West Bank and Gaza Environment Priorities Note (P169628)

Table of Contents

Annex

Tables and Figures

Acknowledgement

The West Bank and Gaza Environmental Priorities Note was prepared by a team led by Enos E. Esikuri (Senior Environmental Specialist) and including Ayumi Koyama (Junior Professional Officer) and Glenn S. Morgan (Consultant). The team would like to thank the following individuals for their valuable inputs during the various discussion sessions: Ahmad Abu Thaher (Director General of Projects and International Relations, EQA), Samer Kalbouneh (Director of Projects Implementation and Follow up/ Projects and International Relations, EQA), Yaser Abu Shanab (Acting Deputy Director General of Environmental Protection, EQA), Hadeel Ikhmais (Head of Section of Climate change/Environmental Resources, EQA), Saed Abu Tarboush (Director of Environmental Media/Environmental Awareness, Education, and Media, EQA); Per-Einar Troften (Consul/ Infrastructure and Environment, Consulate General of Sweden). The team also thanks the following World Bank colleagues: Monali Ranade (Senior Energy Specialist), Imtiaz Hizkil (Consultant), Abdulaziz Alshalabi (Energy Specialist), Adnan Ghosheh (Senior Water Supply and Sanitation Specialist), Zeyad Abu-Hassanein (Senior Environmental Specialist), Marie How Yew Kin (senior Program Assistant), and Fifi Antar (Program Assistant).

I. Background on the sector

1. West Bank and Gaza is faced with natural resources scarcity, which constrains livelihoods and development to varying degrees. The inherent scarcity of natural resources is further compounded by increasing degradation of environment and natural resources. Multiple factors contribute to deteriorating conditions of the environment and natural resources. The pressure over limited land, forest and rangeland resources have led to widespread overgrazing by livestock and deforestation through depletion of plant cover via over-exploitation and clearing of woody vegetation for cropland. The politically fragile situation continues with impacts of restricted movement on people and goods affecting the environment negatively since there are limited options for expansion of built-up areas and other livelihood opportunities (e.g., agriculture). This implies increasing encroachment on critical areas such as protected areas with negative impacts on the rich flora and fauna of West Bank and Gaza. The restricted movement of people also means that the fishing zone available to the fishermen in the Gaza Strip has been reduced. Combined with overfishing and poor management of the coastal and marine resource, this has led to an overall decline of the fisheries yield. In addition, the financial pressure imposed on West Bank and Gaza affects the environment significantly since decision makers may consider it a luxury in the face of extreme budget constraints. This has led to unsustainable practices with diminishing quality of the environment and natural resource-based livelihood opportunities for communities. It is therefore vital that the environment and natural resources scarcity be actively managed in a manner that enhances community livelihoods and resilience in order to contribute to sustainable development.

2. The Environmental Quality Authority (EQA) is the main governmental agency responsible for protecting and managing the environment and natural resources of West Bank and Gaza. However, environmental governance in both the West Bank and Gaza remains weak, and this has contributed to entities and individuals exploiting governance gaps to pursue environmentally degrading and polluting activities. Challenges and gaps related to governance and institutional framework include: weak coordination mechanisms on environmental issues; inadequate human and financial resources required to address environmental challenges; unclear accountability or understanding of environmental challenges from some key decision makers, which can result in lack of support and empowerment for EQA. In addition, the Palestine Environmental Law was approved in 1999 and will need to be updated. Performance in this sector has lagged and the environment and natural resources continue to be degraded at alarming rates.

3. Climate variability and change are likely to compound existing priority environment challenges such water scarcity, drought, land degradation and desertification. West Bank and Gaza will be significantly affected by climate change with climate models for the Eastern Mediterranean region showing mean temperature increases between 3 to 5°C by mid-century and mean annual rainfall reductions of 10-50%. This places the region ahead of most other places in the world in terms of projected temperature and rainfall changes. Responding to the implications of climate change will be challenging given the current institutional and political context of West Bank and Gaza and the fact that resources for both mitigation and adaptation measures continue to be scarce and face many competing demands. The Palestinian Authority has actively engaged in a process of climate change strategic planning and has made national commitments to reduce emissions and undertake adaptation measures. Most notably,

national planning efforts have focused on the preparation of the Initial National Communications Report (INCR) and National Adaption Plan to Climate Change (NAP), both published in 2016. Climate change adaptation planning has been led by the EQA supported and endorsed by Ministries of key sectors including energy, water, agriculture, transport, and planning among others.

4. Climate change scenarios and assumptions used by the Palestinian EQA to evaluate threats and vulnerabilities broadly align with scenarios formulated by other countries in the region and with regional climate changes predicted by the Intergovernmental Panel on Climate Change (IPCC). The Palestinian Climate Change Adaptation Strategy report indicates that "*the IPCC predicts that, for the southern and eastern Mediterranean, warming over the 21st century will be larger than global annual mean warming – between 2.2-5.1 degrees C. Annual precipitation rates are likely to fall in the eastern Mediterranean – decreasing 10% by 2020 and 20% by 2050 – with an increased risk of summer drought*." In addition, there is consensus that sea levels of the Mediterranean Sea will rise. Some regional studies predict 30-100 cm of sea level rise for the Mediterranean by 2100 with serious implications for Gaza. With respect to the likelihood of changes to patterns of extreme weather events and drought, the UNDP reports that regional climate models indicate a tendency towards more extreme events in the future. This includes a higher number of yearly days of high temperature (daily maximum temperatures above 30 degrees C).

5. The National Adaptation Plan (NAP) identifies 12 priority thematic areas which are considered highly vulnerable to climate change. The NAP provides an assessment of the vulnerability of each sector and distinguishes the nature of threats facing the West Bank and Gaza respectively. The NAP provides recommendations on specific adaptation measures and provides preliminary cost estimates to address the issues that are rated as "highly vulnerable". Climate change adaptation planning has been supported and endorsed by national authorities responsible for key sectors. Opportunities in the natural resources and coastal zone management could offer new avenues for collaboration and support.

6. Unaddressed or unchecked, climate change is likely to adversely affect future economic growth, livelihoods, and productivity potential in West Bank and Gaza. Such effects are likely to magnify existing security threats and social instability and may severely diminish viable future economic development alternatives. Coupled with projected population growth[1] and limited economic opportunities, the potential impacts of climate change could be severe. Furthermore, limited access to financial resources as well as limitations imposed by fragility (with limited and slow progress towards peace, internal divisions between Fatah and Hamas), governance, and institutional challenges will constrain the ability of the Palestinian Authority to respond effectively to climate related contingencies.

[1] The State of Palestine's population increased from 1.5 million in 1980 to 4.0 million in 2010 and is expected to reach 8.9 million by 2050. (NDC page 3)

II. National Environmental Management Framework

7. The Palestinian Authority recognizes the challenges that West Bank and Gaza faces in terms of environment and natural resources and has put in places various strategies and programs to address them. While these sectoral and national strategies and plans are important, they require full implementation and follow-up to ensure better environmental outcomes. In many cases lack of adequate and timely resources has prevented these strategies from being implemented.

8. The Cross-Sectoral Environmental Strategy 2017-2022 is the key platform for mainstreaming environment across sectors in Palestine. The Palestinian Authority has formulated various strategies and plans related to the environment at national and sectoral levels, with the Environmental Quality Authority (EQA) taking the lead to plan, coordinate, implement, monitor, and evaluate the Cross-Sectoral Environmental Strategy. The strategy aligns with the Palestinian National Policy Agenda (NPA) 2017-2021 and other relevant policies and plans including the EQA Budget Program. A key vision of the strategy is "protected clean, and sustainable environment," and it outlines five objectives that encompass broader issues under the environment. These are: i) Environmental pollution levels are reduced and controlled, ii) Natural environment and biodiversity are maintained and managed in a sustainable manner, iii) Measures for climate change adaption, combatting desertification, and dealing with environmental catastrophes and emergencies are adopted and implemented, iv) Environmental legal framework is updated and comprehensive and institutional framework strengthened; and v) Increased and enhanced environmental awareness, knowledge, and practice.

9. EQA has also prepared their Strategy Action Plan (SAP) 2016-2021 which outlines the roles and responsibilities of the EQA on environmental management and strengthens their legal and institutional framework. In addition, there are national level policies and strategies on desertification, environmental awareness, biodiversity, sustainable production, and consumption. Furthermore, the Palestinian Authority has ratified key international agreements and conventions on environment as shown in Table 1. While this is commendable, West Bank and Gaza would need resources to effectively implement these global agreements in their sectoral and national development plans.

Table 1: Global Environmental Conventions ratified by the Palestinian Authority

Name of Convention	Date of ratification
UN Convention on Biological Diversity	Signed on April 02, 2014
Cartagena Protocol on Biosafety under the Convention on Biological Diversity	Signed on April 02, 2014
UN Framework Convention on Climate Change (UNFCCC)	Signed on December 01, 2015
UN Convention to Combat Desertification (UNCCD)	Ratified on December 29, 2017
Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and their Disposal	Signed on April 02, 2014

Source: ARIJ (2015) and United Nations[2]

[2] https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-10&chapter=27&clang=_en (accessed on June 3rd, 2019)

III. Key Environmental Issues

10. Based on extensive literature review, discussions with key officials from EQA, donor representatives, and World Bank Group staff, the following 4 'buckets' of environmental issues emerge from this exercise:

A. **Uncontrolled and increasing Pollution** from:

- Solid waste (municipal and industrial)
- Municipal and industrial Wastewater
- Hazardous waste (healthcare; used batteries from Photo-Voltaic (PV) systems; etc.)

B. **Threats to Natural Resources**

- Land degradation (e.g., from quarrying) and biodiversity loss
- Encroachment on critical habitats
- Droughts and desertification

C. **Impacts of Climate Change**

- On all key sectors such as water, agriculture, energy, health, coastal and marine, urban/infrastructure, tourism, terrestrial ecology, etc.

