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Investment in Green Infrastructure and Adaptation with Climate Change in Palestine

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This is the Sixth Paper in a series of discussion papers prepared for the International Academic Symposium "Priorities for Palestine's Economy in the Midst of War" scheduled for December 4, 2024. These papers reflect on optional scenarios for the post-war phase, including Palestinian governance strategies, immediate socio-economic challenges and priorities, and the (legal, institutional and political) tools at the disposal of the Palestinian people to actively determine their future. They will also analyze the economic policies and strategies that are needed to support Palestine's struggle for independence, focusing on self-sufficiency, economic resilience and productive capacity, trade expansion and market diversification and sustainable growth. The issues also include concern about how to strengthen the social contract in Palestine, focusing on how governance, economic policies, and social services can be aligned to meet public expectations and foster social cohesion.

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Introduction

The Palestinian environment has suffered for a long time from substantial challenges that led to steady environmental degradation in various environmental elements. Such a situation is largely related to the challenges imposed by the Israeli occupation on economy, society and various components of the Palestinian environment such as water, soil and air. In addition, there are several subjective challenges associated with unsustainable consumption and production in various economic activities as well as at the level of individuals and households. The steady increase in population and its impact on the process of economic and social growth and development constitutes an increasing demand on natural resources and thus an increase in the volume of wastes and pollutants resulting from increased consumption (National Development Plan 2021-2023, 2021). The Palestine National Voluntary Review for the implementation of the 2030 Agenda indicates that “unsustainable use of resources prevails throughout Palestine, leading to several social, environmental and economic problems that will worsen as these patterns continue” (State of Palestine, 2018).

Environmental elements overlap with different development sectors, meaning that economic activities in different sectors may affect the environment in multiple ways, whether positive or negative they are. For example, agriculture relies substantially on natural resources such as water, soil and air. Therefore, unsustainable farming practices such as the use of chemical pesticides and over-fertilization can affect the soil and water pollution. The same applies to the case for industry, which may produce many environmental pollutants such as toxic gases and substances, harmful chemicals and solid waste. Such pollutants can also pollute air, water and soil and affect ecosystems. Tourism activities also affect the environment by increasing pressure on natural resources such as water, forests and beaches, in addition to the establishment of tourism infrastructure that may lead to the degradation of the local environment. Transportation means also contribute to greenhouse gas emissions and air pollution, and road and railway infrastructure can result in the destruction of local ecosystems and uproot wild flora and fauna. Therefore, and to mitigate the impact of economic activities on the environment, environmentally friendly actions and practices are needed such as regulating the industry to reduce emissions, developing sustainable agriculture, promoting ecotourism, promoting clean transport and investing in green technology (United Nations Environment Programme, 2020).

There is ample evidence on environmental degradation in the Palestinian territories, including surface and groundwater courses and marine ecosystems resulting from discharge of untreated used wastewater, solid waste and industrial waste. However, the most highlighted environmental degradation, in addition to the remnants of Israeli settlements, is the contamination of freshwater and groundwater in the West Bank and Gaza by the wastes of Palestinian cities and villages. In the Gaza Strip, the amount of untreated or partially treated sewage flowing daily into the Mediterranean Sea has increased from 90,000 cubic meters per day in 2012 to 100,000 cubic meters per day in 2016 and 110,000 cubic meters per day in 2018.

There is also a marked weakness in the capacity to dispose solid wastes as local communities, municipalities and village councils struggle to cover the costs of waste collection, transportation and disposal. According to data from the Ministry of Local Government, in 2022, the amount of municipal solid waste generated in Palestine has reached to approximately 1.7 million tons / year (1.1 million tons / year in the West Bank and 0.6 million tons / year in the Gaza Strip).¹. The per capita production rate of solid waste is about 1 kg/day, ranging from 0.93-2.78 kg/day in urban

¹ <https://www.pCBS.gov.ps/postar.aspx?lang=ar&ItemID=4523>

areas, 0.73-1.14 kg/day in rural areas, while waste production in refugee camps is about 0.72 kg/day. These figures are expected to increase by about 4 percent annually due to population growth and current consumption patterns.² Organic wastes constituted 46.4% of solid waste in Palestine, followed by plastic (16.4%) and paper and cardboard (14.1%). There is also a significant increase in emitted greenhouse gas rates, which increased from 2739.9 (one thousand tons of CO₂ equivalent) in 2006 to 6,483.71 (one thousand tons of CO₂ equivalent) in 2022³.

