,47	19,35	7,95

The projected Water Demands for Jordan until 2050 and related sources for water supply in the basin are presented in the next table.

Table 37 – Jordanian Water Demands and Supply in the Basin

Total Domestic Water Demands		2010	2025	2050
JMD 1	Agwhar Shamaliyah	6.536.580	10.509.846	20.917.056
JMD 2	Deir al Alla / Balqa	4.075.500	6.552.796	13.041.600
JMD 3	Shoonah / Janoobiyah	4.217.640	6.781.336	13.496.448
JMD 4	*Foreign population*	7.410.000	6.000.000	4.500.000
JMD 5	to Amman (and northern governorate)	60.000.000	80.000.000	100.000.000
	TOTAL	82.239.720	109.843.979	151.955.104

Total Agricultural Water Demands		CM / yr 2010	2025	2050
JAD1-4	Zone 1 (115,300 dunum)	103.596.865	103.596.865	103.596.865
JAD5-8	Zone 2 (74,959 dunum)	107.169.170	107.169.170	107.169.170
JAD9-16	Zone 3 (120,835 dunum)	65.492.271	65.492.271	65.492.271
	TOTAL	276.258.306	276.258.306	276.258.306
Total Water Demands (CM / yr)		358.498.026	386.102.285	428.213.410

Total Water Resources Jordan LJRB		2010	2025	2050
	Tiberias Carrier Pipe	47,00	100,00	100,00
	Purchased DW to Amman	9,00	9,00	9,00
	Groundwater wells in LJR Jordan	26,74	25,95	24,68
	Yarmouk River	15,21	14,76	14,04
	Import of Treated WW (Irbid and Amman)	0,00	14,00	29,00
	Mukheiba Well Field	27,70	26,88	25,57
	Wadi Arab Dam	10,98	10,66	10,14
	Wadi Ziglab Dam	3,06	2,97	2,82
	Wadi Al Jurum	2,30	2,23	2,12
	Wadi Abu Ziad	0,25	0,24	0,23
	Wadi Yabis Diversion	0,84	0,82	0,78
	Wadi Kufrina	2,43	2,36	2,24
	Wadi Rajib	1,66	1,61	1,53
	Zarqa Carrrier 1 / King Talal Dam	52,95	52,95	52,95
	Zarqa Carrier 2 / King Talal Dam	50,00	50,00	50,00
	Shouib Dam	6,25	6,07	5,77
	Kafreen Dam	11,51	11,17	10,62
	Wadi Hisban	0,78	0,76	0,72
	Local WW Reuse in LJR Jordan	*0,00*	*11,94*	*33,25*
	WW Reuse in LJR from Amman / Northern GV	*0,00*	*22,40*	*44,80*
	TOTAL (MCM / yr)	**268,66**	**366,75**	**420,27**
	Deficit	89,84	19,35	7,95

This water is will be supplied to: 2050				
Total Domestic Water Supply (CM / yr)		2010	2025	2050
JMD 1	Agwhar Shamaliyah	6.536.580	10.509.846	20.917.056
JMD 2	Deir al Alla / Balqa	4.075.500	6.552.796	13.041.600
JMD 3	Shoonah / Janoobiyah	4.217.640	6.781.336	13.496.448
JMD 4	Informal population (according to JVA)	7.410.000	6.000.000	4.500.000
JMD 5	to Amman / Northern Governorate	60.000.000	80.000.000	100.000.000
Domestic	**Subtotal**	**82.239.720**	**109.843.979**	**151.955.104**
Total Agricultural Water Supply			CM / yr	
		2010	2025	2050
JAD1-4	Zone 1 (87,000 dunum in 2010)	81.841.523	103.596.865	103.596.865
JAD5-8	Zone 2 (74,959 dunum in 2010)	71.803.344	97.577.530	104.489.941
JAD9-16	Zone 3 (70,041 dunum in 2010)	32.746.135	55.733.922	60.252.889
Agriculture	**Subtotal**	**186.391.003**	**256.908.317**	**268.339.695**
TOTAL SUPPLY		268.630.723	366.752.296	420.294.799