D. **Weak environmental governance** related to Institutional capacities, roles, and responsibilities

A. Uncontrolled and increasing Pollution

11. Uncontrolled and increasing Pollution from solid waste (municipal and industrial), municipal and industrial wastewater, hazardous waste (healthcare; used batteries from PV systems; etc.). While some sanitary landfills exist, various localities are resorting to open dumping of solid waste since they cannot afford waste transportation due to long distances to the nearest landfills. Cost-recovery continues to be a challenge making most operations unsustainable. Even where landfills exist, leachate leakages are becoming a hazard that needs to be addressed urgently. Several wastewater treatment plants (WWTPs) exist but their sustainability is affected by the (i) issue of cost recovery, (ii) dumping of industrial wastewater (including from quarries) into municipal sewers hence impairing treatment process, (iii) unattended sludge management (especially in Gaza) which leads to sludge accumulation and creates additional pollution. The widespread discharge of untreated industrial (e.g., from quarries, tanneries, olive oil mills, etc.) wastewater into municipal sewers has a devastating effect on the environment and effectiveness of existing WWTPs since they are not designed to deal with such waste. Finally, management of hazardous waste is generally lacking. The scaled-up uptake and use of solar PVs systems is a welcome focus on clean energy; however, the continuing accumulation of used batteries is creating a serious environmental and public health hazard; Gaza currently has a very large stock of used batteries.

a) **Municipal Solid Waste Management**

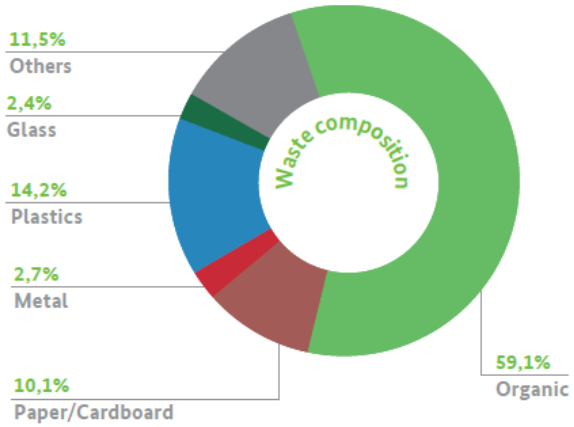
12. As of 2012, GIZ estimated that 1.387 million tons/year of solid waste were generated in Palestine. This translates to 0.94kg/capita/day of solid waste (GIZ 2014), while the average for countries in Middle East and North Africa (MENA) is 0.81kg/capita/day (Kaza et al. 2018). Most (70%) of the solid waste generated in Palestine is organics and paper/cardboard. In 2014 GIZ estimated that 67% of the generated municipal solid waste is disposed of in open dumps. As at 2019, the percentage of solid waste openly is probably lower (perhaps 30-40%) since there are landfills Bethlehem, Hebron, Jenin and Jericho. However, long distances to these landfills means that transportation of solid waste to these disposal sites remains a challenge. As of 2014, about 163 open/random dumps or disposal sites existed in various stages of use with some having been abandoned without any containment. Even where landfills exist, leachate leakages are becoming a hazard that needs to be addressed. Furthermore, various localities are resorting to open dumping since they cannot afford waste transportation to the existing landfills due to long distances. In addition, used tires from vehicles are brought to disposal sites and there is no system to manage them; consequently, most landfill sites are overloaded with used tires that continue to accumulate.

13. The Ministry of Local Government (MoLG) has overall responsibilities for municipal SWM, and operations are covered by municipalities and Joint Services Councils for Solid Waste Management (JSCSWM). JSCSWM is an arrangement of inter-local governments cooperation for SWM. The creation of the JSCSWM was based on Article (14) of the Joint Services Councils adopted and promulgated under Article (2) and Article (15) of the Code of Palestinian Local Authorities (1) for the year 1997[3]. The operational efficiency of JSCSWMs varies widely depending on the local authorities; some municipalities manage SWM on their own. Hence there is a need to harmonize and strengthen the existing institutional arrangements for solid waste management. The Local Authorities' Law gives local authorities a right to collect fees for waste management from residents. However, there is no integrated collection system and an agreed standard for fees. Indeed, cost recovery rates differ widely among the local authorities. Consequently, cost-recovery continues to be a challenge making most operations unsustainable. In addition, potential opportunities for upgrading the waste management value chain remain largely untapped.

14. Most of the waste in the West Bank and Gaza is organic and recyclable waste, and composting, and recycling has excellent potential to reduce the volume of waste to be disposed. The National Development Plan has set the target on the percentage of waste to be recycled at 20%; however, so far less than 1% of solid waste generated is recycled (GIZ 2014). Figure 1 shows the organic waste and recyclable waste share at 59.1% and 29.4% of the total waste respectively. The high organic content in the solid waste generated implies good potential for composting (and using the compost for land rehabilitation). Sorting, and recycling could potentially reduce the volume of waste that needs to be disposed while at the same time generating much needed jobs. Indeed, the reduction of waste volume (via sorting, recycling and composting) could enhance the solid waste management value chains, including cost recovery, reducing the transportation costs since the waste volumes to be moved would be

[3] Joint Services Councils for Solid Waste Management, Bethlehem Governorate (accessed on March 13th, 2019: http://www.bjscswm.org/wpeng/?page_id=7)

lower, extending the lifespan of existing and proposed landfills, and creating much needed jobs.



Source: GIZ (2014)
Figure 1 Waste Composition in West Bank and Gaza

15. Given the challenges, there is much potential for private sector to engage in the sector and help reinforce public sector efforts (see Box 1). International partners such as the World Bank have supported Solid Waste Management efforts in the country with a focus on strengthening institutional and operational capacity as well as opening space for private sector actors. There are three SWM projects supported by the World Bank in Jenin, Southern West Bank, and Gaza. Notably, the Southern West Bank SWM project, collaboration with IFC, has applied public-private partnership model for the operation and maintenance of Al Mynya landfill site. The subsidies supported by the Global Partnership on Output-Based Aid (GPOBA) reduce risks for service providers (GPOBA 2015). Such a scheme creates an enabling environment for private sectors to take part in SWM.

Box 1. Turning recyclable waste into bricks in Gaza

Majd Mashharawi, founder and Chief Executive Officer of Green Cake, is famous for her innovative approach to make bricks from ashes. She produces bricks which are stronger, lighter, and with a cheaper price compared to the ordinary ones using materials that are available in Gaza. Her approach and innovation won 1st prize and received funds and training opportunities from the Japan Gaza Innovation Challenge. She is currently expanding her business and hiring additional local people.

b) **Wastewater**

16. While access to improved sanitation is high in Palestine, the West Bank, to a large extent, still relies on on-site sanitation. The total volume of wastewater generation in the year of 2015 was estimated at 65.82 million cubic meters (MCM) in the West Bank and 48.54 MCM in Gaza (ARIJ 2015). Table 2 shows the types of sanitation systems in use in the West Bank and Gaza. It is clear that one of the key drivers of the sewerage connection lag is household income. Only 13% in the poorest quintile are connected to sewer networks while 42% in the richest quintile are.

Table 2 Sanitation access rates in West Bank and Gaza by type of sanitation system

	West Bank	Gaza
Sewerage networks (%)	17. 30	18. 78
On-site services (%)	19. 64	20. 22
Total sanitation access (%)	21. 94	22. 100

Source: Data based on World Bank (2018)

23. Inadequate wastewater collection and treatment, and unattended sludge management impose public health problems and financial burdens. Most of existing wastewater treatment plants (WWTPs) are not designed to manage the associated sludge, and vacuum tankers usually remove and dump the accumulating sludge into open areas, valleys, sewage networks, or dump sites. This is a threat to public health and the environment including potential for contamination of surface and groundwater (World Bank 2018b). Therefore, while some good WWTPs (6 in West Bank) for municipal wastewater exist in Palestine, their effectiveness and sustainability are affected by (i) the issue of cost recovery (wastewater tariffs, many poor households not connected to sewer networks, etc.), (ii) dumping of industrial wastewater (including from quarries) into municipal sewers hence impairing treatment process, (iii) unattended sludge management (especially in Gaza) which leads to sludge accumulation and creating additional pollution. The only WWTP that is utilizing sludge for anaerobic digestion and subsequent electricity generation is the Nablus WWTP. All the other WWTPs have no sludge management/utilization scheme. The flow of untreated wastewater into Israel presents another transboundary dimension and challenge: in case untreated wastewater flows into Israel, the Israeli Government would charge the Palestinian Authority for treatment of the same. Indeed in 2017, Israel charged the Palestinian Authority $31 million due to cost of treating waste water effluent that had flown across the boundary from the Palestinian side (World Bank 2018b). Therefore, it is important that wastewater collection and treatment be given priority attention to avoid such scenarios in the future.

c) **Industrial pollution**

24. Quarrying, stone cutting, and other industries (olive mills, food processing, tanneries, slaughter houses, etc.,) generate significant pollution. Quarrying and stone cutting in particular constitute one the largest industrial activity, contributing about 25% of the industrial sector (ARIJ 2015). Quarrying areas and facilities (e.g., in Hebron) generate significant air pollution effects. There are no clear air quality standards that need to be enforced. In addition, these activities are mostly undertaken without proper permitting and licensing procedures leading to significant reduction in vegetation cover and damage to sensitive areas and topography. Other industries, for example, food processing, slaughterhouses and olive mills discharge liquid wastes, which may contain high concentrations of nitrate, phosphate, sulphates, fat, and grease. Industrial solid and liquid wastes are often mixed with municipal wastes and discharged without proper pretreatment. Most industries lack on-site pretreatment facilities and do not have incentives/enforceable regulation to do so. Discharge of untreated industrial wastewater into municipal sewers has a devastating effect on the effectiveness of existing WWTPs since most of them are not designed to deal with such waste.

25. Regulations on industrial pollutions are under preparation. Currently, there is no reliable data and enforceable regulations on pollution from industrial establishments. Licensing system for industrial establishments is inadequate and, in fact, many unlicensed industries exist. Thus, the Palestinian Authority is currently preparing various bylaws to regulate industrial pollution such as (a) stone and construction materials; (b) natural resources extraction; (c) hazardous waste, and (d) licensing of industries. The bylaws will codify obligations for industrial establishments to monitor and report on pollution emissions from their operations (ORGUT, 2017).

26. A 2015 industrial mapping (ARIJ 2015) classified 600 existing industrial establishments into 25 sectors based on the international standard industrial classification. The study also identified locations of the establishments on a map and estimated amounts of effluents released based on the collected data. This database provides a good baseline for industrial pollution control in West Bank and Gaza.

d) **Hazardous wastes**

27. While hazardous waste continues to pose challenges to public health and the environment, strategic actions to deal with hazardous waste are not in place. There are efforts by EQA to address this issue, but concrete actions are still lacking. For example, EQA has drafted a bylaw on hazardous wastes, the NDP (2011-2013), the National Solid Waste Management Strategy, and draft Interim Action Plan for Hazardous Waste Management all have plans to address hazardous waste; however, few actions are implemented due to limitations of funds and expertise. Medical waste management is a bit advanced as the bylaw was formulated in 2012, and following "polluter pays principle," facilities that generate medical wastes are responsible for the treatment of their wastes before discharge. However, except for a few cases such as Ramallah hospital and a new facility in Hebron, most of the medical waste is disposed of with municipal waste without pre-treatment (GIZ 2014).

28. E-waste has also become a significant part of the hazardous waste in West bank and Gaza. There are various inappropriate practices (open burning, extraction of parts, etc.) around E-waste that are causing associated environmental pollution. In order to extract valuable materials from e-waste, some villages collect the waste and burn them without any pretreatment system. This, combined with open burning of used tires and other plastics, generates toxic smoke and substances that affect public health and the environment negatively[4].

29. Finally, the scaled-up uptake and use of solar photo-voltaic (PVs) systems is a welcome focus on clean energy; however, the continuing accumulation of used batteries is creating a serious environmental and public health hazard; Gaza currently has a very large stock of used batteries. Used batteries from other systems (vehicles, etc.,) do not have any recycling and management system. It is critical that measures be undertaken urgently to ensure there is a system in place for the proper recycling and management/disposal of used batteries.

