Summary

The overall objective of this NGO Master Plan for Sustainable Development in the Jordan Valley is to promote peace, prosperity, and security in the Jordan Valley and the adjacent regions. All three governments, Jordanian, Israeli, and Palestinian, have shown considerable leadership to date in advancing sanitation solutions and in their master planning efforts. Given that so many of the interim interventions are implementable today, under the current geopolitical situation, investment in these interventions today will help solidify the overarching objective of the NGO master plan, advancing regional cooperation toward the two-state solution and regional integration. In this way, investment in the Jordan Valley presents itself as a priority area for donor states and the international community, as the investment seeks to bring returns that are greater than just developmental in nature. At a time when few opportunities appear on the horizon of Middle East peacemaking, investment in the Jordan Valley represents relative low-hanging fruit that needs to be advanced promptly.

The NGO Master Plan identifies feasible interventions that will restore the valley's environmental and ecological values within a realistic financial and economic framework. The plan assumes that a future independent State of Palestine will be recognized as one of the three riparian states in the Jordan Valley, side by side with Israel and Jordan with all three nations entitled to an equitable share of the valley's resources. The plan assumes furthermore free access to the valley for all people within appropriate and agreed security arrangements.

This plan will be used as an advocacy tool toward Jordanian, Israeli, and Palestinian decision makers and to donors and the international community, who are invited to cooperate, invest, help secure funding, govern, and implement the proposed intervention for the sustainable development of the Jordan Valley. The proposed Israeli interventions are to be funded by the Israeli government, while the international donor community is invited to assist the proposed Palestinian, Jordanian, and Regional, multi-country interventions.

The area covered in this NGO Master Plan relates to the Jordan Valley between the Sea of Galilee in the north and the Dead Sea in the south. It is shared by Jordan, Israel, and Palestine and is renowned around the world for its remarkable geographic features, its ancient civilizations, and its religious heritage. The environmental and ecological values of the basin have declined drastically during the last sixty years: Its water has been diverted; its ecological systems have been degraded; 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 inaccessible for the local inhabitants.

This Regional NGO Master Plan for Sustainable Development of the Jordan Valley aims at identifying feasible interventions that will restore the valley's environmental and ecological values within a realistic financial and economic framework, in which a future independent State of Palestine will be recognized as partner of Israel and Jordan, with all three nations eventually being on par in terms of development level and each entitled to an equitable share of the valley's resources, including full control of the natural resources within the national boundaries. The Israeli settlements in the West Bank will have been dismantled by 2020. Specific Palestinian and Jordanian projects that have been identified in the national plans need to be executed in order to bring the countries on par with Israel in order for all three parties to benefit equally from the implementation of the Regional NGO Master Plan.

The plan furthermore assumes free access to the valley for all people within appropriate and negotiated security arrangements. This plan addresses interventions on a regional and national scale in the areas of water management, pollution control, agriculture development, tourism and cultural heritage, land use, governance, sustainable energy, and urban development and infrastructure. The plan seeks to help create political will among Jordanian, Israeli, and Palestinian's decision makers toward the adoption of the plan in whole or in part and to gain the support of the international community toward the implementation of the proposed interventions.

This NGO Master Plan focuses on the Jordan Valley and provides general outlooks to the national water balances of Jordan, Palestine, and Israel only. Detailed water assessment at a national level or at a wider Jordan River Basin level including Syria and Lebanon goes beyond the scope of this study.

The rehabilitation of the Jordan Valley has been a central aim of EcoPeace's work since its establishment in 1994. Through education and advocacy campaigns, major research, and regional rehabilitation efforts implemented by our respective governments, some real changes have already been made. For instance, new sewage treatment plants are now operating in Jordan, Israel, and Palestine, enabling treatment of some of the polluted wastewater flowing currently into the river. Earlier research conducted for EcoPeace concludes that the lower part of the Jordan River will require 400 MCM of freshwater per year to reach an acceptable rehabilitation level.

In the framework of this study, assessment was made of the existing national plans in Jordan, Palestine, and Israel. However, these national plans generally do not include projections to 2050, and they do not specifically separate the actions required in the Jordan Valley. These aspects are specifically taken up in this NGO Master Plan.

It should be noted that the strategic objectives in terms of wastewater reuse and agriculture set in this Master Plan are ambitious and require a series of interventions to be implemented. However, this Master Plan assumes that a realistic water balance can only be achieved if the three countries embark on maximized reuse of wastewater for agricultural purposes. The suggested agricultural interventions include drip irrigation and other water efficiency measures, but also interventions to improve agricultural production, marketing, and extension services.

This NGO Master Plan provides a baseline of the current status of the basin in terms of land use, natural and cultural resources, the people living in the basin, their socioeconomic circumstances, the different economic sectors and related water demands, and the current governance of the basin. The Master Plan then delivers a projection of 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.

This Master Plan presents a series of strategic objectives for the valley including related interventions that aim at restoring the valley'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 describes the organizational, financial, and planning aspects related to these interventions. This Master Plan has been developed in close cooperation with important stakeholders in the valley. During a series of workshops, these stakeholders have been consulted and participated in discussions to identify the major problems in the valley and to formulate and prioritize the appropriate interventions to address these problems.

A total of 127 interventions have been identified. They aim at addressing all strategic objectives of the Master Plan and have been elaborated at prefeasibility level. This implies that indeed more details are to be elaborated during the next stage following the completion of this study, such as detailed feasibility studies, financing plans, and more. It is not unlikely that during this follow-up phase additional ideas and interventions will be proposed and developed to further fine-tune the actions required. The Master Plan authors are particularly grateful to the cooperation in Jordan of the JVA and in Palestine of the PWA. In Israel, two drainage authorities have either completed or are developing master plans in their area of jurisdiction.

EcoPeace is therefore also grateful for the cooperation developed with the Kinneret and Lower Jordan River drainage authorities in Israel.

This project used the Water Evaluation and Assessment Program (WEAP) to assess the impacts of the interventions on the Jordan Valley's water balance and the Jordan River flow. The WEAP model scheme including all applied nodes and flow lines is provided in Annex 9. Any additional information, including all background detailed hydrological assumptions, will be available on the Web site of EcoPeace.

The King Abdullah Canal (KAC) in Jordan has been constructed to safeguard the flow, supply, and water quality for irrigation purposes. This Master Plan assumes that the canal shall remain crucial until full cooperation between Jordan, Israel, and Palestine has been established in terms of river flow and water quality management. This Master Plan proposes that by then, the Jordan River will become a multi-functional river, serving the needs for nature and the economy, and will be transformed into the key water conveyor in the Jordan Valley from north to south. One of the quality-related aspects is that the southern part of the Jordan River will always remain salty due to brackish groundwater inflow and therefore cannot be used here as freshwater conveyor. This implies that the southern section of the KAC might remain operative. However, this Master Plan sees a multi-functional river as the only feasible option for creating a long-term and sustainable solution for the Jordan Valley.