Table 38 – Israeli Water Demands and Supply in the Basin

Total Domestic Water Demands Israel (CM / yr)		2010	2025	2050
	Emek Hayarden	990.000	1.166.880	1.584.000
	Emek Hamaayanot	990.000	1.166.880	1.584.000
	Beit She'an	1.530.000	1.803.360	2.448.000
	Hagilboa	900.000	1.060.800	1.440.000
	TOTAL	4.410.000	5.197.920	7.056.000
Total Agricultural Water Demands Israel			**CM / yr**	
		2010	**2025**	**2050**
	Jordan Valley WA	21.237.000	21.237.000	21.237.000
	Afikey Main WA	52.015.000	52.015.000	52.015.000
	Harod WA	22.000.000	22.000.000	22.000.000
	Fish ponds	56.400.000	56.400.000	56.400.000
	TOTAL	151.652.000	151.652.000	151.652.000
	Total Water Demands	156.062.000	156.849.920	158.708.000
Total Water Resources Israel LJRB		**2010**	**2025**	**2050**
	Groundwater wells (NE Mountain Aquifer)	22,00	20,00	18,00
	Lake of Tiberias / Jordan River	45,06	45,77	50,00
	Local wells (LJR Basin) Israel	0,00	0,00	0,00
	Harod Stream	54,00	46,00	32,00
	Tavor Stream	2,00	2,00	2,00
	LJR Valley Springs	23,00	21,00	18,00
	Wastewater reuse in LJR Israel	*2,82*	*3,33*	*4,52*
	Wastewater reuse from outside sources	*0,00*	*0,00*	*14,19*
	Fish ponds reuse for agriculture in LJR	*7,00*	*18,00*	*20,00*
	TOTAL (MCM / yr)	**155,88**	**156,10**	**158,71**
	Deficit (MCM / yr)	-0,18	-0,75	0,00

Table 39 – Palestinian Water Demands and Supply in the Basin

Total Domestic Water Demands Palestine (CM / yr)		2010	2025	2050
Palestinians				
PMD 1	Bardala Cluster MD	315.540	1.184.575	5.649.520
PMD 2	Al-Bassariya Cluster MD	273.840	1.105.090	5.470.400
PMD 3	Al-Jiftlik Cluster MD	389.940	1.326.325	5.969.200
PMD 4	Fasayil Cluster MD	69.420	715.575	4.592.080
PMD 5	Al-Auja Cluster MD	265.380	1.088.990	5.434.000
PMD 6	Jericho MD	2.046.720	4.483.360	13.087.280
	Subtotal Palestinian	3.360.840	9.903.915	40.202.480
Settlements				
IMD 1	Cluster North MD	128.250	0	0
IMD 2	Cluster Central MD	356.400	0	0
IMD 3	Cluster South MD	77.400	0	0
	Subtotal Israeli Settlers	562.050	0	0
	TOTAL	3.922.890	9.903.915	40.202.480

Total Agricultural Water Demands Palestine		2010	CM / yr 2025	2050
Palestinians				
PAD 1	Bardala Cluster	10.558.755	13.658.850	13.658.850
PAD 2	Al-Bassariya Cluster	5.240.855	14.396.297	14.396.297
PAD 3	Al-Jiftlik Cluster	5.400.437	24.555.879	24.555.879
PAD 4	Fasayil Cluster	1.173.919	20.329.361	20.329.361
PAD 5	Al-AujA Cluster	3.991.597	23.147.039	23.147.039
PAD 6	Jericho	11.082.381	29.083.044	29.083.044
Settlements				
IAD 1	Cluster North AD	3.100.095	0	0
IAD 2	Cluster Central AD	36.621.768	0	0
IAD 3	Cluster South AD	8.000.662	0	0
	TOTAL	85.170.469	125.170.470	125.170.470
	GRAND TOTAL WATER DEMANDS	**89.093.359**	**135.074.385**	**165.372.950**

Total Water Resources Palestine LJRB		2010	2025	2050
	Local wells (LJR) Palestine	32,00	63,11	46,64
	Water Import (Mekorot)	29,46	0,00	0,00
	Local Springs (Fara, Auja, Jericho, Paza	19,00	25,00	25,00
	WW Reuse Import from West Bank	0,00	17,00	17,00
	West Bank Floods	1,00	1,00	1,00
	Jordan River (agriculture) Palestine	*0,00*	*25,00*	*50,00*
	Wastewater reuse in LJR Palestine	*0,00*	*3,96*	*25,73*
	TOTAL (MCM / yr)	**81,46**	**135,07**	**165,37**
	Deficit	7,63	0,00	0,00

As shown above, the proposed water resources will be more of less sufficient to provide the required water demands throughout the Lower Jordan River Basin by the year 2050. A summary of the proposed water resources within the basin to meet the projected water demands again are summarized below.

