Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized

EUROPEAN UNION

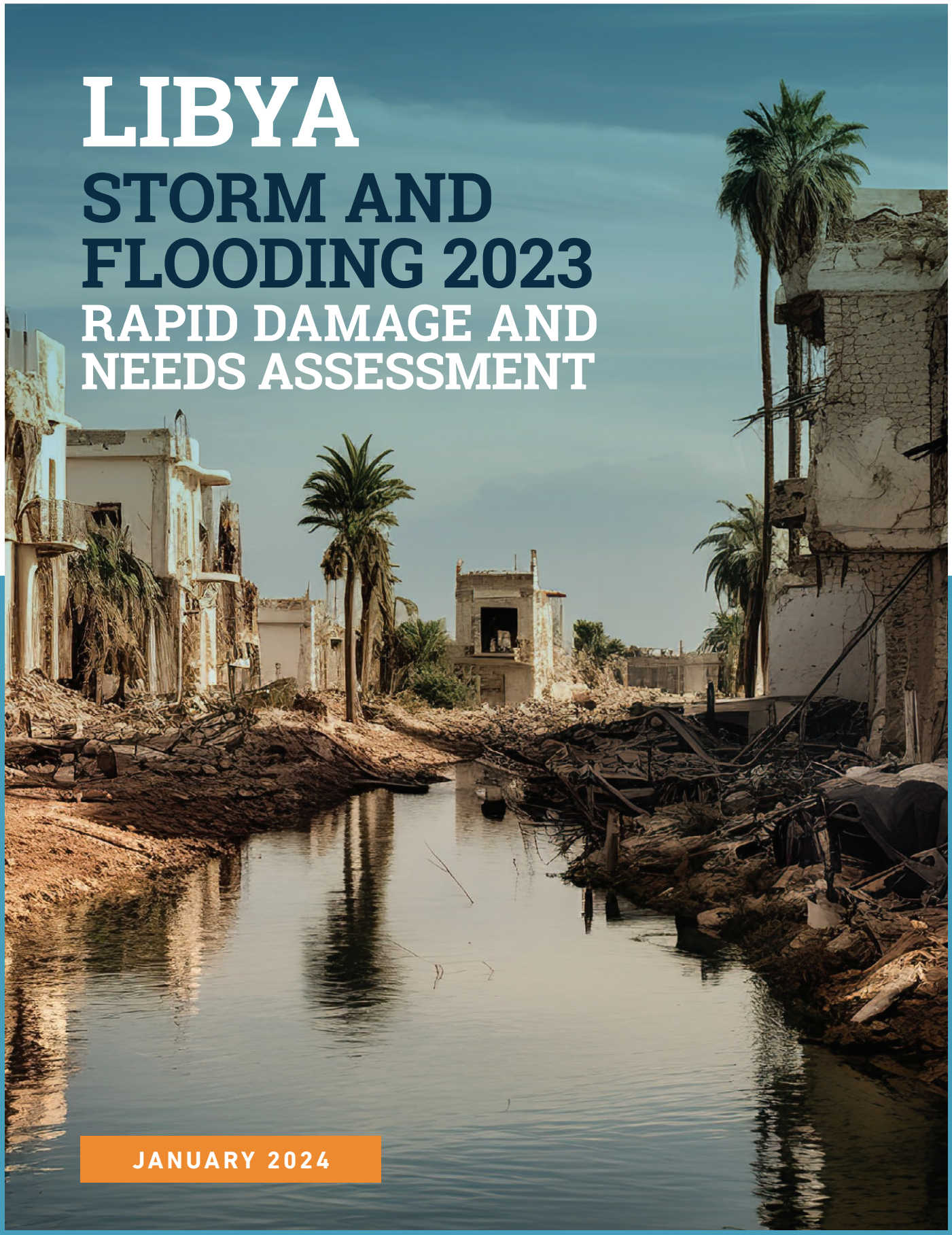
WORLD BANK GROUP

UNITED NATIONS LIBYA

LIBYA

STORM AND FLOODING 2023

RAPID DAMAGE AND NEEDS ASSESSMENT



JANUARY 2024

LIBYA

STORM AND FLOODING 2023

RAPID DAMAGE AND NEEDS ASSESSMENT

JANUARY 2024

GFDRR
Global Facility for Disaster Reduction and Recovery

Administered by
THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

SPF
STATE AND PEACEBUILDING FUND

© 2023 International Bank for Reconstruction and Development / The World Bank
1818 H Street NW, Washington, DC 20433
Telephone: +1-202-473-1000; Internet: www.worldbank.org
Some rights reserved.

This work is a product of the staff of The World Bank. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent. The World Bank does not guarantee the accuracy, completeness, or currency of the data included in this work and does not assume responsibility for any errors, omissions, or discrepancies in the information, or liability with respect to the use of or failure to use the information, methods, processes, or conclusions set forth. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Nothing herein shall constitute or be construed or considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.

Rights and Permissions. This work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given.

Attribution. Please cite this work as follows: World Bank, 2023. Libya Storm and Flooding 2023. Rapid Damage and Needs Assessment. Washington, DC: World Bank.

Translations. If you create a translation of this work, please add the following disclaimer along with the attribution: *This translation was not created by The World Bank and should not be considered an official World Bank translation. The World Bank shall not be liable for any content or error in this translation.*

Adaptations. If you create an adaptation of this work, please add the following disclaimer along with the attribution: *This is an adaptation of an original work by The World Bank. Views and opinions expressed in the adaptation are the sole responsibility of the author or authors of the adaptation and are not endorsed by The World Bank.*

Third-party content. The World Bank does not necessarily own each component of the content contained within the work. The World Bank therefore does not warrant that the use of any third-party-owned individual component or part contained in the work will not infringe on the rights of those third parties. The risk of claims resulting from such infringements rests solely with you. If you wish to reuse a component of the work, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright owner. Examples of components can include, but are not limited to, tables, figures, or images.

All queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; e-mail: pubrights@worldbank.org

Cover Page Photo: cartoonstock/Freepik.com

DISCLAIMER

This assessment relies primarily on data from satellite imagery, publicly available information, and social media analytics, corroborated and validated by other sources and ground means, including data from development partners. The assessment was produced in a quick timeframe to provide a rapid estimate and analysis of the impacts and needs arising out of the September 2023 storm and flooding in Libya. Extensive efforts were made to improve the accuracy of the information that was collected and analyzed, and to use publicly available ground-based data where feasible.

The report uses the exchange rate US$1 = Libyan Dinar (LYD) 4.805.

TABLE OF CONTENTS

Abbreviations and Acronyms 10

Acknowledgments 13

Foreword 15

Executive Summary 16

Context **18**

Objectives and Scope of the RDNA **19**

Key Findings of the RDNA **21**

Distribution of Overall Effects and Needs 21

Macroeconomic Impact 23

Social, Human, and Poverty Impact 24

Forward Look **25**

Introduction 26

The Climate, Disaster, and Conflict Nexus in Libya **27**

RDNA Objectives, Methodology, and Scope **30**

Temporal Scope 30

Geographic scope 30

Sectoral scope 31

Methodology 31

Limitations and Key Challenges 31

Macroeconomic and Human Impact **32**

Macroeconomic Impact 32

Social, Human, and Poverty Impact 36

Summary of RDNA Sector Findings 38

Social Sectors **39**

Productive Sectors **42**

Infrastructure Sectors **44**

Cross-Cutting Sectors **47**

Summary of Sectors Recovery Strategies **50**

Forward Look: International Good Practices, Lessons Learnt and Options for Disaster Recovery Implementation 55

Detailed Sector Assessments 60

Social Sectors 61

Housing 62

Education 73

Health 78

Poverty 88

Social Protection and Jobs 96

Cultural Heritage 102

Productive Sectors 111

Agriculture 112

Financial Sector 120

Infrastructure Sectors 125

Energy 126

Transport 135

Telecommunications and Digital Development 144

Water and Sanitation, and Water Resource Management 150

Municipal Services 163

Cross-Cutting Sectors 169

Governance and Public Institutions 170

Environment 180

Disaster and Climate Risk Management 191

Social Sustainability and Inclusion 200

Impact on Women and Men 203

List of Tables

Table 1: Summary of Total Effects and Needs 22
Table 2: GDP Loss by District (Relative variation vis-à-vis the business-as-usual scenario) 35
Table 3: Housing Damage by Municipality 65
Table 4: Housing Damage Costs 66
Table 5: Housing Economic Loss 67
Table 6: Housing Damage Costs 67
Table 7: Housing Recovery Needs 69
Table 8: Sequencing Housing Recovery Investment 71
Table 9: Damage and Loss Inventory 74
Table 10: Damages and Losses by Municipality 75
Table 11: Costing of Reconstruction for Schools 77
Table 12: Prioritized and Sequenced Interventions for Reconstruction 77
Table 13: Damage and Loss Inventory 80
Table 14: Damages and Losses by Municipality 81
Table 15: Health Sector Costs 84
Table 16: Total Cost of Needs for Health by and Municipality (in US$ million) 85
Table 17: Prioritized and Sequenced Interventions for Health Sector Reconstruction 86
Table 18: SPJ Damage Inventory Table 98
Table 19: SPJ Damages by Municipality 98
Table 20: Damage and Losses by Municipality 106
Table 21: Cultural Heritage Restoration Costs 107
Table 22: Prioritized and Sequenced Interventions for Reconstruction of Cultural Heritage 108
Table 23: Agriculture Damage and Loss Inventory 114
Table 24: Agriculture Damages and Losses by Municipality 115
Table 25: Total Cost of Livestock and Crop Recovery 117
Table 26: Total Cost of Needs by Municipality for Agriculture 118
Table 27: Prioritized and Sequenced Interventions for Agricultural Recovery 119
Table 28: Damage and Loss Inventory for Banks 121
Table 29: Damage and Losses by Municipality 121
Table 30: Total Cost of Banking Sector Needs 122
Table 31: Total Cost of Needs by Municipality 123
Table 32: Prioritized and Sequenced Interventions for Banking Sector Reconstruction 123
Table 33: Damage and Loss in the Energy Sector 129
Table 34: Damages and Losses by Municipality in the Energy Sector 129
Table 35 : Total Cost of Needs in the Energy Sector 131
Table 36: Prioritized and Sequenced Interventions for Reconstruction Needs 131
Table 37: Libya East Region's Power Generation Capacity 132
Table 38: Total Cost of Needs by Municipality 133
Table 39: Damage and Loss Inventory for Transport Infrastructure 138
Table 40: Damages and Losses by Municipality 139
Table 41: Total Cost of Needs 142
Table 42: Prioritized and Sequenced Interventions for Transport Reconstruction 143
Table 43: Damage and Loss - Telecommunications 146
Table 44: Telecommunications Damage and Loss by Municipality 147
Table 45: Telecommunications Cost by Municipality 148
Table 46: Prioritized and Sequenced Interventions for Reconstruction - Telecommunications 148
Table 47: Damage and Loss Inventory for Water and Sanitation 152
Table 48: Average Damages and Losses by Municipality – Water and Sanitation 152
Table 49: Asset Costs – Water and Sanitation 159
Table 50: Costs by Municipality – Water and Sanitation 160
Table 51: Matrix of Short-Term and Medium- Term Needs – Water and Sanitation 161
Table 52: Damage Assessment of Municipal Assets 164
Table 53: Damage Cost by Municipal Assets 165
Table 54: Damage Cost per Municipality for Municipal Services 165
Table 55: Total Recovery Investment Needs for Municipal Services 167
Table 56: Sequencing Recovery Investments for Municipal Services 167
Table 57: Central Bank of Libya (CBL) Data - January– December 2022 171
Table 58: Damage and Losses to Public Institutions 172
Table 59: Damages and Losses to Public Institutions by Municipality 173
Table 60: Reconstruction Costs 175
Table 61: Costs of Prioritized and Sequenced Interventions for Reconstruction 176
Table 62: Environmental Damages and Losses 185
Table 63: Environmental Restoration Costs 188

Table 64: Prioritized and Sequenced Interventions for Environmental Restoration 189
Table 65: Maximum of Daily Maximum, Annual, Mean 193
Table 66: Precipitation Percent Change, Annual 193
Table 67: Changes in Flood Return Level 193
Table 68: Operational Weather and Climate Stations in the East Prior to the 2023 Floods 196
Table 69: Total Cost of Needs 197
Table 70: Prioritized and Sequenced Interventions for Reconstruction 198

List of Figures

Figure 1: Flood Intensity in the City of Derna 18
Figure 2: Abu Mansour Dam 19
Figure 3: Damages and Losses by Sector ($USM) 21
Figure 4: Damages and Losses at the Municipality Level (US$ M) 23
Figure 5: Total Reconstruction and Recovery Needs by Sectors (US$M) 23
Figure 6: Flooding Intensity in the City of Derna 28
Figure 7: Flood–Prone Areas in Northeastern Libya 29
Figure 8: Derna City Following the Floods (13SEP2023) 32
Figure 9: Total Damages and Losses by Municipality 33
Figure 10: GDP Impacts in 2023 and Projections 2024–2025 33
Figure 11: Possible Inflationary Pressures on the Libyan Economy, 2023–2025 33
Figure 12: Potential Reductions in Household Consumption, 2023–2025 34
Figure 13: Sectoral Impacts of Floods, 2023–2025 34
Figure 14: Contribution to GDP of Damage-affected Regions 34
Figure 15: Sectoral GDP contributions 34
Figure 16: Flooding Intensity in the City of Soussa 63
Figure 17: Housing Damage in the City of Soussa 64
Figure 18: Quartile of Average Relative Wealth Per District 88
Figure 19: Average Monthly HH Income Per Capita (LDY) 89
Figure 20: Food Consumer Price Index (2015=100) 90
Figure 21: Average Distance to a School (left) and Health Facility (right) by a Motorized Vehicle (in minutes) 91
Figure 22: Unemployment Rate (%) Across Districts (left) and Sectoral Share (%) of Workers (right) 92
Figure 23: Share of District Under Cropland (%, Left) and in 1km Grids of Flood-Affected Areas (%, Right) 93
Figure 24: Distribution of Women by Education (%) 93
Figure 25: Share of Women who Believe Gender-Based Violence (Women and Men) is Common in Libya 94
Figure 26: Top Priorities for Libyan Women (%) 94
Figure 27: SPJ Buildings and Services in Impacted Municipalities 97
Figure 28: Status of 25 SPJ Buildings 98
Figure 29: Short Term Needs (0–12 months) 100
Figure 30: Medium Term Needs (13–24 months) 101
Figure 31: Damage and Loss Inventory Table 104
Figure 32: Damage by Municipality 104
Figure 33: Damage to Cultural Assets in the city of Shahhat 105
Figure 34: Agriculture Land and Flooding Impact in Northeast Libya 114
Figure 35: Libya's Power Generation Assets 127
Figure 36: Libya's Electricity Transmission System 127
Figure 37: Average Night-Time Brightness in Derna Before and After the Floods 128
Figure 38: Road, Bridge and Housing Damage in the City of Derna 136
Figure 39: Damaged Radio Towers and Baseline 146
Figure 40: Damage to Radio Towers as of October 2023* 146
Figure 41: Damage and Loss by Asset Type (high estimates) - Water and Sanitation 151
Figure 42: Total Damage and Loss by Municipality – Water and Sanitation 153
Figure 43: Landscape Context of Derna Floods, September 10, 2023 155
Figure 44: Al Belad (Derna) Dam, Prior (Left) and Post (Right) Flood 156
Figure 45: Bou Mansour Dam Prior (Left) and Post (Right) Flood 157
Figure 46: Worldwide Governance Indicators: Libya (2012, 2017 and 2022) 170
Figure 47: Fishing Routes Possibly Impacted by Suspended Matter Discharging into the Sea 184
Figure 48: Historically Flood Prone Areas 191
Figure 49: Overlay of 2023 flooded Areas and Historically Prone Areas 195

ABBREVIATIONS AND ACRONYMS

AWS	Automatic Weather Stations
BBB	Building Back Better
BER	Budget Execution Reports
BPD	Barrels Per Day
BRT	Bus Rapid Transport
CBL	Central Bank of Libya
C&D	Construction & Demolition
CGE	Computable General Equilibrium
CoA	Charter of Account
CPI	Consumer Price Index
CRI	Core Relief items
CSO	Civil Society Organization
DCIM	Department to Combat Illegal Migration
DHS	Demographic and Health Survey
DHIS-2	District Health Information System-2
DOA	Department of Antiquities
DRR	Disaster Risk Reduction
DRM	Disaster Risk Management
DSL	Digital Subscriber Line
ECT	Emergency Cash Transfer
EIA	Environmental Impact Assessment
EU	European Union
EWARN	Early Warning Alert and Response Network
EWS	Early Warning Systems
FCS	Fragile and Conflict-affected Situations
FTTP	Fiber To the Premises
GACI	General Authority for Communication and Informatics
GAI	General Authority for Information
GCWW	General Company for Water and Wastewater
GDP	Gross Domestic Product
GECOL	General Electricity Company of Libya
GEMS	Geo-Enabling method for Monitoring and Supervision
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	Green House Gas
GNS	Government of National Stability
GNU	Government of National Unity

GPP	Green Public Procurement
GSMA	Global System for Mobile Communications Association
GTA	General Telecommunications Authority
G2B	Government To Business
G2G	Government to Government
G2P	Government to Person
GWWC	General company for water and wastewater
HDI	Human Development Index
HI	Humanity and Inclusion
HoR	House of Representatives
ICT	Information and Communications Technology
IDP	Internally Displaced Persons
IGFT	intergovernmental fiscal transfers
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IRC	International Rescue Committee
ISSAI	International Standards of Supreme Audit Institutions
IXP	Internet Exchange Point
LAB	Libyan Audit Bureau
LFP	Labor Force Participation
LNA	Libya National Army
LNMC	Libya National Meteorological Center
LPI	Logistics Performance Index
LPTIC	Libyan Post, Telecommunication, and Information Technology Company
LTE	Long-Term Evolution
LTT	Libya Telecom & Technology
LYD	Libyan Dinar
MCM	Million Cubic Mete
M&E	Monitoring and Evaluation
MEB	Monthly Expenditure Basket
MENA	Middle East and North Africa
MIC	Middle-Income Country
MICS	Multiple Indicator Cluster Survey
MHPSS	Mental Health and Psychosocial Support Services
MMR	Man-Made River Project
MoAL	Ministry of Agriculture and Livestock
MoE	Ministry of Environment
MoF	Ministry of Finance
MoLG	Ministry of Local Governance
MoL	Ministry of Labor
MoP	Ministry of Planning
MOSA	Ministry of Social Affairs
MOT	Million Tons
MSW	Municipal Solid Waste

MtCO2e	Metric Tons of carbon dioxide equivalent
MVNO	Mobile Virtual Network Operator
NCAH	National Centre of Animal Health
NCD	Non-Communicable Diseases
NDC	Nationally Determined Contribution
NFI	Non-Food items
OCHA	Office for the Coordination of Humanitarian Affairs
ODAC	Organization for the development of administrative center's authority
O&G	Oil and Gas
PAI	Publicly Available Information
PDNA	Post Disaster Needs Assessment
PD-PFM	Post-Disaster Public Financial Management
PFM	Public Financial Management
PHC	Primary Health Care
PPP	Public-Private Partnership
RBA	Road and Bridge Authority
RCO	Resident Coordinator's Office
RDNA	Rapid Damage and Needs Assessment
REAOL	Renewable Energy Authority of Libya
RRA	Risk and Resilience Assessment
RWI	Relative Wealth Index
SBA	Settlement-based Assessment
SDIP	Strategic Development and Investment Plans
SOP	Standard Operational Procedures
SPF	State and Peacebuilding Fund
SPJ	Social Protection and Jobs
SSA	Social Security Administration
SSF	Social Solidarity Fund
TPM	Third-Party Monitoring
TSA	Treasury Single Account
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNSDCF	United Nations Sustainable Development Cooperation Framework
UNSMIL	United Nations Special Mission in Libya
VOC	Vehicle Operating Costs
WASH	Water, Sanitation and Hygiene
WB	The World Bank
WFP	World Food Programme
WHO	World Health Organization
WGI	Worldwide Governance Indicators

ACKNOWLEDGMENTS

The Rapid Damage and Needs Assessment for Libya was jointly conducted by the World Bank Group, the United Nations, and the European Union, in the aftermath of the devastating floods that struck Eastern Libya on September 10 and 11, 2023.

The RDNA team would like to express its deep appreciation to all individuals and organizations who contributed to this assessment.

From the World Bank: The team from the World Bank side was led by Ayaz Parvez (Lead Disaster Risk Management Specialist) and Dina Ranarifidy (Senior Urban Specialist), under the guidance from Jesko Hentschel (World Bank Country Director for the Maghreb region), Henriette von Kaltenborn Stachau (World Bank Resident Representative, Libya), and Catherine Signe Tovey (Urban, Resilience and Land Practice Manager, Middle East and North Africa).

The core overall report writing and coordinating team included Ghizlane Aqariden (Consultant), Mahi El Attar (Operations Officer), Jemma Vasilyan (Operations Analyst), Fares Salem (Consultant), Sara Boughedir (Consultant), Lucile Gingembre (Consultant), Theresa Abrassart (Consultant), Hend Irhiam (Operations Officer), Haythem Belghrissi (Disaster Risk Management Specialist), Abdulrahman Elgheriani (consultant), and Marc Cortadellas Mancini (Consultant). Anissa Selmi (Program Assistant), and Priyantha Jayasuriya Arachchi (Program Assistant) provided administrative support.

Sector analysis and chapters specialists included:

- **Agriculture:** Yosra Bouaziz, Matthias Mollet
- **Climate and Disaster Risk Management:** Lucile Gingembre
- **Climate Change:** Katharina Ziegler, Adeel Abbas Syed
- **Cultural Heritage:** Ban Edilbi
- **Digital Development:** Younes Errati, Issam Khayat, and Dolele Sylla
- **Education:** Himdat Bayusuf, Fatine Guedira
- **Energy:** Victor Loksha and Mohammed Qaradaghi
- **Environment:** Andrea Kutter
- **Finance:** Safia Hachicha, Dobromir Christow, and Dorothee Delort
- **Fragility, Conflict and Violence (FCV) and displacement:** Joy Aoun, Miguel Angel De Corral Martin, Matthew Ryan Brubacher
- **Governance:** Winston Percy Onipede Cole and Mahi ElAttar
- **Health:** Katriel Friedman, Yu Shibui, and Mohini Kak
- **Housing:** Alexandra Le Courtois and Narayanan Edadan
- **Macroeconomic Impact:** Mohamed Hedi Bchir, and James Liounis
- **Municipal Services:** Dina Ranarifidy, Haythem Belghrissi, Othman Khaled, and Narayan Edadan
- **Poverty:** Federica Marzo, and Nayantara Sarma
- **Social Protection and Jobs:** Sara Hariz, Eric Zapatero Larrio, and Rania Atieh
- **Social Sustainability & Inclusion:** Marcelo Jorge Fabre, and Souad Adnane
- **Transport:** Hakim Al-Aghbari, and Susan Lim
- **Water and Sanitation and Water Resources Management:** Iyad Rammal, Marcus J. Wishart, and Floris Dalemans
- **Women and Men:** Luciana De la Flor Giuffra, Cindy J. Suh, and Majda Benzidia

The team received valuable comments and inputs from Karima Ben Bih (Senior Disaster Risk Management Specialist), Elif Ayhan (Senior Disaster Risk Management Specialist), Estelle Allano and Elena Segura.

The RDNA was prepared in coordination and consultation with **UN agencies and EU partners**, and the authors would like to thank the following EU and UN for their invaluable guidance and support in providing key complementary data and analysis:

From the UN: Jesse Forsythe (UN RCO), Naeun Choi (UN RCO), Naserddin Dekakni (UN RCO), Aadil Mansoor (UNDP), Christopher Laker (UNDP), Sophie Kemkhadze (UNDP), Nouri Alkishriwi (UNDP), Renda Gritili (UNDP), Anne Dalitz (UNDP), Joana Sampainho (UNDP), Erkinbek Kasybekov (UNDP), Nouralddeen Alhouni (UNDP), Dr. Nouri Alkishriwi (UNDP), Randa Gritli (UNDP), Hala Khudari (WHO), Michele Servadei (UNICEF), Vanesa Lee (UNICEF), Abdoulaye Fall (UNICEF), Mark Buttle (UNICEF), Joelle Zeitouny (FAO), Daniele Barelli (FAO), Helene Sow (FAO), Soufien Sghaier (FAO), Iris Monnereau (FAO), Cherif Toueilib (FAO), Heba Fekry (UN-Habitat), Zichao Yan (UNESCO), Maissa Acheuk-Youcef (UNESCO), and May Shaer (UNESCO).

From the EU: Vicente Selles, Dominique Blariaux, Thomas Hockley, Federica Petrucci, Marton Benedek, Matthias Mollet, the Committee on Earth Observation Satellite (CEOS), and its Recovery Observatory team, EU Copernicus.

Technical support for the assessment of the failures of the Bou Mansour and the Derna dams was provided through collaboration with the Embassy of the Netherlands to Libya, including Manon van de Schootbrugge, the Netherlands Enterprise Agency, including Sandra Cats and Gertjan van der Ende, and an expert team led by Rob Steijn (Director, Arcadis) and including Laurent Mouvet (Dam Safety, ICOLD), Werner Halter (Dam Safety, Fugro), Bas Agerbeek (Hydrologist), Michelle Rudolph (Communications, HKV), Antonio Moreno-Rodenas (Remote Sensing Hydraulics, Deltares), Lukas Oosterbaan (Flow Modelling, Arcadis), and Ayoub Elsheikh (Engineer, Arcadis).

The translation of the report was provided by MS Translation and Media Services. The team is also grateful for the design and editorial efforts provided by Sarah Alameddine.

Finally, the team is thankful for the generous financial and technical support from the World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR) and the State and Peacebuilding Fund. The State and Peacebuilding Umbrella Trust Fund (SPF) is a global multi-donor fund administered by the World Bank that works with partners to address the drivers and impacts of fragility, conflict, and violence and strengthen the resilience of countries and affected populations, communities, and institutions. SPF is kindly supported by Denmark, Germany, Netherlands, Norway, Sweden, Switzerland, and IBRD.

SPF STATE AND PEACEBUILDING FUND

FOREWORD

The Libya Rapid Damage and Needs Assessment (RDNA) is an assessment report jointly developed by the World Bank (WB), the United Nations (UN), and the European Union (EU), in cooperation with other development partners, in the aftermath of the devastating storm and floods that affected eastern Libya between September 10 to 11, 2023. This report is an endeavor to stand by the Libyan people in this grave hour of need, and to support the efficient, sustainable, and resilient recovery of the disaster-affected region. The report constitutes an independent, impartial, and systematic assessment of the impacts of the disaster and the associated disaster recovery needs in the short to medium term.

The RDNA provides a comprehensive analysis of sectoral damages, economic losses, and recovery needs arising out of the disaster, estimated through various remote-sensing based data acquisition and triangulation tools, corroborated through ground information where possible. The RDNA follows a globally established and recognized damage, loss, and needs assessment methodology developed by the WB, the UN, and the EC. This methodology has been applied globally in numerous post-disaster and conflict contexts to assess damages, losses and needs towards informing recovery and reconstruction planning.

The report was produced in quick time to provide a rapid estimate of the impacts and needs arising out of the storm and flooding events. The RDNA process was challenged by the scarcity of reliable ground damage data which was overcome by the extensive use of various remote data collection means and technology. Despite these challenges, we are pleased that the RDNA team has been able to provide a robust analysis of disaster-induced damages, losses and needs across nearly all sectors of the economy, informed by various cross-cutting themes relevant to the Libyan context. Substantial efforts were deployed to enhance the accuracy of the gathered data using publicly available ground-based data for triangulation and consultations with partners. The RDNA report has been rigorously reviewed by various global experts and partner agencies on the ground, to enhance the relevance and reliability of its findings and its usefulness towards informing the design, planning and implementation of a coherent and coordinated multi-sector recovery program - in line with global good practices and lessons learnt from disaster recovery in similar country contexts. While all efforts have been made to improve the accuracy and reliability of the results of the assessment, it does not constitute a substitute for more comprehensive and localized ground damage surveys during the recovery planning and implementation phases.

The delivery of this comprehensive RDNA report in a relatively short period of time is a testament to the continued commitment and support of international and national development partners towards all people in Libya in overcoming the impacts of this large-scale disaster. We hope that this report will help Libyan stakeholders move towards conceiving, planning, and implementing an efficient and effective recovery program through a coordinated national platform. Libya can come out of this disaster, stronger and more resilient, by converting adversity into an opportunity for building back better and contributing towards the sustainable development of the regions affected by this disaster, and beyond.

EXECUTIVE SUMMARY

© Mahir Alawami/Shutterstock.com

KEY FACTS

OBJECTIVES

- Assess the impact of the flooding on physical assets, infrastructure, and service delivery.
- Conduct a preliminary estimate of infrastructure reconstruction and service delivery restoration needs in the short- and medium-term.
- Inform the Libyan stakeholders and the international community of the impact of the disaster.

METHODOLOGY

The RDNA assesses (i) damage to physical assets; (ii) economic losses; and (iii) reconstruction and recovery needs. The quantitative results and qualitative analysis of all three were aggregated and used to assess the overall macroeconomic and human impacts.

The RDNA relies largely on remotely collected data, with ground corroboration where possible. The RDNA relies on remote data sources which include 50 cm resolution satellite imagery, (social) media analytics, anonymized cellphone data, night lights data, publicly available information, as well as limited ground corroboration and consultations with partners to improve the veracity of the data.

The RDNA adapts from the Post-Disaster Needs Assessment (PDNA) methodology jointly developed by the European Union, the World Bank Group, and the United Nations. Damages are estimated as the replacement value of totally or partially damaged physical assets; losses are estimated from the disruptions to the economy that arise from the temporary absence of the damaged assets; and reconstruction and recovery needs are comprised of rebuilding infrastructure and restoring service delivery and are costed in the immediate and short-term.

KEY FINDINGS

1.0 DAMAGES
US$ billion

0.6 LOSSES
US$ billion

1.8 NEEDS
US$ billion

SCOPE

GEOGRAPHIC SCOPE

The RDNA covers 20 municipalities with an in-depth analysis in 5 cities.

- **20 Municipalities:** Derna, Al Abraq, Soussa, Al Bayda, Al Marj, Sahel Al Jabal, Shahaat, Jardas Al Abid, Medouar Al Zetoun, Al Qayqab, Ra's Al Hilal, Wardam, Umar Al Mukhtar, Toukara, Benghazi, Gemienis, Suloug, Umm Arazam, Al Qubah, Al Abyar.
- **5 Cities:** Derna, Soussa, Al Bayda, Al Marj, Shahhat.

SECTORAL SCOPE

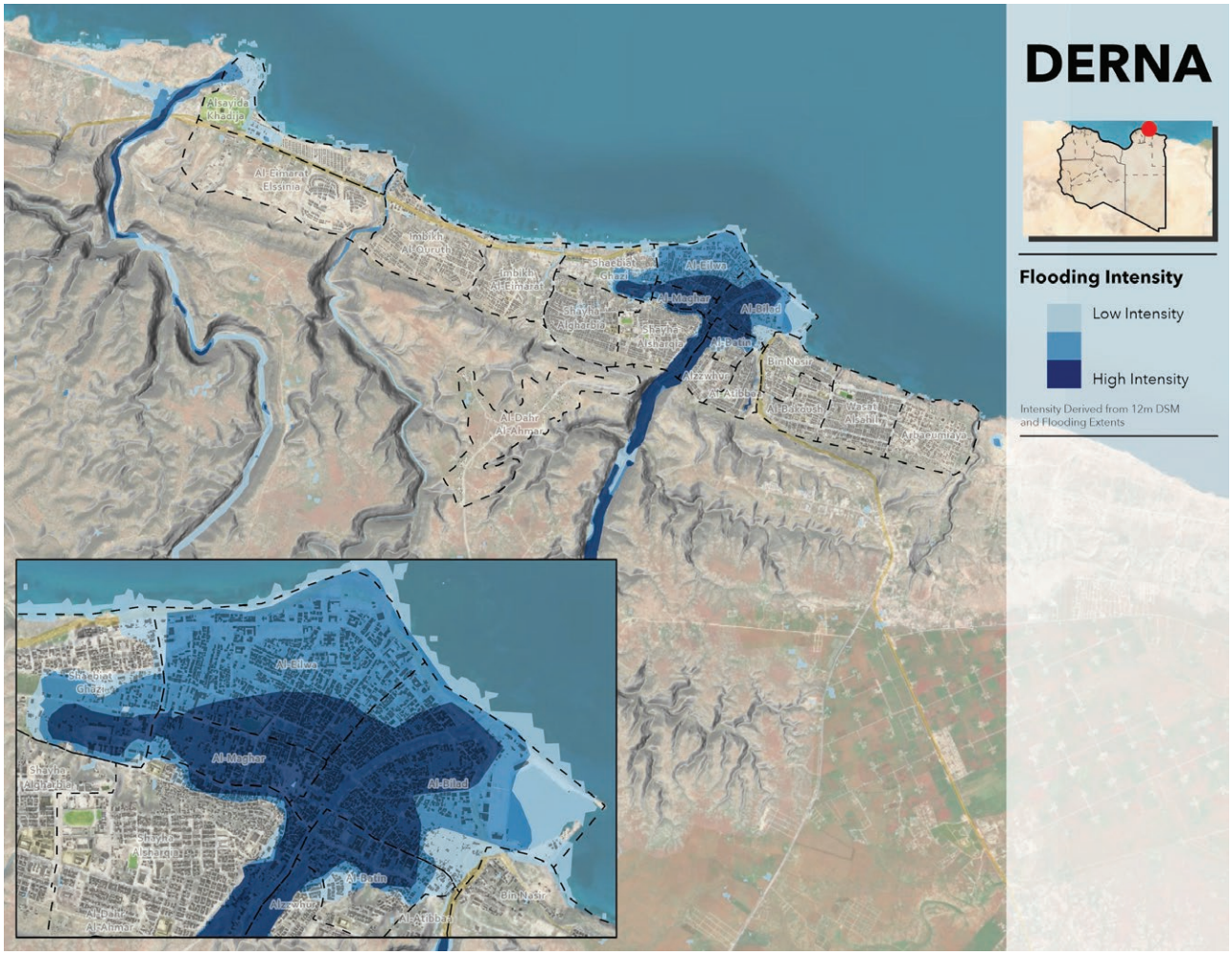
The RDNA covers macroeconomic and socioeconomic impacts, 12 sectors, and 7 cross-cutting areas.

- **Social sectors:** Housing, Education, Health, Poverty, Social Protection and Jobs, and Cultural Heritage
- **Infrastructure Sectors:** Water and Sanitation and Water Resource Management, Transport, Power, Municipal Services, and Digital Development and ICT.
- **Productive sectors:** Agriculture and Irrigation, Finance, Commerce, Industry and Markets
- **Cross-cutting sectors:** Governance, Impact on Men & Women, Environment and Natural Resources, Fragility, Conflict & Displacement, Social Sustainability and Inclusion, Climate Change, Disaster Risk Management.

CONTEXT

On Sunday, September 10 2023, Storm Daniel hit the eastern coastal zones of Libya wreaking havoc with heavy rains and fierce winds. The storm initially affected coastal cities in the northeast, including Benghazi, Soussa, and Toukara. However, the most catastrophic event occurred during the night of Sunday, September 10, and the morning of September 11, when two dams upstream of the coastal city of Derna, situated on the Wadi Darnah River, tragically failed. This led to the release of millions of cubic meters of water, which inundated the river plain and flooded Derna, a city of approximately 120,000 people. According to the United Nations' Office of Coordination of Humanitarian Assistance (OCHA) update of November 28th, 2023, 250,000 people (about one third children) have been affected by the disaster and need humanitarian assistance. Of these 44,800 are internally displaced, 4,352 are deceased and over 8,000 are still missing.