This paper aims to explore how Palestine can enhance environmental resilience and responsiveness through the adoption of green policies in infrastructure. The paper will begin by assessing the impacts of climate change and the recent war on the Gaza Strip on infrastructure and resource sustainability that threaten ecological and economic stability, focusing on the challenges associated with water pollution and the degradation of available agricultural land area. Then, the paper will discuss the key challenges that policymakers may face in integrating green infrastructure into post-war recovery plans for the Gaza Strip in the short to medium term. These challenges include occupation, lack of public policies, limited funding for sustainable projects, and the establishment of local capacities to manage green adaptation initiatives, given the political and economic constraints. Finally, the paper will identify policy priorities to enhance environmental resilience in Palestine, possible strategies to strengthen institutional frameworks that focus on practical steps to implement green public procurement, expand investments in green infrastructure, and promote green economy interventions.

1. The Status Quo After a Year of War: The Environmental Repercussions of the Destructive War on the Gaza Strip and the West Bank

The Israeli occupation and increasingly expanding settlement activities are key factors of environmental degradation, thereby undermining the social contract and intensifying social and economic gaps in Palestine. Israel has exacerbated and it continues to exacerbate environmental damage in the Occupied Palestinian Territory since its occupation of the West Bank and Gaza in 1967, through grave environmental violations such as uprooting trees, stealing water and polluting water canals with sewage from illegal settlements. Furthermore, the negative impacts of prolonged occupation have led to the loss of human and animal biodiversity, harming agriculture, and undermining environmental sustainability (Qumsiyeh and Abusarhan, 2020). Moreover, the negative impacts of prolonged occupation have led to biodiversity loss, posing a threat to endangered species and negatively affecting agriculture, jeopardizing environmental sustainability, and irreversibly damaging vegetation and natural cover in Palestine (Qumsiyeh and Abusarhan, 2020). One of the aspects of environmental degradation is the occupation's control of Palestinian water resources, which has created significant challenges for Palestinians in accessing clean water, which in turn affected public health and livelihoods. Land confiscation in favor of settlements, destruction of natural resources, and transfer of Israeli industrial wastes to Palestinian territories have resulted in land and air pollution, damaged agricultural land and caused health hazards (Qumsiyeh and Abusarhan, 2020).

The environmental situation has seriously worsened **after the seventh of October**, as the Israeli occupation carries out unprecedented systematic destruction of Palestinian cities in the Gaza Strip, accompanied by the large-scale extermination of the agricultural flora and fauna sector, and almost full destruction of fresh water sources and sewage infrastructure in most Gaza Strip areas.

² https://www.cesvi.eu/wp-content/uploads/2019/12/SWM-in-Palestine-report-Thoni-and-Matar-2019_compressed-1.pdf (Data includes East Jerusalem)

³ https://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Emissions-A2-2022.htm

The management of wastewater and solid waste represents significant and increasing challenges in the Gaza Strip, as the comprehensive destruction of infrastructure in the Gaza Strip and the shortage of fuel, since the seventh of October of 2023, caused the disruption of all six wastewater treatment plants and systems in the Gaza Strip, the destruction of about 70 kilometers of sewage networks and the cessation of about 65 sewage pumps that treated about 130,000 cubic meters per day. All these have led to sewage disposal without treatment, either to the sea or to Wadi Gaza, while a large part of it seeps into streets and roads, and sometimes inside homes due to the destruction or blockage of sewage pipes⁴. Over the past year, the cumulative effects of pollution (whether air, soil and groundwater pollution) associated with the release of untreated wastewater have worsened, as untreated wastewater contains pathogens, nutrients, particulate organic matter, plastic and hazardous chemicals (UNDP, 2024b).

