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Adaptation to Climate Change in the Jordan River Valley:

the Case of the Sharhabil Bin Hassneh Eco-Park

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Statutory Declaration

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Key words

Jordan

Adaptation

Climate Change

Middle East

Water

Abstract

The topic of this thesis, titled *Adaptation to Climate Change in the Jordan River Valley: the Case of the Sharhabil Bin Hassneh Eco-Park*, is to examine possible solutions of development projects to help the Jordan River Valley to adapt to the impacts that climate change will have in particular to the natural resources in the valley.

This analysis is based on research made on the field, collaborating with the environmental NGO *Friends of the Earth Middle East*. Therefore, many interviews with local people of the communities of the valley, with staff members of the NGO, as well as with important experts such as the former Jordanian Minister of Water and Irrigation Munther Haddadin, were precious in giving some important insight remarks and showing the situation from different point of views. In addition, the core written sources of the present work included assessment of the Intergovernmental Panel on Climate Change concerning adaptation and vulnerability, as well as a series of paper published by the NGO *Friends of the Earth Middle East*, leader environmental organization in the Middle East.

This thesis is divided in three main chapters. The first one gives an overview of the impacts of climate change in the Middle East. It focuses in particular on the effects on water resources, food security, and biodiversity. Then, it analyses in depth the situation in the Jordan River Valley, firstly the current situation and then the impacts that climate change will have. The second chapter presents the concept of adaptation to climate change and its applicability and implementation in the Jordan River Valley. The third chapter analyses the case study of the Sharhabil Bin Hassneh Eco-Park in the valley, developed by the NGO *Friends of the Earth Middle East*. This chapter discusses how this project could help in adapting to climate change.

This thesis aims at analyzing whether this project could be a successful case of adapting to climate change in the valley. It aims at being an important piece of academic and scientific knowledge available to the world of development studies, policy makers, and NGOs. It aims at advancing in the field of adaptation to climate change showing a successful case of it, and demonstrates how a successful isolated project could become a model to be used and repeated in the whole region.

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the world for man's need
but not for man's greed

Mahatma Gandhi

Foreword

Writing this thesis gave me the opportunity to broaden my knowledge about two different issues: the environment and the Middle East. The focus on the Middle East comes after my interest during my academic studies on the land of my origins, and therefore I wrote my Bachelor's thesis on *The Dream of Faysal: role of the Hashemites in the Arab Nationalism*[1] exploring the role that the Hashemite family had during, before, and after the first world war. During my Erasmus programme of one year at the School of Oriental and African Studies at the University of London, I researched on this issue as well as focusing on the history, anthropology, and religions of the Middle East.

During my Master studies at the Università degli Studi di Trieste, I decided to focus on the current issues of the Middle East, and therefore I came in contact with the water problem in the region. I researched therefore this aspect with experiences on the field at the Embassy of Italy in Amman as well as with the NGO *Friends of the Earth Middle East,* an environmental organization working to build peace through the trans-border environmental protection between the local Jordanian, Israeli, and Palestinian communities of the Jordan River Valley. My master thesis took into consideration the national water policies of this countries today as well as in the last decades and tried to explore the possibility of regional cooperation as a way to avoid the risk of water wars. Having understood the importance of the trans-border natural resources and especially of water, I decided to continue my interest in Middle East as well as in environmental issues.

While my first thesis had a historical point of view, the first master thesis was on the current environmental policies in the region, this master thesis will focus on the future of the Middle East, and therefore how to be ready to face the future environmental challenges in the region, in other words how to adapt to the future impacts of climate change in the Jordan River Valley.

[1] The original title is *Il Sogno di Faysal: Ruolo degli Hashemiti nel Nazionalismo Arabo*

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I would like to acknowledge and thank all those who made this thesis become real. I have to thank first of all Mr. Thierry Béchet, who taught me *politique européenne de coopération au développement et d'aide humanitaire*, in other words European development studies, cooperation, and humanitarian aid at the College of Europe. He accepted to be my supervisor and helped me with great patience and passion in focusing the topic of this thesis on a geographical area very well known and of great interest for different reasons for both of us. He pushed and motivated me while writing it, and was of great help in defining and focusing properly the argument. He gave me the idea of researching the issue of the impact of climate change, and how to act and adapt to it in the Jordan Valley. At the College of Europe, I would like to thank also professor Cándido García Molyneux, who taught me *Current International Environmental Issues Challenges, Policies, and Legal Instruments* and therefore who introduced me to several current environmental issues that helped me also in this thesis, such as biodiversity, climate change, and sustainable development. I would like to thank Mr. Matthew Chambers, always happy to help, for his interest in the topic of this thesis, especially for the sinkhole issue.

I would like to thank three previous professors of mine from the Università degli Studi di Trieste, Italy. Firstly, professor Mainardo Benardelli de Leitenburg, currently Ambassador of Italy in Guatemala, who found the time to teach me development studies explaining me the importance of water and natural resources in the Middle East and in international relations. Secondly, professor Antonio Luigi Palmisano, who taught me the anthropological way of researching, the importance of going on the field and live there for a certain amount of time, together with the local population in their communities, to understand which development projects are more urgent and also to better know in which way to implement them. Thirdly, the late professor Enrico Fasana, who introduced me to the history of the African and Oriental countries, spending a lot of time teaching me the history of the Middle East, of my origins, and of the role of the religions and cultures. He gave me the passion for research and the particular approach of intellectual and inter-personal curiosity for the other's origins,

personal past, and previous experiences as a key to understanding other's cultures, mentality, and societies.

Moreover, I would like to thank Dr. Giuseppe Vasques, expert in European policies in the neighbouring countries, Dott. Stefano Stucci, First Secretary of the Embassy of Italy in Amman, that introduced me together with Dr. Amjad Yaaqba, Director of the Italian Development and Cooperation Office in Amman, to the water issues in Jordan. The staff of the London Middle East Institute as well as Dr. Bruno Marasà and Dr. Zoltan Simon, experts of Middle Eastern politics in the European Parliament, that gave me the opportunity to meet academics involved in the water and environmental issues in the Middle East. Professor Roberto Mazza who taught me Middle Eastern history at the School of Oriental and African Studies and who is now working at the University of West Illinois in the United States. He has been very useful in the last four years and his contribution and help have been precious in supporting me with my academic choices.

I would also like to thank Prof. Tony Allan from the King's College London (and School of Oriental and African Studies) as well as Dr. Munther Haddadin, former Jordanian Minister of Water and Irrigation, who kindly found the time to break off their agenda during the conference *Water for Peace* in Brussels to talk about the role of water in the Middle Eastern relations and for explaining me properly the concept of *virtual water*.

Finally, the NGO *Friends of the Earth Middle East* that has been always very helpful in giving me the available material, interviews, and information as well as for the tours and the unique experience in the Jordan River Valley. They allowed me to perform research on the field, meeting the local communities involved, visiting the Eco-Park, and experts in different fields such as Paolo Pellegrin, photo-reporter of Magnum Agency.

Last but not least, my family, *Ammu* Marco, and all my friends, for their support in Italy as well as abroad. To them I dedicate this thesis.

Introduction

Water resources are a strategic and important natural resource because it is vital for human beings and cannot be substituted. For this reason, international tensions and conflicts over this resource are current, in particular because this by its nature is a shared and trans-border resource because rivers do not take into consideration political borders, but naturally decide where to flee. The Middle East is a water scarce region, and therefore this issue is particularly sensitive and important for the national policies and for the regional politics of this area.

In this scenario, the effects of climate change, in other words of global warming, will be mainly on the water resources of the region, and as a consequence on the biodiversity, agriculture, and national security and stability of these countries. In fact, food security and the availability of fresh water may seriously be a reason for social tensions and regional political conflicts, that could produce environmental induced forced migrations resulting in social and political instability and therefore insecurity. The connection between all these elements is the issue of the *first chapter*. It will analyze the impact of climate change either on the Middle East and then in particular on the East Bank of the Jordan River Valley.

This research is going to focus on the East Bank of the Jordan River Valley because it is an interesting example in the area because of its rich natural, cultural, and historical heritage. The valley is part of the Great Rift Valley and is an important region for birds migrations, particular species of flora and fauna that are threatened, and therefore it would be important to do all that it could be done to save them, and save this valley.

Politically this valley is a globally interesting and complicated situation: the Jordan River as political natural border between Israel and Jordan, in the north there are the Golan Heights disputed between Israel and Syria since 1967, on the West Bank side an intricate political situation, and the water issue that could seem not of primary importance, in reality is an important point of the agenda of negotiation in this region as well as of the political agendas of the countries in the area.

The *second chapter* represents the concept of adaptation and mitigation to climate change, focusing on the first one. Adaptation to climate change is a policy that aims at

helping, where possible, a series of specific targets and groups in adapting to climate change. It analyzes in depth the situation in the Jordan River Valley in regards to the adaptation policies and projects that are implemented in the area, taking into consideration what the Jordan Valley Authority, the responsible for the development of the valley, has done and is doing in this regard.

The *third chapter* considers a case study, the Sharhabil Bin Hassneh Eco-Park, of the NGO *Friends of the Earth Middle East* that has successfully implemented this project involving the local communities. This project aimed at transforming an almost desert land in a park, putting into practice the best good practices, as far as water management and water save design is concerned. The park aimed at building environmental awareness among the local communities and is becoming a model for other areas of the valley as well as for local villages. The biodiversity in the park is rich but the dilemma is whether the Eco-Park is going to remain an isolated successful story in the valley, in other words a green cathedral in the desert or a model to be applied moreover in the valley?

Chapter 1: Situation: the Jordan Valley facing climate change

1.1 Climate change, water, and the Middle East

Water is becoming a strategic resource and it will be the main cause of the wars of this century, according to Ismail Serageldin, former Vice-President of the World Bank, and to Boutros Ghali, former Secretary General of the United Nations.[2] Allocation of the trans-boundary water resources has been the main reason for disputes among boundary countries, for instance between Syria, Iraq, and Turkey for the resources of the Euphrates River, in East-Northern Africa for the Nile River, as well as between Jordan, Palestinians, Israel, Syria, and Lebanon for the Jordan River. As the late King Hussein of Jordan put it in 1990, "water is the one issue that could drive the nations of this region to war."[3] On the other hand, according to many environmentalists involved in the region, water could also be the reason that could drive this region to peace.[4] But these two concepts are not mutually exclusive, water could be at the same time a reason for conflicts as well as for cooperation and peace.[5]

According to the latest Intergovernmental Panel on Climate Change (IPCC) assessment[6], in the Middle East - one of the world's most water-stressed region - climate change is expected to make water resources even more scarce. In fact, climate change, also known as global warming, will increase the temperature in the Eastern Mediterranean between 3 and 5 degrees C by 2080[7], leading therefore to a decrease of

[2] http://www.serageldin.com/ListSpeeches.aspx (consulted on the 10th of March 2010) Daniel Pipes, *Boutros Boutros-Ghali: I Support the Algerian Government*, Middle East Q., September 1997, available at http://www.meforum.org/article/364 (consulted on the 10th of March 2010)

[3] National Environmental Trust, *Global Warming in the Middle East and Central Asia*, Washington DC, 2005, p.19

[4] See the website of the NGO *Friends of the Earth Middle East*: www.foeme.org (consulted on the 12th of March 2010)

[5] Oli Brown and Alec Crawford, *Rising Temperatures, Rising Tensions: Climate Change and the Risk of Violent Conflict in the Middle East*, IISD, Copenhagen, 2009, p.20

[6] http://www.ipcc.ch/ (consulted on the 10th of March 2010)

[7] It refers to the summer period. Hans Brauch, "Impacts of Global Environmental Change for Water Resources of Israel and its Neighbours: New Security Dangers and Shifting Perceptions", in: Hillel Shuval and Hassan Dweik, *Water Resources in the Middle East: Israel-Palestinian Water Issue – From Conflict to Cooperation*, Springer, Vol.2, Hexagon Series on Human and Environmental Security and Peace, 2007, p.366

precipitation by 20 % by 2100[8] and in an increase of the intensity of the rains. This phenomenon could cause frequent droughts and floods, while the higher evaporation and the drier conditions will be caused by the higher temperatures.[9] An increase in the intensity of the rains plus erosion and droughts could mean that the aquifers will not recharge regularly like they did in the past.[10] In addition, a decrease of the rains and an increase of the temperature will effect the flow of the rivers and streams in this region, as well as accelerate the desertification phenomenon.[11]