[4] Haaretz (2019), Israelis and Palestinians Fed Up as Bid to End Burning of E-waste Fails (accessed on May 29th, 2019 https://www.haaretz.com/israel-news/.premium-israelis-and-palestinians-fed-up-as-bid-to-end-burning-of-e-waste-fails-1.7044385)

B. Threats to Natural Resources: Biodiversity and Land Degradation

30. Palestine is gifted with a variety of flora and fauna species. Uniqueness of its location straddling three continents (Europe, Asia, and Africa), the climate that provides it with a rich environment, and its rich soil allow many forms of life to thrive here[5]. Palestine has over 30,000 faunal species, and Table 3 shows the breakdown. Table 4, shows 386 fauna species and flora species listed in the Red List Category; both are the lowest numbers compared to neighboring countries.

Table 3 Fauna species inhabiting Palestine in numbers

Fauna Species	Number
Birds	427
Mammals	92
Amphibians	7
Reptiles	81
Fish	297
Invertebrates	30,000
Total	30,904

Source: ARIJ 2015

Table 4 Red List Category summary for State of Palestine and neighboring countries totals (Plants and Animals)

Country	EX	EW	Subtotal	CR	EN	VU	Subtotal	NT	DD	LC	Total
PLANTS											
State of Palestine	0	0	**0**	0	0	0	**0**	0	0	121	**121**
Egypt	0	0	**0**	2	1	0	**3**	0	4	194	**201**
Saudi Arabia	0	0	**0**	0	2	1	**3**	0	0	169	**172**
Syrian Arab Republic	0	0	**0**	1	0	3	**4**	3	1	135	**143**
Lebanon	0	0	**0**	0	2	3	**5**	3	1	162	**171**
Jordan	0	0	**0**	0	0	1	**1**	1	1	91	**94**
ANIMALS											
State of Palestine	0	0	**0**	4	8	12	**24**	16	10	336	**386**
Egypt	1	1	**2**	6	24	108	**138**	135	132	1168	**1577**
Saudi Arabia	1	0	**1**	5	14	97	**116**	145	106	1055	**1425**
Syrian Arab Republic	1	0	**1**	16	34	54	**104**	43	51	678	**877**
Lebanon	0	0	**0**	6	25	33	**64**	32	39	549	**684**
Jordan	0	0	**0**	5	18	78	**101**	121	62	844	**1128**

Note: IUCN Red List Categories: EX- Extinct, EW- Extinct in the Wild, CR- Critically Endangered, EN- Endangered, VU- Vulnerable, NT- Near Threatened (includes LR/nt - Lower Risk/near threatened), DD- Data Deficient, LC- Least Concern (includes LR/lc - Lower Risk, least concern). Red color: Lowest Value, and Green: Highest Value

Source: IUCN 2015

31. Forests cover 22,959 hectares in the West Bank, and 200 hectares in Gaza, which is approximately 3.94% and 0.55% of the total lands respectively (ARIJ 2006). There are three types of forests: natural forests, planted forests, and bare forests. Among those, natural forests form 79.1% of the total forests area, and 85.3% of them are in the Northeastern part of Tubas governorate (ARIJ 2015). According to the Ministry of Agriculture, comparing designated forests area in 1971 and 1999, about 7,000 hectares were lost (ARIJ 2006). Deforestation is evident and continues to increase even though forests are essential for livelihoods and climate resilience. There are opportunities to reduce deforestation and increase the acreage of forests through afforestation using tree crops such as olives. Currently

[5] Palestine Wildlife Society (accessed on March 11th, 2019: http://www.wildlife-pal.org/article/60/Palestine-Biodiversity)

about 17% of land in the West Bank is planted with olive trees and this provides critical jobs and income from the processing of olives. There needs to be efforts to enhance value addition in the olive oil industry via packaging and branding and increasing acreage under olives. In addition, there are plans to increase the growing of date palms in West Bank and Gaza. Such efforts would contribute to increasing area under planted tree crops.

32. Palestine recognizes the importance of Nature Reserves (NRs) to its economy. There are about 50 protected areas (PAs) in Palestine with most being state lands while some are privately owned and managed. Some of the PAs were declared long time ago during the Ottoman Empire and British Mandate in Palestine; others are newly declared. What is clear is that management effectiveness is lacking in most PAs mainly due to inadequate resources (for basic enforcement, etc.) and encroachment pressures (e.g., from quarrying activities) in some areas. All PAs will require strict regulation of human activities for effective environmental conservation. The government is promoting ecotourism centered around these PAs as a key economic activity. For this to succeed, it is important that key investments are made to improve management of these protected areas for conservation, recreation, and job creation.

33. Land degradation is brought by inappropriate human activity. The growing unsustainable practices such as the current uncontrolled quarrying, poor farming and grazing practices, and ad hoc urbanization are leading to rapid land degradation, desertification, and biodiversity loss. Improper agricultural practices such as the use of pesticides, open dumping of solid waste, and discharging untreated wastewater are all contributors to accelerating the degradation. A 2013 study at Wadi Al Quff Protected Area documented on-going degradation in multiple spots (ARIJ 2015). The main causes include the expansion of agricultural lands, ad hoc urbanization, uncontrolled quarrying, etc.

C. Impacts of Climate Change

a) Climate Change Scenario

Although negative impacts of climate change are evident in West Bank and Gaza, the Palestinian Authority relies on studies and reports published by external organizations and regional data on climate change due to limited independently conducted climate research. Climate scenarios were formulated by EQA through comparative analysis of National Communications (NCs) to the UNFCCC from Lebanon, Jordan, Israel and Egypt and based on available model projections. The National Adaptation Plan (NAP) lays out three climate scenarios which were used as the basis for a vulnerability assessment across 12 thematic areas[6] identified in the report (see Annex 2 for a representation of climate vulnerability pathways in West Bank and Gaza). Analyses have been prepared by year for 2016-2035 (summarized as 2025), 2046-2065 (2055) and 2081-2100 (2090) with changes calculated against simulations for each model for a historical period, 1986-2005. The NAP evaluates both historical temperature and rainfall patterns and presents projections of likely future climate scenarios.

[6] These are: agriculture, coastal and marine resources, energy, food security, gender, health, industry, terrestrial ecology, tourism, urban and infrastructure, waste and waste-water, and water resources.

34. Studies suggest, in general, the overall water situation will deteriorate, with more potential for droughts and floods, increased evaporation, reduced surface water flows, and reduced potential for groundwater recharge among other issues. Such projections align positions expressed in the various national communications. Where climate models are used, a cautionary approach needs to be taken as analyses are based on limited numbers of model projections, either one or just a few, rather than the much larger model ensembles available to the IPCC. To the extent that a consensus exists based on different modeling scenarios, the NAP assumes that future conditions are likely to be drier and with more rainfall variability than in the recent past.

35. Scenarios below (from the NAP 2016) provide an overview of the predictions made for future temperature and rainfall outcomes. The three scenarios are more or less optimistic depending on assumptions made about global GHG emissions and the effectiveness of climate mitigation measures at a global and regional scale (see a review of Climate Change in West Bank and Gaza in Annex 1).

Scenario 1: The most optimistic scenario, most likely should emissions be controlled according to the IPCC target of a global average temperature increase of 2degrees C.

Temperature	Increases by ~1C by 2025, by ~1.5C by 2055, by ~2C by 2090
Temperature-related	Reduced cold periods and more warmer periods, both becoming more prominent in time.
Rainfall	Does not change, or perhaps increases slightly in the period to about 2035
Rainfall-related	A slight possibility of more flooding. A small possibility of increased periods of drought but, in general, limited change overall to rainfall characteristics.

Scenario 2: A mid-range scenario, most likely should emissions continue to increase along recent lines with some reductions from historic levels but breaching the 2degree C target.

Temperature	Increases by ~1C by 2025, by ~2C by 2055, by ~3C by 2090
Temperature-related	Reduced cold periods and more warmer periods, both becoming more prominent in time; more so than under Scenario 1
Rainfall	Decrease by about 10% by 2025; by about 15% by 2055; by about 20% by 2090
Rainfall-related	Little, probably no, possibility of increased flooding risk. High likelihood of more frequent droughts. Perhaps overall less rainfall per day of rain on average.

Scenario 3: The most pessimistic scenario, assuming that emissions continue unabated.

Temperature	Increases by ~1.5C by 2025, by ~2.5C by 2055, by ~4.5C by 2090
Temperature-related	Reduced cold periods and more warmer periods both becoming more prominent in time; perhaps moderated slightly in the Gaza Strip
Rainfall	Decreases by about 20% throughout until 2055, and to about 30% by 2090
Rainfall-related	In general, a pattern of reductions in average daily rainfall and in contributions to total rainfall by heavier rainfall days, extended dry periods and reduced wet periods; thus, an increase in drought risk throughout. However, an indication that the rare wettest days might

	become more frequent, especially in the West Bank, thus, raising a possibility of an increased flood risk.

b) **Impacts of Climate variability and Change**

36. Climate variability and change are likely to compound existing priority environment challenges such water scarcity, drought, desertification, food insecurity. Palestine will be deeply affected by climate change with climate models for the Eastern Mediterranean showing mean temperature increases between 3 to 5°C by mid-century and mean annual rainfall reductions on 10-50%. This places the region ahead of most other places in the world in terms of projected temperature and rainfall changes. Responding to the implications of climate change will be challenging; given the current institutional and political context of West Bank and Gaza and given that resources for both mitigation and adaptation measures continue to be scarce and face many competing demands. The Palestinian Authority has actively engaged in a process of climate change strategic planning and has made some national commitments to reduce emissions and undertake adaptation measures. Most notably, national planning efforts have focused on the preparation of the Initial National Communications Report (INCR) and National Adaption Plan to Climate Change (NAP), both published in 2016. Climate change adaptation planning has been led by the Environmental Quality Authority (EQA) supported and endorsed by Ministries of key sectors including energy, water, agriculture, transport, and planning among others.

37. Climate change scenarios and assumptions used by EQA to evaluate threats and vulnerabilities broadly align with scenarios formulated by other countries in the region and with regional climate changes predicted by the IPCC. The Palestinian Climate Change Adaptation Strategy report indicates that "the IPCC predicts that, for the southern and eastern Mediterranean, warming over the 21st century will be larger than global annual mean warming – between 2.2-5.1 degrees C. Annual precipitation rates are likely to fall in the eastern Mediterranean – decreasing 10% by 2020 and 20% by 2050 – with an increased risk of summer drought."

38. There is general consensus that sea levels of the Mediterranean Sea will rise. Some regional studies predict 30-100 cm of sea level rise for the Mediterranean by 2100 with serious implications for Gaza. With respect to the likelihood of changes to patterns of extreme weather events and drought, the UNDP reports (UNDP 2010) that regional climate models indicate a tendency towards more extreme events in the future. This includes a higher number of yearly days of high temperature (daily maximum temperatures above 30 degrees C).

39. The National Adaptation Plan identifies 12 priority thematic areas which are considered highly vulnerable to climate change. The NAP provides an assessment of the vulnerability of each sector and it distinguishes the nature of threats facing the West Bank and Gaza respectively. The NAP provides recommendations on specific adaptation measures and provides preliminary cost estimates to address the issues that are rated as "highly vulnerable". Climate change adaptation planning has been supported and endorsed by national authorities responsible for key sectors. Opportunities in the natural resources and coastal zone management could offer new avenues for collaboration and support.