Table 40 – Summary of proposed water resources to meet the projected water demands (MCM)

Total Water Resources Total LJR Basin	**2010**	**2025**	**2050**
Tiberias Carrier Pipe to Jordan	47,00	100,00	100,00
Purchased DW to Amman	9,00	9,00	9,00
Groundwater wells in LJR Jordan	26,74	25,95	24,68
Yarmouk River	15,21	14,76	14,04
Import of Treated WW (Irbid and Amman)	0,00	14,00	29,00
Mukheiba Well Field	27,70	26,88	25,57
Wadi Arab Dam	10,98	10,66	10,14
Wadi Ziglab Dam	3,06	2,97	2,82
Wadi Al Jurum	2,30	2,23	2,12
Wadi Abu Ziad	0,25	0,24	0,23
Wadi Yabis Diversion	0,84	0,82	0,78
Wadi Kufrina	2,43	2,36	2,24
Wadi Rajib	1,66	1,61	1,53
Zarqa Carrrier 1 / King Talal Dam	52,95	52,95	52,95
Zarqa Carrier 2 / King Talal Dam	50,00	50,00	50,00
Shouib Dam	6,25	6,07	5,77
Kafreen Dam	11,51	11,17	10,62
Wadi Hisban	0,78	0,76	0,72
Wastewater Reuse in LJR Jordan	*0,00*	*11,94*	*33,25*
Wastewater Reuse from Jordan	*0,00*	*22,40*	*44,80*
Groundwater wells (NE Mountain Aquifer)	22,00	20,00	18,00
Lake of Tiberias / Jordan River	45,06	45,77	50,00
Harod Stream	54,00	46,00	32,00
Tavor Stream	2,00	2,00	2,00
LJR Valley Springs	23,00	21,00	18,00
Wastewater reuse in LJR Israel	*0,00*	*2,08*	*4,52*
Wastewater reuse from Israel	*0,00*	*0,00*	*14,19*
Fish ponds reuse for agriculture in LJR	*10,00*	*20,00*	*20,00*
Local wells (LJR) Palestine	32,00	63,11	46,64
Water Import (Mekorot)	29,46	0,00	0,00
Local Springs (Fara, Auja, Jericho, Pazael)	19,00	25,00	25,00
WW Reuse Import from West Bank	0,00	17,00	17,00
West Bank Floods	1,00	1,00	1,00
Jordan River (agriculture) Palestine	*0,00*	*25,00*	*50,00*
Wastewater reuse in LJR Palestine	*0,00*	*3,96*	*25,73*
GRAND TOTAL	**506,18**	**658,67**	**744,34**
* part of these resources are brackish, and can only be reused for specific purposes			

5.4 Jordan River Flow in 2050

5.4.1 Assumptions

In the vision for 2050 the Jordan River will play a crucial and multi-functional role. This implies that the water in the river will serve different important functions at the same time, in terms of sustaining ecology, supporting tourism and related economic development, and conveying and supplying water throughout the basin, particularly for Jordan and Palestine. However, the Jordan River is a dynamic natural water body, in which water flow and quality depend on a complex and time dependent interaction between inflow, abstractions, evaporation and groundwater flows.

To sustain the ecological conditions in the river, EcoPeace would ideally like to see a non-polluted flow in the Jordan River with a minimum of 400 MCM / yr, including the outflow into the Dead Sea.