Figure 1: Flood Intensity in the City of Derna



Source: Assessment team.[1]

1 In this RDNA, the term "Assessment team" refers to the collaborative efforts of the World Bank (WB), the United Nations (UN), and the European Union (EU).

The 2023 storm and floods constitute a climatic and environmental catastrophe for Libya. Climate change has made floods up to 50 times more likely, and up to 50 percent more intense compared to a 1.2°C cooler climate[2]. The abnormally high rainfall and collapse of Derna's dams created an unprecedented disaster and flooded many areas which had not been historically at risk. The disaster hit coastal cities, including Derna, Benghazi, and Soussa, and also inland, affecting cities such as Al Bayda, Al-Marj and Shahhat. Approximately 22 percent of Libya's population, or 1.5 million people, live in the flood-affected districts, with some located in particularly risk-prone areas, making them more vulnerable to the effects of the disaster. Finally, the disaster severely affected an area rich in natural resources and ecosystem services, impacting coastal ecosystems, forests and woodlands, and agricultural lands.

Soon after this tragic disaster, the World Bank, with support from the United Nations, and the European Union, launched a Rapid Damage and Needs Assessment (RDNA). This RDNA follows a globally established and recognized damage, loss, and needs assessment methodology developed by the World Bank (WB), the European Union (EU), and the United Nations (UN). This methodology has been applied globally in post-disaster and conflict contexts to quantify damages and losses, and to guide recovery and reconstruction.

The substantial damages and losses from the floods amounted to US$ 1.7 billion, approximately 3.6 percent of Libya's GDP in 2022. The RDNA's impact assessment shows that the impact wasn't uniform across the regions and sectors. The municipalities of Al Bayda, Benghazi, Derna, Shahaat, and Soussa emerged as the hardest-hit areas, collectively bearing a staggering 85 percent of damages and losses (Figure 4). This concentration highlights the localized severity of the storm's impact, emphasizing the urgent need for targeted recovery efforts in these regions.

Figure 2: Abu Mansour Dam

Source: World Bank/Ipsos.

2 This exceptional weather event is estimated to hit northern Libya once every 643 years. In a hypothetical, 1.2°C cooler world, this would be an even rarer event with a return period of 1900 years. (Source: *https://spiral.imperial.ac.uk/bitstream/10044/1/106501/14/scientific%20report%20-%20Mediterranean%20floods.pdf*).

OBJECTIVES AND SCOPE OF THE RDNA

The objective of the RDNA is to estimate the impact of the storm and floods on physical assets and service delivery in the most affected areas and take stock of the ensuing recovery needs. The RDNA covers 20 municipalities and provides in-depth analysis of the five most affected cities (Derna, Soussa, Al-Bayda, Al-Marj, and Shahhat) The RDNA employs an assessment methodology developed by the WB, EU and UN that has been successfully applied in numerous disaster-affected countries around the World. The RDNA relies largely on satellite imagery-based data, social media analytics and other means of remote data collection. Despite extensive efforts to maximize the accuracy and reliability of the data collected and utilized for the RDNA, the recovery planning and implementation phases will provide an opportunity to further improve upon the RDNA data through more comprehensive ground damage surveys.[3]

The RDNA provides sector specific strategies for green, resilient, inclusive, and sustainable recovery. Based on these sector-specific strategies, it identifies and quantifies needs for several sectors, distributed, and sequenced across the short-term (0–12 months) and medium-term (1–3 years). These sectors encompass Social Sectors (Housing, Education, Health, Poverty, and Social Protection, and Jobs), Productive Sectors (Agriculture and Financial), Infrastructure Sectors (Energy, Transport, Telecommunications and Digital Development, Water and Sanitation, and Water Resource Management, and Municipal Services), as well as Cross-Cutting Sectors (Environment, Impact on Women and Men, Governance and Public Institutions, Disaster and Climate Risk Management, and Social Sustainability and Inclusion). The RDNA also analyses macroeconomic and socioeconomic impacts of the floods to anticipate how these are affecting the population's well-being. Although the scope of the RDNA is limited to damages, losses and needs caused by the flood, the recommended recovery measures attempt to contribute to longer term stability and improved governance of the disaster affected region.

3 Although it follows a similar methodology, the RDNA is different in this regard from Post-Disaster Needs Assessments (PDNA), which constitutes more in-depth analysis, using more ground data. The RDNA uses the following definitions: damages are estimated as the replacement values of totally, partially, or minimally damaged physical assets; losses are estimated from the disruptions to the economy that arise from the temporary absence of the damaged assets; and reconstruction and recovery needs are comprised of rebuilding infrastructure and restoring service delivery.

KEY FINDINGS OF THE RDNA

Distribution of Overall Effects and Needs

Physical damage and losses caused by the Libya storm and flood are estimated at US$ 1.03 billion and US$ 0.62 billion, respectively, bringing the total estimated Disaster Effects (Damages + Losses) to US$ 1.65 billion. Reconstruction and recovery needs across the 20 affected municipalities are estimated at US$ 1.8 billion, with needs in the first year estimated at US$ 0.7 billion, and needs for the second and third years estimated at US$ 1.1 billion (Table 1).

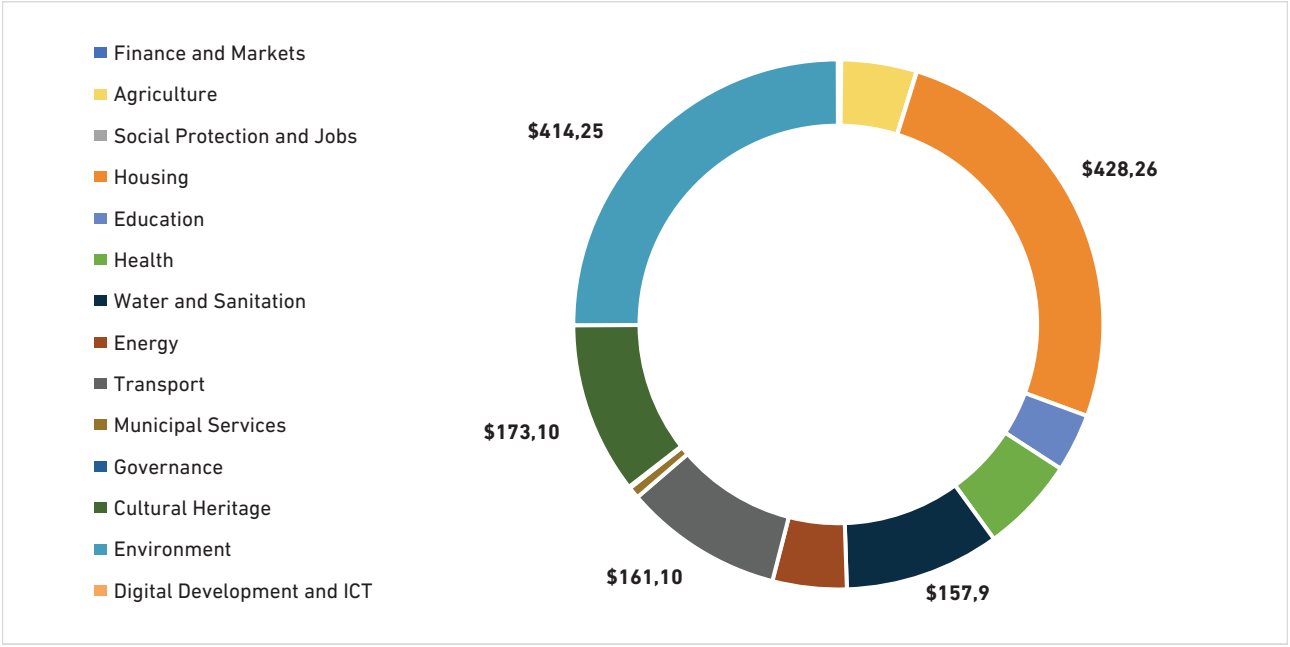
In terms of physical damages, Housing was the hardest hit sector, at US$ 362 million (35 percent of total damages), followed by Environment at US$ 157 million (15 percent), Transport at US$ 139 million (14 percent), and Water and Sanitation at US$ 136 million (13 percent).

In terms of total disaster effects (damages + losses), Housing suffered the most, accounting for US$ 428 million (26 percent of the total effects). The Housing sector is followed by the Environment with US$ 414 million (25 percent); Cultural Heritage with US$ 173 million (10 percent); Transport with US$ 161 million (10 percent); and Water and Sanitation with US$ 157 million (9 percent). The graph below (Figure 3) shows the distribution of total disaster effects across sectors.

At the municipality level, Derna suffered the most, with damages and losses of US$ 309 million, which accounts for 19 percent of all damages and losses. Benghazi followed with damages and losses of US$ 253 million (15 percent). Al Bayda experienced damages and losses worth US$ 206 million (12 percent), Soussa incurred US$ 164 million (10 percent), and Shahaat had US$ 129 million (8 percent). The remaining municipalities had a lower share of damages and losses (Figure 4).

Total reconstruction and recovery needs are calculated at **US$ 1.8 billion**, with needs in the first year estimated at **US$ 0.7** billion, and for the second and third years at **US$ 1.1** billion. The highest estimated needs are in **Housing** (US$ 517 million or 30 percent), **Water** (US$ 234 million or 13 percent), and **Transport** (US$ 209 million or 12 percent).

Figure 3: Damages and Losses by Sector ($USM)



Source: Assessment team.

Table 1: Summary of Total Effects and Needs

Sector	Damages and Losses (US$)			Needs (US$)		
	Damages	Losses	Total Effect	Short Term (0-1 years)	Medium Term (1-3 years)	Total (over 0-3 years)
Productive Sectors						
Finance and Markets	2,559,567	383,935	2,943,502	1,913,276	1,913,276	3,826,553
Agriculture	22,754,045	53,427,619	76,181,663	22,331,789	13,896,641	36,228,430
Productive Sectors Total	**25,313,612**	**53,811,554**	**79,125,166**	**24,245,065**	**15,809,918**	**40,054,983**
Social Sectors						
Social Protection and Jobs	374,571	-	374,571	70,293,949	41,751,281	112,045,230
Housing	361,827,331	65,800,963	427,628,294	268,097,413	249,315,670	517,413,083
Education	30,100,926	28,731,927	58,832,853	35,297,671	82,361,233	117,658,904
Health	28,269,684	68,600,097	96,869,781	56,539,368	56,539,368	113,078,736
Social Sectors Total	**420,572,512**	**163,132,986**	**583,705,498**	**430,228,402**	**429,967,552**	**860,195,953**
Infrastructure Sectors						
Water and Sanitation	136,470,000	20,470,500	156,940,500	22,362,726	212,263,322	234,626,048
Energy	34,000,000	40,881,058	74,881,058	66,400,000	30,900,000	97,300,000
Transport	139,615,471	20,942,321	160,557,791	62,617,539	146,107,590	208,725,129
Municipal Services	11,728,200	-	11,728,200	9,022,151	11,504,563	20,526,714
Infrastructure Sectors Total	**321,813,671**	**82,293,879**	**404,107,549**	**160,402,415**	**400,775,475**	**561,177,890**
Cross-Cutting Sectors						
Governance	1,190,303	357,091	1,547,394	9,250,000	13,750,000	23,000,000
Cultural Heritage	108,740,000	64,488,900	173,228,900	50,890,320	118,744,080	169,634,400
Environment	157,086,833	257,382,646	414,469,479	20,156,000	50,364,000	70,520,000
Digital Development and ICT	448,854	22,443	471,297	383,179	418,026	801,204
Disaster Risk Management (DRM)	-	-	-	11,690,000	15,990,000	27,680,000
Cross-Cutting Sectors Total	**267,465,990**	**322,251,080**	**589,717,069**	**92,369,499**	**199,266,106**	**291,635,604**
Grand Total	**1,035,165,785**	**621,489,498**	**1,656,655,283**	**707,245,381**	**1,045,819,050**	**1,753,064,431**

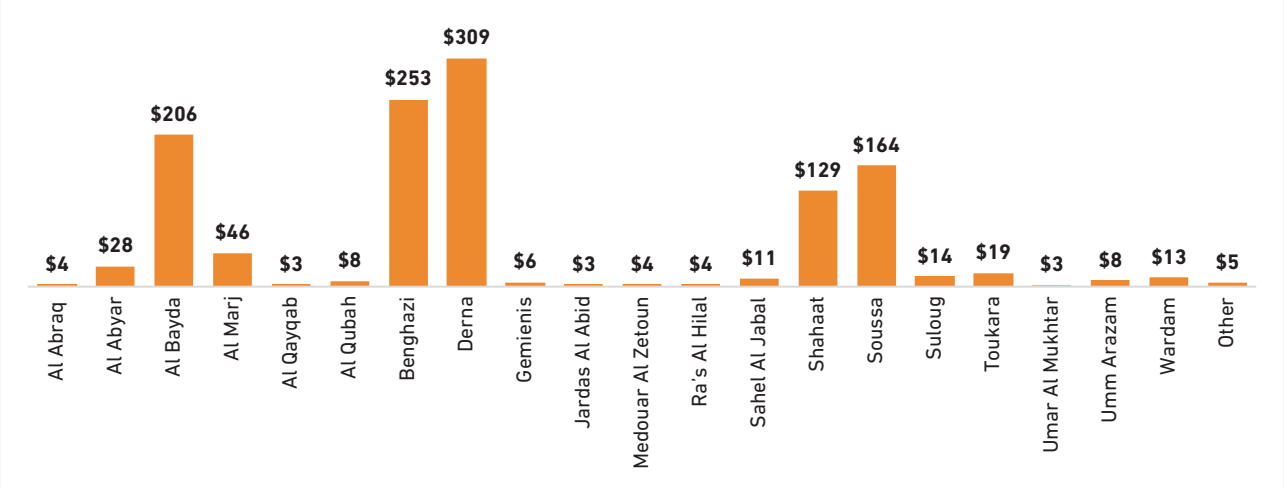
Source: Assessment team.

Of the total reconstruction and recovery needs amounting to **US$ 1.8** billion, approximately 70 percent (US$ 1.2 billion) will be needed for infrastructure. Within infrastructure, Housing accounts for US$ 470 million (38 percent), Transport requires US$ 209 million (17 percent), and Water and Sanitation needs US$ 200 million (16 percent). Around 40 percent (US$ 493 million) of reconstruction and recovery costs are expected to be addressed in the short term, within one year, while the remaining costs will be spread over the next two years following the first-year post disaster recovery.

Macroeconomic Impact

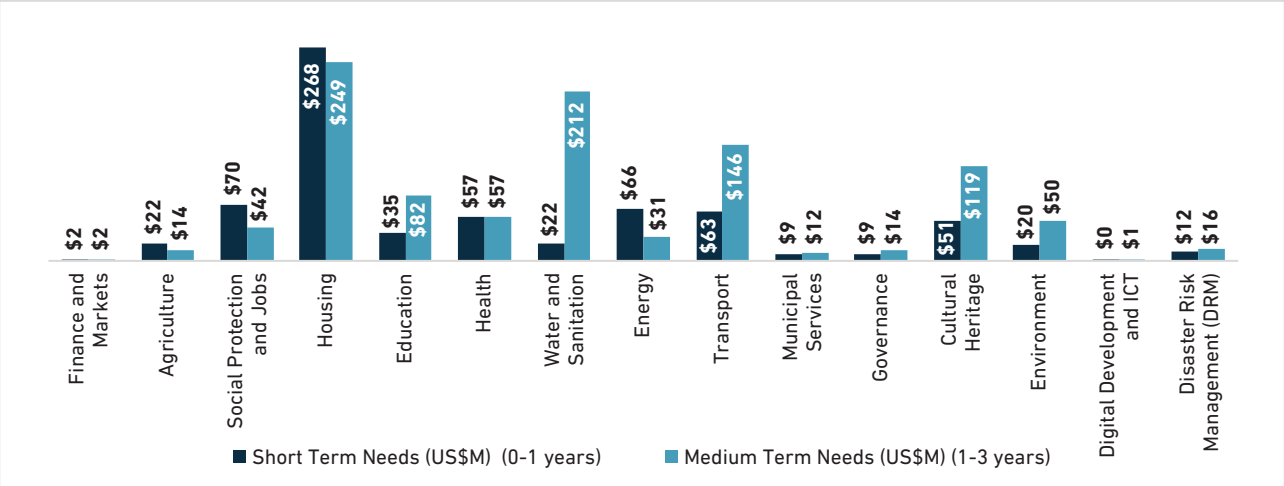
The human toll – lost lives and injuries- is devastating, with potential long-term consequences on the Libyan economy should reconstruction efforts stall. Economic losses and damages and losses across all sectors amounted to US$ 1.7 billion, constituting approximately 3.6 percent of GDP in 2022. The minor macroeconomic impact can be attributed to the location of the disaster in

Figure 4: Damages and Losses at the Municipality Level (US$ M)



Source: Assessment team.

Figure 5: Total Reconstruction and Recovery Needs by Sectors (US$M)



Source: Assessment team.

Libya's poorest regions and their small contribution to Libya's GDP. First, the most affected areas, mainly Al Jabal al Akhdar, Derna, and Al-Marj, account for 75 percent of the estimated damages and loss; their contribution to Libya's GDP is just 7 percent (Figure 4). Nevertheless, GDP loss could be significant, particularly in the Derna, Al Jabal Akhdar, Al Marj, and Benghazi districts. An analysis distributing the GDP loss proportionally to the level of damage in each district, relative to their pre-crisis GDP, shows that Derna experiences severe economic strain, with the most substantial GDP losses: -1.1 percent in 2023, followed by -3.7 percent in 2024 and 2025. Al Jabal al Akhdar faces substantial setbacks, expecting a -0.8 percent GDP loss in 2023, worsening to -2.5 percent in 2024 and 2025. Al Marj forecasts comparatively smaller but still notable declines, projecting -0.3 percent in 2023 and -0.9 percent in 2024 and 2025. Meanwhile, Benghazi anticipates relatively minor reductions, with -0.1 percent in 2023 and -0.3 percent in 2024 and 2025. These impacts could be more pronounced at the municipal level, especially for those that the storm has directly hit.

Initial estimates indicate that while the disaster will not have significant macroeconomic consequences nationally and will marginally affect the initial growth estimation, lack of reconstruction and a clear vision of the funding mechanisms to support recovery could lead to negative growth. Prior to the catastrophe, Libya's economic outlook for 2023 appeared promising, with an expected economic growth of 14.1 percent following a negative GDP growth of -1.2 percent the previous year. A 12 percent rise in oil production bolstered industrial activity, which grew by 11.3 percent. Additionally, a 10 percent rise in the government wage bill fueled a remarkable 18.7 percent growth in services. However, following the floods, a Computable General Equilibrium (CGE) model suggests a potential national 0.07 percent GDP loss in 2023 due to damaged and lost capital in the affected areas in the East. However, without a well-thought-out reconstruction, this loss could escalate to 0.23 and 0.22 percent of GDP in 2024 and 2025, respectively.

In 2023, private consumption might decrease by 0.05 percent, and the Consumer Price Index (CPI) could rise by 0.03 percent. These trends may worsen in 2024 and 2025, with the CPI increasing by 0.09 and 0.12 percent, respectively. Household consumption might also suffer, decreasing by 0.16 percent in 2024 and 0.18 percent in 2025.

The flooding may lead to higher prices for goods and food in Al Jabal Al Akhdar and Derna districts due to damaged infrastructure, affecting local supply chains. The national impact on unemployment is expected to be limited, given substantial public sector employment (51% of the Libyan workforce) and widespread dependence on public income (around 80% of the population). However, at the local level, particularly in affected regions, the impact on private employment and self-employment (approximately 5% of the population) could be more significant, with job loss and income reduction, especially in the agricultural sector..

Social, Human, and Poverty Impact

22 percent of the country's population (1.5 million people) live in areas affected by the floods.[4] Those in the districts of Derna, Benghazi, Al Marj, Sahel Al Jabal and Al Akhdar have been particularly affected. The floods occurred in a country where 11.4 per cent of the population are vulnerable to multidimensional poverty[5], the impacts of conflict and displacement, and external shocks. The estimated number of people in need amounted to 250,000 following the floods. This has led to a complex humanitarian crisis, compounded existing adversities, stretched already scarce resources, and amplified vulnerability. The floods have deepened Libyan household challenges at multiple levels; they have swelled displacement, reduced food security, increased multidimensional poverty, and caused significant loss of livelihood and income.

The disaster destroyed/damaged 18,838 houses (seven percent of the housing stock). Derna incurred the heaviest toll, with approximately 4,000 houses destroyed or damaged. Other immediate consequences include reduced food security and less access to healthcare and education. The internal displacement of nearly 44,800 individuals[6], including approximately 16,000 children, according

4 Libyan Bureau of Statistics and Census, 2020.

5 According to data available from 2014, two percent of the Libyan population are multi-dimensionally poor, and 11.4 percent are classified as vulnerable to multidimensional poverty. UNDP. Multidimensional Poverty Index 2023. *https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/LBY.pdf*

6 According to the United Nations' Office of Coordination of Humanitarian Assistance (OCHA) update of November 28th, 2023.

to UNICEF,[7] exacerbated vulnerabilities, particularly among women, migrants, persons with disabilities, and those with chronic illnesses. The floods have disrupted economic activity and social structures and will produce learning setbacks for children, mental health challenges, and greater socio-economic disparities. Additionally, social protection services and benefits have been disrupted. These are needed by affected populations, newly displaced (IDPs), vulnerable groups (female heads of households, people with disabilities, etc.), and workers in the informal economy.

FORWARD LOOK

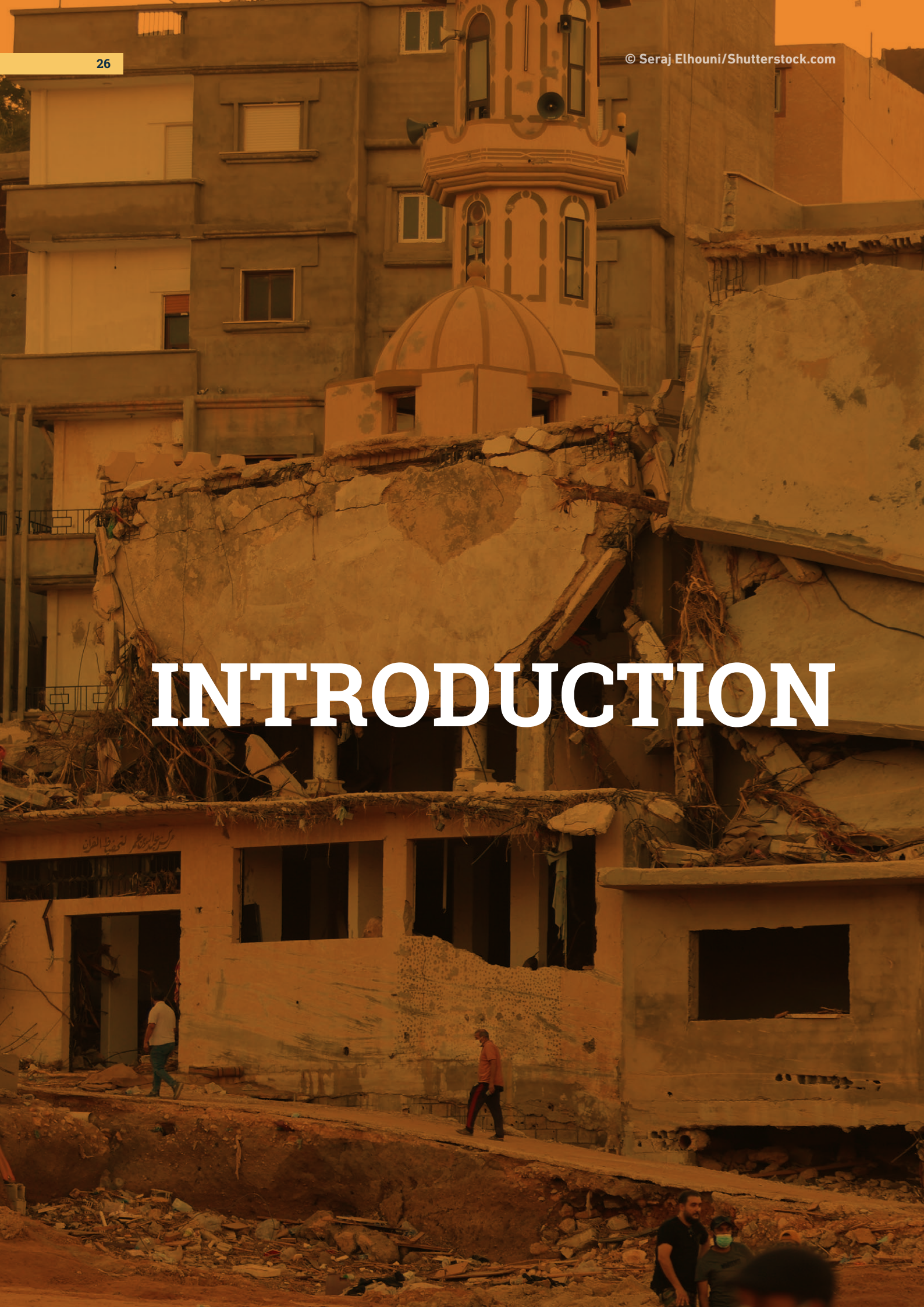
The RDNA provides a solid foundation for identifying and quantifying recovery needs. It emphasizes that post-disaster recovery goes beyond just an assessment and requires a well-coordinated, and well-structured multi-sector and multi-stakeholder approach, to plan, manage, implement and finance the recovery. Government leadership, coupled with collaboration with international partners, civil society, and localized decision-making are crucial for effective recovery. International good practices offer lessons on institutional arrangements, financing, policy development, prioritization, and implementation frameworks for coherent, coordinated, sustainable, and resilient recovery. Adopting a Disaster Recovery Framework (DRF) aligned with these practices can support the recovery process. Prioritizing recovery activities involves inter-sectoral prioritization based on indicators such as humanitarian impact, pro-poor and gender-sensitive agendas, sustainable livelihoods, and critical infrastructure restoration. Post-disaster Recovery requires assessment, planning, resource mobilization, capacity building, coordination, communication, monitoring, and implementation.

Three institutional models can be adopted during post disaster recovery which include: (i) strengthening existing institutions; (ii) establishing a new agency; (iii) or using a hybrid approach. Clarity about leadership and coordination is essential in any institutional arrangement. Project cycle management and decision-making procedures should be transparent and rapid. Multi-layered coordination mechanisms between line ministries, central and local governments, stakeholders, and international partners are critical. Monitoring and evaluation systems need to be established to track program implementation and funding. Moreover, Legal and policy requirements are critical in facilitating DRF implementation. Staffing challenges can be addressed by seeking additional expertise and scaling up staffing. Effective communication and outreach efforts are important for stakeholder engagement. Recovery implementation requires a robust monitoring and evaluation system, accountability mechanisms, data collection and analysis, stakeholder engagement, and rapid procurement mechanisms.

Finally, a successful recovery requires a financing strategy to address the identified financing gap. The strategy should consider the government's financing commitments and constraints, as well as the limited availability of development assistance and private capital. It should be based on the economic costs estimated by the RDNA, assess recovery budgets, identify sources of financing, and outline coordination and allocation options for recovery funds.

It is important to note that a DRF is not a detailed action plan for recovery. While the framework provides a vision, priorities, institutional options, implementation arrangements, and a financing strategy, it is necessary to develop detailed, tailored and coordinated sectoral and/or area-based recovery plans and programs. Libya should develop a framework from which best practice solutions emerge, delivering catalytic and sustainable recovery investments to allow the country not only to bounce back, but also to bounce forward.

7 Yasmine Sherif, Director Education Cannot Wait (ECW) *https://www.unicef.org/press-releases/more-16000-children-are-displaced%E2%80%AFfollowing-libya-floods-unicef*



© Seraj Elhouni/Shutterstock.com

INTRODUCTION

THE CLIMATE, DISASTER, AND CONFLICT NEXUS IN LIBYA

On September 10, 2023, a disaster unfolded in eastern Libya when Storm Daniel wreaked havoc with heavy rains and fierce winds. A week prior, Storm Daniel had developed over Greece, causing strong winds, heavy rain, floods, and loss of life in Greece, Türkiye, and Bulgaria. It then crossed the Mediterranean to the Libyan coast, causing floods on September 10, 2023. It swept eastern Libya with heavy rains and wind speeds of up to 80 km/h.[8] The brunt of the storm's impact was initially felt in the coastal cities of the eastern region of the country including Derna, Benghazi, and Soussa; and later it flooded Al-Bayda, Al-Marj and Shahhat.

The coastal city of Derna was hardest hit by the storm after the failure of two dams upstream of the city on September 10 and 11. This led to the release of 30 million cubic meters of water.

Initially, the Bou Mansour dam overtopped and breached at around 3 am Libya time on September 11 because of the rain. The water flowed 12 kilometers to the downstream Derna Dam, which subsequently collapsed due to the massive water inflow. Derna, a city of 120,000 people, was then flooded, and floodwaters rose to three meters, submerging entire neighborhoods.[9]

As of November 28, the human toll has been significant, making Storm Daniel the deadliest storm in Africa since 1900.[10] OCHA confirmed 4,352 deaths, over 8,000 missing, and 43,400 internally displaced. It is also estimated that approximately 250,000 people will require humanitarian assistance through December.[11]

This event clearly constitutes a climate and environmental catastrophe for Libya. Climate change made the recent rains up to 50 times more likely and up to 50 percent more intense compared to a 1.2°C cooler climate.[12] When the storm reached the northern coast of Libya, an estimated 400mm of rain fell in 24 hours, 267 times higher than the long term average daily precipitation for September of 1.5mm.[13] The return period for such an event has been estimated to be 1 in 300 to 1 in 600 years.[14] The interplay of climate change-exacerbated rainfall, exposure and vulnerability led to widespread impacts in the Mediterranean region, as reported by World Weather Attribution. In Derna, the abnormally high rainfall and failure of the dams caused an unprecedented disaster and flooded many areas that had not been historically at risk. Rising global temperatures are exposing Libya to more climate-related hazards, including floods, droughts, wildfires, extreme heat, sandstorms, and desertification.[15]

The flood and storm surge occurred in a populated coastal area in the context of limited arrangements for effective Disaster Risk Management. Wadi Derna is prone to flooding and experienced five major floods in October 1942, October 1959, October 1968, November 1986, and September 2011. The district of Derna had previously been identified as

8 World Meteorological Organization (WMO).

9 International Federation of the Red Cross (IFRC), November 12, 2023.

10 Relief Web and Yale University, September 15th, 2023.

11 OCHA Humanitarian Update, November 28th, 2023.

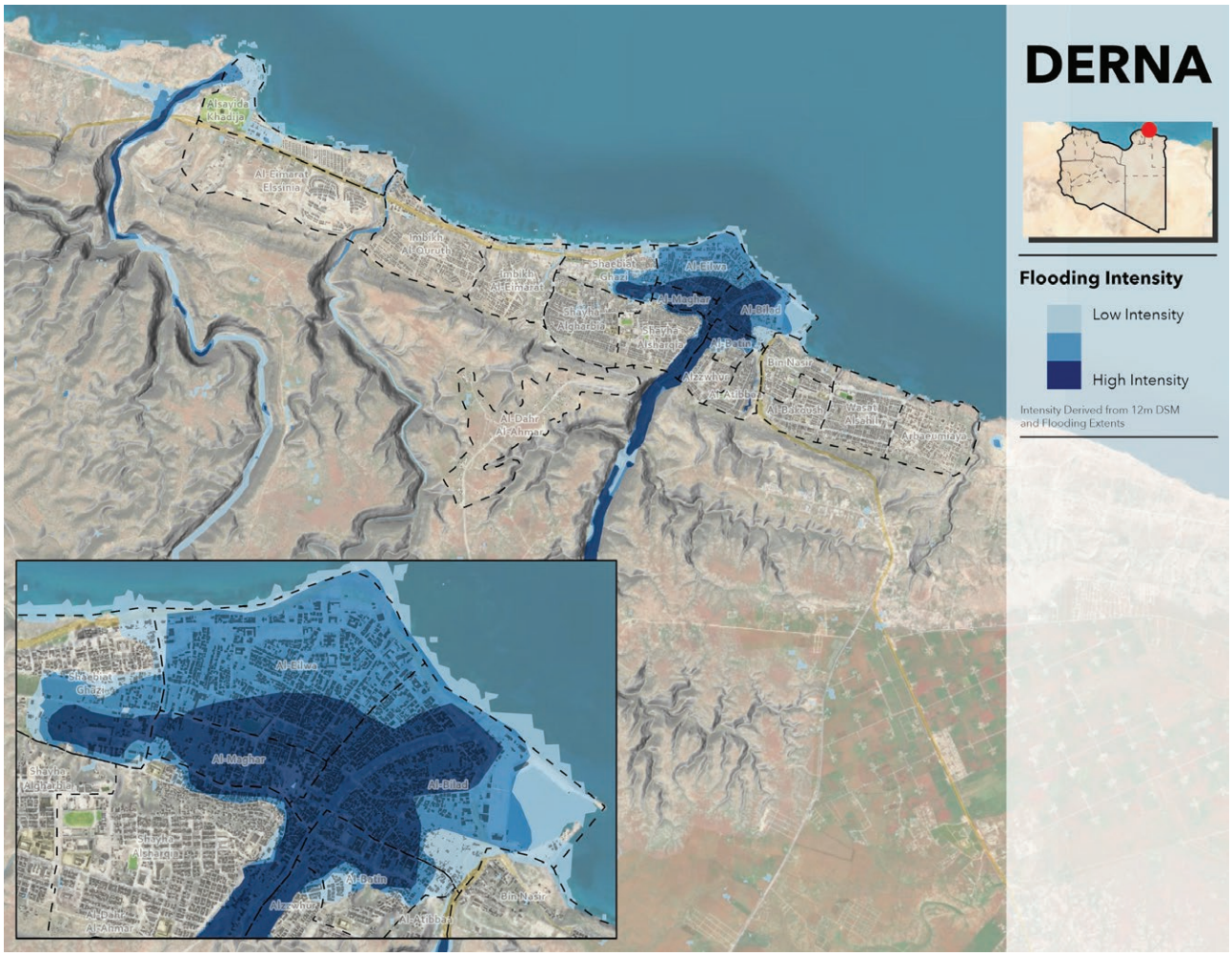
12 This exceptional weather event is estimated to hit northern Libya once every 643 years. In a hypothetical, 1.2°C cooler world, this would be an even rarer event with a return period of 1900 years. (source: *https://spiral.imperial.ac.uk/bitstream/10044/1/106501/14/scientific report - Mediterranean floods.pdf*).

13 Relief Web, September 12th, 2023.

14 Zachariah, M et al. (2023). Interplay of climate change-exacerbated rainfall, exposure and vulnerability led to widespread impacts in the Mediterranean region. Report by World Weather Attribution.

15 UNDRR, 2023. *https://www.undrr.org/media/85834/download?startDownload=true.*

Figure 6: Flooding Intensity in the City of Derna



Source: Assessment team.

one of the six districts in Libya with an extreme risk of floods[16]. In the Libyan context where most of the population resides in coastal areas (85 percent),[17] the storm hit several cities with a high level of informal urban development and where many homes and companies occupy risk-prone areas. In Al Bayda and Soussa, houses, companies and infrastructure on floodplains were significantly damaged the floods. Approximately 22 percent of Libya's population, or 1.5 million people, were living in flood-affected districts. With only a few weather stations in the East, monitoring and forecasting for localized flood warnings were limited. In general, Libya's institutional and regulatory framework for disaster and climate risk management is not clearly defined, leading to ambiguity in mandates, roles, and responsibilities.

