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Compounding Vulnerability: Impacts of Climate Change on Palestinians in Gaza and the West Bank

MICHAEL MASON, MARK ZETTOUN and ZIAD MIMI

Abstract

This paper explores the implications of climate change for Palestinians in the occupied Palestinian territory, through a focus on vulnerability pertaining to water provision and the agricultural sector. Climate vulnerability is understood as exposure to climate-related hazards in the context of social vulnerability. Climate models project, over the course of this century, increased mean temperatures and decreased rainfall for the Eastern Mediterranean, suggesting reduced freshwater availability and poorer food growing conditions. The coping mechanisms that Palestinians have already developed in the face of climate variability and the physical manifestations of the Israeli occupation would be strongly tested by the forecasted impacts of climate change. It is argued that, contrary to technical-managerial framings of climate risk, the Israeli occupation is constitutive of Palestinian climate vulnerability, eroding those living conditions and livelihoods already sensitive to water-related stresses. Israeli military and security practices impair existing coping mechanisms, force new ones, and generally compound the overall level of vulnerability to climate change.

Compounding Vulnerability: Impacts of Climate Change on Palestinians in Gaza and the West Bank

“It is within the context of occupation that Palestinians are particularly vulnerable to climate change... [and] face severe restrictions in terms of our capacity to adapt to climate change,” Palestinian Authority Prime Minister Salam Fayyad, Copenhagen, 16 December 2009

“We have to separate environment from politics... The Mediterranean requires a multilateral [environmental] taskforce independent of political disputes,” Israeli President Shimon Peres, Copenhagen, 17 December 2009

In December 2009, the world’s media descended on Copenhagen to cover the fifteenth conference of the parties (COP15) of the United Nations Framework Convention on Climate Change (UNFCCC). The negotiations, undertaken to produce a new climate agreement, were widely regarded as a failure in the light of the adoption of the non-binding Copenhagen Accord. Yet the Accord did include acceptance of the scientific judgement of the Intergovernmental Panel on Climate Change (IPCC) that deep cuts in greenhouse gas emissions are required to hold projected increases in global mean temperature to 2⁰C (compared to pre-industrial levels). Warming above 2 degrees is taken to be “dangerous anthropogenic interference with the climate system,”¹ which Parties have an obligation to prevent under Article 2 of UNFCCC. There remain uncertainties about how much mean temperatures will rise in relation to predicted greenhouse gas emissions and concentrations, but the IPCC confidently predicts further anthropogenic warming this century if emissions continue at or above current rates.

At the Copenhagen meeting 130 heads of state and government affirmed their commitments to address climate change, including Palestinian Authority (PA) Prime

Minister Salam Fayyad and Israeli President Shimon Peres. Observers hoping that shared climate risks would be an area for Palestinian-Israeli cooperation were to be disappointed. Both leaders acknowledged that significant climate change impacts were forecast by the end of this century for the Eastern Mediterranean region: these impacts, Fayyad noted, included decreased participation, significant warming, a tendency towards more extreme weather events, and a rise in sea-level.² There was also a shared recognition that the key hazards posed by these changes—greater water scarcity, falling agricultural productivity, an increased probability of flashfloods and saline intrusion into groundwater—will be accentuated by a growing regional population.

There the commonality of concerns ended. “Carbon molecules carry no passport,” stated Peres,³ as he invited Israel’s neighbours—including the PA—onto a regional environmental taskforce to tackle climate change. Rejecting this offer, the Palestinian delegation stated that the inhabitants of Gaza and West Bank have long been denied such freedom of movement. Indeed, the Palestinians had only been granted limited access to COP15, as Observers, following lobbying by the Arab League and, in his statement at Copenhagen, Salam Fayyad highlighted the difficulties of representing a territory under occupation, whose full membership of UNFCCC could only come with the assumption of sovereign statehood. The frustrations of a contested Palestinian representative⁴ and the long-term impacts of climate change may be the last concern of Palestinians suffering the daily effects of political strife and conflict. Farmers living in Gaza who grow crops in brackish water only to see them barred from export markets do not have the luxury to consider climate change projections; nor do the herders in the southern Hebron hills routinely subject to settler violence.

But while climate change is not the most pressing issue for Palestinians in the West Bank and Gaza, the climate risks are significant and will compound the current hazards posed by the Israeli occupation. As confirmed by recent United Nations

Development Programme (UNDP) consultations on climate adaptation in the occupied Palestinian territory (oPt),⁵ the impacts of climate change on the livelihoods of most Palestinians pale in comparison with the effects of the Israeli occupation.⁶ The “climate vulnerability” approach employed in this article is a direct attempt to reconcile this tension between immediate living conditions and “external” climate impacts. It thus adds to the understanding of the effects of the occupation, as well as challenging those views—such as the Israeli position at COP15—that claim it is possible to separate environmental issues from politics. We argue that the expected effects of climate change are likely to compound the negative effects of the occupation, primarily through impairing existing coping mechanisms or forcing new ones. We also discuss how the discourse around climate change affects not only Palestinian living conditions and livelihoods but also state-building efforts.