The ongoing Israeli aggression for more than 13 months, and the accompanying significant undermining of municipality capacities through the destruction of most municipal headquarters and transport infrastructure, and the extensive damage caused to vehicles, devices and equipment necessary for the work of municipalities in collecting and disposing solid waste, led to the accumulation of more than 270,000 tons of waste throughout the Gaza Strip (170,000 tons in the south and 100,000 tons in the north).⁵ Most of this waste is accumulated in the temporary landfill sites recently established by municipalities close to residential areas due to the inability to transport the waste to the official landfills (Juhr al-Deek landfill serves the Gaza and northern Gaza Strip governorates, while Al-Fukhar landfill serves the south and center of the Gaza Strip), either because of the lack of vehicles to collect and transport waste or because of the fear of being bombed by the Israeli occupation forces. It should be noted that prior to October 7, the Gaza Strip used to produce 1,726 tons of solid waste daily, including organic materials (more than two-thirds), cardboard, glass, metals, paper and plastics (UNDP, 2024a). This has created significant repercussions on the environmental reality in the Gaza Strip and constituted a major factor for epidemics and skin and infectious diseases by harmful gases (such as methane and carbon dioxide) released by the decomposition of waste inside residential neighborhoods⁶. According to the World Health Organization, sporadic cases of measles and mumps have been reported, more than 600,000 cases of upper respiratory tract infections, and several cases of meningitis, hepatitis, rashes, scabies, lice and chickenpox⁷.

The war on the Gaza Strip has led to the accumulation of huge amounts of debris resulting from the destruction of buildings and infrastructure, posing risks to human health and the natural environment. Debris originates from damaged buildings and infrastructure, and it includes construction materials such as concrete, bricks, upholstery, personal belongings and other waste. Conflict debris differs from ordinary construction and demolition waste in that it contains unexploded ordnance and human remains, and it is released in an unusual way that affects a wider area. According to the United Nations Operational Satellite Applications Software (UNOSAT, 2024), and based on images collected on September 3 and 6, 2024, the Israeli aggression on the Gaza Strip since October 7 has resulted in full or partial destruction of about 163,778 buildings (approximately 227,591 housing units): there are about 52,564 buildings fully destroyed, 18,913 severely damaged, 56,710 moderately damaged and 35,591 potentially damaged. These buildings constitute about 66% of the total buildings in the Gaza Strip. Transport infrastructure was also severely damaged, which significantly affected 62 percent of roads, including 92 percent of main roads, and a large proportion of vehicles, with damage amounting to USD 358 million (World

4 <https://www.palestine-studies.org/ar/node/1654921>

5 <https://www.ochaopt.org/ar/content/hostilities-gaza-strip-and-israel-flash-update-166>

6 <https://www.pcbs.gov.ps/postar.aspx?lang=ar&ItemID=5766>

7 <https://www.who.int/ar/news-room/commentaries/detail/children-in-gaza-are-now-at-risk-of-polio-as-well-as-bombs---we-need-a-ceasefire-now>

Bank, European Union and United Nations, 2024). The destruction of buildings, roads and other infrastructure has generated more than 39 million tons of debris, some of which are contaminated with unexploded ordnance, asbestos and other hazardous materials that lead to significant and long-term soil pollution and the emission of toxic gases into the air, not to mention the thousands of martyrs still buried under this huge amount of building debris.

The agricultural environment and vegetation cover have received their share of destruction, as ground incursions and airstrikes has significantly destroyed agricultural lands that used to play a major role in the ecological balance, in addition to their major role in achieving food security. In the latest assessment conducted using satellite data by the Food and Agriculture Organization of the United Nations and the United Nations Satellite Centre (UNOSAT) in September 2024, 67.6% of agricultural land (6,694 hectares) in Gaza was damaged, compared to 43.6% in May 2024 (FAO, 2024). Specifically, 71.2 percent of orchards and other trees, 67.1 percent of field crops and 58.5 percent of vegetables were damaged. In addition, a total of 1,188 agricultural wells (52.5 percent) and 577.9 hectares of greenhouses (44.3 percent) were destroyed. According to estimates, 25-50 percent of the Wadi Gaza area has been destroyed, along with the ecosystem elements of the area such as wild flora and fauna, ecotourism activities, and the nutrient cycle (such as carbon and nitrogen) (UNDP, 2024a).

The cultural and heritage environment has not been safe by the destructive war in the Gaza Strip. According to estimates by the United Nations Educational, Scientific and Cultural Organization (UNESCO), which conducted a preliminary assessment of damage to cultural property based on satellite imagery, as of 17 September 2024, out of 120 sites that UNESCO was able to assess through satellite imagery, 69 sites were affected: 10 religious sites, 43 buildings of historical and/or artistic importance, two warehouses of movable cultural property, 6 monuments, one museum and 7 archaeological sites (UNESCO, 2024).