In addition to urban areas, the disaster occurred in a zone rich in natural resources and ecosystem services, including coastal ecosystems, forests and woodlands, and agricultural lands. The flood-impacted coastal zone (Cyrenaica) forms a 210 km long and 50km wide crest between Benghazi and Derna of the 2000 km Libyan coastline. The affected coastline supports seabirds, fish, and feeding and nesting turtles and already faces coastal erosion from rising sea levels and increasingly severe winter storms—factors exacerbated by climate change. The flood-affected area is also the only area in Libya with natural forests; Al-Jabal al-Akhdar, or the Green Mountain, stretches between Benghazi and Derna for about 350 km along the Mediterranean coast and is known for its plant diversity. It hosts 70 percent of Libya's flora. Finally, the Northern strip, where the

16 Source: UNICEF (2023), Climate Landscape Analysis for Children (CLAC).
17 Source: *https://www.climatelinks.org/resources/climate-risk-profile-libya.*

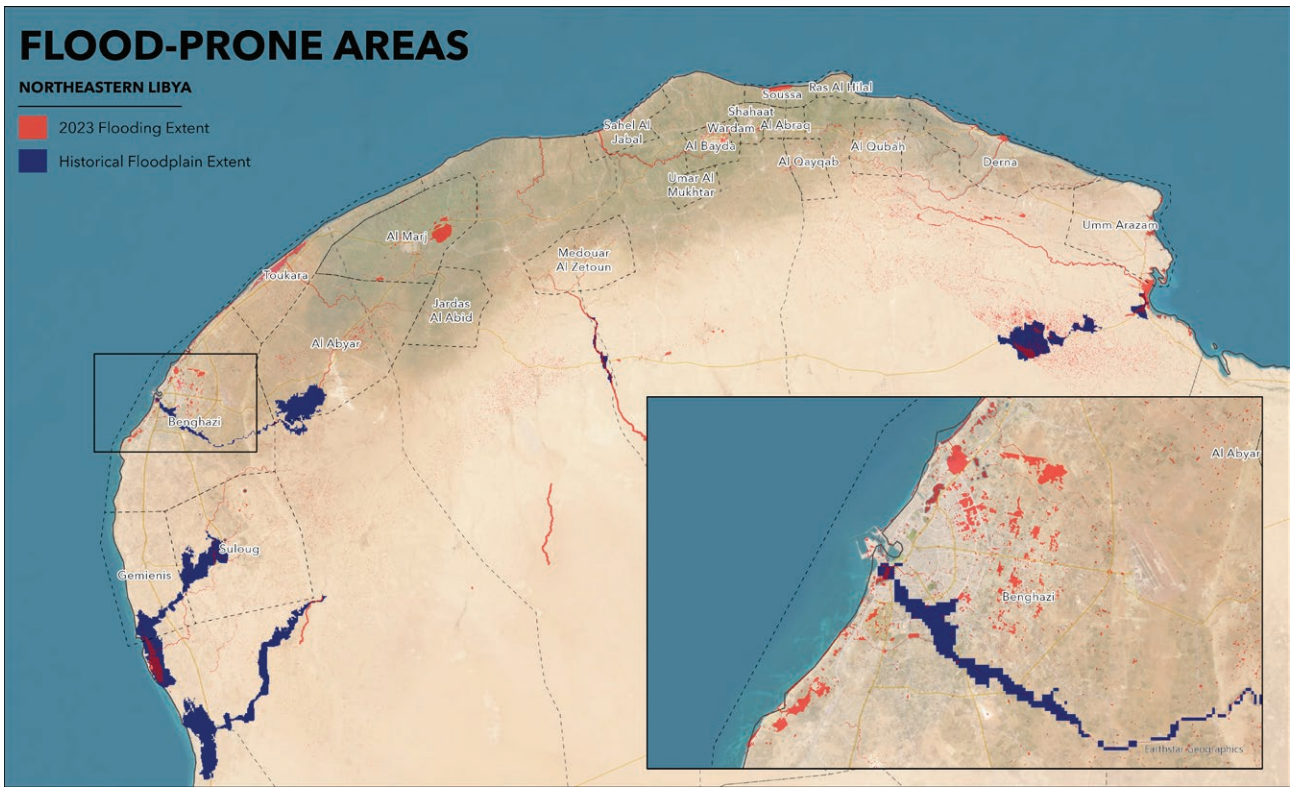
flood occurred, has good rains and fertile soils, and is intensively used for agriculture.

The Conflict and Disaster Nexus

The flood occurred in a context of fragility and conflict. Libya faces many interwoven structural challenges contributing to its protracted state of fragility. Compounding these challenges are the diverse shocks including those related to natural disasters and climate change that further intensify and widen weaknesses related to low institutional capacity and high insecurity, exacerbate population displacement, and deepen the socioeconomic vulnerability of Libyans.

Members of the international community have called for a national unified reconstruction effort. On October 2, 2023, the UN Special Envoy for Libya, Abdoulaye Bathily, called for a unified mechanism to lead the reconstruction efforts caused by the flood. This position was supported by a joint statement of UN member states, echoing Bathily's position in calling for a unified mechanism to deliver transparent and accountable relief in the wake of the flood. On October 30th, 2023, the UN Security Council issued resolution 2702, extending the United Nations Support Mission in Libya (UNSMIL) until October 31, 2024, as it expressed concern over the humanitarian situation in the flood-affected areas and stressed " the need for a coordinated national platform, supported by UNSMIL, to release funds for long-term reconstruction efforts that would be managed transparently with effective oversight and accountability to the Libyan people."[18]

Figure 7: Flood–Prone Areas in Northeastern Libya



Source: Assessment team.

18 UN Security Council Resolution 2702 (2023), available on https://press.un.org/en/2023/sc15469.doc.htm.

RDNA OBJECTIVES, METHODOLOGY, AND SCOPE

In line with an institutionally anchored global tri-party disaster response agreement, the World Bank (WB), United Nations (UN), and the European Union (EU) embarked on a RDNA to assess the impact and needs arising of the disaster. The teams held meetings with the Government of National Unity (GNU)'s Ministry of Finance (MoF) and Ministry of Local Governance (MoLG), as well as representatives from the Benghazi-Derna Construction Fund (BDCF), to provide to provide an orientation on the RDNA process, and methodology.

The overarching objective of the Libya RDNA is to inform Libyan stakeholders of the impact of the storm on the population, physical assets, infrastructure, and service delivery; and to conduct a preliminary estimate of short-, medium-, and long-term physical infrastructure reconstruction and service delivery restoration needs in selected cities and sectors. The RDNA follows a globally established and recognized damage, loss, and needs assessment methodology developed by the WB, EU, and the UN. This methodology has been applied globally in post-disaster and conflict contexts to inform recovery and reconstruction planning. Each sector's assessment has been conducted in a manner that also factors in the drivers of fragility and conflict. Although the scope of the RDNA is limited to damages, losses and needs caused by the flood, the recommended recovery measures attempt to contribute to longer-term stability and improved governance of the disaster-affected region.

Temporal Scope

The RDNA is based on remotely collected damage and loss data validated through limited ground corroboration over September–October 2023. The recovery needs estimated in this RDNA span a 3-year time horizon, further split into short-term recovery over the first year and medium-term recovery over 2–3 years.

Geographic scope

The RDNA covers 20 municipalities with an in-depth analysis in 5 cities.

- **20 Municipalities:** Derna, Al Abraq, Soussa, Al Bayda, Al Marj, Sahel Al Jabal, Shahaat, Jardas Al Abid, Medouar Al Zetoun, Al Qayqab, Ra's Al Hilal, Wardam, Umar Al Mukhtar, Toukara, Benghazi, Gemienis, Suloug, Umm Arazam, Al Qubah, Al Abyar.
- **5 Cities**[19]**:** Derna, Soussa, Al-Bayda, Al-Marj, Shahhat.

19 "Municipalities" refer to administrative divisions that can encompass both urban and rural areas. In contrast, the term "City" specifically denotes the urban area contained within the municipal borders. The total estimated population for these 5 cities amounts to approximately 380,000 inhabitants, representing about 25% of the population out of the total population living in the 20 assessed municipal areas (Source: Libyan Bureau of Statistics and Census, 2020).

Sectoral scope

The RDNA covers macroeconomic and socioeconomic impacts, 12 sectors, and 7 cross-cutting areas.

- **Social sectors:** Education, Health, Housing, Poverty, Social Protection and Livelihoods, and Cultural Heritage
- **Infrastructure sectors:** Water and Sanitation and Water Resource Management, Transport, Power, Municipal Services, and Digital Development and Information and Communications Technology and Digital Development
- **Productive sectors:** Agriculture and Irrigation, Finance, Commerce, Industry and Markets
- **Cross-cutting sectors:** Governance, Fragility, Conflict and Displacement, Environment, Climate and Disaster Risk Management, Social Sustainability and Inclusion, Women and Men.

Methodology

The RDNA assesses (i) damage to physical assets; (ii) economic losses; and (iii) reconstruction and recovery needs per sector. The aggregated quantitative results and qualitative analyses were then used to assess the macroeconomic and human impacts.

The RDNA predominantly relied on remotely collected data, with limited corroboration through ground actors and other sources, including UN agencies. The RDNA employed 50 cm resolution satellite imagery, social media analytics, anonymized cellphone data, night light data, publicly available information, and limited ground corroboration through various sources.

The RDNA is based on the global damage, loss, and needs assessment methodology developed by the EU, WB, and UN, which has been successfully applied in numerous countries. The RDNA uses the following definitions: damages are estimated as the replacement values of totally, partially, or minimally damaged physical assets; losses are estimated from the disruptions to the economy that arise from the temporary absence of the damaged assets; and reconstruction and recovery needs are comprised of rebuilding infrastructure and restoring service delivery, and are phased across the immediate (0–1 years) and medium terms (1–3 years).

Libya's position as a High-Middle-Income Country with a significant government surplus will allow it to use public resources to implement the proposed priorities for immediate and medium-term recovery. Libyan stakeholders may use the results of the RDNA to inform their recovery and reconstruction investments, planning, and implementation. The RDNA process is focused on producing knowledge that could inform future reconstruction and recovery efforts benefiting all Libyans.

A distinguishing feature of the Libya RDNA is its application of various cross-cutting lenses across all impacted sectors and needs assessments. This enhances the responsiveness of sector analyses and recovery strategies, allowing the incorporation of fragility and conflict, Men and Women, climate change and social considerations.

Limitations and Key Challenges

Given the protracted conflict, Libya has a dearth of economic and social data. The international RDNA partners faced challenges in collecting data due to the scarcity of sources and limited on-the-ground presence of the international community, particularly in the affected areas. To address this challenge, an international firm was contracted to remotely assess the extent and degree of damage across sectors and verify recovery and reconstruction unit costs through different sources. The firm primarily collected and triangulated data through remote sensing, anonymized cellular data, and social media sources. This approach helped obtain damage and needs data from neutral and technical actors employing internationally applied rapid remote assessment tools. The RDNA team was able to collect data through remote means and used the firm's on-ground presence to ground-truth and triangulate these data. Additionally, the UN, Impact REACH, and other international partners

were used to triangulate and validate these data. The mixed-use of the RDNA data collection approaches helped ensure the relative accuracy of the data while acknowledging that remote approaches cannot fully substitute for detailed ground-based damage surveys and inventories. The use of such methods helps ensure a neutral and objective assessment of disaster impacts, needs, and costs. Despite these efforts to collect reliable data, the recovery phase will be an opportunity to supplement RDNA data by conducting more comprehensive damage surveys across various sectors and affected areas.

MACROECONOMIC AND HUMAN IMPACT

Macroeconomic Impact

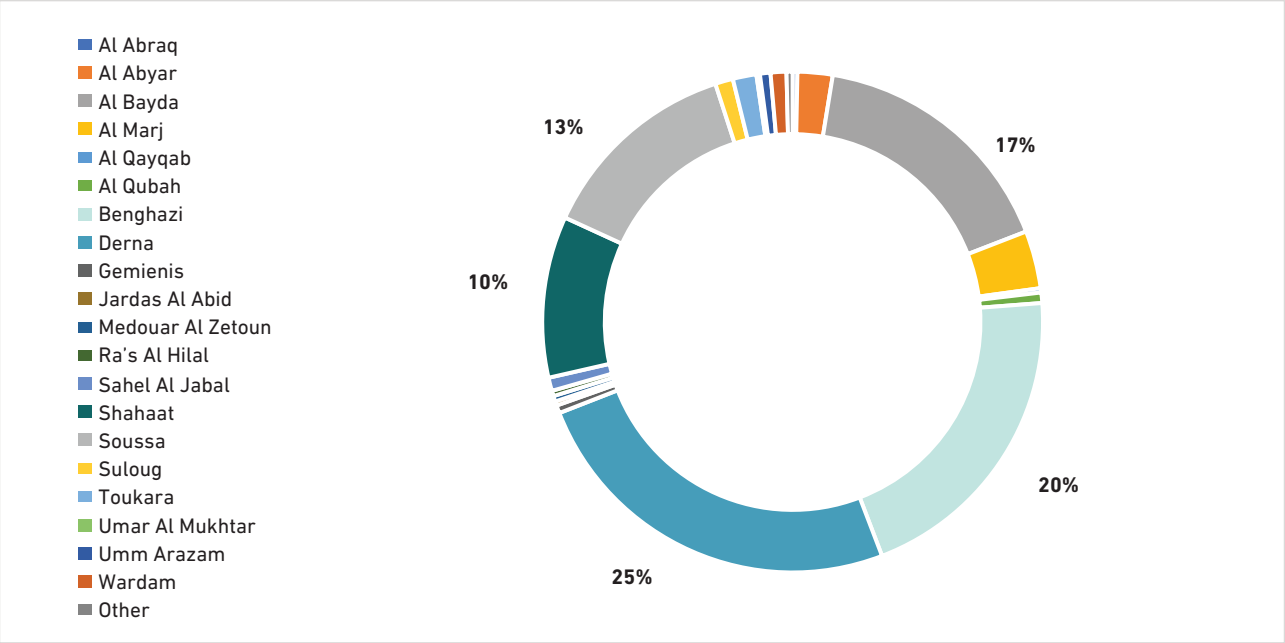
The substantial damages and losses from the floods amounted to US$ 1.8 billion, approximately 3.6 percent of Libya's GDP in 2022. The RDNA's impact assessment shows that the impact wasn't uniform across the regions and sectors. The municipalities of Al Bayda, Benghazi, Derna, Shahaat, and Soussa emerged as the hardest-hit areas, collectively bearing a staggering 85 percent of damages and losses (Figure 9). This concentration highlights the localized severity of the storm's impact, emphasizing the urgent need for targeted recovery efforts in these regions.

Estimates indicate that while the disaster will not have a significant macroeconomic impact and will marginally affect the initial growth estimation, lack of reconstruction and a clear vision of the funding mechanism of this effort

Figure 8: Derna City Following the Floods (13SEP2023)

Source: Assessment team.

Figure 9: Total Damages and Losses by Municipality



Source: Assessment team.

could lead to further negative growth. Prior to the catastrophe, Libya's economic outlook for 2023 appeared promising, with an expected economic growth of 14.1 percent following a negative GDP growth of -1.2 percent the previous year. The surge in oil production by 12 percent during the first nine months of 2023, averaging 1.191 million barrels per day (bpd) compared to 1.057 million bpd in 2022, was a key driver. Enhanced security measures and exemption from output cuts by OPEC contributed significantly to this boost. This surge in hydrocarbon production bolstered industrial activity, which grew by 11.3 percent. Additionally, a 10 percent rise in the government wage bill fueled a remarkable 18.7 percent growth in services. However, a CGE model suggests a potential 0.07 percent national GDP loss in 2023 due to damaged and lost capital in the affected areas in the East. However, without adequate

Figure 10: GDP Impacts in 2023 and Projections 2024–2025

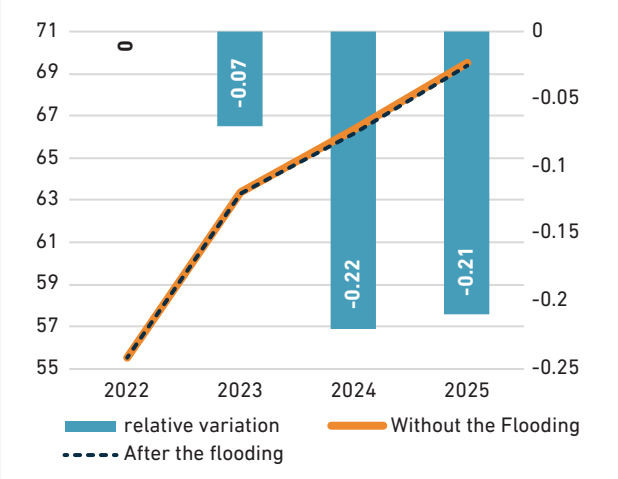
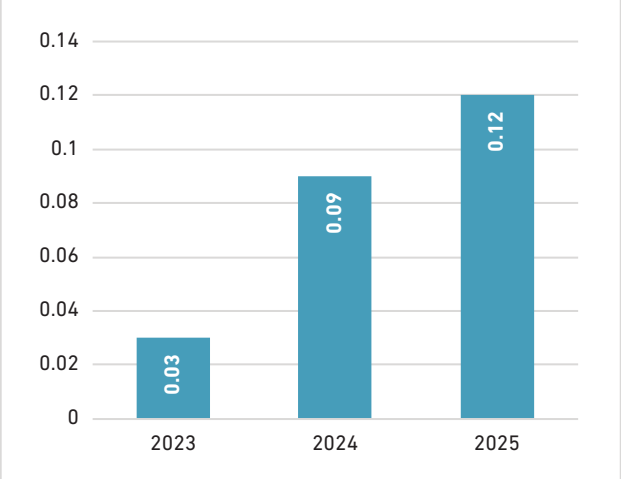


Figure 11: Possible Inflationary Pressures on the Libyan Economy, 2023–2025



Source: Assessment team.

Figure 12: Potential Reductions in Household Consumption, 2023–2025

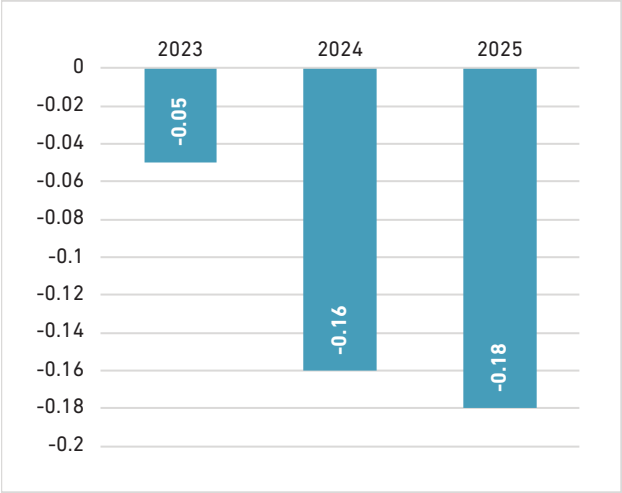
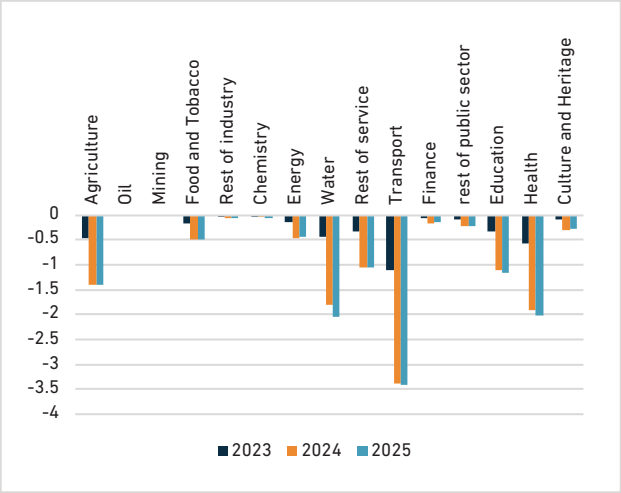


Figure 13: Sectoral Impacts of Floods, 2023–2025



Source: Assessment team.

reconstruction efforts, this loss could escalate, potentially reaching 0.22 percent and 0.21 percent of national GDP in 2024 and 2025, respectively (Figure 10). In 2023, private consumption might decrease by 0.05 percent, and the CPI could rise by 0.03 percent. These trends may continue in 2024 and 2025, with the price index increasing by 0.09 percent and 0.12 percent, respectively. Household consumption might also suffer, decreasing by 0.16 percent in 2024 and 0.18 percent in 2025.

The impact of the catastrophe rippled through diverse sectors, apart from oil and mining. In the initial aftermath, the value-added in non-oil and mining sectors may witness a marginal decrease of less than one percent. Nevertheless, without comprehensive reconstruction efforts, the consequences could escalate notably by 2024 and 2025. This projection foresees a potential 3.5 percent decline in the Transport sector and a two percent downturn in the Water and Health sectors, as illustrated in Figure 13.

Figure 14: Contribution to GDP of Damage-affected Regions

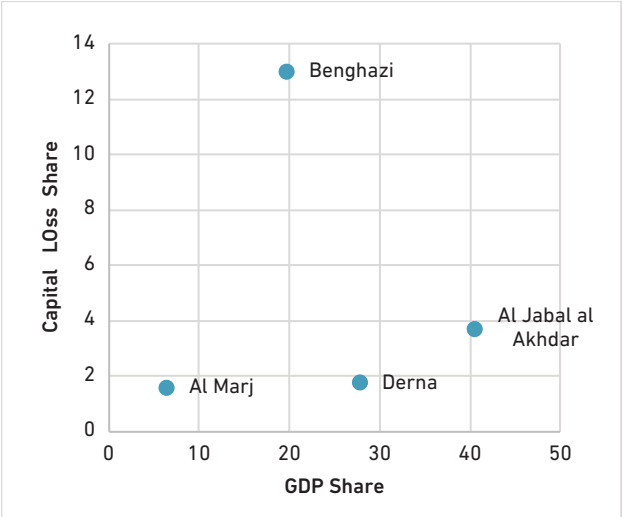
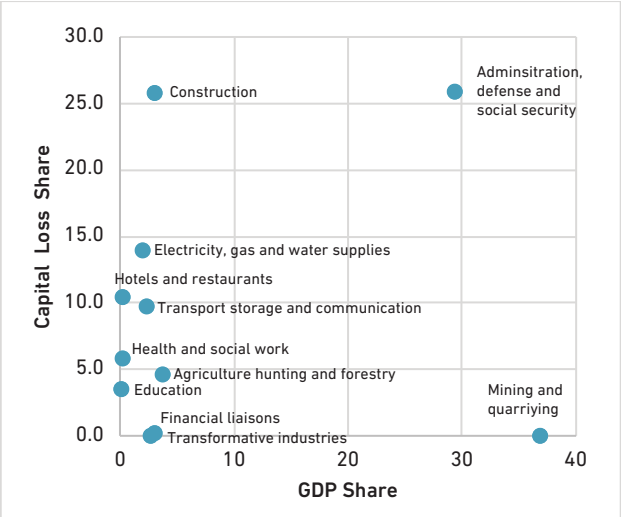


Figure 15: Sectoral GDP contributions



Source: Assessment team (estimation based on RDNA methodology and IIRS Nighttime Lights and Facebook Relative Wealth Index).

The small macroeconomic impact of the catastrophe can be attributed to the concentration of the disaster in Libya's most modest regions and the fact that affected sectors make a minimal contribution to Libya's GDP. First, the most affected areas, mainly Al Jabal al Akhdar, Derna, and Al-Marj, collectively account for 75 percent of the estimated damages and loss; their contribution to the total Libyan GDP stands at just 7 percent (Figure 7). This concentration of impact in regions with relatively lower economic activity has contained the broader economic fallout, limiting its reach across the national economy.

Nevertheless, GDP loss could be significant at the regional level, particularly in the Derna, Al Jabal Akhdar, Al Marj, and Benghazi districts. Table 1 illustrates this by distributing the GDP loss proportionally to the level of damage in each district relative to their pre-crisis GDP. Derna experiences severe economic strain, with the most substantial GDP losses: -1.1 percent in 2023, followed by -3.7 percent in 2024 and 2025. Al Jabal al Akhdar faces substantial setbacks, expecting a -0.8 percent GDP loss in 2023, worsening to -2.5 percent in 2024 and 2025. Al Marj forecasts comparatively smaller but still notable declines, projecting -0.3 percent in 2023 and -0.9 percent in 2024 and 2025. Meanwhile, Benghazi anticipates relatively minor reductions, with -0.1 percent in 2023 and -0.3 percent in 2024 and 2025. These impacts, observed at the district level; could be more pronounced at the municipal level, especially those the storm has directly hit.

Table 2: GDP Loss by District (Relative variation vis-à-vis the business-as-usual scenario)

	2023	2024	2025
Al Jabal al Akhdar	-0.8	-2.5	-2.5
Al Marj	-0.3	-0.9	-0.9
Benghazi	-0.1	-0.3	-0.3
Derna	-1.1	-3.7	-3.7

Source: Assessment team (estimation based on RDNA methodology and CGE model).

In the affected regions, many private employees and self-employed individuals have lost their jobs and incomes. This population in the affected areas, representing five percent of the total Libyan population, primarily works in the agricultural sector, which accounts for 10 percent of economic activity in Derna and 21 percent in Al Bayda.

The flooding also has the potential to increase prices for food and goods in Al Jabal Al Akhdar and Derna due to damage to infrastructure, affecting supply chains. As of November 14, market functionality and prices in flood-affected areas largely returned to pre-flood levels, except for some non-food items[20].

Local markets and economic activities have been disrupted, although banking services are back. However, there is a limit on cash withdrawals, capped at an average of 3,000 LYD (about US$ 610) per month.

At the national level, the impact on unemployment will be limited due to the substantial employment within the public sector (51 percent of the Libyan workforce) and the extensive dependency on income from public sources among the population (approximately 80 percent). However, the impact could be more pronounced at the local level, particularly in affected regions. A significant portion of individuals engaged in private employment or self-employment, accounting for approximately five percent of the population, predominantly in the agricultural sector—representing 10 percent of economic activity in Derna and 21 percent in Al Bayda—have experienced job loss and income reduction.

Before the catastrophe, the GNU achieved a fiscal surplus equivalent to 1.4 percent of GDP during the first nine months of 2023. Meanwhile, the GNU has announced the allocation of US$ 412 million (LYD 2 billion) for the Benghazi and Derna Construction Fund. At the same time, the House of Representatives (HoR) approved US$ 2.1 billion (LYB 10 billion) for regional recovery. The GNU allocated an additional month of salary to civil servants in the affected areas. If the different announced expenditures materialize, the Derna flooding will have a significant fiscal impact. It could reduce the surplus and increase capital expenditures for the response and recovery efforts.

20 OCHA, Libya Situation Report, November 14, 2023.

Social, Human, and Poverty Impact

Over the past decade, Libyan households have confronted a cascade of overlapping shocks, severely impacting their welfare. These encompass a protracted conflict, resulting in more than 135,000 IDPs and approximately 674,000 returnees[21], a severe crisis in food and commodities stemming from reduced imports, the devaluation of the currency in 2021, and, finally, the COVID-19 pandemic causing a significant slow-down and limited recovery of economic activity.[22] Although accurate data on poverty and vulnerability in Libya is limited, estimates suggest that two percent of the population (135,000 people in 2021) are multidimensionally poor, and an additional 11.4 percent are classified as vulnerable to multidimensional poverty (765 thousand people in 2021).[23] The decline in food security over recent years, driven by disruption in the food supply and price increases of staple foods due to the world-wide pandemic and the Russian invasion of Ukraine, has been significant. Prices of essential goods, including housing, food and drinks, water, gas, and transport, have contributed to high inflation since 2021, impacting households across the welfare spectrum and underscoring the proximity of economic hardship.[24]

Estimates indicate that 22 percent of the country's population, totaling 1.5 million individuals, reside in the areas affected by the floods, particularly in the districts of Derna, Benghazi, Al Marj, and Al Jabal al Akhdar. According to the UN's OCHA update on the situation in the disaster regions as of November 28, 2023, 250,000 people need humanitarian assistance, 44,800 are internally displaced, 4,352 are deceased, and over 8,000 are still missing.

Housing and agriculture damages and losses have severely impacted the livelihoods and households of Libyans. The flood caused significant housing damage, with seven percent of the total housing stock of the 20 municipalities destroyed. Derna bears the brunt of this damage, where approximately 4,000 buildings were damaged or destroyed. Additionally, agricultural livelihoods, particularly in the northern parts of affected districts, are vulnerable to income-loss due to the immediate fallout of the floods. This may trigger rising food insecurity, exacerbating existing concerns since 2014 and impeding access to vital services such as healthcare and education. Also, self-employed people in the agricultural sector—representing 10 percent of economic activity in Derna and 21 percent in Al Bayda—have experienced job loss and income reduction.

The scale of internal displacement compounds the complexity of an already precarious situation. Preceding the floods, IOM estimated that Libya hosted 125,000 IDPs. Storm Daniel has added an estimated 44,800 displaced individuals, including roughly 16,000 children.[25] This influx of newly affected populations accentuates vulnerabilities, particularly among women, children, migrants, persons with disabilities, and those grappling with chronic illnesses. The floods have disrupted economic and social domains and created challenges for school children and vulnerable women; they also trigger mental health consequences and widen post-conflict social disparities.

The storm and floods have substantially disrupted social protection services and benefits, critical to supporting affected populations, including newly displaced individuals (IDPs), already socially vulnerable groups (female heads of households, people with disabilities, unaccompanied and separated children, children who lost one or both parents, etc.), and workers in the informal economy. The lack of investment in disaster preparedness and risk reduction prior to the floods has further compounded vulnerabilities. The social protection sector faces effectiveness and efficiency challenges associated with the absence of robust delivery systems that allow the identification of populations in need, and the delivery of programs, including responses to shocks. Following the floods, nearly 26 percent of the infrastructure for social assistance, including physical facilities and offices, was either destroyed or partially damaged. Out of the twenty

21 According to the Internal Displacement Monitoring Center as of the end of 2022.

22 Irhiam, Hend R., Michael G. Schaeffer, and Kanae Watanabe, editors. 2023. The Long Road to Inclusive Institutions in Libya: A Sourcebook of Challenges and Needs. International Development in Focus series. Washington, DC: World Bank. doi:10.1596/978-1-4648-1922-3.

23 *https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/LBY.pdf*.

24 World Bank. September 2022. Libya economic monitor. *https://www.worldbank.org/en/country/libya/publication/libya-economic-monitor-september-2022*.

25 Ibid.

municipalities covered in the assessment, only five have social protection and job institutions– Derna, Soussa, Al Bayda, Al Marj, and Benghazi. These five municipalities were, in fact, the most impacted by the floods.

Reconstruction of physical assets may be prioritized in the aftermath of the floods, but ensuring comprehensive and equitable service delivery is critical for Libya and the affected communities. Pre-existing vulnerabilities from prolonged conflict and the COVID-19 pandemic threaten the ability of affected households to cope and recover from the storm's impact. Immediate needs for food and treated water must be met to prevent malnutrition and water-borne diseases. Reconstruction of damaged or destroyed buildings and other physical capital will take time, but the immediate recovery of human capital, particularly for vulnerable populations, should be monitored. Since flood impacts are concentrated in the eastern part of Libya, an incomplete recovery would exacerbate spatial disparities and may foster social tensions.

SUMMARY OF RDNA SECTOR FINDINGS

© Seraj Elhouni/Shutterstock.com

This section of the report summarizes sector-level assessments of damages, losses and needs, and sector recovery strategies. The full treatment is given in the "Detailed Sector Assessments," which provide sector-level baselines, damages, losses, recovery strategies, and needs; disaggregated for sector asset typologies, and damage and loss distribution across municipalities.

SOCIAL SECTORS

Housing

Damage: US$ 361.8 million
Loss: US$ 65.8 million
Needs: US$ 517.4 million

The damages to the Housing sector are estimated at US$ 361.8 million (LYD 1,739 million). The losses, encompassing household assets and rent losses, are estimated at **US$ 65.8 million (LYD 316.2 million)**. The total damages and losses are thus estimated at **US$ 427.6 million (LYD 2,055 million)** in disaster effects, calculated at replacement values prior to the disaster. Distribution of the total damages and losses across the 20 municipalities indicates that Benghazi and Derna share nearly 65 percent of the total damage cost. It must be noted that while the intensity and extent of flooding in Benghazi municipality was less than in other municipalities, its relatively high damage is due to its higher residential density. Overall, seven percent of the total housing stock of the 20 municipalities, or almost 19,000 units, mostly in urban areas, was damaged during the flood; and of the damaged units, 17.4 percent are considered destroyed as per the definition used in the RDNA. These damages will exacerbate the severe issue of access to housing. This problem has grown since 2011, with diminishing availability and growing demand, especially for low-income wfamilies, migrants, and internally displaced persons (IDPs).

Housing damage costs are estimated at two levels - first by housing typologies[26] and second across the 20 municipalities. Damage estimates are based on projected units for typologies, and this disaggregation has significantly improved their reliability. The assessment also separates flood damage from conflict damage. However, in the absence of a ground-based assessment, the damages derived from the flood-intensity-based estimates may need further verification during the recovery implementation phase.

The total recovery needs of the housing sector are estimated at US$ 517.4 million (LYD 2,486 million) at current prices – with a build-back-better factor. While the reconstruction investment needs of partly damaged and destroyed houses is estimated at **US$ 470.4 million (LYD 2,260 million)**, the financial cost to provide technical assistance to structure the recovery plan is estimated at **US$ 47 million**. In a sequenced approach, nearly **US$ 268.1 million (LYD 1,288 million)** is required in the short term to focus on the rapid benefits of renovation and repair, leaving reconstruction to the medium to longer term. The immediate to short term priority interventions should also include the development of housing and settlement recovery policies and institutional arrangements to coordinate stakeholders and service delivery, and to plan and manage implementation. Recovery will only be achieved through a multi-faceted strategy of access to land, materials, and financing, which enables private sector participation to deliver the mass housing required for rapid recovery. This strategy must include rental housing and protect property rights. A homeowner-based approach will enhance the housing supply in the immediate term and strengthen community ownership and partnerships in reconstruction processes to allow incremental home improvements with greater cost control. Although this approach may not apply to all housing categories, it largely addresses low-income groups who have lost their home. Hence, capacity support will be required to apply sustainable house-building strategies and standards and to mitigate the limited capacity of the national authorities and municipalities to enforce regulations and manage their likely shortcomings. In addition, risk-based urban planning is needed so that units are not sited in flood-prone areas. Disaster-resilient and energy-efficient build-back-better practices should guide reconstruction, and a layered, programmatic approach should be sensitive to the needs of men and women and fragility and conflict-related vulnerabilities.

26 In Libya, the housing stock is classified in 4 categories: traditional home, villa, apartment and informal (or other).

Education

Damage: US$ 30.1 million
Loss: US$ 28.7 million
Needs: US$ 117.7 million

The damage to the education sector is estimated at US$ 30.1 million (LDY 144.7 million). The losses are estimated at US$ 28.7 million (LYD 138.1 million). The total damages and losses are thus estimated at **US$ 58.8 million (LYD 282.7)**. For damages across the 20 municipalities, 37 education facilities were fully destroyed, and 155 facilities were partially damaged. Ninety-seven schools combining primary and secondary education were partially damaged or destroyed, followed by 45 secondary schools, 37 primary schools, and 13 colleges/universities. Economic losses relate to unexpected public expenditures, such as temporary education spaces, safety programs, psychosocial support, educational supplies, and temporary teaching staff.