CLIMATE CHANGE AND VULNERABILITY

In climate research, vulnerability is taken to mean the propensity of people or systems to be harmed by hazards or stresses, and is determined by “their exposures to hazard[s], their sensitivity to the exposures, and their capacities to resist, cope with, exploit, recover from and adapt to the effects.”⁷ There is a claim that climate change is altering exposures to climate-related hazards, understood as extreme weather events (e.g. flooding, extreme heat, droughts) which may trigger various societal shocks (e.g. falls in food productivity or population displacements). What the IPCC labels “key” vulnerabilities to climate change—those meriting policy attention as symptomatic of dangerous anthropogenic interference with the climate system—are seen to depend on the magnitude, timing and distribution of climate impacts.⁸ While early IPCC formulations

avored biophysical framings of climate impacts and ecosystem vulnerability, it is now recognized that vulnerability to climate change properly extends to the socio-economic and political conditions that affect how communities cope with the impacts of climate-related hazards. This has led to a more integrated understanding of vulnerability, which is designed to capture the role of non-climatic pressures on individuals and groups who are also facing climate hazards.⁹

This broader perspective is in line with the definition adopted here, where climate vulnerability refers to the exposure to climate-related hazards in the context of social vulnerability, as well as in relation to response capabilities in both the short-term (coping with the effects) and long-term (adapting to the effects). We claim that, as is the case in many other contexts, climate vulnerability is less about changes in physical systems than the political-economic contexts in which “climate risk” is constructed and produced.¹⁰ The substantive discussion below reports on climate vulnerability as the perceived risks of Palestinians to water-sensitive living conditions and livelihoods in Gaza and the West Bank, with forecasted climate impacts expected to compound the harmful ecological effects of occupation.

Coping with, or adapting to, “climate risks” must be seen in the context of political-economic settings. Alongside other countries in the Middle East and North Africa, the oPt faces significant reductions in water availability as a result of climate change. Yet there are major differences in regional adaptive capacity relating to institutional structures and resources. For example, Egypt has reduced river flow variability through the construction of the High Aswan Dam; while oil rents in the Gulf states have enabled them to overcome physical water scarcity through heavy investments in seawater desalination. Rich Arab countries may also overcome physical water scarcity, which can threaten food security, by importing food—and the water used in its production (“virtual water”).¹¹ Poorer Middle Eastern states less integrated into the

global economy have fewer such policy options available to develop their adaptive capacity in the face of forecasted climate change. For the oPt that adaptation space is even more restricted.

Climate vulnerability in the occupied Palestinian territory

The construction of climate vulnerability in the oPt has been donor driven, led by the UNDP (New York) headquarters as part of its worldwide Adaptation Programme assisting poorer countries in their responses to climate change. Since 2008, the UNDP Programme of Assistance to the Palestinian People (UNDP/PAPP) has funded PA capacity-building for climate adaptation, which in 2010 resulted both in the publication of a *Climate Adaptation Strategy and Programme of Action for the Palestinian Authority* and, by Cabinet decision, the creation of a Palestinian national committee on climate change.¹² This is a significant shift in political attention given that climate change was not mentioned in the *Palestinian Reform and Development Plan 2008-10* and, until the creation of the national climate committee, had not been considered as a policy challenge by the Palestinian Water Authority and Ministry of Agriculture. The UNDP-funded climate change initiative was designed to assist the Environmental Quality Authority, as lead PA agency on environmental protection, develop the institutional capacity to assess and manage climate risks. In so doing, UNDP headquarters promoted a technical-managerial framing of climate vulnerability, which—at least in the oPt—clashed with the conflict-laden experiences of governmental, NGO representatives and even UNDP/PAPP staff during the “stakeholder” consultations on climate change adaptation.