The Jordan Valley

The Jordan Valley 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 part of the 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 are living in the study area on both sides of the lower part of the Jordan River, including about 55,000 Israelis (49,000 in Israel and 6000 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 study area has a total surface area of 2508 km^2, most of which (61.5 %) consists of uncultivated land. A total of 803 km^2 (32 %) is used for agriculture and 89.6 km^2 (3.6 %) as built-up area.

The average annual rainfall in the study area and the wider region 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 2,150 to 2,350 mm per year. The dominant soil types in the area are regosols, rendzinas, and serozems, which are mainly tertiary deposits, and to a lesser extent 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.

Historically, the lower part of the Jordan River received about 600 MCM/year from Sea of Galilee in the north and about 470 MCM/year from the Yarmouk River in the northeast. With some additional inflow from the Zarqa River and nine other streams from the East Bank, the lower part of the Jordan River had an outflow into the Dead Sea of about and 1200–1300 MCM/year. Since the 1950s, the water from the river had been increasingly diverted by Israel, Syria, and Jordan for domestic water supply and development of their agricultural sectors. The water is diverted mainly by the Israeli National Water Carrier taking water from Sea of Galilee, and through the development of various dams and canals in Syria and Jordan, including the Unity Dam on 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 70–100 MCM/year or less.

Climatically, the Jordan Valley is characterized by hot dry summers and mild wet winters, becoming progressively drier moving southward through the valley toward the Dead Sea. Climate change impacts are likely to intensify the water supply-related problems in the Jordan Valley. 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.

The Jordan Valley is characterized by a wide range of bioclimatological 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. Around spring and autumn, the Jordan Valley serves as an important migration route for some 500 Million 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 importantly, large portions, or even entire bird populations, pass through the Jordan Valley, as it serves as a bottleneck for bird migration.

An analysis of the environmental flow requirements for the 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 on 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 salinity and 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.

In thewestern part of the Jordan Valley, a total of 44 natural reserves and national parks have been assigned by Israel from Sea of Galilee to the Dead Sea. It should be noted that the nature reserves in the West Bank have been established by Israel unilaterally without the consent or cooperation with the Palestinians. 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 km^2, while the total protected areas south of the Bezeq stream as defined by Israel amount to 117.5 km^2. The areas of the natural reserves and national parks north of Bezeq stream tend to be smaller than those in the Palestinian West Bank. The protected natural reserves in Jordan are mainly located outside the Jordan Valley.

Pollution Sources

The major sources of pollution on the Jordan Valley include untreated wastewater and diversion of saline water into the valley, solid waste dumping and pollution from agriculture, husbandry, and fishponds. Untreated sewage water flowing in the Jordan River Basin is one of the major pollution sources in the study area. Many communities in Israel, Jordan, and Palestine discharge their untreated or poorly treated sewage water directly or indirectly (through groundwater seepage) into the valley.

Apart from the Israeli section of the study area, there is a lack of adequate sanitary waste disposal or treatment, both for domestic waste and for 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 Jordan Valley, including 120,000 tons in Jordan, 24,000 tons in Israel, and 18,000 tons in Palestine. Landfilling 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 valley area to be disposed of elsewhere.

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 Jordan Valley's

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 for irrigation. Most of the plastic is collected and sold to plastic recycling factories, located mainly outside the Jordan Valley.

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 farm ponds in the region totals to approximately 2000 ha. More than 90 % of the fishponds are concentrated around Harod Stream and in the Valley of Springs Regional Council. Evaporation in the ponds increases the salinity of the water in the ponds. The discharged influent water may have chloride concentrations varying between 2000 and 4000 mg/L depending on the concentrations in the inflow and the differences in operation. About 75 % of the influent water is discharged between October and December; the rest of the influent water is discharged as late as February.

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 Jordan Valley. In the West Bank, over 2,000 ha of land has been fenced by the Israeli military due to landmine-related risks. Some of the minefields 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 nonexistent. Most of the casualties have been children.

Cultural Heritage

The internationally recognized World Heritage values of the Jordan Valley are strongly related to its unique geographic features and its historic, religious, cultural, and archeological values. 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 in the northwest 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 are many other sites distributed in the 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. For instance, 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 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 center of Christianity and continued to be an important city throughout the Byzantine Period.

Infrastructure

The Jordan Valley is in 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 is connects Israel with Jordan though the Sheikh Hussein Bridge in the north and Palestine with Jordan through the King Hussein (Allenby) Bridge. The King Hussein Bridge is located just outside Jericho city and is the only connection between the Palestinian West Bank and Jordan. The Dead Sea Highway (Route 65) is the major regional highway in Jordan that crosses the Jordan Valley from north to south along the western Jordanian border and Dead Sea shoreline. All other roads leading to and leaving from the Jordan Valley connect to this road. The road passes through some heavily populated urban areas where it is widened to four lanes and divided with shops and buildings on both sides of the road.

On the western side of the Jordan River, the main road from north to south is Route 90. This road runs all the way from Metula in the north of Israel to Eilat in the south. 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 are obtained.

Population and Agriculture

The native inhabitants of the Jordan Valley in the early nineteenth 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 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, the Jordan Valley houses a population of about 605,000 people. The information with regard to the population numbers in the study area has 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 local population, whereas Jordan saw a large inflow of refugees as well. The natural population growth in Jordan and Israel contrasts with the Palestinians, for whom the economic opportunities in the region have been much more limited since the late 1960s. Palestinian youth has often been commuted or migrated to other regions in and outside the West Bank looking for opportunities in the labor markets.

In Jordan, the Jordan Valley houses large numbers of informal foreign workers originating mainly from Egypt and Iraq. Lately, the northern part of Jordan provides shelter to numerous refugees from Syria as well. It is estimated that a total of about 250,000 informal people live in the Jordan Valley today, many of them employed as temporary workers in the agricultural sector. In addition, 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.

Today, agriculture still dominates the socioeconomic 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 is a small group of wealthy agricultural entrepreneurs, next to a large group of laborers who live close to the poverty line of JD 32.6 per person per month. The Palestinian part of the Jordan Valley, excluding the Israeli settlements, has 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 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, experience lower temperature, and have better soils. These conditions enable the farming communities to cultivate field crops and tree crops under rain-fed conditions. The middle and southern zones receive marginal rainfall and have poorer soils and higher temperatures, and therefore higher evaporations. These zones where Bedouin nomadic communities used to rear their goats and sheep flocks are unsuitable for rain-fed agriculture. The altitude, climate, soil types, and water resources are different and unique for each of the agricultural zones.