Recovery and reconstruction needs in education, consisting of infrastructure and restored service delivery, are assessed at US$ 117.7 million for a period of three years. The immediate needs in education over the next 12 months amount to **US$ 35.3 million**. In the medium term (years 2 and 3), needs in education amount to **US$ 82.4 million**. The recovery strategy must account for building-back-better and address access to and quality of education in tandem, with the goal of limiting and ultimately reversing learning losses. This must encompass assessing learning losses, planning for learning recovery, establishing systems to track students' access and learning, and continuous education and support for teachers to adapt to new conditions.

Health

Damage: US$ 28.3 million
Loss: US$ 68.6 million
Needs: US$ 113.1 million

The damage to the health facilities, including those completely destroyed (0.3 percent of the total) and those partially damaged (17 percent of the total), is estimated at US$ 28.3 million (LYD 135.8 million) - 17.3 percent of the total. The estimated economic loss to the health sector is more substantial, amounting to **US$ 68.6 million (LYD 329.7 million)**. The total damages and losses are thus estimated at **US$ 96.9 million**. The flood-damaged facilities are mostly primary care facilities, hospitals, and pharmacies. One hospital was destroyed in Benghazi. The highest density of damaged and destroyed facilities is in Soussa, with 100 percent of facilities damaged. The largest category of economic loss is the funds to treat people injured in the floods, including the costs of long-term rehabilitation. Shortages of medicines, vaccines, medical equipment, medical consumables and lack of health staff affect care provision. Infectious and non-communicable diseases (NCD) need immediate attention, and mental health support has emerged as a priority.

The health recovery strategy needs to address the related effects of the conflict and the floods and requires an estimated US$ 113.1 million. The near-term priority is to restore the continuity of essential health services in functional and minimally damaged facilities while continuing to provide services through mobile units in areas without health facilities. This requires vaccines and medicines for pregnant women, children, and patients with chronic diseases, addressing the needs of women's reproductive and maternal health and access to family planning, and providing mental health and psychosocial support services. Health facilities need to be re-equipped with medical and diagnostic equipment and emergency health teams to bolster existing staff. Improved disease surveillance for early detection of outbreaks and preventative measures such as risk communication and water quality monitoring are also needed. In the medium to long term, the priority should be to rebuild facilities with energy-efficient, climate-resilient designs to strengthen medical supply chains and procurement systems, build local health human resource capacity, strengthen PHC service delivery and pandemic preparedness, and systematically engage the private health sector to help provide affordable services.

Social Protection and Jobs

Damage: US$ 0.38 million
Needs: US$ 112 million

The aggregate damage to the Social Protection and Jobs (SPJ) sector is estimated at US$ 0.38 million (LYD 1.8 million). The storm is estimated to have substantially disrupted the provision of social protection services and benefits, which are critical to support the affected populations, including the new IDPs, socially vulnerable groups (female heads of households, people with disabilities), and workers in the informal economy. With respect to the SPJ-related asset damage, around 26 percent of SPJ sector infrastructure (public administrative buildings, employment centers, residential care facilities and payment points) were destroyed or partially damaged across the five most impacted municipalities. The floods resulted in the complete loss of functionality in nine percent of SPJ institutions and a partial reduction in functionality in another nine percent. The bulk of SPJ damage was in the municipality of Derna, where two SSA buildings were destroyed, and an employment center was partially damaged, followed by Soussa, where a Social Security Administration (SSA) building was partially damaged but maintained partial functionality. Notably, data on SPJ losses, including loss of income through the loss of productive assets or the death or injury of breadwinners, remained scarce and not entirely reliable at the time of producing this RDNA and has therefore not been included in the calculations.

An estimated 6,657 households[27] were displaced, which constitute 15 percent of Libya's population, with Derna and Soussa bearing the brunt of housing damage and destruction and, as a result, the highest number of displaced populations. The premise of the SPJ sector proposed approach is to cover every household in the flood-impacted area, given that all households were affected by one form of misfortune or another, and many by multiple misfortunes. All households should be assisted to meet their specific needs based on the challenges they have experienced (livelihood and income loss, fragility, and multidimensional poverty) until they regain access to services, have permanent housing arrangements, and re-establish their livelihoods. Based on this approach, the main objectives of the SPJ recovery strategy are to address the increase in fragility as measured by displacement; income loss as broadly measured by informality; and the increase of multidimensional poverty through (i) emergency cash transfers (ECT) to displaced households to address the loss of shelter; (ii) income support to address livelihood and income loss for households who presumably lost their productive assets; and (iii) consumption support to wage earners (in the public and private sectors) to address the increase in multidimensional poverty.

Cultural Heritage

Damage: US$ 108.7 million
Loss: US$ 64.5 million
Needs: US$ 169.6 million

Storm Daniel had a devastating impact on Cultural Heritage, causing damages of US$ 108.7 million (LYD 530.7 million) and losses of US$ 64.5 million (LYD 314.7 million), with total damages and losses of US$ 173.2 million (LYD 845.4 million).

Around 10 percent of cultural properties in the 20 municipalities have been affected, with 62 cultural properties (9 percent) partially damaged and five completely destroyed (1 percent). The storm also left 11 percent of cultural properties partially or non-functioning, with 45 partially functioning (6.5 percent) and 32 not functioning (4.5 percent). The floods have affected religious sites, including mosques and churches, archaeological and historical sites, and museums across seven municipalities, including 31 of 485 mosques, 1 of 8 churches, 20 of 27 archeological sites, 8 of 20 historical sites, and 2 of 4 museums. Seventy percent of the damage was recorded in Shahhat municipality, home to ruins from the ancient city of Cyrene and a UNESCO World Heritage property.

The storm increased the vulnerability of many of these sites, exposed them to further risks, including looting and vandalism, and exposed

27 Based on estimates from UNHCR and IRC data.

archaeological remains and artifacts requiring urgent documentation and protection. Many of these sites are regularly accessed, and their damage has created disruptions beyond the physical impacts; religious sites serve as community centers, with many used post-disaster as shelters for the displaced or points to access non-food aid and emergency response supplies. Therefore, the calculation of losses considers the costs of documentation and emergency intervention to prevent further damage, mitigation of new risks and increased vulnerabilities, and loss of revenue associated with temporary closure or non-availability of sites.

The recovery investment needs for Cultural Heritage are estimated at US$ 169.63 million (LYD 827.8 million). The figure represents short- and medium-term needs, estimated based on recovery needs, including: the reconstruction of destroyed and partly damaged cultural properties, surveying and safeguarding uncovered archaeological remains and artifacts, implementing temporary measures and restoring fundamental services while repair works are completed, and technical assistance. In the short term, it is recommended that: (1) implement emergency measures such as shoring, propping, sheltering, structural reinforcements, and evacuation of damaged and recently exposed cultural properties and artifacts to prevent further damage and/or collapse; (2) carry out emergency management and conservation measures and inventories to document the extent of damage to existing and newly- uncovered cultural properties and artifacts, identify areas that are at risk of further collapse and store artifacts; (3) repair cultural properties as feasible to restore function and ensure their preservation, particularly for sites regularly accessed by local communities; and (4) provide technical assistance to local authorities and professionals for emergency response for physical and legal protection of cultural properties. In the medium term, it is recommended to continue the repair of cultural properties and undertake further management measures and inventories as excavations continue, while also providing technical assistance to: (1) re-establish and strengthen the governance arrangements and technical capacities of institutions and culture professionals involved in the protection of Cultural Heritage, including the integration of culture and cultural heritage in urban recovery plans and strategies, (2) revise and enforce legal measures to prevent future damage to Cultural Heritage, and (3) develop a disaster risk management strategy for Cultural Heritage, which supports emergency preparedness and response to protect Cultural Heritage in the event of future disasters. The immediate needs should be focused on the protection of cultural properties from further damage and/or collapse, and promoting continuity of services, particularly for sites regularly accessed by local communities. Technical assistance to public institutions is also needed to enhance physical and legal protection to safeguard Cultural Heritage.

PRODUCTIVE SECTORS

Agriculture

Damage: US$ 22.7 million
Loss: US$ 53.4 million
Needs: US$ 36.2 million

Damages and losses in the agriculture sector are estimated at US$ 22.75 million (LYD 111.04 million) and US$ 53.43 million (LYD 260.73 million), respectively, with a total of US$ 76.18 million (LYD 371.77).

This analysis includes annual crops, perennial trees, and livestock but does not consider damages to irrigation systems, infrastructures, buildings, equipment, and machinery due to the lack of available data. In total, 16,209 ha of annual crops were affected and lost their harvest, with a value of **US$ 8.53 million (LYD 41.6 million) in losses.** In addition, a total of 487,078 grape vines and fruit trees were affected, from which 5,011 trees were uprooted with a value of **US$ 1.03 million (LYD 5.01 million)** in damage and will have to be replanted. 2023's whole grape and fruit production was lost, representing a value of **US$ 2.78 million (LYD 13.57 million**) in losses. In terms of livestock, a total of 74,363 animals were reported dead, representing approximately 3.2 percent of the

affected region's herd, of which 2,112 were cattle (80 percent cows), 53,632 sheep and 18,619 goats. In addition to the value of the dead animals, whose damage was estimated at **US$ 21.73 million (LYD 106.03 million**), herders have also lost their animal products (milk, offspring, and wool) until restocking is completed and animals gain maturity, with a loss estimated at **US$ 42.12 million (LYD 205.6 million)**. The physical constitution of the remaining livestock is also affected due to the reduced quality of the pastureland or depletion of rangeland resources after the storm, leading to a potentially higher risk of epidemic outbreaks.

Recovery needs in the agriculture sector are estimated at overall US$ 36.23 million (LYD 176.79 million), of which US$ 22.33 million (LYD 108.98 million) were for short-term interventions and US$ 13.89 million (LYD 67.8 million) for medium-term interventions.

The recovery directly addresses the needs of the affected farming and livestock households and communities through the following proposed recovery interventions: i) replanting annual crops (seeds, inputs, and tractor rent), ii) assistance package for affected perennial crops (fertilizer, tractor rent), iii) restocking of lost animals, iv) vaccination campaign for the remaining animals and v) training workshops on SMART agriculture and climate change adaptation. Estimating the costs for the reconstruction or rehabilitation of the damage to infrastructures, buildings, equipment, and machinery would require a field assessment.

Financial sector

Damage: US$ 2.6 million
Loss: US$ 0.4 million
Needs: US$ 3.8 million

The total estimated damage for the financial sector amounts to US$ 2.6 million (LYD 12.3 million). Loss estimates resulting from the disrupted service amount to US$ 0.4 million (LYD 1.9 million). The total damages and losses are thus estimated at US$ 2.9 million (LYD 14.1 million). 11.3 percent of accounted for financial sector infrastructure[28] was significantly affected by the floods, with eight bank branches partially damaged and five destroyed. Derna is the most affected municipality, accounting for 77 percent of total damage in flooded areas, with five partially damaged bank branches and five destroyed, partially preventing residents from accessing their funds. The remaining three partially damaged bank branches are in Al Bayda, Benghazi, and Shahhat. Banking infrastructure, including core banking systems, remains largely intact, and the impact on business continuity is manageable in most municipalities. Losses resulted from the disrupted service in bank branches and money exchange / transfer offices. Information on other financial institutions (money transfer operators, insurance companies, and microfinance institutions) is not available.

Total needs for a rapid and resilient recovery are estimated at US$ 3.8 million (LYD 18.4 million). Recovery efforts need to focus on rapid repair and reconstruction in the short-term to restore financial services delivery and allow clients to access their funds. In the short-term it is also essential to provide emergency financing to support carefully targeted households and businesses directly impacted by the floods. In the longer term, there is a need to modernize the financial sector and reinforce its resilience, stability, transparency, and integrity, notably through strengthening supervision, improving governance, reinforcing credit infrastructure, further developing digital financial infrastructure, and initiating the greening of the financial sector, notably banking and insurance instruments to finance green transition adaptation and mitigation. Finally, diversifying financial offerings beyond the banking sector would also greatly improve financial intermediation and inclusion.

28 IPSOS data were limited, only accounting for bank and money exchange branches and not for ATMs, PoS, leasing, microfinance, insurance, and other financial sector infrastructure.

INFRASTRUCTURE SECTORS

Energy

Damage: US$ 34 million
Loss: US$ 40.8 million
Needs: US$ 97.3 million

The damage to Libya's electricity infrastructure, including power transmission facilities, is estimated at US$ 34 million in terms of capital cost of the assets. In addition, the loss of functionality of the assets in September 2023 caused power outages leading to economic losses estimated at **US$ 40.8 million**. The total damages and losses are thus estimated at **US$ 74.8 million**. The sector's analysis didn't include gas or oil-related facilities – due to the lack of available data.

The flood-damaged assets are mostly the electric transmission substations. These should be prioritized in reconstruction efforts to restore electricity services to all affected areas. The total needs for their reconstruction are estimated at **US$ 97.3 million**, including **US$ 66.4 million** in the short-term (within one year) and the remaining **US$ 30.9 million** over the following two years. In the longer term, Libyan power utilities should prioritize generation capacity by resuming delayed power plant construction, overhaul, and maintenance. Incentives for energy efficiency and renewable energy development should be created as well.

Transport

Damage: US$ 140 million
Loss: US$ 21 million
Needs: US$ 209 million

Storm Daniel devastated transport infrastructure in the affected region. The estimated damage is US$ 140 million (LYD 671 million), and the losses are estimated at US$ 21 million (LYD 101 million). The total damage and loss to the Transport sector is US$ 161 million (LYD772 million). The storm impacted twenty municipalities in the Eastern region of Libya. A total of 673 kilometers, nearly five percent of the total road network, of primary and secondary roads have been either entirely or partially damaged. Benghazi, Al Bayda, Sousa, and Derna municipalities suffered the highest damage to road transport infrastructure, accounting for more than 80 percent of the total damage. Nearly 220 km of rural roads were severely damaged in Benghazi, followed by 150 km in Al-Bayda, 88 km in Sousa and 86 km in Derna.[29] Following the storm, nearly 50 percent[30] of the road network in the impacted areas became impassable due to flash floods and mud-floods.[31] The impact of the damage to the road infrastructure extends far beyond the immediate physical damage. Losses resulted from falling debris from destroyed buildings, the accumulation of water and mud, and the destruction of vehicles, which impeded people's mobility and access to food and essential services. It also hindered the authorities' and relief agencies' ability to undertake relief and recovery efforts and to reach hospitals and support centers. Due to data limitations, economic losses related to transport disruptions were estimated as a percentage of the total damage in the sector, rather than deriving precise figures from disruption-specific data.

The estimated transport sector recovery and reconstruction costs in the 20 municipalities impacted by the storm is US$ 209 million (LYD 1,003 million). The costs cover both short-term and medium-term initiatives. The initial 12-month

29 The data used was provided by IPSOS vendor, include satellite imagery, and unit rates. The team used the High estimates data for the analysis.

30 Libya new Agency- Roads and Bridges authority reveals percentage to infrastructure in east of the country. 2023-09-23.

31 Roads and Bridges Authority reveals the damage percentage to infrastructure in the east of the country, published 09/23/2023; Libyan News Agency - Roads and Bridges Authority reveals the damage percentage to infrastructure in the east of the country. (*lana.gov.ly*).

phase will primarily concentrate on urgent recovery efforts and reinstating services. Priority will be given to emergency removal and safe disposal of debris and restoring safe access to residential and economic centers. During this phase, plans and strategies should be formulated to develop a national transportation strategy, ensuring inclusivity and multimodality and contributing to Libya's green and sustainable development. The estimated cost for short-term recovery in the transport sector is US$ 63 million. The medium and long-term phases of BBB will strengthen the institutional capacity to safeguard the transportation sector's infrastructure against climate change-related shocks. This phase will be an opportunity to implement long-term multi-year rehabilitation, maintenance programs utilizing asset management, and performance-based maintenance principles, and private sector participation. Additionally, it will establish data systems and cross-sector coordination for Early Warning Systems (EWS). The cost for the BBB phase is estimated at **US$ 146 million**.

Telecommunications and Digital Development

Damage: US$ 0.45 million
Loss: US$ 0.02 million

Assessment of damage to the ICT sector shows limited impact on the mobile communications access network. The total damage and losses in the municipalities of Wardam, Soussa, and Al Bayda were estimated at **US$ 0.47 million (2.3 million LYD), including US$ 0.45 million (LYD 2.2 million) in damage and US$ 0.02 million (LYD 0.11 million) in losses**. This figure takes account of the mobile communication towers that were completely destroyed by the floods, in addition to the partially destroyed towers that require repair/restoration. While assessment of damage to the fixed network and fiber optic transport network was not possible due to the lack of data, the overall damage to radio communication was observed in three out of the 20 municipalities affected by the floods. It affected approximately 10 percent of the radio towers in the targeted area. The damage was concentrated in the municipalities of Wardam, Soussa, and Al Bayda and, while limited, caused the complete destruction of 2.4 percent of radio communication towers and the partial destruction of 7.3 percent of the total baseline in the affected area. The effects of the damage were localized and resulted in service disruption in three municipalities. However, losses due to downtime from damaged radio towers were minimal, as was the overall impact on service delivery for mobile communication services in the areas affected by the floods.

Reconstruction and recovery needs were estimated at US$ 0.8 million (3.9 million LYD), given the increase in the value of telecommunication equipment, global inflation levels and the incidental costs of shipment and installation of replacement equipment. Given the reconstruction needs and the limited, localized damage to mobile communication infrastructure, most of the pressing reconstruction and rehabilitation works can be implemented within 12 months. The medium-term needs include the complete restoration of the partially damaged towers, and their upgrade to more shock-resilient and climate-aware standards. Short-term needs include the reconstruction of the two damaged towers in the municipalities of Wardam and Soussa and the restoration of service to the three affected municipalities.

Water and Sanitation and Water Resource Management

Damage: US$ 136.5 million
Loss: US$ 20.5 million
Needs: US$ 234.6 million

Total damages[32] and losses in the Water and Sanitation and Water Resource Management sector are assessed at US$ 157.0 million (LYD 754.2 million), including US$ 136.5 million (LYD 655.8 million) in damage and US$ 20.5 million (LYD 98.4 million) in losses. The water-related infrastructure covered under this assessment includes dams, storage systems, water treatment facilities (e.g., desalination plants), water pumping stations, wastewater treatment facilities (e.g., small wastewater treatment facilities), wastewater treatment plants and Water, Sanitation and Hygiene (WASH) administration facilities. It does not include smaller infrastructure elements, notably groundwater wells, underground facilities, water and wastewater networks, and stormwater drainage systems. As a consequence of recent storm surges and floods, there is significant damage to several large assets, including the complete destruction of three dams and one wastewater treatment plant. However, despite the magnitude of the storm, reported damage to storage systems, desalination plants[33] and pumping stations appears limited. The administrative buildings associated with water sector institutions and wastewater facilities appeared to be largely unaffected, and most key facilities are assumed to be functioning. Losses resulted from the disruption of service of the damaged infrastructures.

The sector's total recovery and reconstruction needs for the sector are estimated to be US$ 234.6 million (LYD 1,127 million). The immediate requirement of the water sector is to restore the functionality of systems to pre-disaster performance levels or to ensure at least basic minimum service provision, including restoring infrastructure for water supply and sanitation to limit/eliminate the risk of Acute Watery Diarrhea (AWD) pollutant, and provide funding for the repair and operational costs of these facilities. The General Company for Water and Wastewater (GWWC) services needs to complete infrastructure repairs to resume services and ensure water quality. The reconstruction provides an opportunity for BBB and to introduce resilient infrastructure design principles and improved resilience. Another priority is addressing future flood impact risks by establishing a consultative planning process that can build consensus on the most cost-effective, economically efficient, and resilient approach. This would include the potential for hydraulic infrastructure, such as dams in Wadi Derna or flood diversion channels, and alternative approaches to managing the river informed by urban spatial planning.

Extrapolated data was provided for the on-ground facilities, including pumping stations and ground data on desalination and wastewater treatment plants. Since this report relies on satellite images, the analysis was limited to larger, above-ground water infrastructure. This RDNA shall be complemented by additional in-depth field level investigations to determine the magnitude of the damage and the resources needed for reconstruction. The water sector section of the RDNA excludes water irrigation systems, underground infrastructure (water supply networks, sewerage networks, and stormwater drainage), and house-level water infrastructure (e.g., household connections).

Municipal Services

Damage: US$ 11.7 million
Needs: US$ 20.5 million

The total damage costs of public and municipal services provided by the 20 municipalities are estimated at US$ 11.7 million (LYD 56.4 million) at replacement value prices prior to the disaster. Due to the levels of municipal services provided by the municipalities, the absence of cost recovery practices, and the lack of data on the capital and operational

32 This cost represents the average of the low and high estimated cost of the damages and losses.
33 Wastewater treatment plants and the desalination plants were not properly functioning before the flood.

expenditures incurred by the municipalities before and after the disaster, the economic loss to the municipalities is currently considered insignificant or not measurable. The two factors that contributed to the low damage cost are – first, only a few types of services are being assessed in the municipal sector due to lack of data – including town/city hall, police stations, fire stations, entertainment, community market, and municipal building; and second, the level of damage is relatively low - only 13 percent of the baseline assets are damaged, and only 3.4 percent of these are destroyed. Police stations, municipal buildings and theatres are among the services that were destroyed. However, obtaining more data on the missing municipal services may be beneficial to guide recovery efforts and allocate resources. The damage costs incurred by the Derna, Al Bayda and Soussa municipalities are higher than those of other municipalities. Fire stations have been examined as assets within the municipal services category and treated as locally provided services, despite falling outside the purview of municipal council authority.

The total recovery investment need of the public and municipal service sector is estimated at US$ 20.5 million (LYD 98.6 million) at current prices, including the costs to restore the services and technical assistance required to design and implement the recovery strategy. About **US$ 9 million** is needed in the short term. The institutional challenges experienced by the municipalities to provide the minimum level and quality of basic services are twofold; first, the lack of laws[34] to devolve services to the Municipal Councils; and second, the lack of predictive fiscal transfers and devolution of fiscal and financial resources to municipalities, including resource mobilization and expenditure management responsibilities to the municipal councils. Furthermore, it is also important to recognize that the limited technical capacity, both at Central and Local Government levels is another institutional impediment to be addressed in the municipal service recovery strategy. Capacity building at Central and Local levels to conceptualize and implement the fiscal and functional devolution of municipal functions should be an important component of the recovery strategy.

CROSS-CUTTING SECTORS

Governance and Public institutions

Damage: US$ 1.2 million
Losses: US$ 0.35 million
Needs: US$ 23 million

Physical damage to the governance sector is US$ 1.2 million (LYD 5.7 million). The losses incurred to governance facilities in the affected areas amount to **US$ 0.35 million (LYD 1.72 million).** The Municipality-level consolidated damage and functionality data shows no public institution buildings were destroyed[35]. Of the 128 public institution buildings, 102 (80 percent) of buildings in the affected zones had no observable damage, 16 (12 percent) were partially damaged, and 10 (8 percent) were unknown. Of the 20 municipalities assessed, 16 assets are partially damaged, of which five are in Derna, three in Soussa, two each in Al Bayda and Benghazi, and one each in Al-Marj, Jardas Al Abid, Suloug, and Umm Arazam. The 16 partially damaged facilities include courthouses, post offices and provincial and national administration buildings. With regards to functionality, 101 (79 percent) are functioning, 11 (8 percent) are partially functioning, 1 (1 percent) are not functioning, and 15 (12 percent) are unknown. The losses cover removal of debris, lost equipment, vehicles, furniture; temporary rental of premises during rehabilitation; and the loss of documents and records.

Recovery and reconstruction needs for the governance sector are much larger than damages, at US$ 23 million, due to the cross-cutting nature of governing the multi-sector recovery process. In the immediate- and short term, it is critical to restore public services, as disruptions could

34 See Detailed Municipal Sector Assessment on the relevant laws.
35 Outside of the Municipal Services scope of this report.

exacerbate the deterioration of public confidence in public institutions. The recovery and reconstruction needs in the short-term are estimated at **US$ 9 million**. The main priority is restoring the 16 partially damaged public institution buildings to pre-disaster levels and to implementing public financial management reforms to BBB. In addition, the removal of small amounts of debris hindering access to public institutions will facilitate service delivery. In the medium term, the total cost of recovery and reconstruction for the 16 partially damaged buildings, and governance reforms is estimated at **US$ 14 million**. These costs include designs and implementation of governance reforms and systems for recovery across all sectors and are elaborated in the detailed governance sector assessment.

Environment

Damage: US$ 157 million
Loss: US$ 257.4 million
Needs: US$ 70.5 million

The total damages for the Environment sector are assessed at US$ 157.1 million (LYD 754.88 million) and annual losses are assessed at US$ 257.38 million (LYD 1,235.56 million). Environmental sector damage and losses assessment cover various ecosystems, including forests, woodlands, protected areas, wetlands, and coastal zones. Destruction of or damage to Libya's ecosystems does not only impact physical assets but also the often invisible yet vital services they provide. Furthermore, post-disaster environmental degradation can exacerbate pre-existing fragility and conflict challenges, especially in communities that depend on land and agriculture. The calculations presented in this report also include damages and losses resulting from soil contamination due to debris, mud, and leakage, including from landfills and damaged gas stations.

Almost 37 percent of the affected coastal zone area experienced significant damages and losses, with Derna experiencing catastrophic damages and losses, losing around 25 percent of its landmass. Coastal ecosystems not only provide important environmental services and hold a high economic value but, once destroyed, are very costly to restore. The discharge of debris, sediments, and potentially hazardous materials is expected to have significant impacts on marine ecosystems and affect important biodiversity. The extreme rainfall and associated runoff destroyed 4.6 percent of the agricultural area in the flood-affected region, causing the loss of topsoil, which is costly to restore. Almost 63 percent of wetlands, including two RAMSAR sites, were damaged or destroyed, compromising important ecological functions and habitats for globally important biodiversity. Forests and woodlands provide multiple ecosystem services and benefits, and 3.6 percent of these systems were negatively impacted by the disaster. Further, the damage has been assessed for six watershed areas impacted by chemical spills, untreated sewage water discharge, leakage from solid waste management sites, and disaster waste. The affected coastline is home to an active fisheries sector which provides livelihoods for coastal communities. 80 percent of the artisanal fishing vessels in the affected area were destroyed, causing fishermen to lose their boats and source of income. Of significant concern for the fisheries sector is the availability of permanent and seasonal landing sites—5 of the 40 landing sites were destroyed by the disaster.

Recovery and reconstruction needs for prioritized environment sector interventions are estimated at US$ 70.52 million (LYD 338.88 million) for years 1–3. Ecosystem-based adaptation and nature-based Ecosystem-based adaptation and nature-based solutions are key approaches to floods and droughts that are exacerbated by climate change in Libya. Urgent acceleration of these approaches is vital to build resilience at the community and national levels, and to prepare for future events and natural disasters. The estimate for recovery and reconstruction needs encompasses those stemming from flood damages, enhancing natural capital in the most impacted and high-risk sites, and strengthening governance for environmental oversight to maintain the sustainability of reconstruction efforts. A comprehensive environmental recovery strategy is required to BBB, design resilience to climate change-induced disasters, and curb the pace of environmental degradation and pollution. While the overall environmental recovery needs arising from the disaster are much larger and will require many years to implement, this assessment has prioritized the immediate and medium-term needs for a three-year time horizon as part of a comprehensive environmental resilience strategy, amounting to **US$ 70.52 million**. Its four main components are: (i) Ecosystem-based restoration and adaptation in vulnerable landscapes; (ii) Pollution management; (iii) Strengthening environmental governance, and (iv) Investments in the fisheries sector.

Climate and Disaster Risk Management

Libya is exposed to a multitude of natural hazards, and climate change contributes to more intense and/or frequent hydro-meteorological events. Given the complex country context, climate and disaster shocks have the potential to adversely affect critical sectors- including water, agriculture, energy, and health, and exacerbate tensions over access to scarce resources and threaten social cohesion.

The need to strengthen the country's disaster and climate risk management policies and systems amounts to US$ 27.7 million (LYD 135 million). Apart from one private hydrological station damaged by the flood, no additional reports were received regarding damages to buildings and equipment that could potentially hinder weather forecasting and flood warning capacity. Nevertheless, the floods shed light on the criticality of promoting disaster and climate risk resilience in Libya's recovery trajectory. Needs fall into three main types i) reinforcing the institutional and regulatory framework for disaster and climate risk management; ii) improving hydro-meteorological services, early warning systems (EWS), disaster preparedness and response, and iii) improving climate and disaster risk knowledge. Building systems and capacities should be central to all interventions. Specific climate and DRM reform needs are detailed in the sector chapter, but in summary include: review of existing plans and strategies for DRM management; repairing and upgrading equipment for hydro-meteorological observation, real-time monitoring and forecasting; developing and strengthening capabilities for early warning and early action; feasibility studies for grey and green-blue infrastructure for flood protection; upgrading equipment and facilities for emergency response and strengthening capacities for response and recovery; developing preparedness and emergency response plans in pilot cities; organizing community level awareness-raising campaigns on disaster risk management and climate change; developing detailed flood risk maps, risk-informed urban development plans and emergency plans in most-at-risk cities; reforming the building code, developing resilient building standards for infrastructure and incorporating climate considerations into infrastructure and land use planning. These measures could be considered while developing a comprehensive DRM and Climate Change Adaptation Strategy for Libya.

Social Sustainability and Inclusion

The floods in Libya have wrought widespread devastation, impacting nearly 250,000 people and leading to the displacement of 44,800, culminating in a complex humanitarian crisis. The plight of IDPs and affected communities requires a prioritized focus on their needs, including access to safe drinking water and essential services. The disaster has heightened risks of violence against women and men, emphasizing the importance of monitoring and addressing risks. The impact on children's safety, particularly their vulnerability to malnutrition and violence needs to be addressed as well. The additional challenges faced by persons with disabilities are a testimony to the immediate provision of assistive devices and support. It is also important to emphasize the imperative of an inclusive response strategy that specifically caters to the nuanced needs of vulnerable groups and implements robust measures to strengthen protection and support systems.

Urgent actions proposed include dismantling barriers obstructing the participation of the most vulnerable in consultations, establishing accessible complaint mechanisms for cases of Gender-based violence (women, men, and children) and human trafficking, amplifying preventive and responsive initiatives against violence against women, children, and men, fortifying protective measures for children, registering and supporting unaccompanied children, and methodically addressing the needs of persons with disabilities in response efforts. Despite data gaps, this report underscores the critical importance of adopting an inclusive lens to inform and guide recovery activities.

SUMMARY OF SECTORS RECOVERY STRATEGIES

Sectors	Recovery Strategies
Housing	• Homeowner-based recovery strategies: This strategy focuses on rehabilitating partly damaged houses and constructing new houses in a modular manner, depending on housing typology. • Layered programmatic housing recovery approach: The recovery strategy prioritizes the needs of affected families, particularly the most vulnerable ones. • Consideration of fiscal burden: The strategy considers the costs of reconstruction and designs subsidies in a way that allows for mass reconstruction programs. • Risk-informed urban planning: The strategy emphasizes the importance of preparing risk-informed urban plans or concept level instruments. • Formalization of land rights: The housing reconstruction program provides an opportunity to formalize land rights in areas where they are not yet established. • Connection to basic urban services: Before families can move back into their homes, housing units need to be connected to basic urban services such as electricity and water. • Sequencing of recovery needs: This includes improving housing accessibility, livelihoods, and dignity of affected families, improving access to basic services, and enhancing disaster risk reduction.
Education	• Prompt reopening of schools: The top priority is to reopen schools as soon as possible which requires urgent reconstruction and rehabilitation of damaged schools and education facilities. • Support for students dealing with trauma: This includes integrating psychosocial well-being within schools and implementing catch-up programs for affected students. • Coordination of reconstruction and rehabilitation efforts: This involves integrating psychosocial support, providing trainings to teachers, and implementing catch-up programs. • Support for schools with displaced students: Students from severely damaged or non-operational schools are encouraged to enroll in other schools in their areas. Support should be extended to these schools, including the provision of temporary learning spaces and additional teachers. • BBB approach: The recovery plans sector should incorporate a vision for BBB from the outset including prioritizing resilient education infrastructure, enhancing education quality, and integrating climate resilience measures. • Catch-up programs for learning setbacks: This involves recruiting and training teachers and creating educational materials. • Psychosocial support for students and teachers: Long-term planning should incorporate disaster resilience in the education sector, including disaster risk management and emergency response education and training.

Sectors	Recovery Strategies
Health	Short-term priorities: • Restoration of essential health services: The immediate focus is on restoring essential health services in functional and partially functional facilities. • Provision of medical supplies and vaccines: Ensuring a reliable supply chain of medicines, particularly for chronic non-communicable diseases (NCDs), and restoring the vaccine supply chain and cold chain equipment in facilities. • Campaigns for disease prevention and health promotion: Investing in campaigns for vector control, water quality testing, and treatment to prevent infectious and waterborne diseases. • Repair of minimally damaged health facilities and replacement of medical equipment: Repairing facilities with partial damage and replacing damaged medical equipment to restore full functionality. Identifying opportunities for energy-efficient practices and adopting green and resilient building design principles. • Interim services for locations with limited access to facilities: Identifying facilities with limited health staff and locations with limited access to facilities and providing interim services. • Mental health and psychosocial support (MHPSS) services: Establishing MHPSS services to address the immediate mental health needs of the affected population. Medium to long-term priorities: • Systematic needs assessment for reconstruction: Conducting needs assessments prior to the reconstruction of destroyed and damaged health facilities. Prioritizing investments based on beneficiary population, distance from the closest facility, and reduction in out-of-pocket expenditures. Incorporating climate resilience and energy-efficient practices in facility design. • Strengthening medicine and vaccine procurement and supply chain: Developing clear procurement guidelines and a digital supply chain system to manage medicine stockouts and ensure transparency. • Upskilling human resources: Reskilling and upskilling health workers to align with country-level needs. Addressing the uneven distribution of health workers and addressing shortages in key specialties. • Strengthening emergency care and pandemic preparedness: Building capacity in public institutions and personnel to manage emergencies and respond to climate change-related risks and infectious diseases. • Strengthening primary healthcare (PHC) facilities: Enhancing PHC facilities to provide essential services and support continued care for patients requiring rehabilitation services. Strengthening PHCs' readiness to address climate change vulnerabilities and provide basic healthcare needs. • Strengthening health information systems: Improving the availability and quality of health sector data through routine health information and surveillance systems. Introducing digital patient records and conducting periodic surveys to assess disease burden. • Engaging the private sector: Actively collaborating with the private sector to achieve universal health coverage. Exploring collaboration opportunities for specialized medical care and diagnostics, addressing gaps without high out-of-pocket expenditures for patients.

