



فلسطين

# **Environment & Security**

**IN THE OCCUPIED  
PALESTINIAN TERRITORY**

**ZOÏ REPORT 4 / 2012**

# Palestine

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ISBN 978-2-940490-09-7

## **Zoi REPORT 4/2012**

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# Introduction

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Palestine<sup>1</sup> serves as a crossroads for regions and climates, presenting the area with distinctive resources and land. Between the Jordan River and the Mediterranean Sea, the land has proved fertile for agriculture while underneath flow vital aquifers. The contribution of ancient Palestine in the agricultural evolution in the Fertile Crescent testifies how vital these resources were for the development of the regional societies. During the last century, the region has been dominated by the Israeli occupation of Palestine that have left a lasting impact on people, their way of living, and on their environment. This conflict serves to compound challenges of scarce and inaccessible resources, their continuous degradation, and increasing demand from a rapidly growing population. Global climate change is expected to continue to place further stress on these resources. Efforts to address this critical situation are urgently needed but economic vulnerability, institutional weakness, and continuous unrest inhibit Palestinians from accomplishing their goals.

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<sup>1</sup> The term Palestine is used in the text to refer to British Mandatory Palestine (1923–48)







## Background

The mutual recognition between the Government of Israel (GOI) and the Palestinian Liberation Organization (PLO) in the early 1990s put an end to more than half a century of Palestinian struggle for the recognition of their rights to self-determination<sup>2</sup>. The signature of the Oslo Accords (1993-1995) paved the way towards the establishment, on the Occupied Palestinian Territory (oPt) annexed by Israel in 1967, of the first autonomous Palestinian political entity in recent history. Less than ten years later, in September 2000, the explosion of the Second Palestinian Intifada (uprising), undermined by the limited implementation of the Oslo Accords, announced the beginning of a new episode of unprecedented violence that shaped Palestinians lives for more than a decade with far reaching consequences on their society and environment.

With a surface area of 6257 km<sup>2</sup><sup>3</sup>, representing about 23 per cent of British Mandatory Palestine, the oPt is the smallest region of the Middle East. It has common borders with Egypt, Jordan, and Israel - with which it shares the longest and most disputed borders. The oPt is composed of the West Bank and the Gaza Strip, two territories separated physically by Israel. East Jerusalem, the proclaimed Palestinian capital, is situated midway between the Mediterranean Sea and the Dead Sea.

.....  
2 Timeline of the Recent Palestinian History (1917-present: <http://unispal.un.org/unispal.nsf/his.htm>)

3 Desk Study on the Environment in the Occupied Palestinian Territories, UNEP 2003 "this area is endorsed by UN".

# Palestine

- Boundary
- Disputed boundary
- Cease fire line
- Green line (1949 Armistice Agreements)

① Golan heights: occupied by Israel since 1967 and annexed 1981; claimed by Syria

② Golan heights: United Nations Disengagement Observer Force (UNDOF) zone

③ West Bank: administered by Palestinian authorities

④ Gaza strip: administered by Palestinian authorities

0 25 50 75 km

Map produced by ZOI Environment Network, June 2012





## Timeline

**1291-1917:** Palestine constituted part of the Ottoman Empire territories.

**1917:** Balfour Declaration expressed the support of the British Government to "the establishment in Palestine of a national home for the Jewish people".

**1922:** The League of Nations placed Palestine under UK administration, which incorporated the Balfour Declaration in its mandate.

**1936-1939:** The Palestinian Revolt motivated by demands for independence and against massive Jewish immigration.

**1947:** The United Nations put forward the Proposal of the partitioning Plan of Palestine into two independent states (Resolution 181 (II) of 1947).

**1948:** Declaration of Independence of Israel, established on 77 per cent of territory of mandate Palestine, massive Palestinian population expulsion, and placement of the West Bank and the Gaza Strip respectively under Jordan and Egypt ruling.

**1964:** Creation of the Palestinian Liberation Organisation (PLO), which stated its goal as the "liberation of Palestine by armed struggle".

**1967:** In the "Six Day War" Israel claimed territory and occupied the Gaza Strip and the West Bank, including East Jerusalem, which was subsequently annexed by Israel. The Security Council Resolution 242 included an Israeli withdrawal from territories occupied in the conflict and a just settlement of refugees who left their lands and the termination of all claims.

**1973:** International community called for peace negotiations between involved in the Arab-Israeli war and issued the Security Council Resolution 338.

**1974:** The General Assembly reaffirmed the inalienable rights of the Palestinian people to self-determination, national independence, sovereignty, and to return.

**1975:** The General Assembly established the Committee on the Exercise of the Inalienable Rights of the Palestinian

People and conferred on the PLO the status of observer in the Assembly and in international conferences held under UN auspices.

**1982:** Israeli invasion of Lebanon – Expulsion of the PLO.

**1987-1994:** Palestinian First Intifada in the West Bank and the Gaza Strip.

**1992:** Beginning of peace negotiations between Israel and Arab countries in the Madrid peace conference.

**1993:** Signature of the Declaration of Principles on Interim Self-Government Arrangements between the PLO and the Government of Israel (Oslo I Accord) based on the UN resolutions 242 and 338.

**1994:** "Gaza-Jericho First".

**1995:** Signature of the Interim Agreement on the West Bank and the Gaza Strip (Oslo II Accord).

**2000:** Start of the Second Palestinian Intifada.

**2002:** Israel launches the Security Shield operation and takes control of all Palestinian-controlled areas in the West Bank.

**2003:** Road Map for peace proposed by the USA following reforms in the PNA including the nomination of Mahmoud Abbas at the post of Prime Minister.

**2005:** Israel's unilateral withdrawal from the Gaza Strip.

**2006:** Legislative elections won by Palestinian movement Hamas.

**2007:** Control of the Gaza Strip by Hamas, declaration of the Gaza Strip by Israel as an "enemy entity", and reinforcement of Gaza blockade imposed by Israel.

**2008/2009:** Israel launches the Cast Lead Operation against Gaza.

**2011:** Palestine is accepted as a full member of UNESCO.

**2012:** The UN General Assembly votes overwhelmingly to accord Palestine 'non-member observer state' status in the United Nations.

## Towards Palestinian environmental action

The Ministry of Environment Affairs (MEnA) is the main body responsible for the protection of the environment in the Palestinian territory. It replaces the Environmental Quality Authority (EQA) that was created in 2002 replacing the Ministry of Environmental Affairs (MEnA) which was established in 1998. Before that, the responsible authorities were the Palestinian Environment Authority (PEnA) 1996-1998 and the Environment Protection General Directorate in the Ministry of Planning 1994-1996. Prior to 1994, various Israeli environment departments and ministries were responsible for the environment in oPt. The environment authority's evolution, along with its predecessors, has involved the gradual strengthening of the agencies and environmental legislation.

The earlier MEnA was critical in finalising the Palestinian Environmental Law in 1999, which is the current juridical background for environmental management in the oPt. MEnA also developed a ten-year Palestinian Environmental Strategic Plan which addressed the priority environmental issues in the oPt.

The current MEnA is a member of the cabinet of ministers and plays a central role in the development of environmental policy, legislation, standards, and planning. MEnA monitors pollution and coordinates environmental projects. The body also conducts environmental studies, raises awareness, education and training in the field of environment.

Additional governmental structures directly involved in environmental management include the Palestinian Water Authority (PWA), which also reports directly to the cabinet of ministers, manages water and wastewater issues in the oPt. Other structures include specialised departments embedded in the Ministries of Agriculture (MOA), Health (MOH), and Ministry of Planning and Administrative Development (MOPAD).

Several non-governmental organizations (NGOs) are also involved in the environment, among which some have made significant contributions to environmental monitoring and policy development even before the creation of the PNA such as the Applied Research Institute-Jerusalem (ARIJ)/ Society, and the Palestinian Hydrology Group (PHG) and many others.

The Palestinian Central Bureau of Statistics (PCBS) has also issued periodic reports on topics including economy, water and wastewater, biodiversity, and agriculture. In 2008, a Palestinian National Team for Developing an Environment Information System (NT/EIS) was created by contributions of ten ministerial and other governmental bodies, two universities, and three NGOs, with the aim of improving data, and data sharing, related to the environment and natural resources.





# Themes

The climate in the oPt is mainly Mediterranean with an average annual rainfall ranging from 300 to 410mm in the Gaza Strip and West Bank, respectively. Arid, semi-arid, and desert geo-climatic zones constitute almost 85 per cent of its overall lands. The various climate zones, combined with the area's proximity to Africa, Asia, and Europe, have made it historically rich in biodiversity. The presence of unique ecosystems such as the Dead Sea basin and the Wadi Gaza wetland system further contributed to enriching this diversity. Recently, this heritage has been threatened by the destruction of natural habitats, the over-exploitation of resources, the multifaceted environmental pollution, and by the territorial fragmentation that prevents animal movement. The inscription of more than 50 per cent of plant species on the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN), the extinction or near extinction of more than 25 mammal species, and the severe decline of fish populations are some signs of how vulnerable the biodiversity in the oPt is and how urgent corrective measures are needed to address this issue.

This dry environment of the oPt is not exceptional considering its position in the heart of the Middle East and North Africa (MENA) region, one of the most water scarce places in the world. Water resources in such an environment are vital and their control is far more important than the mere value of the services they provide: who controls water, controls life. Since 1948, historical records document 37 incidents of acute conflicts over water, 30 of which were in the Middle East and involved

Israel and one or more of its neighbors (the last occurred in 1970). During the same period, approximately 295 international agreements on water were negotiated and signed<sup>4</sup>.

Both quantity and quality of water accessible to the Palestinian population is a significant issue. Aquifers are the main source of water but these are often overdrawn, inaccessible, or polluted. The annual water share of Palestinians is less than 200 m<sup>3</sup> per capita which is largely under the water scarcity limit of 500m<sup>3</sup> set by the World Health Organisation (WHO). Water resources in oPt are under complete control of Israel which use more that 82 per cent of it.

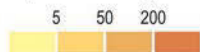
Land, similar to water, is difficult to access for Palestinians. This is critical given the importance of agriculture as both a labour sector and for food security. The separation wall has led to the removal of fruit trees and other species. The reduced land available has been placed under heavier stress and is causing degradation and desertification.

All these factors – water, land, and biodiversity – are threatened by climate change. The Middle East is expected to be one of the areas most affected by the phenomenon. The already arid region could become drier and unpredictable weather patterns will place additional pressure on resources and require a highly adaptive population. Potential ramifications are higher sea levels, an increase of more than 3° C in the region, and changes in precipitation.

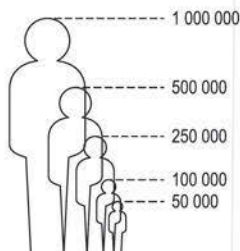
.....  
4 Giordano M. A., Wolf A. T., 2003. Sharing waters: Post-Rio international water management. Natural Resources Forum 27, 163-171

# Palestine

Population density (inhabitants per km<sup>2</sup>)