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 UK, The Netherlands, Canada, Germany, and France, and to a lesser extent, 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 this agricultural production, since the bulk of output 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 market. 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 value chain contributes today to about 4.5 % of Palestine's GDP, compared to 13 % in 1993, with the Jordan Valley playing a very modest role. Israel still fully controls more than 60 % of the West Bank including the vast majority of the western Jordan Valley. In real terms, Palestinian agricultural production in the West Bank has fallen by 30 % in the last two decades. According to the World Bank, the Palestinian economy would grow by one-third if Palestinians had access to all the land in the West Bank. 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 USA.

Tourism

The Jordan Valley 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 states. Tourism in the 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 Jordan Valley. The potentials in terms of recreation, thematic site visits, and touristic tours are huge. The Jordan Valley is the home of a unique combination of tourist attractions. The Jordan River is a sacred, 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.

The tourism-related challenges, as identified by the Palestinian National Strategic Master Plan, include better enforcement and updating existing laws, by-laws, and regulations; developing urban plans with a clear tourism development vision; more archaeological research; better natural and cultural heritage management; tourism product and infrastructure development and management; and strengthening fund management capacities.

Industry

With the exception of the Israeli zone, the industrial sector is weakly developed in the Jordan Valley. 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 high external inputs agriculture (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 Jordanian industrial sector in the Jordan Valley consists predominantly of small industries for the construction sector and package industry. There are several quarries that produce materials for the construction of buildings and infrastructures in the northeastern 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 greenhouses. These small plants spread over the East Bank produce wooden and plastic crates and boxes for packing commercial farmers' produce in accordance with the demands of export markets.

The agricultural sector in Israel has established strong backward and forward linkages through kibbutzim's organization structures. The economic scales of the kibbutz farms enabled mechanization of farm operations and investment 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, such as the production and installation of drip irrigation systems, or in forward industrial services such as 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.

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 valley at 80 m^3 per capita per year.

Agricultural water demands in the valley 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 the open field and vegetables in greenhouses, fruit trees, and field crops. The agricultural water demands have been defined on the basis of currently utilized agricultural lands.

The estimated total water demands in the study area are 647 MCM/year (base year 2010), including 60 MCM/year diverted to Amman. This is approximately 72 % of the total annual water resources available in the Jordan Valley. The actual water supply figures are based on the information obtained from the major water supply authorities and associations in the valley, 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. The following page provides an overview.

The Water

Evaluation and Assessment Program WEAP has been used to calculate the impacts of these water demands on the lower part of the Jordan River itself. This confirms that 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 2409 mg/L salt. Near the Bezeq stream, the flow slightly increases to about 80.5 MCM/year with 1448 mg/l of salt. When it finally meets the Dead Sea, the flow has reached a maximum with about 102.5 MCM/year. Clearly, these values do not meet any of the criteria for lifting the river to a healthy ecological status, and concise interventions will be needed, starting with preventing salt and pollution inflow into the river and mitigating their polluting sources, and next finding sustainable and sensible solutions for a steady increase of the river's base flow.

Governance

The Jordan Valley Authority (JVA) is the most influential organization in the Jordanian part of the Jordan Valley. 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 and 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 and approves all new development initiatives on the basis of the Land Use Master Plan, prepared in 2004. In addition, the Water Authority of Jordan deals with water resources development and focuses on water for domestic and industrial use. The Ministry of Agriculture (MOA) supports the agricultural sector and governs the natural forests in Jordan. The local municipalities are responsible for providing most of the local public services.

Water Balance 2010

Area	Number	Unit	Type	Demand (CM)	Actual Supply (CM)	Deficit (CM)
Jordan						
Agwhar Shamaliyah	108.943	population	domestic	6.536.580	4.902.435	-1.634.145
Deir al Alla / Balqa	67.925	population	domestic	4.075.500	3.056.625	-1.018.875
Shooneh / Janoobiyah	70.294	population	domestic	4.217.640	3.163.230	-1.054.410
Foreign Population	247.000	population	domestic	7.410.000	5.557.500	-1.852.500
To Amman				60.000.000	60.000.000	0
Shooneh North	115.303	dunum	agriculture	103.596.865	94.931.034	-8.665.831
Deir Alla	74.959	dunum	agriculture	107.169.170	62.068.966	-45.100.204
Shooneh South	120.835	dunum	agriculture	65.492.271	35.000.000	-30.492.271
Total				***358.498.026***	***268.679.790***	***-89.818.236***
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	100.000.000	100.000.000	0
Total				***199.662.000***	***199.662.000***	0

Area	Number	Unit	Type	Demand (CM)	Actual Supply (CM)	Deficit (CM)
Palestine						
Palestinians						
Bardala Cluster	5.259	population	domestic	315.540	315.540	0
Al-Bassariya Cluster	4.564	population	domestic	273.840	273.840	0
Al-Jiftlik Cluster	6.499	population	domestic	389.940	389.940	0
Fasayil Cluster	1.157	population	domestic	69.420	69.420	0
Al-Auja Cluster	4.423	population	domestic	265.380	265.380	0
Jericho	34.112	population	domestic	2.046.720	2.046.720	0
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	3.605.687	-1.635.168
Al-Jiftlik Cluster	7.885	dunum	agriculture	5.400.437	5.334.000	-66.437
Fasayil Cluster	1.714	dunum	agriculture	1.173.919	1.173.919	0
Al-AujA Cluster	5.828	dunum	agriculture	3.991.597	3.991.597	0
Jericho	18.854	dunum	agriculture	11.082.381	11.082.381	0
Total				*40.808.783*	*33.175.424*	*-7.633.360*
Israeli Settlements						
Cluster North	1.425	population	domestic	128.250	128.250	0
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
Total				*48.284.576*	*48.284.576*	*0*
Total				***89.093.359***	***81.460.000***	***-7.633.360***
GRAND TOTAL			**CM per year**	**647.253.385**	**549.801.790**	**-97.451.596**

In Israel, the Ministry of Energy and Water Resources (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 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. The Kinneret Drainage Authority is responsible for river rehabilitation issues from the outlet of the Sea of Galilee to the confluence between the Jordan and Yarmouk rivers and the Lower Jordan River Drainage Authority from the Yarmouk to Bezek stream on the Israeli side. 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. The Ministry of Agriculture and Rural Development (MOAG) is responsible for agriculture, land preservation, veterinary services, and rural land use planning. The Ministry of Environmental Protection is responsible for the protection of the environment and ecosystems, with a department dedicated to stream and river rehabilitation. The Israeli part of the Jordan Valley is governed through three local councils.