The aquifers and the groundwater will be deeply affected by climate change: higher temperature and lower frequency of rains means that the surface water infiltration will be reduced. In addition, the rise of the sea level, other important effect of the global warming, will have two main impacts in the region. On the one hand, it will cause an intrusion of salt water into the coastal aquifers, and therefore, have a huge impact on the quality of their water. In the region the coastal aquifer in the Gaza strip is facing this challenge, having already a concentration of chlorides salt, nitrates, pesticides, and bacteria three times more than the level recommended by the World Health Organization (WHO).[12] In fact, in 1999 as well as in 2000 half of the Gaza wells were not respecting the WHO drinking water acceptable level for chlorides.[13] On the other hand, the rise of the sea level will modify the coastal environment. For instance, if the sea level rises by one meter, the Nile Delta will lose one fifth of its area, causing the loss of coastal infrastructures as well as more than 12 million environmental induced migrants, in other words "climate refugees."[14] This phenomenon could be common to

[8] According to the IPCC. G.A. Meehl, T.F. Stocker, W.D. Collins, P. Friedlingstein, et al., *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge UP, Cambridge, 2007, p.768 available at: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch10.pdf (consulted on the 25th of May 2009)

[9] Perspective paper on *Vulnerability of Arid and Semi-Arid Regions to Climate Change – Impacts and Adaptative Strategies*, Arab Water Council, p.2

[10] Elie Bou-Zeid and Mutasem El-Fadel, "Climate Change and Water Resources in Lebanon and the Middle East", in *Journal of Water Resources Planning and Management*, September/ October, 2002

[11] Oli Brown and Alec Crawford, *op. cit.*, note n.5, p.9

[12] Hussein Amery and Aaron T. Wolf, *Water in the Middle East: a Geography of Peace*, Texas UP, 2000, p.54

[13] *Desk Study on the Environment in the Occupied Palestinian Territories*, United Nations Environment
Programme (UNEP), 2003

[14] The President of the United Nations General Assembly, Srgjan Kerim, declared in an interview that "Climate Refugees" are already a reality:

other Mediterranean regions because according to the *Arab Environmental Monitor*, the level of the Mediterranean will increase between 30cm and 1m by 2100.[15]

Biodiversity could also be affected by climate change, because the habitats, the distributions patterns, and behaviours will be influenced. For instance, in Lebanon the Cedar Trees, the symbol of the country, will be impacted because they are likely not to adapt to the climate change quickly and therefore they will be in danger of extinction in the middle-term. In fact, they have been put in the "red list" by the International Union for Conservation of Nature's as a "heavily threatened" species.[16]

Given the particularity and complexity of this region, climate change will not have only effects on water and on the natural environment, but also a political impact. For instance, water is an important element of the Israeli-Arabic conflict, while Jordan is facing serious problems in assuring an adequate quantity of it for its population, which is strongly increasing because of the huge number of refugees coming from Iraq and Lebanon in the last years, as well as from the West Bank from 1948.[17] The Jordanian population is expected to almost double, from more or less 6 million[18] to more than 10 million by 2035.[19]

The water scarcity will also have a social-economic impact on the region. In fact, if water becomes scarce, there will be not only disputes and potential conflicts between countries, but also social tensions within the same country. It has to be considered that the water-scarcity will affect the agricultural production, that will decrease and cost more, according to the price of the water. Water and food prices will rise, and therefore these vital goods will be accessible to those who will be ready to pay

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http://www.un.org/apps/news/story.asp?NewsID=27135&Cr=kerim&Cr1=climate (consulted on the 10th of March 2010)

[15] According to the Arab Environmental Monitor: *Egypt's Nile Delta Threatened by Climate Change,* 27th of August 2007, available at: www.arabenvironment.net/archive/2007/8/204072.html (consulted on the 14th of January 2009)

[16] http://www.iucnredlist.org/apps/redlist/details/42305/0 (consulted the 15th of March 2010)

[17] Esam Shannagh and Yasser Al-Adwan, "Evaluating Water Balances in Jordan", in: David B. Brooks and Ozay Mehmet, *Water Balances in the Eastern Mediterranean*, IDRC, 2000, available at: http://www.idrc.ca/en/ev-9416-201-1-DO_TOPIC.html (consulted on the 11th of March 2010)

[18] 6.316.000 according to the Department of Economic and Social Affairs Population Division, 2009. See also the *World Population Prospects, Table A.1* available at: http://www.un.org/esa/population/publications/wpp2008/wpp2008_text_tables.pdf (consulted on the 15th of April 2010)

[19] According to the Jordan Department of Statistics, *Jordan in Figures, Selected Indicators for 2005*, available at: http://www.dos.gov.jo/dos_home/jorfig/2005/jor_f_e.htm (consulted on the 15th of April 2010)

more. As a consequence, the poorest and most marginalized communities will be deeply affected, becoming more and more socially excluded. This could bring social tensions between rich and poor sectors of the societies that could therefore become a serious issue, as far as security and stability are concerned.[20]

Stability and security in the region are sensitive to the effects that climate change could have on the natural resources in the area. In fact, an increased water scarcity could make some peace agreements untenable and could make the negotiation for new peace agreements and treaties in the region more difficult. In addition, food insecurity could intensify the claiming for the return of occupied lands, like for instance in the case of the Golan Heights, claimed by Syria. This could raise a sense of historical injustice that driven by populism could lead in first instance to domestic political pressures and tensions. Also, environmental or war induced migrations in the region could put pressure on social tensions because a growth of the population would mean a general increase of food and water prices. Moreover, a perception of a shrinking of the water resources caused by the effects of the climate change could have as a consequence the militarization of the strategic rivers, dams, and water resources.[21]

1.2 Description of the situation in the Jordan Valley

The impact of climate change on the Middle East has been highlighted. Now this paper will focus more in depth on a specific area: the East Bank of the Jordan River. The peculiar, strategic, and unique characteristics of the Jordan Valley make the effects of climate change more and more necessary to be analyzed. This boundary valley divides Jordan with Israel and the West Bank, while in the northern part there are the Golan Heights, claimed by Syria. Therefore the water resources in this valley are shared by these neighbouring countries, and as a consequence, this aspect could be a potential reason for conflicts, that could become more urgent because of the effects of climate change on the scarce water resources in the area.

[20] Oli Brown and Alec Crawford, *op. cit.*, note n.5, p.3
[21] *Ibid*.

The international Jordan River, that flows for 228 km through Lebanon, Syria, Israel, and Jordan, is the third largest perennial river of the Middle East. Its main sources come from the Mount Hermon, in the south of Lebanon. Important springs that regenerate the Upper Jordan River are the Hasbani River in the south of Lebanon, the Banias River in the Golan Heights, and the Dan River in Israel. Hence, the Jordan River flows for 14 km and enters the Sea of Tiberias, also known as Sea of Galilee.[22] This sea is used by Israel as a storage from where Israel brings water to the big cities of the centre and the south of the country, such as Tel Aviv, through the National Water Carrier, a huge project of pipelines, tunnels, canals, and pumping stations.[23]

After that sea, the Jordan River receives the water of the Yarmouk River, its main tributary, that constitutes the border between Jordan and Syria before it joins the Jordan River. After this intersection, the Jordan River flows south until the Dead Sea. On its way to the lowest point on earth, some intermittent tributaries join the Jordan River, but at the same time the water of the latter is diverted in order to build dams for agricultural and domestic use. Therefore, as a consequence of its exploitation, diversion and decrease of the rains, nowadays only 20-30 million m3 instead of the 1.3 billion m3 that used to flow fifty years ago reaches the Dead Sea. This means that a reduction of more or less 98% of the amount of water that used to flee in the Jordan River fifty years ago has taken place.[24] This fact has a consequence on the daily life of the growing population of the valley, even if the King Abdullah Canal assures the Jordanian farmers with water for irrigation.

In the valley, the water resources are scarce, variable, and uncertain. Concerning the lower Jordan River, its main tributaries from the Jordanian side are: the Zarqa River, and the intermittent streams, also known as *wadis*, of: Arab, Ziglab, Jurum, Rayyan, Kufranja, Rajib, Shueib, Kafrein, and Hisban. Concerning the wadis of the

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[22] Masahiro Murakami**,** *Managing Water for Peace in the Middle East: Alternative Strategies*, United Nation UP, Tokyo, 1995, chapter 2,5 available at: http://www.unu.edu/unupress/unupbooks/80858e/80858E06.htm#2.5%20The%20Jordan%20River (consulted on the 15th of April 2010)

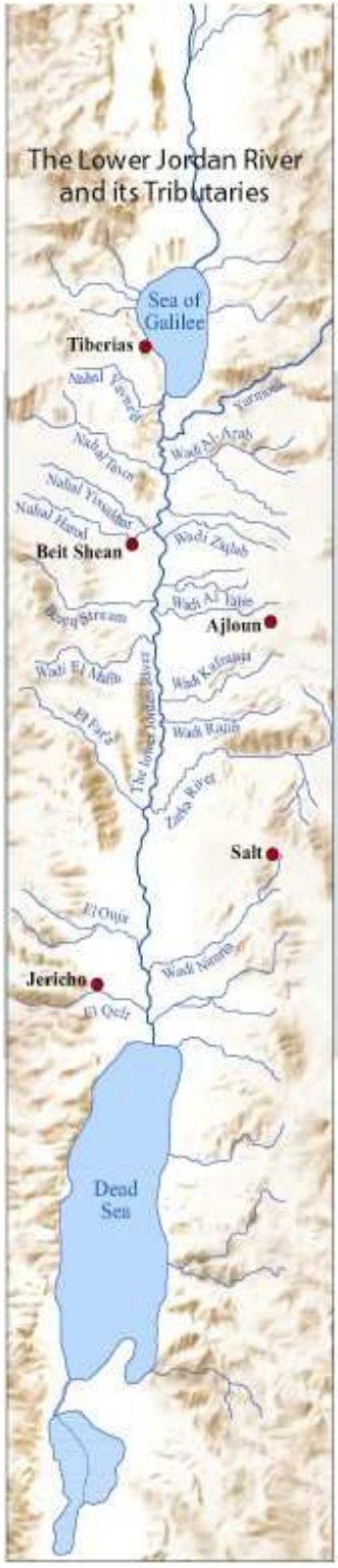
[23] Ehud Zion Waldoks, *Inside the National Water Carrier*, in: *Jerusalem Post*, 18th of February 2008

[24] Michael Turner, Nader Khateeb, Khaled Nassar, *Crossing the Jordan: Concept Document to Rehabilitate, Promote Prosperity and Help Bring Peace to the Lower Jordan River Valley*, Friends of the Earth Middle East, 2005, p.10. For the data: Sarig Gafny, Samer Talozi, Banan Al Sheikh, Elizabet Ya'ari, *Towards a Living Jordan River: an Environmental Flows Report on the Rehabilitation of the Lower Jordan River*, Friends of the Earth Middle East, Amman, Bethlem, Tel Aviv, May 2010, p.16

Dead Sea area, there are: Mujib, Wala, Zarqa Ma'aeen, Karak, Feifa, Khneizerah, Ad Dahil, Fidan, Musa, Dana, As Siq, Hasa, and Ibn Hammad.[25]

[25] Yousef Hasan Ayadi, *Policy and Adaptation in the Jordan Valley*, in: *Rosenberg International Forum, Forum V, Managing upland watersheds in an Era of Global Climate Change*, Banff Canada, September 2006, p. 6

FIGURE 1: The Lower Jordan River and its Tributaries[26]



[26] Map produced by FoEME/EcoPeace, available at: http://www.foeme.org/docs/JR_TR_map.pdf (consulted on the 30th of April 2010)

When it comes to the ground water resources in the valley, it could be said that they are scarce and that the main three well fields are: the Mukheibeh, the Wadi Arab, and the Kafrein.[27]

The Jordan Valley is an integral part of the Great Rift Valley, that is 7,200 km long extending down southwards into East-Africa and it has specific peculiarities, like being the world's lowest point with over 400m in the Dead Sea.[28] In addition, the Jordan Valley is one of the narrowest parts of the Great Rift Valley, and therefore is part of pathway for the migrations of animals, plants, and human beings.[29]

1.2.1 Historical, cultural, and natural heritage

Historically, this valley has been a meeting and crossing place for different migratory animals, human societies, and cultures. This aspect can be seen in the "old bridges" area, where a Roman, an Ottoman, and a British bridge are still there, as a testimony of this important interaction between the two sides of the Jordan River.[30] Historically, this valley has been important during different periods, and therefore has a rich heritage for several different historical epochs. For instance, the biblical Mount Nebo, the Baptism site, Pella - one of the Roman Decapolis - , Jericho - claimed to be the oldest continually inhabited city on earth -, and the Crusaders Medieval Castles are only few of the most famous sites in the area.[31]

To understand the reasons of the rich variety of the flora in the valley, it has to be considered that the valley lies between Asia, Africa, and Europe and this specific position has permitted an interaction and a mixture between different bio-climatic species. In the valley itself there are three different climatic areas that allowed the presence of plants and animals that belong to African, Central Asian, and European bio-climate. Therefore in the southern part of the valley there are specific types of saline vegetation, threatened and worldly protected. In the middle and northern part of the