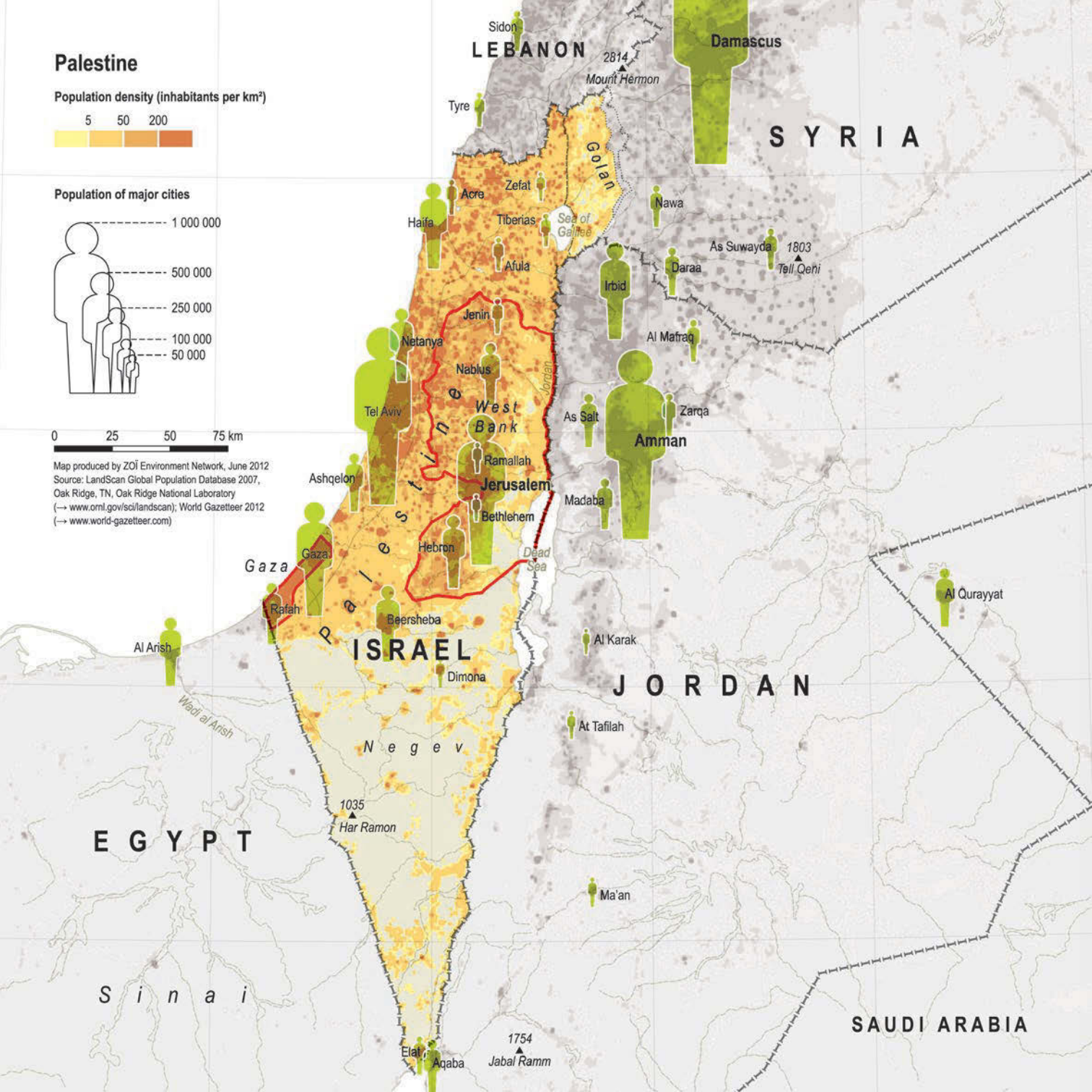


Population of major cities



0 25 50 75 km

Map produced by ZOI Environment Network, June 2012  
Source: LandScan Global Population Database 2007,  
Oak Ridge, TN, Oak Ridge National Laboratory  
(→ [www.ornl.gov/sci/landscan](http://www.ornl.gov/sci/landscan)); World Gazetteer 2012  
(→ [www.world-gazetteer.com](http://www.world-gazetteer.com))

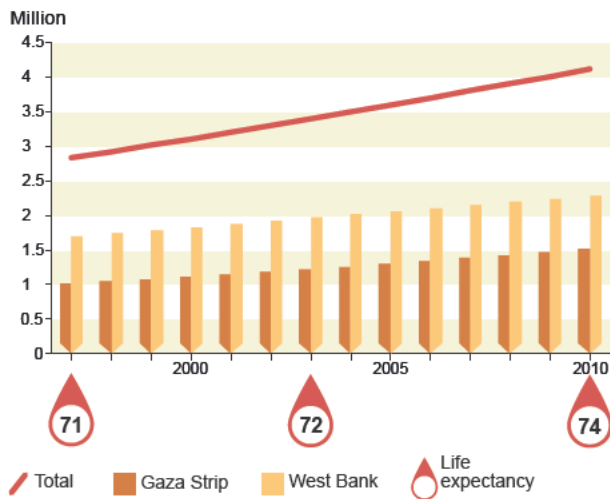




## Population

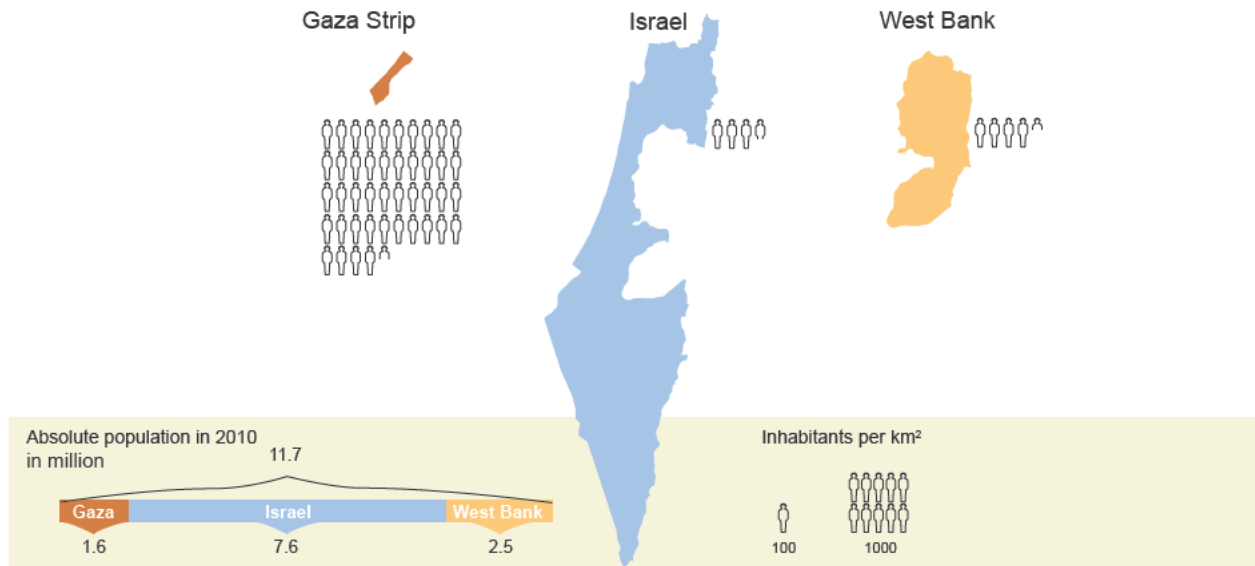
- oPt total: 4.29 million
- West Bank: 2.65 million
- Gaza Strip: 1.64 million
- 40.4% under 14 years old
- Average population density oPt: 713 persons/km<sup>2</sup>
- Gaza Strip: 4,505 persons/km<sup>2</sup>
- West Bank: 468 persons/km<sup>2</sup>
- Annual population growth rate is 3.7% per year (among the highest in the world)
- Literacy: 93.7% of adult females, up to 98% of men (18-24)

## Population in oPt .....



Sources: Palestinian Central Bureau of Statistics, 2011, U.S. Census bureau, 2011.

## Population density in 2010 .....



Sources: Palestinian Central Bureau of Statistics, 2011, CIA factbook, 2012.



## Why this report?

The availability of natural resources is an important variable in determining social stability and instability, which must be seen not as a stand-alone issue, but rather in the context of the overall political economy landscape. Resource scarcity, combined with a vulnerable economic and social situation, has as much potential to provoke social unrest as resource abundance, combined with undemocratic governance. The risk posed by the availability of resources depends as much on the vulnerability of populations, ecosystems, economies, and institutions as on the level of scarcity or abundance.

Resource scarcity may result from the overuse of a renewable resource or from overstrain of the ecosystem's sink capacity. Unequal access to resources is a mechanism that leads to resources rarefaction through concentrating abundant resources in the hands of a few. Uncontrolled population growth leads in the long term to distributing the same quantity of resources among more and more individuals.

The natural resources in the oPt, including fresh water, land, fisheries, and minerals, are sufficient to meet Palestinians' current needs and their future development goals<sup>5</sup>. The geopolitical situation linked to more than 27 years of Israeli occupation, the unsuccessful institutional implementation, and development of the Palestinian

National Authority (where it lacks sovereignty of more than 80 per cent of its territories), are key factors in reduced Palestinian resource shares and increased pressure on the few accessible resources threatening their sustainability. This is compounded by Israeli post-occupation policies, including intrusions, border closure, and movement restrictions in addition to the scattered settlements and separation wall<sup>6</sup>.

All the environmental issues in the oPt are challenging and require immediate and urgent measures. For the purposes of this study, four recurrent environmental themes were analysed for their importance in Palestinians' daily life and for their role in Palestinians' struggle towards sovereignty. These include water and marine resources, land, and biodiversity. Climate change is considered a "risk multiplier" that would put further pressure on these already stressed resources.

The present report is a desk-based study complemented with interviews in the office and the field, carried out over the period 2011-2012. The report aims to examine the main themes highlighted based on the concern that scarce and unevenly distributed resources can lead to conflict, particularly given certain governmental and social contexts. It will contribute to efforts to find ways of addressing the problems.

.....  
<sup>5</sup> The economic costs of the Israeli occupation for the occupied Palestinian territory, 2011. Palestinian Ministry of National Economy and ARIJ publications.

.....  
<sup>6</sup> Desk Study on the Environment in the Occupied Palestinian Territory, 2003. UNEP

# Water resources

.....

The total actual renewable water resources in the oPt is 830 million cubic metres (mcm)/year, of which 750 mcm/year is in the West Bank and 80 mcm/year is in the Gaza Strip<sup>7</sup>. The majority of this flows from underground aquifers. One large-scale seawater desalination plant with a total capacity of 100mcm/year is planned to be fully operational by 2020. Although Palestinians share 13 per cent of the Jordan River catchment, they have no access to its annual flow – more than 1300mcm/year according to recent figures. This situation is in accordance with the Oslo Accords, where no mention of such rights was made.

Groundwater resources in the oPt are distributed between the Mountain Aquifer, located underneath the West Bank, and the Coastal Aquifer, beneath the Gaza Strip, both of which are shared with Israel. The Mountain Aquifer has a surface area of about 4000 km<sup>2</sup> and is by far the most important underground water reservoir in the oPt with a potential annual replenishment estimated at 680mcm. It lies almost entirely under the limestone hills of the West Bank where 95 per cent of its feeding basin and 80 per cent of its stocking basin are located. This aquifer is divided into three sub-aquifers: the Western Aquifer with a potential annual replenishment of 362mcm contains water of the highest quality, the Eastern Aquifer has a renewable volume of about 172mcm/year of which more than half is brackish water of very poor quality<sup>8</sup>, and the North-Eastern Aquifer with a potential annual replenishment of 145mcm of high quality water. The Coastal Aquifer underneath the Gaza Strip is part of the Coastal Basin that extends from Mount Carmel to the

north of the Sinai desert. It has an annual replenishment of 55mcm, 41 per cent of which is assured by local rainfall while irrigation, leakage from deficient distribution networks, and wastewater contribute to almost 60 per cent of its replenishment<sup>9</sup>.

During the period from 1967 and until the signature of the Oslo Accords in 1993, all water resources in the oPt were controlled by Israel and were managed through a series of military orders which denied Palestinians any access unless granted by Israeli military governor<sup>10</sup>. During this period, Israel controlled water processing from extraction until distribution to households and farmers. Most of the currently used wells and water distribution networks in the oPt were inherited from this period.

Since 1993, the Oslo Accords redefined water distribution rights between Israelis and Palestinians according to a bilateral agreement. The agreement took into consideration the available renewable water volumes and was intended to guarantee the fulfilment of Palestinian current and future needs without hindering the economic development of Israel. In 1994, a Joint Water Committee (JWC) was established to foresee the implementation of the issues agreed on. The JWC is composed of an equal number of Palestinian and Israeli experts and works closely with the Palestinian Water Authority (PWA), the legal representative of the PNA for water affairs, and the equivalent Israeli representatives. Since its creation, criticism has been directed at the JWC accusing it of discriminative practices towards Palestinians, and privileging Israeli claims over

.....  
7 Occupied Palestinian Territory Aquastat 2009. FAO

8 <http://www.gsi.gov.il/Eng/Index.asp?ArticleID=159&CategoryID=112>  
&Page=1

.....  
9 Data from the Coastal Aquifer Management Program, 2000. USAID/PWA

10 Troubled water – Palestinians Denied fair access to water, 2009. Israel – Occupied Palestinian Territory, Amnesty International

Palestinian claims<sup>11</sup>. It is estimated that less than 10 per cent of projects presented by Palestinians were accepted and implemented since the creation of the JWC<sup>12</sup>.

According to the Oslo agreement, Palestinians have the right to extract 118mcm/year from the Mountain Aquifer, which represents about 20 per cent of its annual renewable volume.<sup>13</sup> Israel has the right to withdraw the balance. Palestinians were given the right to extract water from the Coastal Aquifer according to their needs. A sustainable extraction level was estimated at 55mcm/year that corresponds to its annual replenishment rate. Both water resources provided the oPt with a total volume of 193mcm/year of renewable water or about 115 liters per person per day.

