

The Gaza Strip and the Climate Crisis

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Infrastructure and sanitation conditions in the Gaza Strip, one of the world's most densely populated areas, are extremely poor, including shortages of water, energy, electricity, food, and health services. Gaza's humanitarian challenge is likely to only worsen, given the demographic trends in the Strip and its acute vulnerability to climate change. While the defense establishment in Israel and the international community are aware of the gordian knot between the humanitarian situation and the security threat emanating from Gaza, they have not thus far considered the compounding impact of climate change. To analyze this issue and identify possible approaches for addressing the effects of climate change, the INSS, in cooperation with the International Committee of the Red Cross in Israel, held a closed workshop with representatives from Israel, the West Bank, Gaza, and the international community. Those attending included representatives of government agencies, academia, and civil society. Summarizing the main insights from the workshop, this article emphasizes that while Gaza poses immediate security challenges, it is imperative to design solutions from a broad perspective that takes long-term scenarios into account.

A contentious debate is currently taking place in Israel on how to deal with Yahya Sinwar, Hamas's leader in Gaza, who is inciting violence in the West Bank and inside Israel, while simultaneously benefiting from economic steps aimed at easing the humanitarian distress in the Strip. At the same time, it is important to keep in mind that in addition to the security dimension, Gaza also poses a humanitarian challenge. Gaza, a territory of 365 square kilometers, is home to 2.1 million people, making it one of the world's most densely populated areas. Furthermore, infrastructure and sanitation conditions in Gaza are extremely poor, with shortages of water, energy, electricity, food, and health services. These conditions are the result of a confluence of geographic circumstances – the Middle East and North Africa region is the most arid and one of the warmest regions in the world – and the political situation, leading to severe restrictions on the movement of goods and people to and from Gaza following Hamas's takeover in 2007.

The humanitarian challenge in Gaza is expected to worsen, given the demographic trends: 3.9 children per family, compared with 3.1 in Israel, and considering the acute vulnerability to climate change: rising temperature, declining precipitation, more frequent and more extreme weather events, and a rising sea level. The Israeli defense establishment and the international community are aware of the gordian knot between the humanitarian situation and the security threat instability emanating from Gaza and are making an effort to improve conditions there. A number of agencies, especially the Coordination of Government Activities in the Territories (COGAT) in the Ministry of Defense and the IDF's Southern Command, are also beginning to think about the Gaza Strip's future. Nevertheless, the attention being paid to the projected effect of climate changes in the region is still inadequate.

To bridge this gap, analyze the effects climate change on Gaza, and identify future challenges and potential solutions, the Institute for National Security Studies (INSS), in cooperation with the International Committee of the Red Cross (ICRC) held a closed workshop on the subject. Representatives from Israel, the West Bank and Gaza, and the international community participated in the workshop, including officials and experts from government, academia, and civil society. This article summarizes the key takeaways from the workshop. It emphasizes that while Gaza poses immediate humanitarian and security threats, it is important to think long-term and design solutions that take into account long-term climatic developments.

The Humanitarian Crisis in the Gaza Strip

Despite important steps in recent years to improve the situation in Gaza, the humanitarian situation remains grave, for a number of reasons: The Hamas regime; repeated rounds of conflict with Israel in 2008–2021 that severely damaged infrastructure and the prospect for development; Israel's imposing of restrictions on the movement of goods and people; the divide between Hamas and the Palestinian Authority (PA); declining donations by the international community; and the COVID-19 pandemic has aggravated the distress. The outcome is economic strife and absence of basic necessities: energy, water, and food. Furthermore, sewage is not treated fully, and health systems are in a state of collapse. The confluence of these factors jeopardizes not only the personal safety of Gaza's residents but also directly affects the situation in Israel, especially in the event of an outbreak of waterborne viral disease caused by water pollution, which would also affect the entire region.