The Palestinian Authority, according to the Oslo Accords, governs only the areas A and B, or about 10 % of the total surface area 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; and Palestinian Water Authority. The Palestinian Water Authority is responsible for management/regulation of water, drainage, and sewage affairs. The Palestinian Environmental Quality Authority is responsible for implementation of the environmental law of 1999, with the objectives to protect the environment against all forms and types of pollution and to protect public health and welfare. The Ministry of Tourism and Antiquities (*MOTA*) is responsible for governing the tourist sector and the antiquities in Palestine, similar to its counterparts in Jordan and Israel.

In June 2014, a new Palestinian Water Law was passed. An important pillar of the water law is the establishment of a Water Sector Regulatory Council (WSRC). The main objective of the WSRC is to monitor all matters related to the operation of water service providers, with

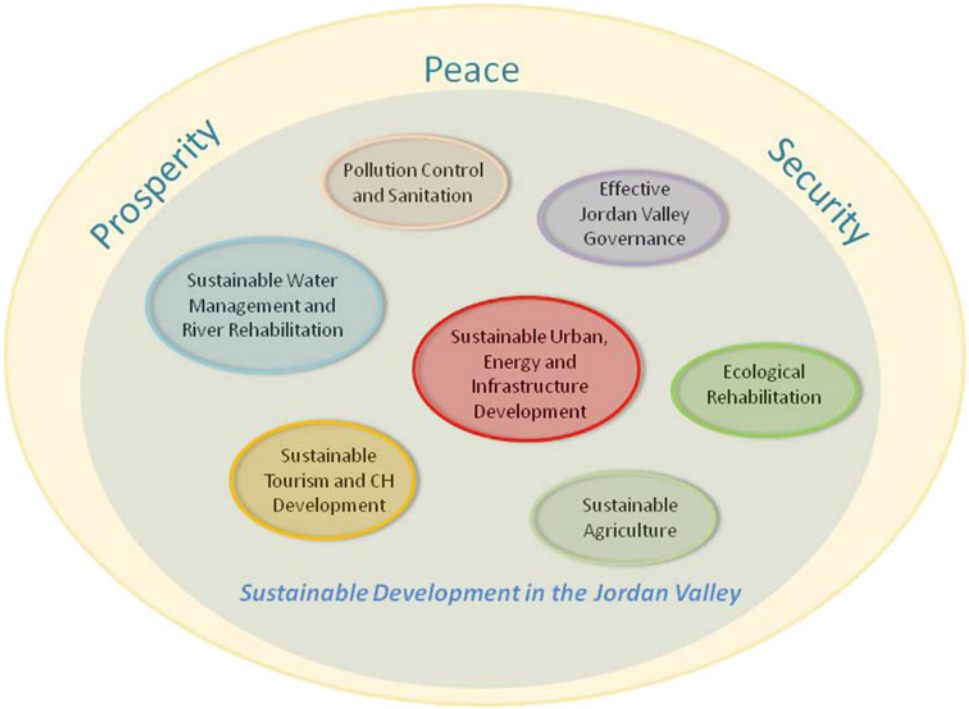


Fig. 1 Strategic planning objectives

the aim of ensuring water and wastewater service quality and efficiency to consumers in Palestine at affordable prices. The council is to monitor operational performance related to activities of water service providers including production, transportation, distribution, consumption, wastewater collection, treatment and disposal, and reuse of treated wastewater for irrigation.

Since 1967, the Jordan River has been under the control of the Israeli and Jordanian militaries, 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. On both sides of the river, a key strip of land is inaccessible for the general public.

The Israel–Jordan Treaty of Peace was signed by the State of Israel and the Hashemite Kingdom of Jordan in December 1994. The peace process between Israel and Palestine seems today far from concluded. During the 2013 and 2014 Peace Negotiations between the Palestinians and Israelis, 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.

Projections for 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 valley in the years 2025 and 2050. This includes natural growth of the autonomous population to 0.92 % in 2050. In addition, this master plan assumes that in Jordan, the high number of foreign inhabitants in the valley 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 Jordan Valley will be removed and that the independent Palestinian State created will see a growth toward an estimated 500,000 people living in the Palestinian section of the Jordan Valley by 2050. It assumes natural population growth under strong economic development conditions in Israel. These

Fig. 2 Regional Jordan Valley coordination scheme

assumptions lead to a total projected population in 2050 of 1.048 million people living in the Jordan Valley, from the southern tip of the Sea of Galilee to the northern edge of the Dead Sea.

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, or Israeli. The total domestic water demands within the Jordan Valley for 2050 are 99 MCM/year. The agricultural water demands in the Jordan Valley are about 553 MCM in 2050. The total amount of wastewater that will be generated in the valley is directly related 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 extent. It is assumed that by 2050, 80 % of all generated wastewater in the valley (or 64 % of all urban water supply, or about 63 MCM/year) will be reused for agricultural purposes. In addition, it is assumed that about 44.8 MCM/year of the total 100 MCM supplied to Amman and the northern governorates will return again to the Jordan Valley for agricultural reuse 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 per person per day in 2025 and to 600 kg per person per day in 2050. This leads to about 800,000 tons of waste being generated in 2050 in the valley (Fig. 1).

Strategic Planning Objectives

The key challenge facing sustainable development in the Jordan Valley 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 ecosystem 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 valley. 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, stability, and security for their residents in the valley and beyond. A key condition for meeting this challenge is that Palestine is recognized as a full riparian state to the Jordan River, entitled to have access to its fair share of water resources and sovereignty over its lands in the valley.

The objective in terms of pollution control is to eliminate all sources of environmental pollution in the Jordan Valley by 2025. This requires full and adequate treatment and reuse of all wastewater flows in the valley and to embark on fully integrated solid waste management. In terms of sustainable water management, the key challenge clearly is to overcome the water scarcity-related problems in the 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 water resources for future generations and for the environment.

Sustainable agriculture development is one of the most important pillars of the Jordan Valley Plan as it provides livelihood and prosperity for all people in the valley. The strategic agricultural objective for the study area is to improve water use and irrigation efficiencies and economic outputs per unit of water used.