Sectors	Recovery Strategies
Cultural Heritage	Short-term recovery: • Emergency measures: Implement urgent actions such as shoring, propping, sheltering, and structural reinforcements to protect cultural properties from further damage or collapse. • Emergency management and conservation: Carry out measures to document the extent of damage, identify areas at risk of collapse, and ensure proper storage of artifacts. • Repair and restoration: Repair cultural properties to restore their function and ensure preservation, particularly for sites regularly accessed by local communities. • Service delivery: Restore fundamental services provided by cultural properties and provide technical assistance to local authorities and professionals for emergency response and governance. Medium-term recovery: • Infrastructure reconstruction: Focus on repairing cultural properties to restore function and integrate them into the urban fabric of the city. Continue with protective measures such as shoring, propping, and evacuation. • Management and conservation: Carry out further management and conservation measures and inventories as excavations continue. • Technical assistance: Re-establish and strengthen governance arrangements and technical capacities of institutions and professionals involved in cultural heritage protection. Revise and enforce legal measures to prevent future demolition of cultural heritage. Develop a disaster risk management (DRM) strategy for cultural heritage, including emergency preparedness and response.
Agriculture	• The recovery plan directly addresses the needs of affected farming and livestock households and communities, while working with the government to strengthen national systems and contribute to stability, peace, and resilience. • Replanting of annual crops will be done through a cash transfer modality, allowing farming households to select inputs such as crop species and fertilizer. • Perennial trees that have lost their fruits will also be addressed through a similar package, including land preparation. • Replacement of dead animals will be based on a cash transfer approach, allowing beneficiaries to select the preferred type of animal from local sources. • A vaccination campaign will be carried out to strengthen herds indirectly affected by floods, targeting areas with high epidemiological pressure or animals to be used for restocking. • Training on SMART agriculture will provide knowledge on climate adaptation and innovative techniques for more commercially oriented agriculture. • A field assessment is needed to estimate the costs for the reconstruction or rehabilitation of damaged infrastructures, buildings, equipment, and machinery. • The most vulnerable households, especially women and youth-headed households, will be prioritized based on time-bound activities, reducing further losses, value for money, number of beneficiaries, availability of inputs, and preparatory work. • Recovery interventions include in-kind assistance, cash transfers, and services provided by specific departments of the Ministry of Agriculture and Livestock. • Localization principle should be applied to ensure ownership and long-term sustainability of the recovery process by local partners. • Linking business with agricultural activities can create employment opportunities and improve food security, requiring the identification of climate-resilient agricultural production systems, training in new technologies, and facilitated access to credit and institutional support. • Communication campaigns are carried out through institutional networks, websites, and social networks to provide information on recovery operations and ensure transparency. Progress reports and financial updates are required from implementing actors.

Sectors	Recovery Strategies
Financial Sector	• The key short-term priority in the financial sector is to repair and rebuild damaged bank branches to restore financial services. • Constraints and impaired functioning of the financial sector will hinder reconstruction and recovery efforts if not addressed, especially in the most affected area of Derna. • Reunification of the CBL and support for all financial institutions regardless of location are crucial for stability and integrity of the financial sector. • In the immediate-to-short-term, emergency financing support should be targeted at households and businesses impacted by the floods, including rebuilding housing units and supporting viable businesses. • Technical support and engagement with the insurance sector are needed to settle claims and address solvency issues. • Medium-term recovery requires strengthening the anti-money laundering and counterterrorism financing framework, ensuring adequate bank capitalization, reopening the credit registry, and promoting digital transformation and green finance. • Diversification of financial offerings beyond banking would improve financial intermediation and inclusion.
Energy	• The priority in the short term is to repair electricity transmission substations to restore reliable electricity service in all affected areas. • In the longer term, the focus should be on closing the gap in available generation capacity by resuming delayed power plant construction and addressing overhaul and maintenance requirements. • Policy framework improvements should aim at improving financial sustainability by reducing subsidies on fossil fuel tariffs for electricity generation, promoting energy efficiency, and renewable energy development. • The recovery process should follow the BBB principle, ensuring that facilities are reconstructed to meet modern standards of safety and reliability, including the ability to withstand severe weather events.
Transport	• The recovery strategy for Libya's transport sector focuses on objectives such as infrastructure recovery, institutional capacity enhancement, climate resilience, efficiency improvement, and inclusive and multimodal transport promotion. • The strategy emphasizes resilient infrastructure, technological integration, and sustainable transport modes. • It highlights the importance of effective project management, regulatory frameworks, workforce development, and creating an enabling environment for private sector engagement through Public-Private Partnerships (PPP). • Technical studies, climate resilience assessments, feasibility studies, and capacity building are crucial for good planning and implementation in the transport sector recovery process.
Water& Sanitation and Water Resource Management	• The first year of recovery in the water and sanitation sector requires restoration and rehabilitation of infrastructure such as storage systems, water pumping stations, wastewater treatment facilities, and WASH administration buildings. • Flood risk management involves considering hazard, exposure, and vulnerability through a combination of structural and non-structural measures, including dam reconstruction, floodwalls, floodplain zoning, land-use planning, and education and awareness campaigns. • Early recovery needs include providing semi-permanent and intermediate structures for water and sanitation support, conducting dam safety assessments, and repairing damaged distribution systems. • Short to medium-term recovery and reconstruction needs involve providing water distribution networks, drainage, and sewerage systems, upgrading sector facilities, and strengthening institutional arrangements for sustainable water supply and sanitation services.
ICT	• The recovery strategy for the ICT sector needs to address vulnerabilities and improve resilience to natural shocks. • The repair and upgrade of partially damaged towers should be completed to ensure climate and disaster resilience. • Structural reforms, private sector resource mobilization, and the adoption of a national broadband plan are important for the long-term development of the telecom sector.

Sectors	Recovery Strategies
Municipal Services	• The recovery investment needs for the municipal service sector are estimated based on the cost of repairs, reconstruction, service provision, and technical support. • Sequencing of investment needs involves restoring 80% of partly damaged assets in the short term and the rest over the medium and long terms. Around 20% of destroyed assets could be reconstructed in the short term. • The recovery strategy should address institutional limitations, clarify fiscal and functional responsibilities, and ensure effective and sustainable provision of municipal services. Prototyping digital municipal services and exploring alternative communication approaches should also be considered.
Social Sustainability and Inclusion	• The Libya floods have had differentiated impacts on vulnerable groups, including migrants, women, children, and persons with disabilities. • Response and rehabilitation efforts must prioritize the needs of all, particularly the most vulnerable, and adopt an inclusive and responsive approach. • Urgent measures include reducing limitations and barriers for the most vulnerable to participate in consultations, establishing complaint mechanisms for gender-based violence cases, strengthening protection against human trafficking, scaling up preventive and response activities for violence against women and men, and strengthening protection mechanisms for children. • It is important to register and provide essential support to unaccompanied minors and account for the needs of people with disabilities in all phases of response efforts.
Governance and Public Institutions	• Unaddressed pre-flood weaknesses in public financial management (PFM) can hinder the effectiveness and transparency of the recovery and reconstruction process. • Technical assistance and capacity building interventions are proposed to ensure a transparent and accountable reconstruction process. • Urgent measures include reducing barriers for participation, establishing complaint mechanisms for gender-based violence cases, strengthening protection against human trafficking, and improving transparency in managing reconstruction funds. • Other proposed measures include improving the publication of decisions and reporting, designing accountable intergovernmental fiscal transfers, integrated strategic planning, digitalization of financial management and payments, placing all public sector funds into the treasury single account, strengthening post-audit capability, and conducting a post-disaster PFM review.
Climate and Disaster Risk Management	Aligning with the strategic priorities of the Sendai Framework for Disaster Risk Reduction, the recovery strategy outlines a comprehensive approach spanning four key areas: understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response and BBB in recovery, rehabilitation, and reconstruction. • In the short to medium-term, the recovery strategy focuses on three main objectives: (I) Reinforcing the institutional and regulatory framework for climate and disaster risk management; (ii) Enhancing government and community disaster preparedness and response capacities, and (iii) Improving climate and disaster risk knowledge.

© Seraj Elhouni/Shutterstock.com

FORWARD LOOK:

INTERNATIONAL GOOD PRACTICES, LESSONS LEARNT AND OPTIONS FOR DISASTER RECOVERY IMPLEMENTATION

The RDNA provides a solid basis for identifying and quantifying recovery needs. Post-disaster cases have shown that meeting recovery needs must go beyond simply conducting a post-disaster assessment. The effective and efficient implementation of the recovery needs and interventions identified in this report requires the design, development and operationalization of a well-coordinated, multi-sectormmulti-stakeholder, consultative, and inclusive platform for recovery planning, programming, and management. This process will require government leadership and coordination for recovery policy-making and financing, as well as localized decision-making and involvement in recovery planning and implementation. Importantly, collaboration with civil society, and grassroots organizations, and international development partners will be key. To this end, many lessons can be learned from global good practices that provide the institutional, financing, policy, prioritization, and implementation frameworks and arrangements for ensuring coherent, coordinated, sustainable, and resilient disaster recovery across all affected sectors of the economy.

Adopting a Disaster Recovery Framework (DRF) aligned with international good practices would support the recovery of the Libyan communities affected by the floods in an accountable, inclusive, efficient, effective, fast, and resilient manner. The framework described in this section is not prescriptive nor does it detail sectoral or area-based recovery plans. Instead, it puts forward options based on examples of international good practice from other disaster recovery contexts, allowing national authorities to determine the best recovery path.. Some examples of good practices on recovery need prioritization, and the institutional, implementation, and financing arrangements for recovery are summarized in this section.

Prioritizing recovery activities. A review of experience with disaster recovery suggests that, while some recovery planning initiatives did not undertake systematic prioritization exercises, others launched inter-sectoral prioritization through a rigorous methodology under which sectors are prioritized first and then key inter-sectoral interventions are prioritized based on stakeholder consultations. Some of these recovery frameworks determined the priority sectors based on a set of indicators. Then they identified sectoral interventions that help to leverage direct humanitarian and recovery impacts in the shortest time. Case studies indicate that housing, livelihoods, and infrastructure sectors often take precedence over other sectors when recovery programs are planned.

Some of the commonly used indicators for prioritizing sectors using the inter-sectoral prioritization process include: (i) potential for direct and widest humanitarian impact; (ii) pro-poor, pro-vulnerable, and gender-sensitive agendas; (iii) potential to generate sustainable livelihoods; (iv) balance between public and private sector recovery; (v) balance between physical infrastructure reconstruction and less visible recovery (such as capacity building and governance); (vi) restoration and rebuilding of critical infrastructure and services[36]. Interestingly, the application of these indicators makes more sense at the intervention level as compared to the sectoral level. They could be calibrated across interventions within each sector more efficiently as compared to prioritizing between sectors depending on two necessary conditions; granularity in recovery data and participation of local stakeholders in the prioritization processes through inclusive strategies using viable communication platforms.

Recovery management. Lessons from international experience indicate that the following roles and responsibilities should be fulfilled to ensure that recovery is well-managed:

- Assessment of damages, losses, and recovery needs (the RDNA);
- Planning, programming, and policy development (an overall recovery plan and, often, detailed sectoral recovery plans as well as supporting policies);
- Resource mobilization and financial management of recovery funds;
- Capacity building to manage the recovery process both within and outside of government;
- Coordination to avoid duplication, maximize synergies, target priority areas, groups and sectors and facilitate the flow of information;
- Communications of recovery timetables and objectives, procedures, and feedback from beneficiaries;
- Monitoring and evaluation to measure implementation progress, assess quality, track finances, and identify gaps in financing and/or spatial coverage; and,

36 GFDRR (2020), Disaster Recovery Framework Guide, Revised Guide, March 2020, p 35.

- Implementation of recovery activities, which requires capacity for financial management, procurement and contracting.

A global review of institutional arrangements for disaster recovery suggests that either of the following three basic models can be adopted depending on the country context:

- Strengthen and coordinate existing institutions or line ministries to lead reconstruction;
- Establish a new institution to manage recovery and,
- Use a hybrid approach to create a new unit within or above existing governmental agencies.

The decision to implement a centralized (national government-led), decentralized (provincial, state, or local government-led), or hybrid approach to recovery (shared authority, planning, and implementation across multiple levels of government) should be considered carefully. In all cases, a lead governmental body, whether an agency, a ministry, or a high-level group, will always need to have an overarching level of control and the responsibility for coordinating and overseeing multi-sector, multi-governmental and multiorganizational recovery processes. Clarity about who is leading and how different levels of government will coordinate their efforts must be part of any set of institutional arrangements for recovery.

Model 1: Strengthen and coordinate existing institutions. This option depends on establishing an institutional arrangement by which individual line ministries and/or decentralized authorities work independently to manage recovery, and to supervise and implement projects, in their sectors or geographic areas. The key features are:

- A high-level coordination mechanism or ministry is used to set policies, establish an action plan, assess progress, and resolve jurisdictional issues;
- Existing capacities of line ministries and/or local authorities are used for planning and implementation (they can be strengthened as needed); and
- Line ministries and/or local authorities are accountable to a central coordination body or ministry for planning, following common guidelines, using recovery funds, reporting on progress, and resolving administrative disputes.

There are two variations of this model – the establishment of a central government coordination body to lead the recovery while using existing implementation capacity, as was done in Chile after the 2010 earthquake, and the strengthening of decentralized institutions to manage recovery, usually at the state/provincial level as is done in India.

Model 2: Establish a new agency. This option creates a single lead implementing agency. Key characteristics are:

- The agency envisions, strategizes, plans, coordinates, and may even partially implement the overall multisectoral reconstruction program;
- The creation of a new institution may be desirable in situations in which existing government agencies are unlikely to be able to coordinate and implement a high number of additional projects at increased speed while sustaining their routine public services; and
- Resources for this option are often brought in from other relevant agencies through secondments, private sector consultants, short-term assignments, and financial recoupment arrangements.

There are two variants of this model: the new agency can be created with a built-in end-date, i.e., a set period to implement the recovery as was the case with Indonesia's tsunami recovery agency, or for an indefinite period as an agency that will be responsible for implementing all future disaster recovery as was the case in Serbia following the 2014 floods.

Model 3: Hybrid approach. A third option increasingly used by governments is a hybrid institutional model. The salient features of this arrangement are:

- An existing government structure is strengthened through the creation of a single unit, department or external commission dedicated to the recovery;
- The unit provides overarching central guidance and support services to keep the reconstruction program on its planned course. It is the single point of coordination of national and international stakeholders;
- It is responsible for ensuring the inclusion of line ministries, local authorities, the private sector, and civil society in all phases of the recovery. It can work with local governments and NGOs to delegate implementation responsibilities; and,
- It does not plan or implement individual recovery projects or programs.

The hybrid option ensures relatively quick delivery of reconstruction deliverables and meeting targets. There are two variants of this option: the internal

Project Implementation Unit, such as the one set up in Turkey following the 1999 earthquake, and the external international commission and reconstruction fund established in Haiti after the 2010 earthquake.

Project cycle and decision-making procedures. The project cycle management should ensure that projects are designed to meet recovery needs, projects within the same sector are well-coordinated and the project portfolio is consistent with the recovery framework. For a recovery project cycle, there is a need for transparent and rapid decision-making procedures to determine which investments will be financed and how they will be sequenced. To do so, the following questions need to be answered:

- Who can develop and propose a program for financing?
- What criteria will be used to evaluate project proposals?
- How are decisions made to proceed with a recovery project and who is involved in the decision-making process?

Coordination mechanisms. International good practice models suggest that multi-layered recovery coordination mechanisms help ensure coherent and well-coordinated recovery programming and implementation:

- Between line ministries involved in recovery;
- Between the central and local governments;
- Between the governments and other stakeholders such as the private sector and NGOs; and
- Between governments and international partners.

Ideally, existing coordination mechanisms should be used to build on existing relationships and avoid the transaction costs of establishing new arrangements. And a consensus-based DRF could serve as an overall reference point and platform for coordination of planning, implementation efforts and financing.

Monitoring and accountability. Monitoring and evaluation systems can be used to track both program implementation and funding. Experience has shown that governments tend to poorly or simply not implement monitoring and evaluation systems linked to disaster recovery. This is problematic because this means that when recovery programs are not well implemented these may continue to run their course instead of being readjusted and improved. This also means the misuse of funds linked to project implementation may go unnoticed. Likewise, funding gaps may not be identified in time.

Legal and policy requirements. A DRF usually requires some legal arrangements to facilitate the implementation of the framework. This could include legislation and/or administrative rules to enable the functioning of a recovery agency, amended roles and responsibilities of other recovery actors within government and/or revised land use planning or procurement procedures. New policies may also need to be developed to, for example, establish who is eligible to receive support for rebuilding houses or businesses and the role of local versus national authorities in planning, implementing, and assessing recovery programs.

Staffing. Staffing for planning and managing the recovery process can be challenging in disaster-affected countries. Governmental authorities may need to be able to call on additional expertise to respond to recovery needs in a wide range of sectors. They may also need to increase their staff temporarily orlong-term. If the government is unable to meet the increased professional and technical requirements for recovery over both the short and longer terms, expertise may be sought elsewhere to direct programmatic activities. Indonesia and New Zealand have pursued successful approaches to scaling up staffing for post-disaster recovery.

Communications. The objective of the DRF's communications and outreach efforts will be to primarily support the framework's operational goal, not just to communicate internally within government and international cooperation partners, but with the provinces, districts, municipalities, communities, and private sector. Lessons learned from other operational contexts demonstrate the importance of strategic communications with all key stakeholders, through various media channels (including broadcast and social media) with key messages that (i) impact information and data, (ii) increased awareness, (iii) link to feedback loops, and (iv) contribute towards outreach to assist in effectively monitoring and evaluating impact. Lessons can be learned from post-disaster communications experiences in Chile and New Zealand.

Recovery implementation. International good practice has highlighted that implementation arrangements need to be in place to ensure recovery is efficient, accountable, and swift. These include: a) a robust monitoring and evaluation (M&E) system to monitor progress in recovery implementation, identify geographic and sectoral gaps, and enable mid-course improvements; b) accountability mechanisms such as community participation and empowerment, feedback mechanisms, use of

local knowledge, and social accountability tools; c) data collection and analysis with the help of a third-party monitoring agent to feed into the M&E system; d) stakeholder engagement and transparency to give voice to stakeholders in recovery planning, management and evaluation; e) use of rapid procurement mechanisms to accelerate recovery implementation; and (f) deploying options for accelerated disbursement to expedite the recovery process.

Recovery financing. A successful recovery requires a financing strategy to close the financing gap identified by the RDNA. The strategy should be aligned with a government's financing commitments and constraints while considering the absence of meaningful official development assistance and limited prospects for crowding in private capital. A recovery financing strategy would build on the quantification of economic costs as estimated by the RDNA, assess recovery budgets, and identify sources of financing and the financing gap while also outlining recovery fund coordination and allocation options as well as mechanisms to manage and track funds.

On a concluding note, it is important to emphasize that a DRF is not a detailed action plan for multi-sectoral or area-based recovery. While it is essential to have a framework that outlines a vision, priorities, institutional options, implementation arrangements, and a financing strategy, it is equally necessary to develop detailed and coordinated sectoral and/or area-based recovery plans and programs. In this regard, Libya should develop a framework from which best practice solutions emerge, delivering catalytic and sustainable recovery investments. International partners may accompany and contribute to building the capacity of the Libyan authorities. This collaborative effort will not only aid the country in bouncing back but also in moving forward with resilience and sustained progress.

DETAILED SECTOR ASSESSMENTS

© Seraj Elhouni/Shutterstock.com

SOCIAL SECTORS

HOUSING

The housing sector in Libya experiences severe shortages both in terms of quantity and quality, particularly in the urban areas. There are institutional and technical capacity issues such as a poor rental market, investment risks due to highly controlled and varied housing regulatory systems, absence of affordable housing and urban land management policies, ambiguous property rights, titling and registry systems, and widespread informal housing markets operating outside the government permit regime[37] are some of the main issues hampering housing supply growth in the country.

Following the beginning of the conflict in 2011, all public-led housing construction programs, which were the main actors at the time, were halted, leading to an absence of a realistic affordable housing policy and a passive public housing program. In parallel, the housing market has suffered from large-scale damages since 2011 because of the conflict. It was reported in 2020 that 30 percent of the housing stock nationally was damaged, either by conflict or otherwise (e.g., from lack of maintenance), with variations across cities, such as an estimated 38 percent in Derna.[38] Access to affordable housing and basic services are also affected by the inadequate fiscal and functional devolution to municipalities under the current institutional arrangements. On the demand side, commercial institutions finance nearly 38 percent of the formal housing units in the country.[39] The absence of a decentralized and efficient housing mortgage market accentuates the housing supply and demand mismatch.

The country's housing stock is estimated at 1,596,069 units in 2023, based on the projected population of 7,166,024 people.[40] Before the oil boom, most houses were traditional. Since the oil boom, the country has experienced significant urbanization and social behavioral changes resulting in high single-family housing occupancy and changes in housing delivery mechanisms. These have replaced family-based self-housing construction with modern housing construction by government and private vendors using modern construction materials and amenities. In 2006, nearly 58 percent of the households lived in traditional houses, 20 percent in modern apartments, 11 percent in villas, and the rest mostly in precarious housing. Due to widespread income inequality and the significant influx of migrants and IDPs, a large percentage of the urban population could not afford expensive houses or rent them, experiencing significant housing accessibility issues.[41]

Housing affordability for low-income and migrant populations is constrained by a shortage of affordable housing, shrinking private sector investments in the housing market, and the absence of an affordable housing policy, resulting in the growth of informal housing and shanty towns. Nearly 60 percent of the inhabitants experience over-crowding, low building quality, and unaffordability issues, and about 97 percent are concerned about tenure risks.[42] IDPs, who in eastern Libya are mostly located in Benghazi[43], represent the largest part of the demand for rental housing, and are most affected by rising rents. They are therefore forced to occupy low-quality houses in cities, and nearly 61 percent of them live in houses damaged by conflict.[44]

The population of the 20 municipalities affected by the disaster is estimated at 1,130,414 people, constituting nearly 61.3 percent of four affected districts.[45] The housing stock in the 20 disaster-

37 Centre for Affordable Housing, Housing Finance Yearbook, Libya, 2022.

38 REACH, 2020.

39 This estimate is based on the annual growth rate of 1.13 percent over the 2020 estimates provided in the Census Metadata.

40 Flash Appeal- Flood Response, Libya, Sept 2023.

41 Gamal N Sheitbani & Tim Havard, The reasons for shortages in housing in Libya, Research Institute for Built and Human Environment, University of Salford, 2016 *https://www.irbnet.de/daten/iconda/CIB_DC26989.pdf* · PDF file.

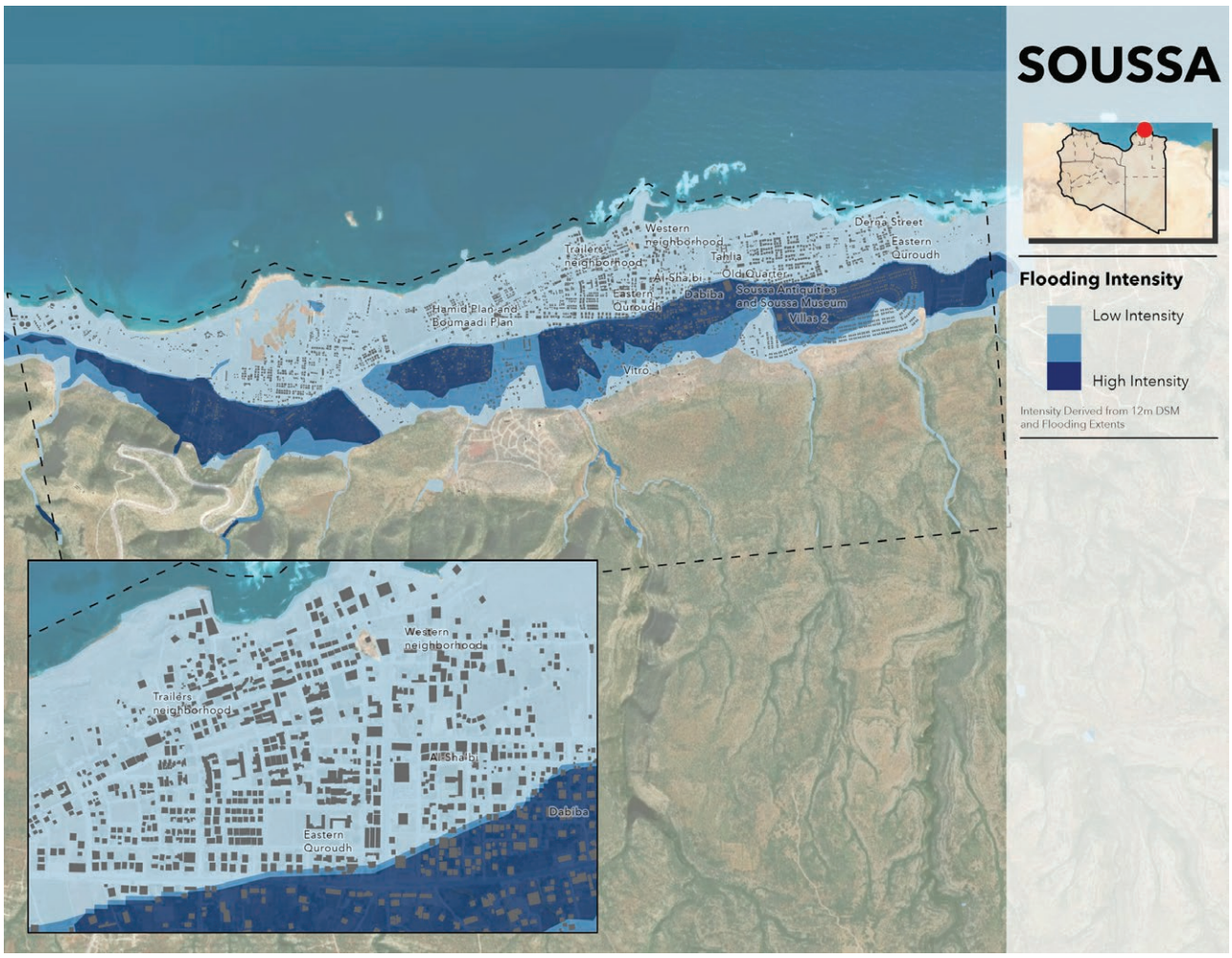
42 OCHA, Libya Humanitarian Aid Overview, 2018.

43 REACH, "Libya: Multi-Sector Needs Assessment, Geneva, 2019.

44 The damaged houses estimates are based on the full count of damaged buildings and the triangulated number of housing units based on the imagery profile of residential densities of these municipalities.

45 Projection of the municipal level population is based on the baseline estimates provided in the World Gazetteer for the year 2011 and the annual population growth rate estimated by the United Nations, Department of Economics and Social Affairs, Population Division, 2022, Projected City Population by the World Population Review, and Housing Occupancy and supply constraints by Gamal N Sheitbani & Tim Havard, (2016), etc. Classifications of damaged housing units into destroyed and partly damaged units are done based the flood intensity model analysis.

Figure 16: Flooding Intensity in the City of Soussa



Source: Assessment team.

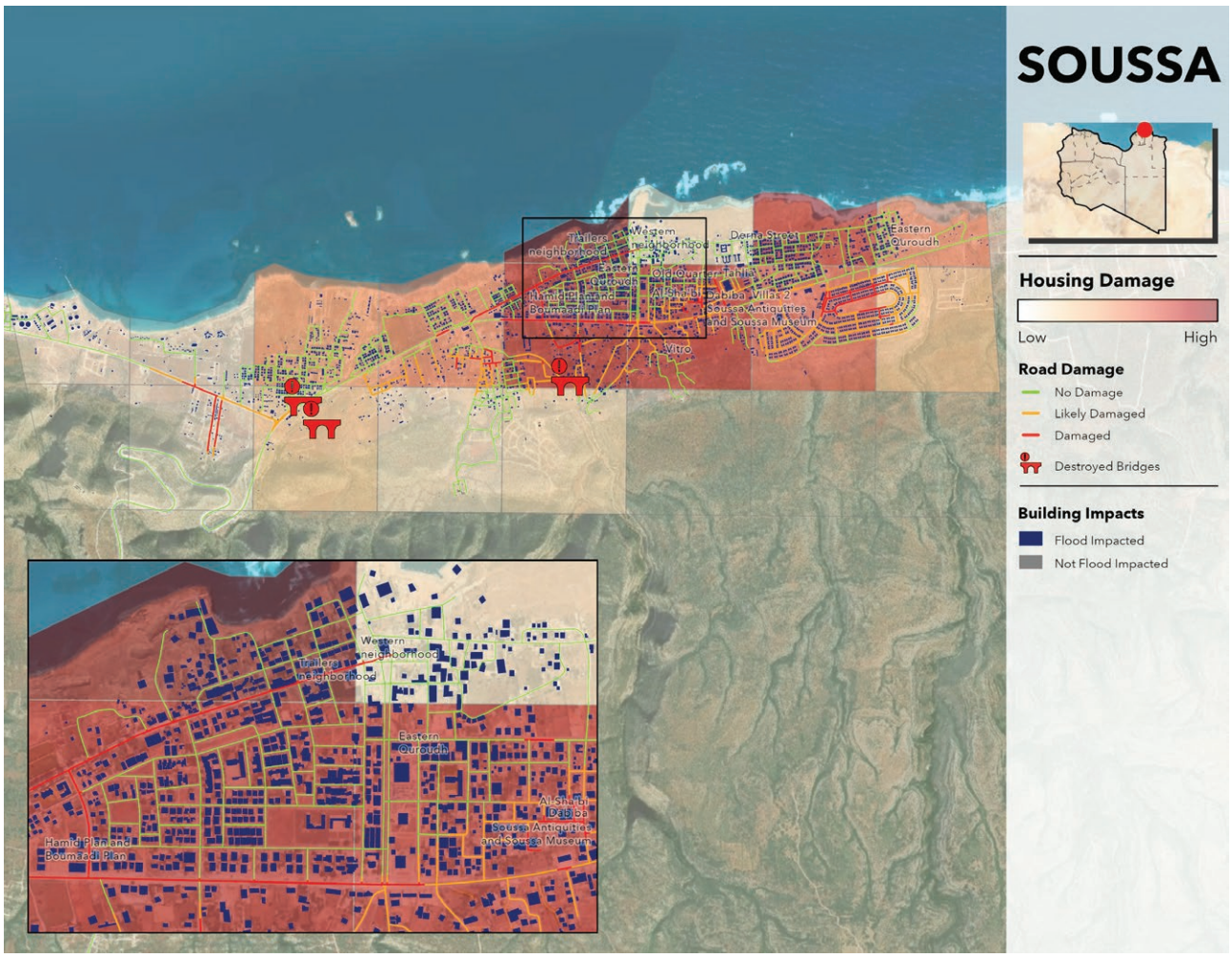
affected municipalities is estimated at 271,258 units, nearly 78 percent of the total housing stock of the four urban districts before the disaster. The spatial distribution of the housing stock is skewed. Four of the 20 affected municipalities - Benghazi, Al Marj, Derna, and Al Bayda - together share nearly 68 percent of the total stock of the 20 flood-affected municipalities, with nearly 52 percent of the total housing stock in Benghazi.

Assessment of Disaster Effects

Housing damages across the 20 municipalities are estimated based on spatial mapping of buildings using the 12M Digital Terrain and Flooding Intensity Models. Estimates are based on spatial counts supplemented by the flood intensity model outputs on flood heights and levels of inundation. The flood intensity model has classified the housing units into four categories- high intensity, moderate intensity, low intensity and not-affected. Damaged housing units falling in the high and moderate flood intensity typologies are grouped into destroyed type, and those falling in the low intensity category are grouped into partially damaged housing units.[46] Detailed damage profiles in the major five cities from these municipalities were also conducted. Overall, keeping the Flooding Intensity Model provides conservative results. It is also important to recognize that in the absence of scientific classification of the partly

46 In scientific assessments, damage is classified as **Partially Damaged** if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage is classified as **Completely Destroyed** if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset. This level of details is not available during the preparation of the RDNA but should be used in the reconstruction phase.

Figure 17: Housing Damage in the City of Soussa



Source: Assessment team.

damaged units into minor damages (less than 20 percent) and above 20 percent (requiring repairs and retrofitting), the partially damaged estimate could be considered as a higher estimate. Similarly, in the absence of field-based technical assessment, including the moderate flood intensity typology as part of the destroyed category may also lead to overestimates.

The total number of housing damage is estimated at 18,838 units, constituting nearly seven percent of the total housing stock of the 20 municipalities.[47] The shares of destroyed units and partly damaged units are estimated at 17.4 percent (3,280 units) and 82.6 percent (15,558 units), respectively, of the total damaged housing units (Table 3). While the Benghazi and Jabal Al Khadar regions together share nearly 73 percent of the total damaged housing units, nearly 70 percent of the total destroyed units are from Derna, followed by Jabal Al Khadar region with 30 percent. Due to the high flood intensity in the Derna municipality, 18.5 percent of the city's housing stock was damaged, and six percent was destroyed. Although Benghazi municipality did not experience high flood intensity, five percent of its housing stock was impacted by low intensity floods. Because of its high residential density in the flooded areas, it contributes largely (38 percent) to the total counts of damaged housing over the 20 municipalities. In addition, a review of available reports suggests that the housing conditions of people living in cities and towns suffered from the conflict and flood.

47 The damaged housing estimates are based on the full count of damaged buildings and the triangulated number of housing units based on the imagery profile of residential densities of these municipalities.

Table 3: Housing Damage by Municipality

Districts	Municipalities	Baseline Stock	Total Damaged	Destroyed	Partly Damaged	Percentage Damaged
Derna	Derna	21,976	4,067	2,287	1,780	18.51
	Al Qubah	4,236	90	1	89	2.12
	Umm Arazam	5,302	83	3	80	1.57
	Al Qayqab	1,970	47	-	47	2.39
	Ra's Al Hilal	1,098	-	-	-	-
	Al Abraq	2,943	11	-	11	0.37
	Sub Total	**37,524**	**4,298**	**2,291**	**2,007**	**11.45**
Al Marj	**Al Marj**	10,659	199	-	199	1.87
	Sahel Al Jabal	2,920	13	-	13	0.45
	Jardas Al Abid	3,818	19	-	19	0.50
	Medouar Al Zetoun	5,038	75	-	75	1.49
	Al Abyar	16,138	513	15	498	3.18
	Sub Total	**38,573**	**819**	**15**	**804**	**2.12**
Jabal Al Akhdar	Al Bayda	11,375	2,213	32	2,181	19.45
	Shahaat	4,568	67	-	67	1.47
	Soussa	3,287	3,122	937	2,185	94.99
	Umar Al Mukhtar	2,188	7	-	7	0.32
	Wardam	1,662	441	-	441	26.54
	Sub Total	**23,080**	**5,850**	**968**	**4,882**	**25.35**
Benghazi	Benghazi	139,714	7,190	1	7,189	5.15
	Qaminia	7,289	101	-	101	1.39
	Suloug	11,698	217	1	216	1.85
	Toukara	12,371	363	4	359	2.93
	Sub Total	**171,073**	**7,871**	**6**	**7,865**	**4.60**
Total		**270,250**	**18,838**	**3,280**	**15,558**	**6.97**

Source: Assessment team.

Table 4: Housing Damage Costs

Housing Typologies	Baseline Units	Damaged Units	Destroyed Cost (US$)	Partly Damaged Cost (US$)	Total Damage Cost (US$)	Total Damage Cost-(LYD)
Traditional House	126,895	8,845	41,122,818	62,337,154	103,459,972	497,176,895
Villa	47,256	3,294	33,570,995	94,326,474	127,897,469	614,611,285
Apartment	78,084	5,443	37,325,828	85,766,760	123,092,588	591,521,430
Informal House	18,016	1,256	2,580,346	4,796,957	7,377,303	35,451,629
Total	**2,70,250**	**18,838**	**114,599,987**	**247,227,344**	**361,827,331**	**1,738,761,239**

Notes: (a) Damage cost of partly damaged units is estimated at 40 percent of the unit cost of reconstruction. (b) The conversion rate of LYD to US$ is assumed as US$1=LYD 4.8055. (c) The weighted average house size and cost of construction are assumed as 175 sqm and US$ 200/sqm, differentiated across the housing typologies.
Source: Assessment team.

