



Environmental Assessment of the Gaza Strip

following the escalation of hostilities in
December 2008 – January 2009



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Table of contents

Foreword	3
Acronyms and abbreviations	4
Weights and measures	5
1. Background	6
2. Environmental assessment of the Gaza Strip	11
2.1 Introduction	11
2.2 Scope of the environmental assessment	12
2.3 Environmental assessment methodology	13
2.4 Background research	15
2.5 Remote sensing analysis	16
2.6 Field work	18
2.7 Laboratory analysis	26
2.8 Limitations and constraints	26
3. Results and discussions	27
3.1 Introduction	27
3.2 Damages directly attributable to the recent escalation of violence	27
3.3 Environmental issues pre-dating the recent escalation of hostilities that were aggravated by it	38
3.4 Institutional assessment	68
4. Recommendations	69
4.1 Introduction	69
4.2 Recommendations for the restoration of damage caused by the recent escalation of hostilities	70
4.3 Recommendations for the remediation of pre-existing environmental degradation that was exacerbated by the recent hostilities	70
5. Economic assessment	72
5.1 Introduction	72
5.2 Scope of the economic assessment	72
5.3 Economic assessment methodology	73
5.4 Limitations and constraints	74
5.5 Findings	75
Endnotes	85
Appendix I: UNEP Governing Council Decision 25/12: The environmental situation in the Gaza Strip	87
Appendix II: List of assessments conducted in the Gaza Strip after the recent escalation of violence and hostilities	88
Appendix III: References	90
Appendix IV: Bibliography	92
Appendix V: List of contributors	96

Foreword

This report and its findings are based on field work by a team of international experts deployed by UNEP following its Governing Council's Decision 25/12 in February 2009, requesting UNEP to assess the environmental damage and carry out an economic evaluation of the rehabilitation and restoration of the environment in the Gaza Strip following the escalation of hostilities in December 2008 and late January 2009.

As part of this process, I personally travelled to the region in April 2009, and met with senior Palestinian and Israeli representatives. I also had the opportunity to visit various sites, including parts of the Gaza Strip.

The team of experts, coordinated by UNEP's Post-Conflict and Disaster Management Branch (PCDMB), concludes that a wide range of environmental challenges require urgent resolve.

These range from safe disposal of large amounts of rubble, some of which is contaminated with substances like asbestos, to sewage pollution of coastal waters. Some of the challenges have been aggravated by recent events but their roots pre-date the latest hostilities.

The most urgent and challenging finding is the state of the underground water supplies, upon which the Palestinian people – and to a large extent the people of Israel – rely for drinking and agricultural irrigation water.

Years of over-abstraction and pollution now mean that the sustainability of the Gaza Strip is now in serious doubt unless the aquifer is 'rested' and solutions such as improved sanitation and desalination are introduced.



This report outlines a range of economically costed options for managing the current situation and leading the Gaza Strip onto a sustainable path.

It is hoped that the facts and economic analysis presented here can assist and guide the relevant national and local authorities and the international community to design forward-looking recovery strategies and transformative investment decisions.

This report, which has been submitted to the UN Secretary-General Ban Ki-Moon, is the latest post-conflict environmental assessment undertaken by UNEP. Others include those carried out in the Balkans, Iraq, Liberia, Afghanistan and Sudan.

As in previous studies, UNEP's report on the Gaza Strip could not have been possible without the support of a wide range of UN agencies operating in the region.

I would thus like to thank colleagues including UNSCO, UNRWA, UNDP, OCHA, WHO, UNDSS and UNMAS. UNEP stands ready to work with the UN family and relevant authorities in the region in forging a more sustainable and peaceful future for the people of this region.

A handwritten signature in blue ink that reads "Achim Steiner". The signature is fluid and cursive.