In order to meet the water demands presented above, and to reach the flow targets in 2050, the following assumptions have been made:

- By 2050 some 238 MCM / yr of water will be released into the Jordan River from the Sea of Galilee. This implies that Israel will have reduced pumping water from the Sea of Galilee into the National Water Carrier, and will have replaced this by other resources, such as desalinated seawater. However, it is assumed that Israel will maintain supplying its domestic and agricultural water needs in the basin from local water resources. The monthly sequence of this release shall be managed in line with the river annual flow predictions (see table 40) and the annual water demands

- Meanwhile the Sea of Galilee will be kept on a medium water level between the top and bottom red lines (What is called now the "green line" by the IWA)

- All pollution flowing into the Jordan River will have ceased by 2025. This implies fully treatment of all wastewater, fully sanitary solid waste management in the Jordan, Israel and Palestine parts of the basin, and diverting salt water flows around the main part of the river. However, termination of all wastewater and waste pollution sources in the Israeli stretch from the Sea of Galilee to Nahareim is already foreseen by 2017, and in the stretch from Nahareim to the Harod Stream by 2020.

- By 2050 Jordan will use the Jordan River as its main water conveyor for water supply purposes instead of the current King Abdullah Canal. This implies that Jordan would stop diverting water from the Yarmouk and other tributaries into the KAC, and instead diverts this water to the Jordan River to the possible extent.

- By 2050 Amman will not only receive 60 MCM / yr from the Jordan River Basin, as today, but will return an additional 60 MCM of treated wastewater back to the Jordan River Basin.

- The river has a natural tendency to become increasingly saline in southern direction, mainly due to brackish groundwater inflow near the Dead Sea. This implies that fresh water can only be supplied from the upper stretch of the river and more brackish water from the lower stretch of the river. Quality requirements for different types of consumption are the following:
    - Raw drinking water quality -<400 mg/l

  - Low Salinity / Semi Fresh irrigation water quality -<600 mg/l
  - Dates irrigation water quality -<1500 mg/l

- In 2050 Palestine will receive from the Jordan River totally 50 MCM / yr.
- In 2050 an additional 50 MCM / yr of treated wastewater from the West Bank / East Jerusalem will be diverted into the Palestinian section of the Jordan River Basin
- Climate change will result by 2050 in a linear decrease of 20% of all water sources and increase in evaporation by 8%.

5.4.2 Salinity

In the WEAP model, salinity is the only indicator of water quality. Designated salinity values of water sources are mentioned below and are documented in the model itself. The calculations of Chloride (Cl) concentrations in the different reaches are based on simple mass balance with no decay mechanisms: Salinity of all the water sources is fixed throughout the year, except for the springs that nourish the Saline Water Carrier (SWC):

- Particularly, the salinity of the SoG does not change with water level and is fixed at 280 mg/L;
- Runoff salinity is 50 mg/L;
- Salinity of return flow from irrigation is 800 and 1500 mg/L for fresh and saline water respectively;
- Salinity of Israeli Sewage is 350 mg/L;
- Effect of evaporation on salinity in the Lower Jordan River itself is neglected.

5.4.3 Groundwater contribution

Groundwater Israel
Direct contribution of groundwater to the LJR from Israel (north of Bezeq Stream) was calculated according to Holtzman, who quantified groundwater in two segments of the LJR, between the Yarmouk and Harod Stream. The model simulates groundwater contribution, by adding groundwater inflow in two reaches: below the Yarmouk and below Issachar. The annual contribution of groundwater into the LJR was estimated to be 18 MCM, with an average salinity of 1150 mg/L.

Groundwater Palestine
For the West Bank (south to Bezeq stream) the current WEAP model assumes that groundwater inflow is constant throughout the year and is about 5-6 MCM/month. The salinity levels have been assumed to be similar range as measured by Farber et al.

Groundwater Jordan
In the southern part of East Bank, the shallow groundwater system consists of Lacustrine sediments and Clastic fluvial components. The aquifer has been developed largely since the 1960ies, and many shallow wells have been drilled, largely for irrigation purposes. Consequently, groundwater levels have dropped and salinity levels increased substantially. Where historically groundwater flow in the Eastern Jordanian valley area had a westwards direction, today more water is abstracted that recharged naturally. In this model it has therefore been assumed that there is no annual contribution of groundwater into the LJR from the southern Jordanian side.

5.4.4 Water Supply Assumptions

WEAP Modeling Assumptions

The aim of the Full Cooperation Scenario is to turn the LJR into the main water conveyor in the Jordan valley, while keeping the flow as long as possible in the river on one hand but minimizing the water discharge into the Dead Sea on the other hand.