The institutional challenge will be to strengthen responsible land cooperation among the involved authorities, including JVA, WAJ, IWA, and PWA, drainage authorities, municipalities, and other related authorities in their role as authorities and regulators of the Jordan Valley. Improvements are required in areas such as water data collection and management; water planning; and 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 more efficient and beneficial water economy.

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

One of the key challenges in the Jordan Valley is to restore the good ecological status of the Jordan Valley 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 floodplain 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 development of dedicated nature recreational areas for the urban population.

Development of the tourism sector and 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 creating jobs in the area. This requires investment planning for major sites such as Pella, the Bakoura National Park, Naharayim, Old Gesher and Jericho, developing transboundary sites, creating free tourism areas 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.

To facilitate the anticipated population and economic growth in the Jordan Valley, it will be crucial to develop sufficient urban housing and infrastructure facilities in the valley and meanwhile increase traffic safety and public transport capacities. This is specifically relevant for 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;

preparation for urban planning and housing projects to accommodate the foreseen growing population and its welfare; and development of transboundary infrastructure facilities, such as opening up of the Damya Bridge and the Abdullah Bridge over the Jordan River.

Meeting the Planning Objectives

A total of 127 interventions have been identified with a total investment value of 4.58 Billion USD. 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 Israeli (ISR), Jordanian (JOR), Palestinian (PAL), or Regional (REG) interventions. It is assumed that the Government of Israel will finance all Israeli interventions and might cofinance regional interventions.

For every set of interventions, a separate regional coordination intervention has been formulated, setting up a regional coordination structure, or steering committee, among key Jordanian, Israeli, and Palestinian governmental stakeholders for the implementation of the proposed national and regional interventions in the Jordan Valley. The objective is that this steering committee will eventually be embedded in the structures of the overall River Basin Organization for the Jordan Valley (ref. intervention IC01 REG Jordan River Basin Organization), as depicted above (Fig. 2).

The proposed pollution control-related interventions focus on eliminating all sources of environmental pollution in terms of wastewater and solid waste in the Jordan Valley by 2025. This includes full and adequate treatment and reuse of all wastewater flows in the valley and embarking on 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. These 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 cooperation among Israel, Jordan, and Palestine, supported with adequate water management tools (like WEAP) to ensure sustainable water supply and an increase of the base flow and rehabilitation of the ecological values of the Jordan River.

The agriculture-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, greenhouse drip irrigation.

The governance-related interventions include setting up a Palestinian Basin Authority, strengthening the Jordan Valley Authority, and establishing a transnational Jordan River Basin Organization (Israel, Jordan, Palestine) that will address water management-related issues from the valley perspective to the benefit of all stakeholders and inhabitants in the valley. It is proposed that for implementing each set of interventions, a regional coordination structure, or steering committee, will be set up. These steering committees shall consist of the key Jordanian, Israeli, and Palestinian governmental stakeholders. The objective is that these sector-related steering committees will eventually be embedded in the structures of the overall River Basin Organization for the Jordan Valley, as proposed under intervention IC01 REG—Jordan River Basin Organization.

The ecological interventions focus on restoring the good ecological status of the Jordan Valley in general and the Jordan River in particular. This includes restoration of the floodplain 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 EcoParks along the borders of the Jordan River, and 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 valley and on boosting the tourism

economy in the area, including parks, hotel facilities, museums, and touristic routes through the valley, and tourism branding and promotion. The interventions aim at creating basin-wide synergies and stronger economic development opportunities for the valley as a whole. The proposed interventions in terms of urban and infrastructure development focus on developing sufficient urban housing and infrastructure facilities in the valley toward the year 2050 and meanwhile increasing traffic safety and public transport capacities.

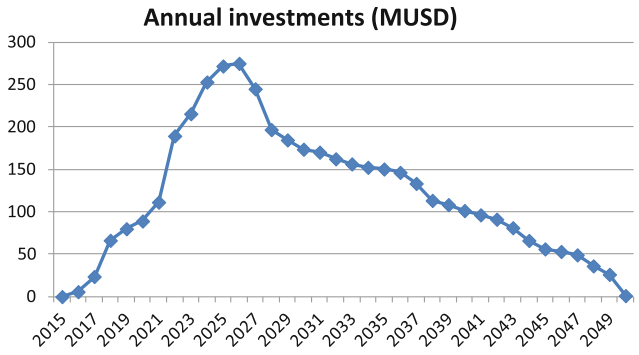
The below scheme provides an overview of the proposed interventions. The proposed short-term interventions are depicted in blue and can be initiated as soon as possible, pending the final peace accord between Israel and Palestine. These interventions aim at improving the baseline situation in the Jordan Valley substantially, resulting in a strong foundation for the establishment of the independent Palestinian State and for effective regional cooperation among the three riparian states afterward. The long-term interventions are scheduled following the peace accord, when regional cooperation can be implemented to the fullest extent.

