GAZA 2021 INFRASTRUCTURE DAMAGE ASSESSMENT REPORT

The report covers the detailed assessment of infrastructure damages resulting from the hostilities on the Gaza Strip from 11 - 21 May 2021

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ACRONYMS

BFB	Build Forward Better
CMWU	Coastal Municipalities Water Utility
COVID-19	Corona Virus Disease - 2019
DBD	Deep Buried Bomb
EOD	Explosive Ordnance Disposal
ERW	Explosive Remnants of War
EU	European Union
GBV	Gender-Based Violence
GDP	Gross domestic product
GEDCO	Gaza Electricity Distribution Company
GIS	Geographic Information System
GMR	Great March of Return
GOI	Government of Israel
GPP	Gaza Power Plant
GPS	Global Positioning System
GRM	Gaza Reconstruction Mechanism
HCT	Humanitarian Country Team
HE	Higher Education
HNO	Humanitarian Needs Overview
HRP	Humanitarian Response Plan
IASC	Inter-Agency Standing Committee
ICT	Information & Communication Technology
ID	Identity document
IDPs	Internally Displaced Persons
ILS	Israeli Shekel
ISDN	Integrated Services Digital Network
IT	Information Technology
KG	kindergartens
KWH	Kilowatt per hour
l/c/d	Litres/Capita/Day
MDLF	Municipal Development and Lending Fund
MHPSS	Mental Health and Psychosocial Support
MoNE	Ministry of National Economy
MOEHE	Ministry of Education and Higher Education
MOH	Ministry of Health
MOLG	Ministry of Local Government
MOM	Minutes of Meeting
MoPWH	Ministry of Public Works and Housing
MOT	Ministry of Transportation
MOTIT	Ministry of Telecommunication and Information Technology
MOU	Memorandum of Understanding
MSF	Médecins Sans Frontières
NGOs	Non-Governmental Organization
OCHA	Office for the Coordination of Humanitarian Affairs
OHCHR	Office of the United Nations High Commissioner for Human Rights
oPt	occupied Palestinian territory
PA	Palestinian Authority
PALTEL	Palestine Telecommunications Company
PCBS	Palestinian Central Bureau of Statistics
PCU	Palestinian Contractors Union
PEC	Palestine Electric Company
PENRA	Palestinian Energy and Natural Resources Authority
PITA	Palestinian Information Technology Association
PNGO	Palestinian Non-Governmental Organization
PPE	Personal Protective Equipment
PWA	Palestinian Water Authority
RDNA	Rapid Damage and Needs Assessment
SDGs	Sustainable Development Goals
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNOSAT	United Nations Satellite Centre
UNRWA	United Nations Relief and Works Agency
US$	United States Dollar
UXO	Unexploded Ordinances
WASH	Water, Sanitation and Hygiene
WB	West Bank
WBG	World Bank Group
WFP	World Food Programme
WHO	World Health Organization

FOREWORD

Gaza has suffered numerous hostilities over the past two decades. The latest hostilities in May 2021 had a devastating impact on the lives of people in the Gaza Strip. 261 Palestinians were killed, including 67 children and 41 women, and the physical destruction of homes, hospitals, schools, water and sanitation facilities, and roads meant that many of those who survived were not able to live in a safe environment nor access essential services.

This crisis further compounded the severe socio-economic conditions and deepening vulnerabilities created by the Israeli occupation and the blockade of the Gaza Strip, as well as the continuing intra-Palestinian divide and the COVID-19 pandemic.

While this protracted crisis cannot be resolved without a political agreement that addresses issues of fundamental rights, and fears of recurrent violence continue to threaten hopes for a sustainable peace, Gazans need to move on with their lives.

This infrastructure damage assessment is one step in the process of helping them to pick up the pieces and move forward. The information can be used to estimate the actual costs of rehabilitation or reconstruction for every damaged or destroyed home, business, or facility.

However, our aim is not to build back to the poor or inadequate state the facility was in, prior to the hostilities. In order to contribute to resilience, we need to build forward better – whether it be a home that is commensurate with the size of the family, or greater capacity of water pumps. Thus, the report also includes estimated costs of integrating these improvements.

Our wish is that the information contained in this report will be utilised to inform efforts to support the recovery of Gaza, and guide priorities for funding. Given the robust assessment methodology used, it is a reliable and accurate source of information for designing and costing infrastructure interventions, along with other critical support - particularly in the area of economic recovery, mental health and psychosocial support.This assessment was made possible thanks to the support from all partners: the Palestinian Contractors Union (PCU), Ministry of Public Works and Housing (MoPWH), line ministries, municipalities, UNRWA, UNOSAT, UNMAS, other local and international organisations. We are grateful to those who shared their expertise and dedicated their time and effort to ensure a safe and accurate field assessment, rigorous verification, and analysis, as well as quality reporting. The assessment was funded with the generous contribution of the Government of Japan and UNDP resources.

Our special appreciation goes to those who were affected by the hostilities, for their willingness and patience to participate in what may have seemed at times, a tedious exercise. This report is dedicated to you, in the hope that the findings will contribute to efforts that will help you to rebuild your lives.

Yvonne Helle

Special Representative of the Administrator
United Nations Development Programme
Programme of Assistance to the Palestinian People

EXECUTIVE SUMMARY

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Background

The political, security and socio-economic context in the State of Palestine is unique. All aspects of life for Palestinians continue to be affected by almost 54 years of occupation and 14 years of blockade of the Gaza Strip, resulting in a state of protracted crisis.

Around 45.5% of households in the Gaza Strip are severely or moderately food insecure (SEFSec 2018)[1], 53% of the population live below the poverty line (PCBS) [2], and the unemployment rate is around 48% (PCBS, 2021)[3]. According to OCHA[4] (HNO and HRP 2021), 1.57 million people in the Gaza Strip are in need of humanitarian assistance, and have limited access to basic services, such as health care, education, WASH, and protection. The already dire situation in Gaza has been further compounded by the COVID-19 pandemic.

Unrest in the occupied Palestinian territory (oPt) intensified in the spring of 2021, as a consequence of the forced evictions of Palestinian refugee families from their homes in East Jerusalem, in addition to increasing settlement activity and the strict movement restrictions imposed on Palestinians. The unrest rapidly developed into the most intense hostilities in Gaza since the 2014 conflict.

The May 2021 hostilities were the fourth round of offensive by Israel on the Gaza Strip, following the 2008, 2012, and 2014 hostilities. It resulted in devastating consequences, taking the lives of 261 Palestinians, including 67 children and 41 women. It led to a considerable destruction of residential and commercial buildings, as well as damages of mosques, schools, health facilities, water and power networks, roads, and public buildings, which in turn disrupted the provision of vital basic services.

Purpose of the Assessment

UNDP led the design and implementation of a detailed infrastructure damage assessment from June to August 2021 in coordination with the Ministry of Public Works and Housing (MoPWH) as well as line ministries, municipalities, the Palestinian Contractors Union (PCU), UNRWA, UNMAS, and in consultation with UN agencies, the cluster coordinators, and civil society actors.

The primary purpose of the assessment was to identify real damages resulting from the May 2021 hostilities, to inform rehabilitation, reconstruction, and recovery interventions. It provides an estimate of two types of costs: a) reconstruction / rehabilitation to the state it was before the destruction / damages (Building Back as was – BBaw), and b) reconstruction / rehabilitation incorporating the principles of Building Forward Better - BFB (e.g. greater capacity to respond to current needs, such as larger households size and greater capacity water pumps, better material for greater durability). Accurate figures would allow for the design of interventions to be more targeted to specific needs, and support evidence-based recovery efforts. This report presents the findings from the assessment of damages related to social infrastructure (housing for non-refugee population, public buildings, education, and health), public infrastructure (roads, WASH, municipal machinery including vehicles, transportation, energy) and private sector infrastructure (e.g. ICT communications).

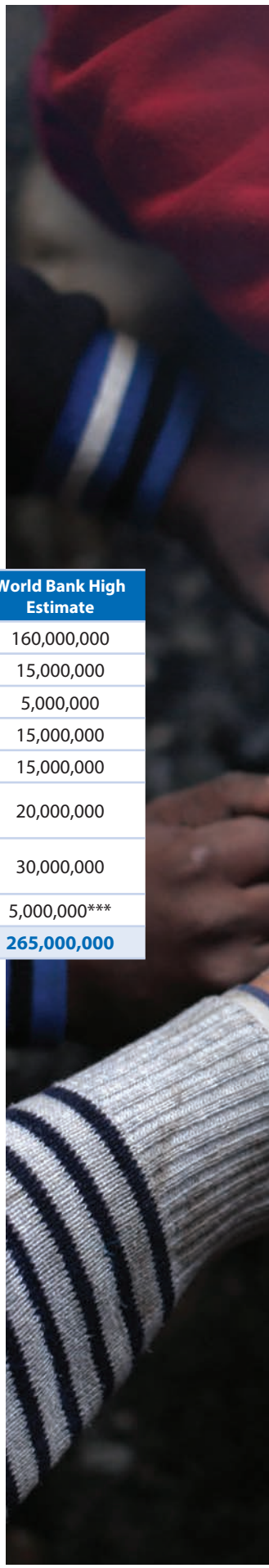
Brief Description of Methodology

The data collection and assessment team, consisting of engineers from relevant ministries/entities, PCU, and UNDP covered all five governorates of the Gaza Strip: North Gaza, Gaza, Middle Area, Khan Younis and Rafah. Data was collected through an online platform[5] using tablets during field visits to physically assess damages. Figures were verified by the assessment committee and endorsed by the relevant line ministries for each sector, and overall, by the MoPWH. This was combined with satellite imagery obtained through UNOSAT to provide a holistic analysis.

Summary of findings

The assessment revealed the following findings:

- A large number of facilities, units and items were affected at varying degrees ranging from severe to moderate. These included 12,558 housing units (non-refugee), 273 educational buildings, 35 health facilities, 239 energy locations, 240 roads, 76 WASH facilities and 116.6 Kilometres of water and wastewater networks,, 1,002 vehicles, 107 workshops, 38 municipal machinery (e.g. vehicles), 77 public buildings (municipal and NGO buildings), and 2,528 private sector facilities.
- The overall estimated cost of damages due to the 2021 escalations (including BFB) is US$ 108,278,755 with the housing sector being the most severely affected (US$ 35,008,917 representing 32.3% of the total costs), followed by the roads and transportation sector (US$ 22,433,832 representing 20.7%), and the energy sector (US$ 21,915,104 representing 20.2%).
- The Gaza governorate sustained the highest proportion of damages, followed by the North Gaza governorate.



Summary of All Sectors Compared with World Bank figures (US$)

Sector	Damage / Building Back as was	Building Forward Better	Total Value	World Bank Low Estimate	World Bank High Estimate
Housing	33,438,554	1,570,363	**35,008,917****	130,000,000	160,000,000
Health	773,370	85,754	**859,124**	10,000,000	15,000,000
Education	2,882,302	472,852	**3,355,154**	0	5,000,000
WASH	9,128,777	1,125,050	**10,253,827**	10,000,000	15,000,000
Energy	10,461,954	11,453,150	**21,915,104**	10,000,000	15,000,000
Roads and Transportation	22,002,032	431,80	**22,433,832**	15,000,000	20,000,000
Municipal and Public Buildings	4,495,409	-	**4,495,409**	25,000,000	30,000,000
Private Sector*	9,957,388	-	**9,957,388**	0	5,000,000***
Total	**93,139,786**	**15,138,969**	**108,278,755**	**200,000,000**	**265,000,000**

* Private Sector includes factories, ICT infrastructure in addition to commercial buildings.
** Figures as of 14 October 2021. Figures subject to change due to structural instability of foundations that may surface later.
*** World Bank estimate of the ICT portion only.
**** This report is available on https://www.ps.undp.org and the data is accessible on the interactive Power BI platform https://bit.ly/3N4dZ3L

Way Forward

At the stage of publication of this report, there is unfortunately limited funding available from donors for the rehabilitation and reconstruction of Gaza – at least not at the scale needed. UNDP, together with key stakeholders engaged in the assessment, is calling for investments not only for the timely rehabilitation and reconstruction of infrastructure including the incorporation of building forward better principles, but also in complementary efforts. These include the strengthening of the capacities of service providers, addressing mental health and psychosocial support, as well as investments in the economic sector to ensure a comprehensive and inclusive recovery. Humanitarian and development actors must work closely together and with relevant authorities to support the people of Gaza to live safely, access essential services, and restore their livelihoods in a dignified manner.

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INTRODUCTION

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1.1 Background and Context

The Gaza Strip is situated along the eastern coast of the Mediterranean Sea, in the occupied Palestinian territory (oPt). It is bordered by Egypt on the southwest for 11 kilometres and Israel on the east and north along a 51 kilometres border. It is 45 kilometres long, and 6 to 12 kilometres wide, with a total area of 365 square kilometres.

The population of the Gaza Strip is approximately 2.11 million, of whom 1.07 million are male and 1.04 million are female (2021)[6]. The population density of the Gaza Strip is significantly high at 5,780 persons/km2 and is considered one of the most densely populated places in the world. There are five Governorates in the Gaza Strip (Northern, Gaza, Middle, Khan Younis, and Rafah) and 25 municipalities.

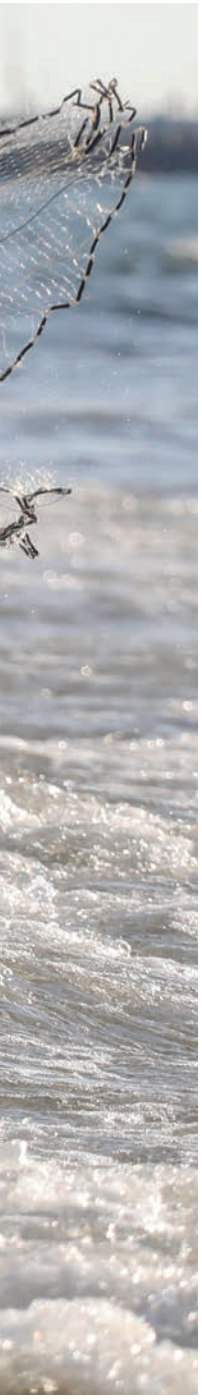

Figure 1-1: Map of the Gaza Strip

Seven years after the 2014 conflict, and more than fourteen years since the start of the blockade, the socio-economic conditions of the Palestinian people in the Gaza Strip are progressively deteriorating. The economy remains fragile, heavily dependent on imports, and investment is minimal. The policy of almost total closure of the crossings, both for access of people and materials, has increased the isolation of the Gaza Strip from the rest of the oPt and the outside world. This has caused serious limitations in access to medical care, education, and economic opportunities. There is also a severe shortage of energy, including daily power cuts of 12-18 hours, which impacts the provision of and access to other primary services such as water and health.

The humanitarian situation in the Gaza Strip has further deteriorated since the Great March of Return (GMR) demonstrations which began on 30 March 2018. The protests were repeated every Friday, until the end of 2019. The high number of wounded has overburdened the already precarious health system, which was already on the verge of collapse. The chronic shortages in essential medications and the huge gap in the competence of health workers also contributed to the deterioration of healthcare services.

The COVID-19 crisis has placed further pressure on the health system in both the West Bank and the Gaza Strip and has negatively affected the already dire Palestinian socio-economic situation. In 2020, the Palestinian economic situation further deteriorated, particularly in Gaza, with the compounding effects of the COVID-19 pandemic leading to increased poverty, unemployment, and food insecurity.

Around 45.5% of households in the Gaza Strip are severely or moderately food insecure (SEFSec 2018)[7], 53% of the population live below the poverty line (PCBS) [8], and the unemployment rate is around 48% (PCBS, 2021)[9]. According to OCHA[10] (HNO and HRP 2021), 1.57 million people in the Gaza Strip are in need of humanitarian assistance, and have limited access to basic services, such as health care, education, WASH, and protection.

Approximately 950,000 people in the Gaza Strip need health and nutrition-related humanitarian assistance, while around 1.4 million people are in need of interventions to improve food security. WASH interventions are needed for at least one million people living in the Gaza Strip. Additionally, approximately 1.3 million people in the Gaza Strip are in need of psychosocial support and protection services.[11]

Decades of protracted crisis and movement / access restrictions[12], recurrent escalations of violence and military hostilities, the slow pace of recovery, within the context of an absence of political solution continue to steadily deteriorate the socio-economic conditions of the people locked inside the Gaza Strip.

1.2 The May 2021 Hostilities

Weeks of rising tension between the Israeli security forces and Palestinians in East Jerusalem, where several Palestinian families are under threat of forced eviction, culminated in clashes around holy sites and across the occupied Palestinian territory.

The situation rapidly deteriorated in early May, and hostilities on the Gaza Strip erupted on 10 May 2021. Air and artillery bombardment by Israel on Gaza resulted in tragic consequences, claiming the lives of 261 Palestinians, including 67 children and 41 women, and injuring over 2,200 people (685 children and 480 women), some of whom may suffer long-term disability. Around 107,000 people became internally displaced while 71,000 people were forced to seek shelters in UNRWA schools. While many affected families were temporarily hosted by their relatives as their homes were either totally destroyed or had become uninhabitable, many would need longer-term shelter solutions[13].

The hostilities resulted in considerable destruction of infrastructure, including housing, health and education facilities, commercial buildings, WASH network, telecommunication, transportation, and roads, which in turn hindered the provision of vital basic services, including COVID-19 vaccination and testing[14]. The infrastructure damages resulting from the hostilities are thoroughly assessed and covered through the following chapters in this report.

Nevertheless, it is important to acknowledge and highlight here that beyond the immediate impact of the hostilities, evidenced by the significant infrastructure damages, there are also medium to longer-term implications: the deepening vulnerabilities and humanitarian situation in Gaza that had already been stretched to the limit due to decades of occupation, blockade, military operations, and the COVID-19 pandemic. These include the ever-growing unemployment, deterioration of essential services, psychological trauma (particularly amongst children and women), insecure living environment (e.g. due to Explosive Remnants of War), as well as environmental impacts (e.g. contamination from hazardous material).

The damages to infrastructure further exacerbated Gaza's chronic power deficits, with severe electricity shortages affecting all vital sectors across the Gaza Strip and resulting in a decrease in access to clean water and

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sewage treatment. It is estimated that around 800,000 people suffered from irregular access to piped water after the ceasefire[15].

Some municipalities have been forced to discharge untreated wastewater into seawater and open areas, which not only poses a risk to the lives and health of citizens, but also constitutes an environmental hazard affecting the marine ecosystem. During the hostilities, the movement of sanitation workers was inevitably restricted, with a 50% shortage in human resources further exacerbating the solid waste management crisis across the Gaza Strip.

The burning of industrial waste resulting from the hostilities are causing soil pollution, where the remnants of ferrous and non-ferrous metals, plastic waste, and electronic waste, as well as chemical fertilisers and pesticides[16] are directly infiltrating the soil. The heavy metals and chemicals resulting from exploded aircraft missiles, tank shells and marine missiles are also making their way into the soil, thus reducing the soil fertility, and affecting the conditions of groundwater.

In addition to the direct human losses and disruption in basic services due to infrastructure damages, the May 2021 hostilities have significantly increased the need for mental health and psychosocial support in particular for children, adolescents, and women – that had already been suffering due to prolonged exposure to violence and trauma. Prior to this last escalation, 1 in 3 children in Gaza already required support for coping with conflict-related psychological trauma. In the aftermath of the hostilities, more and more children in Gaza are reportedly being referred to family centres, as they display symptoms of trauma.[17]

The hostilities have also placed women and girls at higher risk of experiencing Gender-Based Violence (GBV), with psychological trauma, protracted internal displacement and precarious living conditions, and the conflict's impact on GBV shelters and support services, all being contributing factors to an increased need for GBV-focused protection. Last but not least, the latest hostilities were coupled with further tightening of access and movement restrictions from the Israeli authorities, with the Erez Crossing being closed for most Palestinians in Gaza, with the exception of urgent medical referrals. During the last week of May, only 13% of referrals for patients to exit Gaza to Israel, the West Bank and East Jerusalem were approved, with the approval rate of referral requests increasing to 43% in the first week of June. Moreover, Kerem Shalom Crossing was open only for the entry of specific basic commodities, including fodder and medical supplies, as well as fuel for the private sector and for UNRWA.

1.3 The "Building Forward Better" Approach - Humanitarian Development Peace Nexus

UNDP works with partners to strengthen the resilience of the Palestinian people, whether in the immediate aftermath of a crisis, or in its medium- to longer-term programming. This is reflected in the assessment approach and methodology, as well as in the presentation of the findings.

- In order to encourage stakeholders to consider recovery efforts that do not simply focus on rehabilitating or reconstructing back to the status-quo (Building Back as-was - BBaw) but incorporate improvement measures (Building Forward Better - BFB)[18], separate figures are presented in the report for BBaw, and BFB.

- To promote ownership and ensure accuracy of the findings, UNDP worked with the relevant line ministries for each sector, and the Ministry of Public Works and Housing (MoPWH) overall, in the design of the assessment, data collection and analysis, and verification of figures.

Aligned with the Leave No One Behind principles, data was also collected on female-headed households, families with persons with disabilities (PWDs), etc. for the housing sector. To ensure Accountability towards Affected Persons, information was provided to the community regarding how to file claims, and a call centre was set up to address any concerns. Close coordination with UNRWA allowed for a common approach for refugee and non-refugee households.

1.4 Purpose and Scope of the Assessment

Purpose

The primary purpose of the assessment was to identify verifiable infrastructure damages resulting from the May 2021 hostilities, to inform rehabilitation, reconstruction, and recovery interventions. It provides an estimate of two types of costs: a) reconstruction / rehabilitation of infrastructure to the state it was before the destruction / damages (Building Back as was – BBaw), and b) reconstruction / rehabilitation incorporating the principles of Building Forward Better - BFB (e.g. greater capacity to respond to current needs, such as larger households size and greater capacity water pumps, better material for greater durability). Accurate figures would allow for the design of interventions to be as targeted and accurate as possible, to support effective and evidence-based recovery efforts.

Scope

The May 2021 hostilities caused damages across almost all sectors. UNDP worked with partners to assess the infrastructure damages, and this report contains data and analysis related to infrastructure damages only, including calculations for Building Forward Better. The infrastructure sub-sectors include:

- Social Infrastructure: Housing (non-refugees), Municipal Machinery, Public Buildings, Education, and Health.

- Public Infrastructure: Roads and Networks, WASH Facilities, Transportation, Energy

- Private Sector Infrastructure: industrial, commercial, service buildings and Telecommunication (ICT / PALTEL).