Housing damage costs are estimated at two levels, first by housing typologies and second across the 20 municipalities. It is important to recognize that damage costs are based on reported values of average housing size and average construction costs collected through real estate portals, due to lack of accurate numbers.[48] Due to the large variation in costs, a conservative number of US$ 200/sqm has been used, when considering a weighted share of the four housing typologies.11 Since damage costs are based on projected units for housing typologies, the estimates are based on disaggregated data and are therefore more reliable. The total damage cost is estimated at US$ 361.8 million (LYD 1,738.7 million) (Table 4). However, since the specific shares of informal housing typologies in the damage estimates are unknown, these estimates across the various housing typologies shall be considered on the upper end.

In the absence of granular data on average housing rentals and the share of the housing stock in the rental market, it is difficult to estimate economic losses accurately. Since some of these parameters are based on provisional and city-level studies, the housing sector economic loss is estimated based on reported rental market parameters.[49] In the absence of information on the public expenditure for the housing sector in terms of housing subsidies, mechanisms of provision of public and social rental housing, land and property registration systems and land tax collection, it is assumed that the public sector revenue loss could be 0.5 percent of the asset value.[50] If the post-disaster rehabilitation assistance planned by the government entails providing rental subsidies to families with destroyed houses, the total loss to the government could increase to US$ 2.6 million (LYD 12.5 million). The main housing sector economic loss is due to the loss of assets incurred by families during the flood. Since most household assets are not retrievable and reusable due to continued inundation14, the share of assets lost due to the flood is pegged at 25 percent of the asset value.[51] The economic loss is estimated at US$ 65.8 million (LYD 316.2 million) at the replacement value prices prior to the disaster (Table 5).

48 *Property Prices in Libya (numbeo.com)*. Based on the data available for Benghazi, Derna, and Al Bayda cities, the average cost of a one-bedroom apartment is in the range of US$ 350 to 580/ sqm in Derna and Benghazi or a conservative 250 US$/sqm across all cities for an average size of 200 sqm. For a traditional home, the average cost is US$ 150/sqm for an average size of 150 sqm. For a villa, the average cost is US$ 300/sqm for an average size of 250 sqm. For an informal house, the average cost is US$ 100/sqm for an average size of 100 sqm. Since there is a significant variation across cities and housing typology, the construction cost is assumed as US$ 200/ sqm and the weighted average house size is assumed as 175 sqm across the four types of houses.

49 *Property Prices in Libya (numbeo.com)*. Data on rents are not available for all cities. Average monthly rent ranges from US$ 83 for a one-bedroom apartment in the periphery of Al Bayda to US$ 417 for a 3-bedroom apartment in the city center of Benghazi. Hence a conservative rent of US$ 150 has been used to balance the share of Benghazi with smaller cities and factoring different household sizes and socioeconomic profiles.

50 Based on these assumptions the average annual revenue yield of government from the housing sector could be US$ 175 per housing unit. This number shall be reviewed during the recovery planning process.

51 Housing profile studies indicate that household asset value is positively related to the income level and value of the property.

Table 5: Housing Economic Loss

Housing Typologies	Loss of Household Assets	Rent Loss to Homeowners	Rent Expenses to Tenants	Revenue Loss to Government	Total Housing Loss (US$)	Total Housing Loss (LYD)
Traditional House	21,488,469	1,547,280	2,680,198	509,035	26,224,982	126,024,151
Villa	942,108	294,840	17,661	44,137	1,298,746	6,241,124
Apartments	17,424,866	2,106,000	1,133,108	581,870	21,245,844	102,096,903
Informal House	13,517,288	2,833,556	6,452	674,095	17,031,391	81,844,348
Total	**53,372,731**	**6,781,676**	**3,837,419**	**1,809,137**	**65,800,963**	**316,206,526**

Source: Assessment team.

Table 6: Housing Damage Costs

Districts	Municipalities	Total Damage Cost (US$)	Total Loss (US$)	Total Damage Cost + Loss (US$)	Total Damage Cost + Loss (LYD)
Derna	Derna	98,682,286	25,787,769	124,470,055	598,140,848
	Al Qubah	1,213,945	168,909	1,382,855	6,645,308
	Umm Arazam	1,147,257	167,259	1,314,516	6,316,906
	Al Qayqab	618,675	81,881	700,556	3,366,522
	Ra's Al Hilal	-	-	-	-
	Al Abraq	144,796	19,164	163,960	787,909
	Sub Total	**101,806,959.16**	**26,224,982**	**128,031,941.22**	**615,257,494**
Al Marj	Al Marj	2,087,168	290,793	2,377,961	11,427,292
	Sahel Al Jabal	136,348	18,997	155,344	746,506
	Jardas Al Abid	199,277	27,764	227,042	1,091,048
	Medouar Al Zetoun	786,621	109,595	896,216	4,306,768
	Al Abyar	5,617,968	851,597	6,469,566	31,089,498
	Sub Total	**8,827,383**	**1,298,746**	**10,126,129**	**48,661,112**
Jabal Al Akhdar	Al Bayda	36,022,325	4,805,189	40,827,514	196,196,619
	Shahaat	1,067,694	136,228	1,203,922	5,785,449
	Soussa	72,144,719	15,393,530	87,538,249	420,665,057
	Umar Al Mukhtar	111,550	14,233	125,783	604,450
	Wardam	7,027,660	896,664	7,924,325	38,080,342
	Sub Total	**116,373,949**	**21,245,844**	**137,619,793**	**661,331,917**
Benghazi	Benghazi	123,047,556	15,515,006	138,562,562	665,862,393
	Qaminia	1,728,173	217,818	1,945,991	9,351,459
	Suloug	3,732,544	475,813	4,208,357	20,223,261
	Toukara	6,310,766	822,754	7,133,520	34,280,130
	Sub Total	**134,819,040**	**17,031,391**	**151,850,430**	**729,717,243**
Total		**361,827,331**	**65,800,963**	**427,628,294**	**2,054,967,765**

Source: Assessment team.

The aggregate damage and loss are estimated at US$ 427.6 million (LYD 2.055 million) at the replacement value prices prior to the disaster. Distribution of total damage and loss across the 20 municipalities indicates that Benghazi and Derna share nearly 65 percent of damage and loss (Table 6).[52]

Linking Effects to Human Impacts

With about 1.2 percent of the housing stock destroyed in the 20 municipalities, or an estimated 3,280 units, it is estimated that 10,718 people have lost their homes and have no permanent shelter. International experience suggests that households impacted by partial housing damage will remain in their homes while those with destroyed or unfit-for-living housing will move out. Many of these households will try to rent, while those with relatives will seek temporary shelter.

Over the years, the average household size in Libya has become smaller. This has increased pressure on the housing market, which historically had a shortage of two percent.[53] The floods affected seven percent of housing stock in the municipalities affected and worsened the post-revolution and conflict-driven housing problem. In addition, unclear rental policy and limited private sector investments in the residential rental market further exacerbated housing stresses. This will limit how safe houses may absorb post-flood shocks. The housing shortage created by the floods will make houses less affordable to low-income families, migrants, and IDPs.

Housing affordability will also likely be further impacted by the broader socioeconomic impact of the disaster. The rental market may face price increases due to demand, as will the construction sector, which will also experience labor and material availability constraints. While economic losses to the Housing sector will affect flood victims in terms of their quality of life, the socioeconomic impacts would be significant among low-income and migrant families due to the reduced housing affordability coupled with likely reduced earnings due to economic disruptions. In addition, the disaster may further exacerbate the exclusion of vulnerable and marginalized communities due to the decrease in housing affordability and contribute to fissures in social cohesion at the local level. Following the flooding, it is estimated that nearly 250,000 people needed humanitarian and shelter assistance. 24.5 percent of people in need were reported from Al-Marj, nearly 29.7 percent from Al Jabal Al Khadar, and 11.2 percent and 24.3 percent were reported from Darna and Benghazi, respectively.[54]

Recovery Needs and Strategy

The housing recovery investment needs are estimated based on a few key cost parameters. Some of the key factors considered for estimating the recovery investment needs are inflation (financial contingency), physical continency, security premium[55], BBB technologies for climate resilient construction, and insurance premiums as part of the investment risk transfer mechanism.[56] The total recovery investment need of the housing sector, excluding financial support for technical assistance, is estimated at US$ 470.3 million (YLD 2,260.3 million) (Table 7), and the total investment requirements including the cost of providing technical support for designing the recovery plan is estimated at US$ 517.4 million (LYD 2,486.4 million) (Table 8). Since the cost of debris removal is included in the environment sector assessment, this cost is excluded from the housing recovery investment need estimation. It is further assumed that the cost of providing shelters to displaced families and those with destroyed houses will be covered in the humanitarian assistance program (see social protection chapter). Hence, this cost is not included in the estimated housing recovery investment needs.

To enable sustainable recovery of the housing sector and improve housing and delivery mechanisms in

52 The damage mapping exercise has tried to avoid double counting of the conflict-affected damaged houses.

53 Gamal N Sheitbani & Tim Havard, ibid.

54 OCHA, Libya Humanitarian Aid Overview, 2018.

55 Without a detailed security assessment, the cost premium for security risk is based on the assumption of contracting security teams, including surveillance equipment and networking systems, etc., during field-level assessments, recovery project design, and implementation. In the event the security premium is included in the procurements of goods and services, the premium shall be adjusted accordingly. It is also possible that international companies charge higher premiums for security risk mitigations than domestic companies.

56 The investment multiplier of 1.3 is based on the assumed premium rates for inflation and physical contingencies, BBB, security premium and insurance-based risk transfer. These premiums shall be reviewed and adjusted during the recovery programming process.

Table 7: Housing Recovery Needs

Districts	Municipalities	Total Recovery Investment Need (US$)	Short Term Recovery Need (US$)	Medium/Long-Term Recovery Need (US$)	Total Recovery Need (LYD)
Derna	**Derna**	**141,115,669**	42,334,701	98,780,968	678,131,345
	Al Qubah	1,735,942	520,783	1,215,159	8,342,068
	Umm Arazam	1,640,577	492,173	1,148,404	7,883,794
	Al Qayqab	884,705	265,412	619,294	4,251,452
	Ra's Al Hilal	-	-	-	-
	Al Abraq	207,059	62,118	144,941	995,021
	Sub Total	**145,583,952**	**43,675,185**	**101,908,766**	**699,603,679**
Al Marj	Al Marj	2,984,651	895,395	2,089,256	14,342,739
	Sahel Al Jabal	194,977	58,493	136,484	936,963
	Jardas Al Abid	284,967	85,490	199,477	1,369,407
	Medouar Al Zetoun	1,124,868	337,461	787,408	5,405,555
	Al Abyar	8,033,695	2,410,108	5,623,586	38,605,920
	Sub Total	**12,623,158**	**3,786,947**	**8,836,210**	**60,660,584**
Jabal Al Akhdar	Al Bayda	51,511,925	15,453,578	36,058,348	247,540,557
	Shahaat	1,526,803	458,041	1,068,762	7,337,052
	Soussa	103,166,948	30,950,085	72,216,864	495,768,771
	Umar Al Mukhtar	159,517	47,855	111,662	766,558
	Wardam	10,049,554	3,014,866	7,034,688	48,293,132
	Sub Total	**166,414,748**	**49,924,424**	**116,490,323**	**799,706,070**
Benghazi	Benghazi	175,958,006	52,787,402	123,170,604	845,566,195
	Gemienis	2,471,287	741,386	1,729,901	11,875,770
	Suloug	5,337,539	1,601,262	3,736,277	25,649,542
	Toukara	9,024,395	2,707,319	6,317,077	43,366,732
	Sub Total	**192,791,227**	**57,837,368**	**134,953,859**	**926,458,239**
TOTAL		**517,413,083**	**155,223,925**	**362,189,158**	**2,486,428,572**

Source: Assessment team.

the flood-hit coastal cities and peri-urban areas of Libya, it is pertinent to formulate a viable housing recovery strategy enabling inclusive and objective prioritization and sequencing of recovery needs and investments and linking it to risk-informed urban planning. Housing reconstruction should also be seen as an opportunity to build not just safer homes but also resilient communities, towns, and cities. In this regard, it should be supported by better planning and development regulations, coordinated service delivery, and stronger capacity of communities and government institutions to manage disaster and climate risks. In the longer term, considering the historical housing accessibility challenges experienced by households, the housing recovery strategy should adopt coping measures to address some of the main institutional gaps such as access to land, unavailable mass housing construction, inefficient rental market, limited affordable housing value chains, a narrow housing mortgage market, limited urban planning and development control processes, wide-spread informal property rights, weak technical capacity in government institutions and low financial capability of Municipal Governments. The quantity and quality of housing can be improved only through a multi-faceted recovery strategy that addresses not only access to land, materials, and financing but also enables robust private sector participation as a key player in the recovery strategy. Another area of opportunity will be to involve, whenever possible, community-based organizations, including community-based mortgage financing instruments, particularly among tribal communities.

The following considerations are ingredients of the housing recovery strategy that will likely contribute to its efficiency and success, learned from international experiences:

- Homeowner-based recovery strategies are critical for kickstarting the housing recovery program through effective rehabilitation of partly damaged houses and enabling modular reconstruction of new houses. Although this approach may not apply to all housing categories, it largely addresses low-income groups who have lost their homes. International experience shows that homeowner self-reconstruction, possible for individual housing, can help reduce costs and improve the economic recovery of impacted households.
- A layered programmatic housing recovery approach with inclusive prioritization of recovery needs and targeting vulnerable families shall be at the core of such a strategy.
- Considering the fiscal burden of the recovery strategy, careful attention to the costs of reconstruction and to the design of the subsidy will also be important elements to deliver mass reconstruction programs while serving all the population categories, including the most vulnerable, Libyan, and non-Libyan.

In addition, at the operational level, these considerations will be essential to the sequencing of the strategy to maximize the benefits of reconstruction efforts:

- In an urban setting, due consideration of urban planning is important to avoid replicating flood risks. Where risk-informed urban plans are not available, concept-level instruments shall be prepared in an emergency phase to identify the areas of reconstruction and those where construction should be prohibited. When partially damaged houses are located in protected areas, repairs should not be conducted, and relocation should be encouraged.
- Some houses that had been classified as partially damaged by the flood may, in fact, not be eligible for repair because of conflict-related damages and should be fully rebuilt. These houses will be identified as part of a detailed enumeration of housing damage.
- In relation to urban planning requirements, a housing reconstruction program can also be an opportunity to regularize land rights when those are not formalized. This is mostly the case in Libyan cities, either because of informal processes or because records have been lost and the land administration system has not yet been modernized.
- Lastly, the coordination of recovery with service provision will be needed to sequence construction works but also to ensure that housing units are timeously connected to basic urban services such as water and electricity before families can return to their homes.

Against the background of finite financial resources and limited technical capacities to design and implement a housing recovery program, there is an obvious need to sequence recovery needs.[57] Experiences from many countries suggest (i) improving housing accessibility; (ii) improving livelihoods and dignity of disaster-affected

57 The sequencing of investment needs is based on the assumption that nearly 70 percent of the partly damaged houses will be rehabilitated during the short term and the rest during the medium term. It is also assumed that 10 percent of the destroyed houses will be reconstructed during the short term and the rest in the medium and long term and nearly 60 percent of the technical assistance will be spent during the short term and the rest over the medium and long term.

Table 8: Sequencing Housing Recovery Investment

Recovery Interventions	Short Term (US$)	Short Term (LYD)	Medium/ Long Term - US$	Medium/ Long Term - LYD	Total Recovery Investment - US$	Total Recovery Investment - LYD
Rehabilitation of Partly Damaged Houses	224,976,883	1,081,126,413	96,418,664	463,339,891	321,395,548	1,544,466,304
Reconstruction of Destroyed Houses	14,897,998	71,592,331	134,081,984	644,330,977	148,979,983	715,923,307
Technical Supports for Recovery Planning	28,222,532	135,623,377	18,815,021	90,415,584	47,037,553	226,038,961
Total Recovery Investment Need	**268,097,413**	**1,288,342,120**	**249,315,670**	**1,198,086,452**	**517,413,083**	**2,486,428,572**

Note: Technical support for scientific damage assessments and preparation of recovery programming are expected to be financed during the short-term recovery phase.
Source: Assessment team.

families; (iii) strengthening the technical capacity of stakeholders involved in housing recovery; (iv) improving access to basic services that make housing habitable; and (v) strengthening disaster risk reduction through BBB technologies and building practices.

To effectively apply fact-based indicators, conducting a detailed enumeration of houses, along with a comprehensive technical assessment is imperative. Additionally, a meticulous identification of vulnerable households should be undertaken, especially during the initial phase when damages are still visibly apparent. While certain technical interventions and the restoration of partially affected homes can be strategically planned in the immediate and short term (within one year), the primary reconstruction initiatives should be meticulously devised and executed in the medium and long term (spanning two to three years). This planning is contingent upon the antecedent formulation of risk-informed urban planning, clarification of land tenure (particularly in relocation areas), and the establishment of BBB standards and value chains. The immediate and short-term phase necessitates approximately US$ 268.1 million (LYD 1,288.3 million). The sequencing of these efforts is an iterative process, and it should be flexibly designed and implemented, taking into account the evolving political and economic circumstances throughout the recovery implementation plan period, as outlined in Table 8.

An essential aspect of the housing recovery framework is prioritizing needs and sequence investments. While this process should conform to the overall recovery strategy for the flood-affected regions, one of the first considerations could be to sequence investments to address the rehabilitation of partly damaged houses, which will put a large part of the damaged housing stock back into the housing market. Since examining the structural vulnerabilities of the partly damaged houses due to increased piezometric levels in the inundated areas was not possible under this assessment, it is assumed that the partly damaged units will be habitable after repairs and retrofitting. Housing reconstruction in urban areas with most multi-story buildings should follow structured urban planning guidelines, disaster-resilient development regulations, energy-efficient construction practices, and proper property registry and licensing systems.

Linkages with Cross-Cutting Themes

While housing supply could be sectorized in terms of the construction of residential units by the governments and private sector, the level and pattern of housing demand are significantly influenced by cross-sectoral opportunities and challenges.

Housing affordability is not only determined by the disposable income level of households but is also affected by access to land, social and cultural values, vulnerabilities for women and men, and

conflict-related fragilities. It is suggested that vulnerability safeguards for women and men applied in internationally assisted housing programs worldwide, such as registering the reconstructed houses in the joint names of spouses, etc., should be mainstreamed.

Housing accessibility issues experienced by many migrants and IDPs due to economic vulnerabilities should be addressed through shelter and public housing strategies.[58] Rental regulations should also be reviewed to promote equal access to housing and to encourage investments in large and medium-scale rental housing.

Prevailing housing sector limitations can constrain recovery efforts and delay implementation. While housing supply could be improved through rehabilitation and reconstruction of damaged houses, and self-construction, it is equally important to promote medium-scale or mass housing to address housing shortages. Mass housing development depends on public policies to create an enabling environment for private sector investments. It should also allow foreign real estate companies and local medium-size developers to participate but also contribute to implementing effective land management systems and resolving land ownership and titling issues.

Climate-resilient house construction warrants a holistic habitat development approach to building climate-proof and energy-efficient houses. Energy-efficient housing construction is particularly important in countries such as Libya, which depends on fossil fuels, although solar power could contribute to energy-efficient housing.

While BBB technologies and practices may support resilient housing construction, it is also important to employ disaster vulnerability mapping of housing sites, assess soil and drainage patterns, and develop guidelines to safeguard future risks from constructing houses in flood-prone areas. Since most cities in Libya are coastal, coastal management plans and regulations and the preparation and implementation of disaster mitigation-based urban development plans are critical.

Limitations

Estimation baseline housing stock and extrapolating housing damage is based on tier 1 of data reliability variables, so it is important to recognize the following limitations. First, while destroyed buildings could be reasonably determined through imagery analysis, estimations of the number of apartments within damaged buildings and the number of damaged units are based on approximate levels of damages, flood intensity, livability, and housing typologies. Second, due to the large populations in major cities, most damage is in Derna, Al-Marj, Al Bayda, and Benghazi. The share of Benghazi is significantly higher than other major cities, although its level of damage is not as severe as Al-Marj, Derna, and Al Bayda. Accordingly, there is a risk of skewed spatial distribution while extrapolating the Benghazi damage units. Third, the disaster damage cost is based on the assumed average built-up area and unit costs of construction of traditional houses, villas, apartments, and informal houses. Considering the large share of traditional houses with varied physical attributes and social clustering, the damage cost estimate of traditional houses could be tentative. Fourth, in the absence of verifiable data on rental housing, it is assumed that the share of rented housing could be lower. This is due to institutional constraints in the rental market, unaffordable housing for low-income families, and unequal access to rental homes between income groups. These limitations are expected to be reviewed during the recovery planning process.

58 According to the OCHA-DTM study, nearly 890,000 people require humanitarian and shelter assistance in the country.

EDUCATION

Pre-Storm and Context Baseline

Despite free and compulsory education at the primary and lower secondary levels, Libya has experienced a consistent decline in school enrollment since 2011. UNICEF estimates that 200,000 to 300,000 children have been impacted by the ongoing crisis in Libya.[59] In 2021, 49 percent of surveyed households with school-aged children reported that at least one child per household was not enrolled, or no children were enrolled in formal school.[60]

Prior to the floods, prolonged periods of armed conflict disrupted the continuity of education and resulted in widespread damage to the infrastructure of educational institutions, leaving 245 schools either damaged or destroyed, with 74 percent of schools lacking access to safe drinking water. An estimated 159,030 children require humanitarian education support.[61]

Additionally, the Covid-19 pandemic exacerbated existing challenges. In June 2021, all schools and universities had to be suspended to limit the spread of the virus. During the following school year (2021/2022), 13 percent of assessed households reportedly had at least one child who had dropped out of school. The two most cited reasons for dropout were school closures due to the Covid-19 pandemic and households' inability to afford education expenses.

The cumulative impact of inadequate policies, chronic underfunding, extended periods of conflict, and the pandemic has also exacerbated disparities in education. Youth unemployment remains persistently high: more than one out of two individuals aged 15–24 is unemployed, partly due to the skills mismatch between the curriculum and labor market needs.[62] Even prior to 2011, the Global Competitiveness Report ranked Libya 128th for primary education and 138th for secondary education out of 139 countries.[63]

Assessment of Disaster Effects: Damage and Loss Estimates

This assessment covers 974 education facilities located across 20 municipalities. It includes primary schools (162), secondary schools (130), schools providing both primary and secondary education (497) and universities and colleges (185). Out of the 974 education facilities assessed, 15.9 percent have been partially damaged, and 3.8 percent have been destroyed.[64] In total, 97 schools combining primary and secondary education (19.5 percent) were partially damaged or destroyed, followed by 45 secondary schools (34.6 percent), 37 primary schools (22.8 percent) and 13 colleges/universities (7 percent).

The aggregate measures of damage mask a wide variation across municipalities. In Derna, which is the most affected municipality in terms of the share of schools destroyed, 48.4 percent of schools were destroyed, and 38.7 percent were partially damaged by the floods. In Soussa, all schools were affected: 16.7 percent were destroyed, and 83.3 percent were partially damaged. Other severely affected municipalities in terms of the proportion of schools being affected include Jardas Al Abid, where 33.3 percent of schools were destroyed, and 50 percent were partially damaged; Sahel Al Jabal, where 22.2 percent were destroyed and 27.8 percent were partially damaged, and Umar Al Mukhtar, where 20 percent were destroyed, and 50 percent were partially damaged. Al Bayda was also severely impacted, with five schools destroyed and 24 schools partially damaged, representing 60 percent of the schools in the municipality.

---

59 USAID Libya Ministry of Education Human and Institutional Capacity Assessment, Final Report, August 2019 https://pdf.usaid.gov/pdf_docs/PA00W5DB.pdf.

60 REACH, Multi-Sector Needs Assessment 2021 and 2022 – Education and Child Protection Key findings, March 2022.

61 UNICEF, Libya Country Office Annual Report 2021.

62 UNICEF Libya, Youth Employability Skills in Libya – Final Report, September 2023.

63 UNICEF Libya, Libya Ministry of Planning, NESB and National Bureau of Statistics and Census, 2020.

64 Damage may be classified as **Partially Damaged** if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage may be classified as **Completely Destroyed** if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

Table 9: Damage and Loss Inventory

Asset Types	Baseline	Partially Damaged	Completely destroyed	Total Cost (US$ million)	Total (LYD million)
DAMAGE					
Primary schools	162.0	28.0	9.0	5.3	25.3
Secondary schools	130.0	41.0	4.0	5.3	25.5
Schools combining primary and secondary education	497.0	76.0	21.0	16.0	77.1
College/University schools	185.0	10.0	3.0	3.5	16.8
Total Damage				**30.1**	**144.7**
LOSS					
Temporary learning spaces				5.0	24.0
Temporary teachers				2.7	12.9
Psychosocial support				16.8	80.7
Academic catch up				3.0	14.4
Teacher training (education in emergencies)				0.5	2.4
Education materials				0.8	3.6
Total Loss				**28.7**	**138.1**

Source: Assessment team.

The analysis further reveals that as of October 2023, 80.1 percent of schools are fully functioning, and 13.4 percent are partially functioning. Among the rest of the schools, 6.4 percent are not functioning, and 0.72 percent are used as shelters and emergency housing for IDPs. Students enrolled in non-operating schools were encouraged to attend other schools in their area. In Derna, no schools were functioning normally, with 67.7 percent of schools not functioning at all and 32.3 percent partially functioning. Qualitative assessments showed that students from non-operational or damaged schools were assigned to educational facilities in other parts of the city. As of October, most impacted Derna schools were still not operating.

The total infrastructure damages have been estimated at US$ 30.1 million (Table 9). Most of the damage costs are for education facilities in Derna (20 percent), followed by Al Bayda (18 percent) and Shahaat (10 percent). The damage costs for these three municipalities make up almost half of the total damage costs (*Table 10*).

Economic losses were calculated based on unexpected education expenditures and increased operational costs directly linked to the floods.[65] These included temporary learning spaces and payment of additional or reserve teachers; they also include emergency-related operating costs of education institutions such as safety, psychosocial support, catch-up programs, classroom materials and student supplies, and teacher training. Total loss is estimated at US$ 28.7 million over three years.

Linking Effects to Human Impact

The damages and losses resulting from storm Daniel may further impact the Libyan education system, which was already severely weakened due to years of conflict and the impacts of the Covid-19 pandemic. Students are at risk of missing school due to school closures, road damage, and safety concerns. In some municipalities, such as Al Marj, storm Daniel exacerbated already poor access to schools during

65 Losses from higher operational costs and unexpected expenditures due to the floods are calculated for a three-year period (until recovery).

Table 10: Damages and Losses by Municipality

#	Municipality	Total Damage (In millions)		Total Loss (In millions)		Total Damage + Loss (In millions)	
		US$	LYD	US$	LYD	US$	LYD
1	Derna	5.9	28.3	5.6	27.0	11.5	55.3
2	Al Abraq	1.7	8.3	1.7	7.9	3.4	16.2
3	Soussa	1.9	8.9	1.8	8.5	3.6	17.4
4	Al Bayda	5.3	25.4	5.0	24.2	10.3	49.6
5	Al Marj	1.5	7.3	1.4	6.9	3.0	14.2
6	Sahel Al Jabal	1.9	8.9	1.8	8.5	3.6	17.4
7	Shahaat	2.9	13.8	2.7	13.1	5.6	26.9
8	Jardas Al Abid	0.9	4.5	0.9	4.3	1.8	8.7
9	Medouar Al Zetoun		-				-
10	Al Qayqab	0.7	3.3	0.7	3.1	1.3	6.4
11	Ra's Al Hilal	-	-	0.0	0.0	-	-
12	Wardam	0.2	1.0	0.2	1.0	0.4	2.0
13	Umar Al Mukhtar	1.2	5.6	1.1	5.3	2.3	10.9
14	Toukara	-	-	-	-	-	-
15	Benghazi	2.2	10.4	2.1	9.9	4.2	20.3
16	Gemienis	0.1	0.6	0.1	0.6	0.2	1.2
17	Suloug	0.1	0.6	0.1	0.6	0.2	1.2
18	Umm Arazam	1.5	7.0	1.4	6.6	2.8	13.6
19	Al Qubah	0.9	4.2	0.8	4.0	1.7	8.2
20	Al Abyar	1.4	6.9	1.4	6.6	2.8	13.5
Total		**30.1**	**144.7**	**28.7**	**138.1**	**58.8**	**282.7**

Note: Losses by municipality were extrapolated based on the total calculated loss and the proportion of damage in the municipality relative to total damage.
Source: Assessment team.

heavy rains. Early estimates indicated that shortly after the storm, 69 percent of children in affected areas were out of school due to damage or schools being repurposed, with an additional 56 percent not attending school due to their caregivers' precarious situations.[66] The authorities initiated early recovery efforts with the support of humanitarian actors, including UNICEF, focusing on restoring essential services, resulting in the reopening of most schools by early October.

The aftermath of the storm is likely to intensify vulnerabilities among children and youth; necessitating strengthened access to learning and psychosocial assistance to help them cope with the trauma and challenges they have experienced. As of September 2023, an estimated 56 percent of children experienced psychosocial distress related to the floods.[67] Prolonged school closures may also impact mothers and other female caregivers, who must balance caregiving responsibilities with jobs and household duties.

66 UNDAC and REACH. Multi-Thematic Rapid Needs Assessment (MTRNA) Factsheet. September 2023.
67 UNDAC and REACH. Multi-Thematic Rapid Needs Assessment (MTRNA) Factsheet. September 2023.

Recovery Needs and Strategy

The estimated cost for Libya's education sector's recovery and reconstruction needs amounts to US$ 117.7 million over three years. Restoring service delivery constitutes approximately 33 percent of the total requirements, encompassing expenses for temporary learning spaces, salaries, and training for teachers and non-teaching staff, academic catch-up programs, psychosocial support for children, and teaching and learning materials and an EdTEch learning platform, over the three-year period (refer to Table 11).

The most important priority for the education system is to ensure access to quality learning for all students. As such, reconstruction and rehabilitation of damaged schools and educational facilities and additions of extra classrooms to existing schools will be most urgently needed. Supporting students to cope with the trauma caused by the flood and preexisting crises will also be crucial. In the short term, the focus should be on (i) coordinating reconstruction and rehabilitation efforts; (ii) integrating psychosocial wellbeing within schools, including training of teachers and referrals of the severe cases; and (iii) supporting teachers with teaching and learning material. These challenges are significant, especially considering the preexisting need for school reconstruction, rehabilitation, learning support, and psychological assistance before the storm.

Qualitative accounts indicate that children attending severely damaged or non-operational schools are being encouraged to enroll in other schools in their respective areas. Support should be given to these schools in the short run, including the layout of temporary learning spaces, prefabricated classrooms, desks, teacher desks and chairs, whiteboards, learning resources for teachers, as well as the allocation of additional teachers in the school to support those additional students. In conclusion, Storm Daniel presents opportunities for Building Back Better (BBB), aiming to enhance access to education and improve its overall quality.

- Recovery plans for the education sector should incorporate a clear vision for Building Back Better (BBB) right from the outset, aiming to prevent further challenges such as out-of-school pressures, learning loss, and trauma. Accordingly, the education recovery strategy must prioritize the establishment of resilient education infrastructure and enhancements in education quality. Quality education should be prioritized throughout all recovery phases, including assessing learning losses, planning for learning recovery, establishing systems to track students' access and learning, and providing continuous education and support for teachers to adapt to new conditions. In the short term, securing safe and quality temporary learning spaces is crucial, and should be pursued in parallel to reconstructing school infrastructure. It is also imperative to ensure that roads leading to schools are both usable and safe.

- By integrating climate resilience measures into the design and construction of schools — such as the utilization of climate-resistant materials, the implementation of early warning systems, and the development of evacuation plans — the education sector can actively work towards guaranteeing the safety of students and staff during disasters.

- In the medium run, the recovery plan is an opportunity to provide teachers with refresher courses and methodology training and possibly foster new EdTech and digital learning solutions.

- Offering psychosocial support to students and teachers will further contribute to children's readiness to learn. Incorporating disaster resilience in education sector planning and implementation in the long term will strengthen disaster preparedness and response at all levels. This will be achieved through disaster risk management and emergency response education and training.

Finally, verifying damage and economic loss estimates on the ground is crucial to better inform and guide the recovery strategy.

Linkages with Cross-Cutting Themes

As noted above, protracted school closures have ripple effects on mothers and caregivers who must navigate the dual demands of caregiving responsibilities alongside employment and domestic duties.

Recognizing the pivotal role of the education sector is a unique opportunity to instill awareness among students regarding the significance of climate action. By integrating discussions on climate change into the curriculum and drawing connections to recent floods, the education system can foster a

Table 11: Costing of Reconstruction for Schools

Needs Type	Total Cost (US$ million) - including costs for BBB, etc.)	Total Cost (LYD million) - including costs for BBB, etc.)
School construction (primary, secondary and university) and rehabilitation	78.4	376.9
Service delivery including training and supporting teachers, catch up programs, learning and teaching materials, safety for students and teachers, psychological support, potentially school feeding and school transport services.	39.2	188.5
Total Needs	**117.7**	**565.4**

Source: Assessment team.

Table 12: Prioritized and Sequenced Interventions for Reconstruction

Intervention/Activity	Short-term early recovery* (1–12 months)		Medium-term* (1–3 years)		Total Cost in US$ million	Total Cost in LYD million
	US$	LYD	US$	LYD		
School infrastructure reconstruction	23.5	113.1	54.9	263.9	78.4	376.9
Service Delivery Restoration	11.8	56.5	27.5	131.9	39.2	188.5
Total Needs	**35.3**	**169.6**	**82.4**	**395.8**	**117.7**	**565.4**

Source: Assessment team.

deeper understanding of and resilience to climate-related risks. This approach not only empowers students to become catalysts for change in Building Back Better (BBB) initiatives but also contributes to a more comprehensive and sustainable educational experience.

Limitations

The present assessment is constrained by several data limitations, encompassing:

- **Limited Data Availability:** A shortage of comprehensive data impedes a thorough analysis of recovery needs for colleges and universities. Additionally, it hampers the accurate calculation of the number of beneficiaries among school-age children, both within and outside the educational system.
- **Insufficient Data on Unit Costs**: In particular, there is insufficient data on the unit costs associated with various interventions, notably those pertaining to education and emergency services within schools. This encompasses critical areas such as psychological support services, safety programs, and the provision of educational materials.
- **Lack of Clear Data on Infrastructure Needs:** The absence of precise data on the infrastructure and material requirements for partially damaged schools further constrains the assessment, hindering a comprehensive understanding of the recovery needs in these specific cases.

HEALTH

Over a decade of instability in Libya has impacted its health infrastructure and services even prior to the storm and floods. Among the 97 public hospitals and 1,355 public primary health care (PHC) facilities in the country, 18 percent of hospitals and 20 percent of PHC facilities in 2017 were closed either due to maintenance, inaccessibility due to conflict, damage, or occupation by other parties.[68] Service availability in these facilities, assessed against a composite score of indicators from three domains - health infrastructure, health workforce, and service utilization – was however high at 81 percent. On the other hand, service readiness included a composite score of five domains - basic amenities, standard precautions for infection prevention, basic equipment, basic medicines, and diagnostics – which was less than adequate. While the service readiness of hospitals was 69 percent, it was much lower, at 45 percent in PHC facilities. In hospitals, low service readiness was primarily driven by a lack of basic medicines and diagnostic tests. In PHCs, on the other hand, the low availability of basic medicines, diagnostics, basic amenities, and standard precautions for infection prevention impacted service availability.

This sub-optimal status of health facilities in Libya was confirmed by a more recent pre-disaster assessment by WHO in 2023 that covered three of the main flood-affected districts - Al Jabal Al Akhdar, Al Marj, and Derna.[69] Of the 24 assessed hospitals in these districts, only 13 hospitals (54 percent) were fully functional, while 11 hospitals (46 percent) were partially functional. The main reported causes of partial or non-functionality were the lack of medical supplies (drugs and consumables), lack of medical equipment, and shortage of finances. At the same time, out of the 148 assessed PHC facilities in these districts, 120 (81 percent) were either fully or partially functional, while 28 PHCs (19 percent) were non-functional.