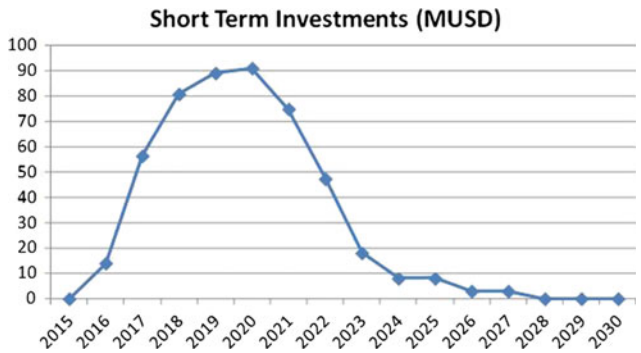
ID		Project (USD)	Subtotal (MUSD)
P01	REG	Jordan Valley Regional Coordination on Pollution Control	6,300,000
P01	ISR	Fish Ponds Short Term Pollution Control Improvement Project	20,000,000
P02	ISR	Mine Fields Removal Project	1,100,000
P03	ISR	Sustainable Fish Farming in the Jordan Valley	26,000,000
P04	ISR	Betanya Tertiary Wastewater Treatment	26,000,000
P05	ISR	Betanya Desalination Plant and Afikim Reservoir Project	51,000,000
P01	JOR	Solid Waste Management	28,700,000
P02	JOR	Environmental Management and Public Awareness Program	4,400,000
P03	JOR	Agricultural Pollution Control Project	2,100,000
P04	JOR	Separate Waste Collection and Reuse Pilots	400,000
P01	PAL	Solid and Hazardous Waste Management Plan	30,000,000
P02	PAL	Enviromental Management Project	1,000,000
P03	PAL	Wastewater Collection and Treatment	31,000,000
P04	PAL	Fish Farm Pollution Control Project	550,000
P05	PAL	Land and Water Quality Protection Project	200,000
P06	PAL	Remediation of Military Bases and Mine Fields	10,300,000
		TOTAL POLLUTION CONTROL	**239,050,000**
ID		**Project (USD)**	**Subtotal (MUSD)**
W01	REG	Jordan Valley Water Demands Management Project	1,500,000
W02	REG	Jordan Valley Regional Coordination on Water Management	6,300,000
W01	ISR	Yarmouk River Dredging and Cliff Protection Project	21,300,000
W02	ISR	Western Drainage Basins Flood Management	2,100,000
W03	ISR	Northern Sewerage Expansion Project	13,000,000
W04	ISR	Springs Rehabilitation Project	2,600,000
W01	JOR	Improved Lower Jordan River Basin Management Project	2,397,000
W02	JOR	Wastewater Collection, Treatment and Reuse Project	42,007,000
W03	JOR	Emergency Waste Water Management Project	22,701,000
W04	JOR	Waste Water Reuse Pilot Projects	1,551,000
W01	PAL	Wells Rehabilitation and Drilling of New Wells in the Jordan Valley	2,450,000
W02	PAL	Rehabiitation and Protection of Springs	2,790,000
W03	PAL	Rehabliltation and Construction of Domestic Water Networks	3,700,000
W04	PAL	Desalination of Brackish Wells	750,000
W05	PAL	Rehabilitation of Al Auja Springs	750,000
W06	PAL	Development of Water Trafic Structure	100,000
W07	PAL	Utilization of Al-Fashkha Spring	5,200,000
W08	PAL	Development of a Water Conveyance System	12,500,000
W09	PAL	Utilization of Jordan River	29,500,000
W10	PAL	Artificial Recharge Scheme	11,000,000
W11	PAL	Construction of Water Networks	31,250,000
W12	PAL	Hydro-Geological Assessment of the Study Areas	1,000,000
		TOTAL WATER MANAGEMENT	**216,446,000**

ID		Project (USD)	Subtotal (MUSD)
A01	REG	Jordan Valley Agricultural Water Efficiency	1,500,000
A02	REG	Jordan Valley Regional Coordination on Agriculture	6,300,000
A01	JOR	Jordan Valley Greenhouses Expansion Project	3,000,000
A02	JOR	Jordan Valley Extension Services Improvement Project	2,171,400
A03	JOR	Jordan Valley Drip Irrigation Improvement Project	12,690,000
A04	JOR	Jordan Valley Post Harvesting Support Project	2,326,500
A05	JOR	Jordan Valley Irrigation Efficiency Improvement Project	3,877,500
A06	JOR	Jordan Valley Authority Support Project	3,102,000
A01	PAL	Shifting in Cropping Patterns	800,000
A02	PAL	Rehabilitation and Upgrading of Water Systems	17,000,000
A03	PAL	Water Rights Policies and Regulation	150,000
A04	PAL	Operate and Expand the Agro-Industrial Park	2,000,000
A05	PAL	Construction of Agricultural Roads	1,000,000
A06	PAL	Enhancement of Palm Production	1,600,000
A07	PAL	Development and Support Livestock Sector	3,995,000
A08	PAL	Support to Women's Organizations and Bedouin Communities	650,000
A09	PAL	Land Rehabilitation	152,000,000
A10	PAL	Strengthening of Extension Services	100,000
A11	PAL	Promotion of Farmers Cooperative	500,000
A12	PAL	Jordan Valley Credit Program	1,098,000
A13	PAL	LEISA Reseach Certification	525,000
A14	PAL	Establish an Agro-Industrial Zone in the Northern JV	12,000,000
A15	PAL	Handover of Settlements Agricultural Lands	16,000,000
		TOTAL SUSTAINABLE AGRICULTURE	**244,385,400**
IC01	REG	Jordan River Basin Organization (JORBO)	4,150,000
IC01	PAL	Jordan Valley Authority Development Program	1,000,000
		TOTAL LOWER JORDAN BASIN GOVERNANCE	**5,150,000**
ID		**Project (USD)**	**Subtotal (MUSD)**
E01	REG	Jordan River Environmental Flows Project	5,000,000
E02	REG	Jordan River Ecological Restoration Project - Regional	30,500,000
E03	REG	Jordan River Fish Stock Restoration Project	5,500,000
E04	REG	Nature Protection Areas and Management Plan	5,500,000
E05	REG	International Accreditation of the Lower Jordan River Valley	1,500,000
E06	REG	Jordan Valley Regional Coordination on Ecology	6,300,000
E01	ISR	Jordan River Ecological Restoration Project - Israel	3,100,000
E01	JOR	Ecological Corridors around Valleys and Dams	7,800,000
E02	JOR	Wetlands and Aquatic Fauna Restoration Project	2,130,000
E03	JOR	Ecological Monitoring and Management Project	3,550,000
E04	JOR	Jordanian Eco-Parks and Projected Areas Project	28,910,000
E01	PAL	Nature Protection Areas and Management Plan	5,500,000
		TOTAL ECOLOGICAL REHABILITATION	**105,290,000**

ID		Project (USD)	Subtotal (MUSD)
U01	REG	Non-fossil, Renewable Energy Development Project	3,000,000
U02	REG	Adam / Damia Bridge Rehabilitation Project	90,000,000
U03	REG	King Abdullah Bridge Rehabilitation Project	30,000,000
U04	REG	Efficient Border Bridges Crossings	10,000,000
U05	REG	Jordan Valley Regional Coordination on Urban and Infra Dev.	6,300,000
U01	ISR	Center of Excellence at Kinneret College	10,500,000
U02	ISR	Eden Regional Agricultural Research and Training Center	21,100,000
U01	JOR	Infrastructure Development Project	267,900,000
U02	JOR	Urban and Infrastructure Development Master Plan	1,424,100,000
U03	JOR	Higher Education and Vocational Development Project	30,000,000
U04	JOR	Non-fossil, Renewable Energy Development Project	285,000,000
U01	PAL	Urban and Infrastructure Development Master Plan	1,019,900,000
U02	PAL	Educational and Vocational Needs Assessment	250,000
U03	PAL	School Building Program	4,900,000
U04	PAL	Higher Education and Vocational Training Program	10,300,000
U05	PAL	Health Care Services Development Project	10,100,000
U06	PAL	Electricity and Telecommunicaions Development Project	202,000,000
U07	PAL	Develop Renewable Energy Resources	22,000,000
U08	PAL	Import and Export Logistics Center	2,000,000
U09	PAL	Utilization of Dead Sea Minerals for Economic Production	23,500,000
		TOTAL URBAN AND INFRASTRUCTURE DEVELOPMENT	**3,472,850,000**
		GRAND TOTAL, all investments	**4,583,048,083**