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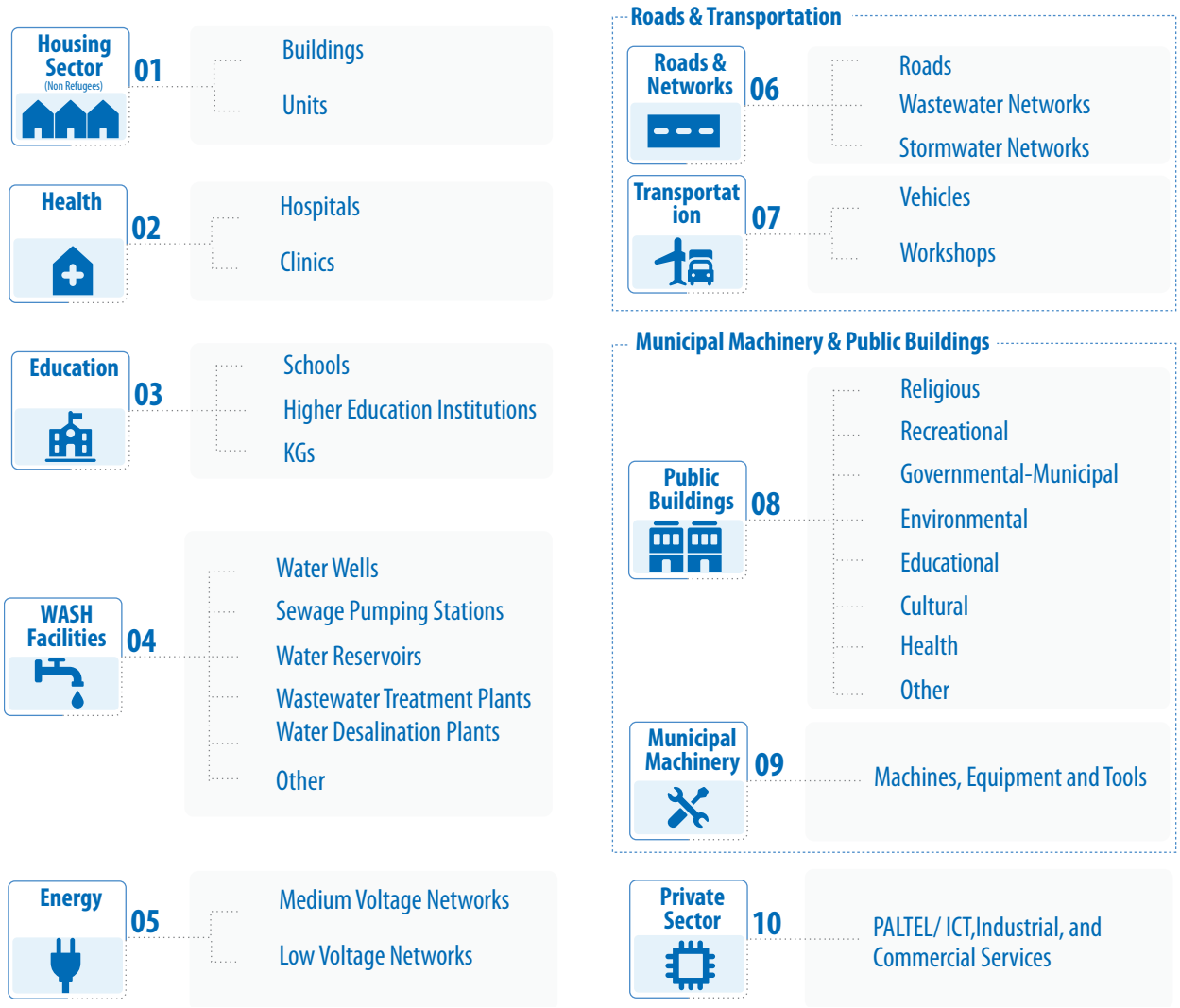
Figure 1-2: Overview of Assessed Sectors



1.5 Key Stakeholders

From the onset of the hostilities, several committees were established to lead assessment and recovery efforts. Many local and international institutions were involved, whether by providing immediate humanitarian assistance, preliminary-rapid assessments, detailed assessments, or devising recovery plans.

The Palestinian government established three committees for Gaza reconstruction on 21 June 2021: the Gaza reconstruction committee; a consultative committee including the NGOs and the private sector; and a technical team for reconstruction. The key one, Gaza Reconstruction Committee, brings together the Minister of MoPWH (chair), the Minister of Local Government, the Minister of National Economy, the Minister of Agriculture, the Minister of Labour, the Head of PENRA, and Head of PWA.[19].

Egypt formed a higher Committee headed by the Deputy Head of the Egyptian General Intelligence Service, to supervise the Egyptian contributions to reconstruction. Following its establishment, Egypt sent equipment, machinery, and engineering personnel to contribute to removing the rubble and expected to to engage in subsequent reconstruction and recovery interventions.

On 01 June 2021, the Higher Governmental Committee of Reconstruction was established in the Gaza Strip and headed by the MoPWH under-secretary, to coordinate assessments and recovery efforts with other entities in Gaza, including all relevant ministries (local government, social development, PENRA and national economy, agriculture, and foreign affairs). In the same context, on 10 June 2021, a technical committee for reconstruction was established in Gaza, with a membership comprising representatives from the following institutions: Ministry of National Economy (chair), Ministry of Education, MoPWH, the General Secretariat of the Council of Ministers, Ministry of Interior, Ministry of Telecommunication and Information Technology, Ministry of Local Government, and Ministry of Foreign Affairs.

Each sector is currently represented by one local key entity, as presented in the following table. The UNDP-led infrastructure damage assessment was conducted in consultation with the line ministries designated by this committee.

Table 1-1: The Representing Entity for Each Sector

Sector assessed by UNDP	Representing Entity
Housing (non-refugees)	MoPWH
Health	MOH
Education	MOEHE
WASH Facilities	Municipalities - MOLG
Energy	GEDCO
Roads and Transportation	Municipalities - MOLG MOT
Municipal Machinery and Public Buildings	Municipalities - MOLG
Private Sector and ICT/PALTEL	MoNE, MOTIT - PALTEL

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ASSESSMENT METHODOLOGY AND FINDINGS

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2.1 Overview

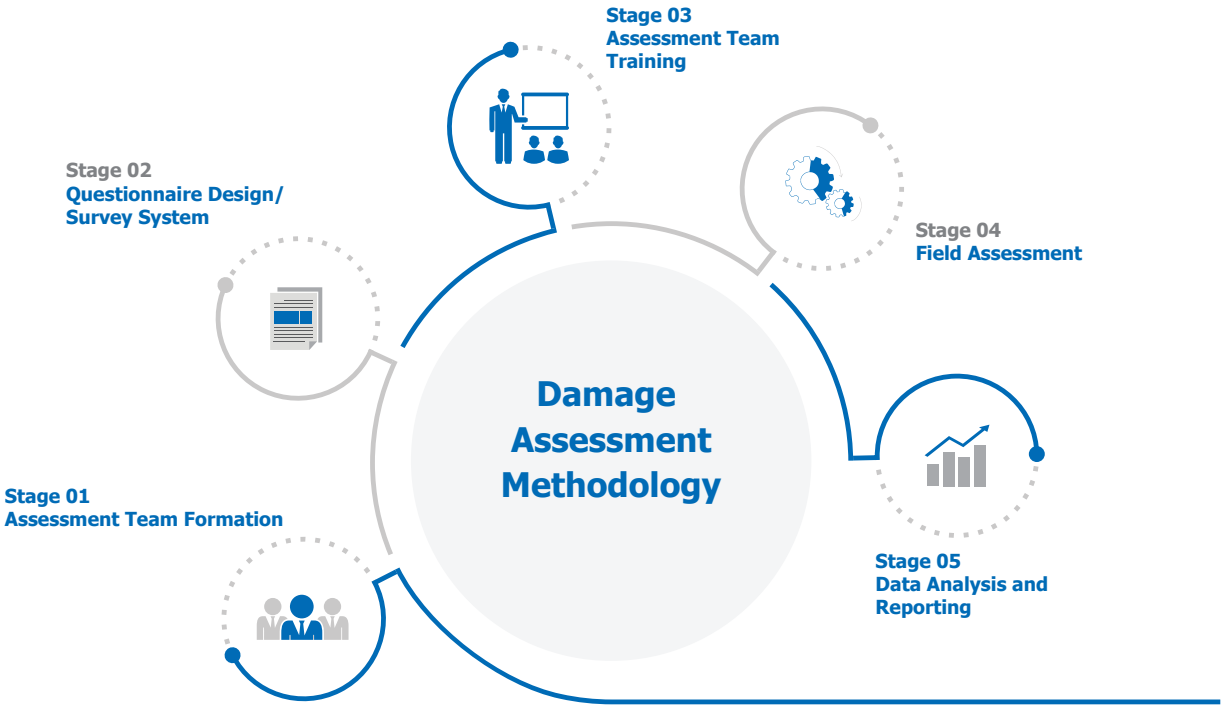
2.1.1 Overall Methodology

Building on past experience from assessments conducted in Gaza after the 2008/2009 and 2014 hostilities, UNDP worked with MoPWH, relevant line ministries and the Palestinian Contractors Union (PCU), as well as UNRWA, to design and conduct an infrastructure damage assessment approach and methodology. As the assessment was focused on infrastructure damages, it centred around field visits by 140 technicians, engineers, and social workers to each affected site to collect data using tablets, including photos. This primary data was complemented by satellite imagery analysis obtained from UNOSAT, and surveys (for economic / private sector infrastructure).

UNDP met with MoPWH, PCU, and UNRWA (for refugee households) to discuss the data collection and analysis process, which resulted in a common understanding and overall framework for the assessment. MoPWH was assigned as the official local focal point with the other line ministries. A Minutes of Meeting (MoM) was signed on 05 June 2021 between UNDP and MoPWH to identify the roles and responsibilities, data ownership, and data sharing guidelines. The MoM was disseminated to all ministries to ensure their cooperation and to facilitate the data collection process. Collaboration with UNRWA ensured that there was a common approach and set of questionnaires for both refugees and non-refugee households.

In order to capture a wide array of data, and to apply the Accountability towards Affected Persons (AAP) and Community Based Complaints Mechanism (CBCM) principles, online platforms were launched and announced for the housing and economy sectors. These platforms were used by individuals and entities to register and report on damages to their homes or facilities, as well as to file any complaints regarding assessed damages. The list of damaged facilities under the other sectors were identified by the line ministries and stakeholders in addition to the satellite images, and then compared with the rapid assessments conducted by the Clusters.

Figure 2-1: Damages Assessment Process



Stage 1: Forming the Assessment Team

The PCU was tasked to identify qualified technical staff for the field data collection: technicians, engineers, and support staff. including social workers for the housing sector. UNDP also reviewed the existing database to recommend engineers with a necessary level of expertise and experience in previous damage assessments in Gaza. These individuals were vetted, and the team members were selected by a joint committee comprised of UNDP, line ministries, and the PCU. A total of 120 engineers and 20 assistants, in addition to five senior engineers with supervisory roles, were selected.

The PCU also hired five GIS specialists who helped senior engineers to develop a plan for the daily dispatch of the assessment team to specific locations. The GIS specialists also reviewed and entered the technical data collected from the field into the GIS platform. The engineers were hosted at the PCU premises in Gaza and were technically supervised by UNDP. The coordinator hired by PCU was responsible for managing day-to-day activities and following up the attendance of the assessment team. This was done in coordination with the UNDP team and the five senior engineers managing the different teams on the ground.

Stage 2: Designing the Questionnaires and Establishing the Survey System

UNDP, in partnership with UNRWA and MoPWH, used agreed questionnaires for the subsequent assessment. Fifteen forms were developed to cover the different sectors. The Crisis Bureau at UNDP Headquarters was consulted on the content of the questionnaires to incorporate good practices and lessons learned from other damage assessments globally.

The questionnaires were digitized using the Kobo Toolbox platform, developed by OCHA and its partners for data collection and management. The Kobo Collect App was installed on 160 tablets for the data collection team. GIS and GPS technologies were utilized to support data accuracy and validation. The Power BI Dashboard was used to provide interactive real-time data and to present the details required to help in the management of data.

The field data was collected utilizing smart devices (tablets) and uploaded directly into the Kobo Toolbox platform in real-time, integrated with the Geographic Information System (GIS). The information collected through the application enabled both the technical assessment of the damage and the actual cost of the reconstruction. It also provided necessary data for a visual representation using Power BI, complemented with UNOSAT satellite imagery analysis. The trainers for the assessment also acted as technical support to run the online platform, including troubleshooting and generation of data reports.

The data collection teams were also instructed to record any observed damages in the vicinity of the buildings they were assessing, even if they were not recorded on the platform / database. This data would later be added to the database and verified through field assessments.

Stage 3: Training the Assessment Team

A comprehensive training was conducted by qualified engineers, who were previously trained by UNDP. The training aimed to ensure that the data collection team understood how to classify the damages into different categories: total damage, severe damage (both making the housing unit uninhabitable), as well as minor damage and major damage (housing unit would be habitable). Moreover, an on-site training was conducted during the first few days to ensure accuracy required for a reliable data collection process. A guide on data collection procedures was developed and disseminated to the data collection team.

In addition, based on experience and lessons learned from 2014, UNDP requested the United Nations Mine Action Service (UNMAS) to provide training to ensure that UXO/ERW-related risks are duly considered and mitigated. An agreed upon mechanism, including Standard Operating Procedures, was put in place to safely perform the damage assessment, in coordination with UNMAS.

Stage 4: Conducting the Field Assessment

The actual field assessment (dispatch of data collection team to the field) started on 05 June 2021. Two months were spent on data collection and assessment of costs (based on pricing), and one month to generate reports, review and agree on the figures, and address any objections or complaints.

Different thematic, sectoral, or geographical distribution methodologies were followed to carry out the field assessment. In the housing sector, which was the most impacted in terms of infrastructure damages, the Gaza Strip was divided into three zones and 25 localities. For each zone, a senior engineer was assigned to supervise the assessment conducted by the field engineers. The number of engineers dispatched to each zone was identified according to the expected damage in each zone.

Stage 5: Analysing, Verifying and Reporting

On a daily basis, a specialized committee reviewed the collected data, compared it with GIS data, and made the necessary corrections. This committee was assigned to follow up with the field engineers and ensure the accuracy of the data.

KoBo Toolbox was also utilised for initial data analysis and verification. The Power BI was used to visualize the results and findings.

Interactive web maps for all sectors were developed using ArcGIS Online Platform to present the findings geographically. The findings are available in different formats to facilitate use of assessment data for recovery interventions (Printed Reports, Interactive Web Dashboards, Web Maps, Photos, Videos, etc.).

2.1.2 Limitations and Challenges of the Assessment

The assessment team encountered several challenges during the data collection and processing, which are outlined in the table below. These include challenges related to data collection, classification of the damages incurred to the facilities and cost estimation, as well as verification of data due to the evolving situation on the ground.

Table 2-1: Limitations and Challenges of the Assessment

Data collection
• As there is no comprehensive database for all non-refugees, significant time and effort was spent to cross-check data and avoid duplication in estimating damages to the non-refugee housing. (UNRWA maintains a refugee database, which was used for their assessment of refugee housing.) • Documenting the ownership of housing units in some areas in the Gaza Strip was a challenge. For example, some are in the name of the household's grandfather and the documentation of the current head of household was not available. • There were minor entry errors of phone numbers, ID numbers, and other details, which took time to verify. • Temporary repairs on roads were performed to ensure public accessibility before the commencement of the data collection process. However the assessment team gathered available data to generate as accurate an estimate as possible regarding the damages incurred and cost of reconstruction. • Establishing the team and developing their capacity and getting them up to speed took time, to ensure that the team has the capacity to conduct a quality assessment applying a consistent methodology, carried out in a safe manner. • UNDP invested significant time and effort working with the partners to explain the difference between the incurred damage costs (building back to 'as was') and the building forward better approach. • Existence of ERWs implied that the data collection exercise had to be carried out very carefully, taking into consideration the risk mitigation measures, which slowed the process.
Classification and Estimates
• Classification of some facilities required verification, where for instance the same facility could be used simultaneously for both commercial and education related activities. UNDP and related ministries agreed to classify the damaged facility according to the nature and function. For example, Al Jawhara tower was mixed use and included residential units, commercial offices and press offices. The press offices equipment and losses were assessed as economic damages, while the building itself was assessed as infrastructure damages. • There is complexity in categorising some residential units as totally or partially damaged. Some of the buildings were tilted and there was significant debate about their stability. A specialized committee was formed to assess and decide on this type of damage. It took efforts by the survey team and MoPWH engineers' to ensure extensive structural analysis to determine the category. • Some residential units have been rated as partially damaged, but it is expected that if they are not rehabilitated soon, the category may change to totally damaged, as the rise in ground water level during the winter season may make the foundations of the facilities unstable. • Some residential units were recorded twice (by the owner and the tenant). Some were identified immediately with quick cross-referencing. However, some duplication was not easily recognised because of the use of different ID numbers. These were identified by the review committee and corrected. • Some individuals may own several units, used for different purposes, located in different governorates, which have sustained varying degrees of damages. To exclude any duplication, the assessment and classification of such units required more time and effort to review and validate. • Some energy and WASH infrastructure (e.g. networks / pipes) are not visible as they are buried underground, and it is difficult to assess their condition. The team used the available drawings to verify the specifications of these items. (USAID has conducted an assessment that looks into this issue[20]) • Fluctuation in exchange rate (from US$ to ILS).

2.1.3 Summary of Findings

The overall damage cost across the eight infrastructure sectors targeted by the damage assessment is US$ 108,278,755, including the costs of Building Forward Better (BFB). This figure does not include the damages of housing units and buildings for refugees, which were assessed by UNRWA. The sector that has sustained the largest proportion of damages is the housing sector. Geographically, the Gaza governorate, which includes Gaza City - the area with the highest level of commercial activity, including wealthier households and offices of international organisations, has experienced the highest proportion of damages.

The Damages

The following infographic represents an overview of the damages in each sector. The total figure of each sector includes both the actual damages or BBaw and BFB costs. The damages per geographical area, sector, and sub-sector will be presented in detail in the following chapters.

Figure 2-2: Overview of Damages and BFB Costs per Governorate and Sector

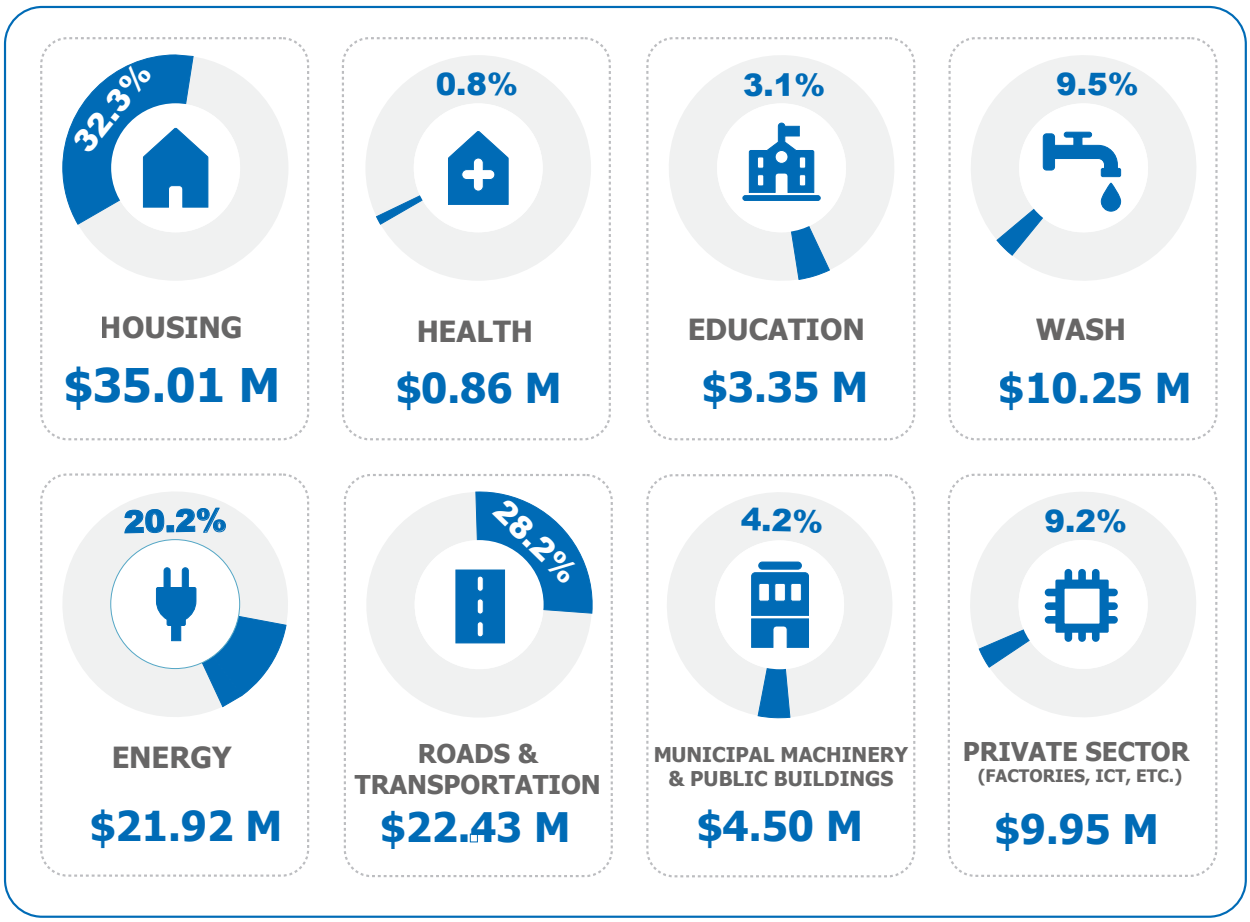
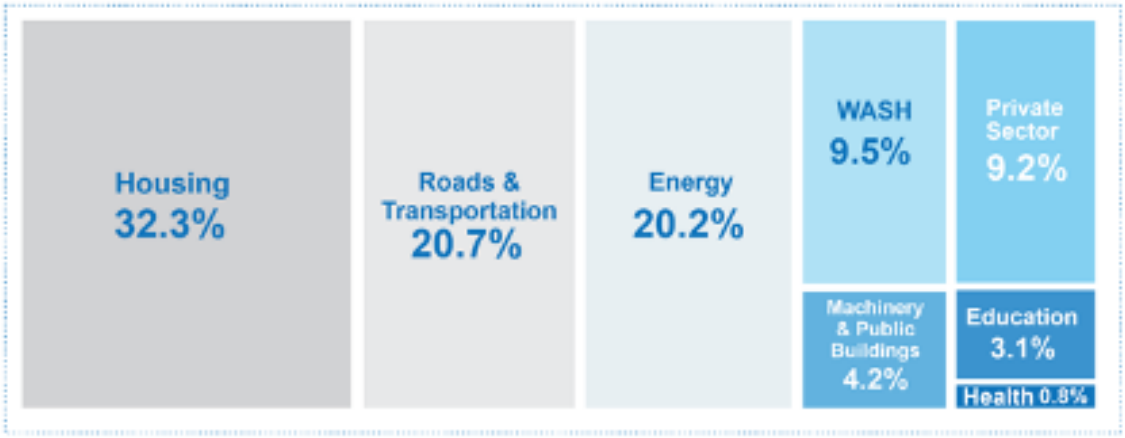


Table 2-2: Cost of Damages (US$) per Sector (Damages and BFB)

	Sector	Total Damage Value (US$)	Total BFB Value (US$)	Total Value (US$)	%
1	Housing	33,438,554	1,570,363	35,008,917	32.3%
2	Health	773,370	85,754	859,124	0.8%
3	Education	2,882,303	472,852	3,355,154	3.1%
4	WASH	9,128,777	1,125,050	10,253,827	9.5%
5	Energy	10,461,954	11,453,150	21,915,104	20.2%
6	Roads and Transportation	22,002,032	431,800	22,433,832	20.7%
7	Municipal and Public Buildings	4,495,409	-	4,495,409	4.2%
8	Private Sector	9,957,388	-	9,957,388	9.2%
	Total	**93,139,786**	**15,138,969**	**108,278,755**	**100.0%**

The following figure shows that the housing sector accounts for the highest volume of damages, followed by roads and transportation, and energy. The damage costs were relatively similar across education, transportation, WASH, public buildings, and ICT sectors. Less damages were reported in the municipal machinery and health sectors.