.....  
11 West Bank and Gaza - Assessment of restrictions on Palestinian water sector development, 2009. The World Bank

12 Ibid

13 National Water Strategy for Palestine (Draft Copy) December 2012

## Water

**1470 m<sup>3</sup>** Natural historical discharge of Jordan river and tributaries

**100 m<sup>3</sup>** Discharge of Jordan river to Dead Sea in 2011

- Palestinian well
- Israeli well

## Daily water consumption per capita



Israeli settlements 401 m<sup>3</sup>  
Israel 242 m<sup>3</sup>  
WHO minimum recommendation 100 m<sup>3</sup>  
Gaza 91 m<sup>3</sup>  
West Bank 72 m<sup>3</sup>

WHO





# West Bank

Although water shares allocated to both parties are coded through the Oslo agreement, Israel's water extractions from the Mountain Aquifer are estimated to exceed by 50 per cent its authorized shares<sup>14</sup>, while Palestinians receive an average of 105mcm, almost 70 per cent of their rightful allocations<sup>15</sup>. The Western Aquifer, which has the highest quality water, is the most extensively over-exploited segment of the Mountain Aquifer: Israeli extractions in 1999 were estimated at 591mcm, almost 230mcm beyond its sustainable annual yield. Currently, this sub-aquifer supplies about 417mcm per year to Israel, almost a quarter of its overall national water needs<sup>16</sup>. The continuous over-extraction of this aquifer has led to increased levels of salinity. It also caused the water table to drop to levels inaccessible to Palestinians due to technical and regulatory restrictions. This has caused severe shortages in water supplies particularly during summer and in years with low rainfall levels.

The West Bank faces a chronic water shortage crisis where the daily water share is estimated at around 70litre/capita in urban centres and drops to less than 20l/capita in remote areas not connected to water distribution networks, most of which are located in Area C (see the map on page 26) controlled by Israel. By comparison, the water distributions per capita in Israel and in the Israeli settlements in the West Bank are respectively 300 and 400l/d. Since 2003, the PWA purchased about 50mcm/

year of water extracted from the Mountain Aquifer by the Israeli National Water Company (Mekorot) to complement its water budget deficit at an estimated cost of \$35 million/year. The annual cost of direct and indirect effects of water scarcity on the Palestinian economy is estimated at about \$350 million<sup>17</sup>.According to the PWA, buying water comprises about 15 per cent of household spending in urban areas and up to 50 per cent in remote areas. The global average for household water budget is 3.5 per cent.

Water scarcity is exacerbated when what little water exists, has been contaminated. In the West Bank, untreated wastewater evacuation into nature is used as an arm of war, prompting observers to describe the situation a "sewage war". Less than 30 per cent of wastewater in the West Bank is being treated properly. Most untreated wastewater is evacuated directly into nature either in dry valleys or in seasonal springs. The highly permeable soil in the West Bank means the wastewater soaks into the aquifer and into the Dead Sea.

Palestinians, who have limited access to land in areas B and C – critical for the construction of new wastewater treatment plants, reject any responsibility for this situation. No statements have been issued regarding the actions of residents of the illegal Israeli settlements in the West Bank where more than 480,000 settlers live, alongside several industrial zones.

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14 West Bank and Gaza - Assessment of restrictions on Palestinian water sector development, 2009. The World Bank

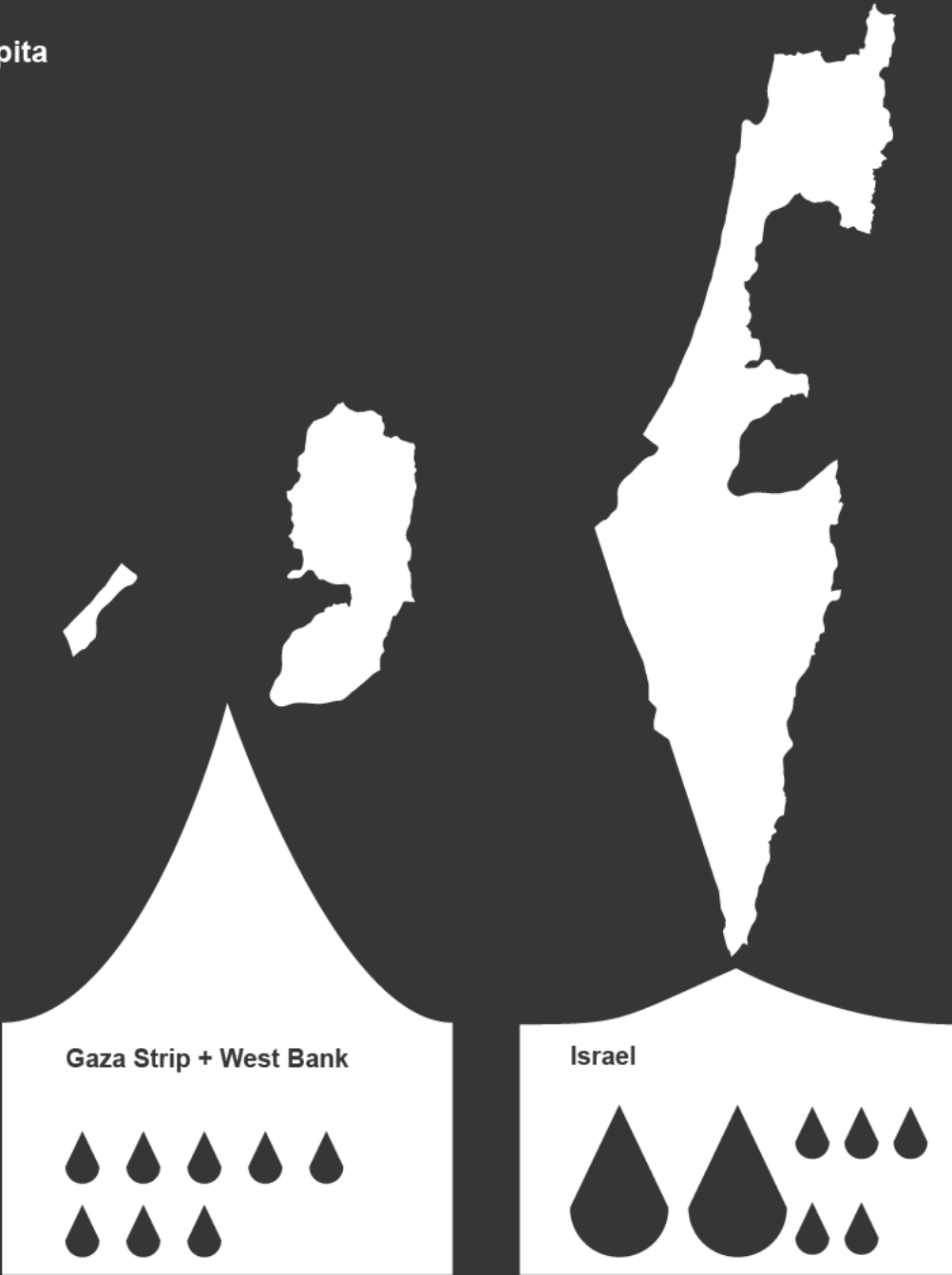
15 Water Crisis in the West Bank and Gaza Continues (IMEMC) (<http://www.ewash.org/en/?view=79YOcy0nNs3Du69tjVnyyumu1jfxPKNuunzXkRpKQN7lpbMTQTG>)

16 Troubled water – Palestinians Denied fair access to water, 2009. Israel – Occupied Palestinian Territory, Amnesty International

.....  
17 The economic costs of the Israeli occupation for the occupied Palestinian territory, 2011. ARIJ

Water available per capita

m<sup>3</sup> per year per inhabitant



Sources: Palestinian Central Bureau of Statistics, 2011, Palestinian Water Authority, 2011, Central bureau of Statistics of Israel, 2010, Israel Water Authority, 2010

# Gaza Strip

In the Gaza Strip, about 130l/d per capita is produced, mainly from Coastal Aquifer extractions, but also by water bought from Mekorot (about five mcm/year), and by more than 2,000 small home-based desalination units (about one mcm/year). Residents only receive about 80l/d per capita after about 40 per cent is lost due to leakage. The annual water extraction from the Coastal Aquifer is estimated at about 170mcm; almost three times its annual replenishment rate. This situation is further stressed by Israel's impacts on the Coastal Aquifer water level by an intensive network of deep wells located around the Gaza Strip, and the diversion of Wadi Gaza, estimated at an average of 15mcm/year, for agricultural use. The over-extraction of the aquifer has led to severe deterioration of the water quality due to seawater intrusion, a process unless countered, would lead to almost irreparable damage of the Coastal Aquifer by 2020 due to salt build-up<sup>18</sup>.

The Coastal Aquifer is subject to large-scale contamination due to polluted agricultural wastes, and untreated industrial and domestic wastewater, which leaks into the water body and contributes to almost 35 per cent of its volume. As a consequence, 70 per cent of water wells in the Gaza Strip are contaminated with high levels of nitrate (>50mg/l) while 60 per cent are contaminated with chloride (>250mg/l). WHO estimated that 90-95 per cent of water distributed in the Gaza Strip is unfit for human consumption due to levels exceeding its recommended values for one or more contaminants. According to health institutions, about 26 per cent of all diseases observed in the area are water-related among which, acute bloody diarrhoea, viral hepatitis, liver and kidney diseases, methemoglobinemia (blue baby syndrome), and anaemia are the most common<sup>19</sup>. The number of cancer cases is high in the Gaza Strip, with agglomerations occurring next to agricultural areas where water supplies are highly contaminated with traces of phytosanitary by-products. The contaminants multiplied by about 400 per cent over the period 1990-1999<sup>20</sup>.

.....  
18 Bohannon J., 2006. Running Out of Water—and Time. *Science*, 313, 1085-1087.

.....  
19 Protecting Children from Unsafe Water in Gaza, 2010. UNICEF  
20 Safi JM. Association between chronic exposure to pesticides and recorded cases of human malignancy in Gaza Governorates (1990–1999), 2002. *The Science of the Total Environment* 284, 75–84.





## Desalination?

Desalination plants could provide a solution to the territories' water needs and fundraising is underway for large plant to be built in Southern Gaza with an eventual capacity of more than 100mcm/year<sup>21,22</sup>. Desalination is used extensively in the arid region, including by Israel, to meet water needs. The urgency of drinking water needs is particularly apparent in Gaza, where the Coastal Aquifer is the sole source of water. The 1.7 million Palestinians in Gaza consume more than 170mcm/year from the aquifer – above its sustainable yield of 55mcm/year and causing increased levels of salinity<sup>23</sup>. This has rendered much of the water undrinkable with a 2009 World Bank report saying 90-95per cent of water in the Gaza Strip is not fit for human consumption. Several smaller desalination facilities were built or under construction earlier<sup>24</sup>.

The Gaza desalination plant project follows several feasibility studies and is being backed by the Union for the Mediterranean among other organisations. It is estimated it will cost 350 million Euros. Fundraising, implementation studies, and tendering will occupy the initial steps of the project before work is expected to start in the second half of 2014 and completed by 2020<sup>25,26</sup>. The desalination

plant is expected to use reverse osmosis technology and produce 55mcm for the first phase and ultimately 110mcm at a later phase<sup>27</sup>.

In early 2012, France pledged 10 million Euros, the European Investment Bank its expertise, as well as Saudi and Kuwaiti Development Funds and the Islamic Development Bank<sup>28</sup>. Arab Gulf states have pledged 50 per cent of costs. Israeli government representatives said the government would support the project<sup>29</sup>.

The project is expected to: help meet long-term drinking water needs of Gaza population; regenerate the coastal aquifer; improve political stability particularly related to water scarcity; reduce pollution through associated waste water programmes; and provide job creation through construction and maintenance<sup>30</sup>.

Although desalination provides a long-term solution to increasing fresh water supplies, the higher costs of water may be difficult for the population to meet<sup>31</sup>. With prices expected to decrease over time, desalination nevertheless remains a reasonable alternative.

.....  
21 Arwa Aburawa, Gaza Seawater Desalination Plant Backed By Europe, March 18, 2012, The Green Prophet, <http://www.greenprophet.com/2012/03/gaza-seawater-desalination-plant-backed-by-europe/>

22 UfM, p.3

23 UfM, p. 1

24 Two brackish water desalination plants are already operating in Khan Yunis and Deir el Balah, and another plant has been specially built for the industrial estate in central Gaza. A fifth seawater desalination plant with a capacity of about 20 mcm per year is being planned with support from USAID. According to UNEP, 2003, p. 30.