This technical-managerial notion of climate vulnerability rested, firstly, on the uncritical adoption of scientific projections from global and regional climate models, reading off climate risks from simulated environmental changes. Such projections carry international scientific authority, even when acknowledging simplifying assumptions and

uncertainties, and feature stark scenarios for the Eastern Mediterranean. The IPCC predicts that warming for the Southern Europe and Mediterranean over the 21st century will be greater than global annual mean warming-between 2.2 and 5.1⁰C according to a credible emissions scenario. Annual mean precipitation is deemed “very likely” to drop in the Mediterranean-decreasing between -4 and -27% with an increased risk of summer drought.¹³ Climate projections to 2100 derived from higher-resolution regional climate models applied to the Eastern Mediterranean generally confirm IPCC predictions, with temperature rises of 3.5⁰C to 4.8⁰C and decreasing winter participation up to 35%. They also identify a tendency towards more extreme weather events, including a greater number of heat waves and heavier spring storms, though there is more uncertainty here than with temperature and precipitation projections.¹⁴ Lastly, sea levels in the Eastern Mediterranean are forecast by Israeli scientists to rise by 10cm every decade, which is consistent with global estimates of a 0.6-1.6m increase by the end of the century.¹⁵ There is some scientific research claiming already to have identified warming and increasing aridity in Israel and the oPt.¹⁶ However, regional climate model simulations have failed to reflect significant environmental variations within the oPt, even though these were used to generate the climate impact forecasts employed in the UNDP consultations on Palestinian climate vulnerability.¹⁷

Secondly, the UNDP construction of climate vulnerability in the oPt highlighted climate risks as a humanitarian threat, placing them within the policy realm of disaster risk management and emergency response operations. Current high levels of food and water insecurity in Gaza and the West Bank are forecast to be exacerbated by climate change, on account of worsening food growing conditions (the agricultural sector consumes over two-thirds of water abstracted or flowing from springs in the oPt) and a fragile water supply infrastructure.¹⁸ Combining population growth forecasts and regional climate change projections, it has been estimated that the oPt will experience a water

deficit of 271 million cubic meters a year by 2020.¹⁹ Given limited institutional capacity for disaster risk reduction in the PA, representing climate vulnerability as a humanitarian concern sustains the “emergency imaginary” of chronic human insecurity in the oPt—one that reproduces the dependence of the population on substantial flows of international assistance and, at the same time, the interventions of external actors.²⁰ Indeed, there is increasing interest from donors in financing climate change adaptation and mitigation activities in the oPt: the donor lead on climate change taken by UNDP is significant here as the agency serves as one of the main conduits for bilateral and multilateral aid allocated to Gaza and the West Bank.

Thirdly, UNDP’s commitment to capacity-building for the PA has also reinforced a technical-managerial framing of climate vulnerability. Developing Palestinian administrative capacity for climate risk management has become another opportunity to inculcate “good governance” norms into the PA supportive of the Quartet agenda; that is, the existence of a Palestinian national authority co-existing peacefully with Israel while embracing democratic governance and market liberalism.²¹ While represented as consistent with UN principles of impartiality and neutrality, the political character of this state-building work was soon evident from the UNDP climate initiative, with Hamas governmental representatives not invited to stakeholder consultations, including meetings in the Gaza Strip. Since the *Second Intifada*, international support for Palestinian governance institutions has reflected US and European interests in fostering a compliant PA at the same time as undermining “rejectionist” groups, including Hamas and Islamic Jihad.²² If the reconciliation pact signed in May 2011 by Fatah and Hamas representatives has now upset this strategy, the Oslo-born PA is still regarded by most of the international community as the sole legitimate political authority for the Palestinian people. The attendance of Prime Minister Fayyad at the Copenhagen climate conference, alongside Palestinian participation in subsequent UNFCCC meetings, indicates an

awareness that the exercise of regulatory authority on climate change is another useful signal to external audiences that the PA is a governmental body ready to assume sovereign powers.

In its climate initiative for the PA, UNDP represented Palestinian climate vulnerability as largely a technical-administrative challenge in the management of ecological risks—notably the increased risk of drought and water scarcity in relation to agricultural livelihoods and public health. However, a series of consultations and workshops conducted by the UN agency between November 2008 and August 2009 in the oPt soon made this “post-conflict” framing untenable. Feedback from governmental officials, scientists and NGO representatives identified occupation-related conditions as constitutive of the vulnerability of Palestinians to climate variability and change. Above all, these conditions relate to the appropriation of Palestinian water and land resources by Israel; for example, most of the best agricultural land in the Jordan River Valley is taken by Israeli settlements, while over a third of arable land in Gaza is effectively not accessible to farmers because it falls within IDF-declared “no-go” and “high-risk” zones adjoining the border.²³ Similarly, the terms and procedures of the “Oslo II” Agreement effectively prevent bulk water imports of clean water into the Gaza Strip and the full development of irrigation in the West Bank. The discussion below sets out the trajectories of climate vulnerability mapped out at meetings in Gaza and the West Bank, as well as the coping strategies currently employed by Palestinians to address existing shortfalls in water and food availability.