[27] *Ibid.*
[28] http://www.visitjordan.com/MajorAttractions/TheDeadSea/tabid/67/Default.aspx (consulted on the 15th of April 2010)
[29] Michael Turner, Nader Khateeb, Khaled Nassar, *op. cit.*, note n.24, p.7
[30] http://foeme.org/projects.php?ind=23 (consulted on the 15th of April 2010)
[31] http://foeme.org/projects.php?ind=49 (consulted on the 15th of April 2010)

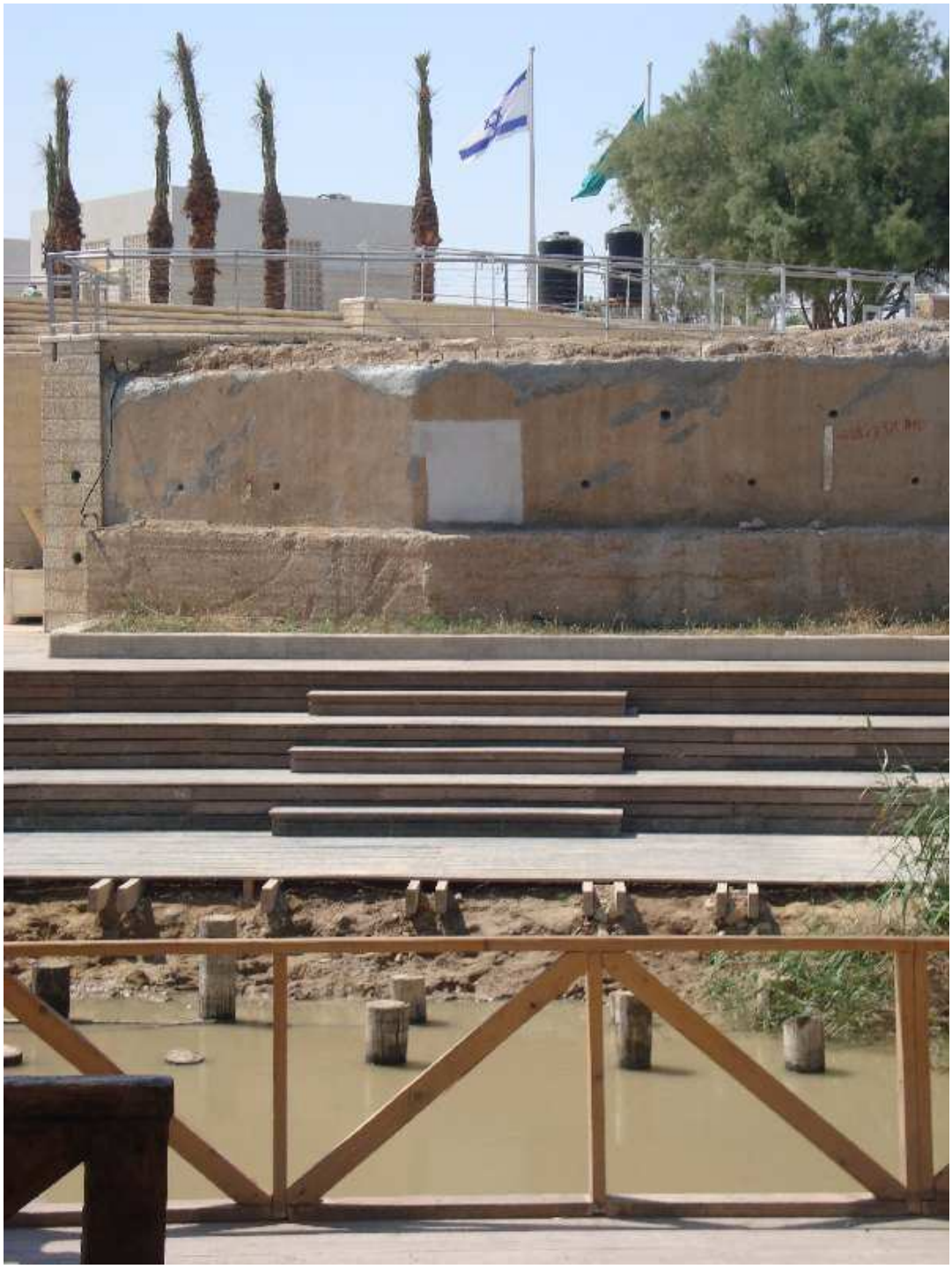
valley there are steppes, typical of central Asia, while in the northern part particularly on the highs there is a rich forest vegetation.[32]

For the same reason, the fauna in the valley is an interesting aspect to be analysed. This valley is the meeting place for the animals coming from different zoogeographic regions: the Mediterranean; the Sahsro-Sindian, and the Ethiopian-Afro tropical. The biodiversity is particularly important because some of the animals in the area are rare, threatened, and endangered[33], for instance the Arabian Leopard, the Palestinian Mountain Gazelle, and the Indian Wolf.[34] In addition, the Jordan Valley, because of its water resources, is an important bird migration flyways, carrying more than 500 million birds from and to the southern and northern hemisphere twice a year.[35]

Historically, this valley has been the meeting place of religions, cultures, and societies. However, today this river has become a military border and has lost its role of building dialogue and ties among different people. As a matter of fact, most of the river is a closed military zone and off limits to the public[36]. In fact, no public access is available outside the following spots: Nahayrim and Old Gesher, from the Israeli side; Kasr el Yehud Baptism side (special permission is needed to visit for all Palestinians and everyone else but this will likely change shortly as the site is officially opened to tourists) from the Palestinian/West Bank side; Bethany beyond the Jordanian Baptism site from the Jordanian side. In addition, from the window of the bus the river could be seen by those crossing the border at the Jordan River Crossing Point, also known as Beit Shean and Sheikh Hussein Bridge, and from Allenby Bridge, also known as King Hussein (Malik Hussein) Bridge.[37]

[32] Michale Turner, Nader Khateeb, Khaled Nassar, *op. cit.*, note n.24. pp. 11-12-13
[33] *Crossing the River Jordan*, , Jordan River Foundation, Amman, 2002, p.9, available at: http://www.jordanriver.jo/articles/pdf.pdf (consulted on the 17th of April 2010)
[34] *Ibid*. p.13
[35] *Ibid*. p.14
[36] http://www.foeme.org/projects.php?ind=23 (consulted on the 16th of April 2010)
[37] Interview with Elizabeth Ya'ari, Coordinator of the project *Jordan River Rehabilitation* of the NGO *Friends of the Earth Middle East*, 18 April 2010.

FIGURE 2: Baptism Site[38]



[38] Photo made on the 12th of May 2009 by the author of this thesis

This division could also be seen in the village of Al Harawiya near Sheikh Hussein Bridge, where a wall has been built by the Jordanian authorities in order not to allow the inhabitants of this village as well as the students attending the local school that looks to the river, to see the river, probably for security reasons. In this way, it is difficult for the people working in the environmental sectors, and for all of those who care about the rehabilitation of the Jordan River, to raise awareness on this topic and on the water issue among the local population, to which it is not allowed to have any contact with the river, even a visual one.[39]

FIGURE 3: Al Harawiya School and the wall[40]

The Bakura area, also known as Naharayim, meaning "two rivers," is an interesting case of this. It is the point of convergence of the Jordan River with its main tributary: the Yarmouk. It is a strategic area because of the important amount of water resources

[39] Interview with some local students and farmers during a trip in the area with the NGO *Friends of the Earth Middle East*, on the 30th of May 2009.
[40] Photo made by the author of this thesis on the 30th of April 2009

present there and of the very fertile and arable land. In addition, it is the northern boundary territory between the Hashemite Kingdom, Israel, and the beginning of the Golan Heights, claimed by Syria. For this reason, in the Peace Treaty between the first two countries signed in 1994, it has been decided to define this area as a "trans-boundary protected area," of Jordanian sovereignty but rented to Israeli farmers for 25 years, that means until 2019, solving in this way the international territorial dispute. It is interesting to see Israeli farmers peacefully cultivating a land on the Jordanian side of the river.[41] However, this area is today a military area, where a Jordanian military observation point controls the situation, as well as an Israeli military point on the other side of the river. It is therefore a non-accessible point to the public, dividing in this way the historical function of the river of meeting place for different cultures, religions, and people.[42]

[41] The author of this thesis participated in a study trip in the Bakura organized by the NGO *Friends of the Earth Middle* East in May 2009 as well as in the launching pre-feasibility event of the project *Jordan River Peace Park* by the NGO *Friends of the Earth Middle East* on the 15th of May 2008 in Amman, Jordan.

[42] Yehonathan Tommer, "Jordan River Valley Peace Park: American Architects Help Brainstorm Concepts for a "Trans-Boundary" Eco-Park", in: *Ohmy News*, 15/05/2008, available at: http://english.ohmynews.com/articleview/article_view.asp?no=382578&rel_no=1 (consulted on the 19th of April 2010)

FIGURE 4: Bakura area[43]

Historically, the Bakura area has a great relevance because in the 1930s there was a huge hydroelectric power station established in order to produce electricity for the whole area. This plan was built by the engineer Pinhas Rottenberg in collaboration with the Hashemite King Abdullah I. This station used to work until 1948, when it has been damaged during the 1948 war. The Bakura area took the name of "Peace Island" in the peace treaty of 1994 because of its peculiarity: the Jordanian area landed to Israeli farmers.[44]

[43] Photo made by the author of this thesis on the 1st of May 2009

[44] *Neighbours Path: Jordan Valley, Friends of the Earth Middle East*, p.2, available at: http://www.foeme.org/docs/Brochure_JV_English.pdf (consulted on the 18th of April 2010)

1.2.2 The population of the valley and the Jordan River

When it comes to the whole population of the Valley, in the Jordan Valley live 47,000 Palestinians among twenty communities, including the city of Jericho, even if since 2005 the valley is off limits to those Palestinians that cannot demonstrate their residence there, and for those who can, checkpoints and barriers "makes freedom of movement extremely difficult;"[45] 11,000 Israelis who live in 17 colonies constituting the Emek HaYarden Regional Council, while an additional 7,500 reside in 26 settlements;[46] and around 100,000 Jordanians.

The Jordanian side of the Jordan River Valley is known as East Bank. Its population before the war of 1967 was of 60,000 while after the war it fell down to 5,000. During the following decades, new infrastructural projects in the area convinced many Jordanians to move there, where today 100,000 people live.

Agriculture is the main activity of this area. In fact, this area, that represents only 5% of the Jordan territory and where less than 6% of Jordanians live,[47] is important because over 60% of the national agricultural production comes from this valley.[48] Benefiting from its position – below sea level – and therefore from warm winters and hot summers, and from the water brought along the river by the King Abdullah Canal – also known as East Ghor Canal – and used mainly for irrigation, Jordan increased its agricultural productivity and manages to export a certain amount of fruits and vegetables, such as bananas.[49] Farmers in the valley prefer to cultivate fruits, whose production needs a larger quantity of water, than vegetables and field crops because: of the stability of the fruits prices, to avoid the risk of changing agricultural policies – that is less with fruit-trees - and because in the mind of the farmers growing fruits is perceived as occupying a higher social class. This phenomenon is taking place

[45] Cit. from: Michael Mason, Ziad Mimi, and Mark Zeitoun, *Climate Change Adaptation Strategy for the Occupied Palestinian Territory*, Final report to the UNDP/PAPP, 2009, p.31
[46] http://www.jordanvalley.org.il/ (consulted on the 16th of April 2010)
[47] Yousef Hasan Ayadi, *op. cit.*, note n.25, p. 3
[48] http://www.jordanembassyus.org/new/jib/factsheets/agriculture.shtml (consulted on the 16th of April 2010)
[49] http://www.kinghussein.gov.jo/tourism4.html (consulted on the 16th of April 2010)

mainly in South Shuna and in the Safi villages, while in the village of Deir Ala'a farmers are mainly cultivating field crops.[50]

FIGURE 5: Cultivations of bananas in the Jordan River Valley[51]

The highest amount of precipitation in the valley is in its northern part, decreasing gradually southwards. The range is from 394 mm in the area of Bakura, in the northest part, to 74 mm in the Ghore Safi district, near the Dead Sea.[52] This is one of the driest areas of the country. As a matter of fact, in the northern part of the country, namely in Ajloun and Balqa, the range is between 600 and 550 mm, while in the

[50] Tareq Al-Zabet, "Integrated Agricultural and Water Management in the Jordan Valley", in: Ozay Mehmet and Hasan Alì Bicak, *Modern and Traditional Irrigation Technologies in the Eastern Mediterranean*, IDRC, 2002, pp. 99-101

[51] Photo made by the author of this thesis on the 30th of April 2009

[52] *Jordan's Second National Communication to the United Nations Framework Convention on Climate Change*, 2009, p.28, available at: http://www.undp-jordan.org/LinkClick.aspx?fileticket=ieOv%2BtI2mqQ%3D&tabid=36&mid=373 (consulted on the 12th of April 2010)

southern part of Jordan, in Karak and Shoubak, the range is between 350 and 300 mm.[53]