40. Ignored or unchecked, climate change is likely to adversely affect future economic growth and productivity potential in West Bank and Gaza. Such effects are likely to magnify existing security threats and social instability and may close off viable future economic development alternatives. Coupled with project population growth[7] and limited economic opportunity, the potential impacts of climate change could be severe. Furthermore, limited access to financial resources as well as limitations imposed by governance and institutional challenges will constrain the ability of the Palestinian Authority to respond effectively to climate related contingencies.

D. **Weak Environmental Governance**

41. The Environmental Quality Authority (EQA) is the main governmental agency responsible for protecting and managing the environment and natural resources of West Bank and Gaza. However, environmental governance in both the West Bank and Gaza remains weak. This has contributed to entities and individuals exploiting governance gaps to pursue environmentally degrading and polluting activities. Challenges and gaps related to governance and institutional framework include: weak coordination mechanisms on environmental issues; inadequate human and financial resources required to address environmental challenges; unclear accountability or understanding of environmental challenges from some senior decision makers, which can result in lack of support and empowerment for EQA. Gaps in institutional capacities, roles, and accountabilities and coordination mechanisms lead to poor outcomes in environmental management at local and national levels. In addition, the Palestine Environment Law approved in 1999, which is the primary governing law on the environment and consists of 82 articles covering a wide range of environmental issues, will need to be updated to keep up with current trends and realities. Performance in this sector has lagged and the environment and natural resources continue to be degraded at alarming rates.

42. EQA is expected to act as a leader, coordinator, regulator, and advocator rather than implementor. The ORGUT, the consulting firm hired by the Consulate General of Sweden in Jerusalem conducted organizational review of EQA[8], and found that the Environment Law specifies 10 technical areas on which EQA takes the lead: solid waste, water quality, wastewater, agricultural chemicals, marine environment, air and noise pollution, natural resource extraction, nature protection, biodiversity, and desertification. In addition, public awareness, environmental monitoring and inspection, and environmental approvals are under EQA's duties. More recently, EQA is taking the leading on climate change coordination. Despite the various responsibilities, EQA suffers from a lack of human and financial resources, which makes performing these duties overwhelming (Mahmiyat.ps 2017). Indeed, weak enforcement of the existing environmental laws and regulations due in part to inadequate capacity and resources is a constant challenge.

43. Overall responsibility for Environmental Impact Assessment (EIA) is under EQA; however, it lacks a clear quality assurance process. The Environmental Impact Assessment policy (2000) codifies the process of environmental approvals, screening, scoping and study, review, environmental assessment approval, permitting, monitoring, and types of major development projects which need EIA. But a key gap and weakness is to ensure quality assurance and

[7] The State of Palestine's population increased from 1.5 million in 1980 to 4.0 million in 2010 and is expected to reach 8.9 million by 2050. (NDC page 3)

[8] ORUGUT (2014)

standardization of the EIA process. Hence the quality of EIAs varies leading to poor performance in the application of environmental considerations in sector projects. Currently, clear certification standards on conducting EIA are absent, and sometimes unqualified firms provide services (Mahmiyat.ps 2017). The process of follow-up and continuous monitoring and enforcement of approved projects is also lacking. This implies that many projects are undertaken without the necessary environmental considerations as stipulated in the law. Therefore, there is a need to standardize the EIA process, and enhance the capacity of EQA and EIA practitioners through training, certification, licensing, and data management.

44. Currently, West Bank and Gaza does not have a system to integrate all environment-related information in one place. There exists data collected by Palestinian Central Bureau of Statistics (PCBS), universities, NGOs, and donors. A key challenge is each organization works without close coordination so that valued data is scattered (ORGUT 2017). Integrating such scattered data and setting up a data and knowledge platform would be key for evidence-based environmental management. Such a platform for environment information could be based at EQA and could serve as basis for (i) targeting scarce resources at the most critical environmental challenges, (ii) informing policy and decision makers on key environment trends and issues, and (iii) timely environmental monitoring, evaluation, and reporting.

IV. Conclusion and way forward

45. **Uncontrolled Pollution**: Increase investments to manage uncontrolled and increasing pollution from solid waste (municipal and industrial), municipal and industrial (e.g., stone industry; olive oil mills; food processing) wastewater, and hazardous waste (healthcare; used batteries from PV systems; tanneries; etc.). Specifically:
    - **Solid waste**: (i) promote sorting and recycling to reduce volumes to be transported and disposed of and extend functionality of landfills; (ii) promote cost recovery including resource recovery and composting; (iii) ensure leachate management and treatment; (iv) invest in recycling facilities in West Bank and Gaza;
    - **Municipal and industrial Wastewater**: (i) promote on-site pre-treatment facilities for industrial wastewater; (ii) promote cost-recovery of WWTPs including through resource recovery (including re-use of treated waste water; using gas from anaerobic digestion to generate electricity for operating the WWTPs, etc.); (iii) ensure sludge management is part of the management scheme of the WWTPs;
    - **Industrial pollution**: (i) ensure proper air quality standards; (ii) clear guidelines, emission standards and effective regulation of industries that emit effluents that affect people and the environment; (iii) develop a clear policy on management of quarrying activities in West Bank and Gaza;
    - **Hazardous waste (medical waste, E-waste including used batteries from PV systems, etc.):** (i) clear policy/strategy to support hazardous waste management with clear norms for recycling/disposal (especially used batteries, etc.) and standards that cover occupational health standards for workers; (ii) implement the masterplan on hazardous waste.

46. **Threats to Natural Resources**: Promote climate resilient community-based natural resource livelihoods and land rehabilitation interventions. Engaging local communities especially women and youth in environmental restoration (e.g. rangeland rehabilitation, reforestation using **multiple-use trees** such as olives and date palms, etc.) measures would provide short-term and long-term employment and livelihoods while enhancing the environment in Palestine. There is good potential for promoting non-timber forest products (NTFPs) in West bank and Gaza such olive oil, honey, dates, and medicinal plants. In 2013 the EQA signed a memorandum of understanding (MOU) with the Ministry of Women's Affairs with the objective of ensuring women participate fully in environmental issues. NTFPs (such as olive, honey, dates, etc.) directly generate goods for household consumption while creating (primary and secondary) income for many households in West bank and Gaza. Thus, supporting the sustainable production, processing, and marketing of non-timber forest products (NTFPs), in particular olive oil, honey, and dates would expand income opportunities, particularly for women, youth, poor and vulnerable households, while enhancing biodiversity and natural resource management and climate resilience. In addition:
    - Regulate uncontrolled quarrying and other industries;
    - Enhance biodiversity protection via co-management plans with local communities;
    - Invest in drought mitigation measures (structural and soft) across all sectors (e.g., rainwater harvesting from roadside drainage systems and use the water for irrigation/afforestation activities).

47. Finally, the sustainable and organic production, processing, and marketing (including branding) of non-timber forest products (NTFPs), in particular olive oil and honey, as well as fish and marine products, would expand income opportunities and lend themselves to private sector investments either in provision of inputs such as processing and packaging material or in direct purchasing of the products for value-addition and eventual selling to markets and consumers. This would increase private sector participation in enhancing natural resources management in Palestine.

48. **Climate Smart Investments: Invest in climate change adaptation and mitigation measures** in all affected sectors especially ecosystems management, coastal and marine, and water, including wastewater treatment and re-use as part of adaptation strategy. This should include the formalization of the National Environment and Climate Change Fund by the Cabinet. In addition:
    - **Consider climate resilience aspects** (e.g., storm water management; green spaces, etc.) especially in **urban programs and infrastructure** given the fact that many people are located in urban areas and extreme events related to climate will increase in frequency.
    - **Promote investment in the blue economy** in Gaza by supporting sustainable community-based fisheries management (including stock assessments; building databases on fisheries that include fish size distribution and fishing efforts; national regulations for fisheries management; control of marine litter and pollution; etc.) to revamp the fisheries sector for economic growth and support the livelihood of the local communities.

49. **Environmental Governance**: Strengthen environmental governance in both the West Bank and Gaza by enhancing the capacity of the Environmental Quality Authority (EQA) for monitoring and enforcement. The current structure is weak, and this has contributed to a situation in which individuals and entities exploit governance gaps to pursue activities (e.g., uncontrolled quarrying) that degrade and pollute the environment. EQA would need more

human resources (“environmental police”) to enhance enforcement, monitoring and compliance on environmental issues. In addition:

- Standardize the quality of the EIA process by having a robust quality assurance mechanism and a certification process for EIA practitioners. This would help to inject upstream sustainability in all investment programs and projects in West Bank and Gaza.
- Strengthen capacity for coordinating among the ministries and concerned organizations and establish a shared environmental data and knowledge platform.
- Promote citizen-centered environmental management in national and sectoral programs.

V. Main References

Applied Research Institute – Jerusalem (ARIJ). 2015. "Status of The Environment in The State of Palestine," Jerusalem

Brown, Oli, and Alec Crawford. 2009. "Rising Temperatures, Rising Tensions: Climate change and the risk of violent conflict in the Middle East," International Institute for Sustainable Development, Canada

Bursche, Anja. 2011. "Agricultural Water Demand Management in the Palestinian Territories," EcoPeace/ Friends of the Earth Middle East, Amman, Bethlehem and Tel Aviv

ClimaSouth Technical Paper N.2. 2016. "The Economics of Climate Change in the Palestine. February 2017" Prepared by: Tippmann, R. and Baroni, L.

ClimaSouth. 2017. "The Economics of Climate Change in the State of Palestine" (Retrieved from http://www.climasouth.eu/sites/default/files/CS%202.pptx, accessed in February 2019)

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2014) "Country report on the Solid Waste Management in Occupied Palestinian Territories," Germany

Environmental Quality Authority (EQA). 2016. "National Adaptation Plan to Climate Change". Palestinian Authority.

EQA, UNEP, and IUCN. 2015. "State of Palestine Fifth National Report to the convention on biological diversity"

"Executive Summary of the Cross Sectoral Environmental Strategy 2017-2022", n.d., shared by EQA in February 2019

Ghattas, Roubina, Nader Hrimat, and Jad Isaac. 2006. "Forests in Palestine," ARIJ, Jerusalem

Imadeddin. 2017. "Current Status of Nature Reserves in Palestine", *Journal of Entomology and Zoology Studies*, 5(1): 618-621

Kaza, Silpa, Lisa Yao, Perinaz Bhada-Tata, and Frank Van Woerden. 2018. "What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development Series." Washington, DC

Mahmiyat.ps (2017) "Environmental Conservation and Protected Areas in Palestine, Challenges and Opportunities," the Hanns Seidel Foundation

Mason, Michael, Zeitoun, Mark and Mimi, Ziad (2012) "Compounding vulnerability: impacts of climate change on Palestinians in Gaza and the West Bank." Journal of Palestine Studies, 41 (3). pp. 1-16. ISSN 1533-8614

Mason, Michael and Mimi, Ziad. 2014. "Transboundary climate security: climate vulnerability and rural livelihoods in the Jordan River Basin" Middle East Centre, LSE, London, UK

Mimi, Ziad A., and Sireen Abu Jamous. 2010. "Climate change and agricultural water demand: Impacts and adaptations," *African Journal of Environmental Science and Technology*, 4(4): 183-191

Netherlands Commission for Environmental Assessment. 2013. "Palestinian Territories EIA profile"

ORUGUT. 2014. "Organisational Review of the Palestinian Environment Quality Authority (EQA)"

Palestinian National Authority. 2010. "National Strategy for Solid Waste Management in the Palestinian Territory 2010-2014," Palestinian Territory

Palestinian Water Authority. 2012. "National Water Strategy for Palestine: Toward Building a Palestinian State from Water Perspective"

Palestinian Water Authority. 2013. “Status Report of Water Resources in the Occupied State of Palestine - 2012”

Palestinian Water Authority “National Water Policy for Palestine. Final Draft Water Policy 2013-2032”

Samhan, Zaghloul. 2016. “Environment Sector Working Group Cross-Sectoral Environmental Strategy” (Retrieved from https://slideplayer.com/slide/12821187/ accessed in February 2019)

State of Palestine. 2014. “National Development Plan 2014-2016. State Building to Sovereignty”

State of Palestine. 2016. “Initial National Communication Report to the UNFCCC” (INCR).