Since the seventh of October, systematic destruction of natural and environmental resources and bulldozing agricultural land have accelerated in the West Bank in an unprecedented manner with the aim of expanding settlements or establishing new military zones. During the past year, the Israeli occupation has carried out extensive destruction of infrastructure, including roads, water, electricity and sewage networks, and accumulation of solid waste in many cities in the northern West Bank, especially Jenin, Tulkarm and Nablus refugee camps, which significantly affected the environmental reality in these cities, particularly due to the accumulation of wastewater in the streets and within residential neighborhoods. The high erection of checkpoints in various areas of the West Bank has also affected the environment through the high amount of burning fuel of cars and trucks due to long hours of stopping at checkpoints or having to use unpaved roads as an alternative to the main ones. Settlers and the army systematically destroyed agricultural land and uprooted trees for settlement expansion, which exacerbated the challenges to the West Bank's ecosystem. According to a recent report by the UN Office of the High Commissioner for Human Rights, farmers in the West Bank have not been able to access 96,000 dunums of land planted with olive trees across the occupied West Bank, resulting in losses estimated at \$10 million due to the Israeli occupation ban of access to these lands or because of settler attacks (OCHA, 2024).⁸ In addition, the Applied Research Institute – Jerusalem (ARIJ) monitored about 87 attacks on Palestinian trees in the occupied West Bank over the year 2023 (especially after the seventh of October 2023), resulting in the uprooting of more than 8,800 productive trees, 90% of which are olive trees while the other trees that were uprooted are almond, grape, citrus and forest-trees⁹.

8 <https://www.ohchr.org/en/press-releases/2024/10/israel-must-stop-violent-settler-attacks-palestinian-farmers-threaten-their>

9 <https://www.arj.org/ar/latest-ar/olive-ocu-2023/>

2. Key Challenges of Investing in Green Infrastructure during Relief, Rehabilitation and Recovery phases

Investing in green infrastructure in Palestine during the relief, rehabilitation and recovery phases constitutes a multidimensional challenge, stemming from the complex crosscutting between political, social, economic and environmental factors. While green infrastructure is an urgent necessity to promote climate change adaptation and achievement of sustainable development, these efforts are hampered by significant obstacles represented by the Israeli occupation, weak public policies, and limited funding for sustainable projects. In addition, institutional and societal challenges highlight the need for local capacity building, finding innovative solutions adapted to constraints imposed on resources. In this context, this section seeks to review the main challenges facing green infrastructure investment, with a focus on the factors that affect the integration of these projects into relief and recovery plans in the short and medium term.

Despite the specificity of the Palestinian context, international experiences in this field can be used. Experiences of post-conflict countries such as Afghanistan and Syria (UN Habitat, 2022; Kamjou et al., 2024, demonstrated that investing in green infrastructure is not only a means of economic and social recovery, but also a tool to enhance environmental resilience and address climate changes. After decades of war in Afghanistan, the Afghan government began cooperating with international organizations to develop solar and wind energy projects as part of reconstruction efforts, including water management, dam construction, waste recycling, mechanized agriculture and desertification fighting¹⁰. In Syria, as well, there are local initiatives aimed at replanting conflict-affected areas, such as tree-planting and using sustainable farming techniques. Moreover, in Iraq, projects have been implemented to improve water management and sustainable agriculture, despite security challenges. In this context, this section addresses the main challenges facing investment in green infrastructure in Palestine, highlighting how to leverage global models to overcome these obstacles and ensure that green infrastructure is integrated as an essential part of relief and recovery strategies.

2.1 Political Instability

The Israeli occupation of the Palestinian territories in the West Bank and Gaza Strip is the main obstacle to sustainable development efforts, as most of the sustainable development goals, include environmental dimensions. After the seventh of October, as mentioned earlier, the frequency of Israeli attacks on various environmental elements have increased, whether in the Gaza Strip or in the West Bank.

The approach towards renewable energy is one of the most prominent policies adopted and supported by the Palestinian government during the past decade in the field of transformation towards green infrastructure, and as a means of gradual disengagement from the Israeli energy sector, and the provision of clean and environmentally and financially sustainable energy sources. However, government efforts and private sector investment in the field of renewable energy have been faced with the complexities of the security scene and the difficult political reality in the Palestinian territories. According to the Investment Promotion and Industrial Estate Agency (IPIEA) in Palestine,¹¹ Palestine enjoys a fertile environment for renewable energy through 300 sunny days throughout the year, and a solar radiation rate exceeding 2,000 kWh per square meter. However, the

¹⁰ <https://www.ilo.org/resource/news/afghanistan-would-benefit-just-transition-green-economy-workshop-hears>