The following conditions were assumed:

- Israel will reduce pumping water from the Sea of Galilee to the National Water Carrier
- Israel will maintain present agricultural consumption at the basin of the Sea of Galilee.
- By 2025 Jordan will stop diverting water from the Yarmouk and other tributaries to the KAC and have started using the LJR as main conveyor instead, to the possible extent.
- All Palestinian irrigation of fresh water will be supplied with effluents from the Jordan Valley as well as from outside towns such as Ramallah and Nablus.
- Amman will consume 100 MCM/Yr of potable water from the KAC and provide some 80 MCM/Yr of effluents (of which 70% will be used in the LJV).
- Irbid will produce 13 MCM/Yr of effluents, of which some 9 MCM/Yr will be used in the LJV.
- Water demands are in accordance with the above presented tables.
- Sea of Galilee is to be kept on a medium water level between the top and bottom rend lines (What is called now the "green line" by the IWA)
- All pollution from the river, with possible exception of fishponds groundwater leakage, will be removed from the LJR by 2025.
- All locally produced municipal wastewater will be treated and reused for irrigation.
- Water quality demand with respect to mg/l of Chlorides is:
  - Drinking water - 400 mg/l
  - Fresh irrigation - 600 mg/l
  - Dates irrigation - 1500 mg/l
- Water sources in the west bank amount to 85 MCM/Yr which include the Eastern mountain aquifer and springs.
- Climate change will result by 2050 in a linear decrease of 20% of all water sources and increase evaporation by 8%.

Main water supply assumptions

Within WEAP model run for 2050 the LJR will be largely divided into 4 zones. The following assumptions have been made:

- Water of drinking quality within the basin will be supplied from the Sea of Galilee to upstream of the confluence with Harod.
- Water for fresh irrigation quality purposes will be provided from the confluence with Harod to upstream of the confluence with Zarqa.
- Water for Dates irrigation quality purposes will be provided from the confluence with Zarqa to the confluence with Wadi Qilt
- From the Confluence with Wadi Qilt to the Dead Sea the river water quality will not be rehabilitated.

The brine water resources in the basin will be conveyed to the lower stretch of the Jordan River, at the confluence with Wadi Qilt and from there through the river into the Dead Sea. At this point the river will receive brine from two sources:

- Western Brine Carrier - A new conveyor west to the LJR that will carry water of the Saline Water Carrier, brine originating from desalination, and from fishponds discharges.
- Brine from the Abu Zeighan desalination plant

In addition, three major pumping points will be established as follows:

Pumping to the KAC

Pumping to the KAC upstream the confluence with Harod - The KAC will be used from this point on as a conveyor of drinking water quality to Jordan. it will convey 170 MCM/Yr from the LJR, of which 70 MCM will be supplied to JAD1 (irrigation), 22 MCM to JMD 1 (municipal) and 70 MCM will be transferred southwards. a reservoir network with a capacity of 30 MCM will be built to support supply to JAD1 and facilitate storage from winter to summer. The rest of the water to JAD1 will come from Mukheiba well and treated WW from JMD1 and Irbid.

Pumping for Irrigation at Zarqa

Pumping of irrigation water upstream to the confluence with Zarqa. The water will be distributed as follows:

12 MCM to a network of Palestinian reservoirs with a storage capacity of 40 MCM. The backbone of the system will be the existing Tirza reservoirs that will now serve for fresh irrigation. The reservoirs will also receive 32 MCM of treated local wastewater, 32 MCM of effluents from eastern Jerusalem, 18 MCM from local aquifer/springs and 1 MCM of floods from Wadi Fara'a to sustain Palestinian agriculture

60 MCM to Jordan as follows: (1) 55 MCM to JAD2. a reservoir network of 20 MCM will be built to support supply to JAD2 and facilitate storage from winter to summer. JAD2 will also receive 9 MCM of effluents from JMD2; (2) 5 MCM to JAD3. The bulk of supply to JAD3 will come as 55 MCM of treated WW from JMD3 and Amman. For that a reservoir of 10 MCM will be required.

Pumping downstream of Qaser El Yahud

Pumping downstream Qaser El Yahud (Upstream the brine discharge point) of 50 MCM/yr for the dates plantations in the west bank. The pumping will be concentrated in the winter so a network of reservoirs with a capacity of 40 MCM will have to be built.