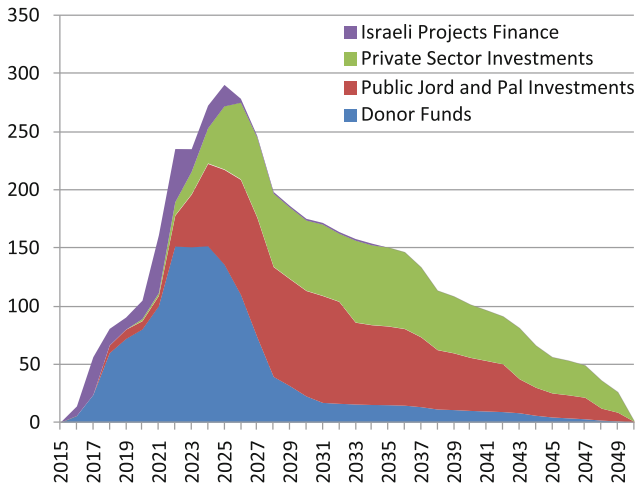
ID		Project (USD)	Subtotal (MUSD)
C01	REG	Jordan River Mouth Tourism Information Center	2,200,000
C02	REG	Jordan River Baptism Site Improvement Project	4,100,000
C03	REG	Jordan River Peace Park Improvement Project	4,100,000
C04	REG	Jordan River Regional Routes	2,000,000
C05	REG	Cultural and Historic Museum for the Lower Jordan Valley	3,000,000
C06	REG	Jordan Valley Regional Coordination on CH and Tourism	6,300,000
C01	ISR	Tsemach to Naharaym Tourism Development Project	26,000,000
C02	ISR	Gesher to Bezeq Stream Tourism Development Project	26,000,000
C01	JOR	Pella Tabaqat Fahel Site Improvement Project	3,102,000
C02	JOR	Abu Ubaydah Tomb Improvement Project	775,500
C03	JOR	Cultural and Historic Museum for the Lower Jordan Valley	3,080,850
C04	JOR	Archaeological Landmarks Development Project	4,935,000
C01	PAL	Cultural Heritage Protection and Management Plan	1,700,000
C02	PAL	Tourism Branding and Promotion	500,000
C03	PAL	Museum of Natural and Cultural History of the Rift Valley	42,750,000
C04	PAL	Rehablitation of the Catchment of Ancient Jericho	12,600,000
C05	PAL	Rehabilitation of Salt Industry Sites, Rusheideyeh	4,300,000
C06	PAL	Rehabilitation of Ancient Jericho	4,300,000
C07	PAL	Rehabilitation of Hisham's Palace	3,700,000
C08	PAL	Rehabilitation of Tel Abu El Alayek	4,733,333
C09	PAL	Rehabilitation of Khirbet El Biyadat or Tel Ouja	5,800,000
C10	PAL	Rehabilitation of Khirbet El Makhrouq	5,800,000
C11	PAL	Rehabilitation of Tel El Hamma	5,300,000
C12	PAL	Archaeological Landmark Features	1,500,000
C13	PAL	Spa, Thalasso Therapy and Balneo Therapy Center	3,300,000
C14	PAL	Jesus Village	3,500,000
C15	PAL	Hiking Trail Development	2,000,000
C16	PAL	Sport and Adventure Center	18,000,000
C17	PAL	Travelers Centers	5,200,000
C18	PAL	Hotel Rooms 4 Stars (Resort)	80,000,000
C19	PAL	The Mud Brick Youth Village	5,100,000
C20	PAL	Youth and Guest houses	4,200,000
		TOTAL SUSTAINABLE TOURISM AND CH DEVELOPMENT	**299,876,683**





The total of required investments is 4.58 billion USD until the year 2050, excluding operation costs. The annual disbursement schedule is shown below (in MUSD/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. As mentioned, the short-term interventions depicted in blue in the table above can be initiated as soon as possible. The related annual short-term investments are presented above (in MUSD/year).



The bulk of the investment will be required in the long-term from 2020 onward and includes urban and transportation development investments. The annual investments will reach their maximum in 2025, when about 260 MUSD of investments will be required, of which 76 % relates to urban development and infrastructure investments.

This Master Plan assumes that the required investments in the Lower Jordan Basin for Jordan and Palestine will largely depend on international donor funds until 2028, reaching its peak by 2023 with about 150 MUSD donor investment requirements for that year. It assumes furthermore that the Israeli Government will invest about 250 MUSD in the Israeli part of the Jordan Valley in the period mainly until 2027. Gradually, national public investments by Jordan and Palestine will catch up, and later on private investment as well, due to increasing economic opportunities, lower investment risks, and a more attractive investment environment in the basin. This leads to the following investment scheme for donor funds, public investments, and private investments (in MUSD per year).

The aim of the proposed interventions in this Regional Master Plan for the Jordan Valley 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, which will also depend 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.

Municipalities and civil communities need to play an important role in the further preparation and implementation of the suggested interventions, as they represent the local population living in the valley and play a key role in providing services to the inhabitants in terms of water, wastewater collection, and solid waste management. The subsidiary principle is again relevant here again. In addition, proper environmental and social impact assessments, including stakeholder participation and potential resettlement action plans, shall be part of all infrastructure preparation works.

Finally, EcoPeace Middle East is foreseen to play a key role in most of the interventions as one of the major active NGOs in the Jordan Valley, particularly with regard to organizing grassroots environmental protection activities, and engaging and organizing local stakeholders in further preparation and implementation of the proposed interventions. Furthermore, EcoPeace is a unique organization at the forefront of the environmental peacemaking movement and is therefore very well equipped to help promote transboundary cooperation and dissemination components of the proposed interventions.

The Year 2050

Under the scenario and strategy described in this Regional Master Plan, by 2050 the Jordan Valley will be a cooperative, confident, and peaceful region with a healthy economy and strong development perspectives for the people living there. They will experience a clean healthy environment and sufficient flows in the Jordan River to sustain healthy ecosystems. At the same time, the river will act as natural water conveyor and source for water supply in the Jordan Valley. Water will be equitably shared among the three riparian states, and the valley 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.