25 UfM, p.5

26 Arwa Aburawa, Gaza Seawater Desalination Plant Backed By Europe, March 18, 2012, The Green Prophet, <http://www.greenprophet.com/2012/03/gaza-seawater-desalination-plant-backed-by-europe/>

.....  
27 UfM, p.3

28 WaterWorld, World Water Forum: Gaza desalination project gets financial kick start, March. 14, 2012, WaterWorld, <http://www.waterworld.com/articles/2012/03/world-water-forum-gaza-desalination-project-gets-financial-kick-start.html>

29 AFP, Israel says it backs Gaza Strip desalination plant, March 13, 2012, AFP, <http://www.google.com/hostednews/afp/article/ALeqM5iSYyi00S4GAKBH83HR6XV-4fME3g?docId=CNG.d490a4a8d-201f33526e674bd4db7e68.a1>

30 UfM, p.3

31 UNEP, p.131

# Challenges

Political unrest, Israeli restrictive measures, and the institutional weakness of the PNA are the driving forces of the chronic water crisis in the oPt and seriously challenge its future improvement, according to a recent World Bank report<sup>32</sup>. The asymmetrical power and capacity of the joint governance system of the water sector, best represented by the JWC, renders almost impossible the rational planning and development of Palestinian water resources and infrastructure. The movement restrictions and the exhaustive regulatory measures imposed by Israel on local and international investors in the water sector in the oPt render excessively costly and time-consuming any operation regardless of its size. The structural and institutional weakness of the PNA and other water sector actors, undermined by the Israeli occupation and post-occupation practices in addition to chronic financial crisis of the Palestinian National Authority reduce considerably the Palestinians' capacity to plan and develop their water infrastructure making only emergency rather than strategic water development plans operationally feasible.

The current water crisis in the oPt is expected to further worsen as a result of the demographic expansion, the deficient water transportation and distribution systems, and the continuous deterioration of water resources also due to climate change. Since the creation of the PNA in 1993, Palestinians have seen their water shares per capita almost halve as a result of population growth. Despite the declining trend of the population growth rate observed recently<sup>33</sup>, the annual growth rate of 3.7 per cent places the Palestinian population as one of the most

rapidly growing of the world. The deficiency of water transportation networks, most of them are inherited before the establishment of the PNA, are responsible for an unaccounted-for water loss of about 30 per cent and 50 per cent of the overall extracted volume in the West Bank and the Gaza Strip, respectively<sup>34</sup>. Further losses in water are caused by the extremely inefficient irrigation water wells, most of which were built in the 1950s and 1960s, the inefficient irrigation water distribution networks, and the low water use efficiency at the farmer level due to the small dimensions of land tenure and water sharing organization<sup>35</sup>. The degradation of water resources as a consequence of the deliberate or uncontrollable contamination from untreated wastewater evacuation or leakage, unsupervised solid wastes dumping, and excessive use of chemicals in farms close to water resources, will make supplying water meeting international quality standards in sufficient quantities an excessively costly operation.

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32 West Bank and Gaza - Assessment of restrictions on Palestinian water sector development, 2009. The World Bank

33 Palestinian Central Bureau of Statistics (PCBS), July 2012

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34 Water supply report, 2010. Palestinian Water Authority

35 Occupied Palestinian Territory Aquastat 2009. FAO

Future

In an effort to find a solution, the PWA has proposed the following plan<sup>36</sup>:

- Equitable and reasonable re-allocation of shared freshwater resources in accordance with international law, which entails equal water allocations, and providing Palestinians access to their rightful share of water.
- The implementation of the agreed-on arrangements in a timely manner in order to give Israel time to complete existing plans to increase its desalination capacity and to introduce greater efficiencies in water use, and Palestinians the time to expand their water infrastructure to cope with increased volumes of water.
- New arrangements for the coordinated management of shared water resources to better protect these resources, creating a more stable environment for future cooperation in the production of new water.

These suggestions are based on the expansion of water allocations according to the needs per capita of both parties considering current and future water resources, which imply the inclusion of non-conventional new water resources (eg.desalination and waste water treatment) in order to overcome the acute water crisis in the region.

Palestinians are working on the development of alternative water resources that would contribute to improving their water independence. The planned construction of a regional desalination plant in the Gaza Strip with a final total capacity of about 100mcm/year, has the immediate objective of

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36 The Positive-Sum Outcome: A Solution for All. B'Tselem, The World Bank, The Palestinian Water Authority

relieving the Coastal Aquifer and in the long run ensuring water independence. The plant, for which the first stages were recently approved<sup>37</sup>, replaced projects involving the purchase of fresh water from Turkey (the Manavgat River project) or from neighbouring Egypt<sup>38</sup> both of which had been excluded due to the high cost of transporting water, and due to diplomatic and technical obstacles. Supplies from Israel, which constitute a possible urgent alternative to stop the deterioration of the aquifer, are uncertain due to the political situation<sup>39</sup>.

Water scarcity is among the most serious challenges facing the establishment of a fully sovereign Palestinian state and seriously threatens its sustainable development. Without additional resources to those allocated to Palestinians in the framework of the Oslo Accords, the oPt will face a water deficit of more than 300mcm/year by 2020 and more than 530mcm/year in 2030. When alternative resources are considered, including seawater desalination, wastewater reclamation, rain water harvesting, and additional water purchased from outside sources, a significant improvement to the water deficit level could be achieved. This, however, will not be enough to resolve the problem as even considering these additions, a residual deficit of more than 220mcm/year is expected by 2020 and of 335mcm/year by 2030<sup>40</sup>. The situation could become more critical under the projected changes in temperature and precipitation patterns associated with climate change where aquifer recharge is expected to drop to less than 50 per cent of current levels.

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37 <http://www.diplomatie.gouv.fr/en/country-files/israel-palestinian-territories/palestinian-territories-2156/events-2759/article/french-assistance-amounting-to>  
38 The Blue Peace: Rethinking Middle East Water, 2011. Foreign insight group  
39 <http://www.telegraph.co.uk/news/worldnews/middleeast/israel/8918983/Israel-threatens-to-cut-water-and-power-to-Gaza.html>  
40 The Blue Peace: Rethinking Middle East Water, 2011. Foreign insight group

# Marine environment and resources

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Palestinians' access to the Mediterranean Sea has been increasingly restricted by Israel since the beginning of the Palestinian Second Intifada in 2000, impacting their economy, food security, and the potential to generate water through desalination or treat it through sewage plants. Despite the fact that the oPt is a riparian of the Dead Sea, it has no right to benefit from its natural resources or touristic potential. The pollution of the Mediterranean Sea and the Dead Sea caused by the evacuation of untreated wastewater is a serious environmental problem which has severe consequences on the water bodies ecological functioning and long-term sustainability.

## The Mediterranean Sea

The Oslo Accords<sup>41</sup> divided the Mediterranean Sea offshore the Gaza Strip into three areas (see the map on page 26) :

- Area L: Extends more than 40 km along the Gaza Strip and 20 nautical miles (nm) offshore. It is under full Palestinian control for all purposes.
- Area K: A 1.5 nm wide slit inward of the Gaza coast that separates the north of the Gaza Strip from Israel.
- Area M: 1 nm south of the Gaza Strip on the borderline with Egypt<sup>42</sup>

After the beginning of the Second Palestinian Intifada in 2000, Israel progressively reduced the boundaries of the main zone from the 20 nm agreed to 12 nm, and further to less than six nm since Hamas took control of the Gaza Strip

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41 <http://www.unhcr.org/refworld/publisher/ARAB,,,3de5ebbc0,0.html>

42 Both areas K and M are security zones strictly prohibited for Palestinians.

in 2007. This has been further restricted to less than three nm since the Israeli Operation Cast Lead in 2008-2009<sup>43</sup> reducing the fishing area to less than 220km<sup>2</sup>. These restrictions continued despite several agreements between Palestinians and Israelis, achieved under the umbrella of the United Nations<sup>44</sup>. Palestinian boats have frequently been attacked by Israeli warships offshore from the Gaza Strip with 150 attacks registered between January 2011 and April 2012<sup>45</sup>. These attacks caused severe damage to their equipment and led to several fatalities among the fishermen<sup>46</sup>.

Fish catches have decreased to less than 300 tons since 2007<sup>47</sup>. This quantity is far less than the 20,000 tons estimated as necessary to fulfil the needs of the fast growing population<sup>48</sup>. Previously, the development of improved fishing equipment, techniques, and PNA's supervision of fish stocks, enabled the recovery of the fishing sector after it was degraded during the First Palestinian Intifada (1987-1992). During this time, fish catches were almost 4,000 tons per year; a level similar to that observed during the 1970's when Palestinian fishermen had an area of activity covering more than 75,000 km<sup>2</sup> <sup>49</sup>.

The annual economic contribution provided by the Mediterranean Sea to the Palestinian economy, including fishing, tourism, recreation and waste-treatment services, are estimated at \$50million<sup>50</sup>. This value does not consider the

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43 Gaza Fishing: An Industry in Danger, 2007. UNOCHA

44 <http://unispal.un.org/UNISPAL.NSF/0/06325D5A3898232285256C410069B52B>

45 Israeli human rights violations targeting Palestinian fishermen in the Gaza Strip, 2012, Euro-Med Observer for Human Rights

46 Gaza Fishing: An Industry in Danger, 2007. UNOCHA oPt

47 Locked In: The humanitarian impact of two years of blockade on the Gaza Strip, 2009. UNOCHA oPt

48 Palestinian Economic Prospects: Gaza Recovery and West Bank Revival, 2000. The World Bank

49 Gaza Coastal and Marine Environmental Protection and Management Action Plan, 2000. Palestinian National Authority, Ministry of Environmental Affairs.

50 Mangos, A., Bassino, J-P., Sauzade, D. 2010. The economic value of sustainable benefits rendered by the Mediterranean marine ecosystems.



potential benefits of the gas reservoirs located offshore of Gaza, discovered by the British Gas Group in 1999. According to the company's estimates, more than 1.3 trillion cubic feet of natural gas are available and technically recoverable in these fields. This quantity was estimated to be sufficient to provide the oPt with energy for more than a decade, with excess for exportation. Despite long negotiations with Israel, including the possibility to receive excess Palestinian gas directly or indirectly via Egypt with preferential prices, a satisfactory accord was not achieved. After the beginning of Hamas' control of the Gaza Strip in 2007, all negotiations between parties ceased. Due to restrictions on foreign investment in the oPt imposed by Israel, this project could not be developed further. According to Palestinian experts<sup>51</sup>, the annual loss to the Palestinian economy as a consequence of the non-exploitation of these reserves is estimated at \$US160 million, around two per cent of GDP in 2010.

Pollution is a serious problem directly threatening public health, and the immediate and long-term sustainability of the Mediterranean marine environment. The main sources of pollution are untreated wastewater from domestic, agricultural, and industrial sources, as well as solid waste dumping. In 2010, the volume of partially or inadequately treated wastewater diverted on daily basis from urban centres of the Gaza Strip into the Mediterranean Sea was estimated at 80,000m<sup>3</sup><sup>52</sup>. Reports on the high levels of contamination of the Gaza beaches and shores with faecal bacteria and pathogenic microorganisms have been repeatedly documented<sup>53</sup>. Other direct sources of

pollution include untreated toxic solid waste dumped in landfills adjacent to the coastline, and surface runoff of agricultural waste loaded with organo-phosphoric pesticides and nitrogen fertilizers, which passes through Wadi Gaza during heavy rain causing occasional sea eutrophication and toxic algal blooms<sup>54</sup>. Coastal erosion, atmospheric pollutants runoff, and the potentially adverse effects associated with global climate change could also contribute to impacts.

## Dead Sea

The Dead Sea is considered a natural wonder, as one of the saltiest lakes in the world and occurring at more than 400m below sea level. It is called so because barely any macroscopic life survives in the water body. However, this is not the case for the basin itself and recent scientific missions revealed rich microscopic diversity, especially in the complex system of fresh water springs under the sea<sup>55</sup>. At present, more than 70 salt-tolerant microscopic fungal species have been identified in areas of the Dead Sea<sup>56</sup>.

The Dead Sea is a major regional and international tourist attraction for recreational, medical, and religious purposes. It is rich in valuable minerals, mainly potash, which was first exploited by Palestinians during the British Mandate through the Palestine Potash Company founded in 1929. Since 1952, following the creation of the State of Israel, the company was succeeded by the Israeli-owned Dead Sea Works Ltd., which took entire control of the site.

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Plan Bleu, Valbonne. (Blue Plan Papers 8).

51 The economic costs of the Israeli occupation for the occupied Palestinian territory, 2011. Palestinian Ministry of National Economy and ARIJ publications.

52 One Year After - Gaza Early Recovery and Reconstruction Needs Assessment, 2010. UN Development Programme Report.

53 Elmanama, A.A., Fahd, M.I., Afifi, S., Abdallah, S., Bahr, S., 2005. Microbiological beach sand quality in Gaza Strip in comparison to sea-

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water quality. Environmental Research, 99, 1-10.

54 Abou Auda, M and Shahin, U, 2005. National Action Plan For Reduction of Pollution of Mediterranean from Land Based Sources. The Palestinian Authority, Ministry of Environmental Affairs.