State of Palestine. 2016. “Nationally Determined Contributions /United Nations Framework Convention on Climate Change (UNFCCC)”

State of Palestine. 2016. “Nationally Determined Contributions/United Nations Framework Convention on Climate Change Summary for Policy Makers”

The Global Partnership on Output-Based Aid (GPOBA) (2015) “Output-Based Aid for Solid Waste Management Nepal and the West Bank”

The State of Palestine Ministry of Agriculture. 2016. “National Agricultural Sector Strategy (2017-2022) Resilience and Sustainable Development”

United Nations Conference of Trade and Development. 2015. “The Besieged Palestinian Agricultural Sector,” NY and Geneva

United Nations Development Programme. 2010. “Climate Change Adaptation Strategy and Programme of Action for the Palestinian Authority,” Jerusalem

World Bank. 2009. “Assessment of Restrictions on Palestinian Water Sector Development,” Washington, DC.

World Bank. 2010. “West Bank and Gaza Municipal Finance and Service Provision,” Washington, DC.

World Bank. 2018a. “Toward Water Security for Palestinians: West Bank and Gaza Water Supply, Sanitation, and Hygiene Poverty Diagnostic. WASH Poverty Diagnostic.” World Bank, Washington, DC.

World Bank. 2018b. “Securing Water for Development in West Bank and Gaza.” World Bank, Washington, DC.

World Bank. 2019. “Palestine’s Economic Update – April 2019,” Washington, DC.

Annex 1: A Review of Climate Change Impacts and Agenda for Action.

Summary

Climate change is only one of many urgent problems facing the West Bank and Gaza, nevertheless its role as a potential "threat multiplier" should be taken seriously. Climate change scenarios suggest that expected changes are likely to exacerbate and compound existing priority problems in the Palestinian Territories such as water and energy shortages and lack of climate resilient infrastructure. Responding to the implications of climate change will be challenging given the current institutional and political context of the West Bank and Gaza and given that resources for both mitigation and adaptation measures are likely to be scarce and face many competing demands.

The Palestinian Authority has actively engaged in a process of climate change strategic planning and national commitments to reduce emissions and to undertake adaptation measures. Most notably through the Initial National Communications Report (INCR) and National Adaption Plan to Climate Change (NAP) both published in 2016. The NAP identifies 12 priority sectors which are highly sensitive to climate change. It provides an assessment of the vulnerability of each sector and it distinguishes the nature of threats facing the West Bank and Gaza respectively. The NAP also provides recommendations on specific adaptation measures and outlines preliminary cost estimates to address the issues that are rated as *highly vulnerable or vulnerable*.

Climate change adaptation planning has been led by the Environmental Quality Authority (EQA) supported and endorsed by Ministries of key sectors including energy, water, agriculture, transport, and planning among others. While the NAP has been endorsed by various lead agencies it is not clear to what extent these sectoral agencies have internalized climate change objectives into their own national plans or strategies. Thus, it seems that there may be opportunity to both strengthen the institutional readiness to advance the climate change agenda as well as operationalizing strategic objectives by supporting investment priorities.

The World Bank and other partners such as Sweden seem well positioned to support and facilitate priority climate adaptation and mitigation measures which could be considered "no-regrets" in nature but at the same time well aligned with NAP priorities. In the past, the Bank has mobilized and leveraged Trust Fund (TF) resources to finance activities in sectors identified both as vulnerable to climate change and national priorities. An ongoing review of about 25 currently active and future projects indicates that there are likely to be important opportunities for generating climate co-benefits as well as supporting national investment priorities.

The World Bank portfolio of operations indicates a strong presence in key sectors such as water resources management; energy planning; solid waste and sewage management; and resilient urban infrastructure. Still, several projects which may have potential adaptation co-benefits have not attempted to evaluate climate change implications in a systematic manner. This may be due to historic factors in that teams did not prioritize co-benefits assessments; there may not have been adequate contextual analysis available; West Bank and Gaza face numerous challenges which are immediate and of higher priority and so on.

Among other possible actions, the World Bank and other partners could seek to maximize climate co-benefits in TF operations through a more careful assessment of the potential for such co-benefits. Such assessments could be based on the themes identified as "highly vulnerable" and/or "vulnerable" in the NAP. Historically, the Bank support has focused on key sectors – energy, water, resilient urban infrastructure, waste and wastewater management. Future operations in these sectors should seek to support climate mitigation and adaptation objectives more directly in sectors which are multi-faceted

such as energy and water management. It is necessary to build on these initial areas of engagement such as renewable energy, especially solar. It also needs to seek opportunities to integrate climate change planning into other relevant strategic planning documents such as national water, energy, agriculture, waste and wastewater management planning.

What is known about climate change risks in West Bank and Gaza?

Palestine is a small contributor to GHG emissions in both relative and absolute terms[9][10]. Nevertheless, the Palestinian Authority has actively engaged in a process of climate change strategic planning and national commitments, most notably through the **Initial National Communications Report (INCR)** and **National Adaption Plan to Climate Change (NAP)** both published in 2016. The formulation of climate change strategy and policy recommendations has been led by the Environmental Quality Authority (EAQ). In addition to leading the production of the NAP, the EQA has worked closely with UNDP on climate issues. In 2011 UNDP published a pre-cursor to the NAP, the **Climate Change Adaptation Strategy and Programme of Action for the Palestinian People.**

While the Palestinian Authority has taken steps to document the state of scientific understanding regarding the likely climate scenarios facing West Bank and Gaza, it currently lacks the ability to independently conduct climate research or run sophisticated climate models. Thus, it must rely heavily on scientific and technical work carried out and published by external entities. The current understanding of climate scenarios and risks faced by WBG are based on review of best available science, published peer-review journal articles, authoritative technical publications as well as other grey-literature. Climate scenarios were formulated by EQA through comparative analysis of National Communications (NCs) to the UNFCCC from Lebanon, Jordan, Israel and Egypt and based on available model projections.

The NAP lays out three climate scenarios which were used as the basis for a vulnerability assessment across 12 thematic areas identified in the report. Analyses have been prepared by year for 2016-2035 (summarized as 2025), 2046-2065 (2055) and 2081-2100 (2090) with changes calculated against simulations for each model for a historical period, 1986-2005[11]. The NAP evaluates both historical temperature and rainfall patterns and presents projections of likely future climate scenarios.

To the extent that a consensus is possible, available data suggests that there is strong confidence that temperatures have risen in the recent past, and that they will continue to rise in the future. Current projections of future temperature change indicate that temperatures will rise but depending on assumptions used there is a range in estimates from less than 2 to as much as 4 degrees Celsius by the year 2100. The extent of predicted temperature increases for the remainder of this century depend upon many factors such as the quality of available models and assumptions regarding GHG emissions globally, global forest cover, success of planned mitigation measures and so on.

Predicting changes in future rainfall patterns against those in the recent past presents more technical difficulties than predicting temperature change. Thus, the projections for rainfall change are less

[9] According to the NDC report, in 2011, there were 0.8tCO2eq per capita per year7, forecasted to grow to 1.6 tCO2eq per capita per year in 2040 under the independence scenario or 1.2 tCO2eq per capita per year under the status quo scenario. This is significantly less than the global average of 7.58 tCO2eq8 per capita per year

10 Anthropogenic emissions and removals of GHGs in the State of Palestine were estimated to be 3,450 Gg CO2 eq. in 2015. Under the Business as Usual (BAU) 'independence' pathway, these emissions are projected to grow to 5,960 Gg CO2 eq., 10,020 Gg CO2 eq. and 18,060 Gg CO2 eq. by 2020, 2030 and 2040 respectively; in rough terms, this is equivalent to a five-fold increase between 2015 and 2040. Under the BAU "status quo" pathway, GHG emissions are forecast to be 5,200 Gg CO2 eq., 6,860 Gg CO2 eq. and 9,130 Gg CO2 eq. by 2020, 2030 and 2040 respectively.

[11] Appendix 3 of the NAP report provides a detailed discussion of the methodology used to assess climate change scenarios used as the basis for the NAP assessment.

certain. The problem of anticipating rainfall changes is not only a question of estimating the amount of rainfall but also its timing, intensity, and location – all of which are influenced by a myriad of factors. Some analysts predict decreases in rainfall overall while others show possible increases.

In general, studies suggest that the overall water situation will deteriorate, with more potential for drought and floods, increased evaporation, reduced surface water flows, and reduced potential for groundwater recharge among other issues. Such projections align positions expressed in the various national communications. Where climate models are used, a cautionary approach needs to be taken as analyses are based on limited numbers of model projections, either one or just a few, rather than the much larger model ensembles available to the IPCC. To the extent that a consensus exists based on different modeling scenarios, the NAP assumes that future conditions are likely to be drier and with more rainfall variability than in the recent past.

The following scenarios below (from the NAP 2016) provide an overview of the predictions made for future temperature and rainfall outcomes. The three scenarios are more or less optimistic depending on assumptions made about global GHG emissions and the effectiveness of climate mitigation measures at a global and regional scale.

Scenario 1: The most optimistic scenario, most likely should emissions be controlled according to the IPCC target of a global average temperature increase of 2degrees C.

Temperature	Increases by ~1C by 2025, by ~1.5C by 2055, by ~2C by 2090
Temperature-related	Reduced cold periods and more warmer periods, both becoming more prominent in time.
Rainfall	Does not change, or perhaps increases slightly in the period to about 2035
Rainfall-related	A slight possibility of more flooding. A small possibility of increased periods of drought but, in general, limited change overall to rainfall characteristics.

Scenario 2: A mid-range scenario, most likely should emissions continue to increase along recent lines with some reductions from historic levels but breaching the 2degree C target.

Temperature	Increases by ~1C by 2025, by ~2C by 2055, by ~3C by 2090
Temperature-related	Reduced cold periods and more warmer periods, both becoming more prominent in time; more so than under Scenario 1
Rainfall	Decrease by about 10% by 2025; by about 15% by 2055; by about 20% by 2090
Rainfall-related	Little, probably no, possibility of increased flooding risk. High likelihood of more frequent droughts. Perhaps overall less rainfall per day of rain on average.