VULNERABILITY PATHWAYS AND COPING STRATEGIES IN GAZA AND THE WEST BANK

Vulnerability pathways in the Gaza Strip

The UNDP climate change consultations conducted in Gaza in 2008/9 revealed a strong consensus among participants that its inhabitants as a whole have *high climate vulnerability*, though some communities are particularly exposed to climate-related hazards; e.g. residents of Jabalya and Khan Younis, due to recent storm water overflows, and residents of inland low lands, including neighbourhoods of Gaza City.²⁴ This view reflects the exposure of the population to multiple biophysical hazards and, despite a wide array of coping mechanisms, its low capacity to adapt over the long-term to the Israeli sanctions and blockade. The pathways of climate vulnerability identified by Palestinians in Gaza through the UNDP consultations are shown in Figure 1. Highlighted above all is the dominant role of the Israeli blockade (represented most often in the consultations as a “siege”) in co-producing vulnerability to climate risks: its direct and indirect effects were seen by stakeholders as significantly eroding conditions of public health and rural livelihood opportunities.

The left-hand side of Figure 1 reveals the impact of the blockade on land and water resources, including restrictions to off-shore fishing limits. Since December 2008 Israel has imposed a sea-border on Gaza of three nautical miles, severely impacting fishermen and reducing the fish catch in the Gaza Strip from 15,000 tons a month in 2000 to 15-20 tons a month in 2010.²⁵ Food insecurity is further compromised by barriers to external markets. The blockade has also cut off major sources of income from produce (generally strawberries, oranges and cut flowers) destined for Israel, Egypt or Europe.

The effects of the blockade on wastewater treatment is yet another conflict-related source of climate vulnerability. Untreated or partially treated wastewater (including the “sewage lakes” of the Northern Treatment Plant in Beit Lahiya and the rapidly growing raw sewage outflows around Khan Younis and Rafah) seep into the groundwater, further increasing nitrate and chloride levels, with associated health concerns.²⁶ This vulnerability is accentuated by Israeli military assaults, including the legacy of *Occupation Cast Lead*, which resulted in serious damage or destruction to 203 registered agricultural wells and four drilling wells, alongside damage to over 19,000 meters of water pipes. Furthermore, a direct hit to the embankment wall of the Az Zaitoun wastewater treatment plant caused a sewage spillage affecting 55,000 square meters of agricultural land.²⁷

Figure 1: Climate Vulnerability Pathways in the Gaza Strip.²⁸

[FIGURE 1 TO BE INSERTED HERE]

The current vulnerability of the residents of the Gaza Strip to the ecological ill-effects of conflict is compounded by expected longer-term risks of climate change set out on the right-hand side of Figure 1. Projected higher rainfall variability and decreases in precipitation were judged as threats to yields for rainfed agriculture and an additional strain on stressed groundwater resources. Increased temperatures are expected to accentuate this, because of greater groundwater pumping under conditions of increased evapotranspiration and desertification (particularly in the south).

The effects of worsening water quality reach even further. Israeli and Palestinian over-pumping of the coastal aquifer has been occurring for decades. The “sustainable limit” of the Coastal Aquifer has been estimated at 350 MCM/y, of which the Gazan portion is roughly 55 MCM/y.²⁹ Total pumping within the Gaza Strip in 2008 is estimated from roughly 100-170 MCM/y.³⁰ Not accounting for return flows, this means that the Gazan portion of the aquifer is already being over-drawn *two to three times its sustainable limit*. With the additional water stresses predicted from climate change and rapid population growth, the existing need for alternative water sources (e.g. significant transfers from southern Israel and/or a major desalination plant in Gaza) becomes even more pressing.

Palestinians living in the Gaza Strip already suffer the effects of severe water quality issues, the scale of which is difficult to exaggerate.³¹ Due primarily to its permeable and sandy cover, the transboundary coastal aquifer supplying groundwater to the Gaza Strip has a significant “intrinsic vulnerability” to pollution.³² Projected climate change-induced reductions in precipitation would exacerbate groundwater salinity levels through reduced soil flushing and groundwater recharge, while reductions in air moisture increase the soil water requirement of crops. Additional saline contamination of groundwater is expected with projected sea-level rise, compounding “natural” sources of salinization.³³

Community and household coping mechanisms in Gaza

A number of coping mechanisms have been developed by the residents of Gaza in response to climate vulnerability. In some cases, these mechanisms are impaired by the Israeli occupation: other coping mechanisms are less by choice than imposed by extreme conditions of life. In the most extreme cases, coping mechanisms develop and, as with the smuggling under the border with Egypt, ingenuity can be perceived as criminal activity. Whether impaired or enforced, these coping mechanisms carry their own risks, and may serve to perpetuate climate vulnerability.