- Economic distress:* As of the end of 2021, per capita GDP in Gaza was \$1,211 – like in Zimbabwe, and lower than the \$1,334 per capita GDP of Syria – a country torn by war. Half of all the participants in the labor force are unemployed. 70% of the unemployed are young people, and according to the World Bank, every second person lives below the poverty line. 1.2 million people, more than half of the population, receive aid from international organizations. Israel's policy – blockading Gaza by air and sea; imposing severe restrictions on movement of people (over 90% of the Gaza Strip's population has never been outside its borders); preventing the entry of a detailed list of dual-use goods, including equipment for construction and maintenance of infrastructure, such as pipes, which are on the one hand essential for water infrastructure but on the one hand are used by Hamas to build rockets for targeting Israel– contributes to the non-functioning economy in the Gaza Strip, although it is not the sole reason. The Gaza Strip is not connected to the international clearance and banking systems due to concerns regarding terror financing. The international community, not recognizing Hamas's rule, supports projects in Gaza through the PA, which uses this leverage as a political bargaining chip. For example, in the summer of 2017, the PA announced that it would cut the purchase of electricity for Gaza by \$12 million per month, which led to electricity supply of only 4–6 hours a day. Thus, the entire Gazan economy relies on cash, and it is legally difficult for private organizations and companies, as well as for Israel, to operate systematically in the area and to promote large-scale projects. Another obstacle to improving the economic situation is concern about strengthening the status of Hamas vis-à-vis the PA and reinforcing the narrative of resistance as the only way of dealing with Israel.
- Energy:* Power sources in Gaza consist of a power plant, electrical wires transmitting electricity from the Israel Electric Corporation, and solar energy, which is making significant strides. These sources, however, supply only 270 megawatts, while demand totals 600 megawatts. As of May 2022, Gaza had power for only 12 hours a day, and there is large-scale dependence on private generators operating on diesel fuel. The Israeli defense establishment and international organizations have plans for improving the electrical infrastructure and increasing capacity to 790 megawatts by 2030 (a significant improvement that depends on implementation of the Gas for Gaza (G4G) plan, for which a memorandum of understanding has been signed, providing grounds for optimism). Considering the projected increase in the population of the Gaza Strip to 3

million in 2030 and 4.5 million in 2050, however, and the need to operate water desalination and sewage treatment plants, there could still be a gap of 200 megawatts in 2030 and a larger gap in the subsequent decades. It is important to note that the power plant in Gaza was originally designed to operate on natural gas from the Marin natural gas field, located in Gaza's territorial waters. Due to the absence of agreement between the PA, Hamas, and Israel, however, the gas field has not yet been developed, and the power plant is being operated on diesel fuel, which causes a great deal of air pollution in the area.

- *Water:* The information about the water system in the Gaza Strip comes almost exclusively from the Palestinian Water Authority. In addition to [questions](#) about its reliability, there are also gaps in the data. Nevertheless, the international community and the Israeli defense establishment are relying on these assessments, according to which the gap between the demand for water and its supply amounts to 102 million cubic meters per year (compared with a 33 million cubic meter gap in the West Bank). Water consumption is almost completely based on the aquifer, which is unfit for drinking, and its high salt level and concentrations of nitrate, caused by overpumping at the rate of four times the rate of renewal, make it a health hazard. This water is used mostly for agriculture, cleaning, and industry, while 90% of the population drinks desalinated water produced at 154 public and private desalination facilities, over 100 of which operate without a license or inspection. Even if these facilities reduce water salinity, they do not necessarily remove the pollutants that pose risks to public health. This source is supplemented by water from Israel (10% of water consumption) and from three small desalination facilities that supply 62 million cubic meters of water; however, they are not fully functional due to lack of energy and maintenance difficulties. The shortage of water also affects agriculture, a critical sector for both economic development and food security in Gaza. According to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), 68% of Gaza's residents currently suffer from medium-to-severe food insecurity, and this trend is liable to worsen with the decline in donations by the international community. Construction of the Gaza Central Desalination Plant (GCDP), which, when completed, will supply an additional 55 million cubic meters of water a year, is progressing slower than planned, in large part due to Israeli restrictions on importing dual-use items (including chemicals and electromagnetic equipment) and absence of funding for operation (in contrast to construction costs, which are funded by the international community). A feasibility study is now

underway for linking the desalination plant to the G4G project, which could ensure a steady and less polluting power supply when construction is completed. Even then, however, the aquifer will still constitute the main water source in the Gaza Strip. In planning ahead, it is therefore necessary to consider both the demographic trend and its associated increase in demand, as well as energy demands for operating not only the GCDP and smaller facilities but also future facilities that will be needed in Gaza.