55 <http://www.greenprophet.com/2011/09/new-life-found-dead-sea>

56 Oren A, Gunde-Cimerman N., 2012. Fungal life in the Dead Sea. Prog Mol Subcell Biol. 2012; 53:115-32.

# Occupied Palestinian Territory

## Palestinian areas

- Area A (full civil and security control by the Palestinian Authority)
- Area B (Palestinian civil control and joint Israeli-Palestinian security control)

## Israeli settlements

Area C (full Israeli civil and security control, except over Palestinian civilians)

- Area within municipal boundary (settlement)
- Area annexed to Israel
- Separation barrier (completed)
- Separation barrier under construction or projected
- Green line (1949 Armistice Agreements)
- Roads prohibited or subject to permit restrictions
- Jerusalem municipal area
- Israeli military base
- Refugee camp
- Checkpoint
- Closed checkpoint
- 1 nautical mile (nm) = 1.852 km



Despite the fact that the oPt is a riparian of the Dead Sea, the rights of Palestinians to any of the previously cited services have been denied. This is estimated to cost the Palestinian economy around \$1.1bn/year, which amounts to 13 per cent of the national GDP<sup>57</sup>.

The environmental crisis of the Dead Sea is a multi-faceted problem that threatens its existence and consequently all the associated ecological and economic services. Since the 1950s, the Dead Sea has lost almost one third of its overall volume and its surface level has dropped by about 30m. Since 2000, this trend had dramatically intensified. The surface level is now dropping at a rate of about 1.3m per year compared to less than 0.39m per year during 1969-1977<sup>58</sup>. The formation of more than 3,000 sinkholes in the already dried seabed due to fresh water infiltration and dissolved salt in the sediments pose a threat to people and their economic activities.

The diversion of the Jordan River and its tributaries by the riparian countries, especially Israel and to a lesser extent Syria and Jordan, for drinking and agriculture is the most important cause of the Dead Sea's reduced water levels. Currently, the fresh water volume entering the Dead Sea by the Jordan River varies between 10 and 100mcm/year, compared to its original annual flow of 1300mcm that used to offset the sea's natural evaporation keeping it's level almost constant over the past 10,000 years. The projected increase in the regional average temperatures, decrease in average rainfall, and the drop by up to 80 per cent of the natural flow of the Jordan River due to global climate change will worsen the situation<sup>59</sup>. By the end of this century, the Dead Sea is expected to shrink to a small hyper-saline lake of 450km<sup>2</sup>, half of its current size<sup>60</sup>.

The intensive evaporation of the Dead Sea by mineral mining companies is another driver of the sea's low water levels. Both Israeli and Jordanian companies extract minerals through open pond evaporation, which accounts for the loss of more than 250mcm/year, almost 30 per cent of the overall annual evaporation. Friends of the Earth Middle East (FoEME), an NGO involving Jordanian, Israeli, and Palestinian environmentalists, has recommended using less environmentally threatening Reverse Osmosis technology, but evaporation ponds continue to be the main method deployed and their use is expanding.

Between 500 and 700mcm of untreated wastewater, brackish water, and agricultural wastes flow into the Dead Sea annually. The polluted waters mainly flow from Israeli agricultural agglomerations in the Jordan River valley and Israeli settlements in the east of the West Bank, as well as smaller flows from Palestinian urban centres, particularly the Jerusalem region<sup>61</sup>. The consequences of the wastewater on the ecosystem of the Dead Sea are still largely unknown. However, an increased degree of salinity in Dead Sea tributaries has resulted from brackish water and untreated wastewater in this system. It has caused drastic modifications of the faunal and floral biodiversity in the river valley, leaving behind only a few salt-tolerant species. The shrinking of the Dead Sea also threatens one of the major bird migratory corridors in the region which is associated with the adjacent wetland system. The algal blooms recorded in the Dead Sea during 1980 and 1992 (heavy rainfall years), explained by slight modifications of its acidity<sup>62</sup>, suggest that the modifications of the chemical and physical properties of the Dead Sea could have far-reaching consequences on its unique ecosystem.

57 The economic costs of the Israeli occupation for the occupied Palestinian territory, 2011. Palestinian Ministry of National Economy and ARIJ publications.

58 Gladiusz, J., 2010. New Life For the Dead Sea ? Nature, 464, 1118-1120.

59 Brown, O and Crawford, A., 2009. Rising Temperatures, Rising Tensions : Climate change and the risk of violent conflict in the Middle East. International Institute for Sustainable Development (IISD)

60 Gladiusz, J., 2010. New Life For the Dead Sea ? Nature, 464, 1118-1120

61 Foul Play: Neglect of the Wastewater Treatment in the West Bank, 2009. B'Tselem.

62 Oren A, Gunde-Cimerman N., 2012. Fungal life in the Dead Sea. Prog Mol Subcell Biol. 2012; 53:115-32.

# Future

The Hashemite Kingdom of Jordan, the State of Israel, and the Palestinian National Authority jointly requested the World Bank in 2005 to undertake a study program to investigate the feasibility of transferring water from the Red Sea to the Dead Sea in order to reverse its environmental degradation. The feasibility study<sup>63</sup>, conducted at a cost of \$16million, assessed the plan to build a pipeline or tunnel feeding between 1000-2000mcm/year(over phases) to the Dead Sea. It would also supply desalinated water(about 900mcm/year) and electricity to Jordan, a country in need of both resources. The cost of implementing this project was estimated at about US\$10 billion. This project is seen as a peace-building instrument<sup>64</sup>. According to the World Bank, however, the right of Palestinians to benefit from the Dead Sea when the project is finalised was not considered in the Terms Of Reference of the feasibility study although they are supposed to be one of the beneficiary parties<sup>65</sup>.

Although the study found the project was technically possible<sup>66</sup> concerns have been raised by scientific and non-governmental environmental experts about the potential impact of the project on the fragile environment of the Dead Sea basin<sup>67</sup>. The study found supplementing the Dead Sea with seawater of the Red Sea or with desalination brine could cause serious and irreversible modifications of the Dead Sea properties if the annual discharge exceeds 300mcm.

Concerned by the potential environmental drawbacks of the project, Friends of the Earth Middle East (FoEME), an NGO involving Jordanian, Israeli and Palestinian environmentalists, proposed an alternative plan consisting of a cluster of urgent measures to be undertaken<sup>68</sup> including limiting tourism development and preserving ecologically sensitive areas on the Eastern and Western shore and encouraging eco-sensitive tourism. The NGO also proposed establishing the basin as a Man And Biosphere Reserve (MAB) or World Heritage Site, obliging governments to create a plan for sustainable development of the region. This would also make the basin eligible for technical and financial assistance from UNESCO for preservation efforts. It was also recommended that a joint management plan be created which took into account carrying capacities and rational target development rates.

More details in the chapter "Water deficit" of the Jordan Environment and Security report by Zoï Environment Network.

Available on → <http://www.zoinet.org/web/publications>

63 <http://www.worldbank.org/rds>

64 Glausiusz, J., 2010. New Life For the Dead Sea ? Nature, 464, 1118-1120.

65 Red Sea-Dead Sea Water Conveyance Study Program: Question and Answer Sheet, 2012 at <http://www.worldbank.org/rds>

66 *ibid*.

67 [http://foeme.org/www/?module=projects&record\\_id=51](http://foeme.org/www/?module=projects&record_id=51)

68 [http://foeme.org/www/?module=projects&record\\_id=21](http://foeme.org/www/?module=projects&record_id=21)

Gaza beach. Fishermen can no longer fish far out at sea. Their access is limited to three nautical miles, which is not enough to catch reasonable amounts of fish. In an attempt to compensate, fishermen use offshore nets.









In 2001, the Palestinian Ministry of Environmental Affairs presented the Gaza Coastal and Marine Environmental Protection and Management Action Plan<sup>69</sup>; a comprehensive programme for the integrated management of the Gaza coastal area and marine environment. The project was presented as part of the Palestinian Environmental Strategy Plan.

The first result of the project was the establishment of the multi-stakeholders' Coastal and Marine Environmental Protection Committee, headed by the Ministry of Environmental Affairs. In the framework of this committee, three Task Forces were formed: the Environmental Protection Task Force on Sand Exploitation (EPTF-SE), Environmental Protection Task Force on Coastal Erosion (EPTF-CE), and Environmental Protection Task Force on Marine Pollution (EPTF-MP). The programme also included the foundation of the Gaza Marine Information System (GAMIS) that serves to provide geo-referenced maps of the marine area offshore the Gaza Strip as well as data on the status of sand dunes, coastal erosion, and marine ecological status in the coastal area. The action plan identified five themes for priority actions and measures to be undertaken: habitats destruction and biodiversity decline; beaches; fish and fisheries; water quality; and public Information.

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69 Gaza Coastal and Marine Environmental Protection and Management Action Plan, 2001. Palestinian National Authority, Ministry of Environmental Affairs

In 2005, the Global Environmental Facility of the United Nations Environment Program (GEF-UNEP) supported a National Action Plan For Reduction of Pollution of Mediterranean from Land Based Sources<sup>70</sup>. The report identified wastewater, solid waste, industrial and agricultural effluents and land use planning as the areas where urgent management improvement is needed. The report pointed out the necessity to clarify the institutional setup regarding coastal and marine environmental protection and recommended to include non-governmental and private stakeholders, besides the governmental institutions, in the protection efforts.

The current efforts to include Wadi Gaza Coastal Wetlands on the list of protected World Heritage Sites of the UNESCO will contribute, besides preserving the unique biological diversity of the site, in mitigating one of the most important sources of pollution of Gaza coastal area.

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70 Abou Auda, M and Shahin U, 2005. National Action Plan For Reduction of Pollution of Mediterranean from Land Based Sources. The Palestinian Authority, Ministry of Environmental Affairs

# Land

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The West Bank is the largest contiguous entity of the oPt with an area of 5,879km<sup>2</sup>.<sup>71</sup> Its landscape is dominated by mountainous areas with evergreen Mediterranean forests in the northwest to bare desert landscapes in the southeast. The Gaza Strip is a narrow coastal strip extending more than 42km on the extreme southeast corner of the Mediterranean, between the Sinai and the Negev deserts. Its 378km<sup>2</sup> surface is dominated by sand dunes and calcareous sandstones covered with sparse vegetation.

## Land distribution and access

Currently, 60 per cent of the West Bank is under full Israeli control with limited Palestinian access, including 38 per cent which Palestinians cannot enter at all for security reasons<sup>72</sup>. This situation corresponds to the terms of the Oslo Accords regarding land control. According to Article XI of the Interim Agreement on the West Bank and the Gaza Strip (Oslo Accord II)<sup>73</sup> signed in 1995, the oPt was divided into three distinct areas with regard to the extent of each party's control:

- Area A: Represents about 17 per cent of the territories and is largely dominated by Palestinian urban areas. It is under full Palestinian civil and security control.
- Area B: Represents 23 per cent of the oPt. Under Palestinian civil control and Israeli military control.
- Area C: More than 60 per cent of the West Bank. Holds most Israeli settlements, nature reserves, and areas of security interest. Entirely under Israeli control and Palestinian access subject to approval.

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71 Desk Study on the Environment in the Occupied Palestinian Territories, UNEP 2003

72 West Bank and Gaza - Assessment of restrictions on Palestinian water sector development, 2009. The World Bank

73 <http://www.mfa.gov.il/MFA/Peace+Process/Guide+to+the+Peace+Process/THE+ISRAELI-PALESTINIAN+INTERIM+AGREEMENT.htm>

This situation was intended to last for a transitional stage of five years following the signature of the agreement, during which final state negotiations towards a definitive status of the oPt were planned. The beginning of the Second Palestinian Intifada in September 2000 put an end to the transfer of control in areas B and C to the PNA. Currently, the movement between the three zones is highly restricted by a network of more than 600 checkpoints distributed in and around the West Bank. These checkpoints occur along arbitrary frontiers set unilaterally by Israel and create fragmented areas and “islands” of Areas A and B in the “ocean” of contiguous Area C<sup>74</sup>. This situation is further aggravated by the construction of the Israeli separation wall<sup>75</sup>, voted for in 2002 by the Israeli government under the pretext of preventing the infiltration of Palestinians into its territories. About 85 per cent of the projected route of the 709km length wall is estimated to run on West Bank land and not along the Green Line<sup>76</sup> and goes as deep as 25km into Palestinian-owned lands<sup>77</sup>. When the project is completed according to Israeli plans, about 10 per cent of West Bank land will be blocked west of the separation wall, and will deprive Palestinians of almost 50 per cent of their forests and natural protected areas and up to 28 per cent of their agricultural production. The Eastern portion of the wall will block access to about 275ha of Palestinian land, which comprises one fifth of Palestinian agricultural production, and about 88 per cent of rangelands<sup>78</sup>. The area under the Eastern Segregation Zone is estimated at 1664 km<sup>2</sup> representing 29.3% of the west Bank.