An example of impaired coping comes from the wastewater dilemma—to send it to the sea, or to let it percolate into the groundwater. Under more “normal” conditions, the Palestinian Water Authority (PWA) and the Coastal Municipalities Water Utility (CMWU) would carry out an emergency upgrade to the Beit Lahiya wastewater treatment plant, while sending the sewage temporarily into the sea in order to avoid a grave public health risk. As both these options have been closed down by the Israeli blockade, the resource managers “cope” by shoring up the bank of the reservoir, thereby protecting the residents living on the edge, but letting the sewage contaminate the freshwater aquifer.

The development of private-sector water treatment plants exemplifies an “enforced” coping mechanism. In Gaza the increasingly poor drinking water quality has led to increased purchase of desalinated water from neighborhood-level reverse osmosis vendors, or the purchase of under-the-sink water filtration units. Both coping mechanisms contribute to the ever-greater share of household income spent on basic services, at least for those who can afford the option.³⁴ The quality of the water sold by the neighborhood vendors is not regulated and never tested. Contamination is very likely either at the source (because of poor maintenance) or during transportation (contaminants entering the jerry-cans and buckets used to transport the water). Even the water produced by the household filtration units remains biologically contaminated for

lack of proper maintenance. The PWA and CMWU have responded in turn by mixing sources of safe and unsafe water to increase drinking water availability at a marginally safer quality level. By notifying the residents when it supplies safe water (from a less polluted source) and when it supplies unsafe water—which may still safely be used for washing—the overall coping ability of the community is increased. But the resilience of such enforced coping mechanisms in the long-term is, at best, precarious.

While other coping mechanisms are more benign, their contribution to long-term adaptive capacity may not be. Coping with the water crisis in the agricultural sector is becoming evident through the selection of less water-intensive and more salt-resistant crops, such as dates. This practice is in fact a return to tradition, as water-intensive citrus production originated from the period of Israeli settlement in Gaza. Similarly, the lack of stock fertilizers on the market has led to farmers rediscovering organic methods (as well as the use of partially-treated wastewater). The piloting of solar food-drying techniques has resulted from shortages in cooking gas.³⁵ Yet if the worst-case climate change scenarios were to develop, with increased crop water requirements and decreased water quality and availability, such “benign” coping mechanisms may prove insufficient to sustain farming livelihoods. With that threshold breached, a new set of vulnerabilities may have to be faced, such as prospects for alternative livelihoods in an economy prevented from trading with the world.

Vulnerability pathways in the West Bank

As in the case of Gaza, living conditions and livelihoods in the West Bank are impacted by both the biophysical and political-economic co-production of climate vulnerability—specifically risks associated with decreased (and more variable) precipitation and risks associated with various aspects of the Israeli occupation. Given its large utilization of available water resources and importance as the key source of rural

livelihoods, agriculture is again the sector most sensitive to climate variability and change, particularly in the Governorates of Jenin and Tulkarem, and along the Jordan River Valley. This sensitivity is heightened by a reliance on rain-fed agriculture—94% of (non-settlement) arable agricultural land (166,000 ha) is rain-fed, with about two-thirds of this taken up by fruit trees (olives, citrus, grapes) and field crops accounting for most of the rest. While olive and some citrus trees are relatively resilient (and can tolerate several drier-than-usual seasons), yields of wheat and fodder crops are very sensitive to rainfall.³⁶

Groundwater, stored in aquifers and accessed primarily through wells, is by far the main source of water for the West Bank. Each of the three aquifers lying under the West Bank are transboundary with Israel. There is high variability in the recharge rates and sustainable yields of these aquifers, but the terms of Article 40 of the “Oslo II” Agreement dictate that Palestinians limit their abstraction to 20% of the estimated renewable potential. Debates are fierce over whether the estimated potential reflects actual sustainable yields. Israeli abstractions from 1995 to 2003 regularly exceeded the treaty- (80%) or physical limit (on average 72 MCM/y over the Oslo-II allocated abstraction).³⁷ The terms of this agreement also prevent any Palestinian drilling from the preferred aquifer basin (in terms of quality, quantity, and abstraction costs), and subjects drilling plans in the other basins to Israeli approval through the Joint Water Committee.³⁸

With groundwater resources in the West Bank abstracted at or beyond their sustainable limits, regional projections for climate change-induced precipitation decline and warming will, if accurate, exacerbate water quantity and quality stresses. Recent Palestinian research forecasts significant falls in aquifer recharge volumes and increased water salinization as a result of climate change, though with significant uncertainty attached.³⁹

The stakeholder consultations on climate vulnerability undertaken by UNDP in the West Bank revealed agreement on reduced rainfall as the most important climate risk

to rural livelihoods. This is shown on the right-hand side of Figure 2 by the various negative effects of reduced precipitation on groundwater supply and agricultural yields. Apart from reduced aquifer recharge rates, decreased rainfall is projected to lead to lower soil moisture, lower supply of water from Israel, less spring flow, and increased groundwater salinization. The lower agricultural yields associated with these changes are forecast to impact negatively on agricultural livelihoods, either directly through reduced incomes or indirectly through an expected loss of land ownership from leaving fields unplanted for three years (a Israeli land appropriation practice, enabled by an Ottoman-era law, discriminately applied in the West Bank).