Scenario 3: The most pessimistic scenario, assuming that emissions continue unabated.

Temperature	Increases by ~1.5C by 2025, by ~2.5C by 2055, by ~4.5C by 2090
Temperature-related	Reduced cold periods and more warmer periods both becoming more prominent in time; perhaps moderated slightly in the Gaza Strip
Rainfall	Decreases by about 20% throughout until 2055, and to about 30% by 2090
Rainfall-related	In general, a pattern of reductions in average daily rainfall and in contributions to total rainfall by heavier rainfall days, extended dry periods and reduced wet periods; thus, an increase in drought risk throughout. However, an indication that the rare wettest days might become more frequent, especially in the West Bank, thus, raising a possibility of an increased flood risk.

Source: Appendix 3, National Adaptation Plan (EQA, Palestinian Authority 2016)

The climate change scenarios and assumptions used by the Palestinian EQA to evaluate threats and vulnerabilities broadly align with scenarios formulated by other countries in the region and by regional estimates predicted by the IPCC.[1213] The Palestinian Climate Change Adaptation Strategy report indicates that "in its Fourth Assessment Report, the IPCC predicts that, for the southern and eastern Mediterranean, warming over the 21st century will be larger than global annual mean warming – between 2.2-5.1oC according to a realistic emissions scenario (Scenario A1B). Annual precipitation rates are likely to fall in the eastern Mediterranean – decreasing 10% by 2020 and 20% by 2050 – with an increased risk of summer drought."

While there is some certainty that sea levels of the Mediterranean Sea will rise, the NAP does not currently offer firm projections of sea-level rise. Some regional studies predict 30-100 cm of sea level rise for the Mediterranean by 2100 but, in general, there appears to be less confidence expressed as to the exact nature of expected changes. Technical assessments of sea-level rise are difficult since the relationship between the Mediterranean Sea and global oceans is complex and not completely understood.[14] For example, the extent to which thermal expansion and global ice-melt would be off-set by decreases in atmospheric driven sea-level changes [15] has not been firmly established. Nevertheless, there appear to be a number of risks associated with sea level rise including beach and shoreline erosion, elimination of several sq. km of beach areas. The NAP does project some important implications for the Gaza Strip.

With respect to the likelihood of changes to extreme weather events, the UNDP reports that regional climate models indicate a tendency towards more extreme events in the future. This includes a higher number of yearly days of high temperature (daily maximum temperatures above 30oC), though there is more uncertainty here than with general temperature and precipitation trends. As with rainfall data, these predictions do not reflect a strong consensus emerging from climate modelling.

What are the Implications of climate change for development in West Bank and Gaza?

It is generally acknowledged and accepted that climate change is only one of many pressing issues affecting the West Bank and Gaza today. Given the current social, political and economic situation faced by Palestinians, climate change may not seem to be among the highest priority problems. Nevertheless, the role of climate change as a "threat multiplier" [16] should not be under-estimated and should be taken seriously. Climate change scenarios described above suggest that expected changes are likely to exacerbate and compound existing priority problems in Palestinian Territory.

[12] NAP page 107

[13] According to the NAP, "The NCs perspectives of future climate change are consistent in expecting temperatures to increase. However, the range of temperature increase differs from less than 2°C to 4°C by the end of the century. These differences are to a major extent dependent upon the approaches taken. Most of the NCs anticipate reductions in rainfall; some by a few per cent, others by a substantial amount. Model results presented in the Egypt Second NC, albeit with relatively early generation climate models, illustrate the opposite possibility of substantial future increases in rainfall. There are some positions taken with respect to other aspects of rainfall, which would all lead to negative impacts, e.g. more droughts and floods, longer drought periods, and less daily rainfall but higher intensity falls leading to stronger floods."

[14] Without considering climate change, the Ministry of Environmental Affairs 2000 Plan for Coastal Protection and Environment cites sources predicting annual storm surges of 64cm, with century surges rising up to 110cm (Ministry of Environmental Affairs 2000). According to different greenhouse gas emissions scenarios (IPCC 2000), sea levels are forecast, by 2100, to rise at least 18 to 38cm (emissions scenario B1) and as much as 26 to 59cm (emissions scenario A1F1) (IPCC 2007).

[15] See Šepić, J., Vilibić, I., Jordà, G. and Marcos, M. 2012.

[16] See International Institute for Sustainable Development (IISD 2009)

Climate change in West Bank and Gaza will take place in a context of existing water shortages, deteriorating surface and groundwater quality, problems of coastal aquifer recharge, energy shortages, land constraints, and conflicts over natural resources and territorial boundaries. Unchecked, climate change is likely to adversely affect future economic growth, productivity potential, increase security threat, social instability and may close off viable future development alternatives. Furthermore, the ability to respond effectively to problems exacerbated by climate change will be hampered by weak institutions and lack of financial resources. However, limited access to financing as well as limitations imposed by governance and institutional challenges will constrain the ability of the Palestinian Authority to respond effectively to climate related contingencies.

According to the UNDP, *"Some scientists have argued that climate changes are already happening: analyses of precipitation and temperature data in the last century reveal rising summer temperatures and a delay in the rainfall season (Khatib et al. 2007), as well as increasing inland aridity (Kafle and Bruins 2009). Agricultural production in the oPt has already been affected by recent droughts and climate predictions suggest that these will become more pronounced over time."*

It is generally acknowledged that the most sensitive impacts of climate change for West Bank and Gaza relate to water security (including quantity and quality of water) and its potential knock-on effects relating to food security. Water resources are already under significant threat due to varying degrees of mis-management resulting from over extraction and water contamination from point and non-point sources.

The NAP 2016 identifies 12 thematic areas which it considers to be most vulnerable to climate change. These are[17] : Agriculture; Coastal and Marine Resources; Energy; Food Security; Gender; Health; Industry; Terrestrial Ecology; Tourism; Urban and Infrastructure; Waste and Waste-Water; and Water Resources. The West Bank and Gaza face many similar climate risks but there are some essential differences as well. Most notably, the potential risks to coastal resources, fisheries, shoreline and beach erosion.

Beyond the specific context of Palestine itself, climate change will be a pressing and urgent problem for the region as a whole. Many climate change challenges are trans-boundary and cross-cutting in nature (e.g., surface water resources and the coastal aquifer) and will require multi-faceted as well as regional, multi-stakeholder solutions. National assessments from neighboring countries in the region indicate that climate change as a regional problem could have transformative implications especially on regional water management, agriculture, energy alternatives, and existing refugee challenges. The responses and management strategies of neighboring countries have the possibility of constraining options for West Bank and Gaza planning thus regional strategies should be considered (e.g., surface and groundwater management).

How is West Bank and Gaza integrating climate risks into national planning systems?

The challenges of managing future GHG emissions and the threats from climate change for the West Bank and Gaza are recognized by the Palestinian Authority and they have taken steps to document what is known about historic trends, likely future climate scenarios, and the potential vulnerabilities. In 2016, led by the EQA, Palestine also endorsed and published their National Adaption Strategy (NAP) which provides a comprehensive review of the state of the science, comparisons with other national perspectives of neighbouring countries. The State of Palestine has also completed its Nationally Determined Commitment (NDC) report which lays out various commitments and objectives for addressing climate change. The NDC report builds on stakeholder engagement and planning

[17] Presented in alphabetical order not presented in order of priority.

processes used for the NAP. The NAP identifies 12 priority sectors/themes which are sensitive to climate change and provides an assessment of the vulnerability and distinguishes between West Bank and Gaza. (See Table 1)

Climate change adaptation planning is supported and endorsed by internal authorities responsible for key sectors including Ministries of Agriculture, Water, Transport, Tourism, Energy & Natural Resources, Public Works & Housing among others. However, while the NAP is endorsed by these various lead agencies *it is not clear to what extent these agencies themselves have internalized climate change objectives into their own national plans or strategies*. This is exemplified by the absence of any reference to climate change in the National Development Plan (NDP) for Palestine. While the priorities spelled out in the NDP are not necessarily inconsistent with the NAP, climate change itself is not referred to as a constraint or a major challenge to be taken into account in the implementation of the NDP.

Similarly, the Palestinian Water Policy 2013-2032 is largely silent on the risks and implications of climate change for sustainably managing water resources. As with the National Development Plan, there is nothing in the current Water Policy that prevents a "no regrets" approach to climate change adaptation measures, its absence in a major national policy is striking.

To their credit, the Ministry of Agriculture (MOA) identifies climate change as a strategic priority under the "Second strategic objective: Natural and agricultural resources sustainably managed and better adapted to climate change" in the National Agricultural Strategy for 2017-2022. Climate change, along with drought and natural calamities, is flagged as one of ten key factors affecting the development of the agricultural sector. MoA further articulates their role as facilitator and coordinator across various sectors.
"The second strategic objective intersects with various sectors, especially water, environment, local government, justice and international relations sector. Consequently, this requires that MoA acts as the leader of the sector, with the aim of ensuring continuous coordination with all other stakeholders in the aforementioned sectors to reach maximum sectoral results. "(from MoA Agricultural Strategy)"

Responding to the implications of climate change will be challenging given the current institutional and political context of the West Bank and Gaza and given that resources for both mitigation and adaptation measures are scarce and face competing demands. Clearly, there will be a need for continued awareness raising and consensus building to fully mainstream climate risk management into national economic and sectoral planning processes.

An important consideration for prioritizing investments in an environment of competition for scarce resources would be to implement a strategy of maximizing investments with climate co-benefits. In other words, undertaking priority investments under national economic and sectoral plans which also promote the climate adaptation agenda identified in the NAP. This will require an analytical approach which goes beyond simply endorsing climate adaptation strategies to operationalizing them through informed investment decision making.

Improving the institutional readiness for adaptation co-benefits will require greater consensus on how climate change ranks among Palestine's other urgent, non-climate related problems. NAP provides recommendations on specific adaptation measures and provides preliminary cost estimates to address the issues that are rated as "highly vulnerable". The total cost to implement the adaptation actions set out in the NAP is $3.5 billion USD (targeting the highly vulnerable sectors only), with the cost per adaptation action per theme/sector." (NDC, p18) It is also evident that WBG will not be able to finance the costs of climate adaptation using national resources alone. The mitigation actions proposed in the NDC can only be delivered with appropriate international support. The total cost of

implementing the mitigation actions set out in the NDC is estimated to be about US$ 10.6 billion. (from NDC 2016)

World Bank Support to Climate Change Priorities Through Trust Fund (TF) Operations

The World Bank seems to be well suited to support and facilitate priority climate adaptation and mitigation measures which are "no-regrets" in nature and well aligned with NAP priorities. In the past, the Bank has mobilized and leveraged Trust Fund resources to finance activities in sectors now identified as vulnerable to climate change and national priorities in the NAP. The Bank portfolio of operations indicates a strong presence in key sectors such as water resources management; energy planning; solid waste and sewage management; and resilient urban infrastructure.