Figure 2-3: Damage Volume per Sector (Damages and BFB)



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2.2 Housing Sector

2.2.1 Context

Gaza is one of the most densely populated areas in the world (5,780 persons per square kilometre), with a total estimated population by mid-2021 of 2.11 million (1.07 million male and 1.04 million female)[21].

There are 25 municipalities in the Gaza Strip[22] with approximately 186,000 residential buildings, including 403,000 housing units (2017 census) [23]. According to the MoPWH strategic plan (2019-2023), the estimated shortage in housing units, as of 2012, was 61,000 while the required number of housing units was estimated at 13,000 per year. The longstanding housing shortage is currently estimated to exceed 120,000 units. It has been driven by over 15 years of restrictions on the import of building materials and equipment, the deteriorating socio-economic situation, and the recurring waves of hostilities.

The results of the 2017 PCBS census highlighted that 12% of households live in housing units with three persons or more per room, with the average density being 1.6 persons per room, and 3.4 rooms per housing unit[24]. Housing units are classified as follows: 76.7% are apartments, 21.5% are houses, and 1.8% are of other types.

The successive hostilities since 2000 have resulted in thousands of totally or partially damaged housing units, leading to a radical change in the urban landscape and a through the complete removal of residential neighbourhoods.

According to the HNO-2021[25], it is estimated that 433,000 Palestinians across the oPt are in need of humanitarian assistance to access an adequate shelter, with 83% of them in the Gaza Strip.

Impact of the Hostilities

The housing sector was severely affected by the latest hostilities. 664 housing units were totally damaged, and another 11,894 were partially damaged for the non-refugee population. A significant number of civilian residential buildings and housing units were directly and indirectly affected or sustained partial or total damage. As a result, and according to the Government Media Office, around 107,000 people became internally displaced during the hostilities, with 71,000 people being forced to seek shelter in UNRWA schools and others being hosted by relatives. As of October 2021, and according to the latest OCHA Situation Report, about 8,250 internally displaced people (IDPs) across the Gaza Strip still remain with host families or in rented accommodation and need longer-term shelter solutions. It is worth mentioning that there are still houses, as well as other buildings and facilities, on the waiting list for rehabilitation from the previous waves of hostilities.

The Egyptian technical team has removed around 50% of the rubble of demolished buildings, with efforts continuing to remove the remainder. UNDP has also removed 80,000 tons of rubble and is working, in close collaboration with UNMAS and MoPWH, on the rubble removal for the assigned list of damaged facilities. UNDP is expected to remove a total of 110,000 tons of rubble (41.5% of the anticipated total rubble).

2.2.2 Methodology

Immediately after the ceasefire, UNDP, UNRWA, MoPWH and the shelter cluster discussed the public announcement of the online registration platform for the housing sector. MoPWH launched the platform on 25 May 2021 for a 5-day registration period, which was subsequently extended until 2 June 2021. A total of 38,686 applications were received, out of which 13,490 were from non-refugees, based on cross-checking with UNRWA.

The online platform for registration proved to be a time-saving tool for the survey team in terms of identifying the locations of the affected houses. However, in order to ensure comprehensive coverage, the opportunity of house-to-house visit was also utilized to survey the surrounding area in case people with damaged housing had missed registering on the platform. In addition, UNDP established a call centre comprising three operators, as a mechanism for receiving and following-up on community claims and complaints. Contact numbers were advertised on different social media platforms.

Different thematic, sectoral, or geographical distribution methodologies were followed to carry out the damage assessment. In the housing sector, which was the most impacted in terms of infrastructure damages, the Gaza Strip was divided into three zones and 25 localities to facilitate the damage assessment. In each zone, a senior engineer was assigned to supervise the damage assessment implemented by the field engineers. The number of engineers in each zone was identified according to the expected damage in each zone.

Three teams were formed in zones as dictated by the geographical distribution of areas that were damaged. The assessment team was assigned to the different areas as follows:

Table 2-3: The Assessment Teams Distribution for Governorates

Team (1) North Gaza	Team (2) Gaza	Team (3) Middle Area, Khan Younis and Rafah	
• Beit Lahia • Jabalia • Beit Hanoun • Um Al Nasser	• Tal Al Hawa • West Gaza City • East Gaza City (Shijaeya, Tuffah, Zaitoon and Daraj) • Rest of Gaza (Remal, Sheikh Radwan, Sabra, etc.)	• Wadi Gaza • Al Mughraqa • Al Zahra city • Al Nuseirat • Al Bureij • Al Maghazi • Al Zawaydeh • Deir Al Balah • Wadi Al Salqa • Al Musaddar	• Khan Younis city • Abasan Kabira • Abasan Jadida • Bani Suhila • Al Qarara • Fukhari • Khuzaa • Rafah City • Al Shoka • Al Naser

The Gaza Strip was divided into five zones to facilitate the damage assessment of housing for non-refugees. In each zone, a senior engineer was assigned to supervise the damage assessment implemented by field engineers. The assessment team was assigned to different areas as follows:

- One team of 10 Field Engineers and three social workers were assigned to North of Gaza Strip to assess Beit Lahia, Jabalia and Beit Hanoun & Um Al Nasser. Due to the extent of damage, subgroups were formed according to the needs on the ground.

- One team of 35 Field Engineers and 14 social workers were assigned to Gaza City to assess Tal Al Hawa and West Gaza City, East Gaza City (Shijaeya, Tuffah, Zaitoon and Daraj) and rest of Gaza (Remal, Sheikh Radwan, Sabra, etc). Due to the wide geographical distribution, subgroups were formed according to the needs on the ground.

- One team of 12 Field Engineers and three social workers were assigned to Middle and South Areas to assess the damages in 20 localities, namely, Wadi Gaza, Al Mughraqa, Al Zahra city, Al Nuseirat, Al Bureij, Al Maghazi, Al Zawaydeh Deir Al Balah, Wadi Al Salqa, Al Musaddar, Khan Younis city, Abasan Kabira, Abasan Jadida, Bani Suhila, Al Qarara, Fukhari, Khuzaa, Rafah City, Al Shoka and Al Naser.

The affected housing units were classified as either totally or partially damaged buildings, with disaggregation by geographic location (governorate), floor area (square meters), type of ownership such as owned, rented, shared, etc. as well as the structural engineering status (at the time of assessment visit) to identify which buildings can be maintained or shall be removed based on their stability and risk of collapse.

The assessment considered the status of internal finishing of the housing units where the internal finishing works was classified into unfinished (only block works), upscale (the cost of finishing is high compared with normal finishing), normal (painting, or tiles with low material cost) or sub-standard (finishing material is low cost and does not meet minimum standard), as this affects the estimated cost of the housing unit.

The estimated cost took into consideration the Building Forward Better approach. It included the minimum area according to family size, adaptation to the needs of PWDs, and energy efficiency through the installation of PV solar systems.

At the start of the assessment, a meeting was conducted between UNDP and MoPWH to agree on the scope of damages assessment. MoPWH and UNDP signed a minutes of the meeting endorsing the cost of the housing sector damages, including BFB to accommodate PWDs requirements (5% additional cost for reconstruction) and the installation of PV Cells (3 KW Solar system for each occupied housing unit).

2.2.3 Summary of Findings

The housing sector damage assessment covered in this report only accounts for the non-refugee housing units, while the damage to refugee housing units was covered by UNRWA. -It is estimated that the percentage of affected housing units of refugees and non-refugees are 70% and 30% respectively.

The total cost of damage of the housing sector for non-refugee housing units is US$ 33,438,554. The assessment recorded 11,894 housing units (94.7%) as partially damaged, affecting the living conditions of 64,826 people. Among these, 971 are Internally Displaced Persons (IDPs) as their houses incurred severe damages and are currently uninhabitable. Furthermore, 664 (5.3%) housing units were totally damaged leaving additional 1,577 IDPs. The total number of affected people is 66,403, including 34,556 males and 31,847 females.

The assessment showed that a total of 80,509 square meters were totally damaged. The following table represents the percentage of damaged housing units versus classified ranges of area.

Table 2-4: The Areas of Damaged Houses

Housing unit area	# Of totally damaged buildings	% Of totally damaged buildings	# Of partially damaged buildings	% Of partially damaged buildings
<100 square meters	230	34%	1,847	16%
100-200 square meters	389	58%	8,809	74%
>200 square meters	45	8%	1,238	10%
Total	**664**	**100%**	**11,894**	**100%**

Regarding the ownership of land and housing units, the majority had owners except for the squatter housing units. The following table represents the percentage of damaged houses considering the different status of ownership.

Table 2-5: The Ownership of Damaged Houses

Ownership	# Of totally damaged units	# Of partially damaged units
Occupied by the owner	322	10,974
Rented	95	39
Shared	5	423
Squatter	0	1
Other (all unoccupied damaged units were set under others)	242	457
Total	**664**	**11,894**

At the time of collecting the assessment data, a total of 99 totally damaged buildings were still standing but needed a construction assessment to evaluate their status, (81 need total removal, 18 need partial removal, while 44 were totally demolished into rubble). The following table represents the percentage of damaged buildings considering their structural engineering status at the time of visit.

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Table 2-6: The Buildings Structural Engineering Status at the Time of Assessment Visit

Building Status at the Time of visit	# Of Buildings
Stands but needs partial removal and Others (mixed of total, partial, rubble, etc.)	18
Stands but needs total removal	81
Already removed	19
Existing in rubble	44
Standing but dangerous	3
Total	**165**

Gaza and North Gaza governorates have the highest numbers of totally damaged buildings, with 92 (56%) in Gaza and 41 (25%) in the North of Gaza. In addition, these governorates have the highest numbers of partially damaged buildings: 2,462 (30%) in Gaza and 4,199 (51%) in the North of Gaza. The total damage cost of totally damaged buildings and units is US$ 20,458,407, while the total damage cost of the partially damaged buildings and units is US$12,980,147 (total of US$ 33,438,554). The following figure represents the percentage of totally damaged buildings considering different governorates.

Table 2-7: Damage Level of the Damaged Buildings per Governorate

Governorate	# Of Totally Damaged Buildings	% Of Totally Damaged Buildings	Damage Cost US$	# Of Partially Damaged Buildings	% Of Partially Damaged Buildings	Damage Cost US$
North	41	25%	3,252,775	4,199	51%	4,941,007
Gaza	92	56%	14,724,632	2,462	30%	6,385,858
Middle Area	2	1%	70,000	208	2.5%	143,820
Khan Younis	30	18%	2,411,000	1,198	14.5%	1,293,141
Rafah	0	0%	0	174	2%	216,321
Total	**165**	**100%**	**20,458,407**	**8,241**	**100%**	**12,980,147**
	33,438,554					

The majority of the totally damaged buildings were used as residential buildings (76.4%). The following figure represents the percentage of totally damaged buildings/housing units considering their usage.

Table 2-8: The Previous Usage of Damaged Buildings

Building Usage	# Of Totally damaged Buildings	% Of Totally damaged Buildings
Combined	28	17.0%
Work	6	3.6%
Residential	126	76.4%
Resort	5	3.0%
Total	**165**	**100.0%**

The majority of damaged buildings were concrete buildings (78.2% of the totally damaged buildings and 88% of the partially damaged buildings respectively). The following table represents the percentage of totally and partially damaged buildings considering the roof material.

Table 2-9: The Materials Used in Damaged Building

Type/Material of the Roof	# Of Totally Damaged Buildings	% Of Totally Damaged Buildings	# Of Partially Damaged Buildings	% Of Partially Damaged Buildings
Concrete Building	129	78.2%	7,254	88.0%
Eternit Sheets	4	2.4%	141	1.7%
Iron Sheets	23	13.9%	438	5.3%
Concrete / Eternit	1	0.6%	93	1.1%
Concrete/Iron	1	0.6%	284	3.5%
Other (mixed types / materials)	7	4.3%	31	0.4%
Total	**165**	**100%**	**8,241**	**100%**

Most of the totally damaged buildings (76) and partially damaged buildings (4,556) were composed of 2-3 floors buildings. The following figures represent the number of totally and partially damaged buildings considering floor numbers.

Table 2-10: The Floors Number for Damaged Buildings

Floors number	# Of Totally Damaged Buildings	# Of Partially Damaged Buildings
Only one floor	49	2,187
2-3 floors	76	4,556
4-5 floors	22	1,301
> 5 floors	18	197
Total	**165**	**8,241**

69% of the totally damaged units were internally finished by normal finishing while 4% of them were totally unfinished. The following figures represent the percentage of totally damaged housing units considering their internal finishing.

Table 2-11: The Internal Finishing Type of the Damaged Housing units

Internal Finishing of the Units	# Of Totally Damaged Units	% Of Totally Damaged Units
Unfinished	28	4%
Upscale	156	24%
Normal	460	69%
Subnormal (Sub-standard)	20	3%
Total	**664**	**100%**

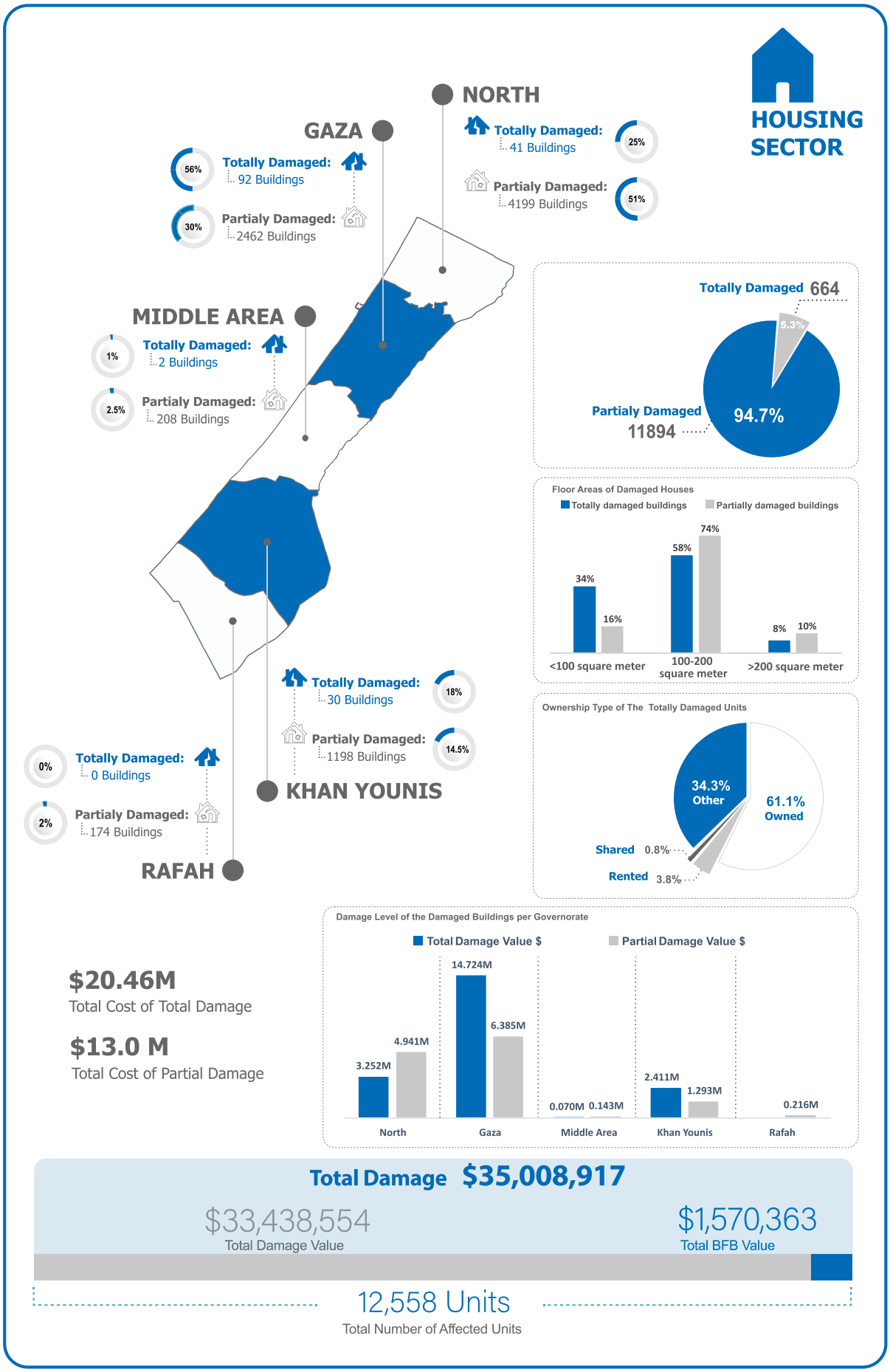
Cost of BFB

The damages were assessed and estimated in parallel with the costs of BFB. In the housing sector, the BFB is necessary to ensure that the reconstruction is considering the minimum area of each housing unit according to the household size, considering 5% additional cost for reconstruction of the housing units including requirements of the Persons with Disabilities (PWDs) and considering the installation of 3 KW Solar systems for each housing unit. The cost of these three additional items is estimated at US$ 161,730; 18,633; and 1,390,000 respectively, for a total of US$ 1,570,363.

Table 2-12: Cost of Damages and BFB Values (US$) for Housing Sector

	Description	Cost (US$)
Damages	**Totally Damaged Buildings**	**20,458,407**
	Partially Damaged Buildings	12,980,147
	Total Cost of Damages	33,438,554
BFB	Minimum Area According to the Family Size	161,730
	Adapting to the PWDs requirements (Considering 5% Additional cost for reconstruction for the housing units including PWDs)	18,633
	PV Cells (3 KW Solar system for each occupied housing unit to be considered in the reconstruction cost)	1,390,000
	Total Additional Cost of Building Forward Better (BFB)	**1,570,363**
Grand Total		**35,008,917**

Figure 2-4: Housing Sector Damage Summary



2.3 Health Sector

2.3.1 Context

The Palestinian health sector includes five main providers of health services: The Ministry of Health, the military medical services (the government sector), the United Nations Relief and Works Agency for Palestine Refugees (UNRWA), the civil society sector (NGOs) and the private sector. The MoH is the largest employer of human resources within the Palestinian health sector. Since the establishment of the Palestinian Authority, a significant shift has occurred in MoH personnel, in terms of both quantity and quality, with the number of healthcare personnel – including specialized surgeons – increasing over time.

The dire economic situation and severe resource constraints, as well as access restrictions have impaired the Ministry of Health in Gaza to provide adequate services. [26]. The closure of the Gaza Strip crossings has isolated Gaza from the rest of the occupied Palestinian territory and the outside world, causing serious limitations for residents to access health services that are not available in Gaza. Public health institutions, including 17 hospitals and 52 primary health care centres encounter a sustained shortage of consumables and medical supplies, including shortage of medicine stock as well as poor maintenance of medical equipment due to the lack of the needed spare parts. The healthcare system is highly unstable and on the verge of collapse.

Moreover, since March 2020, the already fragile and exhausted healthcare system has been experiencing additional distress due to the COVID-19 crisis. Efforts to contain the virus have undermined the delivery of other essential healthcare services. Only 19 out of 52 primary healthcare centres are functioning. Healthcare centres have been converted into COVID-19 quarantine and isolation centres, while some 810 doctors, nurses, and administrative staff in addition to 480 workers and cleaners of health personnel being mobilized to support their operation. Management of non-communicable diseases and palliative care have been suspended, affecting more than 64,000 people. About 3,500 elective surgeries per month are also being delayed. In addition, there are on average approximately 2,000 elective surgeries per month added to the waiting list, which has now reached 11,400 surgeries[27].

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Impact of the Hostilities

Gaza's health system has been impacted by the recent conflict both directly, through damage to health facilities, as well as indirectly, due to interruptions in service delivery. The hostilities have resulted in 2,200 people wounded, including 685 children and those with disability. Several casualties were reported among health care providers, with around 42 health workers suffering injuries[28]. The hostilities severely challenged the delivery of emergency medical services, as ambulance teams were obstructed from reaching the injured and evacuating them to hospitals, with roads being targeted and damaged. During the hostilities, the COVID-19 response in Gaza was also affected, as evidenced by a slowdown in testing and vaccination rates.

2.3.2 Methodology

The affected health facilities were assessed and classified as totally damaged and partially damaged buildings, with disaggregation by geographic location (governorate), type of facility (Hospital, Primary Health Centre/Clinic, MoH Admin Building), type of ownership such as Private, Governmental, etc.

A team of three Field Engineers was assigned to undertake the assessment of the damaged facilities in close coordination with MoH. At the start of the assessment, a meeting was conducted between UNDP and MoH to agree on the scope of the damage assessment. MoH and UNDP signed minutes of meeting endorsing the cost of the health sector damages, including BFB.

Furniture and equipment were not included in the damage costs. However, the estimated cost considered BFB includes finishing works (such as painting, plastering, and tiling) to keep up the aesthetic appearance of the damaged part of the building, as well as provision of basic furniture and curtains.

2.3.3 Summary of Findings

The assessment concluded that 35 health buildings were affected - including partial and total damages - with a total damage cost of US$ 859,124 (91% of the damaged health facilities incurred partial damages). The following table represents the level of damages, with the associated cost of damage.

Table 2-13: Damage Level for Healthcare Buildings

Damage Level	# Of Buildings	% Of Buildings	Damage Cost US$	% Of Damage Cost
Totally damaged	3	9%	75,500	9%
Partially damaged	32	91%	783,624	91%
Total	**35**	**100%**	**859,124**	**100%**

The Gaza governorate accounts for the highest number of damaged healthcare facilities, with 3 totally damaged and 18 partially damaged facilities, with a total damage cost of US$ 639,231. The following table displays the distribution of damaged facilities and associated damage costs per governorate.