Figure 2 also shows how a higher variability in precipitation as a result of climate change is expected to impact on agricultural yields and associated livelihoods in the West Bank. The altered intensity of rainfall and duration of growing seasons would have a number of major impacts. Firstly, periods of heavier rainfall will be concentrated in a shorter time, with consequent increased run-off and erosion from stormwater floods. Less water retained in the soil will result in lower pasture production, forcing farmers and herders to purchase (more) fodder. Secondly, reduced rainfall will result in a lower quantity of water harvested and stored in cisterns, impacting negatively on agricultural productivity. The altered growing season further puts crops (and yields) at risk, as seeds sown generally in the autumn in anticipation of late November rains risk spoiling if the rains are delayed to January.

Figure 2: Climate Vulnerability Pathways in the West Bank.⁴⁰

[FIGURE 2 TO BE INSERTED HERE]

It is also possible that increases in seasonal temperature variability and the frequency of temperature extremes may endanger cold- and heat-sensitive crops. Drought damage is expected to increase with reduced water availability, hotter temperatures and shorter winters. Under such conditions, more pests and pathogens will not only increase crop diseases but also their sensitivity to drought, and loss of biodiversity may reduce the natural control of agricultural pests. A delayed growing season would also cause the Palestinian agricultural sector to lose its advantage over countries in colder climates as an early exporter of flowers, fruits and vegetables.

The physical stress on water resources induced by climate variability and change in the West Bank is compounded by the Israeli occupation, as highlighted on the left-hand side of Figure 2. The diverse effects lead to more precarious livelihoods as well as increased tensions between communities, Palestinian ministries and Israeli authorities.

The numerous access and movement restrictions arising from the separation barrier, expanding settlements, and Israeli settler/military roads significantly impair agricultural activity. Palestinian farmers are prevented from gaining regular access to their lands and/or to markets, impacting directly on yields and rural livelihoods. Unchecked settler violence against Palestinian civilians and property (including crops and water infrastructure) constitutes also a routine impact of the occupation on rural Palestinian communities.⁴¹ Indeed, the potential for longer-term adaptation strategies is also compromised by Israeli occupational practices: for example, the restrictions imposed by the Separation Wall on Palestinian wells have significantly reduced availability of agricultural water for the northern West Bank.⁴²

Community and household coping mechanisms in the West Bank

Palestinians in the West Bank have developed a number of mechanisms to cope with the climate vulnerability they experience. At least from the time of Ottoman rule, sedentary farmers and Bedouins in the southern Hebron region have effectively adapted to periods of drought by shifting between livestock breeding and small-scale farming. That the Hebron Governorate still includes both the largest area in the oPt for barley cultivation and the highest concentration of farm animals suggests a continuing adaptive coordination between agricultural subsectors in response to varied conditions of food production. Historical adaptation to climatic hazards and other pressures on livelihoods is evident historically from the extensive remains of the *kehrab* (temporary villages) in the region—where land was not cultivated until environmental and market conditions were favorable. Until recently, it also remained common for rural incomes to be supplemented by family members gaining seasonal employment in nearby cities in the West Bank (e.g. the glass industry in Hebron) or in Israel. However, since the outset of the *Second Intifada* in 2000, Israeli work permits have become very difficult to obtain for Palestinians, and

income from traditional coping mechanisms has dried up. Many in the Hebron Governorate have turned to breeding small ruminants breeding to cope economically. Herd sizes have increased significantly in the past ten years, increasing human pressures on climate-stressed rangeland, triggering a vicious cycle of overgrazing and land degradation.⁴³

In the northern governorate of Tubas, which is economically dependent on agriculture, repeated drought periods have reduced springflow, limiting the time farmers have for irrigating their crops, and for producing second or third yearly harvests. As in the south of the Hebron Governorate, half the population of the Tubas Governorate is not connected to the Palestinian water network, making them dependent on rainwater harvesting, cisterns and tankers. Israeli movement restrictions block access to agricultural land for several villages in the region (e.g. around Al-Bikai'a). As with other Palestinian villages in Area C, these controls also mean that rural communities typically pay higher prices and suffer poorer water quality than would otherwise be the case.⁴⁴