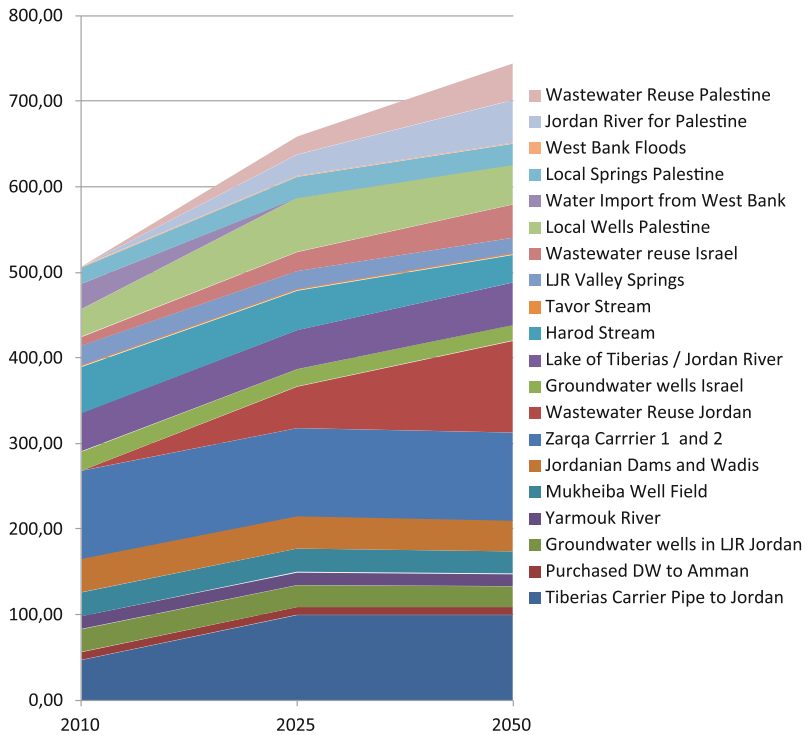
In 2050, the valley will house around 750,000 people in Jordan, 500,000 people in Palestine, and 90,000 people in Israel, who will enjoy their environment in terms of living, working, and recreational conditions. They will live in a comfortable and sustainable urban setting with an average of about 3.5 people per household. There will be about 370,000 household units in the valley, compared to about 65,000 today. This will be the result of substantial investments in urban and infrastructure projects in the range of 3.47 billion USD until 2050, with relatively smaller housing units than exist 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 agribusiness, as well as in housing, infrastructure, higher education, and public services, the people in the valley 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 in Palestine, to about 50,000 USD per household in Jordan, 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 to sufficient water resources needed to meet their demands as described before. This will have synergetic positive impacts on the basin economy at large, due to growth of exports and imports 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 effect on related sectors, such as the stone and marble industries, public utilities, commercial sectors, telecommunication, and more. In addition, it is expected that rising land prices will contribute substantially to the overall economic growth. This will apply particularly to Palestinian land prices in (previous) Area C. For example, the World Bank's economic analysis of Area C and its future economy (Orhan Niksic et al. 2014) indicate that current cost per dunum in Area A in Jericho is around USD100,000, while in Area C towns like Bardala, the current cost per dunam Bardala, it is not more than USD10,000 per dunum. 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 from the full coooperation of the three riparian partners that will be established by then. Five to ten million of national, regional, and international tourists per year will visit the cities, nature parks, cultural and religious sites, and a wide variety of museums

established in the valley, leading to an economic growth in the range of 5–10 billion USD per year. In addition, expanded urban centers will provide a wide variety of commercial services. This will lead 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.

By 2050, the Jordan Valley will be supplied with water from the following resources (MCM/year).

The land use distribution in the Jordan Valley will be as follows.

Area (km^2)	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	1337.2	884.0	2508.4
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	1337.2	884.0	2508.4

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 valley, particularly for Jordan and Palestine.

Within the framework of this Master Plan, the following environmental flow strategy has been assumed. The 2050 environmental flow regime is based on a multi-functional river approach. This means that the river will be used for both ecological, economic/tourism, and water conveyance purposes, as such maximizing the flow within the river itself, and maximizing the ecological/economic value of the water flow. This implies that all sources of pollution have been mitigated and that the river water will have reclaimed a natural water quality, only affected negatively by the natural salt inflow from the southern brackish aquifer systems.

In accordance with the study's water modeling calculations, this will require that by 2050 some 238 MCM/year of water will be released into the Jordan River from the Sea of Galilee, reflective of Israeli leadership needed in the rehabilitation effort. In addition, the river will receive 12 MCM/year from the Valley of Springs, 8 MCM/year from the Harod Spring, and 8 MCM/year from Wadi Arab. It will also receive 18 MCM/year from natural groundwater outflow in the Israeli part of the valley and 5–6 MCM/year in the Palestinian part of the valley. No groundwater contribution from the Jordanian side is foreseen. However, it is assumed that by 2050 Jordan will use the Jordan River instead of the King Abdullah Canal for conveying water from north to south to the point where brackish groundwater naturally infiltrates into the Jordan River, near the Harod Stream.

In addition, it is proposed to have at least one minor flood (c.a. 20–50 m^3/s) per two years, to be achieved for instance by fully opening the Deganiya Dam for 24 h every other winter. In order to bring back the original habitats of the river, flow bed of the river will be widened to 50 m in the north and at least 15 m down to Wadi Qelt, with floodplains on both sides. This includes construction of new meanders and cascades.

This measure will lead to an average flow of 200–300 MCM/year in the upper section of the river and around 100 MCM/year of water flowing into the Dead Sea. The average salt content will be between 300–700 ppm in the upper section and around 1350 ppm in the lower section, which is highly acceptable from an ecological point of view. The final southern stretch of the river, below Wadi Qelt, will see higher concentrations up to 3000 ppm due to brackish groundwater seepage and discharge of the Saline Water Carrier.

A minimum flow of 400 MCM of freshwater per year throughout the major stretch of the Jordan River depends on an additional contribution of 100 MCM/year from Syria by 2050 through the Yarmouk River and an additional inflow of 100 MCM/year of treated wastewater into the Jordan River from the wider region in Israel, Jordan, and Palestine around the Jordan Valley. However, these options will come against certain costs probably not below 30 MUSD/year, which is to be assessed in a detailed cost-benefit analysis, for instance during the feasibility assessment phase of such interventions.

In all, this study and the related model calculations show that a sustainable and environmentally friendly water regime that creates a clean and helathy river system and appropriately facilitates the interests of all three riparian states of Palestine, Jordan, and Israel can be created in the Jordan Valley by 2050.

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, the consistency in the applied planning approach, and the importance of the overarching objectives of the NGO Master Plan will convince the international community that it makes sense to embark on implementing this plan, including continued cooperation within the Jordan Valley among Jordanian, Israeli, and Palestinian neighbors.