¹¹ <http://www.pipa.ps/files/file/Value%20Proposition/AR/PIPA-%20Renewable%20Energy%20Sector%20VP%20Booklet-%20Arabic.pdf>

majority of unused areas, representing a significant opportunity for renewable energy investments, are located in areas classified as “C” under the administrative classifications imposed by the Oslo Accords, constituting 61 percent of Palestine’s land in the West Bank, in which Israeli occupation manages civil and security affairs. Israeli restrictions pose a formidable challenge to investment in renewable energy, especially large projects with high economic feasibility, due to the complex and prolonged procedures for obtaining licenses to establish solar power plants, which are often not granted to investors under security pretexts. The occupation also destroyed many solar energy projects and initiatives in communities in areas classified as (C) (Abu Mezied, 2023), which the government and its supporters provided to strengthen the resilience of citizens. In the Gaza Strip, too, solar energy investments and initiatives have witnessed remarkable growth, especially after the year 2006, as an alternative to the problem of power cuts, which was only available for a few hours a day (4-8 hours in the best-case scenario). After 2013, affluent Palestinian households in Gaza turned to solar photovoltaic systems to generate electricity, resulting in an increase in the number of installed systems from 591 in 2015 to 8,760 in 2019 and an increase in the area covered by panels from 115 square meters in 2012 to 20,000 square meters in 2019 (Abu Mezied, 2023).

In recent months, the pace of land confiscation has increased, and the occupation has multiplied restrictions on the utilization of Area “C”. New restrictions have been added to areas classified as “B”, over which the occupation has declared administrative control through the extremist Minister of Finance Smotrich¹², who has begun carrying out demolitions of homes and structures classified by the occupation as illegal. This means that any investments in the field of renewable energy or in the agricultural sector in the West Bank will be faced with current and future obstacles that the occupation is expected to impose, especially since there is a high tendency to work rapidly on the plan to annex the West Bank after Trump won the last U.S.A elections and will take office in early 2025, according to the statements by the leaders of the occupation. In the Gaza Strip, the occupation continues to destroy all necessities of life in the northern Gaza Strip and destroys residential neighborhoods and agricultural properties, turning them into security islands inside the Strip. This increases the significant deterioration of the environment and biodiversity in the Strip, increases demographic pressures and limits agricultural areas or those suitable for renewable energy projects.

2.2 Weak Public Policies and Funding

There is no doubt that political and economic crises plaguing the Palestinian territories as a result of the Israeli occupation significantly affect all government endeavors to achieve inclusive economic, social and environmental development, and its ability to implement the plans and policies it develops for itself. Recent years have witnessed increasing interest in Palestine in initiatives to shift towards a green economy, especially in the field of renewable energy utilization, which was represented in many prominent initiatives carried out by various parties. Such efforts reflect the growing awareness of the importance of investing in the environmental aspect, and its role in promoting economic growth and achieving sustainable development goals and being in line with global approaches in this regard.

1.2.2 Clean Energy and Electric Vehicles

In promoting the transition **towards clean energy**, the Energy Authority, in cooperation with partners, was able to achieve about 92% (119 MW) of the targets included in the renewable energy strategy, which targeted providing 10% of the total electricity used from clean energy

¹² <https://www.palestinechronicle.com/further-steps-towards-annexation-smotrich-moves-to-expel-palestinians-from-area-b/>

sources by 2020, which is equivalent to 130 MW (Prime Minister's Office, 2020). The Energy and Natural Resources Authority's vision also aims to develop the power generation capacity through gas-fired plants, along with the expansion of solar power plants to reach more than 500 megawatts of solar photovoltaic energy by 2030. As for **green economy**, the debate in this regard has begun early in Palestine. In 2017, the Project of "Creating an Enabling Environment for Business within the Concept of Green Economy" was launched. It was funded by the European Union, managed and implemented by the Palestinian Trade Center "PalTrade", in partnership with the Environment Quality Authority, the Ministry of National Economy, the Ministry of Tourism and Antiquities, the Ministry of Agriculture and the Palestinian Federation of Industries.¹³ The project aimed to develop a national policy that would promote business within the concept of "green economy", which simulates the thought keen on the environment, natural resources, the rights of future generations, and the production of environment friendly products and enhances their presence locally and globally. However, the project's outputs did not meet the hoped due to the absence of government policies supporting the green economy as well as the absence of joint work between various government bodies.