Table 2-14: Damage Level of Healthcare Buildings per Governorate

Governorate	North	Gaza	Middle Area	Khan Younis	Rafah	Total
# Of totally damaged buildings	0	3	0	0	0	3
# Of partially damaged buildings	11	18	2	0	1	32
Total cost of the damage	211,376	639,231	7,815	0	702	859,124
% Of total damage cost	24.6%	74.4%	0.9%	0%	0.1%	100%

Out of the 35 damaged health facilities, 23 are primary health centres/clinics, which account for 49.1% of the total damage costs for the health sector. The following table represents the damage per health facility type.

Table 2-15: Damage per Health Facilities Type

Type	# Of Facilities	Damage cost US$	% Of damage
Hospital	9	222,296	25.9%
Primary Health Centre/Clinic	23	421,569	49.1%
MoH Admin. Building	3	215,259	25%
Total	**35**	**859,124**	**100%**

Governmental health facilities account for the highest damage cost, with 62% of the total damage cost for the health sector, as compared with the private facilities (38%). The following table shows the damage to governmental and private facilities.

Table 2-16: Damage per Governmental and Private Health Facilities

Type	# Of Damaged Facilities	Damage Cost US$	% Of Damage
Private	18	326,919	38%
Governmental	17	532,205	62%
Total	**35**	**859,124**	**100%**

Cost of BFB

The affected facilities included Hospitals, Primary Health Centre/Clinic and MoH Admin Building. to ensure the assessment calculated BFB costs to ensure resumption of health services with better quality, especially considering that some of the health care facilities were already facing deteriorated and sub-standard infrastructure conditions prior to the hostilities. The cost of the additional items for BFB was estimated at US$ 85,754.

Table 2-17: Damage and BFB Costs (US$) for Health Sector

Damage level	Private		Governmental		Total Cost (US$)
	# Of Damaged Facilities	Damage Cost (US$)	# Of Damaged Facilities	Damage Cost (US$)	
Totally damaged					
• Hospital	1	32,000	-	-	32,000
• Primary Health Centre /Clinic	2	43,500	-	-	43,500
• MoH Admin Building	-	-	-	-	-
Sum of Totally damaged	**3**	**75,500**	**-**	**-**	**75,500**
Partially damaged					
• Hospital	6	158,239	2	26,817	185,056
• Primary Health Centre/Clinic	8	79,011	13	241,828	320,839
• MoH Admin Building	1	14,169	2	177,806	191,975
Sum of Partially damaged	**15**	**251,419**	**17**	**446,451**	**697,870**
Total Cost of Damages (Totally + Partially damaged)	773,370				
Additional Cost of Building Forward Better (BFB)	85,754				
Total	**859,124**				

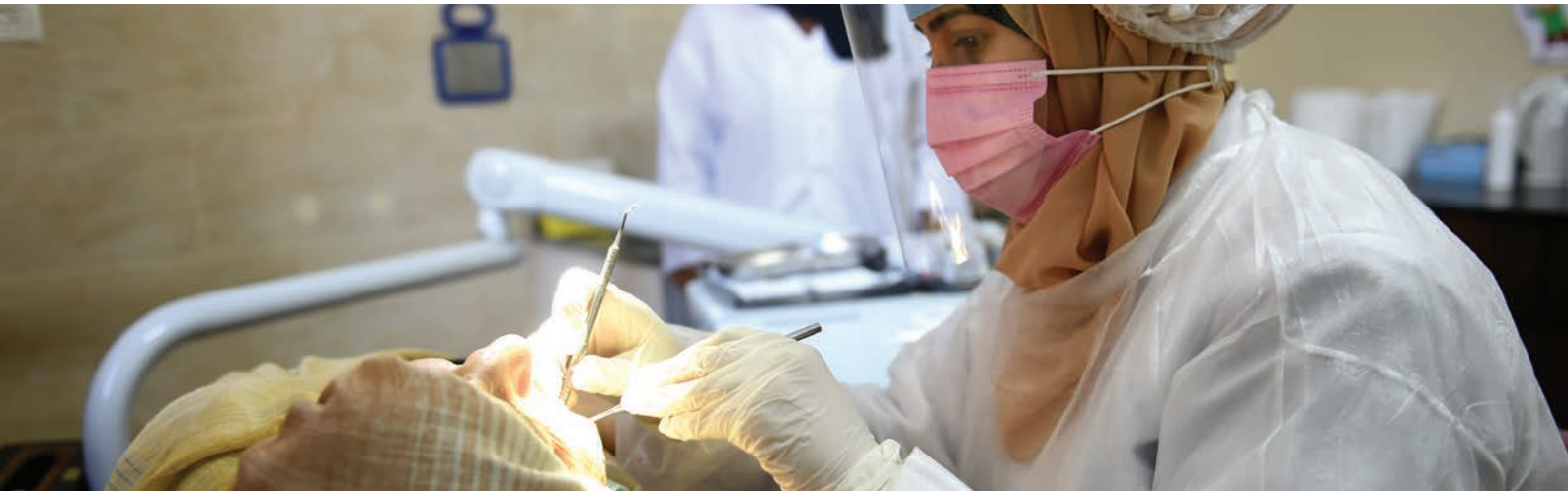

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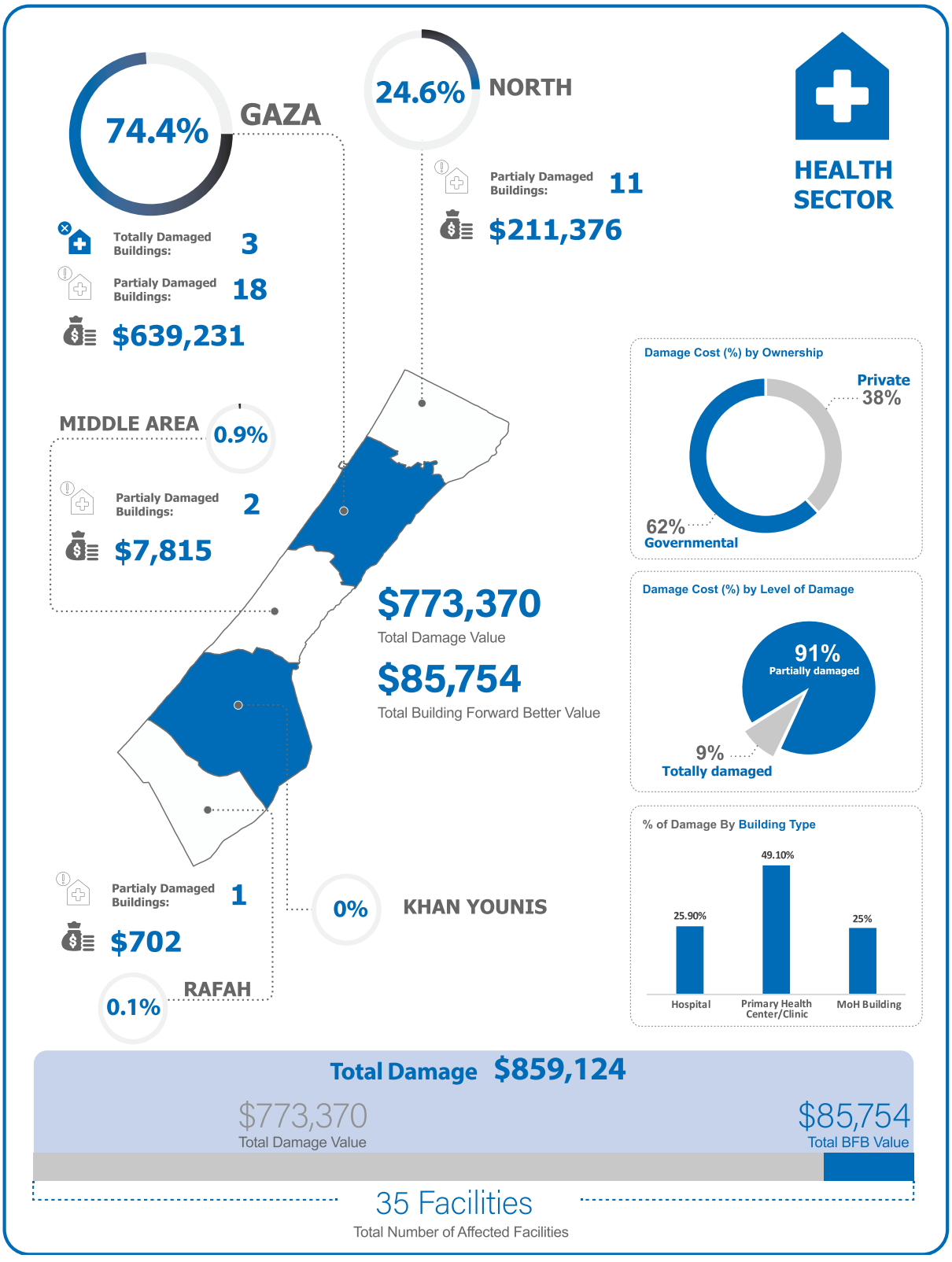
Figure 2-5: Health Sector Damage Summary



2.4 Education Sector

2.4.1 Context

The basic education system in Gaza Strip is comprised of 751 schools run by different service providers (Ministry of Education, UNRWA and the private sector), serving 591,599 students (286,327 MoE school students, 287,019 UNRWA school students, 18,253 Private school students).

Schools in Gaza are overcrowded, with an average number of students per classroom of 41.2 in UNRWA schools and 39.6 in governmental schools. Moreover, 70.14 per cent of UNRWA schools and 57.82 per cent of governmental schools operate on a double shift system, which reduces learning hours on core subjects, negatively affects the quality of education, and leaves little room for supporting students with learning disabilities, providing remedial education, or offering extracurricular activities.

According to the MoE, 86 new school buildings need to be built and 1,081 new classrooms need to be added to already existing buildings, in order to absorb a growing number of students and to provide a safe and quality learning environment. The governmental schools are facing deficit in covering the monthly budget of US$130,000 that is required to supply the fuel for generators in the schools, which also significantly affects the schools' capacity to provide quality education for their students[29].

Pre-school education is provided by 712 private kindergartens, serving 66,253 students[30]. Currently, only 30 per cent of younger children (aged 3-6) attend licensed preschools. This can be directly attributed to the widespread socio-economic vulnerabilities and the high poverty rate across the Gaza Strip.

Higher education in the Gaza Strip is comprised of 17 educational institutions (5 universities, 6 university colleges, 6 community colleges) in the 2021 academic year. The ongoing blockade of the Gaza Strip has had a negative impact on the capacity of the higher education institutions to meet the requirements for ensuring quality education, including in terms of adequate furniture and equipment for their buildings and laboratories. At the same time, the capacity of higher education institutions to promote international knowledge exchange for students and academic staff is significantly constrained by the blockade and movement and access restrictions[31].

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Impact of the Hostilities

A large number of educational facilities have sustained damages affecting 591,599 school students, 80,523 university students and 57,469 children in kindergartens[32], in addition to vocational training centres and higher education colleges. Damages include destroyed classrooms, labs, cracked walls, demolished school fences, damaged school playgrounds and infrastructure, including water and electricity networks, water tanks, solar panels, and WASH facilities. For around 79% of the schools assessed, maintenance and minor rehabilitation will be sufficient to enable students to safely return to their education facilities. The rest of the schools need reconstruction and moderate rehabilitation before allowing students to go back to a safe learning environment.

Accordingly, the Ministry of Education has ended the academic year for Grades 1 to 11 with immediate effect after the end of hostilities. Furthermore, the national Grade Twelve (Tawjihi) examination was also postponed to 24 June 2021[33].

2.4.2 Methodology

The affected educational facilities (kindergartens, schools, higher education institutions, MoE buildings) were classified as totally damaged buildings and partially damaged buildings, with disaggregation by geographic location (governorate), as well as type of ownership (i.e., Governmental, Organization-NGOs, Private).

Furniture and equipment were not included since it is outside the scope of this assessment. However, the estimated cost under the BFB approach, included the cost of finishing works to ensure a healthy, safe, and conducive environment for quality education in the classrooms.

A team of seven Field Engineers was assigned to undertake the assessment of the damaged facilities, in close coordination with MoE. The assessment included public schools and universities. The assessment of damages in kindergartens was carried out in full collaboration with Save the Children. At the start of the assessment, a meeting was conducted between UNDP and MoE to agree on the scope of the damage assessment and by the end of the task, MoE and UNDP signed minutes of meeting endorsing the cost of the Education sector damages including BFB that was originally based on the housing sector rates for the damaged items.

2.4.3 Summary of Findings

The buildings of Ministry of Education have incurred damages for a total cost of US$ 3,996, distributed between West Gaza and North Gaza directorates, as reflected in the following table.

Images: © UNDP/PAPP - Shareef Sarhan, Mohammad Za'noun, Abed Zaqout

Table 2-18: The MOE Directorates Damages

Directorates	# Of Damaged Buildings	Damage Cost US$
West Gaza	1	1,696
North Gaza	1	2,300
Total	**2**	**3,996**

A total of 271 education buildings were damaged either totally or partially. 112 kindergartens, serving 15,358 children, were partially damaged. 135 school buildings serving 119,343 students were also partially damaged, in addition to one totally damaged building. Twenty-three higher education buildings affiliated to thirteen higher education institutions were partially damaged. Overall, the education facilities of all types (kindergartens, Schools, and higher education) incurred damages for a total cost of US$ 3,351,158. The following table represents the level and cost of damage for all types of education facilities.

Table 2-19: The Level of Damage for Education Buildings

Level of damage	Kindergartens		Schools		Higher Education	
	# Of KG	KG Damage Cost US$	# Of Schools	School Damage Cost US$	# Of HE Buildings	HE Damage Cost US$
Totally destroyed	0	0	1	921,500	0	0
Partially damaged	112	230,270	135	1,718,696	23	480,692
Total	**112**	**230,270**	**136***	**2,640,196**	**23**	**480,692**
Total Number	**271**					
Total Cost	**3,351,158**					

*NB. 136 buildings for 135 schools since there is one school with two buildings, where one was totally damaged, and one was partially damaged.

Schools face the highest damage costs (US$ 2,640,196) among all damaged educational facilities. The highest damage cost was recorded in the Gaza governorate, in terms of kindergartens and HE buildings (US$ 106,530 and US$ 272,128 respectively), while the highest damage cost for schools is noted in the Middle Area (US$ 1,069,546), where there is one totally damaged school sub-building. The following table shows the damage cost of educational facilities per governorate.

Table 2-20: Damage Level of Education Buildings per Governorate

Governorate	Kindergartens		Schools		Higher Education		MoE admin.	Total	%
	Damage Cost US$	%	Damage Cost US$	%	Damage Cost US$	%	Damage Cost US$		
North Gaza	59,466	25.8%	402,635	15.3%	137,018	28.5%	2,300	601,419	17.9%
Gaza	106,530	46.3%	1,053,550	39.9%	272,128	56.6%	1,696	1,433,904	42.7%
Middle Area	12,965	5.6%	1,069,546	40.5%	11,817	2.5%	0	1,094,328	32.7%
Khan Younis	43,180	18.8%	42,410	1.6%	21,673	4.5%	0	107,263	3.2%
Rafah	8,129	3.5%	72,055	2.7%	38,056	7.90%	0	118,240	3.5%
Total	**230,270**	**100%**	**2,640,196**	**100%**	**480,692**	**100%**	**3,996**	**3,355,154**	**100%**

Out of the damaged kindergartens, 88.4% are privately-owned and account for a total damage cost of US$ 193,694.5. Governmental schools make up to 90% of all damaged schools, with the remaining 10% being private schools. Nineteen privately owned higher education buildings represent 82.7% of privately owned higher educational facilities that were also partially damaged, at a cost of US$ 367,707. The following table represents the damage for different types.

Table 2-21: The Level of Damage per Education Building Type

KG			Schools			HE		
Ownership	% Of item	% Of damage cost	Ownership	% Of item	% Of damage cost	Ownership	% Of item	% Of damage cost
Governmental	0.0%	0.0%	Governmental	90%	54%	Owned	82.7%	76%
Non-Governmental Organizations (NGOs)	11.6%	16%	UNRWA	0%	0%	Rented	13.0%	22%
Private	88.4%	84%	Private	10%	46%	Squatter	0%	0%
						shared	0%	0%
						other	4.3%	2%
Total	**100%**	**100%**	**Total**	**100%**	**100%**	**Total**	**100%**	**100%**

Cost of BFB

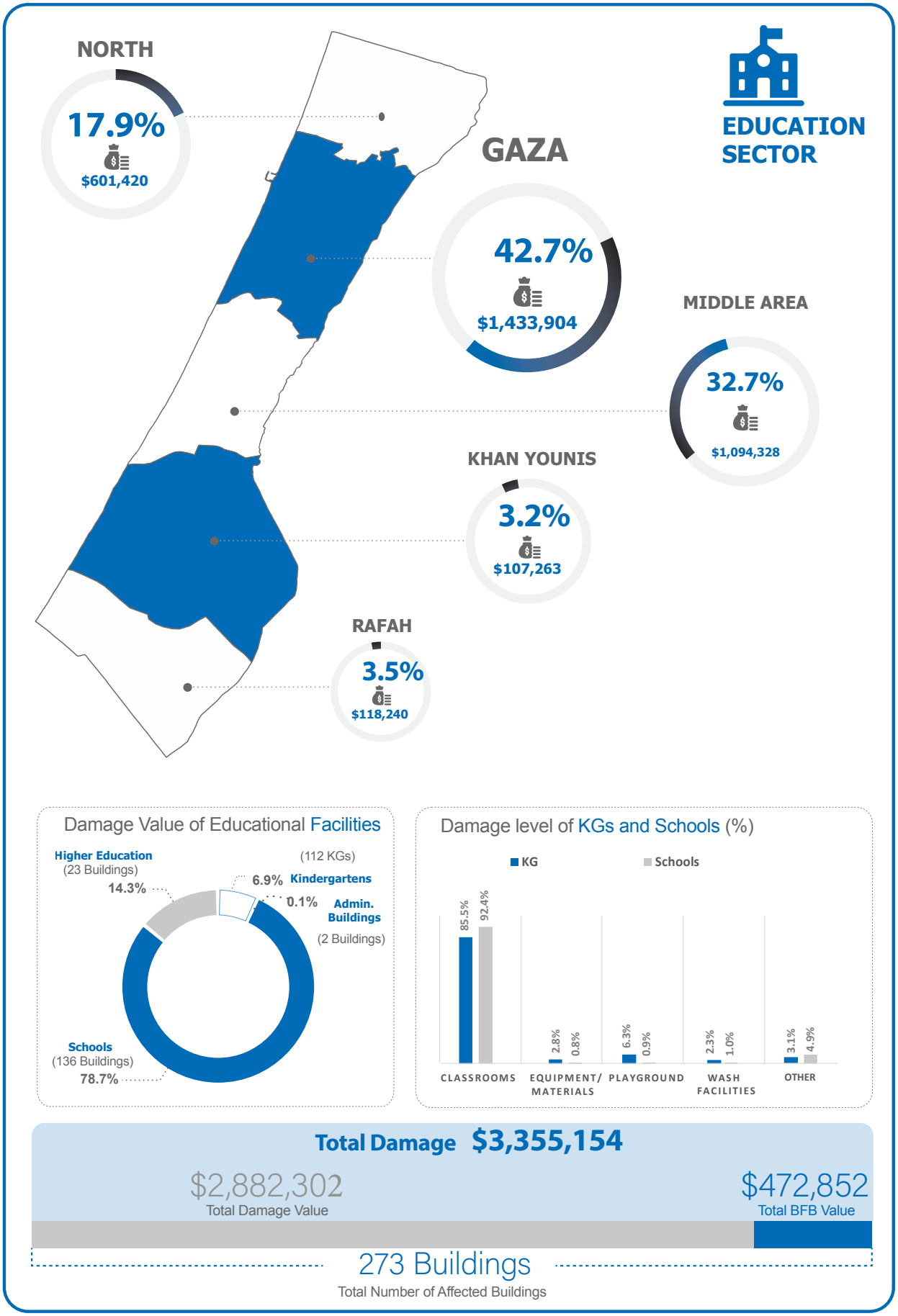
The cost of repairing the damaged educational facilities was estimated considering the BFB principle. In governmental schools, the reinstatement of finishing works has taken into consideration the need to ensure a conducive learning environment for children and maintaining the aesthetic appearance of classrooms. This would include ensuring that classrooms have no evident traces of the damages incurred during the hostilities, which could potentially trigger psychological distress and re-ignite trauma amongst students. The cost of the additional works was estimated at US$ 472,852.

Table 2-22: Cost of Damages and BFB Values (US$) for Education Sector

Type of Educational Facility	No. of Damaged Buildings	Damage Cost (US$)	BFB Cost (US$)	Total Cost (US$)
Governmental Schools	122	950,848	472,852	1,423,700
Private Schools	14	1,216,496	-	1,216,496
Kindergartens	112	230,270	-	230,270
Higher Education Institutions	23	480,692	-	480,692
MoE Admin. buildings	2	3,996	-	3,996
Total	**273**	**2,882,302**	**472,852**	**3,355,154**

Images: © UNDP/PAPP - Shareef Sarhan, Mohammad Za'noun, Abed Zaqout

Figure 2-6: Education Sector Damage Summary



Images: © UNDP/PAPP - Shareef Sarhan, Mohammad Za'noun, Abed Zaqout

2.5 Water, Sanitation and Hygiene (WASH) Sector

2.5.1 Context

There is a continuous decline in groundwater levels in the Gaza coastal aquifer as a result of over-pumping. Most of the coastal area within a distance inland of about 2 km is affected by seawater intrusion. With protracted over-pumping, the seawater intrusion influence is expected to progressively expand inland, affecting a larger number of water wells.

The average per capita consumption from the total water supply is about 140 l/c/d, while the actual consumption after considering the system efficiency is 86 l/c/d. However, the consumed water is undrinkable due to high salinity and nitrate (NO3) content, making 97% of water not appropriate for human use.

The current installed power supply to operate water and wastewater facilities is estimated at 29 MW, while projected power supply demand for water and wastewater facilities is estimated at 81.5 MW in 2020. Accordingly, the PWA's strategy aims to provide all water desalination and wastewater treatment plants with solar energy system to save energy for the sustainable operation of these plants. So far, 3.3 MW are either installed or under implementation.

The PWA developed a strategic plan to meet growing water demands, to save the aquifer and provide sustainable solutions to Gaza's water crisis through a Rolling Program of Interventions (RPI) consisting of: construction of a central desalination plant, 3 Short-term low volume (STLV) desalination plants, reduction of the non-revenue water, wastewater treatment plants, pilot and large-scale wastewater reuse schemes, increased quantity of imported water from the Israeli side and improvement of water management in agriculture.