Poor services in the public health sector have contributed to a growing private health sector in Libya and increasing out-of-pocket expenditures for health. There are currently far more in-patient hospitals, pharmacies, and diagnostic imaging centers in Libya's private sector than in its public sector.[70] Public healthcare spending has declined over the past decade with concerns about efficiencies in expenditure. In 2019, nearly a third of the population incurred catastrophic health expenditures, defined as health spending that constituted more than 40 percent of a household's non-food expenditures.[71] This is a significant increase in comparison to 2006 when out-of-pocket expenditures were 23 percent of total expenditures on health.[72]

Data to assess the impact of declining public health services on health outcomes is limited. There has been no nationally representative household survey measuring health outcomes and service coverage in Libya, such as the DHS or MICS, over the past decade. Current estimates are, therefore, largely based on estimations suggesting either a decline or stagnation of key health outcomes.[73] The only recent survey was the SMART survey[74] that focused on maternal and child nutrition and services, which remains unpublished. Data indicated a prevalence of widespread and severe acute malnutrition in Libya of 3.5 percent and 1.1 percent, respectively, while the prevalence of stunting was 8.2 percent. While nutrition outcomes were found to be poorest in the southern region, key child health services, such as measles vaccination rates were the lowest in the East Region at 80.9 percent. The prevalence of diarrhea (in the past two weeks) was also highest in the Benghazi region at 38.3 percent.

---

68 Service Availability and Readiness Assessment (SARA) of Public Health Facilities in Libya, 2017. Ministry of Health, Libya, WHO and EU.

69 WHO Libya Country Office: Situation Update 2: East Coast Daniel Storm 12 September 2023.

70 Mapping of Private Health Facilities of Libya, 2019. Ministry of Health, WHO and EU.

71 Duran, D., and M. Hamza. 2022. Background paper: Determinants of Healthcare Access and Spending in Libya: A Post-Conflict Analysis. Washington, DC: The World Bank.

72 WHO EMRO 2007.

73 Irhiam, Hend R., Michael G. Schaeffer, and Kanae Watanabe, editors. 2023. The Long Road to Inclusive Institutions in Libya: A Sourcebook of Challenges and Needs. International Development in Focus series. Washington, DC: World Bank. doi:10.1596/978-1-4648-1922-3.

74 Libya National Nutrition Smart Survey Report, 2022, UNICEF, WFP, Action Against Hunger, Primary Health Care Institute, Libya, and Bureau of Statistics and Census, Libya (unpublished).

Assessment of Disaster Effects[75]

The RDNA estimated damage flood damage to 11 types of public and private health facilities, shown in Table 1. The four affected districts have an estimated 902 facilities, of which three (0.3 percent) facilities (one general hospital, one PHC and one pharmacy) have been completely destroyed, and 153 (17 percent) partially damaged. In total, this damage is estimated at US$ 28.3 million. The destroyed hospital is the Al Jumhuria Hospital in Benghazi; the other two destroyed facilities are in Derna. From among the 153 partially damaged facilities, 37 are hospitals (16 percent of total hospitals), 76 are primary care facilities (PHC units, centers and polyclinics, private outpatient clinics – 17 percent of total PHCs), 37 pharmacies (17 percent of total pharmacies) and three laboratories (38 percent of total laboratories) (Table 13). The highest density of damaged and destroyed facilities is in Soussa, with 100 percent of facilities damaged (11 facilities), followed by Medouar Al Zetoun (50 percent), Al Bayda (46 percent), Derna (38 percent), Gemienis (35 percent), and Wardam (33 percent). Of the 20 municipalities included in the RDNA, 16 had damaged health facilities (Table 14).

The RDNA also estimated several categories of losses (Table 14). The economic losses in the health sector were more substantial, amounting to a total of US$ 68.6 million. The largest category of economic losses was additional expenditures required for the treatment of people injured in the floods, including the costs of long-term rehabilitation. Injury-related costs are estimated at US$ 36.7 million (54 percent of all losses). Costs of the response, as well as extra expenditures for patients referred to other facilities and lower revenues for health facilities that lost patients, made up the remaining US$ 31.9 million of losses.

The primary impediments to health service delivery include the lack of medicines, medical supplies, medical equipment, and vaccines. The extent of these impediments, particularly with respect to damaged medical equipment and staff requirements varies across municipalities, depending on the extent of damage caused by the floods and the status of facilities prior to the floods. For example, an in-depth facility assessment by WHO in Al Jabal Al Akhdar district[76] found that 74 percent of assessed facilities had partially damaged medical equipment and only three percent of facilities had the required equipment intact, while 23 percent of facilities did not have equipment pre-floods. At the same time, in Almarj District, 83 percent of assessed facilities had intact medical equipment, with eight percent being partially or fully damaged equipment and nine percent of facilities with no equipment pre-floods.[77]

There is also a lack of medical and health staff to respond to existing needs; however, accessibility to health facilities is less of an issue. About 104 health workers are known to have died in the floods.[78] There is a large need for emergency medical teams across all districts. The need for general practitioners, gynecologists, pediatricians, general surgeons, and orthopedic surgeons has been expressed across districts. Even prior to the floods, a shortage of specialized medical staff was noted for some of the affected areas.[79] However, most facilities remain accessible, with roads getting back to normal after the flooding. In the limited areas where accessibility remains an issue due to poor facilities and roads, people have to travel longer distances to reach health facilities or are serviced by mobile clinics.

Infectious diseases and chronic NCDs are both major health challenges. As of November 23, 2023, 4,352 deaths were reported (including 104 health workers), 9,969 cases of acute diarrhea, 8,160 respiratory infections and 38 Hepatitis A infections were reported.[80] Reports from NGOs supporting the health response indicate that in addition to diarrhea, chronic conditions, including diabetes, hypertension, upper respiratory and lower respiratory tract infections are the most common morbidities for which people seek services.[81] However, due to the

75 Damage may be classified as Partially Damaged if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage may be classified as Completely Destroyed if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

76 Public Health Facilities Update: Libya Flood Response, Al Jabar Al Akhdar District: WHO, September 25, 2023.

77 Public Health Facilities Update: Libya Flood Response, Almarj District and Tukra municipality/ Benghazi District: WHO, September 30, 2023.

78 WHO Situation Report: Libya Flood Response, October 11, 2023.

79 REACH, Settlement-Based Assessment, Libya, Derna municipality, March 2023; and IPSOS - Libya Rapid Damage and Needs Assessment: Derna.

80 WHO Situation Report: Libya Flood Response, October 11, 2023.

81 International Medical Corps: Libya Flooding Situation Report #6, October 16, 2023.

Table 13: Damage and Loss Inventory

Asset Types	Baseline	Partially Damaged	Completely destroyed	Total Cost (US$ million)	Total (LYD million)
DAMAGE					
Private Hospital	11	5	0	2.1	10.0
Private Primary Health Care (Outpatient) Clinics and Dental Clinics	213	43	0	2.0	9.5
General Hospital	194	29	1	13.1	63.0
Rural Hospital	11	2	0	0.8	4.0
Tertiary Hospital	10	1	0	0.4	2.0
Primary Health Care Unit	56	4	0	0.2	0.9
Primary Health Care Centre	94	10	1	0.6	2.7
National Centers for Disease Control Clinic	0	0	0	0.0	0.0
Polyclinic	77	19	0	6.3	30.4
Hospital (Unknown)	0	0	0	0.0	0.0
Pharmacy/Dispensary	223	37	1	2.6	12.6
Laboratory (Private)	8	3	0	0.1	0.7
Health Administration Building	5	0	0	0.0	0.0
Total Damage				**28.3**	**135.8**
LOSS					
Cost of demolition and rubble removal				0.3	1.4
Higher expenditures for treatment of injured, including long-term rehabilitation				36.7	176.4
Higher expenditures on patients referred to other facilities				1.1	5.1
Lower revenues due to smaller patient numbers, including patients lost to mobile teams and clinics				2.1	10.2
Cost of interim service delivery through mobile clinics				9.0	43.5
Cost of reducing environmental risks through water quality testing and vector control				1.3	6.0
Cost of intensified prevention and health promotion				1.3	6.0
Cost of temporary reassignment of health workers (supplementary expenses for transport, housing, hardship)				2.5	12.1
Cost of supplementary trauma-related mental health and psychosocial support services				11.0	52.6
Higher expenditures for surveillance of water-borne and displacement-related illnesses				3.4	16.2
Total Loss				**68.6**	**329.7**

Source: Assessment team.

Table 14: Damages and Losses by Municipality

#	Municipality	Total Damage		Total Loss		Total Damage+ Loss	
		US$	LYD	US$	LYD	US$	LYD
1	Derna	2,095,515	10,069,998	5,085,043	24,436,172	7,180,558	34,506,170
2	Al Abraq	0	0	0	0	0	0
3	Soussa	3,096,451	14,879,996	7,513,945	36,108,263	10,610,396	50,988,259
4	Al Bayda	5,531,160	26,579,991	13,422,086	64,499,836	18,953,247	91,079,827
5	Al Marj	45,781	220,000	111,093	533,858	156,874	753,858
6	Sahel Al Jabal	45,781	220,000	111,093	533,858	156,874	753,858
7	Shahaat	91,562	439,999	222,186	1,067,716	313,748	1,507,715
8	Jardas Al Abid	0	0	0	0	0	0
9	Medouar Al Zetoun	45,781	220,000	111,093	533,858	156,874	753,858
10	Al Qayqab	0	0	0	0	0	0
11	Ra's Al Hilal	0	0	0	0	0	0
12	Wardam	45,781	220,000	111,093	533,858	156,874	753,858
13	Umar Al Mukhtar	45,781	220,000	111,093	533,858	156,874	753,858
14	Toukara	91,562	439,999	222,186	1,067,716	313,748	1,507,715
15	Benghazi	15,553,009	74,739,986	37,741,417	181,366,380	53,294,426	256,106,366
16	Gemienis	674,227	3,239,999	1,636,101	7,862,282	2,310,328	11,102,281
17	Suloug	112,371	540,000	272,683	1,310,380	385,055	1,850,380
18	Umm Arazam	461,970	2,219,999	1,121,032	5,387,118	1,583,002	7,607,117
19	Al Qubah	133,181	640,000	323,181	1,553,045	456,361	2,193,045
20	Al Abyar	199,771	960,001	484,771	2,329,567	684,542	3,289,568
		135,849,966	**68,600,097**	**329,657,765**	**96,869,781**	**465,507,731**	**28,269,684**

Source: Assessment team.

severe shortage of vaccines in the affected areas, approximately 9000 children under one year of age may be at risk of missing routine vaccinations.[82] No cholera or vector-borne disease outbreaks have occurred.

The impact on mental health is believed to be significant. Mental health support was reported[83] by people as an urgent healthcare need (59 percent), second only to first aid and emergency care (61 percent). Other needs included treatment for chronic disease (58 percent) and routine vaccinations (52 percent), as noted in the paragraph above. While mental health, and psychosocial support services (MHPSS) are being scaled up with support from INGOs and UN agencies such as UNICEF, these will need to be sustained beyond the emergency response phase with a 5–15 percent estimated increase in caseloads expected. Experience from a mental health helpline established by an INGO indicates that approximately 70 percent of callers use and receive MHPSS services, while 30 percent of callers inquire about these services. Approximately 69 percent of the callers

82 WHO Situation Report: Libya Flood Response, October 11, 2023.

83 Northeastern Libya Floods 2023 - Multi-Thematic Rapid Needs Assessment (MTRNA).

are female and about 44 percent come from directly affected areas.[84]

Linking Effects to Human Impact

In addition to the tremendous loss of lives, the floods disrupted health services and increased the risk of morbidity and mental distress, with women and children being particularly vulnerable. While increased morbidity impacts education outcomes and productivity; for children in the early years, if unaddressed, it may have lasting implications for growth, cognitive development, and long-term health. Women's reproductive and maternal health needs are especially compromised by damaged facilities, infrastructure, and lower economic resources. These create potential impacts on unwanted pregnancies, prenatal care, access to skilled labor assistance, and maternal mortality. In addition, in the absence of psychosocial support, mental distress from the floods may result in mental disorders. Mental disorders are associated with poor education, low productivity, poverty, premature and excess mortality, and poor overall health[85], and exact a heavy toll on sufferers and society. Early and long-term support is needed to overcome long-term impacts.

Recovery Needs and Strategy

Recovery efforts at recovery will require replacing, repairing, and rebuilding damaged assets and restoring service delivery, as well as investments to strengthen the health system through BBB. This will include investments for immediate to short-term requirements for restoration and continuity of health services in the affected area, addressing disaster-specific and general morbidity, and mitigating increased public health risks. It will also require investments to address pre-disaster constraints in service delivery and access, and promote sustained, equitable, quality services and country-wide health coverage.

The sort-term priority to restoring essential health services in functional and partially functional facilities and offering services through mobile units. In addition, more MHPSS services are needed (Table 15, Table 16 and Table 17). More specifically, this should include:

i. *Provision of medical supplies and vaccines*: A reliable supply chain of medicines, particularly for chronic NCDs such as hypertension and diabetes, is critical. This is because nearly 80 percent of deaths in Libya are attributable to NCDs. Equally important is vaccination for measles, diphtheria, and polio. Restoring the vaccine supply chain and cold chain equipment in facilities is critical.

ii. *Campaigns to prevent infectious diseases, health promotion, and strengthened disease surveillance.* The risk of infectious and waterborne diseases is high post-disaster, and investments in campaigns for vector control, water quality testing and treatment are critical. Health promotion campaigns informing people where to go for NCDs, pregnancy related services, child vaccinations, mental health, and rehabilitative services will be important to facilitate access. Campaigns on hygiene and food safety will be essential to prevent disease outbreaks. Intensified detection and reporting on infectious diseases and profiles of patients accessing health services in the short term will be critical to ensure timely detection of any disease outbreak and responsiveness.

iii. *Repair of minimally damaged health facilities (hospitals and PHCs) and replacement of medical equipment*: Medical equipment essential for service provision in several health facilities was damaged by the floods and even prior to the floods. Replacing this equipment in facilities with minimum physical damage and undertaking repairs in facilities where there is partial damage to physical infrastructure would help restore full functionality in these facilities, allowing them to become fully functional and serve the population's needs more effectively. Where possible, opportunities to transition to energy-efficient practices should be identified, using renewable energy sources, and adopting green and resilient building design principles. Renewable energy systems can ensure that health facilities can operate during power outages or disruptions and enhance disaster preparedness and resilience.

iv. *Identify facilities with limited health staff and locations with limited access to facilities and put in place interim services.* The WHO assessment

84 International Medical Corps: Libya Flooding Situation Report #6, October 16, 2023.

85 UNDP Human Development Report 2021/2022: Uncertain Times, Unsettled Lives, Shaping our future in a Transforming World.

highlighted that there were a select few locations where health facilities remained difficult to access and where there was a shortage of specialized health staff. To provide adequate services, a temporary re-assignment of health staff as part of a short-term emergency response will be important. In addition, support packages for local health staff impacted by the disaster (such as housing, transport etc.) to enable them to resume work will be important. For villages with access issues, mobile clinics are an effective interim measure.

v. *Establish MHPSS services to cater to the immediate mental health needs of the population*. Even prior to the floods, there was an established need for mental health services in the region. Approximately 2,000 people in Derna, for example, were receiving mental health support prior to the floods.[86] Post-disaster, the need for mental health support has increased significantly. Putting in place mental health helplines, and training health facility staff to respond to these needs will be critical to the recovery of the people affected by the disaster. At the same time, it is important to recognize that health workers themselves may need psychosocial support. Health workers are generally involved in the immediate response despite themselves being impacted by the disaster, including the deaths of family and loved ones, and there is growing evidence of these impacts on their wellbeing.[87] In addition to establishing MHPSS services to cater to the immediate mental health needs of the population, it is crucial to integrate awareness campaigns around mental health and wellbeing.

In the medium to long term, a system strengthening approach will be important for sustained systemic change. This will require increased investment in the health sector to reverse the trend of declining health expenditure per capita.

i. *Systematic needs assessment prior to the reconstruction of destroyed and damaged health facilities*. Reconstruction of destroyed facilities and renovation of significantly damaged facilities may be required. In general, priorities for investments in the complete reconstruction of health facilities should be based on the size of the potential beneficiary population, the distance from the closest health facility, and the anticipated reduction in out-of-pocket expenditures. Climate resilience should be included as an integral part of the facility design, transitioning to more energy-efficient practices, utilizing renewable energy sources, and adopting green and resilient building design principles. As mentioned earlier, renewable energy systems can ensure that health facilities operate even during power outages or disruptions in the grid supply and enhance the facility's disaster preparedness and resilience.

ii. *Strengthening the medicine and vaccine procurement and supply chain system*. The low availability of medicines in public health facilities is one of the biggest challenges in the public health system, and one of the key drivers of out-of-pocket expenditures. Clear procurement guidelines and a digital supply chain system that tracks and manages the supply and delivery of medicines will be critical for transparency and management of medicine stockouts.

iii. *Upskilling human resources*. Although there are enough health workers in the country overall, their distribution is highly uneven. Additionally, while there is a shortage of key specialties, such as mental health workers and nurses with degrees (4–6-year university degrees), there is a surplus of others, such as dentists. Reskilling and upskilling health workers in the East to align with country-level needs will be important to provide equitable, sustained health services in affected areas.

iv. *Strengthening emergency care and pandemic preparedness*. Preparedness to respond to natural or man-made disasters is important, as shown by the COVID-19 pandemic. With climate change increasing the risk of infectious diseases and the emergence of new ones, preparations are needed in order to respond rather than react. Capacity building of government institutions and personnel on the establishment of cross-

86 WHO Situation Report: Libya Flood Response, October 11, 2023.

87 Tahernejad S, Ghaffari S, Ariza-Montes A, Wesemann U, Farahmandnia H, Sahebi A. Post-traumatic stress disorder in medical workers involved in earthquake response: A systematic review and meta-analysis. Heliyon. 2023 Jan 3;9(1): e12794. doi: 10.1016/j.heliyon. 2023.e12794. PMID: 36685451; PMCID: PMC9850193.

Gaiser M, Buche J, Baum NM, Grazier KL. Mental Health Needs Due to Disasters: Implications for Behavioral Health Workforce Planning During the COVID-19 Pandemic. Public Health Rep. 2023 May-Jun;138(1_suppl):48S-55S. doi: 10.1177/00333549231151888. PMID: 37226951; PMCID: PMC10225905.

Table 15: Health Sector Costs

Needs Type	Time frame	Total Cost (US$ million) - including costs for BBB etc.	Total Cost (LYD million) - including costs for BBB etc.
Infrastructure reconstruction	Short-term	22.6	108.7
	Medium-term	14.1	67.9
Service delivery restoration	Short-term	33.9	163.0
	Medium-term	42.4	203.8
Total Needs		**113.1**	**543.4**

Source: Assessment team.

sectoral platforms to manage emergencies will be important in this regard.

v. *Strengthening PHC facilities to provide an essential service package and support continued care for patients requiring rehabilitation services post-disaster.* Pre-disaster data from the affected sites and Libya as a whole clearly indicates that PHC facilities, which play a critical role in delivering basic healthcare services, are not operating at their full capacity. PHCs are expected to be the first point of contact for basic health care needs, and their readiness to provide basic services is a crucial step in preparing the country to address its vulnerability to climate change and other disasters.[88] PHCs are crucial during disasters as evidenced in the global response to COVID-19.[89] Post-accident rehabilitation services, and mental health and psychosocial support services should be available either at PHC facilities or through referral linkages to specialized centers and social support programs.

vi. *Strengthening health information systems.* Strengthening the availability and quality of health sector data through routine health information and surveillance systems, introducing digital patient records to enable seamless patient care across facilities, and building capacity and establishing mechanisms to conduct periodic nationally representative surveys to assess the current disease burden in the country is essential for improved planning and management of health services. While an Early Warning Alert and Response Network (EWARN) and District Health Information System-2 (DHIS-2) is available in the country, the use and completeness of data from these systems is an issue. Building the capacity of health workers on using data systems and creating a culture of using data for informed decision-making will be important for strengthening service delivery and planning in the health sector.

vii. *Systematic engagement of the Private Sector.* The growth of the private sector in Libya necessitates the need for active collaboration towards achieving universal health coverage. Potential for collaboration exists for the provision of specialized medical care and diagnostics, which are areas where the public sector is facing challenges. This will require developing a clear framework for engaging the private health sector, such that it complements the public sector and addresses key gaps without resulting in high out-of-pocket expenditures for patients.

88 WHO 2018. Technical Series on Primary Health Care: Brief on Primary health care and health emergencies.

89 Li D, Howe AC, Astier-Peña MP. Primary health care response in the management of pandemics: Learnings from the COVID-19 pandemic. Aten Primaria. 2021 Dec;53 Suppl 1(Suppl 1):102226. doi: 10.1016/j.aprim.2021.102226. PMID: 34961573; PMCID: PMC8708808.

Table 16: Total Cost of Needs for Health by and Municipality (in US$ million)

#	Municipality	Needs category	Cost (US$ million)	Cost (LYD million)
1	Derna	Infrastructure Reconstruction	2.7	13.1
		Service Delivery Restoration	5.7	27.2
2	Al Abraq	Infrastructure Reconstruction	0.0	0.0
		Service Delivery Restoration	0.0	0.0
3	Soussa	Infrastructure Reconstruction	4.0	19.3
		Service Delivery Restoration	8.4	40.2
4	Al Bayda	Infrastructure Reconstruction	7.2	34.6
		Service Delivery Restoration	14.9	71.8
5	Al Marj	Infrastructure Reconstruction	0.1	0.3
		Service Delivery Restoration	0.1	0.6
6	Sahel Al Jabal	Infrastructure Reconstruction	0.1	0.3
		Service Delivery Restoration	0.1	0.6
7	Shahaat	Infrastructure Reconstruction	0.1	0.6
		Service Delivery Restoration	0.2	1.2
8	Jardas Al Abid	Infrastructure Reconstruction	0.0	0.0
		Service Delivery Restoration	0.0	0.0
9	Medouar Al Zetoun	Infrastructure Reconstruction	0.1	0.3
		Service Delivery Restoration	0.1	0.6
10	Al Qayqab	Infrastructure Reconstruction	0.0	0.0
		Service Delivery Restoration	0.0	0.0
11	Ra's Al Hilal	Infrastructure Reconstruction	0.0	0.0
		Service Delivery Restoration	0.0	0.0
12	Wardam	Infrastructure Reconstruction	0.1	0.3
		Service Delivery Restoration	0.1	0.6
13	Umar Al Mukhtar	Infrastructure Reconstruction	0.1	0.3
		Service Delivery Restoration	0.1	0.6
14	Toukara	Infrastructure Reconstruction	0.1	0.6
		Service Delivery Restoration	0.2	1.2
15	Benghazi	Infrastructure Reconstruction	20.2	97.2
		Service Delivery Restoration	42.0	201.8
16	Gemienis	Infrastructure Reconstruction	0.9	4.2
		Service Delivery Restoration	1.8	8.7
17	Suloug	Infrastructure Reconstruction	0.1	0.7
		Service Delivery Restoration	0.3	1.5
18	Umm Arazam	Infrastructure Reconstruction	0.6	2.9
		Service Delivery Restoration	1.2	6.0

#	Municipality	Needs category	Cost (US$ million)	Cost (LYD million)
19	Al Qubah	Infrastructure Reconstruction	0.2	0.8
		Service Delivery Restoration	0.4	1.7
20	Al Abyar	Infrastructure Reconstruction	0.3	1.2
		Service Delivery Restoration	0.5	2.6
Total			**113.1**	**543.4**

Source: Assessment team.

Table 17: Prioritized and Sequenced Interventions for Health Sector Reconstruction

Intervention/Activity	Short-term early recovery* (1–12 months)		medium-term* (1–3 years)		Total Cost in US$ million	Total Cost in LYD million
	US$	LYD	US$	LYD		
Provision of medical supplies and vaccines	4.2	20.4	0.0	0.0	4.2	20.4
Treatment and rehabilitation of injuries	5.7	27.2	22.6	108.7	28.3	135.8
Repair of health facilities and replacement of equipment	22.6	108.7	0.0	0.0	22.6	108.7
Interim service delivery through mobile clinics	8.5	40.8	0.0	0.0	8.5	40.8
Establish mental health and psychosocial support services	4.2	20.4	5.7	27.2	9.9	47.5
Reconstruction of destroyed health facilities based on systematic needs assessment	0.0	0.0	14.1	67.9	14.1	67.9
Strengthening the medicine and medical supply procurement and supply chain system	0.0	0.0	2.8	13.6	2.8	13.6
Upskilling health human resources	0.0	0.0	5.7	27.2	5.7	27.2
Strengthening emergency care and pandemic preparedness	0.0	0.0	2.8	13.6	2.8	13.6
Reducing environmental risks through water quality testing and vector control	2.8	13.6	0.0	0.0	2.8	13.6
Intensified prevention and health promotion, including vaccination campaigns	5.7	27.2	0.0	0.0	5.7	27.2
Temporary reassignment of health workers (supplementary expenses for transport, housing, hardship)	2.8	13.6	0.0	0.0	2.8	13.6
Systematic engagement of the Private Sector	0.0	0.0	2.8	13.6	2.8	13.6
Total Needs	**56.5**	**271.7**	**56.5**	**271.7**	**113.1**	**543.4**

Source: Assessment team.

Linkages with Cross-Cutting themes

Interactions among health institutions in the different regions are largely at technical levels. While there is equitable access to healthcare between women and men, healthcare needs for women differ from those of men and are important to account for in the disaster response. For example, beyond the immediate requirement of food, first aid and shelter, women have additional service requirements for reproductive and maternal health, which are often ignored in the immediate disaster response. In addition, pregnant women and children are particularly vulnerable and have additional needs specific to their condition. Female counselors and psychosocial support in safe spaces are also important investments, as are support programs for women and children who lost their families in the floods.

Climate change contribes to frequent extreme weather events, such as heatwaves, storms, and floods, which contribute to the disruption of food systems, and an increase in zoonotic and food-, water- and vector-borne diseases, and mental health issues. These challenges escalate the demand for health services and simultaneously diminish the system's capacity to meet these needs. In building back better, reconstruction efforts need to incorporate climate-resilient infrastructure, green energy power supply, integrated service delivery, primary health care to prevent disease outbreaks, and enhanced coverage and outreach of health services.

.

Limitations

The main limitations of the health sector assessment, beyond those noted earlier for the overall assessment, are:

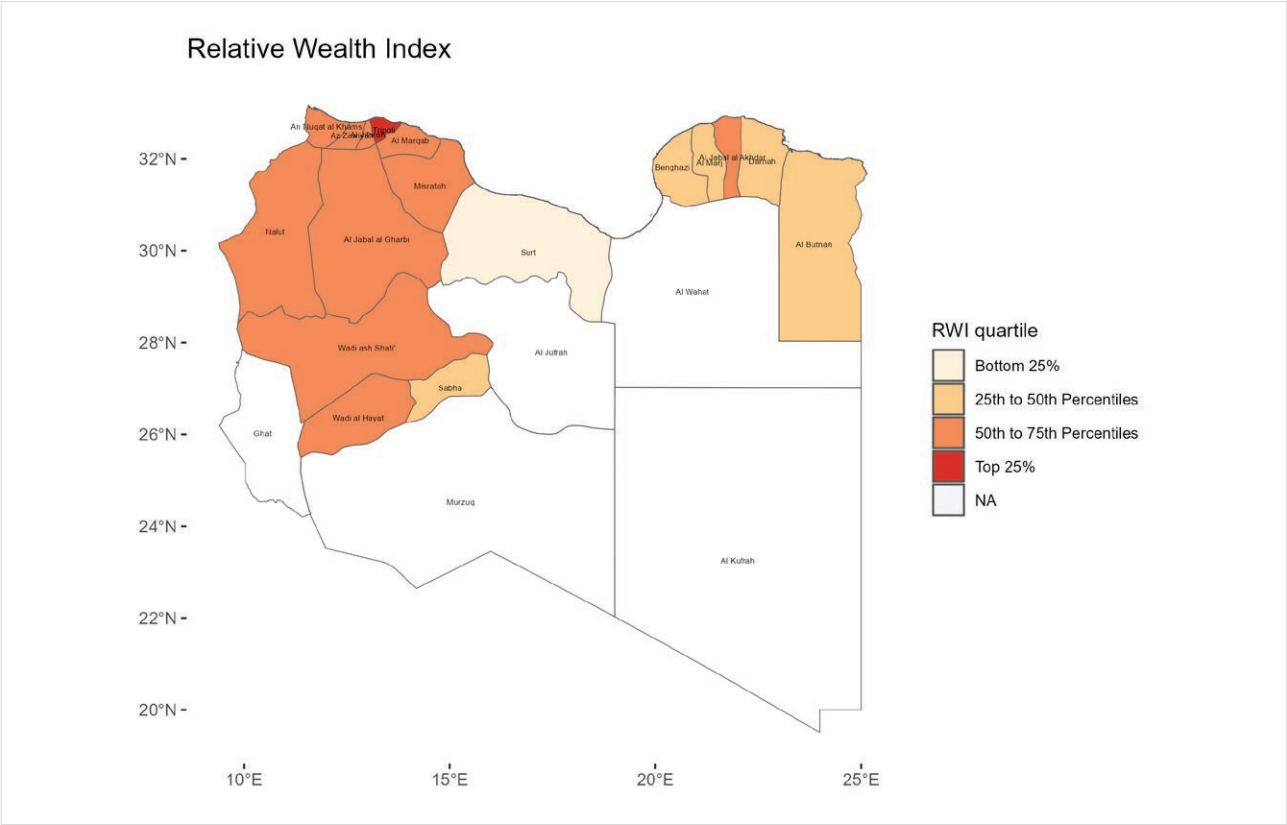
- Information on damage and disruption of health services varies across districts and municipalities and has been used to provide generalized recommendations across impacted areas.
- Several detailed assessments by partners (WHO and UNICEF) are currently underway, which will likely provide updated and robust information on some of the issues mentioned in this assessment of the health sector.
- Limited data on disease surveillance was available, which made it difficult to estimate the change in the incidence of diseases in the aftermath of the floods.
- The private health sector was a key pre-disaster service provider in Libya. However, information from this sector was insufficient to establish replacement costs for private health care services.
- The disaster exacerbated the limitations of the health sector in the region, and several recommendations for rebuilding were relevant prior to the disaster. However, rebuilding efforts provide an opportunity to address these long-standing issues in the health sector.

POVERTY

Libya is ranked 104th out of 191 countries according to the Human Development Index (HDI) 2021–22 and is placed in the 'high human development' category. However, the HDI has fallen since 2010 after more than a decade of instability. The drop is mainly due to an erosion in the quality of public services, particularly health and education. While life expectancy increased by 2.5 years and Libya's Gross National Income (GNI) per capita increased by about 5.9 percent, the expected years of schooling dropped by 1.2 years between 1990 and 2021.[90] High employment in the public sector and untargeted subsidies serve as a type of social benefit to mitigate against the erosion in services. According to data available from 2014, two percent of the Libyan population is multi-dimensionally poor, and 11.4 percent are classified as vulnerable to multidimensional poverty.[91]

Measures of welfare and poverty in Libya are limited due to the inaccessibility of official and nationally representative household survey data, and the outdated population census. Published reports by the Libyan Bureau of Statistics and Census, high-frequency phone surveys conducted post-COVID, and non-traditional measures using satellite data

Figure 18: Quartile of Average Relative Wealth Per District



Note: Districts in white do not have data coverage and are sparsely populated.
Source: Assessment team (using Meta's Data for Good (Chi et al., 2021)).

90 UNDP. Forging New Ways through Uncertainties in Libya. UNDP Libya/ Malek Almoghrabi - *https://www.undp.org/arab-states/press-releases/forging-new-ways-through-uncertainties-libya.*

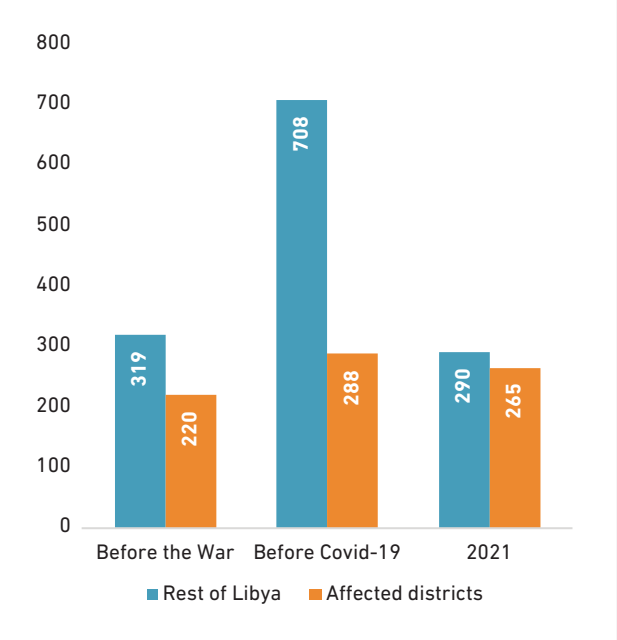
91 UNDP. Multidimensional Poverty Index 2023. *https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/LBY.pdf.*

provide some baseline or pre-flood correlates of welfare. However, additional data will be required to comprehensively assess post-flood impacts on poverty and welfare. The analysis below was based on data collected by the WB, Libyan institutions, and international partners.[92]

Prior to the flood, 55 percent of all Libyan households reported deprivations in at least one of five dimensions - housing, food, education, health, and safety. Data from phone surveys conducted by the WB, the World Food Programme (WFP) and in collaboration with the Libya Bureau of Statistics and Census in 2021 indicate that the majority of households in Libya were deprived in at least one key dimension of welfare, with many households facing multiple deprivations.[93] Non-traditional measures of baseline welfare, such as the Relative Wealth Index (RWI)[94], placed the flood-affected districts of Derna, Benghazi, and Al Marj below median levels of wealth in Libya. Residents of Derna, Benghazi, and Al Marj are, on average, between the 25th and 50th percentiles of welfare distribution. However, districts in the West have higher relative wealth than the eastern flood-affected districts.

According to the National Labour Force Survey conducted by the Bureau of Statistics and Census in 2022, workers in Libya earned a monthly average of 1,306 LDY or PPP$ 2023.[95] Other data sources estimate mean household income per capita to be roughly 260 LDY or PPP$ 390.[96] Household per capita incomes are lower than average earnings per worker since earnings from a few members are spread thinly across the whole household. At 41 percent, employment rates are relatively low in Libya and household sizes are high at around 6.1 persons. Female labor force participation, albeit high in the MENA region, stands at 39 percent of the working-age population, further limiting incomes. Across the country, average income per capita has fallen since the pandemic. Flood-affected areas had recovered somewhat since the civil conflict, but damage from the flood threatens to undo this partial recovery.

Figure 19: Average Monthly HH Income Per Capita (LDY)



Note: Affected districts include Derna, Al Jabal al Akhdar, Al-Marj and Benghazi. Before the War refers to a typical month between 2012 and 2014; Before Covid-19 refers to January 2020, and 2021 refers to a typical month in 2021.
Source: The multiple scars of the War and COVID19 Survey conducted by WB and ARAA (HFS 2021).