5.4.5 Impacts on Flows in the Jordan River

The above data and assumptions lead to the following flow regime of the Lower Jordan River.

Table 41 – Anticipated Flows in the Lower Jordan River (2050)

Location on LJR	MCM month min	MCM month max	Avg mg/l Cl	Calculated * MCM/Yr	Estimated** MCM/Yr (incl additional 210 MCM reuse inflow from wider region)
Alumot	17	27	280	238	238
Yarmouk inflow	17	33	265	274	274
Withdrawal to KAC	18	35	320	291	291
Withdrawal to Tirza/JAD2	4	21	700[7]	138	230
Withdrawal to Palestinian dates	2	16	1350[8]	105	238
After last withdrawal	0	10	1350	55	215
After brine inflow	3	14	3050	90	287
Outflow into the Dead Sea				90	300

* Major inflows into the LJR that are above 5 MCM/Yr are the following:
  - Sea of Galilee – 245 MCM / yr
  - Groundwater inflow, spread along the entire river – 45 MCM / yr
  - Western Brine Carrier (inflow at Wadi Qelt) – 35 MCM / yr
  - Yarmouk – 34 MCM / yr
  - Valley of Springs – 12 MCM / yr
  - Harod Stream – 8 MCM / yr
  - Wadi Arab – 8 MCM / yr

** assuming additional 197 MCM / yr of treated wastewater diverted into the river from the wider regions in Jordan, Israel and Palestine, possibly generating hydropower at the same time

The calculated water balance will provide all demands in the basin by 2050, and the related flow in the Jordan River will reach in maximum just before the KAC withdrawal, with 291 MCM / yr. Next it will reduce towards the the Dead Sea (90 MCM / yr outflow into the Dead Sea). If one would aim at an outflow of 300 MCM / yr into the Dead Sea instead, this would require an additional inflow of 210 MCM / yr, including for instance a future contribution of Syria of 100 MCM / yr and additional 110 MCM / yr of inflow into the basin from wider sources of treated wastewater.

Detailed assessment of these alternative and additional resources goes beyond the scope of this study. However, in line with earlier studies, including those of the World Bank Study on Alternatives related to the

[7] in Nov-Apr, when most of the water is being taken, salinity is less than 600 mg/l. In the summer it is higher though, and that emphasizes the need for large reservoirs to facilitate more extraction in winter and also dilution of water.

[8] In summer and autumn salinity can top 1500 mg/l, which again necesitates reservoirs

Red – Dead Sea Water Conveyance Project, it may be assumed that this water can be identified in 2050 as inflow of additional treated wastewater into the basin from the wider regions in Jordan, Israel and Palestine.

Such additional release of water into the Dead Sea will come at a certain cost, which may be directly compared to economic benefits of the Dead Sea economy by 2050. It should be noted though that flows required for stabilizing the Dead Sea Water levels are substantially higher than 300 MCM / yr, and may reach to more than 800 MCM / yr.

The Palestinian fresh irrigation demands will be met from treated wastewater (32 MCM locally produced and the rest imported from upper Palestine. Here to, a reservoir network of 35 MCM will be required as wastewater supply is constant but the agricultural demand fluctuates. The backbone of the system will be the existing Tirza reservoirs that will now serve for fresh irrigation. The existing pumps on the Jordan River to Tirza reservoirs will serve as backup, but will not be used regularly.

The above water balance relies on natural resources only. Future water demands however, can be met, on average, via optimal usage of natural sources. Meeting the demand will become increasingly difficult though, with water quality problems throughout summer and autumn. For that reason large reservoirs (with a total capacity of nearly 150 MCM on both sides of the river) will be needed to facilitate storage from winter to summer. The above is true for average and wet years only. In dry years, which are frequent in this region, local water and WW will not be able to quench the demand. The 150 MCM of reservoirs will not mitigate shortage in dry years, as that storage volume is seasonal, from winter to summer, and not annual. There is little point in adding even more storage capacity as consecutive dry years are common and thus, water from wet years cannot be stored for future dry years (much less considering evaporation).