1.3 Impact of climate change in the Jordan Valley

Global warming could have a huge impact on Jordan and in particular on the equilibrium of the Jordan Valley. The impact would be mainly on the water resources, and therefore as a consequence also on many other sectors. According to Khaled Irani, Jordanian Minister of Environment, "Jordan is facing a severe challenge in water scarcity to be magnified by the impacts of climate change. Jordan is statistically the fourth most water scarce country in the world with a per capita share of 150 cubic meters."[54] According to the International Panel on Climate Change, Jordan as well as Israel and the West Bank is facing indeed a situation of water scarcity, that means that these countries are under the level of 1,000 m^3 per person per year, respectively: 169 m^3, 265 m^3, and 90 m^3.[55] As a consequence of climate change, according to Khaled Irani, there will be a reduction of 20% in precipitation. Also according to experts from the Stockholm International Water Institute there will be a major decrease in the quantity of water availability in the valley.[56] Because of climate change, the Jordan River could lose 80% of its current water resources by 2100.[57]

The decrease of the precipitation will further have an impact not only on the Jordan River, but also on other surface water resources as well as on the aquifers, that will take more time to regenerate. One of the main and immediate consequences of the increasing scarcity of water in the valley will be on the agriculture and on the farmers. As a matter of fact, with a 15% reduction in the Jordan River, almost 50% of the

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[53] Munther J. Haddadin, *Water Resources in Jordan: Evolving Policies for Development, the Environment, and Conflict Resolution*, Ariel Dinar, Resources for the Future, Washington D.C., 2006, p. 9-10

[54] Khalid Irani, "Saving the World and our Own Future", in: *Jordan Watch*, 16th of October 2009, available at: http://www.jordanwatch.net/archive/2009/10/955798.html (consulted on the 17th of April 2010)

[55] Oli Brown and Alec Crawford, *op. cit.*, note n. 5, pp.11-12

[56] See http://www.siwi.org/ (consulted on the 17th of April 2010) and Rami Abdelrahman, "Jordan Valley: Hot Spot for Climate Change – Scientists", in: *The Jordan Times*, 19 August 2007, available at: http://www.jordantimes.com/?news=1569 (consulted on the 16th of April 2010)

[57] Volker Mrasek, "Climate Change Threatens the Cradle of Civilization", in: *Der Spiegel*, 16/04/2008

Jordanian farmers would be significantly affected while more than 20% would immediately be put out of business.[58]

This phenomenon is already happening, according to Jordanian experts.[59] In fact, many farmers of the valley were to leave their activity because of the increasing farming costs as a consequence of the effects of climate change, and therefore decided to switch to other jobs mainly in the governmental field.[60]

The decrease in the agricultural sector, pose a question of national food production. Vegetables and fruits are mainly produced in this area, and a decrease in the food productivity induced by the increase of the water scarcity, and therefore the rising of its price, would mean a strong increase in the price of the food products. In addition, it has to be considered the strong growth of the Jordanian population that will mean an increase in the food demand.

As a consequence of less rainfall and the abandonment of farming practices would be the destiny of these lands. In fact, the conversion of croplands - not sustainable anymore due to rainfall - in marginal areas, change of jobs and therefore overgrazing - in the case of shepherds - and uncontrolled urbanization could have an impact on the previously cultivated lands, which degradation and erosion would be quicker and the risk of desertification higher.[61]

Another consequence of the drastic decrease of the flow of the Jordan River, are the consequences on the level of the Dead Sea. In the case of the Jordan River level, this is mainly due to the diversion and to the dams built by Israel, Jordan, and Syria (on the Yarmouk, the main tributary of the Jordan River), but indeed lower precipitation and higher temperature have also an impact on the river. For this reason, the level of Dead Sea is falling every year by more or less 1 meter, losing more than 25 meters in the last thirty years.[62] If no actions will be taken, the risk is that within fifty years this

[58] *Ibid*., according to Heinz-Peter Wolff, a German expert from the University of Höhenheim
[59] Khalid Irani, *op. cit.*, note n.54
[60] *Ibid*.
[61] Mu'taz Al Alawi, "Desertification in Jordan", in: P. H. Liotta, David A. Mouat, William G. Kepner and Judith M. Lancaster, *Environmental Change and Human Security: Recognizing and Acting on Hazard Impacts,* Springer Netherlands, 2008, p.81 available at: http://www.springerlink.com/content/t130k85197p03117/ (consulted on the 17th of April 2010)
[62] Marie Armelle Beaulieu, *The Dead Sea is Dying*, Friends of the Earth Middle East, available at: http://www.foeme.org/docs/dead_sea_english.pdf (consulted on the 17th of April 2010)

sea will disappear.[63] This phenomenon in the last years has generated an other new visible consequence: more than 2,000 sinkholes.

A sinkhole is a natural hole, a depression, in the surface of the land surrounding the sea and it is formed suddenly. These sinkholes are supposed to be caused by a groundwater level drop – as a consequence of the Dead Sea level drop – forming cavities underground, where fresh water used to be previously. Incoming water will then dissolve salt layers, causing internal holes that collapsing, will suddenly create the sinkholes around the Dead Sea.[64] This phenomenon, happening suddenly, may be seriously dangerous for workers and people happening to be in the area where the sinkhole will form.[65] As a matter of fact, a farmer together with his donkey died falling in a sinkhole that was forming under them while he was working on his land.[66] A sinkhole can open at any time swallowing up everything on the surface, like an earthquake. Together with the risk for the local people, there are two other problems: firstly, it is dangerous to cultivate the area near the Dead Sea; secondly many economic activities such as industries have been seriously damaged and had to close for security reasons. For instance, in the village of Ghor Haditha, along the Jordanian side of the southern Dead Sea, more than 100 sinkholes appeared damaging agricultural lands, forcing the farmers to abandon these areas, as well as damaging economic industrial activities.[67] In fact, in the same village a factory producing Dead Sea's soaps and beauty products had to close for security reasons after that it has been seriously damaged by this phenomenon.[68]

[63] Interview with the photo-reporter Paolo Pellegrin who was working on the Jordan River and Dead Sea issues for *The National Geographic* for the special issue on water published in April 2010. the interview took place on the 11th of May 2009 in Amman, Jordan.
[64] Meir Abelson, Yoseph Yechieli, Onn Crouvi, Gidon Baer, et al.. *Evolution of the Dead Sea Sinkholes*, in: *New Frontiers in Dead Sea Paleo-Environmental Research*, Geological Society of America, special paper 401, 2006, p. 242
[65] Damien Closson, Naja Abou Karaki, and Frederic Hallot, "Along the Jordanian Dead Sea Coast Triggered by the Lake Level Lowering", in: *Environmental Earth Journal*, Volume 59/number 7, Springer, Heidelberg, February 2010, P. 1417
[66] It happened in South Ghor area in may 2009; interview with local farmers conducted in the area on the 12th of May 2009.
[67] "Dead Sea Need Help to Stay Alive", in: *Kuwait Times*, 25 November 2009, p.14
[68] Interview with some employees that used to work in this factory, conducted in the village of Ghor Haditha on the 12th of May 2009

FIGURE 6: the impact of sinkholes on the factory in Ghor Haditha[69]

[69] Photo made by the author of this thesis on the 12th of May 2009

FIGURE 7: the impact of sinkholes on agriculture in Ghor Haditha[70]

Climate change will have an impact on the biodiversity of the area. As this paper has highlighted, the Jordan Valley and the Great Rift Valley as a whole are an important region from a natural point of view: a particular mixture of plants and animals live there. Many of these species are today in danger. In addition, the Jordan Valley is a flyway path for migratory birds and animals that find in this valley a place where to stop to rest and feed along the way.[71] Every year around 500 million birds of more than 500 different species fly through this valley regularly in spring and autumn. However, land and water quality degradation, the decrease in the quantity of rainfalls

[70] Photo made by the author of this thesis on the 12th of May 2009

[71] Kathy MacKinnon, Claudia Sobrevila, and Valerie Hickey, *Biodiversity, Climate Change, and Adaptation: Nature-Based Solutions from the World Bank Portfolio*, International Bank for Reconstruction and Development / World Bank, Washington, 2008, p.38

and in the rivers, as well as the degradation of the lands are creating serious challenges for the biodiversity of the area.[72]

Many of these birds belong to threatened species according to the International Union for Conservation of Nature. These species use the Jordan Valley as a flyways because they profit from its natural and agricultural resources in order to feed, restore, forage, and rest, and the effects of climate change are seriously putting challenges to them, that will have to consider the possibility of changing migratory flyway.[73]

Moreover, there are also human responsibilities related to climate change that are causing damages to the biodiversity in the valley: the unsustainable development and the urbanization caused by the abandon of agricultural practices for climate change induced reasons; mismanagement of rangelands; over-grazing; over-fishing; hunting; unsustainable use of chemicals in agriculture. These factors are causes of degradation for the arable land, changes in job activities for instance from farmers to other activities such as hunting, fishing, or governmental jobs push the population to move from small villages, and therefore, a growing population in the main cities and villages of the valley means an urban expansion also to ecologically relevant lands. For these reasons, a destruction and strong degradation of the natural habitats of flora and fauna is taking place in the valley.[74] For instance, the Jordan River is becoming more and more polluted, and the quality of its water is seriously damaged, becoming very salty and polluted.[75] In the last decade the discharge of the river was between 0.65 and 3 m/sec, which creates difficulties for the inhabitants and challenges the ability for rich biodiversity. As a result, many species of the rich biodiversity of the river disappeared in the last years and only these species highly tolerant are resisting.

In fact, "due to the high regulation of the river's flow the Lower Jordan River has lost all fast flow habitats and floods, resulting in a dramatic reduction in the river's biodiversity. Biodiversity was found to be at least 50% lower than levels at comparable

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[72] *Conserving Biodiversity*, The Royal Society for Conservation of Nature, available at: http://www.rscn.org.jo/orgsite/RSCN/HelpingNature/ConservingBiodiversity/tabid/75/Default.aspx (consulted on the 17th of April 2010)

[73] *Jordan Valley Project: Together for Birds and People in the Jordan Valley*, available at: http://www.wildlife-pal.org/jordan_valley.htm (consulted on the 17th of April 2010)

[74] Batir Wardam, "Arab Countries Off-Track in Achieving Biodiversity Targets", in: *Arab Environmental Watch*, 26/01/2010, available at: http://www.arabenvironment.net/archive/2010/1/1007822.html (consulted on the 18th of April 2010)

[75] Sarig Gafny, Samer Talozi, Banan Al Sheikh, Elizabeth Ya'ari , *op. cit.*, note n.24, p.44

reference sites, primarily due to a loss of fast flow habitats and floods and the high salinity of the waters."[76]

[76] Cit. from: Sarig Gafny, Samer Talozi, Banan Al Sheikh, Elizabeth Ya'ari , *op. cit.*, note n.24, p. 17.
See also pp.45-48

Chapter 2: Solutions: adaptation to climate change

2.1 Adaptation to climate change

As this paper has described, the effects of climate change are evident worldwide and the impacts are related to the natural, social, and economic spheres. The impacts are already visible, but more effects are projected for the next decades. For this reason, the international community and in particular the international organizations such as the United Nations and the European Union are taking measures to fight climate change and its effects. The two main policies adopted are mitigation and adaptation to climate change.[77]

On the one hand, mitigation refers to a series of actions to be taken in order to turn down the intensity of the change in net irradiance at the atmospheric boundary between the troposphere and the stratosphere with an aim of reducing the global warming.[78] In practice, it is usually referred to the reduction of the greenhouse emissions in order to reduce the effects of climate change.[79] The aim of this policy is to take measures to reduce the long-term risks of climate change to the nature and to humans also in their economic and social activities.[80] According to the IPCC, it is "an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases."[81]

On the other hand, adaptation, that is the aspect that this paper will consider, refers to a series of measures and actions aiming at adjusting and adapting a group or a specific target to the effects of to the potential effects of climate change. In other words, it could be said that it is a way to moderate a potential damage or to cope with the

[77] Anthony Giddens, *The Politics of Climate Change*, Polity Press, Cambridge, 2009, p.162

[78] Aviel Verbruggen, IPCC Glossary Working Group III, p.818, available at: http://www.ipcc.ch/pdf/glossary/ar4-wg3.pdf (consulted on the 19th of April 2010)

[79] Mario Molina, Durnwood Zaelke, Madhava Sarmac, Stephen Andersen, et al., *Tipping Elements in Earth Systems Special Feature: Reducing Abrupt Climate Change Risk Using the Montreal Protocol and other Regulatory Actions to Complement Cuts in CO_2 Emissions*, Proceedings of the National Academy of Sciences, 2009, available at: http://www.pnas.org/content/early/2009/10/19/0902568106.full.pdf (consulted on the 19th of April 2010)