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74 Area C and Palestinian State Building, 2011. EU Heads of Diplomatic Missions Report

75 International Court of Justice term

76 [http://www.btselem.org/about\\_btselem](http://www.btselem.org/about_btselem)

77 Issac, J. and Hirnat, N., 2005. Assessing the Impact of Israel's Segregation Wall on the Palestinian Agricultural Biodiversity. Applied Research Institute Jerusalem (ARIJ)

78 West Bank and Gaza - Assessment of restrictions on Palestinian water sector development, 2009. The World Bank.

## Land

- |  |  |
|--|--|
|  | Agriculture  |
|  | Pasture  |
|  | Nature reserve                                     |
|  | Forest   |
|  | Wetlands   |
|  | Separation barrier (completed)                     |
|  | Separation barrier under construction or projected |
|  | Green line (1949 Armistice Agreements)             |







## Land use

Laurence Oliphant<sup>79</sup> wrote in 1887 describing the Valley of Jezreel in Palestine as “...a huge green lake of waving wheat, with its village-crowned mounds rising from it like islands; and it presents one of the most striking pictures of luxuriant fertility which it is possible to conceive”. During its long history, Palestinian society has developed an agricultural tradition vital for its economy and culture. Until the early 1970s, the agriculture sector contributed up to 36 per cent of the Palestinian GDP and employed about 46 per cent of the overall Palestinian working power. Since the beginning of the Israeli occupation in 1967, the economic importance of this sector has progressively decreased, dropping to almost a third of its post-occupation value by the early 1990s and to less than five per cent of GDP in 2011<sup>80</sup>. The sector is still considered a cornerstone in poverty alleviation and food security provision in the oPt. It is also seen as a way to protect land from confiscation and settlements<sup>81</sup>.

The continued decline of the agricultural sector has occurred despite the favourable environment for agricultural development in the oPt<sup>82</sup>, including a climatic diversity permitting the cultivation of a wide range of seasonal crops as well as highly competitive off-season crops, a high number of skilled workers, and an advanced level of technology. This combined with the

strategic location of the oPt on regional and international trading crossroads make it an ideal place for development and capital flow. Political instability has prevented the establishment of a positive investment climate and Israeli policies have inhibited the sector. The sector has been among the most exposed to Israeli punitive measures exposing it to successive financial crises. According to the Palestinian MoA, the annual losses of the agricultural sector due to Israeli policies amount to \$US140 million in the West Bank and up to \$US250 million in the Gaza Strip<sup>83</sup>.

Rangelands represent almost 35 per cent of lands in the West Bank, most of which are located in the Eastern slopes, and about 12 per cent in the Gaza Strip. Due to closure and heavy restrictions on Palestinians’ movement, only 15 per cent of these rangelands are accessible exposing them to severe consequences due to overgrazing.

The oPt holds 93 forests covering a total area of about 230km<sup>2</sup> representing almost four per cent of its overall surface area. About 79 per cent of all the forests are natural, most of which are located in the north-eastern part of the West Bank, although afforestation, mainly around Hebron, occurred under earlier eras of governance<sup>84</sup>.

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79 Laurence Oliphant (1829 – 1888) was a British Member of Parliament, author, traveller, diplomat, and mystic

80 PCBS, 2009

81 Agriculture sector strategy – A shared vision, 2010. Ministry of Agriculture/FAO

82 Developing the Occupied Territories: an investment in peace: Vol. 4: Agriculture, 1993. The International Bank for Reconstruction and Development, The World Bank

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83 Agriculture sector strategy – A shared vision, 2010. Ministry of Agriculture/FAO

84 Forests in Palestine, 2006. ARIJ



# Challenges

Natural and man-induced land degradation are serious threats facing land use sustainability in the oPt. Israeli policies of land closure, land confiscation, and limited water allocations in Area C have led to increased pressure on already limited land resources. Lack of sovereignty over land resources make it almost impossible to develop and implement coherent national policies and plans. With less than 20 per cent of potential agricultural land and less than 15 per cent of rangelands accessible, Palestinian farmers have tended to increase their production through the intensification of production and the use of vulnerable highly productive crops. This has led to soil contamination, reduced soil diversity, and consequently organic matter sequestration, all prone to intensifying soil degradation. The overgrazing of the few available rangelands for livestock has led to a loss of natural vegetal cover. This cover has not regenerated in many areas and led to desertification, particularly in the east of the West Bank<sup>85</sup>. The situation in the Gaza Strip has many similarities with this situation where almost 35 per cent of agricultural soils and rangelands are inaccessible to Palestinian farmers due to their location within or close to the security buffer zone set by Israel around the Gaza Strip.

During the period 2000-2011, Israel uprooted more than 1.5 million trees, of which 500,000 were fruit (mostly olive) trees. The construction of the separation wall by Israel, which started in 2002, caused an additional loss of about 100,000 fruit trees. During the period 1970-1999, the forest cover decreased by 23 per cent and 95 per cent in the West Bank and the Gaza Strip, respectively. Besides the direct economic loss, the uprooting of trees and the loss of vegetation has the consequence of intensifying wind and water erosion, decreasing the quality of aquifers, reducing soil fertility, and increasing the loss of biodiversity.

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85 West Bank and Gaza - The Economic Effects of Restricted Access to Land in the West Bank, 2009. The World Bank

The shortage of water and uncertain access to land in Area C of the West Bank has led Palestinian farmers to abandon their lands, leaving them more exposed to soil erosion and degradation. In the Gaza Strip, the use of highly saline water for irrigation multiplies the risk of soil salinisation particularly when the low precipitation levels and the high evapo-transpiration in the region are considered. Although no national surveys had been yet performed to estimate the extent of land abandonment due to soil salinisation, several cases had been already observed. Almost 75 per cent of lands in the oPt are arid and semi-arid, receiving an annual rainfall of less than 300mm. These areas, located mainly in the eastern slopes of the West Bank, are highly exposed to salinisation and water erosion due to irregular and intensive rainy episodes. With reduced rainfall and higher temperatures projected under regional global climate change scenarios, aridity in the oPt is expected to further expand leading to increased salinisation and subsequent desertification<sup>86</sup>.

Other drivers of land degradation include the use of techniques such as deep tilling, and the intensive use of chemical fertilizers and pesticides causing depletion of soil organic matter and soil biodiversity. Water intensive agriculture is used which increases erosion while crude wastewater is also sometimes used for irrigation. Poor roads to remote cultivable areas mean those areas are abandoned and subsequently exposed to erosion and salinization. Meanwhile, land use has intensified due increased demand from the growing population, and the pressure of urban developments on agricultural lands have exposed the land to additional pressure and threaten their sustainability.

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86 Dudeen B., 1996. Land degradation in Palestine: Main Factors, Present Status and Trends, Recommended Actions. Land Research Center – Jerusalem

# Future

The National Agricultural Sector Strategy 2011-2013 aims to develop a “sustainable and feasible agriculture, that is capable of achieving food security, competitive in the local and foreign markets through an optimal use of resources as part of comprehensive development, cementing the bonds and sovereignty of Palestinians over their land, there on towards building the state”<sup>87</sup>.

In 2006, the Ministry of Agriculture in the Gaza Strip started an equivalent programme for Strategic Development of the Agricultural Sector, the last stage of which is a ten-year plan started in a 2010<sup>88</sup>. The goals of this programme include optimizing the use of resources by providing appropriate infrastructures and services in order to reduce land degradation and strain on resources, supporting small farmers and empowerment of marginalized social

groups, increasing the competitiveness of Palestinian agricultural products on national and international markets, strengthening the role of the industrial and private sectors in agricultural development, and insuring an attractive environment for investment. The cost of the implementation of this 10-year plan is estimated at \$1bn.

According to ARIJ analysis<sup>89</sup>, the construction of the separation wall, the confiscation of lands, and environmental degradation in the oPt could be considered as violations of basic human rights and a number of international protocols and agreements. Strengthening the juridical awareness of the different stakeholders aims at enhancing the humanitarian coordination and advocacy of the Palestinian people and to support their claims to their land and other resources<sup>90</sup>.

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87 Agriculture Sector Strategy: A shared Vision/2011-2013. Palestinian National Ministry of Agriculture – Ramallah

88 Strategy for Sustainable Agricultural Development: A General Framework/2010-2020. Palestinian Ministry of Agriculture - Gaza

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89 The Status of the Environment in the oPt – A Human Rights Based Approach, 2011. ARIJ

90 Among the humans rights in question are the Article 49 of the Fourth Geneva Convention of 1949, Articles 4, 7, 13 (1), 17 (1), 23 (all parts), and 25 (1) of the Universal Declaration of Human Rights (UDHR); Part I (Article 1) and Part II (Article 9) of the International Covenant of Civil and Human Rights (ICCPR).



## Climate Zones

Five climate zones can be distinguished in the oPt .

- Coastal zone, exclusive to the Gaza Strip, is located along the Mediterranean Sea. Varies from semi-desert (<250mm/y) in the south to wet Mediterranean in the north (>450mm/y).
- Semi-coastal zone (400km<sup>2</sup>) is located on the extreme northwest of the West Bank. It has a relatively high annual rainfall average (>600mm) and hosts the most fertile lands in the oPt.
- Central Mountains zone (3500km<sup>2</sup>) which extends from south to north across the West Bank, where major Palestinian urban centres are found. It has a varying climate and vegetation ranging from semi-desert rangelands in the south to Mediterranean evergreen forests in the north.
- Eastern Slopes zone is a transitional zone between the Mediterranean and the desert climates with an average annual rainfall ranging between 150-250mm. This region has the most important rangelands in the oPt.
- Jordan Valley (Ghors Zone) (400km<sup>2</sup>) stretches on the east of the West Bank between 90-400m below sea level. It has a desert climate with annual rainfall averages of less than 150mm.

← Farmers and semi-nomadic Bedouins traditionally graze their livestock across the desert valley in search of water and fresh feed. The Bedouins are increasingly restricted in their movement.

# Biodiversity

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Biological diversity surveys on Palestinian lands and water have historically held a wealth of species despite its small size. This is due to its position on the crossroad of Africa, Asia, and Europe, the diversity of its eco-zones, and its location on one of the most important migratory bird corridors<sup>91</sup>. The current geopolitical context to which the oPt are submitted has placed a considerable pressure on these resources, seriously threatening their sustainability.

The oPt is host to more than 2,900 plant species, of which six per cent are endemic. Four main plant zones are recognizable although the boundaries overlap<sup>92</sup>, stretching from the evergreen woodlands of the Mediterranean zone to the Sudanese-influenced zone in the Jordan Valley, containing poplars.

Birdlife is one of the most remarkable features of the Palestinian biological diversity, as more than 200 million birds are estimated to cross the region during the year. About 500 bird species are recorded either as residents, summer breeders/nesters, winter breeders/nesters, common migratory, or occasional migratory<sup>93</sup>. The Palestine Sunbird *Nectarinia osea* is an emblematic symbol of this diversity. Palaearctic birds are the most represented in the oPt with more than 250 species mostly present in the coastal Mediterranean region. Ethiopian and Indian types account for about 50 species and are almost exclusively observed in the Dead Sea basin and the Jordan Valley.

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91 Isaac, J. and Gasteyer, S., 2000. The Issue of Biodiversity in Palestine. ARIJ publications.

92 Wetlands in Palestine, 2009. EQA, PNA

93 <http://flora-fauna-palestine.webs.com/faunainpalestine.htm>







The oPt is home to 95 mammal species, with the most recently recorded species the endemic Gaza house mouse *Mus musculus gazaensis* discovered in 2007. The largest mammals observed are mountain gazelles, wild boar, foxes, jungle cats, leopards, hyenas, jackals and wolves. In addition, 120 Herpetofaunistic species of which 95 reptiles are documented, a large number of which is under threat of extinction including the endemic Viper *Vipera palaestinae*<sup>94</sup>.

By 2000, 201 fish species had been identified in Gaza waters, of which about 40 per cent are rare to very rare species. Many algae and small sea-floor dwelling creatures have also been recorded. Other species have been seen, including sea turtles and dolphins, but no records are available. Efforts are underway to document unexplored parts of the entire Levantine Basin of the Mediterranean Sea, including Gaza offshore<sup>95</sup>.

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94 Vertebrate Fauna of Wadi Gaza: Amphibians, Reptiles, Birds and Mammals, 2002. WetMedCoast Project  
95 <http://www.eastmedit-seaweeds.net/>

# Challenges

The wealth of biological and genetical resources in the oPt is under increasing pressure and some alarming signs doubting its long-term sustainability have been recorded. More than 900 plant species in the territories have been listed as threatened, of which about 300 species are on the Red List of Endangered Species of the IUCN<sup>96</sup>. All aquatic birds nesting, breeding, or passing by the wetland system of Wadi Gaza have been called extremely threatened<sup>97</sup>. This is in addition to a long list of endangered endemic and migratory soaring birds (MSB), which continue to decline as a consequence of unsupervised hunting in spite of regulatory legislation<sup>98</sup>. Already seven mammal species are believed to be extinct since the early 1990s while 18 other species are listed as near extinction<sup>99</sup>. Desertification due to the overgrazing of rangelands has also caused drastic modifications of trophic webs and plant associations<sup>100</sup>. The increasing presence of Indo-Pacific species, entering the Levantine Basin through the Canal of Suez, besides over-fishing threatens the sustainability of native fish species: almost 40 per cent of species recorded are considered rare to very rare<sup>101</sup>.