Hence, the solution is either reducing demand, or relying on a stable external water source. Calculations show that additional 120 – 190 MCM/Yr from an external source will be required to meet the environmental goals set by FoEME, on average. In dry years, the environmental goals will not be met in full though. The added water will also enable reliable water supply for consumers across the basin, except for the most extreme dry years[9]. That water will also allow reducing the required storage capacity, as more water will be pumped in the summer, when it is needed most.

Various alternative measures from outside the study area may be considered in this respect, such as presented in the World Bank Study on Alternatives for the Read – Dead Sea Program, Sept 2012.

1. Additional sources of generated wastewater from regions outside the Lower Jordan Valley, but still located within the watershed area may be treated and conveyed to the Lower Jordan Valley for agricultural applications.

2. The agricultural water demands in the Lower Jordan Valley may be further reduced through water efficiency measures and / or by limiting certain lower priority agricultural activities such as fish ponds. This may lead to a reduction of the total agricultural demands in the study area from 557 MCM / yr as assumed above, to 490 MCM /yr instead

[9] 2014 was the driest year in recorded history, to the extent that the natural water balance of the Sea of Galilee was negative. meaning that even if no water would have been pumped from the lake, its level would still go down that year. In such an extreme case, the Sea of Galilee cannot sustain a release of 250 MCM and so, water will be in short supply. Such a year however is infrequent.

3. Replacing the 60 MCM / yr supply of water from the Jordan Valley to Amman by other water sources or measures, such a Red Sea desalination, increasing DISI aquifer supply; maximization of wastewater reuse within the urban context, or lowering unaccountant for water percentages within the city

4. Conveying desalinated water from the Mediterranean to the upper part of the Lower Jordan Valley

5. Or a combination of above four measures

In all, the model calculations show that a sustainable and environmentally friendly water regime can be created in the Lower Jordan Valley by 2050 that creates a clean and healthy river system and facilitates the interests all riparian states appropriately, including the future independent state of Palestine,

6 FINAL CONCLUSIONS AND RECOMMENDATIONS

Eco Peace Middle East in partnership with the Stockholm International Water Institute (SIWI) and the Global Nature Fund (GNF) have assigned Royal HaskoningDHV in partnership with DHVMED, Core and MASAR Centre in 2012 to develop this transboundary NGO Master Plan for the Lower Jordan River basin. The major challenge of the LJR Basin is to rehabilitate the Lower Jordan River in terms of water flows and quality and ecological values; and to develop a sustainable water management framework and a healthy economic development perspective for the Jordanian LJR Basin. The aim of this draft plan is to identify feasible interventions that will restore the basin's environmental and ecological values within a realistic financial and economic framework.

The draft Strategic Objectives and associated interventions will help develop a final Transboundary NGO Master Plan. Presented in this report are a series of feasible interventions within the context of an integrated problem analysis of the region and an assessment and elaboration of the best possible solutions for these problems. This plan has been prepared in co-operation with a wide variety of Jordanian, Israeli and Palestinian stakeholders.

This transboundary NGO Master Plan will be finalized and presented at an international conference scheduled for May 2015 to be used as an advocacy tool by EcoPeace and its partners towards national and international decision makers and the international community for the implementation of the proposed interventions. The authors of this draft NGO Master Plan are also grateful to the excellent work and projects that have been done earlier in the basin, particularly the "Good Water Neighbors" (GWN) project, established by EcoPeace in 2001. This program proved to be a good example of how the challenges in the basin can be addressed from a regional perspective, based on the idea that identifying cross border communities and utilizing their mutual dependence on shared water resources is a good basis for developing dialogue and cooperation on sustainable water management across the national borders. Upscaling these good grass root examples to regional or national governance levels remains however a major challenge.

The above presented river flow will be average in the range of 300 MCM /yr. This water will be of potable quality due the pollution control related measures, and will allow for sustainable environmental flows. .

In all, the model calculations show that a sustainable and environmentally friendly water regime can be created in the Lower Jordan Valley by 2050 that creates a clean and healthy and multi-functional river system and facilitates the interests all riparian states appropriately, including the future independent state of Palestine.

Finding international and national partners for implementing the most urgent interventions is the next challenge. We trust that the depth of the analysis presented here and the consistency in the applied planning approach will convince these future partners that it makes sense to embark on implementing this plan, including continued co-operation on basin level within the Lower Jordan River among the Jordanian, Israeli and the Palestinian neighbors.

7 COLOPHON

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