The PWA's strategic plan faces several implementation challenges including the blockade, as well as constrained financial resources, and limited energy sources. Therefore, only 50% of the proposed capacity for the STLV plan is completed and connected with the water supply system. The Central Gaza Sea Water Desalination plant, with 55MCM/y capacity an estimated cost of US$450 was originally planned to be put into operation by 2016, but its launch is still delayed until today.

Impact of the Hostilities

The WASH sector has been severely impacted by the hostilities including water and wastewater infrastructure and services. 76 WASH facilities and more than 116.6 Kilometres of water and wastewater networks were damaged, including various WASH structures, such as water wells, water and sewer pumping stations, water reservoirs, water desalination plants and wastewater treatment plants. These damages have affected access to water and sanitation services for more than 1.2 million Palestinians in the Gaza Strip.

- The power supply in Gaza dropped by more than 60% (5 to 7 hours of electricity per day) following damage to electricity infrastructure. Therefore, many WASH facilities, particularly the desalination plants and wastewater treatment plants, have decreased their operational hours by more than 50%.

- The WASH service providers decreased or suspended the operation of water and sanitation facilities. According to the Coastal Municipalities Water Utility (CMWU), the operational capacities of the WASH facilities in Gaza dropped by more than 50% which led to the irregularity of water and wastewater services in the Gaza strip. WASH service providers in Gaza were struggling to secure the required resources for the operation and maintenance of their WASH facilities. Challenges were faced due to the lack of adequate materials in Gaza and the limitations imposed on the import of the dual-use list. As a result of the hostilities, the service providers' stocks of WASH materials and spare parts were consumed during the hostilities.

- Destruction and damages affected 69,173 meters of water lines and networks, under sidewalks and roads, with different types and diameters.

- Water supply per capita decreased by 30% during the conflict due to direct impact and loss of electricity, adversely affecting 800,000 people in Gaza[34].

- Destruction and damage affected 40,363 meters of sewage lines and networks, 7,100 meters of storm water drainage pipes, as well as sewage lines and networks under sidewalks and roads. Sewage pumping station number one was targeted and almost totally destroyed and out of service, which led to the leakage of sewage to the seashore and and its polution[35]. More than 100,000 m3 of untreated/ poorly treated wastewater is discharged directly to the sea[36] flooding some residential neighbourhoods and creating environmental crises in the surrounding areas.

- Re-instatement of roads and the relevant infrastructure networks will take into consideration the future needs including increasing diameters of water and wastewater pipes and replacing the asbestos pipes to ensure BFB.

The most vulnerable households became unable to mitigate the interruption in WASH services and adopted negative coping mechanisms, such as decreasing their water consumption and discharging wastewater to open areas in their neighbourhoods. The damages to WASH infrastructure pose a significant risk for the population's health, with the risk of transmission of water-borne infections and diseases increasing due to the lack of clean water and wastewater management. Moreover, untreated wastewater was discharged directly to the sea and on the streets, with a considerable impact on the ecosystem.

2.5.2 Methodology

The affected WASH infrastructure included a variety of networks and facilities, including but not limited to; water distribution networks, storm water networks, sewage collection networks, sewage pumping station, water wells, WWTP, water reservoirs, and water desalination plants. Each facility was assessed as totally or partially damaged, with geographic disaggregation by governorate. Due to the urgency of maintaining WASH services, some immediate responses were implemented and the assessment team has also collected data about the temporary and permanent repairs carried out by WASH cluster members. On the other hand, the water, wastewater, and storm water networks were assessed by the roads assessment team, who caried a detailed assessment for the damaged networks, including pipes and related fittings and BFB.

A team of five Field Engineers was assigned to undertake the assessment of the damaged WASH facilities and networks, in close coordination with MoLG. At the start of the assessment, a meeting was conducted between UNDP and MoLG, to agree on the scope of the damage assessment. A training was conducted for the field engineers and the focal persons from MoLG, to ensure an efficient use of tablets and the correct application of the survey approach. The MoLG assigned a focal engineer to facilitate the damages assessment process and to provide the data related to the damages on the ground.

MoLG and UNDP conducted meetings to revise the cost of the damages and agree on the developed assessment, as well as sign formal minutes of the meeting endorsing the cost of the WASH sector damages including BFB.

2.5.3 Summary of Findings

A total of 76 WASH facilities and more than 116.6 Km. of water and wastewater networks were affected by the hostilities, with 92% of the WASH facilities incurring partial damages. The six (6) totally damaged WASH facilities included five (5) water wells and one (1) sewage pumping station. The total cost of damages reached US$ 10,253,827. The following tables display the number of the damaged WASH facilities and related networks with associated damage costs.

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Table 2-23: Damage Level of WASH Facilities

Damage level	# Of WASH facilities	% Of WASH Facilities	Damage Cost US$	% Of Damage Cost
Totally	6	8%	930,300	42.3%
Partially	70	92%	1,270,744	57.7%
Total	**76**	**100%**	**2,201,044**	**100%**

Table 2-24: Total Damage and BFB costs of roads' water, wastewater, and storm water networks

Network Type	Pipes		Fittings		Total Damage and BFB cost US$
	Quantities (meters)	Damage and BFB cost US$	Quantities (No.)	Damage and BFB cost US$	
Water Networks	69,173	2,481,051	1,168	326,320	2,807,371
Wastewater Networks	40,363	2,081,052	2,150	1,114,220	3,195,272
Storm water Networks	7,100	1,529,450	428	520,690	2,050,140
Total	**116,636**	**6,091,553**	**3,746**	**1,961,230**	**8,052,783**

North Gaza and Khan Younis governorates account for the highest share of damage costs for WASH facilities, as they are the only governorates which include totally destroyed WASH facilities (2 and 4 facilities respectively), in addition to the partially damaged ones (19 and 12 facilities respectively). Northern Gaza and Gaza governorates recorded the highest damages to the networks. The following tables represent the damage cost distribution per governorate.

Table 2-25: Damage Level of WASH Facilities per Governorate

Governorate	Totally Damaged Facilities		Partially Damaged Facilities		Damage Cost US$	% Damage Cost
	No.	%	No.	%		
North	2	33%	19	27.14%	997,974	45%
Gaza	0	0%	10	14.29%	330,080	15%
Middle Area	0	0%	19	27.14%	225,720	10%
Khan Younis	4	67%	12	17.14%	474,100	22%
Rafah	0	0%	10	14.29%	173,170	8%
Total	**6**	**100%**	**70**	**100%**	**2,201,044**	**100%**

Images: © UNDP/PAPP - Shareef Sarhan, Mohammad Za'noun, Abed Zaqout

Table 2-26: Damaged roads' water, wastewater, and stormwater networks per governorate

Governorate	Water Network		Wastewater Network		Storm water Networks		Total Damage Cost US$	% Damage Cost
	Total Length (meters)	Damage Cost US$	Total Length (meters)	Damage Cost US$	Total Length (meters)	Damage Cost US$		
North	27,205	996,725	10,850	766,700	2,020	283,320	2,046,745	25.4%
Gaza	28,118	1,137,376	20,773	1,859,982	2,850	992,970	3,990,328	49.6%
Middle Area	4,540	193,910	5,560	356,310	1,540	367,350	917,570	11.4%
Khan Younis	7,620	408,420	1,830	114,480	520	221,550	744,450	9.2%
Rafah	1,690	70,940	1,350	97,800	170	184,950	353,690	4.4%
Total	**69,173**	**2,807,371**	**40,363**	**3,195,272**	**7,100**	**2,050,140**	**8,052,783**	**100%**

Table 2-27: Total damage cost US$ of WASH facilities and networks per Governorate

Governorate	Damage cost US$ of WASH facilities	Damage cost US$ of WASH networks	Total damage cost US$	% of damage cost
North	997,974	2,046,745	3,044,719	29.7%
Gaza	330,080	3,990,328	4,320,408	42.1%
Middle Area	225,720	917,570	1,143,290	11.1%
Khan Younis	474,100	744,450	1,218,550	12.0%
Rafah	173,170	353,690	526,860	5.1%
Total	**2,201,044**	**8,052,783**	**10,253,827**	**100%**

Sewage pumping stations and water wells have sustained the highest levels of damages and account for the highest share of total damage costs for the WASH facilities sector, with estimated costs of US$ 906,030 (41%) and 693,444 (31.5%) respectively.

The following table shows the damage for each infrastructure type.

Table 2-28: Damage Level of WASH Infrastructure Type

	Infrastructure type	No. of Damaged Facilities/items	% of Damaged Facilities/items	Damage Cost US$	% of Damage Cost
WASH Facilities	Sewage Pumping station	16	21.1%	906,030	8.9%
	Water Well	41	54%	693,444	6.8%
	WWTP	4	5.3%	348,370	3.4%
	Water reservoirs	7	9%	70,520	0.7%
	Water desalination plant	4	5.3%	14,600	0.1%
	Others	4	5.3%	168,080	1.6%
	Sub-Total	**76 Facilities**	**100%**	**2,201,044**	**21.5%**
Road Networks	Water Networks (Meters)	69,173	59.3%	2,807,371	27.4%
	Wastewater Networks (Meters)	40,363	34.6%	3,195,272	31.1%
	Storm water Networks (Meters)	7,100	6.1%	2,050,140	20.0%
	Sub-Total	**116,636 Meters**	**100%**	**8,052,783**	**78.5%**
	Grand Total			**10,253,827**	**100%**

Immediate Repairs Implemented

The WASH Cluster (in coordination with PWA and CMWU) developed an immediate response plan with a total budget of US$ 7.5 million, to restore and maintain provision of urgent WASH services. More than 20 WASH Cluster partners contributed to the development of this immediate response plan, with

WASH interventions being currently implemented according to pre-identified criteria and technical standards. This immediate response plan has been fully secured by WASH cluster partners through the UN humanitarian appeal.

Some temporary repairs have been made immediately to 32 WASH infrastructures (42% of the total WASH infrastructure needing repairs). The following table represents the percentages of WASH facilities repairs.

Table 2-29: The Immediate Responses for WASH Facilities Repairs

Response	# Of WASH Infrastructure	% Of WASH Infrastructure
Temporary repairs	32	42%
Permanent repairs	1	1%
None (no response)	43	57%
Total	**76**	**100%**

Despite the repairs, WASH Cluster partners, CMWU, and PWA are still facing several challenges and constraints in restoring and maintaining WASH services after the recent hostilities. These challenges include: (1) Restricted access to required construction and operational materials, as well as equipment (2) WASH services efficiency and unseen WASH damages, (3) shrinking capacities of service provider, and (4) the continuing power supply shortages.

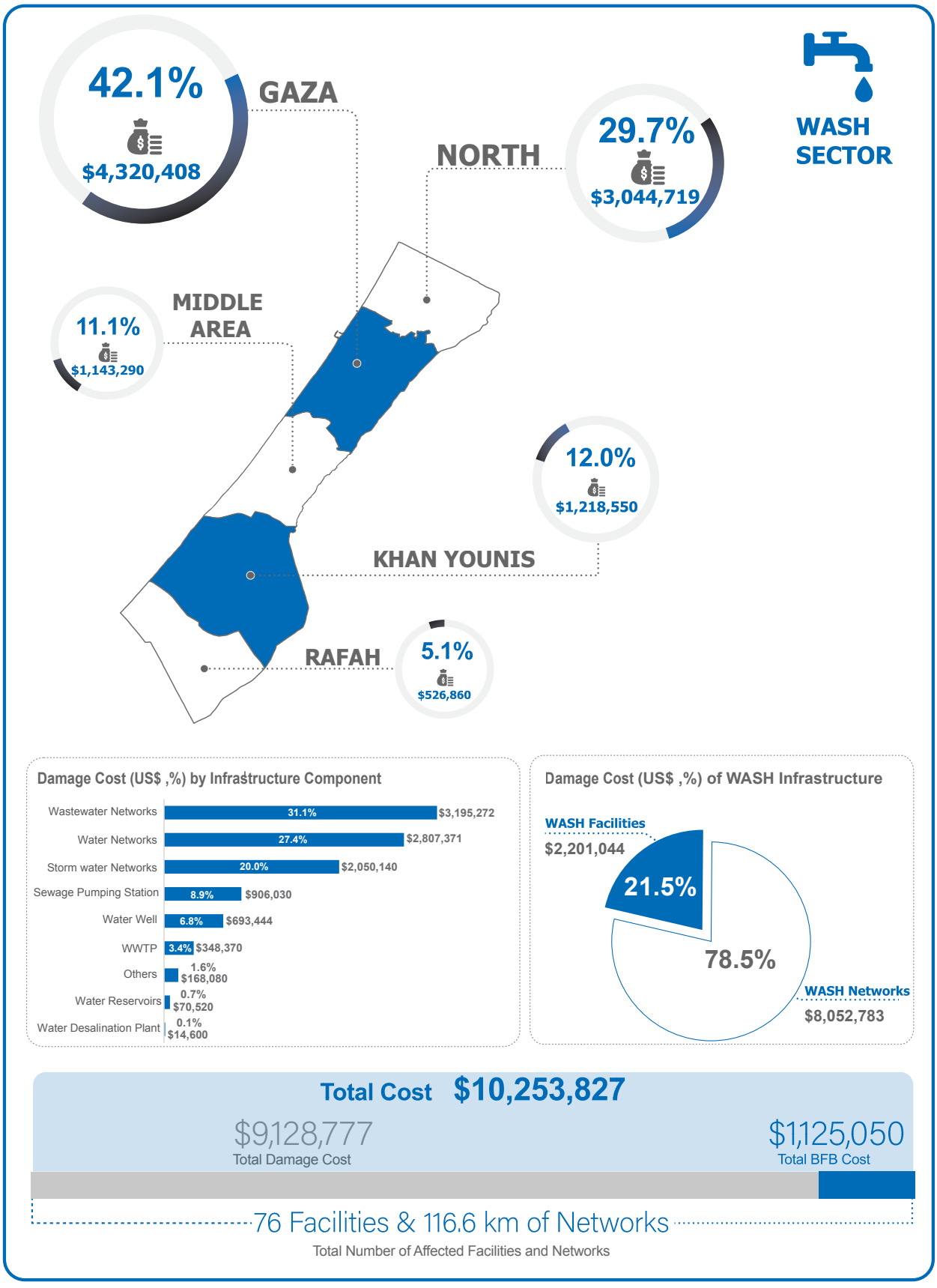
Cost of BFB

The estimated costs described in the sections above include the cost for reconstruction of sewage pumping stations and networks that have sustained severe damages. This cost was estimated at US $1,125,050. The following table summarizes the costs of damages and BFB.

Table 2-30: Damage and BFB Costs (US$) for WASH sector

Sector	Total Damage Cost (US$)	Total BFB Cost (US$)	Total Cost (US$)
1. Road Networks	**7,642,033**	**410,750**	**8,052,783**
Water Networks	2,752,071	55,300	2,807,371
Wastewater Networks	3,063,822	131,450	3,195,272
Storm water Networks	1,826,140	224,000	2,050,140
2. WASH Facilities	**1,486,744**	**714,300**	**2,201,044**
Total	**9,128,777**	**1,125,050**	**10,253,827**

Figure 2-7: WASH Sector Damage Summary



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2.6 Energy Sector

2.6.1 Context

The power supply system in Gaza Strip consists of the regulatory sector represented by the Palestinian Energy and Natural Resources Authority (PENRA), the production sector represented by Palestine Electric Company (PEC), and the power transmission and distribution sector represented by the Gaza Electricity Distribution Company (GEDCO).

Currently, Gaza's electricity supply comes from two sources[37]: the first being Israel's electricity company, which supplies 120 MW of electricity to the Gaza Strip through ten lines; the second being the Gaza Power Plant. It is worth mentioning that the southern area of the Gaza Strip had been connected to the Egyptian electricity network for several years through three lines with a total of 23 MW. However, these three lines are disconnected and not working since 2018 to date.[38]

Transformers and fuel tanks, have been targeted multiple times over recurring hostilities since 2006. The capacity of the Gaza Power Plant (GPP) ranges from 140 mw to 70 Mw, depending on the availability of fuel. For the past decade, the Gaza Strip has been suffering from a chronic electricity deficit[39], which undermines the already fragile living and socio-economic conditions. The situation has further deteriorated since April 2017, in the context of disputes between the de facto authorities in Gaza and the Palestinian Authority.

According to GEDCO, the ban on the entry of fuel used to operate the power plant causes a decline in the amount of electricity produced by the plant. As a result, the aggregate amount of electricity available in the Gaza Strip from all sources ranges between 155 Mw to 200 Mw, while the average demand ranges between 425 Mw during the morning hours and increases during the day and evening to exceed 540 Mw. GEDCO estimated that the gap between supply and demand of electricity is between 50-75%, prompting the company to supply only four hours of electricity at a time, followed by 16 hours of power cut.

The ongoing power deficit severely affects and disrupts the provision of essential services, particularly health, education, water, and sanitation services, and undermines Gaza's fragile economy, particularly the manufacturing and agriculture sectors. Failing to address the energy deficit will further weaken local production capacities, resulting in additional families falling into poverty.

The high dependency on the electricity produced by Israel, coupled with limited access to alternative sources of energy and losses in electricity distribution networks have resulted in increased unaffordability, whereas the electricity prices in the Gaza Strip are considered relatively higher, compared to other countries in the region.

Recently there is a growing interest, to mainstream renewable energy sources. Some projects proposed by humanitarian organizations include provision of solar energy systems, as part of the project components, and some infrastructure facilities (mainly WASH facilities) include an alternative energy source.

In a solar energy mapping led by UNDP, it was found that, as of April 2021, 106 solar energy projects were completed with a total installed power of 12,923 Kw.

Impact of the Hostilities

PENRA emphasized that energy sources and electricity networks across the Gaza Strip were targeted during the hostilities. Power supply in the Gaza Strip declined to only 96Mw, bringing the power supply deficit to 76% and resulting in only five hours of electricity per day. The electricity outages also affected the functioning of basic services – primarily health, water and sewage systems and the operation of hospitals and other basic services[40]. The airstrikes and shelling prevented maintenance teams from accessing and repairing damaged networks, causing a permanent power cut for some neighbourhoods.

The hostilities exacerbated the electricity crisis in Gaza, as more than half of the limited power available in Gaza was lost due to the destruction of seven main power lines and the shutdown of the Gaza Power Plant. The electricity distribution sector was affected during the escalation, where the networks of medium voltage and high voltage networks as well as the substations were targeted. Six main feeder lines (out of 10 lines feeding Gaza Strip), with a capacity of 72 Mega Watt were damaged, while the Israeli authorities did not allow the crews to access them for necessary maintenance. Also, the closure of Kerem Shalom crossing point and preventing the supply of fuel for the power plant has resulted in a reduction of production capacity to 50 MW, leading to increasing electricity outages of up to 16 hrs[41].

2.6.2 Methodology

The damage assessment in the energy sector involved all items and components of the electricity network including distribution transformers, cables & conductors, wooden poles steel poles, fittings,

cable joint & clamps, switches, meters as well as concrete bases and accessories for connections, with disaggregation by geographic location (governorate).

The estimated cost considered a BFB approach to ensure an upgrade and an expansion of the electricity network coverage and efficiency.

A team of two Field Engineers was assigned to undertake the assessment of the damages of GEDCO facilities and utilities in close coordination with GEDCO. At the start of the assessment, a meeting was conducted between UNDP and GEDCO to agree on the scope of damages. GEDCO and UNDP signed a minutes of meeting endorsing the cost of the Energy sector damages including BFB.

2.6.3 Summary of Findings

The estimated costs of damages for the electricity networks reached US$ 8,575,372. The damages included several essential items, as shown in the table below, where the highest cost of damaged items is noted in the cables and conductors (US$ 3,867,621), accounting for 45.1% of the total damage costs. The following table represents the number of damaged units and their respective cost.

Table 2-31: Damage Level of Energy Machinery and Equipment

Items (Machinery & Equipment)	Unit	Quantity	Estimated Damage Cost US$	% Of Estimated Damage Cost
Distribution Transformer	No.	35	820,300	9.6%
Cables & Conductor	meter	318,979	3,867,621	45.1%
Steel equipment (poles, pole bases & Arms)	No.	847	531,262	6.2%
Fittings, cable joint & clamps	No.	12,767	205,073	2.4%
Wooden poles 8.5 meter	No.	472	74,450	0.9%
Switches L.V & M.V	No.	160	2,437,625	28.4%
Smart meters (KWH)	No.	1,080	151,200	1.7%
Concrete & Accessories for connections	No.	20,722	487,841	5.7%
Total			**8,575,372**	**100.0%**

The highest damages cost occurred in Gaza governorate (54.6%) followed by the North governorate (24.0%), as illustrated in the following table.

Table 2-32: Damage Level of Energy Equipment per Governorate

Governorate	North	Gaza	Middle Area	Khan Younis	Rafah	Total
Damage Cost US$	2,055,930	4,691,057	648,234	289,432	890,719	**8,575,372**
% Of damage cost	24.0%	54.6%	7.6%	3.4%	10.4%	**100%**

Cost of BFB

The energy sector requires special consideration, as it is affected by every hostility while the demand for energy is continuously increasing. The damages to the energy sector have a significant negative impact on all aspects of social and economic life. While the continuous improvement of the sector, in terms of network coverage and efficiency, has been a critical area of investment for the last 15 years, damages incurred as a result of recurring hostilities inevitably challenge the long-term development of the sector.

In line with the BFB approach, the cost of re-construction for the damaged items was calculated taking into account the required improvements of the electricity network (machinery & equipment). The cost of BFB is estimated at US$ 9,387,828 and installation and labour cost is 22% of the total damage cost, making the total cost for Energy sector damages US$ 21,915,104.

Rafah and Gaza governorates face the highest costs of reconstruction, accounting for 34.4% and 32.6% of the total reconstruction costs, respectively. Regarding the type of items, the cables, and conductors account for the highest share of estimated reconstruction costs (62%), followed by Switches L.V & M.V (23.38%). The following table represent the required reconstruction costs per damaged item.

Table 2-33: The Reconstruction Cost of Energy Equipment

Items (Machinery & Equipment)	Unit	Quantity	Cost of Reconstruction US$	% Of Cost of Reconstruction
Distribution Transformer	No.	17	446,980	4.76%
Cables & Conductor	Meters	277,301	5,823,564	62.03%
Steel equipment (poles, pole bases & Arms)	No.	738	379,350	4.04%
Fittings, cable joint & clamps	No.	10,689	210,098	2.24%
wooden poles 8.5 meter	No.	21	3,312	0.04%
Switches L.V & M.V	No.	137	2,194,825	23.38%
Smart meters (KWH)	No.	0	0	0.00%
Concrete & Accessories for connections	No.	18,256	329,699	3.51%
Total			**9,387,828**	**100.00%**

The highest cost of reconstruction was identified in the Rafah governorate (34.4%), followed by the Gaza governorate (32.6%). The following table represents the damage cost per governorate.