Table 1 illustrates the NAP priority sectors and themes considered to be "highly vulnerable" or "vulnerable" as well as how the Bank's existing portfolio – and pipeline of projects - aligns with strategic priorities and vulnerabilities as assessed in the NAP. While there appears to be a strong strategic alignment, the World Bank does not appear to have explicitly factored climate change into project specific planning or strategic/sectoral planning in any significant way (based on review of available project documents and strategy papers). Interestingly, in the agriculture sector, which is arguably among the most sensitive sectors to climate change – especially to highly variable rainfall and potentially drier conditions - the Bank does not appear to have any significant presence.

None of the planned operations appear to have systematically assessed potential adaptation co-benefits even though they are in sectors which align with NAP priorities (**see Water Security Development Program**). Based on a rapid review of project appraisal documents only one (**Hebron Regional Wastewater Management**) explicitly identified climate co-benefits.

Climate change co-benefits assessments have not been common in the portfolio and only one or two examples were found where the issue was directly discussed in a project context. The review has not yet found any operations that mention climate change as an operational constraint or a factor which needs to be considered in design or operations. In the past, World Bank project teams did not prioritize climate co-benefits assessments or there may not have been adequate contextual analysis and data available.

The World Bank pipeline of investments supported through TF appears to have some potential for climate mitigation co-benefits but has largely missed any opportunity for identifying adaptation co-benefits. For example, a brief assessment of the current pipeline of operations indicates that two out of five planned pipeline operations have flagged mitigation co-benefits, specifically related to solar energy investments. However, several projects which may have adaptation co-benefits have not attempted to evaluate climate change implications in a significant manner.

A brief assessment of the current pipeline of operations indicates that two out of five planned pipeline operations have flagged mitigation co-benefits, specifically related to solar energy investments. For example, the **Electricity Sector Performance Improvement project (P148600)** has an **estimated co-benefits potential of about $2.67 million** (about 24.3% of the project value). **The Finance for Jobs II (P159337) has an estimated Climate co-benefit of about $4.00 m**. (50% of the project value).

Operations such as the **Northern Gaza Emergency Sewage Treatment (NGEST)** illustrate the complex and cross-cutting nature of investments which simultaneously address wastewater and effluent treatment, flood protection, aquifer recharge, and public health in a fragile security context and where power supply is insufficient and inconsistent. The project illustrates the multi-objective nature of

investment in waste-water management with important implications for public health and improvement to environmental quality.

Recommendations

Build an investment portfolio that is climate informed. Currently virtually no reference to climate change is made even though the Bank facilitates financing in many climate sensitive sectors. For example, there are no active investments relating to coastal and marine issues in Gaza and there is currently no active support for environmental institutional capacity building or in areas related to terrestrial or aquatic biodiversity protection.

Build on experience by investing in climate resilient infrastructure. Especially with respect to Investments to support mitigation of greenhouse gas emissions. According to the INCR, GHG emissions are projected to have the highest and fastest growth rates in the energy (electricity generation), transport and industrial sectors. Priority opportunities for investing in mitigation thus will be in promotion of renewables (solar), energy efficiency, waste to energy and control of methane emissions from landfills.

Maximize co-benefits and no-regrets initiatives. Assessments on co-benefits could be based on the themes identified as "highly vulnerable" and/or "vulnerable" in the NAP. Historically, the Bank support has focused on key sectors – energy, water, resilient urban infrastructure, waste and wastewater management. Future operations in these sectors should seek to support climate mitigation and adaptation objectives more directly in sectors which are multi-faceted such as energy and water management. It would be important to continue to build on these initial areas of engagement such as renewable energy, especially solar.

Support the strategic priorities identified in national planning. Where appropriate, seek to engage in dialog with key partners on climate change strategies, especially in non-traditional sectors such as environment, health, jobs and business competitiveness which can greatly assist in coping with and adapting to adverse effects of climate change[18].

Improve the technical knowledge base. It is necessary to improve the national capacity to collect and manage climate data with particular emphasis on being able to generate country specific hydro-meteorological data. Furthermore, there is a need for climate modelling and research capacity-building in the oPt tailored to Palestinian adaptation priorities in the face of future climate risks. [UNDP Climate Change Adaptation Strategy]

Integrate climate change into sectoral planning to improve institutional readiness and governance. The PA should seek opportunities to integrate climate change planning directly into other relevant strategic planning documents such as national water, energy, agriculture, waste and wastewater management plans. The EQA has taken the lead in developing the NAP and overall climate risk management strategies. However, they are not an operational Ministry and do not have resources or the mandate to develop stand-alone investment projects. Climate change risk management should be fully integrated into the national development vision. The mainstreaming of climate change risk can be part of a strategy to operationalize the "no-regrets" and/or "low regrets" priority investments with climate co-benefits.

Improve donor coordination. The PA should consider steps to mobilize donor support, primarily through better targeted and prioritized donor-financing of priority climate related actions. Access to

[18] See, for example, the Finance for Jobs II project which could get up to 50% mitigation co-benefits for its support to a solar energy sub-project.

international financing sources for targeted climate-informed investments is not readily available but perhaps improved donor coordination could assist.

Continue to emphasize water resources management as a strategic priority. Explore whether the scope to pursue operations in the agricultural sector where there are significant knock-on effects from climate change. The potential adverse impacts for agriculture and food security will be exacerbated by climate change, especially since the risks to surface and ground water resources (quality and quantity) and also from potential shifts in precipitation patterns puts will put agriculture – and the households and communities that depend on agriculture - at a significant disadvantage.

Disaster risk management. Explore the extent to which climate change can, or should be, framed in terms of disaster risk management and emergency response planning in order to mobilize resources quickly in the future of needed. Formulation of contingency planning for flood management, extended droughts, and extreme weather events may be best undertaken by a lead coordinating agency for disaster risk reduction. The UNDP CCAS correctly emphasizes that disaster risk reduction (DRR) – the development and implementation of policies and practices that minimize risks from disasters – is the first line of institutional defense against serious future climate change impacts. Strengthening disaster management planning capacity within the Palestinian Authority is critical to effective climate change adaptation within West Bank and Gaza.

World Bank Operations in relation to Climate Change Priorities in NAP.

Themes ranked as "Highly Vulnerable" or "Vulnerable" in NAP	West Bank	Gaza	Relevant Bank TF Operations [19]
Agriculture	Olive production; Grape production; Stone fruits; Rain-fed vegetables; Field crops; Irrigated vegetables; Grazing area and soil erosion; Irrigation water; Livestock production	Livestock production; Cost of agricultural production; Employment; Vegetable production; Olive production, Citrus; Irrigation water Watermelon production; Greenhouses; Soil erosion; Cut-flower production	None
Coastal and marine	N/A	Fishing/fisheries; Coastal agriculture; Condition of beaches	None
Energy	Domestic/local energy production; Energy imports; Condition of infrastructure Domestic/local energy and prices	Domestic/local energy production; Energy imports; Condition of infrastructure Environmental impacts; Social impacts; Imported energy prices; Cost of domestic feedstocks	**Electricity Sector Improvement Project (P148600):** supports design and implementation of roof-top solar pilot **Finance for Jobs II (P159337**): Potential mitigation co-benefits since risk sharing instrument supports a solar panel project **West Bank and Gaza: Gaza Electricity Network Rehabilitation (P116199):** Potential co-benefits related to system improvements; loss reductions; Gaza electricity master plan development; **Additional Financing for Gaza Emergency Response for Electricity Network Rehabilitation (P152411)**: No co-benefits identified in project paper; no certified co-benefits; restoration of electricity services
Food	Domestic food prices; Imported food prices	Domestic food prices; Imported food prices Exported food prices;	**Social Protection Enhancement Project (P160674):** references to food insecurity See also **Cash Transfer Project (P119307)**

[19] **GREEN:** Projects in active portfolio/pipeline with co-benefits potential identified through screening.
RED: Projects under implementation that did not identify climate co-benefits, but which appear to have some potential
BLACK: Not likely to have mitigation or adaptation co-benefits

Themes ranked as "Highly Vulnerable" or "Vulnerable" in NAP	West Bank	Gaza	Relevant Bank TF Operations [19]
	Food processing sector; Food storage	Food storage; Food waste	
Gender	Major diseases related to water and sanitation Employment and gender; Maternal mortality and life expectancy; Food security and gender	Employment and gender; Major diseases related to water and sanitation; Food security and gender Maternal mortality and life expectancy	**Social Protection Enhancement Project (P160674):** not significant co-benefits; however strong focus on women's vulnerability; broadly consistent with vulnerability themes See also: **Abraham Path (P147235)** **Cash Transfer Project (P119307)** **West Bank and Gaza: Finance for Jobs (P151089)**
Health	Major diseases related to water, sanitation, and food Mortality morbidity and life expectancy; Infrastructure; Health costs.	Major diseases related to water, sanitation, and food Mortality, morbidity and life expectancy; Infrastructure; Health costs	**Health System Resiliency (P150481):** not likely to have co-benefits but is broadly in line with NAP strategy; no co-benefits attributed in PAD;
Industry	Value of raw materials imported; Infrastructure; Energy supply; Energy demand Industrial production; Value of industrial products imported and exported; Production of raw materials; Value of raw materials exported; Employment;	Value of industrial products exported; Value of raw materials exported; Employment; Energy supply; Energy demand Industrial production; Value of industrial products imported; Production of raw materials; Value of raw materials imported; Infrastructure; Waste management	**Finance for Jobs (P151089):** no co-benefits identified in PAD; focus on job opportunities in (a) agriculture; (b) IT and digital entrepreneurship; (c) tourism; (d) construction; and (e) energy; Some focus on women and youth as vulnerable groups;