Achim Steiner

United Nations Under-Secretary General
Executive Director
of the United Nations Environment Programme

Acronyms and abbreviations

BOD	biological oxygen demand
BTEX	benzene, toluene, ethyl benzene and xylene
CAMP	Coastal Aquifer Management Plan
CAPEX	capital expenditure
CMWU	Coastal Municipalities Water Utility
COD	chemical oxygen demand
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
EPA	Environmental Protection Agency
EQA	Environmental Quality Authority
EWC	European Waste Catalogue
FAO	Food and Agriculture Organization
GPS	Global Positioning System
GSSO	German Sewage Sludge Ordinance
HHCW	hazardous healthcare waste
IDF	Israeli Defence Forces
LAGA	Laender-Arbeitsgemeinschaft Abfall (German Federal States' Working Group on Waste)
NGO	non-governmental organization
OCHA	Office for the Coordination of Humanitarian Affairs
OPEX	operational expenditure
PAH	polynuclear aromatic hydrocarbon
PAPP	Programme of Assistance to the Palestinian People
PCB	polychlorinated biphenyl
PCEA	post-conflict environmental assessment
PCM	phase contrast microscopy
PWA	Palestinian Water Authority
SPCSO	soil protection and contaminated sites ordinance
TPH	total petroleum hydrocarbon
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNDSS	United Nations Department of Safety and Security
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNITAR	United Nations Institute for Training and Research
UNMAS	United Nations Mine Action Service
UNOSAT	United Nations Operational Satellite Applications Programme
UNRWA	United Nations Relief and Works Agency
USD	United States dollar
UXO	unexploded ordnance
VOC	volatile organic compound
WHO	World Health Organization

Weights and measures

cfu	colony forming unit
cm	centimetre
cm ³	cubic centimetre
ft	foot
kg	kilogramme
km	kilometre
l	litre
m ²	square metre
m ³	cubic metre
mg	milligramme
ml	millilitre
mm	millimetre
m/s	metre/second
ng	nanogramme
μg	microgramme
μm	micrometre
μs	microsiemens

1 Background

The Gaza Strip has been a theatre of conflict for decades. Each of these conflicts has left its mark, and over time, a significant environmental footprint has developed in the Gaza Strip. During the most recent fighting – between 27 December 2008 and 18 January 2009 – Israeli Defence Forces (IDF) conducted a major combined military operation in the Gaza Strip. The operation comprised bombardment by land, sea and air, and incursions into the Gaza Strip by Israeli troops. Before and during that period, Hamas and other Palestinian militant groups fired rockets from Gaza into Israel and engaged Israeli troops in Gaza during the ground invasion.

The fighting resulted in extensive casualties and the destruction of homes, livelihoods and infrastructure. With fighting taking place in densely populated areas, and with hospitals and UN facilities being hit by shells, there was almost no safe space in the Gaza Strip. As the borders were sealed, civilians had no place to flee, and bore the brunt of the fighting.

Homes and public infrastructure throughout the Gaza Strip sustained extensive damage. Gaza City was the worst hit. A unilateral Israeli ceasefire on 18 January, followed a day later by a unilateral ceasefire by Hamas and other Palestinian factions, put an end to the fighting.

The Israeli army completed its withdrawal from the Gaza Strip on 21 January.

The environmental situation in the Gaza Strip was already serious prior to these events, due to underinvestment in environmental systems, lack of progress on priority environmental projects and the collapse of governance mechanisms. The recent escalation of hostilities caused additional damage and increased the pressure on environmental facilities and institutions. Two of the most striking examples are the significant volume of demolition debris that was generated and the serious damage done to the sewage system. Other adverse environmental impacts include the widespread destruction of agricultural areas, damage to smaller industrial enterprises and an increase in pollution discharged into the Mediterranean and into the groundwater.

According to a United Nations (UN) damage assessment carried out using satellite imagery, 2,692 buildings and 180 greenhouses were destroyed or severely damaged during the hostilities and 167 kilometres of road were damaged. The assessment revealed 220 impact craters on roads and bridges and more than 700 craters on open or agricultural land. Utilities infrastructure in energy (fuel and electricity), transportation and telecommunications also sustained severe damage during the crisis. Water supplies were affected by damage to water wells and drinking water pipes, as were wastewater systems.

Box 1. The Gaza Strip: geography, climate and population

The Gaza Strip is a narrow strip of land on the Mediterranean coast. It borders Israel to the east and north and Egypt to the south. It is approximately 41 kilometres long, and between 6 and 12 kilometres wide, with a total area of 378 square kilometres.

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