[80] *Climate Mitigation and Adaptation*, available at: http://www.global-greenhouse-warming.com/climate-mitigation-and-adaptation.html (consulted on the 19th of April 2010)

[81] Cit. from: IPCC, *Climate Change 2007: Working Group II: Impacts, Adaptation, and Vulnerability*, available at: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch18s18-1-2.html (consulted on the 19th of April 2010)

effects already currently induced by climate change. Within the adaptation strategy, there are two main approaches: one is oriented toward adapting to the effects of global warming after they have appeared, and the other one focuses on potential future impacts, and therefore could be seen as "pro-active adaptation."[82]

At first, environmentalists in the last decade preferred not to consider adaptation as a strategy because it would have meant a decision not to fight against climate change. They preferred to fight directly against climate change and therefore they did not want to consider measures to adapt to climate change, because it would have been not coherent. They preferred to deal with mitigation, in other words with the causes of global warming, than with adaptation, in other words the effects of climate change.[83] However, after the Bali discussions that took place in 2007 within the Conference of the Parties (COP) meetings, adaptation became an important and strategic aspect of climate change measures and policies.[84]

Another concept to bear in mind is vulnerability. It is the risk that people or systems face during a change and their sensitivity to the effects on climate change, as far as social, economic, and natural fields are concerned. Its opposite is resilience, that means the adaptive capacity that people or systems have to cope with sudden changes and shocks caused in this sense by global warming.[85] Therefore, a good adaptation policy should first of all understand how it could best act in order to help individuals and systems to prepare themselves to face the changes environmental induced, working therefore in a way aiming at reducing their vulnerability.[86]

Adaptation should be taken into consideration and be an integral part of all the development assistance policies of the countries. It has to be noted that it is not always possible to have an adaptation policy for the impacts of climate change. As a matter

[82] Cit. from Anthony Giddens, *op. cit.*, note n.77, p. 163
[83] *Climate Mitigation and Adaptation*, available at: http://www.global-greenhouse-warming.com/climate-mitigation-and-adaptation.html (consulted on the 19th of April 2010)
[84] Anthony Giddens, *op. cit.*, note n.77, p.162
[85] Anthony Giddens, *op. cit.*, note n.77, p.163
[86] Tom Mitchell, and Thomas Tanner, *Adapting to Climate Change: Challenges and Opportunities for the Development Community*. IDS and Tearfund, Teddington, 2006, available at: www.id21.org/society/s3tt1g2.html (consulted on the 19th of April 2010)

of fact, the small islands and the low-lying coastal regions threatened by the rise of the level of the sea cannot adapt to that, and should therefore consider other options.[87]

However, it has to be considered that mitigation and adaptation do not exclude each others, but are complementary. It is true that the more mitigation there is, should mean that the effects of the global warming will be less and therefore less adaptation will be needed. For this reason, the cost of adaptation will be reduced with a good and strong mitigation strategy.[88] However, one main problem of the adaptation policy today is imperfect information and therefore a good planning on how to intervene could be difficult.[89]

In any case, adaptation to climate change is already a reality. As a matter or fact, there are already adaptation measures considered for instance in the design of the coastal defence in the Maldives and in The Netherlands, as well as the water management policies in Australia.[90] The methodology of implementation is not always the same, but it works according to geographical, climatic, and political peculiarities.

The adaptive responses could be very different: technological measures, for instance the sea defences; behavioural; managerial; and policy, for instance national water management and planning regulations. An important barrier for the implementation of adaptive measures for developing countries that has to be taken into consideration is the economic aspect.[91]

In any case, development projects for adaptation to climate change should not be seen as a completely separate project from all the others running on. In fact, adaptation measures are usually implemented in the framework as part of non-climatic projects. Therefore, adaptation actions will be implemented in coherence and consistency with other programmes. It is indeed important that the donor will make sure that adaptation measures will be coherent with the development programmes and

[87] Nicholas Stern, *The Economics of Climate Change: the Stern Review*, Cambridge UP, Cambridge, 2007, p.457
[88] *Ibid*., p.469
[89] *Ibid*., p.466
[90] See the IPCC Third Assessment of human activity to adapt to observed and anticipated climate change, available at: www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf (consulted on the 19th of April 2010)
[91] IPCC, 2007: *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Martin Parry, Osvaldo Canziani, Jean Palutikof, Paul van der Linden, et al., Eds., Cambridge University Press, Cambridge, p.19

projects, in order to avoid mal-adaptation, in other words an increase in vulnerabilities.[92]

Usually these adaptation measures are taken in the field of: natural resources management, for instance supply and demand management; productive sectors linked and connected to the availability of natural resources, for instance agricultural and forestry; urban centres; and health policies.[93]

2.2 Adaptation to climate change in the Jordan Valley

In the case of Jordan, adaptation measures have been taken mainly in the field of water and agriculture. In fact, climate change will affect mainly the water resources in the Jordan Valley, related as this paper has analyzed, to many other fields. According to the UNFCCC, the raising of temperatures will increase in Jordan the water demand for agricultural purposes by 18%, while the decrease in rainfalls will increase the water demand for irrigation by 5%. For this reason, measures in water and agricultural practices are urgent in this area.[94]

It is important to have good cooperation between the local communities affected by the same problems because the best adaptive strategies take place at the community-local level. It is therefore important to share the "best practices" of adaptation among these communities, as well as it is important the role that the civil society could have in raising awareness on the impact of climate change, and therefore on the importance of the efficient use of water and natural resources.[95]

A good project that has been established in the Jordan Valley in 2001 by the Israeli - Jordanian - Palestinian NGO *Eco Peace / Friends of the Earth Middle East* (FoEME) is called "Good Water Neighbours". This project started in 2001 involving

[92] Commission of the European Communities, Communication from the Commission to the Council and the European Parliament, *Climate Change in the Context of Development Cooperation,* Brussels, 11/03/2003, p.16, available at: http://ec.europa.eu/development/icenter/repository/env_cc_com_2003_85_en.pdf (consulted on the 17th of April 2010)
[93] *Ibid*.
[94] *Jordan's Second National Communication to the United Nations Framework Convention on Climate Change*, 2009, *op. cit*., note n.52, p.86
[95] Oli Brown and Alec Crawford, *op. cit.*, note n. 5, p. 33

only 11 communities, while today it involves 25 different Israeli, Jordanian, and Palestinian communities of the Jordan Valley. This project aims at educating and raising awareness concerning environmentally common issues, in particular focusing on water resources and on the effects of climate change. In this way, these communities are sharing the best practices and the successful practices to adapt to climate change and to the decrease of water.[96]

In this area there are NGOs involved in environmental protection and climate change adaptation, as well as the national authorities such as the Jordanian Ministry of Water and Irrigation and the Jordanian Ministry of Environment. In addition, the Jordan Valley Authority, that was established in 1977, since 1988 has been delegated by the Ministry of Water and Irrigation in order to work on the development of the valley in all the aspects concerning development and the daily life of the Jordanian citizens in the valley.[97]

The Jordan Valley Authority focuses its action for adaptation to climate change on water resources because water, as previously seen in this paper, is related to biodiversity, agriculture, etc. For this reason, the Jordan Valley Authority is already implementing a number of projects to face climate change and to help the valley to adapt to it.[98] These projects concern mainly the following fields:

1) Water efficiency. In order to improve the water efficiency in the valley, some measures have been taken. Firstly, the surface irrigation for agricultural purposes in the valley has been updated, and changed from a series of irrigation channels to a network of pressurized pipes. In this way, a large amount of water resources for irrigation can be saved. The farmers of the valley have also been pushed to adopt micro-irrigation systems instead of the surface ones. Secondly, a Water Management Information System has been installed in order to make it more simple to calculate the balance

[96] Friends of the Earth Middle East, *Good Water Neighbours: a Model for Community Development Programs in Regions of Conflict. Developing Cross-Border Community Partnerships to Overcome Conflict and Advance Human Security*, August 2005, p.3, available at: http://foeme.org/index_images/dinamicas/publications/publ19_1.pdf (consulted on the 20th of April 2010) and: Friends of the Earth Middle East, *Good Water Neighbours: Identifying Common Environmental Problems and Shared Solutions*, February 2007, p.6, available at: http://foeme.org/index_images/dinamicas/publications/publ69_1.pdf (consulted on the 20th of April 2010)

[97] Yousef Hasan Ayadi, *op. cit.*, note n.25, p. 18

[98] For the complete list, please see: *Ibid*. pp.27-30

between the availability of water and its demand. Thirdly, many NGOs, universities, and researchers are involved in a pilot project that aims to install in the farms some dispositives to control the needs of the crops. In this way, the water could be optimized and crops could receive it only when they will need it. Fourthly, in each irrigation line a hydraulic simulation model has been installed. This is supposed to make the pressure stable in the irrigation lines.[99]

2) Awareness and training. Awareness and training have been important issues in order to share with local farmers the best practices in agriculture. Awareness raising has been done therefore in the valley to spread the Good Agricultural Practices to the farmers of the valley. Another activity was to encourage the farmers of the valley to form water-user associations. These associations, on a geographic basis, have to plan the irrigation activities, in order not to stress the same water network at the same moment of the day. In addition, knowing the schedule of the other local farmers, helps to have water transparency and to optimize efficiency avoiding losses. 16 groups have been established involving more than 40% of the farmers. Training for the farmers was given in order to help them to irrigate specific typologies of crops tolerant to the salt. In this way, water of low quality from the shallow aquifer near the Dead Sea could be used for agricultural purposes. Training and best practices have been given to the farmers concerning the use of the reclaimed water. This is due to the diversion of large amount of fresh water to the municipalities for domestic purposes.[100]

3) Jordanian-Israeli Peace Agreement. The King Abdullah Canal, that brings water mainly for agricultural reasons from the Upper Jordan River - from the Israeli side - to the Lower Jordan Valley in accordance to the peace treaty between Jordan and Israel signed in 1994, has been rehabilitated. In addition, a system to monitor and control water flow has been installed. Thanks to the rehabilitation and installation, losses are avoided and the operational conditions have been definitely developed.[101] Negotiation and studies are still on-going concerning the possibility of allocating 50 mcm/years of

[99] *Ibid*., p.27
[100] *Ibid*., p.28
[101] *Ibid*., p.27

fresh water from Israel to Jordan, as it was decided in the Peace Agreement.[102] The Joint Water Committee between the Hashemite Kingdom and Israel, established according to the Peace Treaty signed in 1994, meets regularly in order to monitor the water relations between the two countries according to the decisions taken in the treaty. It has been decided to bring extra amount of water from the Tiberias or Galilee Sea to the King Abdullah Canal.

4) A water tariff system. A water tariff system has been adopted in the valley as well as in the whole country. This system aims at increasing an efficient use of the water and charges more those farmers who use a large amount of water. It has been noticed that this mechanism is saving irrigation water.[103] This new system aims at promoting water efficiency and conservation sanctioning heavy consumers and supporting the poorest social classes.[104]

5) Virtual water. Banana and citrus were cultivated in the valley. However, these consume a huge amount of water, and therefore it has been decided not to give licenses to the farmers of this area to cultivate these kind of plants. In effect, this is a more general discourse: agriculture in the Jordan River Valley as well as in the country is the sector that consumes the most water, contributing only to 2.2% of the Jordanian gross domestic product.[105] According to the principle of virtual water, that measures the amount of water needed to produce any good and service, in a dry region such as the Jordan Valley and Jordan, fruits and vegetables that require a lot of water, for instance bananas, should not be cultivated but imported in the country.[106]

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[102] *Ibid*.
[103] *Ibid*., p.29
[104] Philipp Magiera, Suzan Taha, and Lothar Nolte, *Water demand management in the Middle East and North Africa*, in: *Management of Environmental Quality: An International Journal* 17(3), 2006, p.292
[105] Khalid Irani, *op. cit*., note n.54
[106] The concept of *virtual water* was introduced by Professor John Anthony Allan of the Kings College London (KCL) and from the School of Oriental and African Studies (SOAS) of the University of London. He received the Stockholm Water Prize 2008. Prof. Allan has been interviewed on the water situation in the Jordan Valley in Brussels, Belgium, on the 13th of February 2009. For more information concerning the water issue in Middle East: John Anthony Allan, *Water, Peace and the Middle East: Negotiating resources in the Jordan Basin*, I. B. Taurus, New York, 1996; John Anthony Allan, *The Middle East Water Question: Hydro-politics and the Global Economy*, I. B. Taurus, New York, 2002; David J.H. Phillips, John Anthony Allan, Marius Classen, Jakob Granit, et al., *The Two Analyses: Introducing a Methodology for the Trans-boundary Waters Opportunity Analysis*, Report N. 23, SIWI, Stockholm, 2008

6) Yarmouk River. According to the international bilateral agreement between the Hashemite Kingdom of Jordan and Syria, a committee meets regularly in order to monitor the allocation of the shared water resources, namely the Yarmouk River resources. In order to better monitor the water resources of the Yarmouk River, a weir has been built in Adasiyeh. In order to store the floods of the Yarmouk River, a dam called Al Wehda has been built in Maqarin, on the Jordanian-Syrian border.[107]