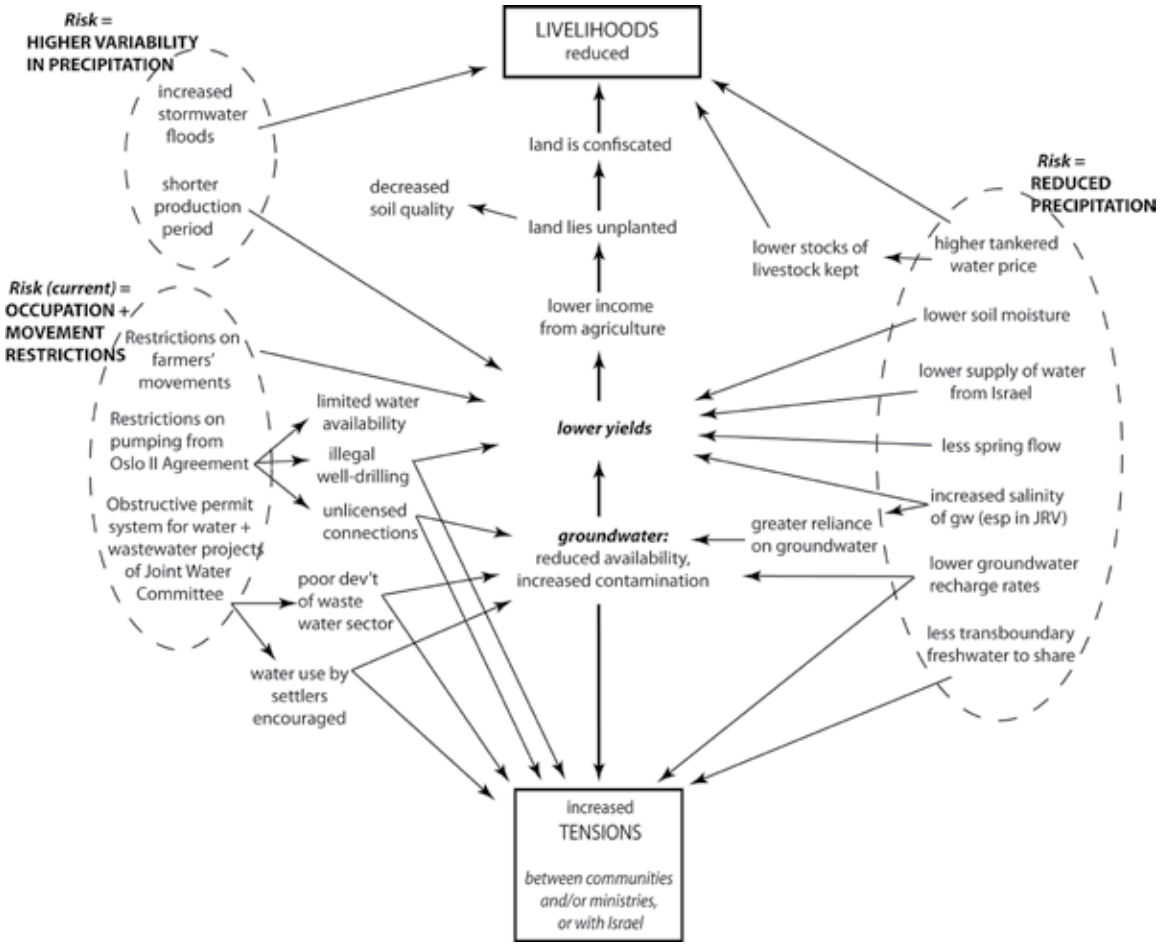
Themes ranked as "Highly Vulnerable" or "Vulnerable" in NAP	West Bank	Gaza	Relevant Bank TF Operations [19]
	Waste management		
Terrestrial Ecosystems	Habitat connectivity Biodiversity; Invasive species; Forest shrublands and grasslands; Nature reserves; Birds, mammals, reptile and amphibians; Habitat area; Habitat quality	Wadi Gaza – Habitat connectivity Biodiversity; Habitat – birds; Wadi Gaza – fauna; Wadi Gaza – flora	None
Tourism	Condition of cultural heritage Infrastructure of the tourism sector; Income from tourism	N/A	**Masar Ibrahim / Abraham Path: Economic Development Across Fragile Communities (P147235):** not clear of co-benefits but is consistent with the NAP "Vulnerable" Tourism theme; also addresses issues of women and youth employment opportunities;
Urban and Infrastructure	Urbanization Urban economy; Urban drainage	Building conditions; Urban drainage Urbanization; Urban economy; Urban air pollution;	**Third Municipal Development Project (P159258):** Potential mitigation co-benefits if construction of parks includes tree planting or if street lighting use renewable sources **Gaza: Second Municipal Development Project (P127163; P155268 AF):** no mitigation or adaptation co-benefits identified in the project paper; component 2 includes reference to investments in solar energy in public facilities **Gaza: Integrated Cities and Urban Development (P150991):** no co-benefits identified; not clear whether or to what extent urban planning measures could claim co-benefits; **Local Governance and Services Improvement Program (P148896):** Eligible activities include roads works (construction, paving, rehabilitation, upgrading, retaining walls, street

Themes ranked as "Highly Vulnerable" or "Vulnerable" in NAP	West Bank	Gaza	Relevant Bank TF Operations [19]
			lighting), water and sewerage networks extensions, storm water drainage, solid waste collection, parks and recreational facilities, markets, and other service delivery improvements. Not clear whether, how, PforR operations could claim co-benefits. **Gaza Emergency Response 2nd Municipal Development (P152523):**
Waste and Wastewater	Waste management Management of wastewater	Waste management Cost of waste management; Sewerage; Management of wastewater	**Hebron Regional Wastewater Management (P117449):** identified 60% mitigation co-benefits in project paper but did not see any analysis presented in the paper; identified as a series of HRWM projects each with potential co-benefits **Gaza Water Supply and Sewage System Improvement (P101289):** (i) rehabilitation and reconstruction of existing and damaged water and wastewater systems, and (ii) enhancing the capacity of the Coastal Municipalities Water Utility (CMWU) to sustain water and wastewater services. Rehabilitation and upgrading of electro-mechanical works and services were done for all water wells in the project areas, and a number of old and less efficient pumping units have been replaced by more efficient systems. This has lead to a significant reduction in the specific power consumption per cubic meter of water to reach 0.39 kw/h/m3. In total, 1.9 million inhabitants (of which 49% women) in urban areas were provided with access to improved water sources and over 1.9 million inhabitants benefitted from restored water supply and wastewater services **Additional Financing for Water Supply and Sewage Systems Improvement (P151032**): No climate co-benefits identified despite -- (i) rehabilitation and expansion of existing water and wastewater systems, and (ii) enhancing

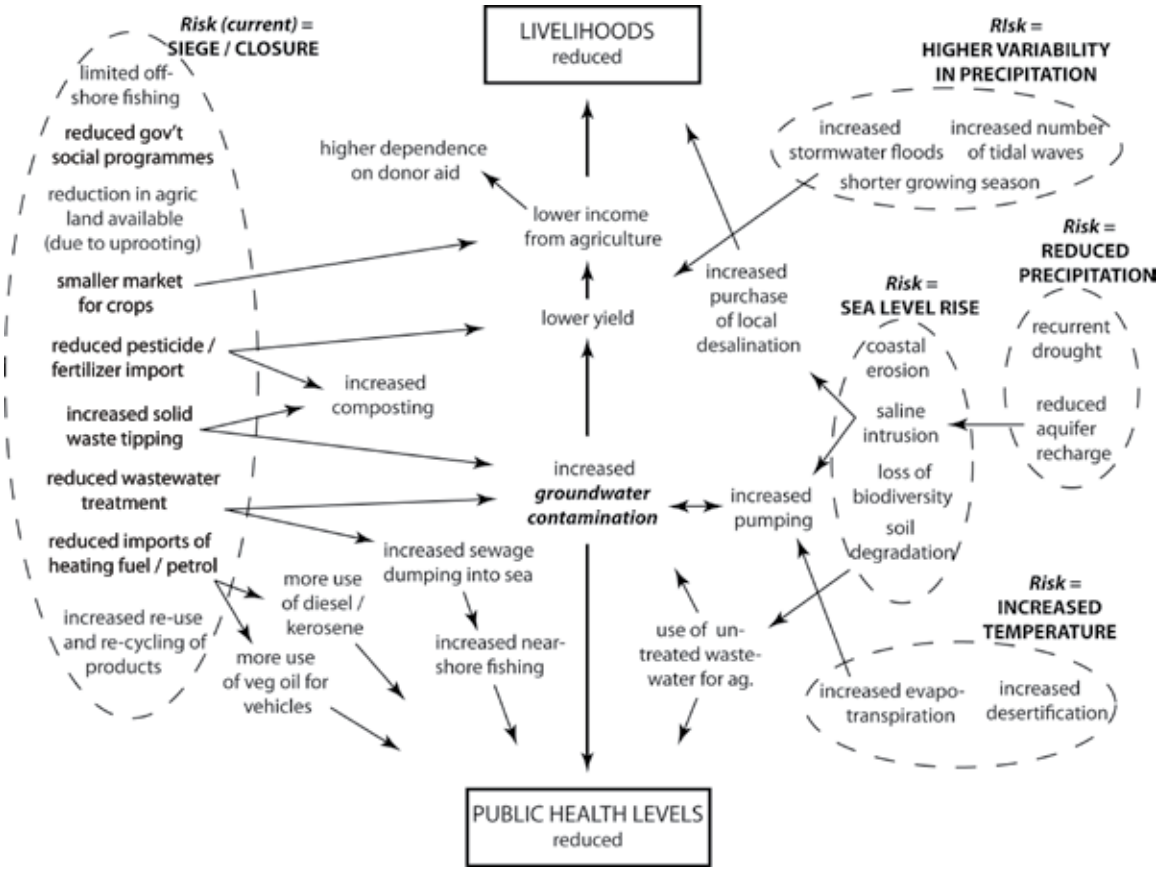
Themes ranked as "Highly Vulnerable" or "Vulnerable" in NAP	West Bank	Gaza	Relevant Bank TF Operations [19]
			the capacity of the Coastal Municipalities Water Utility (CMWU) to sustain water and wastewater services **Solid Waste Management OBA Pilot in West Bank (P132268):** This project aims to provide efficient, socially acceptable, and environmentally friendly SWM services through (i) strengthening the JSC-H&B administrative and technical capacity; (ii) the provision of a sanitary landfill in Al Minya; and (iii) carrying out a public awareness campaign to promote waste minimization, resource recovery and cost recovery of SWM. Tackles the main problems faced by municipalities in managing their solid waste management (SWM) system, namely (a) high inefficiencies linked to internal costs of primary waste collection (e.g. excess workers, inadequate equipment/routes); and, (b) low fee collection ratios. **Southern West Bank Solid Waste Management Project AF (P154102):** No adaptation co-benefits assigned in project paper. **Gaza Solid Waste Management (P121648):** no climate co-benefits identified in Project Paper; paper discusses leachate management which is identified as priority vulnerability in Gaza N**orthern Gaza Emergency Sewage Treatment NGEST (P074595):** Part A, consisting of the construction of a new terminal pumping station and 9 infiltration basins, as well as the installation of a pressure pipeline to support the transfer of effluent from Beit Lahia to the proposed new wastewater treatment plant (WWTP) site; Part B consisting of the construction of a new WWTP, would support the objective of providing a long-term, sustainable wastewater management solution;

Themes ranked as "Highly Vulnerable" or "Vulnerable" in NAP	West Bank	Gaza	Relevant Bank TF Operations [19]
			NGEST supports environmental protection by completing the first phase of the proposed effluent recovery and reuse scheme, which is necessary to ensure the protection of water quality in the Coastal Aquifer. The Coastal Aquifer is vital for Gaza's water supply, and it is shared with Israel. The scheme will also support agricultural production with reduced use of freshwater resources.
Water	Ground water supply; Flood management; Condition of infrastructure Surface water supply; Water quality (surface and groundwater water); Water prices; Volume of water imported	Groundwater supply; Groundwater quality; Flood management Surface water supply; Surface water quality; Condition of infrastructure; Volume of water imported	**Water Security Development Program (P158615):** potential mitigation co-benefits for rehabilitation of water supply if energy efficiency improvement is substantial **Gaza Sustainable Water Supply Program (P150494):** project paper indicates no climate co-benefits. **Water Sector Capacity Building AF (P153889):**

Annex 2: Schematic Representations of Climate Vulnerability Pathways for West Bank and Gaza



From UNDP Climate vulnerability pathways in the West Bank



From UNDP Climate vulnerability pathways in the Gaza Strip