- *Sewage treatment:* The Gaza Strip has seven sewage treatment facilities, which treat sewage and discharge the treated water into the Mediterranean Sea. Despite ease of Israeli restrictions on access and movement in and out of Gaza ([as also positively noted](#) in the UN report to the conference of donor countries that took place recently in Brussels), these facilities are not fully operational, because they require both a great deal of energy as well as constant maintenance, which in turn requires a steady supply of materials, some of which are defined by Israel as dual-use and hence restricted. One possible solution for power shortages is renewable energy. Progress has been made in this area in the past year, although here, too, the dual-use policy and financial and maintenance challenges are delaying the completion of the construction of photovoltaic (PV) solar facilities. Even when the facilities operate regularly, they treat 70,000 cubic meters of sewage, but 20,000 cubic meters of untreated sewage is discharged directly into the sea, and an additional 20,000 cubic meters are discharged on land and pollutes the aquifer. With no suitable infrastructure, the treated water is discharged into the sea, instead of being used for agriculture. Sewage treatment is also critical for Israel because polluted water could both limit desalination (as demonstrated by the closing down of the desalination facility in Ashkelon as a result of sea pollution from the Gaza Strip) as well as endanger public health in Israel.
- *Public health:* Poor water quantity and quality, combined with inadequate sewage treatment capacity, is dangerous for public health both in Gaza and in Israel. Waterborne diseases are the principal cause of illness among children (26% according to UNICEF), particularly diseases involving diarrhea, which make it difficult to absorb food and lead to malnutrition among children. The worst risks in water pollution and lack of sanitation include coliform, shigella, salmonella, cholera, polio, foot and mouth disease, and meningitis, which is still relatively common in Gaza, with outbreaks having occurred in 1997, 2004, and 2013. The many overlapping challenges are not confined to Gaza, because pathogens can [potentially](#) be transmitted through the sewage system and water channels into Israel.

While medical teams in Gaza are able to track and identify infections transmitted by water, the poor public health infrastructure, shortage of clinical equipment, medicine, and medical teams hamper the potential for early treatment and in preventing transmission of infectious diseases. In a “business as usual” scenario, the health system in the Gaza Strip will continue to deteriorate, exacerbating these risks.

The Climate Trends in the Gaza Strip

It is difficult to predict the climate trends in the Gaza Strip with a high degree of accuracy because there is no infrastructure for collecting meteorological data there – which in itself is a problem, especially for farmers and fishermen who need to prepare for weather events. The Israel Meteorological Service (IMS), however, has recently developed [climate forecasts](#) extending through the year 2100 for the expected rise in temperature, extreme weather events such as heatwaves and rainstorms, and likely precipitation patterns. These forecasts are based, inter alia, on [measuring stations](#) close to Gaza, for example at Besor Farm, Nahal Oz, Be’eri, and Magen, which give an indication of weather patterns in Gaza. According to the models, under all scenarios, the average temperature will rise, especially in the summer, but also in the spring and fall. The summer will become longer at the expense of the winter, and the average temperature will rise by 1.5 degrees Celsius by 2050. Gaza is characterized by both a coastline and a coastal plain. In both areas there will be an increase in the number of days above 30 degrees Celsius (60% more days on the coastline) and above 34 degrees Celsius (triple the number of days). As in Israel, the heatwaves in Gaza are projected to become longer, more intense, and more frequent, and are expected to occur in months during which they have rarely occurred thus far. Consequently, the heatwaves will hurt basic existence and economic activity, jeopardize the health of those who lack access to air-conditioning (most of Gaza’s residents), and increase demand for refrigeration, which, given the state of Gaza’s infrastructure and the electrical system, will be even more difficult to meet.

Furthermore, the IMS is projecting a large [decrease](#) in average precipitation in the southern coastal plain, which will lower the potential for renewing the coastal aquifer with rainwater and, in turn, will also negatively affect agriculture in Gaza. At the same time, rain events will become more intense, with extreme rainstorms causing flooding – already a known phenomenon in Gaza (in January 2022, for example, floods [damaged](#) hundreds of homes and put drainage systems out of commission, forcing hundreds of people out of their homes). Storms are also liable to damage dilapidated electrical and water infrastructure. Furthermore, sea level in the area is projected to rise by [0.7-1.8](#) meters by the end of the century. A

rise of one meter in the sea level will [increase](#) the inland penetration of seawater by 0.5 kilometers on top of the current penetration rate of 1–3 kilometers, depending on the area, as a result of overpumping.