7) Red-Dead Sea canal. A project known as Red-Dead Canal aims at bringing water from Aqaba to the Dead Sea. This project has been considered in order to save the Dead Sea, which is drastically falling by 1 meter a year, and that has lost one third of its surface compared to 60 years ago. This project is supposed to solve the problem of the level of the Dead Sea (and consequently of the sinkholes), and could also produce an amount of hydropower. However, it does not take into consideration the fate of the Jordan River, whose level today is more or less only 2% of its level of fifty years ago.[108]

The Jordan Valley Authority, therefore, has focused mainly on water and water-related issues, including agriculture. However, an other important field taken into consideration by some local NGOs concerns biodiversity. One type of solution proposed by the United Nations Environment Programme (UNEP) concerns protected areas.[109] Climate change will mainly have an impact on biodiversity because it will shift in a neighbouring area the distribution of ecosystems and species. It has to be studied, therefore, how climate change will impact the ecosystem of the Jordan River Valley, to better know how to intervene to help the rich biodiversity of the area to adapt to it. According to the UNEP, it is important to focus not only on single sites, but on a

[107] Yousef Hasan Ayadi, *op. cit.*, note n.25, p.30
[108] *Ibid*. See also the latest publications of FoEME, for instance: http://www.foeme.org/index_images/dinamicas/publications/publ117_1.pdf
[109] *Climate Change and Biodiversity: Protected Area Networks*, World Conservation Monitoring Centre, United Nations Environment Programme, available at: http://www.unep-wcmc.org/climate/pas.aspx (consulted on the 14th of April 2010). See also: "Valuing the Impacts of Climate Change on Protected Areas in Africa", in: *Ecological Economics***,** 2005; and: "Would climate change drive species out of reserves? An assessment of existing reserve-selection methods", in: *Global Change Biology***,** 2004

regional ones.[110] In fact, in this way it would be simpler to intervene to conserve biodiversity, because animals and plants would be facilitated in moving and shifting from a protected area to a nearer one with better specific environmental and climate conditions.[111]

However, in the Middle Eastern countries, regional coordination and cooperation concerning eco-parks and protected areas is not very developed yet. As a matter of fact, usually in this area projects and programs are developed on a country basis, or even in isolated sites. There is also a lack of places where networking could be done and therefore the possibility of sharing successful experiences, as far as eco-parks, protected areas, and conservation of biodiversity are concerned.[112]

[110] *Ibid*.
[111] *Ibid*.
[112] Batir Wardam, "Arab Countries Off-Track in Achieving Biodiversity Targets", in: *Arab Environmental Watch*, 26/01/2010 available at: http://www.arabenvironment.net/archive/2010/1/1007822.html (consulted on the 20th of April 2010)

Chapter 3: Implementation: the Eco-Park case study

"All water resources within the boundaries of the Kingdom, whether they are surface or groundwater, river or internal seas, are considered to be state-owned property and shall not be used or transported except in compliance with law."[113] The institutions that in the country are responsible for the Jordanian water management are: the Ministry of Water and Irrigation (MWI), responsible for the national water policies, planning, development, and financing; the Water Authority of Jordan (WAJ), which deals with water and sewerage services; the Jordan Valley Authority (JVA), which is geographically focused only on the Jordanian part of the Jordan Rift Valley and is responsible for water resources and, therefore, also for the management of the dams on the Jordan River.

As this paper has analyzed in the second chapter, the Jordan Valley Authority is developing projects and programmes in the valley aiming at adapting the valley to the effects of climate change, especially in the water resources fields. This paper has also examined that a problem of the whole Middle Eastern region concerns the lack of regional actions for the protection of the rich biodiversity. This issue is faced locally, but there is a lack of trans-border cooperation and this issue is often not taken seriously into consideration.[114]

3.1 The Dilemma of the Eco-Park Project

This chapter will examine and analyse the implementation of the Sharhabil Bin Hassneh Eco-Park in the East Bank. This is a project of the NGO *Friends of the Earth Middle East* (FoEME) / *Eco -Peace*,[115] a non-governmental organization working for the environmental protection in the area and for the construction of dialogue and peace between Jordanians, Israelis, and Palestinians through the environmental protection. This is a Jordanian, Israeli, and Palestinian NGO that has three directors and three

[113] Cit. from Water Authority Law No. 18 of 1988, see also: http://www.mwi.gov.jo/English/WAJ/Pages/default.aspx (consulted on the 2nd of May 2010)
[114] See the 2.2. chapter of this thesis
[115] For more information concerning the NGO please visit their official website: www.foeme.org (consulted on the 26th of April 2010)

offices respectively in Amman, Tel Aviv, and Bethlehem. This leading environmental organization in the Middle East has received many awards and recognition in the last decades locally, regionally, and internationally.[116]

When FoEME in 2004 applied to the Jordan Valley Authority in order to have an amount of land in the valley in order to start their activities for the rehabilitation, conservation, and protection of the valley through the establishment of an Eco-Park, the Jordan Valley Authority found itself facing a dilemma: whether to trust an NGO giving them a certain amount of land, considering that they are based in Amman and therefore far from the valley, the local powers, and the local tribes, or support the local tribe of Bedouins that were using the land for their goats as well as the local farmers for an unsustainable agriculture.

This dilemma has been solved after internal discussions, and the Jordan Valley Authority decided to give a chance to FoEME, the NGO that even if based many kilometres away from the valley, has demonstrated a good will in promoting a sustainable development in the area in the previous years, caring about the valley as a whole and therefore building dialogue between the communities even if belonging to different states. In particular the project Good Water Neighbours demonstrated to the local authorities the good work carried on by the NGO, working on a community level basis and involving first of all the local population. For this reason, the Jordan Valley Authority, whose aim is first of all the development of the valley, decided to give 100 donums to the FoEME in order to develop their idea of an Eco-Park, with the eventual possibility of further expansions.[117]

In the place where today there is the park, before 2004 it was farmland and there were Bedouins that used the area for their goat herds. This land suffered from overgrazing, erosion, and lack of irrigation, and therefore there was no rich vegetation growing.

[116] Just to mention some: Skoll Award 2009, Time Magazine 2008 defined the three directors "Environmental Heroes of the Year", Seed Finalist Award 2008; in addition a resolution of the U.S. Senate supports the activities of the NGO. For more information, please visit: http://foeme.org/about_us.php (visited on the 27th of April 2010). See also annex number 1

[117] See annex number 2

3.2 The Eco Park of Sharhabil Bin Hassneh[118]

The Eco Park of Sharhabil Bin Hassneh is situated in the Tabket Fahel, near the archaeological historical site of Pella. It is therefore located in the northern part of the Jordan River Valley, right near the oldest dam in Jordan, Ziglab or Sharhabil bin Hassneh Dam, built in 1960.

FIGURE 8: Ziglab Dam[119]

[118] The information contained in this part are taken from a series of interviews during a study trip in the Eco-Park in May 2009. Interviews with Munqeth Mehyar, Elizabeth Ya'ari, Abdulrahman Sultan, Baha Afaneh, Gidon Bromberg, and Nader Khateeb on the 30th of April and on the 1st of May 2009 . In addition, also the following book has been consulted: FoEME Master Plan Project Team: Munqeth Mehyar, Abdel Rahman Sultan, Baha Afaneh, Amani Mansour, et al., *Sharhabil Bin Hassneh Eco Park: Development, Operation and Land Use. Master Plan*, Eco-Peace Friends of the Earth Middle East, USAID/Jordan, Amman, July 2009

[119] Photo made by the author of this thesis on the 30th of April 2009

The Eco-Park has been created "as a pilot project whose goal is to establish a model for preserving ecologically important habitats within the Jordan Valley."[120] The park is an extension of the Neighbours Path, a series of paths that constitute the FoEME project Good Water Neighbours, aiming at promoting cross-border cooperation, bridges of dialogue, and peace through the environmental protection. The Eco-Park, therefore, should not be seen only as a local project, but also as a regional one, involving Israeli and Palestinian communities, as well as having an international dimension. As a matter of fact, the Sharhabil Bin Hassneh Park aims at: ensuring environmental sustainability through influencing the local, regional, and national authorities in adopting green and sustainable policies; and decreasing the impact of climate change on the water resources as well as on biodiversity. For these reasons, the Eco-Park is supporting the Millennium Goal of the United Nations number 7, namely ensure environmental sustainability.[121]

To do so, the NGO decided to involve the local communities since 2005, consulting them as well as the stakeholders, including the local civil society, international agencies, and the surrounding municipalities. In this way, FoEME had the opportunity to better know the needs of the local population and therefore took into consideration the results of these consultations that underlined the following main problems: lack of green areas; unsustainable urbanization, industrialization, and agricultural practices; and a lack of environmental awareness.

The NGO had therefore to address these issues and at the same time make the most for rehabilitating this specific area that was facing serious problems before: over-grazing, water issues, and technical knowledge. In fact, as this paper has underlined, this area was used for unsustainable agriculture as well as for goat herds, facing therefore the problem of overgrazing. The water issue includes both the excessive runoff and erosion of the area, as well as the adjacent Sharhabil bin Hassneh Dam that blocks the natural water flow to the park. Finally, the environmental awareness and the

[120] Cit. from: FoEME Master Plan Project Team: Munqeth Mehyar, Abdel Rahman Sultan, Baha Afaneh, Amani Mansour, et al., *op.cit.*, note n.115, p.6

[121] For more information concerning this Millennium Goal please visit: http://www.undp.org/mdg/goal7.shtml (visited on the 28th of April 2010) and for more information concerning the Millennium Development Goals of the United Nations: http://www.undp.org/mdg/ (visited on the 28th of April 2010)

concept of biodiversity protection and of Eco-Park were not very familiar within the local communities.

Therefore the actors that since 2005 are taking part in planning and realizing the Eco-Park are a number of NGOs, including the Royal Society for Protection of Nature and the Jordan Society for Sustainable Development, local communities and municipalities, including Pella Municipality and the Jordan Valley Authority, lead by Friends of the Earth Middle East. This project is financially supported mainly by international agencies as well as by local private and public donors.

3.2.1 Objectives

The aims of the park are:

- **Build regional peace**: the Eco-Park is part of the biggest project of the NGO of building new opportunities of dialogue and of trans-border cooperation through the protection of environment and of the Jordan River Valley in particular. FoEME is trying to achieve this goal of protection of both the human and natural environments focusing on one aspect: education. This does not simply mean meeting students in the school to teach them environmental issues, but it implies also lobbying to publicize, campaign, and promote the present challenges and possible solutions to local, national, and international actors that could be involved in achieving this goal.[122]

- **Create new opportunities**: first of all the park will offer a number of employment places to the local population, and therefore could be seen as an economic opportunity for the local villages. In addition, environmental education will enhance locals with a new way of thinking and of living their daily relation with the environment. In addition, stakeholders will collaborate together, building friendship among them and working together with a common aim of saving the nature of their valley will create a feeling of

[122] In this sense, it is important the activities of the NGO in involving the Senate of the US with the Resolution number 387 of the 16th November 2007 supporting trans-border cooperation in the Jordan River Valley, as well as the conferences held at the European Parliament on this topic (the next one will take place the 28th of June 2010) and the special issue on the National Geographic on Water of April 2010, with an article on the activities of FoEME and the Jordan River Valley.

belonging to the construction of the common ideal. Finally, the park will be an example of sustainable development, giving a practical example of how the environmental protection can involve at the same time economic growth, thanks also to eco-tourism and to all the activities that are going to take place in the area.

- **Reduce vulnerability**: this protected area will conserve the natural resources of the park from the huge urbanization, traffic, and from all the massive human activities.

- **Environmental protection and conservation**: the park will demonstrate and show how a land apparently un-productive could be rehabilitated and recovered following good practices. In this way, the area could reduce the vulnerabilities for biodiversity that is going to face the problem of climate change as well as of the land facing desertification, scarce water resources, and unsustainable agriculture. Therefore the park aims at increasing the biodiversity, in other words the number of different types of flora and fauna species, within its boundaries.

- **Environmental awareness**: the Eco-Park aims at spreading the principles and the importance of the conservation and rehabilitation of the environment among the local population. Educational programmes as well as campaigns and advertisements could involve students, women, and men in order to make the most of the possibilities to raise awareness first of all among the communities of the valley. It could ncrease not only knowledge, but also interest and curiosity concerning the flora and the fauna and the challenges that they are facing today is a priority for the NGO. In this sense, the local authorities would be pushed to ensure the promulgation and implementation of more environmentally friendly laws and regulations.