Table 2-34: The Reconstruction Cost of Energy Equipment per Governorate

Governorate	North	Gaza	Middle Area	Khan Younis	Rafah	Total
Damage cost US$	1,497,138	3,057,704	1,178,302	427,203	3,227,471	**9,387,828**
% Of damage cost	15.9%	32.6%	12.5%	4.6%	34.4%	**100%**

Table 2-35: The Total Cost of Damages and Reconstruction for "Building Forward Better"

Items (Machinery & Equipment)	Quantity	Estimated Damage Cost US$	Cost of BFB US$	Total Cost US$
Distribution Transformer	52	820,300	446,980	1,267,280
Cables & Conductor	596,280	3,867,621	5,823,564	9,691,185
Steel equipment (poles, pole bases & Arms)	1,585	531,262	379,350	910,612
Fittings, cable joint & clamps	23,456	205,073	210,098	415,171
Wooden poles 8.5 meter	493	74,450	3,312	77,762
Switches L.V & M.V	297	2,437,625	2,194,825	4,632,450
Smart meters (KWH)	1,080	151,200	0	151,200
Concrete & Accessories for connections	38,978	487,841	329,699	817,540
Sub-total	**662,221**	**8,575,372**	**9,387,828**	**17,963,200**
Workmanship, supervision, and installation Cost (22%)		**1,886,582**	**2,065,322**	**3,951,904**
Total	**662,221**	**10,461,954**	**11,453,150**	**21,915,104**

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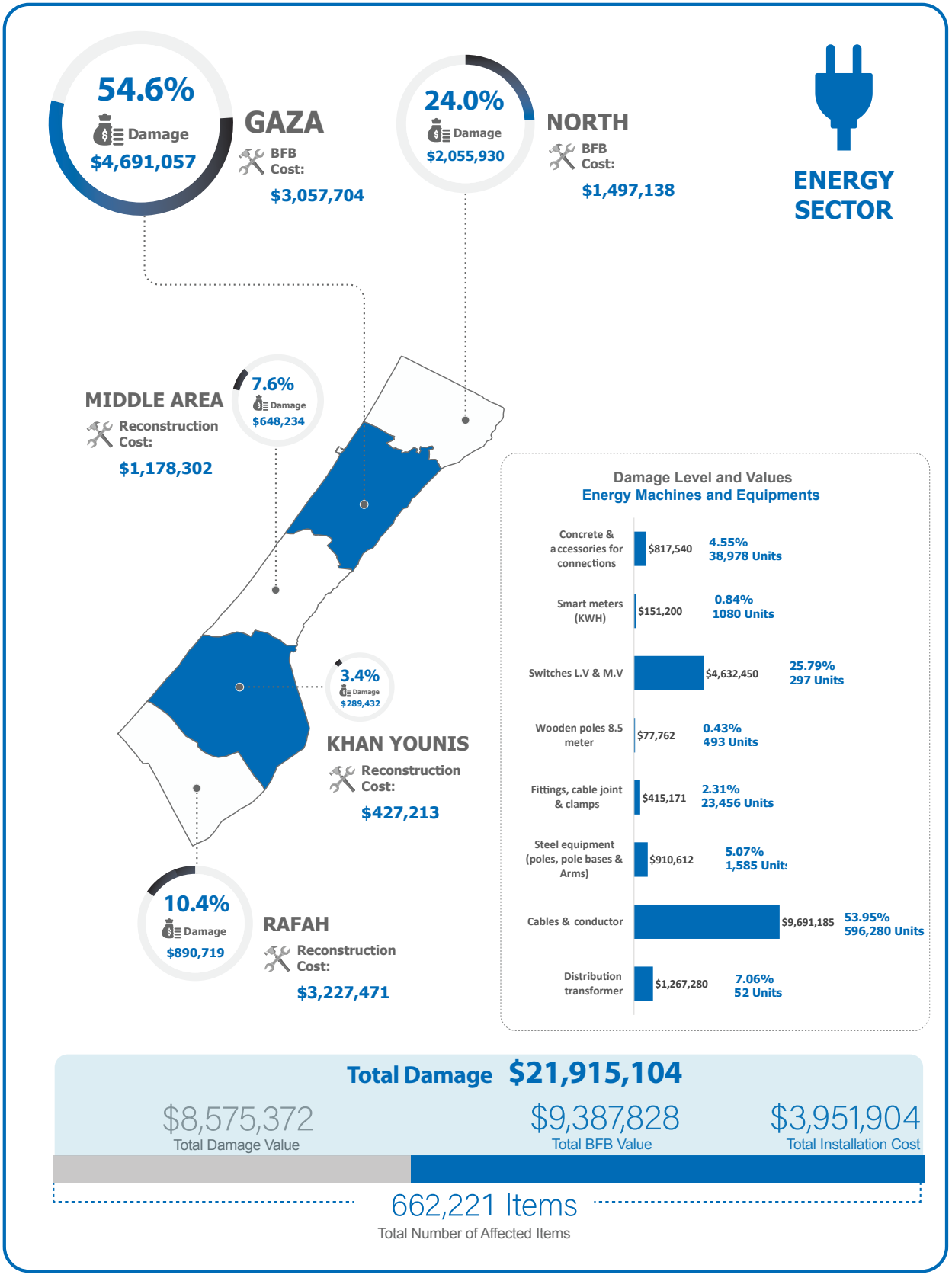
Figure 2-8: Energy Sector Damage Summary



2.7 Roads and Transportation Sector

Roads and transportation play an important role in the facilitation of the movement of people and goods. In the Gaza Strip, the smooth movement of people and goods is further challenged by the limitations of a small and poor-quality road network, coupled with the absence of airport, seaports, tunnels, and bridges. Additionally, the lack of parking lots in the city centres contributes to severe traffic congestion and interrupted traffic flow.

2.7.1 Context of Roads Sub-sector

The total length of roads in the Gaza Strip is 297 kilometres (76 Main, 122 Regional, 99 Local)[42]. The overall area of Gaza Strip roads is around 24.2 square kilometres, equal to 6% of the Strip's area.

There are no systematic statistics or surveys assessing the conditions of roads in Gaza Strip (such as road surface condition surveys). Some roads are paved but nevertheless unfit, as they are full of cracks and splits. Overall, roads in the Gaza Strip appear to be of low standard.

Since the establishment of the Palestinian Authority in 1994, considerable attention was devoted to improving the roads' networks and infrastructure, with a significant amount of donor funding being directed towards expanding the road networks, constructing new roads, and rehabilitating the existing ones. Over the past ten years, there were significant efforts for road maintenance and new road construction, especially following the initiation of work on regional roads and a number of main roads as part of projects funded by Qatar, the Gulf Cooperation Council, World Bank, MDLF and other donors.

Impact of the Hostilities

The damaged road networks are totalling a length of 10,500 meters, and 454 public transport vehicles were completely destroyed[43]. During the escalation, the damages to a large number of main roads, especially those leading to main hospitals, caused serious disruptions of the emergency efforts and delayed access of the injured people to hospitals. After the ceasefire, the damages of roads and piling up of rubble in different locations have created disruptions to traffic flow and affected the movement of people and vehicles, thus impacting access to hospitals, schools, universities, and workplaces, especially in the main cities.

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2.7.2 Methodology for the Roads Sub-sector

The assessment of the road sub-sector included an assessment of the damages and losses in the road components (including asphalt, concrete, interlock tiles for streets and sidewalks, curb stone, areas of unpaved roads, lighting networks and lighting poles), as well as in the infrastructure networks (water, wastewater, and storm water networks)

While estimating the cost of damages in the roads sub-sector, it was essential to include the additional costs that must be considered in the re-installation of roads and infrastructure items such as increase in diameter of water or wastewater pipes below the roads, to ensure better capacity, as well as replacing old and deteriorated lines. In the assessment of the road sub-sector, WASH facilities were included in the cost estimates for repairing the damages and BFB, since all future road projects should include the WASH infrastructure.

A team of nine Field Engineers was assigned to undertake the assessment of damages, in close coordination with MoLG across the five governorates of the Gaza strip. At the start of the assessment, a meeting was conducted between UNDP and MoLG to agree on the scope of the damage assessment. A training was conducted for the field engineers and the focal persons from MoLG, focusing on the appropriate use of tablets and the survey mechanism for the damages. The MoLG assigned a focal engineer to facilitate the damage assessment process and to provide data related to the damages on the ground. MoLG and UNDP conducted meetings to revise the damage costs and agree on the developed assessment and signed a minutes of meeting endorsing the damage cost for the road sub-sector, including BFB.

2.7.3 Summary of Findings for the Roads Sub-sector

1. Road components

In total, 115 asphalt-paved municipal and regional roads, 87 interlock-tiled roads, 24 unpaved roads, and 14 combined roads were destroyed during the last hostilities.

A significant number of roads and their components were directly targeted or indirectly affected, worsening the already poor conditions of the road network. Overall, the hostilities led to damages o 240 roads, with an extended area of 298,101 m2. The following table illustrates the damages incurred per road type.

Table 2-36: Damage Level per Road Type

Road type	# Of Damaged Item (road)	Damage Area (m2)
Asphalt	115	197,421
Street interlock tiles	87	64,725
Unpaved	24	3,790
Combined	14	32,165
Total	**240**	**298,101**

The hostilities resulted in damages to different road components, including sidewalks, kerbstones, lighting networks and lighting poles (Note: cost of Base course damages is included in the Asphalt and interlock tiles). The following table describes the damages for road components.

Table 2-37: Damage Level per Road Components

Road components	# Of Damaged Items	# Of Roads Including Damaged Items
Concrete (m3)	428	74
Sidewalks interlock tiles (m2)	68,764	119
Curb stone (L.M)	41,060	135
Lighting networks (L.M)	24,035	131
Lighting poles (number)	777	143

The damage costs for the road sub-sector amount to a total of US$ 19,479,077. Gaza governorate recorded the highest damage costs, amounting to US$ 11,699,430 or 60.1% of the total damage costs for the road sub-sector.

With regards to road types, the asphalt component has the highest damage costs of US$ 11,852,690 (or 60.8% of all components).

Table 2-38: The Damage Cost for Roads Components

Road Item	Damage Cost US$
Asphalt	11,852,690
Concrete	85,700
Sidewalk interlock tiles	2,203,212
street interlock tiles	2,885,200
Curb stone	989,000
Unpaved roads	50,400
Lighting networks	600,875
Lighting poles	812,000
Total	**19,479,077**

Table 2-39: The Roads Damage Value per Governorate

Governorates	North	Gaza	Middle Area	Khan Younis	Rafah	Total
Damage Cost US$	4,079,172	11,699,430	1,448,540	1,898,510	353,425	**19,479,077**
%	20.9%	60.1%	7.4%	9.8%	1.80%	**100%**

The Gaza governorate accounts for the highest damage cost for the asphalt component (US$ 7,974,240), followed by the North Gaza governorate (US$ 1,725,170). The following table represents the road components, damage costs and percentages by governorate.

Table 2-40: The Roads Components Damage Value per Governorate

Road Components	North US$	Gaza US$	Middle Area US$	Khan Younis US$	Rafah US$	Total US$	%
Asphalt	1,725,170	7,974,240	774,020	1,191,360	187,900	11,852,690	60.8%
Concrete	25,200	33,100	14,200	12,000	1,200	85,700	0.4%
Sidewalk interlock tiles	421,377	1,521,465	101,970	135,300	23,100	2,203,212	11.3%
street interlock tiles	1,259,200	798,400	410,200	368,600	48,800	2,885,200	14.8%
Curb stone	250,000	583,375	44,000	96,500	15,125	989,000	5.1%
Unpaved roads	26,900	2,000	3,000	18,500	0	50,400	0.3%
Lighting networks	191,125	293,250	45,750	37,250	33,500	600,875	3.1 %
Lighting poles	180,200	493,600	55,400	39,000	43,800	812,000	4.2%
Total	**4,079,172**	**11,699,430**	**1,448,540**	**1,898,510**	**353,425**	**19,479,077**	**100.0%**
%	**20.9%**	**60.1%**	**7.4%**	**9.8%**	**1.8%**	**100.0%**	

2. Road infrastructure:

The damaged road networks include poor and deteriorating utilities. The assessment has considered all damages incurred in the services networks, including water, wastewater, and stormwater. The details of the damages and related costs for roads WASH infrastructures are highlighted in the WASH sector in this report.

Cost of BFB

While estimating the cost of damages for the road sub-sector, it is essential to include the additional costs that must be considered in the re-installation of roads and infrastructure items such as increased diameters of water or wastewater pipes to ensure better capacity, as well as replacing old and deteriorated lines. The overall BFB cost for the road sub-sector was estimated at 431,800, including the replacement of old lighting lamps with LED and operating them with PV cells. The following table summarizse the costs.

Table 2-41: Damage and BFB Values (US$) for Road Components and networks

Item	Damage Cost (US$)	BFB Cost (US$)	Total Cost (US$)
1) Roads Components	**19,479,077**	**431,800**	**19,910,877**

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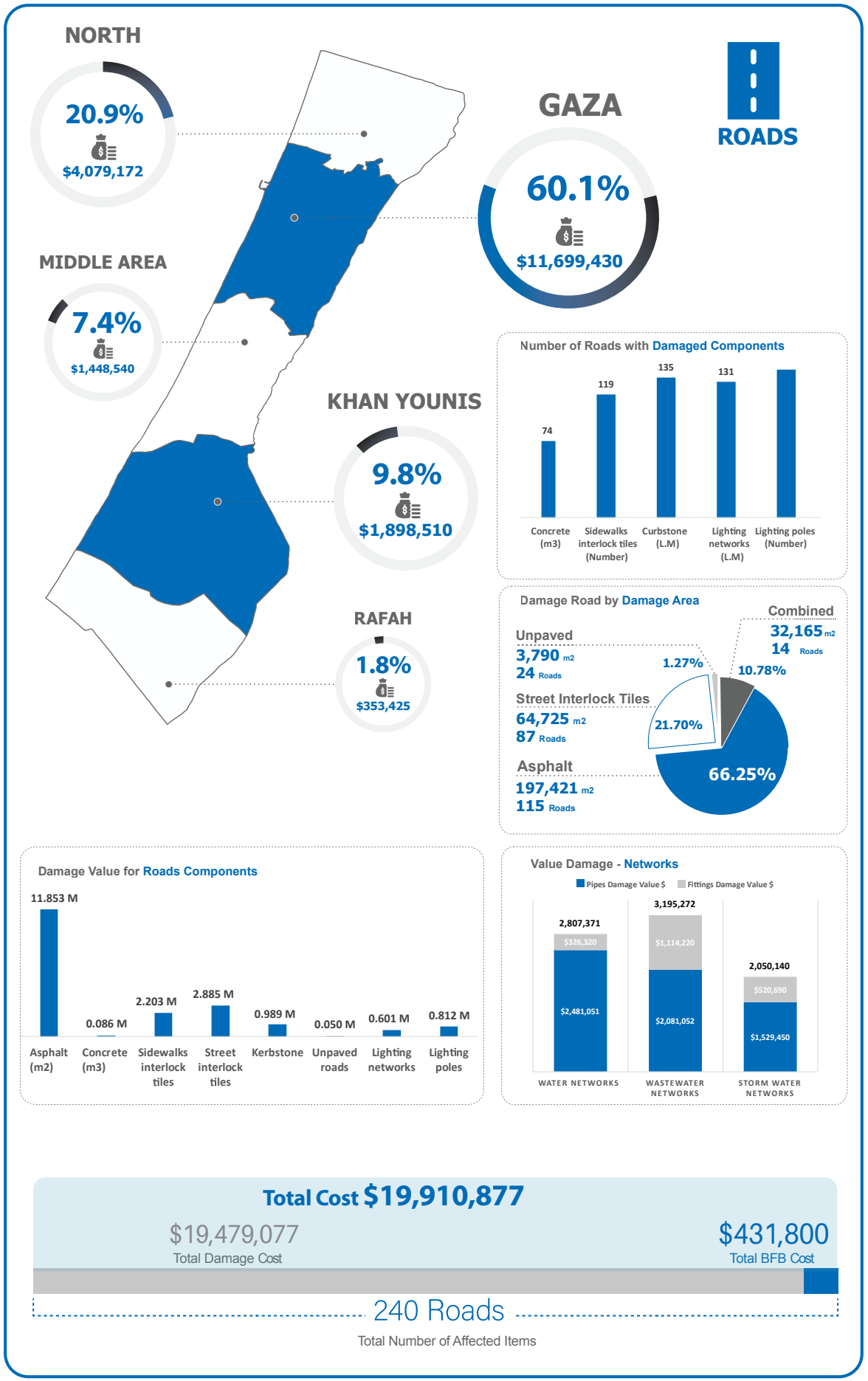
Figure 2-9: Road Sector Damage Summary



Total Cost $19,910,877

$19,479,077
Total Damage Cost

$431,800
Total BFB Cost

240 Roads
Total Number of Affected Items

2.7.4 Context of Transportation Sub-sector

The transportation sub-sector in the State of Palestine accounts for 1.7% of the GDP, with an added value of US$ 286 million for the year 2019. The results of the Transportation Outside Establishments Survey 2019 showed that the number of vehicles operating in this sector in the State of Palestine reached 10,979, of which 2,612 vehicles are in the Gaza Strip; 5.7% private transportation vehicles, 2.8% freight transport by road, and 91.5% public transportation vehicles. The number of employed persons in transport in the outside establishments sector was 2,714 in the Gaza Strip. However, the total number of all registered vehicles in Gaza Strip is about 74,137 in 2018, according to the Ministry of Transportation.

According to the Transport Survey conducted by The Palestinian Central Bureau of Statistics (PCBS) and the Ministry of Transport and Communications, the value of total compensation for wage workers for the transport sector in the State of Palestine is US$ 41 million, of which US$ 3 million are accounted for by the Gaza Strip. The survey also showed that the proportion of public passenger transport vehicles accounted for 91.5% of the total vehicles, followed by private passenger transport vehicles, which accounted for 5.7%, and road transport vehicles for goods accounting for 2.8%[44]. The Gaza strip depends only on road-based transport without any air or sea transport, including 3 main crossing points (Karm Abu Salem, Bait Hanoun "Erez", and Rafah).

Impact of the Hostilities

The transportation sector was damaged by the cracks in the roads' surfaces and by the ashes that resulted from destroyed buildings. Satellite imagery results confirm the damage directly extended to 264 destroyed private and public vehicles, 6 trucks and 47 buses, and indirectly resulted in income losses and disruptions in the logistics and supply chains.

The roads closure due to debris has forced road users to use detours, which in turn increase the transportation time and costs. Limited resources for road reconstruction pose a critical challenge for the recovery of the transportation sector [45].

2.7.5 Methodology for the Transportation Sub-sector

Damages in the transportation sector included vehicles and mechanical workshops, classified by ownership (individual, company, or private/cooperative) as well as with disaggregation by geographic location (governorate). Damaged items included buildings, construction and infrastructure, furniture and office equipment, machinery, equipment, units and spare parts, raw materials, and products.

A team of two Field Engineers was assigned to undertake the assessment of the damages to the transportation sub-sector, in close coordination with MoT in the five governorates of the Gaza Strip. At the start of the assessment, a meeting was conducted between UNDP and MoT to agree on the scope of the damage assessment. The MoT assigned personnel as focal points to facilitate the damage assessment process and to provide data related to the damages on the ground. MoT and UNDP conducted meetings to revise the cost of the damages and agree on the developed assessment and signed a minutes of meeting endorsing the damage cost for the transportation sub-sector.

2.7.6 Summary of Findings for the Transportation Sub-sector

The key components of the damage costs for the transportation sub-sector include US$ 1,832,570 for vehicles, and US$690,385 for workshops, with a total damage cost of US$2,522,955. A total of 1,002 vehicles were affected by the hostilities, with the majority (913 vehicles) being partially damaged. The following tables show the level and cost of damages for the transportation sub-sector per component.

Table 2-42: Damaged Level of Vehicles

Damage level	# Of Vehicles	% Of Damaged Vehicle	Damage Cost US$	% Of Damage Cost
Totally damaged	89	8.9%	824,850	45.0%
Partially damaged	913	91.1%	1,007,720	55.0%
Total	**1002**	**100.00%**	**1,832,570.00**	**100.00%**

74 mechanical workshops were partially damaged, and another 15 were severely damaged. The total damage costs for mechanical workshops reach US$ 690,385, with totally damaged workshops accounting for the highest share of total damage costs (47.5%). The following table represents the level and cost of damage for each damage category.

Table 2-43: Damaged Level of Workshops

Damage level	# Of Workshops	% Of Damaged Workshops	Damage Cost US$	% Of Damage Cost
Totally Damaged	18	16.8%	327,650	47.5%
Partially damaged	74	69.2%	182,331	26.4%
Severely damaged	15	14.0%	180,404	26.1%
Total	**107**	**100%**	**690,385**	**100.0%**

The Gaza governorate accounts for the highest damage cost for workshops, reaching US$ 413,384.5 or 59.9% of the total damage costs for workshops. The following table represents the distribution of damage costs for workshops by governorate.

Table 2-44: The Damaged Workshops per Governorate

Governorate	North	Gaza	Middle Area	Khan Younis	Rafah	Total
Damage cost US$	125,093.3	413,384.5	85,435.9	61,341.3	5,130.0	690,385.0
% Of damage cost	18.1%	59.9%	12.4%	8.9%	0.7%	100.0%

The majority of affected workshops were owned by individuals (71%), while the remaining (29%) were owned by companies. The following table shows the distribution of damaged workshops by ownership.

Table 2-45: The Damaged Workshops Ownership

Ownership	# Of Workshops	% Of Workshops
Individual	76	71%
Company	31	29%
Private/cooperative	0	0%
Total	**107**	**100%**

Only a few workshops have been repaired (15.9%), while the majority (84.1%) are still waiting for suitable support to be repaired or replaced. The following table represents the current situation of the damaged workshops.

Table 2-46: The Situation of Damaged Workshops at the Time of Visit

Current situation	# Of Workshops	% Of Number of Workshops
Repaired	17	15.9%
Will be repaired	71	66.4%
Replaced	0	0.0%
Will be replaced	19	17.7%
Total	**107**	**100.0%**

With regards to damages incurred by workshops' components, the highest cost of damages was recorded for machinery, equipment, units, and spare parts, with a total cost of US$ 320,121.9 (or 46.4% of the total damage cost for workshops). The following table displays the damage cost per item.