Recommendations

A combination of geographic and political circumstances in Gaza has created an especially difficult challenge not only for Gaza’s residents but also for the Israeli defense establishment and the international community. On the one hand, they seek to improve the humanitarian situation, while on the other hand, they encounter both governance challenges and legal and moral limitations that impede action vis-à-vis the threat posed by Hamas, the de facto ruler of the Strip.

This tension was also notable in the workshop, where most participants focused on the current already complex situation in Gaza, finding it difficult to project future problems and their potential solutions. Given the demographic and geographic trends, however, which are expected to worsen the situation in Gaza Strip, all stakeholders must develop long-term thinking that will also consider the effects of climate change. Given that climate change is regarded as a “threat multiplier,” which aggravates socioeconomic tensions, creates conditions conducive to the flourishing of terrorist organizations, causes geopolitical instability, and pushes for immigration and refugeehood, it is critical to take climatic effects into account, especially in the context of Gaza.

Therefore, the key recommendation is to adopt a long-term planning approach that relies on calculated risk management, while not undermining the pursuit of seeking immediate solutions to Gaza’s urgent problems (which are gravely serious, as international agencies [stated](#) in last month’s donors’ conference).

It is important to realize that the water risks in Gaza are also likely to affect Israel, and Israel should therefore devise a policy for managing transborder environmental threats including those from Gaza, [as called for](#) by the State Comptroller in 2017. A relatively simple example of such a policy is the flood warning system of the IMS, which can be adapted to the specific conditions in Gaza to provide early warning and prevent disasters that are liable to increase given projected increase in the frequency and intensity of extreme weather events.

In addition, a long-term planning policy on water and electrical infrastructure must be based on data, the reliability of which is limited when it comes to water. It is therefore recommended that the international community and Israel analyze available data and, where necessary, collect current data, which can accurately inform and guide need-based project development.

The energy deficit in Gaza has led to significant growth of a renewable energy industry. According to a [study](#) by the Hebrew University, Gaza generates 25% of its electricity from solar energy, and experts say that this percentage is increasing, albeit limited by the defective electrical grid, improvement of which is projected to cost \$200 million. The international community should invest in reconstructing the electrical grid and in creating incentives for switching to renewable energy in order to reach the desired situation sought by the [World Bank](#) by 2030 – a mix of locally produced solar energy, Palestinian gas-powered power plants, and electricity imported from Israel and other neighboring countries.

Another recommendation is to begin planning an effective solution for the storage and use of surface runoff water, most of which currently runs into the sea. Storing this water can reduce the aquifer's salinity and supply water for agricultural needs.

EcoPeace, an environmental organization, is proposing two intriguing transborder solutions, which face political and diplomatic challenges. The first is for Jordan to supply solar energy to Gaza to support more desalination facilities, with Jordan receiving water in return. While there is currently insufficient water in Gaza, a steady electrical supply (combined with political stability, regular funding, and ease of dual-use restrictions by Israel) could enable the construction of larger desalination infrastructure that can produce excess water beyond local demand, with the excess being sold to Jordan in exchange for solar electricity. The second proposed solution is construction of solar farms in Area C, with the electricity being sent to Gaza through the Israeli grid.

Moreover, despite substantial improvement over the past year, Israeli restrictions on imports of dual-use items still hinder timely implementation of infrastructure projects. This policy is understandable, given the risk that Hamas will use these materials for a military build-up. Nonetheless, this calls for a calculated risk management, because in the absence of a long-term solution, the immediate security risk will be replaced by another risk, which will hurt Israel's drinking water, undermine public health, and eventually also will aggravate the security threat that Gaza poses in the long run.

Finally, both Israel and the international community should continue pushing for the return of the PA to managing Gaza's affairs in order to overcome the Strip's governance issues (a subject that is beyond the scope of this article) and deal with long-term problems, such as the climate crisis. The PA, which is aware of the effects of climate change on the West Bank and Gaza Strip, has joined the United Nations Framework Convention on Climate Change (UNFCCC), and in 2016 developed a plan for coping with climate change projections through 2100. Yet,

although official plans exist, implementation is lacking, and combined with lack of control over Gaza, the PA is not positioned as an active partner in dealing with the climate crisis beyond the facilitation of funding for current projects.

The authors thank the ICRC in Israel and the participants in the workshop for the information that they presented and for their contribution to the open discussion.