FIGURE 9: the difference between the land in the Eco-Park and outside[123]

The characteristics that the NGO is using to reach the goals are several. First of all, the location of the Eco-Park, near some villages and not isolated, is a strategic choice because in this way it is more simple to involve the local population, that will be proud of a successful Eco-Park in their area. In the park the best practices of the

[123] Photo made by the author of this thesis on the 30th of April 2009

conservation of natural resources and for their management will be adopted, for instance water saving activities, introduction of new technologies and building design for the reduction of the water losses. The NGO hopes that these practices will be learned and introduced by the locals in their villages, houses, and everyday life. The issue of sustainability will be represented by the park itself and will be a good way to teach it to the people of the valley. As a consequence, the activities of the park and the park itself could be copied and taken as a model for the villages and for the other parts of the valley, becoming therefore a replicable model.

T

he issue of sustainability will also be taught as linked to economic growth and to the management of the natural environment. Green entrepreneurship as well as the promotion of sustainable tourism that will care on the environment and to its respect, will demonstrate the link that there could be between economic benefits and respect of the natural resources.

The park will be a democratic place of peace and therefore the principle of non-discrimination will reign there and will be taught to its visitors; for this reason the park will be open to everyone and no discrimination will be done "on the basis of race, gender, nationality, religion, or sexual orientation."[124]

In order to protect and respect the cultural heritage of the area of the park, including the site of Pella in the area of Sharhabil bin Hassneh, cultural events will be organized through exhibitions and storytellers evenings. In this way the value of the local traditional assets will be increased and preserved.

To involve students in environmental awareness, youth and Scout programs, summer camps, are organized, while researchers and universities are involved in environmental issues. To raise awareness, also *eco-tourism* tours in the area are organized, as well as group activities for local populations.

[124] Cit. from: Master Plan Project Team: Munqeth Mehyar, Abdel Rahman Sultan, Baha Afaneh, Amani Mansour, et al., *op. cit.*, note n.118, p.14

3.2.2 Implementation

The Eco-Park project started in 2005, and was divided in a planning stage and in an operational one. The first one, was sub-divided in assessment, analyses, and design, while the second one in implementation, monitoring and evaluation, and advocacy.

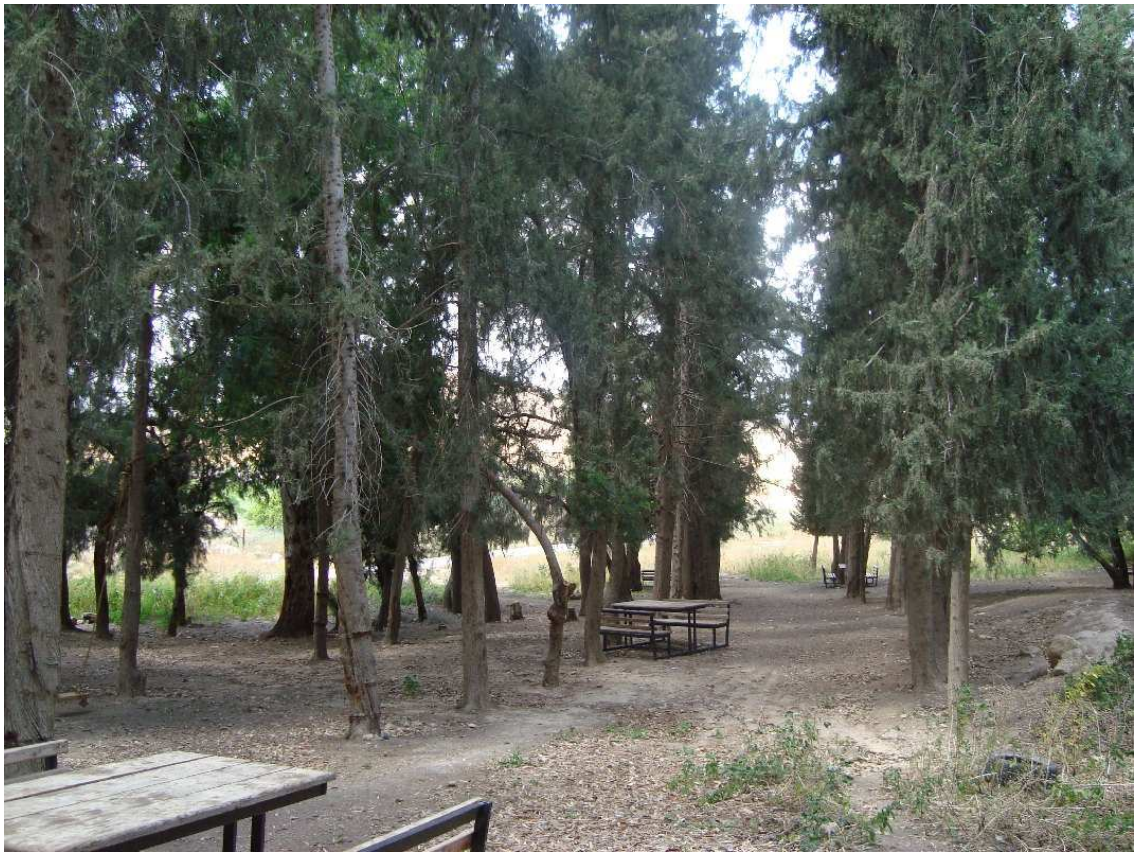
The assessment was done by the Jordan Society for Sustainable Development, a Jordanian environmental NGO founded in 1997 by its current president, HRH Prince Firas ben Raad, and materially done by the experts Dr. Fares Khuri, Khaled Nessar, Salam El-Labadi, and Rami Ihsan.[125] In the assessment more than 200 different species of flora were observed and registered as well as a number of birds and animals. The soils, water resources, and other data and baseline of the park have been analyzed and registered.

In the second phase, analysis, all the data collected have been examined and interpreted by ecological experts. In particular the studies carried on by the Jordan Society for Sustainable Development and by the Japan International Cooperation Agency focused on the habitat, the fauna, the flora, and the management of the area, for instance on grazing, fishing, and the impact of the sound of the human activities in the park.

In the third phase, the best design will be studied in order to sort out eventual problems that raised in the previous phases and in order to make the park the most ecological and green possible. The three criteria that have been taken into consideration to decide whether to include a specific design or element in the park were to see if it goes in the direction of: protection of the valley and of its habitats, increase knowledge and raise awareness on environment, improve spiritual, mental, and physical wellbeing after the visits in the park. In this phase, for instance, picnic tables, dry toilets and sinks to save water, a water save irrigation system, solar panels, and fencing in order to keep out of the park goats to protect it from overgrazing are only a few examples.

[125] For more information please visit: www.jssd-jo.org (consulted on the 28th of February 2010)

FIGURE 10: picnic area in the Eco-Park[126]



Concerning the phases of the second stage, implementation of the design and of the previous phases took place. As far as infrastructure is concerned, the previous have been implemented with: boundaries of the park, management and eco-info-point, and public facilities. Concerning the fencing, it was created in 2006, providing protection to the vegetation of the park threaten by overgrazing. On some occasions, the fencing has been breached by some Bedouins that wanted to let their goats graze and therefore destabilize the equilibrium of the Eco-Park. Therefore, measures to make sure that similar episodes will not take place again have been taken, supported also by the local authorities and communities. When it comes to the public facilities, a series of shelters, picnic facilities, and dry toilets have been installed, aiming at being a model to be copied also in the local communities. As part of this stage, a park manager, ranger, and

[126] Photo made by the author of this thesis on the 30th of April 2009

ecologist have been nominated in order to carry on the concerned duties.

FIGURE 11: the Bedouin camp and the fences of the Eco-Park[127]

When it comes to the protecting policy adopted by the NGO in the park, the following activities have been prohibited: hunting, swimming in water behind the dam (discouraged), fishing, disturbance of birds and animals, cars in the park (discouraged), grazing, picking flowers and plants), dumping, and fires.

Concerning the social and educational programmes, a series of activities have been implemented. In particular, concerning the youth programmes, many activities have been organized in collaboration with the local schools, including programmes such as: "water weekend" where students will spend two days in the park learning

[127] Photo made by the author of this thesis on the 30th of April 2009

about water issues; “what’s in the air weekend” where students will study the sky, including birds, constellations, and cycles of CO_2; “the earth under your feet weekend” that will introduce their students to geology, soil, and rock cycle.

The Eco-Park, implemented successfully by the NGO, has received in 2007 a further support from the Jordan Valley Authority that decided to extend the area under administration of FoEME for the Eco-Park from 100 dunums to 206 dunums.[128] This decision has been taken because the local communities as well as the authorities had seen that after one year of presence of the fenced Eco-Park, the biodiversity increased becoming rich while the vegetation developed and expanded. The environmental awareness campaigns involved a huge part of the local communities as well as of the schools of the area. The Eco-Park is becoming an important point for *eco-tourism* in the northern part of the valley. After only one year, the strong difference between the land within the boundaries of the park, where plants are growing richly, and outside the fence where the area is subject to erosion and under the threat of desertification, were clear.

Today, the local and national authorities, as well as the civil society, strongly support the Eco-Park. For this reason it has been expanded further, from 206 to 2,000 dunums. This is a clear sign of the success of this project, recognized and supported by all the stakeholders, authorities, and the actors involved in the area.[129]

[128] See annex number 3

[129] interview with Amany Mansour, project assistant of the NGO *Friends of the Earth Middle East*, on the 4th of May 2010.

FIGURE 12: the difference between the Eco-Park and the land outside[130]

3.2.3 The new dilemma: a series of Eco-Peace parks?

This success of the NGO, however, is facing a new dilemma: to seriously help the valley in facing climate change and the challenge of adapting to it, it is needed to have not only one protected area in the valley, but a series of Eco-Parks, in order to help the biodiversity in moving northern or southern and to be able to find a protected area where to stay and recover or to have a series of paths for the migratory birds during their migrations. In addition, the fate of the Jordan River and of its valley as a

[130] Photo made by the author of this thesis on the 30th of April 2009

whole should be taken into consideration, and not only one isolated site should be considered. Therefore the dilemma that FoEME are facing is: is the successful story of the Sharhabil Bin Hassneh Eco-Park going to become a replicable model, or maybe only a green cathedral in the desert?

At the time being, FoEME is considering two areas of the valley where to establish two more protected areas. The idea is to take the Sharhabil Bin Hassneh as a successful example, but emphasizing the trans-bordering cooperation and function of peace building. The NGO has therefore identified the Bakura in the north of the valley[131] and the Baptism Sites area near Jericho, in the southern part of the valley, both culturally, historically, and naturally important, and both trans-border areas with a direct contact with the Jordan River.[132]

In the Bakura case, the intention of FoEME is to transform it into the Jordan River Peace Park, a protected area aiming at enhancing the peaceful cooperation, dialogue, and collaboration between the neighbouring countries and at the same time at the conservation of the rich biodiversity and natural heritage.[133] The same is planned for the second project near the Jericho area. The Jordan River Peace Park project has already the support of the local authorities[134] and a feasibility study has already been done and publicized.[135]

In conclusion, the dilemma will be solved only after seeing the destiny of these two projects, and the impact that they will have on protecting the biodiversity and natural resources and in helping the valley in adapting to climate change.

[131] Please see chapter 1.2.1
[132] See also http://www.foeme.org/projects.php?ind=128 (consulted on the 2nd of May 2010)
[133] See also: *The Jordan River Peace Park Pre-feasibility Study*, FoEME, July 2008, available at: http://www.foeme.org/index_images/dinamicas/publications/publ103_1.pdf (consulted on the 2nd of May 2010)
[134] See annex n.4
[135] The author of this thesis participated in the launching pre-feasibility event of the project *Jordan River Peace Park* organized by the NGO *Friends of the Earth Middle East* on the 15th of May 2008 at *Wild Jordan* in Jabal Amman, Amman, Jordan.

Conclusions

The current situation of the Jordan River Valley highlighted in this paper is not very helpful. Water scarcity, and water related problems are already perceived by the local population. For instance, many farmers had to change their jobs because agriculture was not sustainable anymore in some areas. Food security could be an important issue that is to be considered together with the high demographic growth of the country. Social and political pressures could increase in the future as consequences of the scarcity of some natural resources in the area, such as water, to which many other sectors, as highlighted in the first chapter, are connected.

Global warming, therefore, is having and will increasingly have huge impacts on the valley. As a matter of fact, one of the main effects of climate change will be on the water resources, which will become more and more scarce. This phenomenon will put serious difficulties to the rich biodiversity of the valley, to the farmers, and to the Jordan River and to the Dead Sea, already facing a serious falling of its level causing thousands of sinkholes in the area, and therefore an impact on the surrounding economic and agricultural activities.

Therefore, this work has underlined the importance of acting today to help to reduce these prospected impacts. A series of projects and initiatives in order to, first of all, mitigate the effects of climate change in the valley, and then of adaptation are needed. Adaptation to climate change means to taking a series of measurements aiming at helping a target or group to adapt to the future effects that climate change will have.