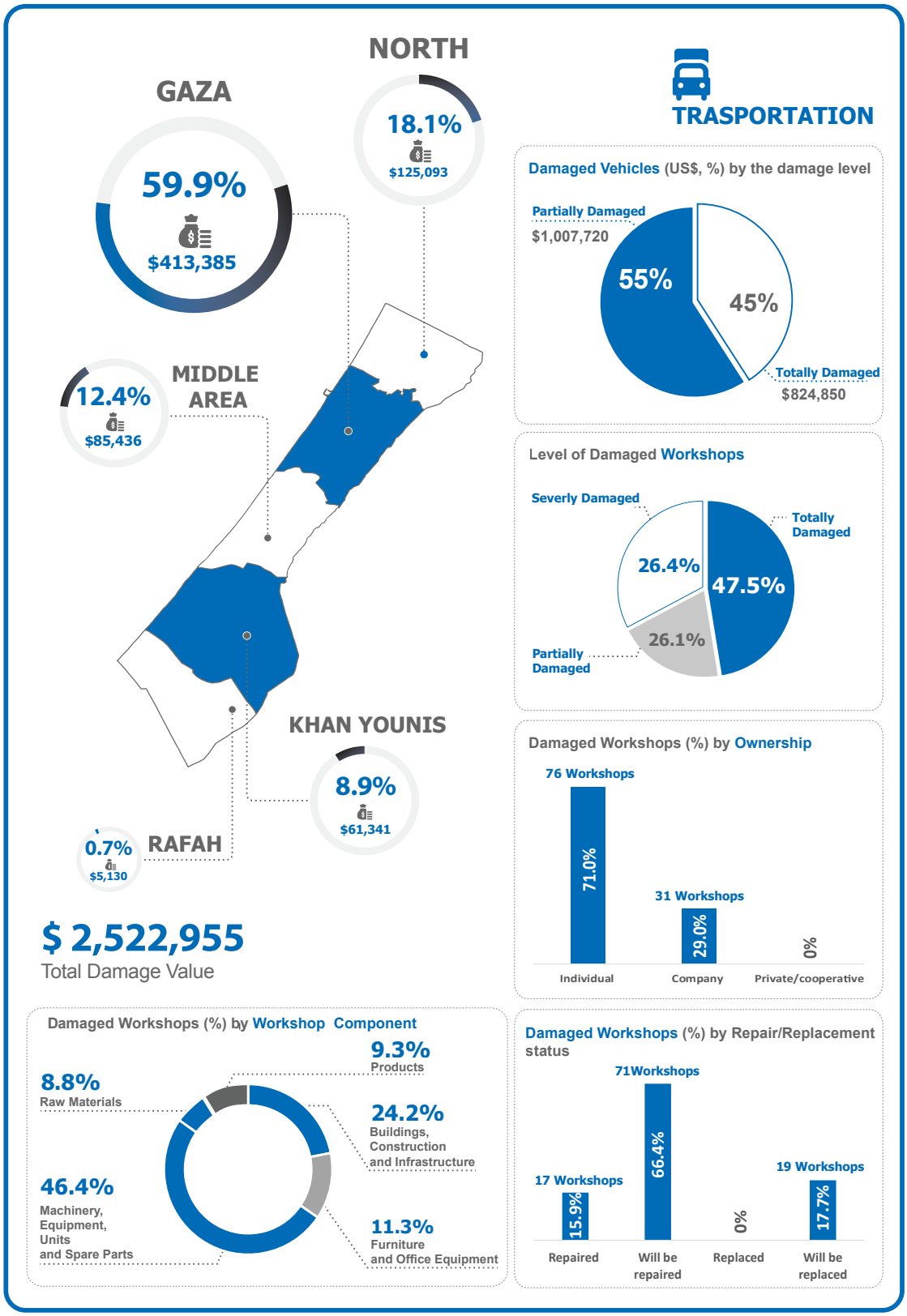
Table 2-47: The Damage Cost for Workshops Components

Damage Type	Damage Cost US$	% Of Damage Cost
Damage Cost of buildings, construction, and infrastructure	166,793.8	24.2%
Damage Cost of furniture and office equipment	78,156.8	11.3%
Damage Cost of machinery, equipment, units, and spare parts	320,121.9	46.4%
Damage Cost of raw materials	60,895.9	8.8%
Damage Cost of products	64,416.6	9.3%
Total	**690,385**	**100%**

Table 2 48: Total Damage Cost of Transportation Sector

Damage Type	Damage Cost US$	% Of Damage Cost
Vehicles	1,832,570	72.6%
Workshops	690,385	27.4%
Total	**2,522,955**	**100.0%**

Figure 2-10: Transportation Sector Damage Summary



2.8 Municipal and Public Buildings Sector

2.8.1 Context of Municipal Sub-sector

The Local Government (Municipal) Sector runs essential services in cities, urban and rural areas for the purpose of servicing thousands of people and communities every day. Since the Gaza Strip is considered one of the most densely populated areas in the world, the municipal sector is burdened with delivering all the required municipal services and covering the needs across 25 municipalities with limited resources.

According to the Palestinian Local Authorities Law No. 01 of 1997 and its amendments, the municipalities are responsible for town and street planning, building licenses approval and demolition of dangerous building structures, providing clean drinking water, providing electrical power with suitable subscription prices, building sewage networks, organizing and monitoring public markets, organizing crafts and industries, collecting and disposing of waste, public health monitoring, monitoring public shops and parks, ensuring disaster risk management, monitoring cultural and sports institutions, building a suitable transportation system, building cemeteries and monitoring hotels[46].

CMWU was established to efficiently manage the water supply and sewage work of all municipalities in the Gaza Strip in 2005, and most of the municipalities had completed asset transfer procedures to CMWU. Also, GEDCO was established to manage the distribution of electricity. The Gaza Strip suffers from a severe imbalance in the quality of services provided by local government units as a result of the blockade imposed since 2007 and the recurring hostilities. Related implications included frequent power cuts, lack of fuel supplies and limited financial resources at the municipal level.

These factors have weakened the capacities of the municipalities to adequately perform their functions, resulting in a widening gap between the services provided and the actual needs of the population. All 25 municipalities have experienced serious challenges over the past 14 years because of the significant discrepancy between their actual revenues and the operational expenses incurred[47].

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Impact of the Hostilities

The results of the preliminary damage survey issued by the Palestinian government media office indicated that several municipal service facilities were targeted, in addition to water networks, sewage stations and power lines being exposed to damage[48]. Some of the municipal machineries were totally or partially damaged. These machineries were already negatively affected as a result of deterioration and lack of periodic maintenance, which severely impacted the municipal performance and quality of service provision.

It was estimated that the destroyed residential and public buildings have left 265,000 tons of rubble [49]. The damage to public buildings hindered the capacity of local government units to fulfil their duties and provide services to the citizens, thus negatively impacting the already dire living conditions in Gaza.

2.8.2 Methodology of Municipal Sub-sector

For the purpose of this report, the municipal buildings were grouped under public buildings. This section highlights the damaged municipal machinery and equipment only.

This sector included all types of municipal machinery including excavators, tractor vehicles and cars, mobile pumps, compactors, waste transport an asphalt shears.

The data collection and assessment team, consisting of engineers from relevant ministries/entities, PCU, and UNDP, covered all five governorates of the Gaza Strip: North Gaza, Gaza, Middle Area, Khan Younis and Rafah. Data was collected through an online platform using tablets, during field visits to physically assess damages. Figures were verified by the assessment committee and endorsed by the relevant line ministries for each sector, and overall, by the MoPWH. This was combined with satellite imagery analysis obtained through UNOSAT to provide a holistic analysis.

2.8.3 Summary of Findings of Municipal Sub-sector

38 municipal machineries were damaged as a result of the last hostilities on the Gaza Strip (7 totally damaged and 31 partially damaged), with a total cost reached US$ 1,182,710. The Gaza governorate incurred the highest damage cost (US$ 809,500), accounting for 68.4% of total damage cost for municipal machinery. Cars and vehicles account for the highest number of damaged machineries, as 17 cars and vehicles were damaged (with 5 being totally destroyed and 12 being partially damaged). The following table represents the number of damaged machineries and their costs per governorate.

Table 2-49: Damage Level of Municipal Machinery per Governorate

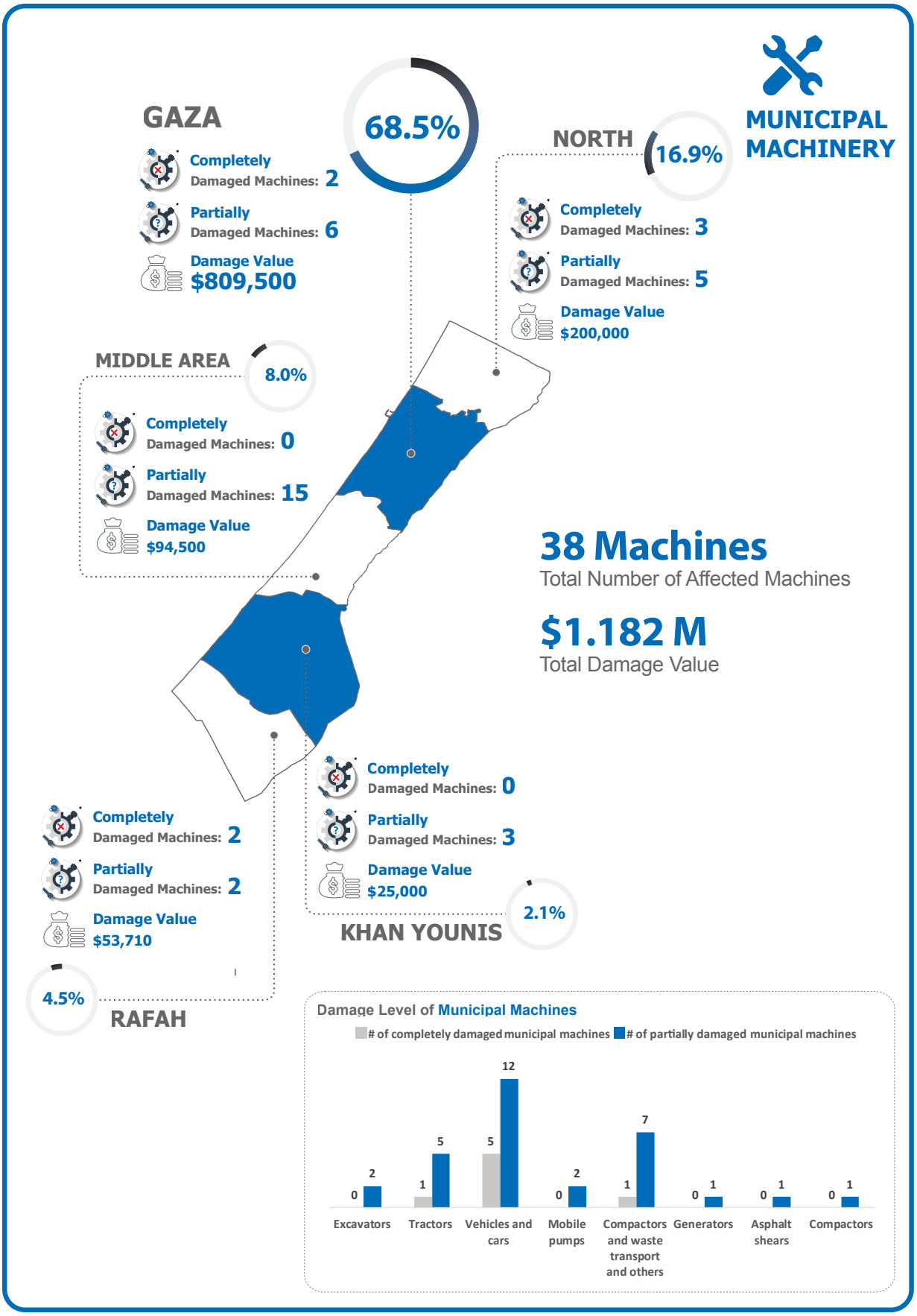
Governorate	# Of Totally Damaged Municipal Machinery	# Of Partially Damaged Municipal Machinery	Damage Cost US$	% Of Damage Cost
North	3	5	200,000	16.9%
Gaza	2	6	809,500	68.5%
Middle Area	0	15	94,500	8.0%
Khan Younis	0	3	25,000	2.1%
Rafah	2	2	53,710	4.5%
Total	**7**	**31**	**1,182,710**	**100.0%**

Table 2-50: Damage Level of Municipal Machinery

Machinery	# Of Totally Damaged Municipal Machinery	# Of Partially Damaged Municipal Machinery
Excavators	0	2
Tractors	1	5
Vehicles and cars	5	12
Mobile pumps	0	2
Compactors and waste transport	1	7
Generators	0	1
Asphalt shears	0	1
Compactors	0	1
Total	**7**	**31**

The maintenance of some machinery is a high priority as delays in maintenance will hinder the capacity of the municipalities to fulfil their activities and reduce the quality-of-service delivery.

Figure 2-11: Municipal Machinery Sector Damage Summary



2.8.4 Context of Public Buildings Sub-Sector

Public infrastructure is any building owned by a branch of government and used to serve the public. This includes – but is not restricted to - government buildings, public libraries, recreational facilities, community centres, courts, information centres, and public housing. The public buildings sector aims to provide different services to civilians and intersects with other sectors.

Impact of the Hostilities

The damage to public buildings hindered the capacity of the local government units to fulfil their duties and provide the needed services to citizens. The damage of public buildings is therefore impacting living conditions, hampering the provision of services, and further reducing the quality of work.

2.8.5 Methodology of Public Buildings Sub-sector

The affected public buildings were classified as totally damaged buildings and partially damaged buildings, with disaggregation by geographic location (governorate) and type of building (cultural, environmental, governmental/municipal, religious, recreational, and other).

A team of three Field Engineers was assigned to undertake the assessment of the damages of MoPWH facilities, in close coordination with MoPWH. At the start of the assessment, a meeting was conducted between UNDP and MoPWH to agree on the scope of the damage assessment. MoPWH and UNDP signed minutes of meeting endorsing the damage cost for the Public Buildings, including BFB.

2.8.6 Summary of Findings of Public Buildings Sub-sector

A total of 77 public buildings were affected across all sectors, with 84% of them being partially damaged. The total public building damage cost is US$ 3,312,699. The following table represents the level and costs of damage for public buildings.

Table 2-51: Damage Level of Public Buildings

Damage level	# Of Buildings	% Of Buildings	Damage Cost US$	% Of Damage Cost
Totally damage	12	16%	2,319,430	70%
Partially damage	65	84%	993,269	30%
Total	**77**	**100%**	**3,312,699**	**100%**

Municipal/government buildings account for the majority of partially and totally damaged public buildings (52% and 50% respectively), followed by cultural buildings accounting for 25% of partially damaged public buildings. The following table shows the percentage distribution of partially and totally damaged building across the different sectors/types of building.

Table 2-52: Damage Level of Public Buildings Type

Building sector	% Of Partially Damaged Buildings	% Of Totally Damaged Buildings
Cultural	25%	16.6%
Environmental	0%	0%
Governmental/Municipal	52%	50.0%
Religion	0%	0%
Recreational	8%	16.7%
Other	15%	16.7%
Total	**100%**	**100%**

The Gaza governorate incurred significantly higher damages compared to other governorates, and accounts for 51.8% of the total damage cost for the public buildings sector. The following table displays public building damage costs per governorate.

Table 2-53: Public Buildings Damage Cost per Governorate

Governorate	North	Gaza	Middle Gaza	Khan Younis	Rafah	Total
Damage cost US$	450,503	1,714,542	64,815	248,994	833,845	3,312,699
% Of damage cost	13.6%	51.7%	2.0%	7.5%	25.2%	100.0%

With regards to the utilization of the damaged public buildings, 58% of the totally damaged buildings used for public service. The following table represents the totally damaged buildings' usage.

Table 2-54: The Previously Usage of the Damaged Public Buildings

Building Use	# Of Totally Damaged Buildings	% Of Totally Damaged Buildings
Combined	2	17%
Work	7	58%
Residential	0	0%
Boundary walls	0	0%
Resort	1	8%
Others	2	17%
Total	**12**	**100%**

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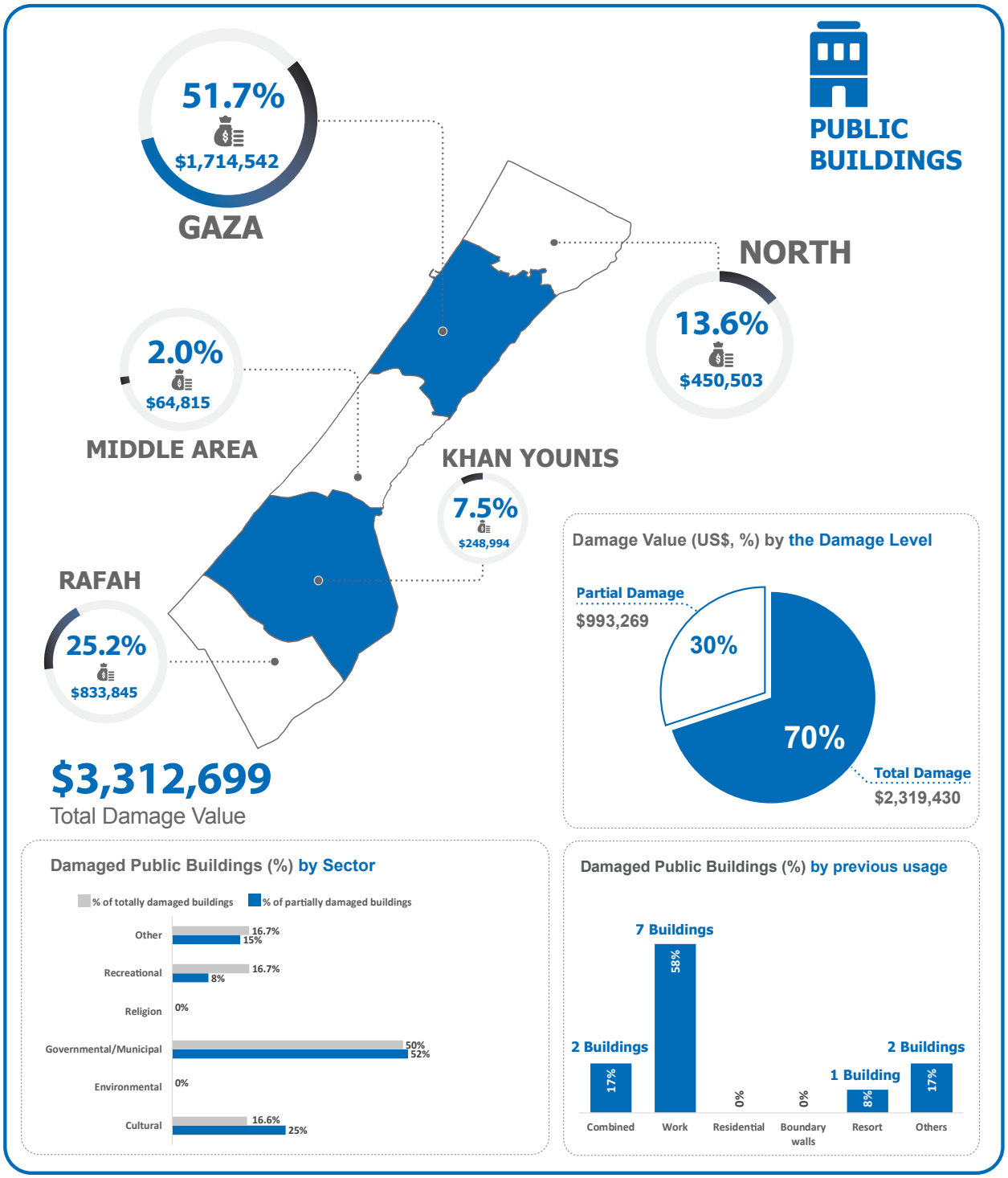
Figure 2-12: Public Buildings Sector Damage Summary



2.9 Private Sector: Factories Infrastructure, Commercial Buildings, and ICT

2.9.1 Context

While this assessment report covers the damages to ICT / PALTEL infrastructure, a more comprehensive assessment of the economic impact of the hostilities is elaborated in a separate UNDP report, titled 'Impact of the May 2021 Hostilities on the Economy'. This includes an assessment of damages to economic infrastructure, losses such as raw material and equipment, as well as jobs and employment.

Infrastructure damages in the private sector included the industrial, commercial and services sub-sectors, as well as the damages to ICT / PALTEL infrastructure. The private sector infrastructure and its production ability was severely impacted during the hostilities. The Gaza Industrial Estate has been directly hit and damages have affected facilities, furniture, solar rooftop panels, and operating equipment. MoPWH reported a total of 7,000 establishments that incurred moderate to severe damages.

Access to communication and internet services is of great importance to the residents of the Gaza Strip, particularly taking into consideration the strict 14-year blockade, and the continued restrictions imposed on the freedom of movement of people, goods, and equipment. These services, despite their limitations, have become a window to communicate with the outside world, exchange information and experiences, access job opportunities, participate in international events and keep abreast of scientific developments in all field, as well as follow up on news and developments that affect the daily lives of residents of the Gaza Strip. The importance of these services has increased remarkably since the onset of the COVID-19 pandemic, especially with a view to swiftly cope with and adapt to COVID-19 precautionary measures. This includes adopting e-learning modalities instead of face-to-face education, as well as increasingly focusing on and transitioning to e-trade and e-work.

The Palestinian Telecommunication Company (PALTEL) was established in 1995 and was granted the franchise to operate in the oPt in 1997, where it started operating the landline network and providing telephone, information transmission and other services. Since then, the number of subscribers has significantly increased by around 400% (in the West Bank and Gaza Strip). Currently telephone service is available to over 98% of the population. The network was upgraded by introducing advanced digital technology with rented digital lines of varied speeds. A fibre optic ring was established in the oPt and new services were added to the landline network, such as the ISDN[50].

The ICT sector has been subject to many challenges due to the occupation and blockade, including the interdiction to launch the third and fourth generations (3G and 4G) of mobile internet, which would create a qualitative leap in digital services. The restrictions imposed on the entry of essential materials and supplies such as cables, equipment, and devices, as well as the ban on entry of advanced devices and the severe restrictions on the electromagnetic field also represent a major impediment to the efficiency, quality, and development of the ICT sector in the Gaz Strip. Additionally, the ICT companies incur high costs due to the continuing electric power crisis[51].

Data of the Population, Housing and Establishments Census[52], 2017 indicated that the number of establishments working in the ICT sector in the State of Palestine accounted for 1,008 enterprises out of the total of 158,573 operating economic establishments, where this sector employed 9,200 persons in 2017 in both West Bank and Gaza Strip. In the Gaza Strip, there are 210 enterprises working in the ICT sector[53].

The Ministry of Telecommunications and Information Technology (MTIT) presented a set of indicators and statistics for the ICT sector, where the number of fixed telephone line subscribers reached 126,800, the number of access lines and Internet subscribers reached 130,218, with a total Internet penetration rate of 74.6% of the population and the average speed of access lines is 8 Mb/s[54].