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96 Red List of threatened plant species in the West Bank and the Gaza Strip and the role of botanic gardens in their conservation. Biodiversity and Environmental Research Centre (BERC)

97 Vertebrate Fauna of Wadi Gaza: Amphibians, Reptiles, Birds and Mammals, 2002. WetMedCoast Project

98 Mainstreaming conservation of migratory soaring birds into key productive sectors along the Rift Valley/Red Sea flyway, 2006. UNDP Project Document

99 Natural reserves and Forests in Palestine, 2001. ARIJ publications

100 Ali-Shtayah M. S. and Salahat A. G. M., 2010. The impact of grazing on natural plant biodiversity in Al-Fara'a area. Biodiversity and Environmental Sciences Studies 5, 1-17.

101 Gaza Coastal and Marine Environmental Protection and Management Action Plan, 2000. Palestinian National Authority, Ministry of Environmental Affairs.

This trend is not expected to reverse considering the projected changes in regional climate patterns in both marine<sup>102</sup> and terrestrial environments<sup>103</sup>. Information on the consequences of the shrinking of the Dead Sea, the drastic modifications of the physico-chemical properties of the Jordan River as a result of the over-extraction and pollution, and the construction of the separation wall on and around the West Bank on the regional biological diversity, are still scarce and should be considered in future studies.

Habitat destruction caused by deforestation, overgrazing, overfishing, excavation of sand dunes, coastal marine pollution, and the expansion of urban centres, are among the most significant threats to biodiversity in the oPt that should be considered in future conservation efforts, according to Palestinian officials. The evacuation of crude or partially treated wastewater, the uncontrolled dumping of untreated solid toxic waste, and the surface runoff of highly polluted agricultural waste, are generators of large-scale environmental pollution that contribute to biodiversity decline.

The adoption by Palestinian farmers of modern cultivars and genetically selected high yield varieties pushed most local landraces out of use. The local fish varieties offshore from the Gaza Strip, already extremely endangered due to overfishing and habitat destruction, are increasingly exposed to alien species of Indo-Pacific origins; a trend that is expected to increase as a result of global climate change. The high rate of population growth in the oPt

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102 Ben Haj S. and Limam A., 2011. Impact of climate change on marine and coastal biodiversity in the Mediterranean Sea: Current state of knowledge. RAC/SPA.

103 Brown O. and Crawford A., 2009. Rising Temperatures, Rising Tensions: Climate Change and the Risk of Violent Conflict in the Middle East. International Institute for Sustainable Development.

adds further pressure on biological resources, driving most ecosystems to the limit of their sustainability and several species to the edge of extinction.

Constructing illegal settlements and bypass roads on previously declared nature reserves, increasing the stress on the available lands through land confiscation and closure, restricting water allocations, illegal dumping of industrial toxic wastes, and evacuating untreated wastewater into agricultural and natural areas are among the most recurrent environmental abuses of Israel in the oPt, which seriously threaten the conservation of biological resources.

The physical barriers built by Israel around and in the oPt, best represented by the separation wall currently under construction, exacerbate the habitats' fragmentation already caused by the shared land control between Israelis and Palestinians. These barriers restrict animals' movement and pollen exchanges between domesticated and wild races leading to weakening their genetic diversity with grave consequences on the overall functioning of their ecosystems. In an extreme example, the fence enclosing the Gaza Strip constructed by Israel in the early 1990s is held responsible for the extinction of almost all large wild animal species in the Gaza Strip<sup>104</sup>. Recently, repeated attacks on farms in the north of the West Bank by wild boars have been observed, which are largely thought to result from the destruction of its habitats by the separation wall<sup>105</sup>.

## Plant zones in the oPt

- The Mediterranean zone with a natural cover of evergreen woodlands in which the native Palestine Oak *Quercus calliprinos*, Carob *Ceratonia siliqua* and the Turpentine *Pistacia terebinthus* prevail. Recently, most of these species were destroyed and replaced by Mediterranean shrubs such as the Brushwood *Sarcopoterium spinosum* and the Safflower *Carthamus tenuis*.
- Iranian Turanian zone is characteristic of the eastern slopes of the West Bank where steppe and semi-steppe vegetation, best represented by Sidr trees *Ziziphus lotus* and White broom *Retama raetam*, dominate.
- Saharan-Arab zone is found in the south of the West Bank and is dominated by Sahran type plants such as palms *Phoenix dactylifera* and Indian fig cactus *Opuntia ficus-indica*.
- Sudanese-influenced zone stretches over the Jordan Valley and the Dead Sea basin and has a subtropical savana type vegetation dominated by date and Acacia trees *Acacia radianna* and *Acacia tortilis*, Arabian jujube *Ziziphus spina-christi*, Mustard tree *Salvadora persica*.

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104 Vertebrate Fauna of Wadi Gaza: Amphibians, Reptiles, Birds and Mammals, 2002. WetMedCoast Project

105 Wild Boars in West Bank Causing Damage to Palestinian Villages and Farms, 2009. ARIJ

# Future

Biodiversity is critical to environmental resilience and is increasingly seen as an essential component for human welfare as it provides multiple economic, cultural, and social services. The Biodiversity Strategy and Action Plan for Palestine (BSAPP), elaborated by the PEnA in 1998 in collaboration with the International Union for Conservation of Nature (IUCN) and funds of the Global Environment Facility (GEF), is the framework for actions related to biodiversity. The biodiversity plan stated five objectives and mechanisms to achieve its goals: biodiversity conservation, including identifying and protecting important habitats; sustainable use of biodiversity and natural resources; raise awareness of the value of biodiversity; equitable sharing of biodiversity benefits, including creating a National Trust Fund on biodiversity conservation and sustainable use; human resources capacity development through targeted training courses and school and university programs<sup>106</sup>.

So far, legislation has been reinforced to protect biological diversity through a polluters pay system, however not yet practiced in oPt. In addition, the government is managing 19 nature reserves amounting to about 16,000ha in Areas A and B of the West Bank. These reserves are part of the 43 nature reserves that were supposed to be put under Palestinians' control according to the Oslo agreement. Other areas have also been identified for conservation

including the Wadi Gaza Coastal Wetland<sup>107</sup> and the Village of Battir near the city of Bethlehem<sup>108</sup>, both of which are currently under consideration by UNESCO for World Heritage status. MENA with support from IUCN conducted an assessment for 26 nature reserves and protected sites in the West Bank. The Palestinian authorities have also been assisting regional and international efforts to save the Dead Sea. Other conservation measures have involved the development of botanic gardens, nurseries, and gene banks. Several partnerships with international organizations and in cooperation with Israeli research institutes<sup>109</sup> had been initiated for this purpose. Reforestation has also been conducted including the projects Green Palestine, realised in two phases between 1997 and 2003, and the Million Trees project started by the MoA in 2003.

Officially, the oPt does not have any International Reporting obligations since the PNA is not a contracting party to any convention, although it does follow the Convention on Biodiversity (CBD) and adhere to regional commitments to biodiversity and conservation<sup>110</sup>. On a voluntary basis, the EQA presented three country reports on biodiversity and represented the PNA in a number of regional and sub-regional programs on biological conservation. Environmental education programmes have also been held.

106 *Ibid*.

107 <http://whc.unesco.org/fr/listesindicatives/5722/>

108 [whc.unesco.org/document/116691](http://whc.unesco.org/document/116691)

109 The Israeli-Palestinian Conservancy Project ([www.growseed.org/IPSC.pdf](http://www.growseed.org/IPSC.pdf)) seeks the preservation of landrace wheat which face extinction due to the introduction of modern cultivars, representing over 90% of overall wheat produced and consumed in the Israel and the oPt.

110 National Biodiversity Strategy and Action Plan for Palestine (BSAPP), 1999. Palestinian Environmental Authority (PEnA)

## Wadi Gaza nature reserve

Wadi Gaza the largest wadi in Gaza Strip, is part of a large catchment area of about 3500 km<sup>2</sup> and it stretches more than 100km across the Negev Desert from the Hebron (Al Khalil) Mountains to the coastline<sup>111</sup>. The last several kilometres meander through the Gaza Strip, just south of Gaza City<sup>112</sup> and the largest valley in the Gaza Strip.

The wadi traditionally was rich in biodiversity with more than a hundred bird species counted there in studies and many more passing through due to its importance on migratory routes<sup>113,114</sup>. However, its natural water source has been reportedly blocked due to a dam on Israeli land<sup>115</sup>. It has since been threatened with pollution as it has become a channel for between 6,000-8,000m<sup>3</sup> a day raw sewage from nearby refugee camps<sup>116</sup>. This is exacerbated in winter when there is higher rainfall<sup>117</sup>. Additionally, barbed wire fences around the Gaza Strip have hampered the movement of animals into the wadi<sup>118</sup>.

Wadi Gaza is the largest wetland and due to it historically high biodiversity, it has received significant rehabilitation attention. The wadi is additionally important as many other wetlands in the area have been drained or built over<sup>119</sup>. The Palestinian National Authority established the Wadi Gaza nature reserve in June 2000<sup>120</sup>. The largest rehabilitation plan is the 'Emergency Employment Generation Program (EEGP) on the Development of the Wadi Gaza'<sup>121</sup>. Backed by \$3.8mn funding provided by the GEF-UNEP and USAID, it aims to rehabilitate the wadi and restore its biodiversity, protect heritage sites, develop recreational and tourist activities, and deliver socio-economic benefits to about 10,000 people living nearby. The military attacks on Gaza in late 2008 have however destroyed most of the infrastructure buildt in the valley as part of the project. Regrettably, the estuarine wetland has been confiscated by the local Palestinians.

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111 UNEP, p.105

112 PNA-EQA, p. 7

113 UNEP, p.105

114 PNA-EQA Palestine Wetland p. 6

115 PNA-MEA: Gaza Coastal and Marine Environmental Protection and Management Action Plan, p.14

116 UNEP, p.105

117 PNA-MEA, p. 70

118 PNA-MEA, Gaza plan, p. 74

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119 PNA-EQA, 2009, p.3

120 UNEP, p.98

121 UNEP, p. 106



# Climate Change

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During the last century, an average increase of 0.6°C of the planet's surface temperature was recorded and a further increase of 1.3-5.6°C is expected by the end of this century. Projections of climate trends also include changes in the global precipitation patterns, an increase in the frequency and intensity of extreme climate and weather events, an increase in oceans acidity, and sea level rise with possible modifications in global deep-sea currents<sup>122</sup>. The most vulnerable to these changes will be coastal regions and fragile ecosystems in low latitudes, particularly in underdeveloped countries with economic difficulties and weak adaptation capacities<sup>123</sup>.

Global and regional climate models predict the Middle East will be the most severely affected<sup>124</sup>. Besides a significant increase in the average annual temperatures over the course of the 21st century, precipitation changes and more extreme weather events are projected<sup>125</sup>. Mediterranean biomes are expected to shift 300-500 km northward<sup>126</sup>, threatening the Fertile Crescent by causing Israel, the oPt and Jordan would become more desert-like. It is also expected there will be an increase in vector-borne diseases and pests, along with public health ailments related to the lack of water and heat stress.

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<sup>122</sup> *Ibid*.

<sup>123</sup> Campell, K. M., Gullledge, J., McNeill, J.R., Podesta, J., Ogden, P., Fuerth, L., Woosley, R. J., Lennon, A. T. J., Smith, J., Weitz, R., Mix, D., 2007. The age of consequences: The foreign policy and national security implications of global climate change. Center for Strategic and International Studies, and Center for New American Security.

<sup>124</sup> Freimuth L., Bromberg G., Mehya M., Al Khateeb N., 2007. Climate Change: A New Threat to Middle East Security. FoEME

<sup>125</sup> Brown O., Crawford A., 2009. Rising Temperatures, Rising Tensions : Climate change and the risk of violent conflict in the Middle East. International Institute for Sustainable Development (IISD)

<sup>126</sup> Akio Kitoh, Akiyo Yatagai, Pinhas Alpert, 2008. First super-high-resolution model projection that the ancient "Fertile Crescent" will disappear in this century. Hydrological Research Letters 2, 1-4

The coarse resolution and spatial uncertainties of models make the prediction of climate change trends in the small-sized oPt unreliable. This is further exacerbated by the absence of long-term, time-series of environmental data and atmospheric conditions permitting the development of local prediction models<sup>127</sup>. However, the "Climate Change Adaptation Strategy and Programme of Action for the Palestinian Authority"<sup>128</sup> has identified several climate trends.

The temperature in the territories is expected to rise by an average of 2.2°C to 4.8°C by the end of the century. This increase will be more significant in the summer season and the predicted high inter-annual temperatures' variability would lead to an increase in the frequency of extreme temperatures.