This work has highlighted the case of the Eco-Park project of the NGO *Friends of the Earth Middle East* in the Sharhabil Bin Hassneh area. This is a successful example of adaptation to climate change. As a matter of fact, it aims at introducing a series of building design for water saving, environmental awareness, and adapting biodiversity to new climate conditions.

However, one isolated site in the valley would not be of great help for helping biodiversity and the valley to adapt to climate change. A series of Eco-Parks would be needed to do that and to be successful in this mission. Therefore, the dilemma will be to see whether the Sharhabil Bin Hassneh Eco-Park, that started covering only 100 dunums and that today expanded with the support of local and national authorities until

2,000 dunums, will be able to become a repeatable model in the valley or will become an isolated site, in other words a green cathedral in the desert.

The projects of the NGO in the Bakura area called *Jordan River Peace Park* and the Eco-Park in the Jericho area at the Baptism Sites show a positive possibility of implementing Eco-Parks all over the Lower Jordan River. In addition, the previous dilemma that the Jordan Valley Authority had at the time of accepting to trust the NGO giving them 100 dunums of land for the Eco-Park, turned out to be a great project. For this reason it could be thought that all the Lower Jordan River could become in the future one long, big Eco-Park surrounding a rehabilitated river, deserving to be called a River and not a stream, as probably today it should be called.

However, today there is no answer to this dilemma. Only time will tell us whether this idea of a green valley could become a reality, and will therefore be able to help the biodiversity and the valley as a whole to face climate change in a untroubled way.

Annex 1: US Senate Resolution for saving the Jordan River

110th CONGRESS
1st Session

S. RES. 387

Expressing the sense of the Senate regarding the degradation of the Jordan River and the Dead Sea and welcoming cooperation between the peoples of Israel, Jordan, and the Palestinian Authority.

IN THE SENATE OF THE UNITED STATES

November 16, 2007

Mr. LUGAR (for himself and Mr. Durbin) submitted the following resolution; which was considered and agreed to

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RESOLUTION

Expressing the sense of the Senate regarding the degradation of the Jordan River and the Dead Sea and welcoming cooperation between the peoples of Israel, Jordan, and the Palestinian Authority.

Whereas the Dead Sea and the Jordan River are bodies of water of exceptional historic, religious, cultural, economic, and environmental importance for the Middle East and the world;

Whereas the world's 3 great monotheistic faiths—Christianity, Islam, and Judaism—consider the Jordan River a holy place;

Whereas local governments have diverted more than 90 percent of the Jordan's traditional 1,300,000,000 cubic me-

ters of annual water flow in order to satisfy a growing demand for water in the arid region;

Whereas the Jordan River is the primary tributary of the Dead Sea and the dramatically reduced flow of the Jordan River has been the primary cause of a 20 meter fall in the Dead Sea's water level and a *Vz* decline in the Dead Sea's surface area in less than 50 years;

Whereas the Dead Sea's water level continues to fall about a meter a year;

Whereas the decline in water level of the Dead Sea has resulted in significant environmental damage, including loss of freshwater springs, river bed erosion, and over 1,000 sinkholes;

Whereas mismanagement has resulted in the dumping of sewage, fish pond runoff, and salt water into the Jordan River and has led to the pollution of the Jordan River with agricultural and industrial effluents;

Whereas the World Monuments Fund has listed the Jordan River as one of the world's 100 most endangered sites;

Whereas widespread consensus exists regarding the need to address the degradation of the Jordan River and the Dead Sea;

Whereas the Governments of Jordan and Israel, as well as the Palestinian Authority (the ''Beneficiary Parties''), working together in an unusual and welcome spirit of cooperation, have attempted to address the Dead Sea water level crisis by articulating a shared vision of the Red Sea-Dead Sea Water Conveyance Concept;

Whereas Binyamin Ben Eliezar, the Minister of National Infrastructure of Israel, has said, ''The Study is an excellent example for cooperation, peace, and conflict reduc-

tion. Hopefully it will become the first of many such cooperative endeavors';

Whereas Mohammed Mustafa, the Economic Advisor for the Palestinian Authority, has said, 'This cooperation will bring wellbeing for the peoples of the region, particularly Palestine, Jordan, and Israel . . . . We pray that this type of cooperation will be a positive experience to deepen the notion of dialogue to reach solutions on all other tracks';

Whereas Zafer al-Alem, the former Water Minister of Jordan, has said, 'This project is a unique chance to deepen the meaning of peace in the region and work for the benefit of our peoples';

Whereas the Red Sea-Dead Sea Water Conveyance Concept envisions a 110-mile pipeline from the Red Sea to the Dead Sea that would descend approximately 1,300 feet creating an opportunity for hydroelectric power generation and desalination, as well as the restoration of the Dead Sea;

Whereas some have raised legitimate questions regarding the feasibility and environmental impact of the Red Sea-Dead Sea Water Conveyance Concept;

Whereas the Beneficiary Parties have asked the World Bank to oversee a feasibility study and an environmental and social assessment whose purpose is to conclusively answer these questions;

Whereas the Red Sea-Dead Sea Water Conveyance Concept would not address the degradation of the Jordan River;

Whereas the Beneficiary Parties could address the degradation of the Jordan River by designing a comprehensive strategy that includes tangible steps related to water con-

servation, desalination, and the management of sewage and agricultural and industrial effluents; and

Whereas Israel and the Palestinian Authority are expected to hold high-level meetings in the Washington area in the winter of 2007 to seek an enduring solution to the Arab-Israeli crisis: Now, therefore, be it

Resolved, That the Senate—

(1) calls the world's attention to the serious and potentially irreversible degradation of the Jordan River and the Dead Sea;

(2) applauds the cooperative manner with which the Governments of Israel and Jordan, as well as the Palestinian Authority (the ''Beneficiary Parties''), have worked to address the declining water level and quality of the Dead Sea and other water-related challenges in the region;

(3) supports the Beneficiary Parties' efforts to assess the environmental, social, health, and economic impacts, costs, and feasibility of the Red Sea-Dead Sea Water Conveyance Concept in comparison to alternative proposals, such as those that focus on the restoration of the Jordan River;

(4) encourages the Governments of Israel and Jordan, as well as the Palestinian Authority, to continue to work in a spirit of cooperation as they address the region's serious water challenges;

(5) urges Israel, Jordan, and the Palestinian Authority to develop a comprehensive strategy to rectify the degradation of the Jordan River; and

(6) hopes the spirit of cooperation manifested by the Beneficiary Parties in their search for a solution to the Dead Sea water crisis might serve as a model for addressing the degradation of the Jordan River, as well as a model of peace and cooperation for the upcoming meetings in the Washington area between Israel and the Palestinian Authority as they seek to resolve long-standing disagreements and to develop a durable solution to the Arab-Israeli crisis.

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Annex 2: Authorization for 100 dunums[136]

بسم الله الرحمن الرحيم

The Hashemite Kingdom
Of Jordan
Ministry Of Water & Irrigation
Jordan Valley Authority

Ref.No .....
Date .....

المملكة الأردنية الهاشمية
وزارة المياه والري
سلطة وادي الأردن

الرقم .....
التاريخ .....
الموافق

السادة جمعية اصدقاء الارض /فرع الاردن
ص.ب ٩٣٤١ عمان ١١١٩١

ارجو اعلامكم بان مجلس ادارة سلطة وادي الاردن قد اتخذ بجلسته المنعقده بتاريخ ٢٠٠٤/٨/٥ القرار رقم (٦٢٠٣) والمتضمن الموافقه على استغلال ما مساحته (١٠٠) دونم تقريبا من الاراضي المستملكه لمشروع سد شرحبيل بن حسنه والواقعه اسفل جسم السد وذلك لغاية انشاء حديقة الشيخ حسين لخدمة المواطنين في المنطقه ضمن الشروط التاليه :-

١- ان تبقى ملكية الارض لسلطة وادي الاردن .
٢- ان تقوم الجمعيه بادارة الحديقه وصيانتها .
٣- للسلطة الحق في ادارة وصيانة الحديقه بعد انشائها .
٤- للسلطة الحق في استعمال الارض في حال حاجتها .

واقبلوا الاحتـــــرام ...

أمين عام سلطة وادي الاردن
المهندس محمد ظافر العالـم

Tel. 5689400/410/419 Fax:5689916
P.O.Box 2769 Amman Telex 21692 JVC JO
Cable : JOVACO
قرار رقم ٢٠٠١/١٢٦

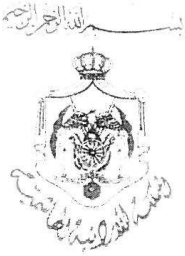
تلفون ٥٦٨٩٤٠٠/٤١٠/٤١٩ فاكس ٥٦٨٩٩١٦
ص.ب ٢٧٦٩ عمان تلكس ٢١٦٩٢
العنوان البرقي جيوفاكو

[136] With this official document the Jordan Valley Authority, delegated by the Ministry of Water and Irrigation of Jordan, gives to the NGO "Friends of the Earth Middle East" on the 5th of August 2004 the permit to use 100 dunums of land in the Sharhabil Bin Hassneh area for the purpose of the Eco-Park project.

Annex 3: authorization for 106 more dunums[137]

THE HASHEMITE KINGDOM
OF JORDAN
Ministry OF Water & Irrigation
Jordan Vally Authority

Ref.No.
Date



المملكة الأردنية الهاشمية
وزارة المياه والري
سلطة وادي الأردن

الرقم
التاريخ
الموافق

السادة جمعية أصدقاء الارض الشرق الاوسط/ فرع الاردن

يـــرجى إعلامكـــم بـــان مجلـــس إدارة الســـلطة اتخـــذ القـــرار رقـــم (٧١٠٥) تـــاريخ ٢٠٠٧/٩/٢٠ بالموافقـــة لكم باستغلال ما مساحته (١٠٦) دونمات لتوسعة المنتزه الواقع أسفل جسم سد شرحبيل بن حسنه.
يـــرجى مـــراجعة رئـــيس لجنة انتقاء المزارعين الاولى/الأغوار الشمالية لاستكمال الاجراءات

واقبلوا الاحترام،،،،

امين عام سلطة وادي الاردن
المهندس موسى صافي الجمعاني

نسخة : لمساعد الامين العام للاراضي والتنمية
نسخة : لمدير مديرية الاراضي
نسخة : لرئيس لجنة انتقاء المزارعين.
س.ر

تلفون ٤١٩ / ٤١٠ / ٥٦٨٩٤٠٠ – فاكس ٥٦٨٩٩١٦ / ٥٦٨٩٥٩٢ صندوق بريد ٢٧٦٩ الرمز البريدي ( ) عمان العنوان البرقي : جوفاكو
Tel. 5689400 / 410 / 419 Fax. 5689592 / 5689916 P.O.Box : 2769 - Amman ( ), Cable: JOVACO
بريد إلكتروني : E-mail : jvadewan2@mwi.gov.jo

[137] With this official document the Jordan Valley Authority, delegated by the Ministry of Water and Irrigation of Jordan, gives to the NGO "Friends of the Earth Middle East" on the 20th of September 2007 the permit to expand the Eco-Park of 106 more dunums.

Annex 4: Memorandum for the *Jordan River Peace Park*

Memorandum of Understanding
To Create the Al Bakoora / Naharyim / Gesher Peace Park

Muaz Bin Jabal Municipality, Jordan – Jordan Valley Regional Council, Israel and Beit She'an Valley Regional Council, Israel

In a regional meeting held on Wednesday, January 10th 2007 the Jordanian Mayor of Muaz Bin Jabal and Israeli Mayors of the Jordan Valley Regional Council and the Beit She'an Valley Regional Council, recognized the value and importance of the protection of the River Jordan flowing between their communities and the potential of creating in the area of Al Bakoura / Naharayim / Gesher a trans-boundary Peace Park.

The mayors hereby declare that in the Al Bakoura / Naharayim / Gesher area it is the intention of the municipalities to create a bird sanctuary, eco-lodges, a visitor's center, nature trails and develop cultural heritage sites, that will serve residents and tourists and safeguard open spaces for nature. The respective mayors see the development of the peace park as a cooperative effort and as a centerpiece of peace building activities between their neighboring communities.

The River Jordan is today heavily polluted and has been turned into a backyard dumping site, causing destruction of the ecosystems that once thrived to the loss of local residents. Today, mayors and citizens of the communities are determined to reverse the situation.

The mayors declare their intention that the Peace Park be the start of a larger rehabilitation project of the River Jordan, as a symbol for sustainable regional development.

We support the role of EcoPeace / Friends of the Earth Middle East in helping pave the way to good neighborly relations based on peace and environment.

Mayor Muaz Ben Jabal	Mayor Beit She'an Valley Regional Council	Mayor Jordan Valley Regional Council
Eng. Abdulla Al Salaman	Mr. Dani Tamari	Mr. Yossi Vardi

THE RICHARD & RHODA GOLDMAN FOUNDATION

Friends of the Earth *Middle East*

FoEME

Foreign & Commonwealth Office

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