Impact of the Hostilities

The hostilities' impact on PALTEL assets include partial and total damage of copper aerial cables, copper ground cables, fibre cables, columns, boxes, manholes, lockers, and pipes. In addition, damages also incurred in assets, devices, equipment, and external networks. The damages to all the afore-mentioned elements of the ICT network have resulted in service cut off or shortage supplied to local companies and entrepreneurship projects, which in turn affected a wide range of services. The internet services provided by some local companies were highly disrupted and even completely stopped due to the destruction of their transmission towers located on roofs of some multi-story buildings. Huge indirect losses are also estimated due to contractual and operational obligations and consequences including delaying, obstructing, and confusing the work of thousands of youths working through "remote work platforms".

Moreover, The Palestinian Information Technology Association (PITA) confirmed that it recorded damages to 56 companies, where 13 of them were totally

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destroyed, 25 were partially damaged, and another 18 companies suffered losses as a result of contract termination and suspension. Offices of 40 companies and internet service distributors and sub-distributors were destroyed. This was reflected on the service and directly affected citizens and institutions working in the field of ICT, as well as business owners and workers[55].

2.9.2 Methodology

Damages in the private sector included the industrial, commercial and services sub-sectors as well as the damages of ICT / PALTEL infrastructure with disaggregation by geographic location (governorate). Classification of damages included total damage, partial severe and partial. In particular, the damages to ICT/PALTEL included cost of materials (copper aerial cables, copper ground cables, columns, boxes and wheels, fibre cables manholes lockers and pipes) and accessories.

A team of two Field Engineers was assigned to undertake the assessment of the damages to PALTEL facilities and utilities, in close coordination with PALTEL. At the start of the assessment, a meeting was conducted between UNDP and PALTEL to agree on the scope of damage assessment. PALTEL and UNDP signed a minutes of meeting endorsing the cost of the PALTEL damages.

On the other hand, a team of 33 Field surveyors was assigned to undertake the assessment of the damages of economic sector facilities and utilities in close coordination with MoNE. At the start of the assessment, a meeting was conducted between UNDP and MoNE to agree on the scope of damages assessment. MoNE and UNDP signed a minutes of meeting endorsing the cost of the economic sector damages

2.9.3 Summary of Findings

A total of 2,528 facilities were damaged across the industrial, commercial, services and PALTEL networks sub-sectors. These include 461 totally damaged, 1,511 severely damaged, and 284 partially damaged facilities, in addition to damaged PALTEL Networks in 272 different locations.

Table 2-55: The Damage of Private Sector Facilities.

Type of Facility	Damage Level	No. of Units	Damage in the building/ infrastructure US$
Industrial	Total	51	990,270
	Partial Severe	60	1,121,820
	Partial	214	380,235
	Sub-total	**325**	**2,492,325**
Commercial	Total	226	2,141,595
	Partial Severe	136	969,821
	Partial	808	647,787
	Sub-total	**1,170**	**3,759,203**
Services	Total	184	645,240
	Partial Severe	88	263,435
	Partial	489	644,128
	Sub-total	**761**	**1,552,803**
ICT / PALTEL	Material	272 damaged locations	1,947,529
	Accessories		205,528
	Sub-total	**272**	**2,153,057**
Total Damages		**2,528**	**9,957,388**

The hostilities resulted in 272 damaged PALTEL locations distributed all over the Gaza Strip. The Gaza Governorate accounts for the largest portion of the damaged PALTEL locations, with 108 locations or 40% of all the damaged PALTEL locations). The following table represents the number and distribution of damaged PALTEL locations per governorate.

Table 2-56: The Damage of PALTEL Locations per Governorate

Governorates	# Damaged Locations	% Of Damaged Locations
North	85	31%
Gaza	108	40%
Middle Area	31	11%
Khan Younis	32	12%
Rafah	16	6%
Total	**272**	**100%**

The total damage cost for PALTEL was US$ 2,153,057, distributed across materials and accessories. The following table displays the PALTEL damage cost for its materials and accessories. The total damage cost for PALTEL material is US$ 1,947,529, with copper aerial cables accounting for 63.1% of the damage costs for PALTEL materials.

Table 2-57: Damage Value of PALTEL Networks

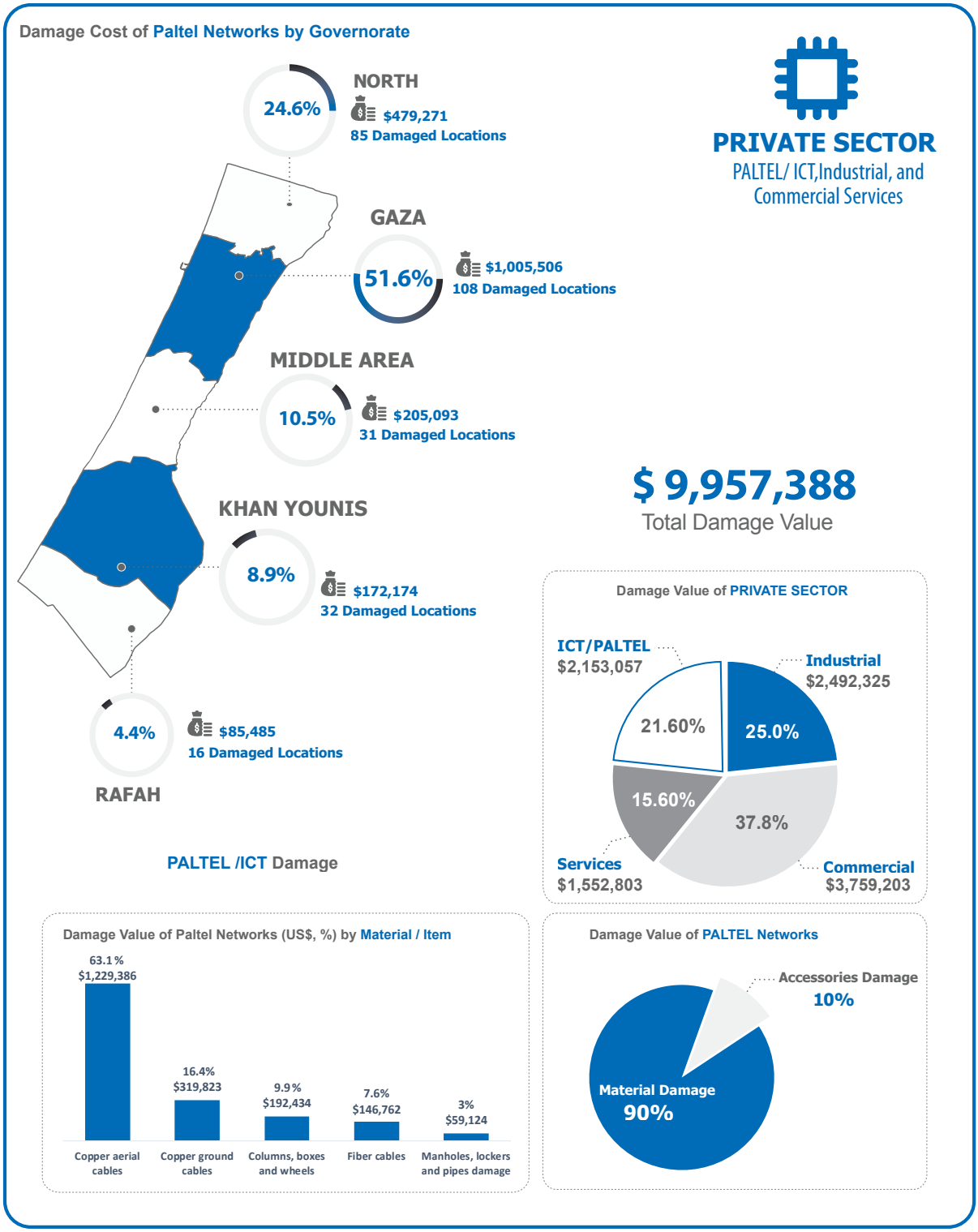
Item	Unit	Damage cost US$	% Of Damage cost
Cost of Material US$		**1,947,529**	**90%**
Copper aerial cables	meter	1,229,386	63.1%
Copper ground cables	meter	319,823	16.4%
Columns, boxes, and wheels	No.	192,434	9.9%
Fibre cables	meter	146,762	7.6%
Manholes, lockers, and pipes damage	No.	59,124	3.0%
Cost of accessories US$		**205,528**	**10%**
Total cost for ICT (PALTEL networks) US$		**2,153,057**	**100%**

As the Gaza governorate accounts for the highest number of PALTEL damaged locations, it also faces the highest share of damage cost for PALTEL materials compared to other governorates (51.6% of the total damage cost for PALTEL materials). The following table shows the distribution of damage costs for PALTEL materials by governorate.

Table 2-58: Damage Level of PALTEL Material per Governorate

Governorate	Material Damage Cost US$	% Of Material Damage Cost
North	479,271	24.6%
Gaza	1,005,506	51.6%
Middle Area	205,093	10.5%
Khan Younis	172,174	8.9%
Rafah	85,485	4.4%
Total	**1,947,529**	**100%**

Figure 2-13: Public Digital Infrastructure Sector (ICT-PALTEL) Damage Summary



CONCLUSION

The May 2021 hostilities were yet another round of crisis that further exacerbated the devastating political, security, social, economic, and environmental conditions faced by the residents of the Gaza Strip.

While the immediate rehabilitation and reconstruction of the damaged facilities are a first step to recovery, there are underlying causes of vulnerabilities that must be addressed, including: occupation and the blockade and movement restrictions for people and goods; the intra-Palestinian divide which impact the delivery of services, limited participation of citizens in decision making processes, and lack of an effectively functioning social protection system and protection of human rights.

Nevertheless, the infrastructure damage assessment has provided insight into key considerations for immediate interventions to support those affected by the recent hostilities

- The priority sectors for rehabilitation and reconstruction are housing, energy, roads, and economy, as they sustained the greatest damages during the hostilities, and are directly impacting the quality of life of the people in the Gaza Strip.
- The timing and speed of rehabilitation and reconstruction is a crucial factor, as the structural foundations of housing and certain facilities may be further compromised as time goes by. This is due to the instability of the soil underground due to the impact of the projectiles, as well as the arrival of winter and the rainy season. A delay in the reconstruction process will have an adverse impact on the already fragile socio-economic conditions of Palestinians in the Gaza Strip.
- Rehabilitation and reconstruction efforts should integrate efforts to build forward better, rather than merely building back to the state it was prior

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to the hostilities. This may include improving the quality of materials for enhanced durability and environmental sustainability and rebuilding to accommodate greater need (e.g. housing commensurate with family size, capacity of water pumps).

- Infrastructure related support should be coupled with soft components such as training and systems improvements to ensure the rehabilitated or reconstructed facilities will be maintained and operated effectively and efficiently.

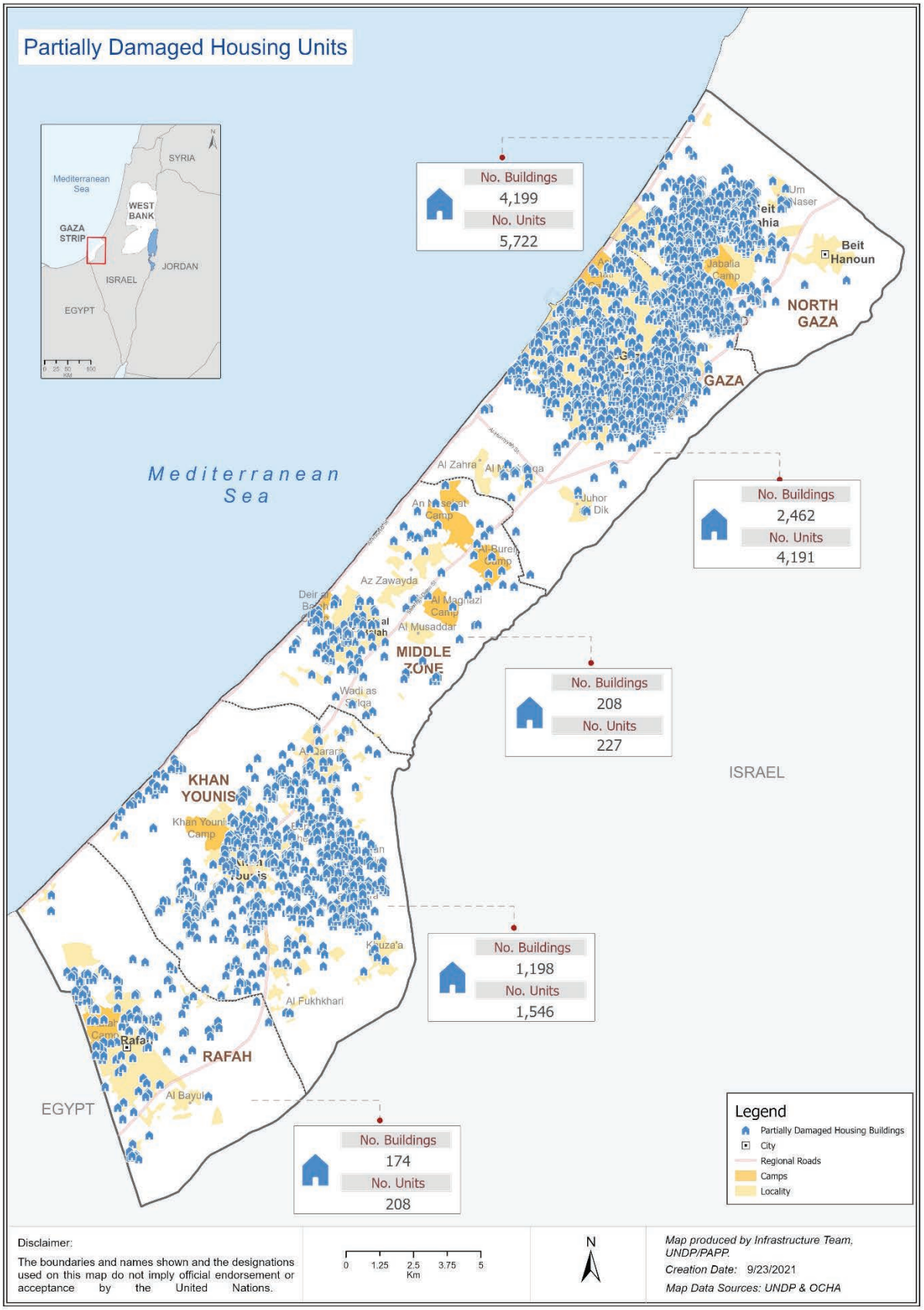
- Support to the private sector should address issues related to the business owner (e.g. rehabilitation / reconstruction of factories, business premises) as well as to the employees (e.g. salary subsidies to return to work).

- Interventions should incorporate capacity building measures for key counterpart entities, such as line ministries, to continue to strengthen local ownership and sustainability. These may include conducting technical training; promoting community participation in planning processes; establishing assessment and monitoring systems; adopting safety, social and environmental sustainability measures; and providing equipment and tools.

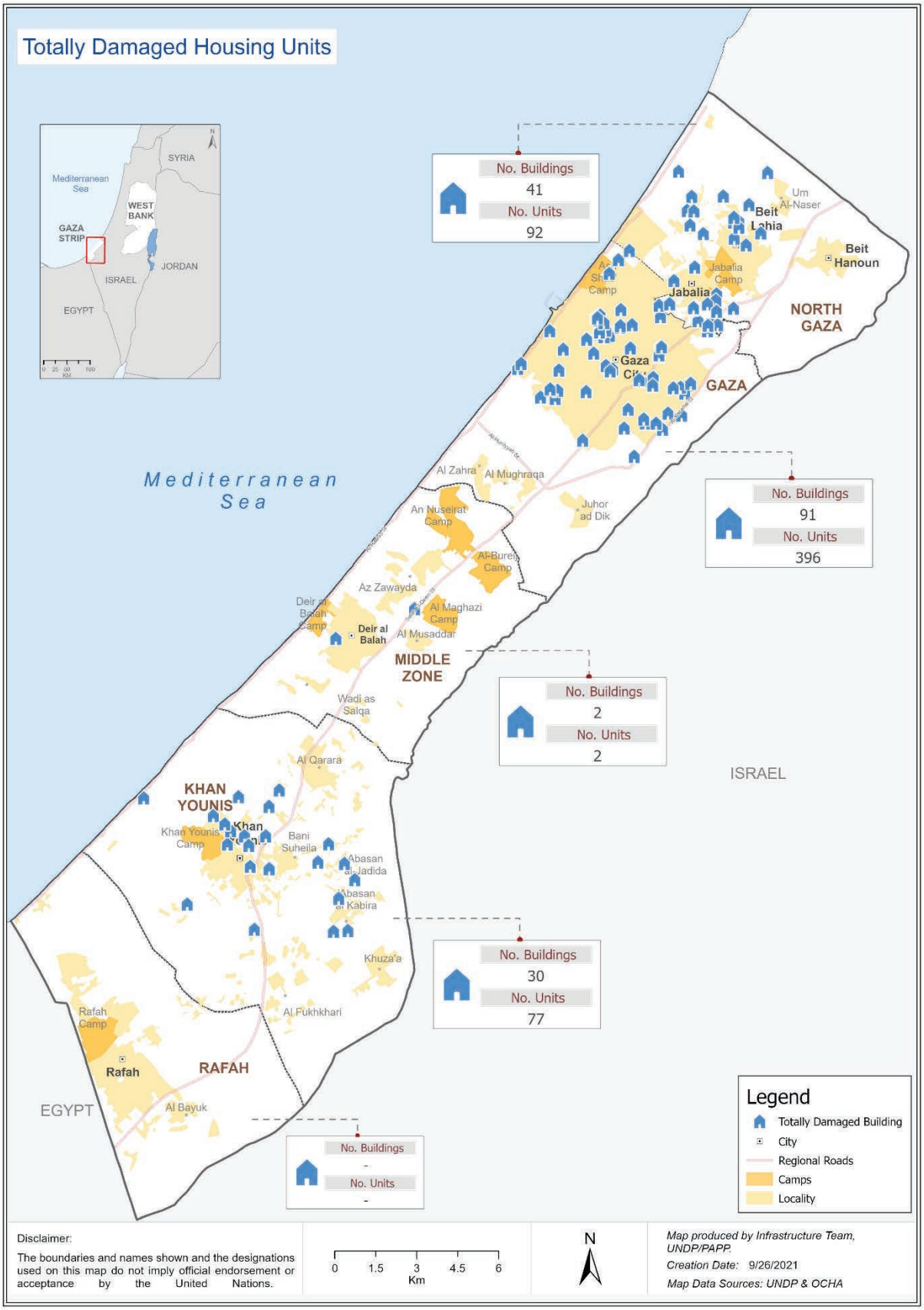
- A holistic approach must be adopted in the recovery phase, integrating multi-sectoral interventions, engaging stakeholders from government, civil society, private sector, the UN, and donor community to ensure complementarity of investments and sustainability of the results.

Annex A: Maps

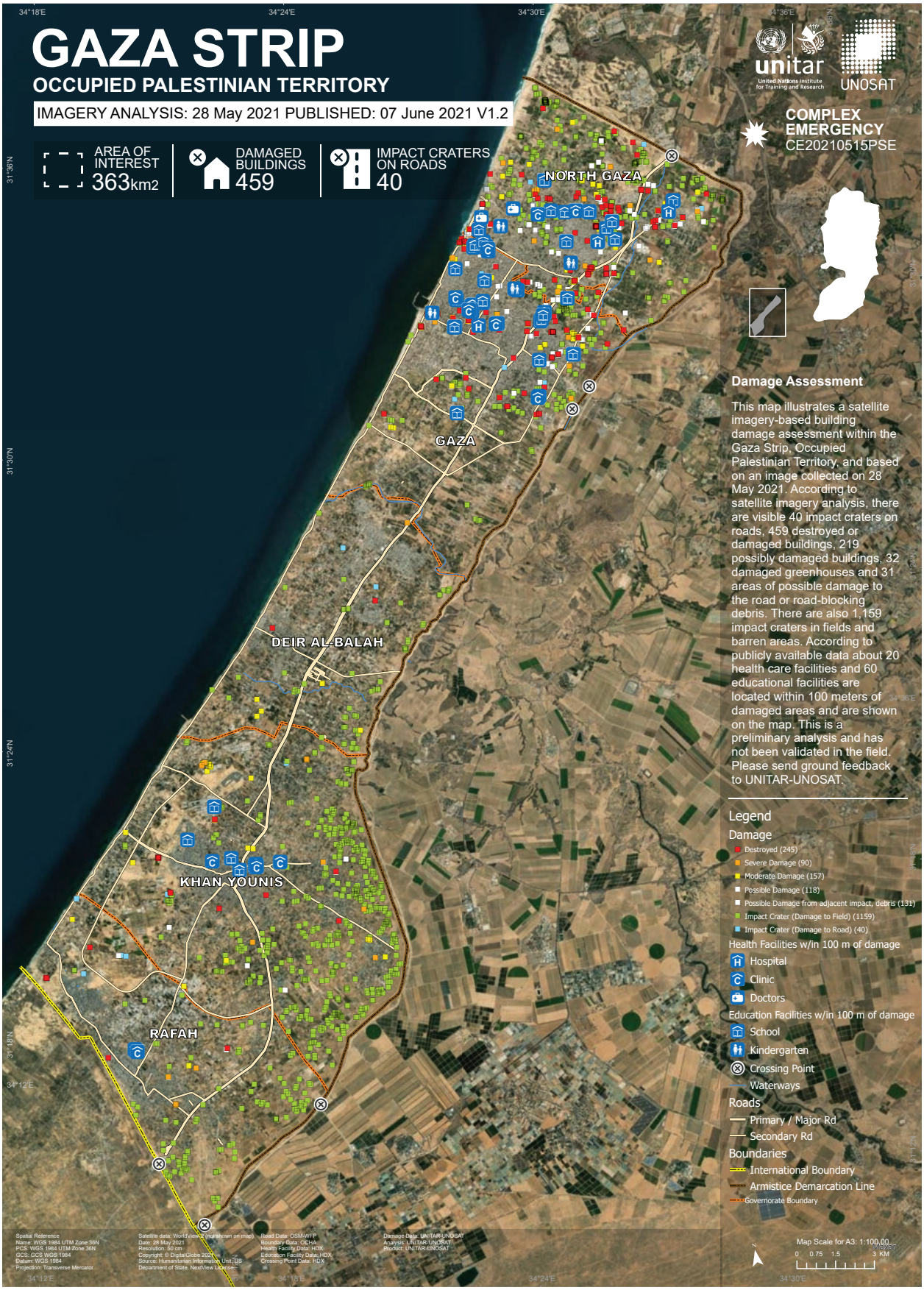
MAP A1: Partially Damaged Housing Units



MAP A2: Totally Damaged Housing Units



Annex B: UNOSAT Satellite Imagery Analysis



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