Despite the efforts paid to promote the transition towards green infrastructure and a sustainable economy in Palestine through prominent initiatives such as the Sustainable Production and Consumption Plan, the Renewable Energy Strategy, and internationally funded green economy projects, these initiatives show significant gaps that obstruct the achievement of sustainable and widespread impact. On the one hand, these initiatives reflect a growing awareness of the importance of the transition towards sustainable development and its role in strengthening the Palestinian economy in light of political and environmental challenges. On the other hand, the gaps are clearly visible in the weak coordination between the concerned institutions, and the absence of an integrated national vision that unifies efforts and directs them towards achieving strategic goals, and sets clear and realistic priorities crosscutting environmental, economic and social goals. There is also a lack of integration between environmental policies and other sectoral policies, such as industry, transport and agriculture, which limits the achievement of the overall impact of sustainability. In addition, many initiatives demonstrate weaknesses in supportive infrastructure and implementation on the ground, as they are limited to small or pilot projects and do not rise to the level of large-scale projects of a wide impact. Many of them also lack financial and institutional sustainability, as they heavily rely on donor support without a clear plan to ensure their sustainability in the long run. Moreover, the lack of technical capacity, both in government institutions and in the private sector, reflects a significant gap in the capacity to transform these initiatives into practical and integrated action programs. In addition, there are no effective monitoring mechanisms to ensure compliance with environmental and sustainability standards, such as practices in the construction or agricultural sector, the absence of integrated legislations and policies that support the implementation of major green infrastructure projects, and the absence of a strong incentive system for investors in this sector.

Although the government has adopted the general strategy **for renewable energy**, there are many legal and regulatory challenges. The infrastructure for transmitting electricity from renewable sources suffers from significant weakness, as there are more than 250 connection points with the Israel Electricity Company in the West Bank, and 10 connection points in the Gaza Strip, but the goal of the National Transmission Company to unify the connection points to become only 10 points is still elusive due to the geopolitical situation that does not allow connecting the grids (Khalidi et al., 2022). Preliminary estimates also indicate that the existing grids are limited to

¹³ <https://www.raya.ps/news/1096131.html>

accommodate the electricity targeted in the National Renewable Energy Strategy, as they can accommodate no more than 50% of the targets of achieving 500 MW by 2030 (PENRA, 2021).

The shift to **electric vehicles holds** a promising set of returns and positive impacts on the significantly challenging environmental development in Palestine, as electric vehicles can significantly reduce greenhouse gas emissions and air pollution. Furthermore, the use of electric vehicles can enhance energy security by reducing dependence on imported fossil fuels and can stimulate economic growth through the development of local electric vehicle sector, thereby promoting job creation and innovation. However, the ecosystem for switching to electric vehicles faces many challenges, including the need for significant infrastructure investments in charging points, upgrading the electricity grid, and providing reliable sources of power generation; in addition to weak supportive policies and regulations, including incentives and standards for electric vehicles (MAS, 2024).

1.1.2 Green Public Procurement

Green or sustainable public procurement is an effective and critical tool for enhancing the environment and reducing the negative impacts of unsustainable consumption and production. The website of the Supreme Council for Public Procurement Policies indicates that the total annual spending on public procurement¹⁴ is estimated at about \$ 750 million, constituting about 22% of the total net government spending. The share of public procurement in the Gross Domestic Product GDP of the West Bank is about 12.3% (including purchases of health services and medical referrals). However, any future efforts to enhance the environmental dimension of public procurement face many legal and regulatory challenges. The legal framework related to public procurement includes many gaps or challenges that limit its effective implementation in sustainable public procurement. There is a lack of systems that effectively and genuinely support sustainable public procurement, not in the legal texts themselves, which leads to a lack of clarity on how sustainability principles are applied. There is also a gap in detailed instructions and guidelines and mandatory standards in standard documents on ways to achieve sustainability, especially in terms of realizing energy efficiency, environment protection, and green building. The standard regulations and documents for public procurement in Palestine depend only on direct cost, but there is no assessment or considerations of indirect impacts on the environment, with the absence of any mandatory standards or policies to enhance the environmental and social dimension, which requires effective mechanisms to ensure compliance with sustainable policies in the environmental and social fields, and regular examination of reports and performance.

3. Possible Priorities and Policies to Promote Climate Adaptation and Investment in Green Infrastructure

After reviewing the status quo of green infrastructure in Palestine, including its intertwined political, environmental and economic challenges, and highlighting institutional gaps and poor coordination between stakeholders, it is clear that addressing these challenges requires a clear vision and thoughtful interventions. Analysis of existing policies and initiatives also shows the importance of building on efforts paid to promote environmental sustainability, while addressing implementation shortcomings and ensuring project sustainability.