Short-term coping mechanisms and long-term adaptation strategies alike are impaired in the Jordan River Valley. Dry years have also resulted in freshwater cuts from the Israeli water supplier Mekorot to southern regions of the Jordan River Valley (as was the case in 2008 also for domestic consumers in Israel), thereby limiting the number of harvests. These communities have had access to the rich farmlands adjoining the Jordan River blocked, or taken by settlements (approximately 27,000 dunums used by 7,000 settlers in 2006, compared with 53,000 dunums used by 47,000 Palestinians).⁴⁵ Compared to the effects of Israeli occupation practices, climate-induced water scarcity is negligible. It has been suggested that Israeli deep well extraction (for settlements) from the Eastern Aquifer has reduced groundwater levels, seriously impacting Palestinian springs and wells: less than 90 of the 184 agricultural wells in the Jordan River Valley are currently functioning.⁴⁶ There are signs that farmers are attempting to adapt to conditions of

greater water scarcity—for example, moving away from banana and citrus crops in the irrigated lands around Jericho—but movement restrictions prevent reliable and cost-effective access to external markets for alternative cash crops (e.g. eggplants, tomatoes, squash, maize) as well as livestock and dairy products

Traditional forms of household and community coping in the face of adversity offer rural models for Palestinian adaptation to climate change, but the ongoing effects of the Israeli occupation undermine the market conditions necessary to their operation—the free movement of goods and people—perpetuating the “de-development” of Palestinian economic and institutional capacity.⁴⁷ To be sure, Palestinian households and communities have had to cope with problems not directly linked to Israeli government policy—e.g. a financial crisis in the PA, fluctuations in food and fuel prices—but the absence of effective control of their natural resources is *constitutive of* the climate vulnerability of West Bank Palestinians.

CONCLUSION

The idea that Palestinians are vulnerable to climate change is largely the product of a donor agenda, which fused international concern over “dangerous” climate change with the emergency imaginary of chronic human insecurity in the oPt. Both the environmental and humanitarian discourses deployed here are authoritative: from climate modelling applied to the Eastern Mediterranean, climate scientists concur that projected warming is highly likely to cause hazardous biophysical impacts across the region, including Gaza and the West Bank; and unequivocal evidence on *current* food and water scarcity in the oPt provides (further) support for those who speak of a Palestinian humanitarian crisis. It is not surprising that agricultural livelihoods feature at the

convergence of these two discourses, as the agricultural sector consumes two-thirds of withdrawn water in the oPt and is sensitive to significant shifts in temperature and precipitation. Thus, the UNDP climate adaptation initiative for the PA focused on food- and water-related stresses in its construction of climate vulnerability pathways for Gaza and the West Bank.

For the UNDP, climate vulnerability was gauged by gathering “stakeholder” input on scientifically-derived climate projections, with a view to informing, and legitimizing, climate adaptation policy proposals for the PA. Developing climate governance capacity therefore became part of a state-building process anticipating a “post-conflict” future in which the PA assumes sovereign control of some Palestinian territory in Gaza and the West Bank. As noted above, this technical-managerial framing was disrupted by the insistence of stakeholders in Gaza and the West Bank that the Israeli occupation is constitutive of the vulnerability of Palestinians to climate risk. Whether for security or settlement purposes, Israeli appropriation and degradation of environmental resources in the oPt is by far the most immediate, as well as enduring, threat to Palestinian living conditions and livelihoods. The UNDP climate consultations also highlighted how Israeli military and security practices significantly weaken the capacity of Palestinians to cope with, and adapt to, climate risks.

Contrary to technical-managerial representations, climate change impacts in the oPt are inherently politicized, and it makes little sense to develop “post-conflict” climate impact assessments or governance institutions for the Palestinians without an end to the occupation. Indeed, some claim that the existing conflict could be exacerbated by climate change as asymmetries in per capita water between the oPt and Israel are accentuated.⁴⁸ Such claims are overblown: by itself water scarcity is not a robust predictor of violent conflict as virtual water and new water (e.g. seawater desalination and treated wastewater) can enhance adaptation to climate-induced water stresses. However, Palestinian calls for

equitable access to transboundary waters remain central to their aspirations for resource sovereignty. On this issue, it is instructive that, should serious final status negotiations resume, Israeli negotiators have cited forecasted climate change impacts as justification for *opposing* any reallocation to the Palestinians of shared groundwater supplies. Such a stance exposes as disingenuous the content and intent of the Israeli Prime Minister's call for regional cooperation over climate change.

¹ UNFCCC, *Decision 2/CP.15: Copenhagen Accord*. New York: United Nations, Document FCCC/CP/2009/11/Add.1, p. 5, <http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=4> (accessed April 12, 2010). “Climate change” in this article means “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere which is in addition to the natural climate variability observed over comparative time periods” (UNFCCC Article 1.2).

² Mr. Salam Fayyad, Address to UNFCCC COP15, Copenhagen, 16 December 2009, http://unfccc2.metafusion.com/kongresse/cop15_hls/templ/play.php?id_kongresssession=4150 (accessed April 12, 2010).