Precipitation and evapotranspiration trends are uncertain, partly due to a lack of long-term climate data in the oPt. Projections suggest a reduction in the annual precipitation levels in the northern oPt by 100-200mm compared to current levels. Rainy events are expected to shift towards both ends of the wet season (October/November and March/April) and will be concentrated over short episodes of heavy rainfall. Evapotranspiration is expected to be enhanced by decreasing the precipitation levels and increasing temperatures similar to other parts of the Levant. Broader Middle East models predict the potential for a 25 per cent increase in evaporation. This combined with a 25 per cent decrease in precipitation would lead to

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<sup>127</sup> Mimi Z., Jamous S., 2010. Climate change and agricultural water demand: Impacts and adaptations. African Journal of Environmental Science and Technology 4, 183-191

<sup>128</sup> Mason M., Mimi Z., Zeitoun M., 2010. Climate Change Adaptation Strategy and Programme of Action for the Palestinian Authority. United Nations Development Program, Programme of Assistance to the Palestinian People

a 50 per cent drop in runoff by the end of the century and a drastic decrease in regional available water resources.

The frequency of extreme weather events are expected to increase, including a tendency towards more days with temperatures higher than 30°C, acute heat waves, major sand storms and heavy rainfall episodes. Recent climate records in the oPt reported several successive heat waves (1997/98, 2000, and 2004), spring floods in the West Bank (1997, 1999) and flash floods in the Gaza Strip (October 2008) causing the collapse of storm-water and wastewater drainage systems.

The sea level in the eastern Mediterranean Basin is projected to increase annually by 10mm(up from an annual increase of 4mm)<sup>129</sup>. This trend will have serious impacts on coastal marine activities such as tourism, fishing and recreation, and will increase risks to coastal infrastructures and water reserves in the coastal aquifer<sup>130</sup>.

The water and agriculture sectors are expected to be the most exposed to climate change adverse consequences in the oPt<sup>131</sup>. The water sector depends almost entirely on underground water resources mainly fed by local rainfall. The sector will have to cope with recurrent water shortages due to lower rainfall and higher evaporation, and increased storm water flooding from greater rainfall variability. It will also be challenged by insufficient rain to recharge aquifers, reduced surface and groundwater quality, and a lower supply of water from Israel. The rising sea level will require

further steps are taken to prevent saline water intrusions into the Coastal Aquifer, coastal erosion and coastal soil degradation. The agriculture sector, where 80 per cent of cultivated farms are rain-fed, will have to deal with more frequent droughts and increased desertification and changes in the economic viability of crops (e.g. shorter growing seasons). The sector will need to manage crops with increased water requirements, a decline in grazing ranges and stocks, and higher food prices.

These changes will increase competition for scarce water resources, intensify food insecurity due to increased agricultural vulnerability to climate changes, and increase the social instability as a result of poverty and unemployment. The likelihood of climate-born social unrest and cross-border conflicts as a result are expected to multiply and their extent will depend on:

- The sustainability of existing water agreements and the capacity of parties to deal with extreme circumstances such as prolonged drought and desertification,
- The power relationships between the parties involved and whether it is politically expedient to cooperate over shared resources to allocate water fairly and to ensure a certain degree of sovereignty in natural resources management.
- The economic vulnerability and the ability of a given political entity to cope with and to adapt to possible high levels of unemployment and mass migration due to the destruction of productive sectors heavily dependent on climate variables such as agriculture;
- The existence and the level of development of the institutional and political infrastructures<sup>132</sup>.

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129 Golan-Engelko I., Bar-Or Y., 2008. Israel's Preparations for Global Climatic Changes : Phase I – The implications of climate changes on Israel, and interim recommendations, State of Israel Ministry of Environmental, Protection Office of the Chief Scientist

130 *Ibid*.

131 *Ibid*.

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132 Freimuth L., Bromberg G., Mehryar M., Al Khateeb N., 2007. Climate Change: A New Threat to Middle East Security. FoEME



## Future

The West Bank and the Gaza Strip are considered as “highly” to “very highly vulnerable” to climate change due to the physical and conflict-induced scarcity of resources, the economic and institutional weakness, and the rapid population growth. A number of adaptive mechanisms to counter the predicted climatic effects have been suggested which aim to increase the resilience of the two most climate-vulnerable sectors in the oPt - water and agriculture. The adaptive options for the water sector were set to maintain individuals’ access to sufficient water, according to international standards for quantity and quality. Agriculture is treated as a priority economic sector due to its role as a generator of employment and ensuring food security.

The Palestinians prioritize non-climate challenges, especially the occupation and its practices including closure, movement restrictions, and territorial fragmentation, on their agenda for action rather than climate-induced changes. The oPt has been given observer status and some additional rights at the UN, but is neither a full member of the UN nor a party to multilateral environmental agreements. As funding is frequently linked to party status under environmental agreements, this also makes it difficult for the PNA to receive financing for certain environmental projects including aid for vulnerable economies to cope with, and to adapt to, the adverse effects of climate change.

# Environment and security link

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A lack of access to fresh water resources has created a water crisis for Palestinians such that the current annual water allocations are estimated at 48m<sup>3</sup> per capita, less than 5 per cent of what internationally considered the minimum 1000m<sup>3</sup>/yr for water and food security. The land fragmentation as a result of the deployment of Israeli military forces following the Oslo Accords, the recurrent Israeli measures consisting of the construction of settlements and the separation wall, bypass roads, land closure, accessibility limits, and land confiscation, have deprived Palestinians of the proper use of their lands with devastating consequences on their traditional lifestyle and economic activities. The overuse of the increasingly shrinking resources by the rapidly growing population is pushing all ecosystems in the oPt over the edge - seriously threatening their sustainability for future generations. The clearest example is the Coastal Aquifer beneath the Gaza Strip, expected to be beyond irreparably damaged in less than a decade due to the over-extraction of water, depriving a population of more than 1.6 million of their only renewable water resource. This situation will be exacerbated under future scenarios of global climate change that will drastically modify the entire Middle East region. These factors alone do not necessarily lead to conflict, but when added to a weakened economy, society, and political system, are certainly less likely to create grounds for cooperation.

The Palestinian economy has been distorted by the successive crises to which it has been exposed recently. This is emphasized by the distribution of activity sectors, atypical for an underdeveloped economy, where services contribute to 80 per cent of the overall GDP while agriculture contributes to less than 5 per cent. The Palestinian economy relies heavily on international donors' aid, thanks to which it continues to have a high one-digit

growth rate<sup>133</sup>. The Palestinian society, however, has a very high rate of unemployment, which accounts for nearly one-quarter of its working power and culminates to 31.9 per cent in the Gaza Strip where 80 per cent of the population is food insecure<sup>134</sup>. Despite the successful implementation of several economic and security reforms, the Israeli closure policies disrupting labour and trade flows, national and international commerce, industrial development and access to natural resources prevented the improvement of the economic situation. The vulnerability of the Palestinian economy is a major obstacle facing the PNA, which has to resolve urgent needs such as food and physical insecurity instead of prioritizing the serious environmental challenges it faces.

The likelihood of social unrest and ultimately violence in the Palestinian society and with its neighbours is very serious. The recurrent conflicts among Palestinian communities and administrations around water resources in rural areas are alarming. The recent riots in the city of Hebron, where angry protesters attacked the employees of the PWA and destroyed the municipality's water installations<sup>135</sup>, reveals how critical the situation is. Clashes among Palestinian landowners, between landowners and shepherds, and between landowners and Jewish settlers in the West Bank are recurrent and their number is on the rise<sup>136</sup>. Fatalities between Palestinian fishermen exceeding the limits of the fishing zone imposed by Israel offshore the Gaza Strip have been well documented<sup>137</sup>. The image of Palestinians

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133 <https://www.cia.gov/library/publications/the-world-factbook>

134 Data of the Palestinian Central Bureau of Statistics (PCBS), 11 July 2012

135 <http://www.pwa.ps/DesktopModules/Articles/ArticlesView.aspx?tabID=0&lang=ar-JO&ItemID=1201&mid=12175>

136 West Bank and Gaza - The Economic Effects of Restricted Access to Land in the West Bank, 2009. The World Bank

137 Gaza Fishing: An Industry in Danger, 2007. UNOCHA oPt



destroying the borders between the Gaza Strip and Egypt in January 2008 and fleeing in hundreds of thousands into the Egyptian territories illustrates how explosive and unpredictable the situation could become.

The current situation of severe humanitarian and economic crisis in the oPt could degenerate into generalized violence particularly taking into account the few political options left and the reigning unrest in the region. Correcting this situation implies tackling its fundamental causes through:

- The accords signed between Palestinians and Israelis should be revised and replaced by more fair and flexible agreements based on international humanitarian law which guarantees the equitable allocation of shared resources between parties;
- Israel, recognized as the occupying power, should be made accountable for its acts in the oPt including its obligations to protect the civil population, their lifestyle, their space of living, and their resources;
- The Palestinian claims for independence should be urgently met in order to concretize their claims to their resources, to protect their environment, and to allow the flow of international funds for environmental protection.

The past 20 years of peacemaking have proven that mutual trust between Palestinians and Israelis is necessary but not enough to fulfil both parties' engagements, making the role of the international community necessary.

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# ACRONYMS

ACSAD	Arab Center for Studies of Arid Lands and Desertification	MCM	Million cubic metres
AHLC	Ad Hoc Liaison Committee	MCSD	Mediterranean Commission on Sustainable Development
ALECSO	Arab League Educational, Cultural and Scientific Organization	MEA	Multilateral Environmental Agreement
AOAD	Arab Organization for Agricultural Development	MEaA	Ministry of Environmental Affairs
APELL	UNEP's Awareness and Preparedness for Emergencies at a Local Level	MLG	Ministry of Local Government Affairs
ARIJ	Applied Research Institute – Jerusalem	MOPIIC	Ministry of Planning and International Cooperation
BOD	Biochemical oxygen demand	NBSAP	National Biodiversity Strategy and Action Plan
CAMP	Coastal Aquifer Management Programme	NEAP	National Environment Action Plan
CAMRE	Council of Arab Ministers Responsible for Environment	NGO	Non-Governmental Organisation
CBD	Convention on Biological Diversity	PCB	Polychlorinated biphenyls
CCD	Convention to Combat Desertification	PCT	Polychlorinated terphenyls
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	PDP	Palestinian Development Plan
CMS	Convention on Migratory Species	PEA	Palestinian Environmental Authority
DU	Depleted uranium	PECDAR	Palestinian Economic Council for Development and Reconstruction
DURP	Department of Urban and Rural Planning	PLC	Palestinian Legislative Council
EIA	Environmental Impact Assessment	PNA	Palestinian Authority
EPD	Environment Planning Directorate	PVC	Polyvinylchloride
EQA	Environmental Quality Authority (formerly Ministry of Environmental Affairs)	PWA	Palestinian Water Authority
EU	European Union	SMAP	Short and Medium-Term Priority Environmental Action Plan
EWG	Multilateral Working Group on the Environment	SRAP	Sub-Regional Action Programme under the CCD
GDP	Gross Domestic Product	SWGs	Sector Working Groups
GEF	Global Environment Facility	UNDP	United Nations Development Programme
GIWA	Global International Waters Assessment	UNEP	United Nations Environment Programme
	HDPE High-density polyethylene	UNFCCC	United Nations Framework Convention on Climate Change
IAEA	International Atomic Energy Agency	UNICEF	United Nations Children's Fund
IUCN	The World Conservation Union	UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
JEEC	Joint Environmental Experts Committee	UNSCO	Office of the United Nations Special Coordinator
JLC	Joint Liaison Committee	USAID	United States Agency for International Development
JWC	Joint Water Committee	USD	United States Dollars
LACC	Local Aid Coordination Committee	WHO	World Health Organisation
MAP	Mediterranean Action Plan	WSSD	World Summit on Sustainable Development
		WWTP	Waste Water Treatment Plant



Palestine<sup>1</sup> serves as a crossroads for regions and climates, presenting the area with distinctive resources and land. Between the Jordan River and the Mediterranean Sea, the land has proved fertile for agriculture while underneath flow vital aquifers. The contribution of ancient Palestine in the agricultural evolution in the Fertile Crescent testifies how vital these resources were for the development of the regional societies. During the last century, the region has been dominated by the Israeli occupation of Palestine that have left a lasting impact on people, their way of living, and on their environment. This conflict serves to compound challenges of scarce and inaccessible resources, their continuous degradation, and increasing demand from a rapidly growing population. Global climate change is expected to continue to place further stress on these resources. Efforts to address this critical situation are urgently needed but economic vulnerability, institutional weakness, and continuous unrest inhibit Palestinians from accomplishing their goals.

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<sup>1</sup> The term Palestine is used in the text to refer to British Mandatory Palestine (1923-48)

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