Based on these data, the recommendations section provides a roadmap to enhance environmental sustainability, through the adoption of practical policies and innovative strategies that contribute

¹⁴ <https://www.shiraa.gov.ps/News/Id/54>

to promoting climate adaptation and developing a green infrastructure that supports sustainable development in Palestine.

3.1 Reconstruction in the Gaza Strip within an Inclusive Environmental Vision

The systematic destruction of the Gaza Strip after the seventh of October has caused serious environmental damage not only to the destruction of infrastructure, but also to the continuous deterioration in the quality of potable water, the destruction of the agricultural sector, which is a vital source of food security and biodiversity, and the pollution of groundwater due to the leakage of untreated sewage, which exacerbates the repercussions of epidemics and diseases in the deteriorating health conditions. This systematic and ongoing environmental destruction poses a direct threat not only to the health of the population in Gaza, but also a long-term challenge to sustainable development efforts in the region and it requires urgent interventions in order to mitigate these repercussions and begin the process of rehabilitating the damaged environment.

In the medium term, the integration of solar cell technology into buildings is an essential step towards achieving energy sustainability and reducing dependence on traditional energy sources. In addition to the importance of exploiting solar energy in residential buildings and public institutions such as schools and hospitals, which contributes to providing clean and renewable energy, and therefore reduces environmental pollution and relieves pressure on the local electricity grid. Solar panels can be installed on roofs or in available spaces on buildings to achieve the most benefit of sun rays, which helps generate electricity for lighting, heating and cooling needs, as well as the possibility of storing surplus energy for use at peak times. The use of solar panels also contributes to reducing the energy bills of households and institutions, which reduces the financial burden on the population. Moreover, the integration of this technology into buildings contributes to creating a healthy environment by reducing carbon emissions, supporting environmental sustainability, and enhancing the Gaza Strip's ability to adapt to future environmental challenges.

In the long term, the reconstruction of the Gaza Strip is a strategic opportunity to implement the principles of green building, which aim to use environmentally friendly building materials and techniques that contribute to reducing negative impacts on the environment. The reconstruction in Gaza should include innovative designs that consider energy and water sustainability, with a focus on the use of local and sustainable construction materials to reduce carbon emissions. It is also important to ensure energy efficiency in the reconstruction through using thermal insulation, solar panels, and energy-efficient lighting systems. Greywater recycling systems must be established, and waste management techniques must be used effectively, which ensures that pollution and uncontrolled accumulation of waste is reduced. In addition, urban afforestation and the use of green roofs that improve air quality and contribute to heat insulation must be promoted, thereby reducing the effects of climate change. Adopting green construction in the reconstruction of Gaza will not only contribute to avoiding environmental damage but will also contribute to creating a healthy and sustainable housing environment for the residents of the Strip.

The reconstruction process of the Gaza Strip, after the widespread destruction of its infrastructure, residential and public buildings, requires the adoption of a comprehensive green environmental vision within a strategic vision for green reconstruction, focusing on promoting environmental sustainability and protecting natural resources. Reconstruction priorities should be geared towards minimizing the negative environmental impacts of war, such as water and soil pollution and waste

accumulation. This requires the adoption of sustainable construction techniques and the use of environmentally friendly materials, as well as enhancing the Gaza Strip's ability to recycle waste and improve wastewater management. Furthermore, it is essential to restore damaged vegetation by promoting sustainable agriculture to provide food security and protect biodiversity. Adopting this green environmental vision is not only about rebuilding what has been destroyed by war, but it represents a step towards creating a healthy, safe and sustainable environment for future generations in Gaza.

It is important to establish wastewater treatment plants and reuse the water for agriculture or irrigation, taking into account green practices such as biological water treatment techniques and plant-based systems, reusing wastewater from homes (such as bathing, washing and sink water) after treatment which can contribute to relieving pressure on treatment plants and providing water for agricultural irrigation, using advanced filtration and treatment technology such as reverse osmosis and bio sand filters, and designing treatment plants to rely on Solar energy to operate the necessary equipment. This will reduce traditional energy consumption and will contribute to reducing the carbon footprint of these plants. There is also an urgent need to treat the soil from rocket residues, gunpowder and toxic substances resulting from the use of internationally prohibited weapons in the destruction of the Gaza Strip, through the adoption of several innovative and effective practices. For example, using certain plants that are able to absorb toxins and heavy metals from the soil¹⁵, applying insulation or mulching techniques to trap toxic substances and prevent their leakage into the surrounding environment.