³ Mr. Shimon Peres, Address to UNFCCC COP15, Copenhagen, 17 December 2009, http://unfccc2.metafusion.com/kongresse/cop15_hls/templ/play.php?id_kongresssession=4164 (accessed April 12, 2010).

⁴ As Fayyad’s appointment as Prime Minister of an “emergency government” was not approved by the Legislative Council, its constitutional legitimacy is questionable and contested by the Hamas Government in Gaza and other parties.

⁵ Our use of the term “occupied Palestinian territory” follows the current nomenclature employed by the United Nations, including UN agencies working in Gaza and the West Bank. Unless otherwise specified, the use of the term “Palestinian” here refers to Palestinians living in the oPt.

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⁷ Neil Leary and others, “For Whom the Bell Tolls: Vulnerabilities in a Changing Climate,” in *Climate Change and Vulnerability*, ed. Neil Leary and others (London: Earthscan, 2008), p. 4.

⁸ Stephen H. Schneider and others, “Assessing Key Vulnerabilities and the Risk from Climate Change.” In *Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. M.L. Parry and others (Cambridge: Cambridge University Press, 2007), p. 784.

⁹ W. Neil Adger, “Vulnerability,” *Global Environmental Change*, 16, no. 3 (2006): pp. 269-281; Anthony G. Pratt and others, “Vulnerability Research and Assessment to Support Adaptation and Mitigation: Common Themes from the Diversity of Approaches,” in *Assessing Vulnerability to Climate Change*, ed. A.G. Patt and others (London: Earthscan, 2009), pp. 1-25.

¹⁰ David Demeritt, “The Construction of Global Warming and the Politics of Science,” *Annals of the Association of American Geographers* 91, no. 2 (2001), p. 307-337; Mary E. Petenger, ed., *The Social Construction of Climate Change* (Aldershot: Ashgate, 2007); Mike Hulme, *Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity* (Cambridge: Cambridge University Press, 2009).

¹¹ Tony Allan refers to the role that this virtual water plays as “economically invisible and politically silent.” Tony Allan, “Energy and Water: Interdependent Production and Use, the Remediation of Local Scarcity and the Mutuality of the Impacts of Mismanagement,” in *Renewable Energy in the Middle East*, ed. Michael Mason and Amit Mor (Dordrecht: Springer, 2009), p. 202.

¹² UNDP, *Climate Adaptation Strategy and Programme of Action for the Palestinian Authority* (Jerusalem, UNDP, 2010). The first meeting of the Palestinian national climate committee was held on 24th August 2010.

¹³ Jens H. Christensen, Bruce Hewitson and others, “Regional Climate Predictions”. In *Climate Change 2007: the Physical Science Basis. The Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. S. Solomon and others (Cambridge: Cambridge University Press, 2007), p. 854.

¹⁴ See especially: Akio Kitoh and others, “First Super-High-Resolution Model Projection that the Ancient ‘Fertile Crescent’ Will Disappear in This Century,” *Hydrological Research Letters* 44 (2008), pp. 1-4; Samuel Somot and others, “21st Century Climate Scenario for the Mediterranean Using a Coupled Atmosphere-Ocean Regional Climate Model”, *Global and Planetary Change* 63, nos. 1-2 (2008), pp. 112-26; Imad Khatib and others, *GLOWA-Jordan River-Project 3 Final Report: Regional Climate Scenarios* (Jerusalem: Palestine Academy for Science & Technology, 2009), Debbie Hemmings and others, “How Uncertain are Climate Model Projections of Water Availability Indicators Across the Middle East?”, *Philosophical Transactions of the Royal Society* 368 (2010), pp. 5117-35.

¹⁵ Office of the Chief Scientist, *Preparation of Israel for Global Climate Change: The Consequences of Climate Change in Israel and Interim Recommendations* [in Hebrew] (Tel Aviv: Ministry of Environmental Protection, 2008); Svetlana Jevrejeva and others, "How Will Sea Level Respond to Changes in Natural and Anthropogenic Forcings by 2100?" *Geophysical Research Letters* 37 (2007), L07703.

¹⁶ Ahmed El-Kadi, "Global Warming: A Study of the Gaza Temperature Variations in the Period 1976-1995," *Islamic University Magazine* 13, no. 2 (2005), pp. 1-19; Simon O. Krichak and others, "The Surface Climatology of the Eastern Mediterranean Region Obtained in a Three Member Ensemble Climate Change Simulation Experiment," *Advances in Geosciences* 12, (2007), pp. 67-80; Hemu Kharel Kafle and Hendrik J. Bruins, "Climatic Trends in Israel 1970-2002: Warmer and Increasing Aridity Inland," *Climatic Change* 96, no. 1 (2009), pp. 63-77.

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