2.3 Developing a Comprehensive Strategic Vision for Green Infrastructure in the West Bank

As mentioned earlier, Palestine currently lacks a comprehensive and integrated strategic vision that supports the development of green infrastructure, which leads to the fragmentation of efforts between government agencies and the private sector, and the failure to make full use of available resources and opportunities. A clear strategic vision will ensure that policies and resources are directed towards achieving specific and ambitious national goals. It is important that this vision includes achieving a qualitative leap in the use of natural resources through sustainable and environmentally friendly technologies, reducing dependence on imported resources, such as traditional energy. This can be achieved by expanding the use of renewable energy and strengthening the resilience of Palestinian areas, especially Area C, through innovative green projects. This certainly requires a range of important policies and interventions, whether in the field of renewable energy, sustainable transport, green public procurement, sustainable agriculture, and others.

- **In the field of renewable energy**
 - Developing legislations and policies related to the renewable energy sector for promoting private investment, in particular an explicit legislation on tenders for projects that can be implemented on government land, defining the responsibilities and obligations of the relevant authorities with regard to the implementation of renewable energy projects, improving licensing procedures for renewable energy plants, and procedures related to complaints, developing legislations related to grid code, and a legislation to reduce distortions on the grid **(Khalidi et al., 2022)**.
 - Modernization existing electricity grids, which have become dilapidated in many cities and cannot afford the quantities of renewable energy that can be generated from investment projects.

¹⁵ <https://daily.jstor.org/in-phytoremediation-plants-extract-toxins-from-soils/>

- Providing government support for the construction of conveyor lines between generation plants and distribution grids.
 - Providing long-term sovereign guarantees to private sector investors
 - Identifying and allocating lands near connection points for the purpose of establishing solar power plants.
 - Unifying and abiding by the principles of public-private trade agreements, such as power purchase agreements.
- **In the field of adopting sustainable public procurement policies:**
 - Promoting the adoption of comprehensive institutional policies and strategies by government institutions in Palestine that support sustainable procurement, while improving the regulatory and guidance system to ensure the continuity and expansion of these practices in a systematic and sustainable manner.
 - Addressing private sector and suppliers' concerns about the potential additional costs of implementing sustainable practices, by providing the necessary technical support to private suppliers, motivating suppliers to switch towards sustainability practices, and prioritizing suppliers who adhere to practices that create positive environmental and social impacts in government contracts.
 - Developing a manual by the Environment and Natural Resources Quality Authority in cooperation with the relevant institutions on "sustainable production and consumption" that includes clear environmental and social standards for the private sector to adopt in its production processes. There should be also a close cooperation between the relevant government agencies, the private sector and universities in order to develop joint programs and entrepreneurial initiatives that support the transition towards green production and encourage innovation in this field.
 - **In the field of Sustainable Public Transport (MAS, 2024)**
 - Strengthen the regulatory framework in the context of promoting sustainable transport, as the current Traffic Law does not directly address environmental aspects.
 - Promoting the transition towards green transport through the development of the public and smart transport sector, as the use of public transport is an effective way to reduce the movement of vehicles, thus reducing traffic congestion and emissions resulting from vehicles. This requires policies or legislation that enable municipal-level transportation systems to switch to electric public transport models.
 - Encouraging the adoption of electric buses in the public transport sector, as it is applied in many countries of the world.
 - Collaborating with private sector institutions and foreign investors to build an extensive network of fast-charging and convenient electric vehicles charging stations to promote the adoption of electric vehicles.
 - Encouraging private sector investment in electric vehicle infrastructure, such as charging stations, fast-charging networks, and battery replacement facilities, and providing incentives and support to attract private sector investors.
 - Developing national and regional standards for charging station infrastructure, particularly for charging points deployed in public transport systems.
 - Strengthening legal measures that limit unlicensed cars and passenger-transporting by

private vehicles and enacting strict laws on winter examination and carbon monoxide emissions. In addition to following up the work of car slaughterhouses, installation shops and illegal spare parts, especially in area "B".

- Encouraging the recycling of vehicle waste, especially damaged tires (caoutchouc and plastic), which are considered one of the main soil pollutants as they are made of rubber, and when burned, they enhance carbon dioxide emissions and other hazardous gases.

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