92 Sources includes the Preliminary population estimates (2020) and the National Employment Survey (2022) conducted by the Libyan Bureau of Statistics and Census; Vulnerability Shocks and Coping Mechanisms Survey (VSCM-S 2021) collected over phone jointly by the WFP, World Bank, in collaboration with the Libya Bureau of Statistics and Census; The multiple scars of the War and COVID19 Survey conducted by WB and ARAA (HFS 2021); Meta's Data for Good (Chi, Guanghua, Han Fang, Sourav Chatterjee, and Joshua E. Blumenstock. "Microestimates of wealth for all low-and middle-income countries." Proceedings of the National Academy of Sciences 119, no. 3 (2022): e2113658119.); FAOSTAT (*https://www.fao.org/faostat/en/#data/CP*); WFP prices (*https://dataviz.vam.wfp.org/economic_explorer/prices*); OpenStreetMaps and ESRI satellite data; IPSOS data and MTRNA dashboard.

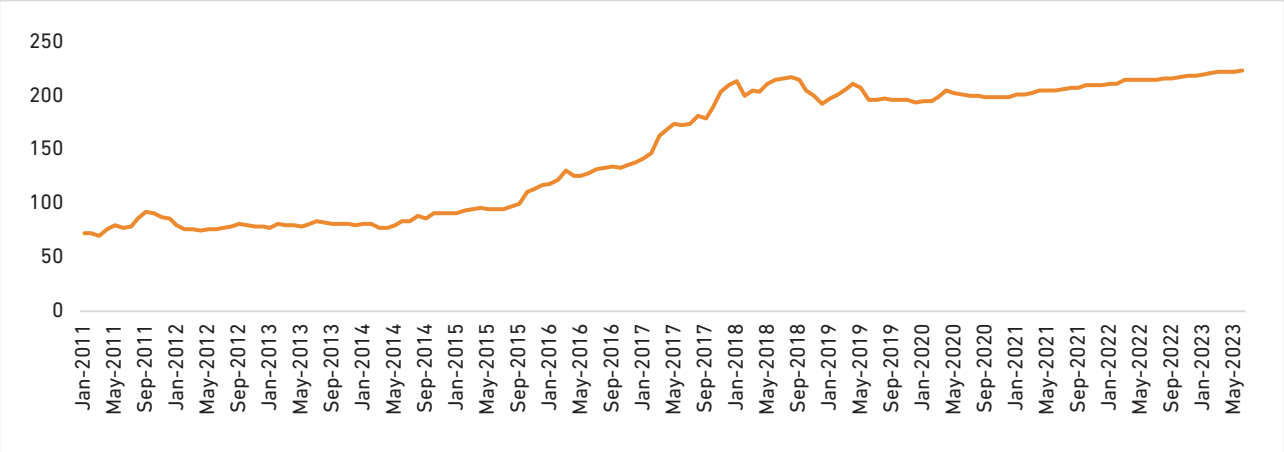
93 Vulnerability Shocks and Coping Mechanisms Survey (VSCM-S 2021) collected over phone jointly by the WFP, World Bank, in collaboration with the Libya Bureau of Statistics and Census.

94 The RWI leverages sources such as mobile networks, internet connectivity, road density, weather, and topographical data to yield a relative welfare measure within a country. The index is available from Meta's Data for Good platform and can be accessed at https://data.humdata.org/dataset/relative-wealth-index (Chi et al., 2021).

95 National Labor Force Survey, 2022 and using PPP conversion factor =0.6454554 (from *WDI* 2022).

96 HFS 2021; VSCM-S 2021 using PPP conversion factor =0.6670251 (from *WDI* 2021).

Figure 20: Food Consumer Price Index (2015=100)



Source: FAOSTAT (*https://www.fao.org/faostat/en/#data/CP*).

Assessment of Disaster Effects

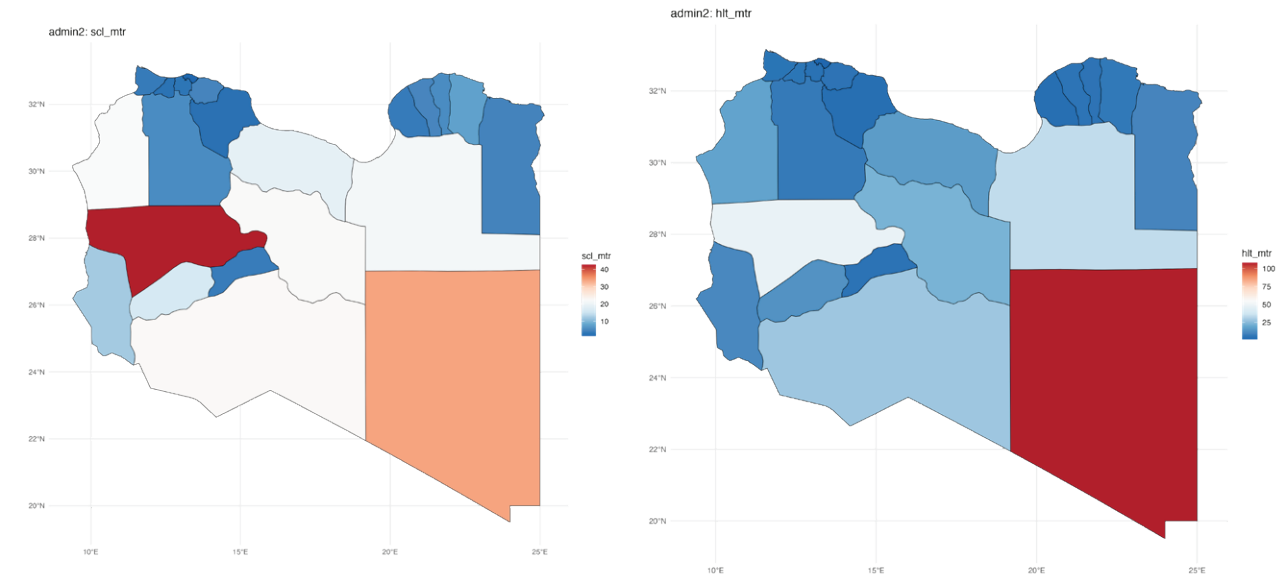
Residents in affected areas have faced welfare losses in housing, food security, education, and health.[97] Key informant interviews (KIIs) report that only 30 percent of buildings in their communities were undamaged.[98] Deprivation in housing is likely to be exacerbated after the flood with around 4,000 buildings damaged or destroyed in Derna alone (see housing chapter). Housing is a particular concern for IDPs in the affected regions. Even before the floods, IDPs were more likely to live in informal settlements, which faced greater flood damage when Storm Daniel struck. Flood damage also extended to roads and bridges, indicating a loss in connectivity and interruption to local supply chains. This implies an immediate threat to food security and access to essential supplies (e.g., medicines, sanitary products).

Volatility in food prices is likely in the aftermath of the flood and has also been witnessed after other economy-wide shocks, such as conflicts and the COVID-19 pandemic. Food security in Libya has been a concern, especially since 2014, due to sharp rises in food prices (*Figure 20*). Price volatility is higher in food items like meat, chicken, and couscous, which are also reported to be most in demand after the floods, in addition to rice, bread and cooking oil.[99] Prolonged shortages in food items pose a threat in terms of malnutrition in the short-term and stunting in the long term. Shortages would exacerbate baseline food insecurity, which ranged between 11–14 percent in Derna, Benghazi, and Al Marj.[100] Food shortages and price volatility tend to have a higher impact on women, who reduce food intake by shifting their diet to a less diverse one and reducing their own consumption to feed others.[101] Key informant interviews revealed that in the aftermath of the floods, food security is one of the top five priorities in affected areas. While market stores are still the most common source of food, humanitarian assistance is playing a key role. In addition, a small share of households had to resort to emergency coping mechanisms like borrowing/bartering, depleting stocks, and begging.[102]

Flood-affected areas faced interrupted access to education and health, with potential adverse medium-term effects. Schools were closed immediately after the floods and some were still not operational in heavily impacted areas even a month afterward, namely in Derna, Shahaat, Soussa, and Al Marj.[103]

97 Libya Joint inter-agency MTRNA *Key Informant interviews.*
98 Libya Joint inter-agency MTRNA *Key Informant interviews.*
99 WB staff calculations using WFP price monitoring surveys and Libya Joint inter-agency MTRNA *Key Informant interviews*
100 VSCM-S 2021.
101 Oxfam (2019). Gender Inequalities and Food Insecurity: Ten years after the food price crisis, why are women farmers still food-insecure? Briefing paper.
102 Libya Joint inter-agency MTRNA *Key Informant interviews.*
103 Qualitative reports from IPSOS.

Figure 21: Average Distance to a School (left) and Health Facility (right) by a Motorized Vehicle (in minutes)



Source: Assessment team (calculations using OpenStreetMap's data).
https://data.humdata.org/dataset/libya-healthsites
https://data.humdata.org/dataset/hotosm_lby_education_facilities

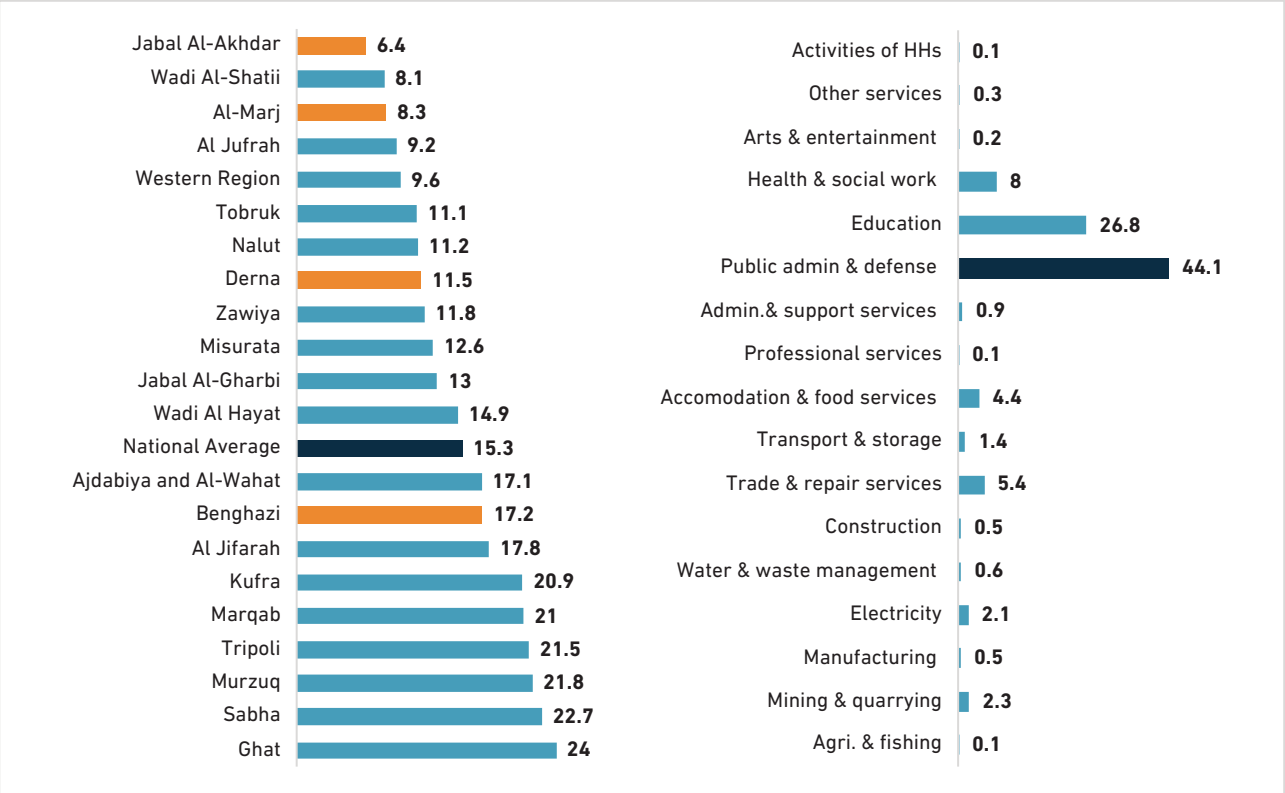
Although students from non-operational schools were encouraged to attend classes in operating schools, challenges relating to inadequate or damaged road infrastructure, distance, adjustments to new classes and learning environments remain. In the medium term, this could lead to learning losses for children who have already suffered conflict-related interruptions in the past, and social difficulties in acclimatizing to new classmates and teachers. Expected years of schooling for children of school-entering-ages is the one HDI component that has deteriorated over the past three decades, and deprivation in education contributes the most to multidimensional poverty.[104] Before Storm Daniel, residents in the flood-affected districts lived, on average, less than 10 minutes away from a school and less than 25 minutes from a health facility using a motorized vehicle. The impact on children, potential risks, and the disruption of education are discussed in more detail in the Social Sustainability and Inclusion Chapter.

Access to healthcare is likely to worsen and exacerbate pre-existing conflict-related damage to health facilities and significant loss of hospital equipment in all impacted municipalities. Lack of healthcare infrastructure and equipment had contributed to the reluctance of healthcare personnel to work in certain areas even before the floods.[105] Given these challenges, health outcomes, both psychological and physical, must be monitored closely. This applies particularly to water-borne diseases, as most people in affected areas do not treat water.[106]Access to prenatal and natal care should also be monitored, as inattention can have long-lasting impacts on health and human capital. Mental health should not be neglected in post-conflict and post-disaster context, especially as ground reports indicate pressing needs for mental healthcare professionals[107] (see Health chapter).

Prior to the floods, unemployment in flood-affected districts ranged between 6.4–17.2 percent, with higher rates in Benghazi (Figure 22). According to the National Labor Force Survey, most affected districts, except Benghazi, had unemployment below the national level at 15.3 percent. Much of the workforce in Libya is engaged in the public administration and defense sector. This is followed by education, health,

104 https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/LBY.pdf and https://hdr.undp.org/data-center/specific-country-data#/countries/LBY.
105 Qualitative reports from IPSOS.
106 Libya Joint inter-agency MTRNA Key Informant interviews.
107 Qualitative reports from IPSOS.

Figure 22: Unemployment Rate (%) Across Districts (left) and Sectoral Share (%) of Workers (right)



Source: National Labor Force Survey, 2022.

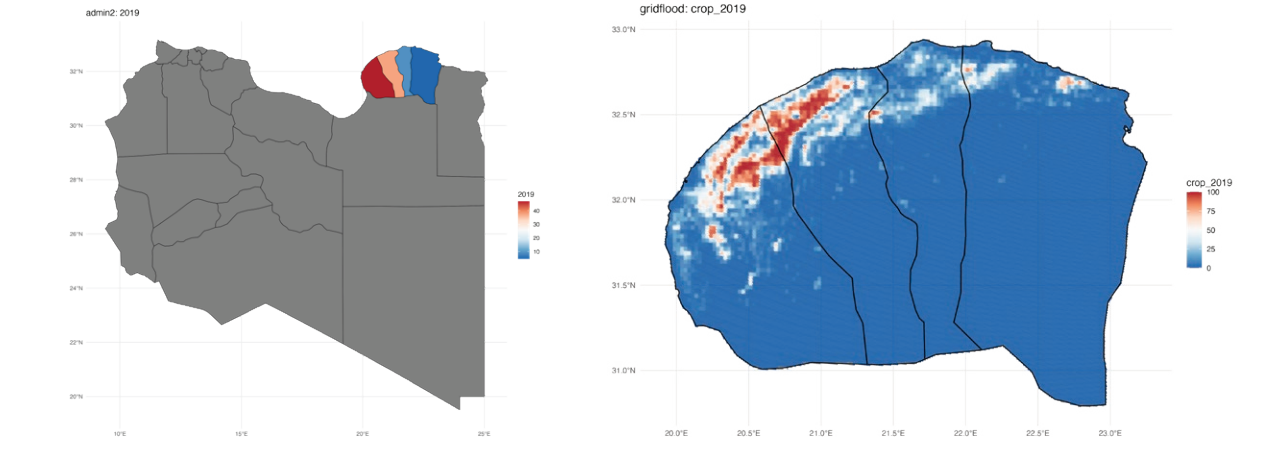
and social services (Figure 22, right). While livelihoods in public administration may not be at immediate risk, rebuilding education and social infrastructure is vital so teachers and health workers can return to their jobs and learning can fully resume.

Agricultural livelihoods, particularly in the northern parts of affected districts, are vulnerable to income-loss due to the floods. Although 19 percent of the population report farming for their own consumption, the formal agriculture sector employs less than one percent of the Libyan workforce (Figure 22), but the share may be higher in some districts. This information is not available disaggregated by district. Satellite data indicates that Benghazi has the highest land area under crops among the flood-affected districts - approximately 40 percent of its total area was farmed in 2019 (Figure 23). This suggests that agricultural livelihoods in the northern parts of affected districts would be vulnerable to income loss due to the floods.

Economic shocks may affect women more adversely - either within the household through domestic tensions and unequal allocation of resources or in public spaces where women's issues tend to get de-prioritized.[108] Libyan women lag behind men in labor force participation (LFP) by almost 20 percentage points. According to the National Labor Force Survey (2022), the LFP rate for women is 39 percent compared to 58 percent for men. More than 40 percent of women are educated up to tertiary levels, but at the other end of the distribution, 20 percent of adult women in Libya have no formal, or only elementary levels of education (Figure 24). Nevertheless, given their education and skills, Libyan women's human resource potential is not fully realized. Data on flood impacts disaggregated by gender are not available. However, it is essential to monitor education, health, mobility, and labor market outcomes (e.g., return to work, wages, absenteeism) for both women and men so that inequalities are not exacerbated. Furthermore, it is crucial to recognize that women are among the hardest hit by disasters like this flood,

108 How Do Women Weather Economic Shocks? What We Know (*World Bank, 2011).*

Figure 23: Share of District Under Cropland (%, Left) and in 1km Grids of Flood-Affected Areas (%, Right)

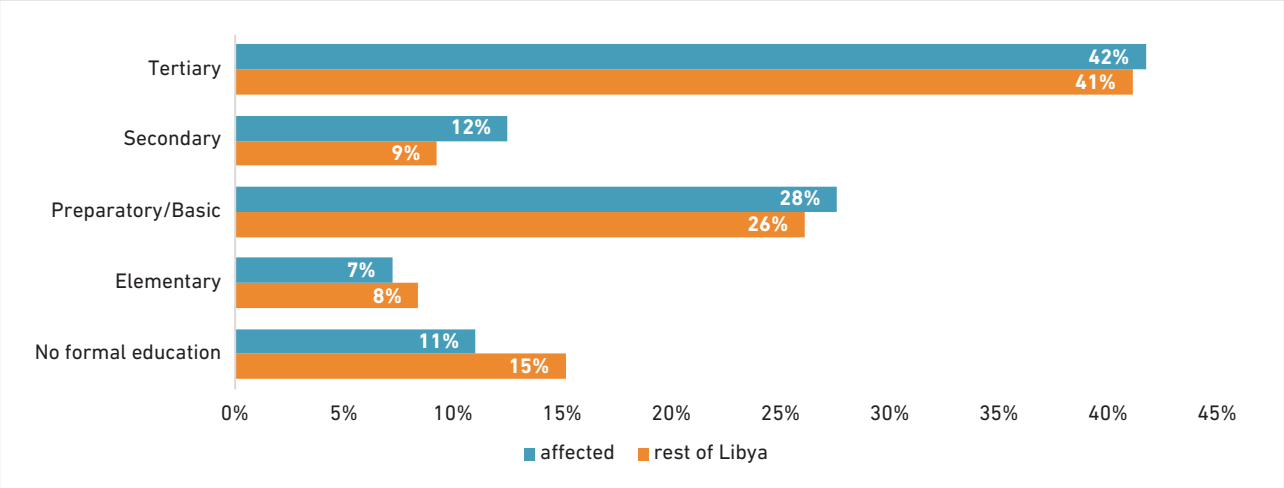


Source: Assessment team (calculations using ESRI 2019 data (of affected districts only).

given their limited access to communication and financial tools. Women are less likely to use a mobile phone, and they also have less access to savings accounts, potentially excluding them from vital mitigation measures.[109] The impact of post-disaster conditions on women is discussed in more detail in the Social Development and Inclusion chapter.

Economic shocks may also lead to higher violence against women and men due to financial and psychological stresses.[110] Adequate safeguards against such violence (against women and men) in the recovery phase should be prioritized, with provisions for recourse.

Figure 24: Distribution of Women by Education (%)



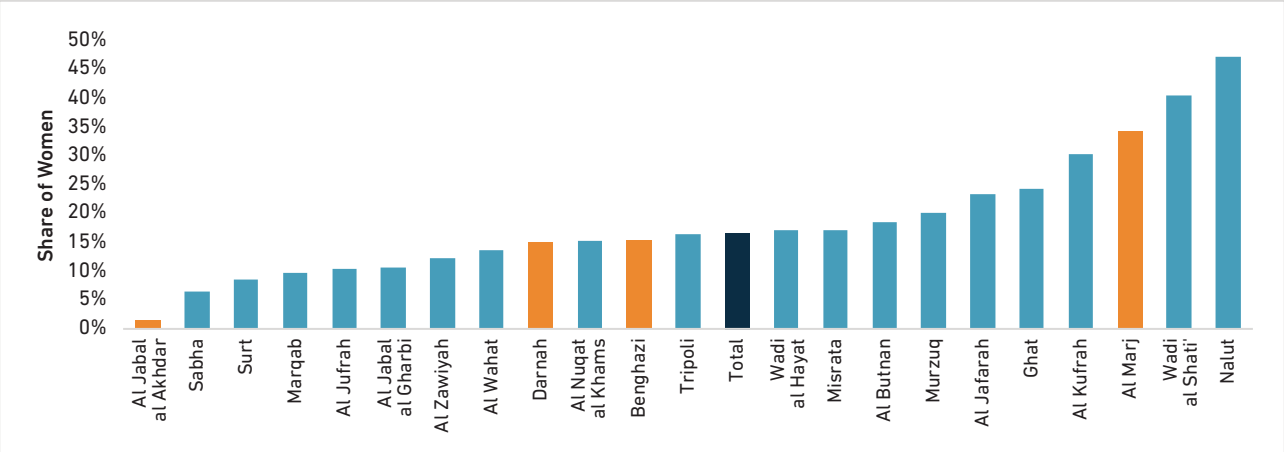
Note: Above graph shows only female respondents above 18 years.

Source: The multiple scars of the war and COVID19 Survey conducted by WB and ARAA (HFS 2021).

109 World Bank (2023). Gender Data Portal. https://genderdata.worldbank.org/countries/libya.

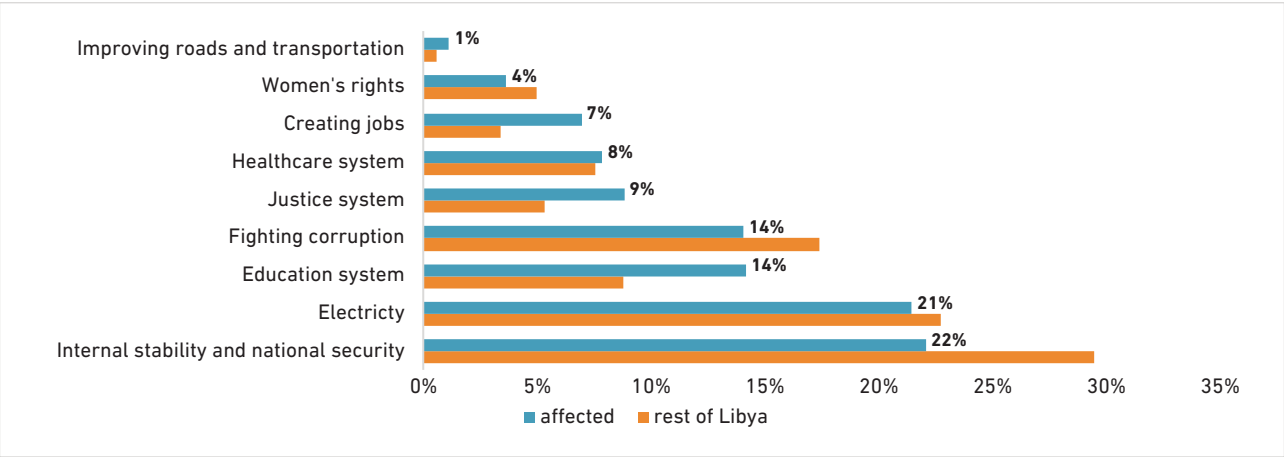
110 Agüero, Jorge M. "COVID-19 and the rise of intimate partner violence." World development 137 (2021): 105217.; and Bhalotra, Sonia R., Uma S. Kambhampati, Samantha Rawlings, and Zahra Siddique. "Intimate partner violence and the business cycle." (2018).

Figure 25: Share of Women who Believe Gender-Based Violence (Women and Men) is Common in Libya



Source: The multiple scars of the war, and COVID-19 Survey conducted by WB and ARAA (HFS 2021).

Figure 26: Top Priorities for Libyan Women (%)



Source: The multiple scars of the war and COVID-19 Survey conducted by WB and ARAA (HFS 2021).

Recovery Needs and Strategy

Post-flood priorities of all residents in affected areas have shifted to immediate and urgent needs such as shelter, food security, health, water and search and rescue.[111] shows that this is a shift in the top priorities reported by women in flood-affected districts, which were internal stability and security, closely followed by electricity and education. Women in flood-affected areas were more likely than those in the rest of Libya to report concerns with education. Given that electricity and education were concerns even at baseline, flood damage to electricity supply and schools might exacerbate these concerns. While reconstruction of physical assets may get priority, ensuring comprehensive and equitable service delivery would be critical.

As recovery begins, priorities and needs may change. Accurate and updated data on living standards, food prices and availability, livelihoods, health, and education outcomes are necessary to inform the recovery process. Data collection exercises can vary from nationally representative household surveys conducted in-person to 'pulse' surveys conducted over the phone or at the community-level. It is important that vulnerable sections of

111 Libya Joint inter-agency MTRNA *Key Informant interviews.*

the population are adequately represented so their needs and priorities are captured. Collaboration across agencies and stakeholders would be key in facilitating data collection and leveraging data to respond to the most urgent needs.

Linkages with Cross-Cutting Themes

The floods may exacerbate existing challenges, strain already limited resources, and de-prioritize the needs of vulnerable populations. Prior to the floods, the IOM estimated that Libya had 831,000 displaced persons, including 126,000 IDPs and 705,000 returnees.[112] Storm Daniel, as a conservative estimate, is reported to have further displaced 44,800 people, adding to the complexity of an already intricate humanitarian landscape, as highlighted by the OCHA.[113] Given the pre-existing administrative burdens and humanitarian needs of vulnerable populations in Libya from previous shocks, it becomes imperative to closely monitor the medium-term adverse impacts and welfare of marginalized groups. Ensuring their needs are prioritized in recovery planning is crucial. For a detailed examination of the post-disaster conditions and their impact on IDPs and migrants, refer to the Social Development and Inclusion chapter.

Limitations

The assessment of welfare impacts resulting from Storm Daniel is limited by the absence of up-to-date household-level data. Given this limitation, this assessment relied on baseline data and estimates, which may have dated compared to current ground realities. The reliance on old data risks under- or over-estimating the impacts of the floods, as households or individuals may not be accurately identified. Additionally, the welfare situation and needs in the Libyan context change rapidly. The effectiveness of development responses and monitoring in the future hinges on overcoming this limitation.

112 *IOM (August 2023).*
113 *OCHA, November 28, 2023.*

SOCIAL PROTECTION AND JOBS

Libya has a social protection system that is inclusive by law and generous by design but limited in terms of coverage and impact. The system consists of (a) universal energy subsidies, which constitute the bulk of social assistance expenditure, amounting to 18.5 percent of GDP in 2022;[114] (b) cash transfers to socially vulnerable groups such as women, the elderly and the disabled; and (c) a social security system that covers retirement, disability, and unemployment in the public and private sectors (enterprises that employ five individuals or more). Other programs, such as a universal food subsidy, existed, but ceased operation due to the decade-long conflict and subsequent crises, while some continue but with no coverage in the eastern half of the country. Therefore, there have been no data on implementation or beneficiaries in the Eastern region since 2016, and data only covers the Western region. On the labor side, and similar to oil-rich developing economies, Libya relies on rent distribution of oil revenue through public sector employment, which employed approximately 86.5 percent of the population in 2022.[115] The remaining 13.5 percent either worked in the private sector, or were self-employed, or worked for a family business.[116]

The social protection sector is managed by several agencies that often operate separately in the Western and Eastern regions. The Social Solidarity Fund (SSF), an autonomous[117] institution, manages a social assistance program for vulnerable groups across the country, while MoSA manages grants. The National Oil Corporation (NOC) operates the universal fuel subsidy. The SSA[118] manages pension, disability, and unemployment insurance payments. The MoL executes public policies and vision regarding workforce management and recruitment. Finally, the Zakat Fund is subordinated to the Council of Ministers under the General Authority for Religious Affairs and Endowments and supports poor and vulnerable individuals countrywide.

The lack of investment in disaster preparedness and risk reduction has further compounded vulnerabilities. The Social Protection sector lacks systems to identify populations in need and deliver programs to respond to shocks. The Libyan Government in Tripoli initiated work on a national, unified social registry in early 2023. The system was managed by the General Authority for Information (GAI), who faced difficulties using it. Thus, the system could not be used to respond to the storm nor to identify impacted populations and deliver assistance.

At the same time, as mentioned earlier, Libyan households have been facing overlapping shocks that severely impacted their welfare. These include a protracted conflict that left over 125,000 IDPs and around 674,000 returnees,[119] a severe food and commodity crisis due to reduction of imports, the devaluation of the currency in 2021, and, finally, the COVID-19 pandemic that resulted in a sharp slowdown in and limited recovery of economic activity.[120] While Libya continues to lack welfare data to assess the levels of poverty and vulnerability, the most recent publicly available data for multidimensional poverty (2014) estimates that two percent of the population (135,000 people in 2021) are multidimensionally poor, and an additional 11.4 percent are classified as vulnerable to multidimensional poverty (765,000 people in 2021).[121] According to the survey, almost

114 Estimated at $8.5bn. Libya: 2023 Article IV Consultation-Press Release; Staff Report; and Statement by the Executive Director for Libya, IMF Staff Country Reports, 2023(201), A001. Retrieved Nov 17, 2023, from https://doi.org/10.5089/9798400243578.002.A001.

115 Libyan Bureau of Statistics and Census. 2022. "Preliminary Results for National Labor Force Survey".

116 Ibid.

117 The SSF has its own revenues and covers all Libyan territories, based in Tripoli.

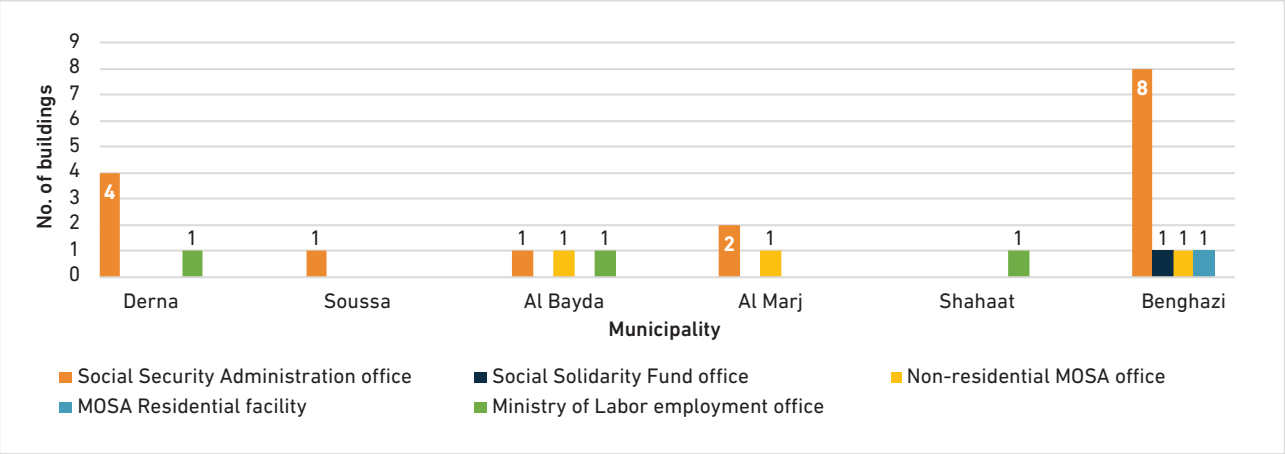
118 Known as Social Security Fund, but not to be confused with the Social Solidarity Fund (SSF).

119 IOM and UN Secretary-General's Special Adviser on Solutions to Internal Displacement.

120 Irhiam, Hend R., Michael G. Schaeffer, and Kanae Watanabe, editors. 2023. The Long Road to Inclusive Institutions in Libya: A Sourcebook of Challenges and Needs. International Development in Focus series. Washington, DC: World Bank. doi:10.1596/978-1-4648-1922-3.

121 UNDP. Multidimensional Poverty Index 2023. https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/LBY.pdf.

Figure 27: SPJ Buildings and Services in Impacted Municipalities



Source: Assessment team.

15 percent of households in the country are female-headed households. National unemployment stood at 15.3 percent in 2022, with female unemployment at 18.4 percent, compared to males at 13.3 percent.[122]

Food insecurity, on the other hand, has increased dramatically in the past few years, driven by disruption in the food supply and price increases of staple foods due to the pandemic and the Russia's invasion of Ukraine. Prices of essential goods, including housing, food and drinks, water, gas and transport, have contributed to high inflation since 2021, impacting households across the welfare spectrum and making many more vulnerable to economic hardship.[123] In 2021, the incidence of food insecurity was estimated at 14 percent, with two percent of the population considered severely food insecure, and displaced households being twice as likely to be food insecure as non-displaced.[124] Average expenditures on food constituted the bulk of household expenditures at 63 percent of total expenditure, leaving households highly vulnerable to shocks.[125]

Assessment of Disaster Effects

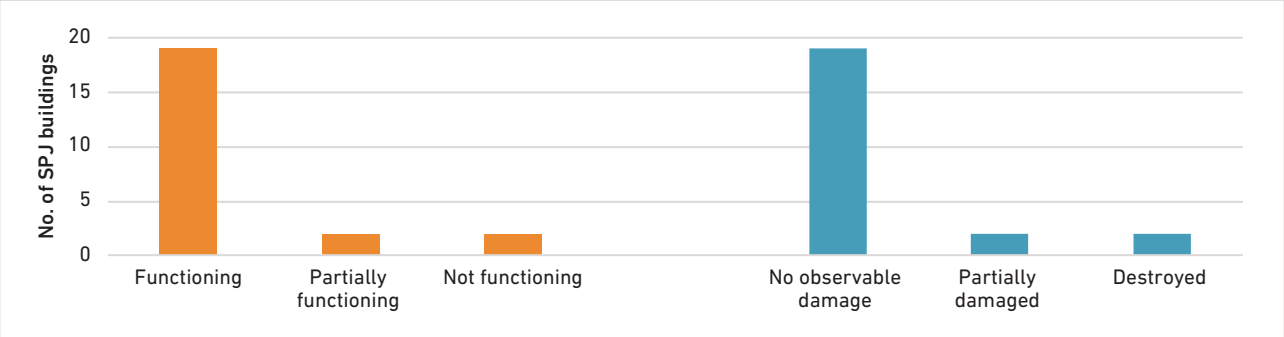
The storm has substantially disrupted social protection services that would have supported the affected populations, including flood-displaced households, already socially vulnerable groups (female heads of households, people with disabilities), and workers in the informal economy. Data on damage to SPJ infrastructure became gradually available; but data on SPJ losses through loss of productive assets, or death or injury of breadwinners were scarce and unreliable at the time of producing this RDNA. An exception was data on the loss of housing. Good data allowed for the calculation of cash transfer needs to displaced households to address aspects of fragility, in addition to housing needs covered under the Urban sector. However, the need to address livelihood losses was calculated based on a worst-case scenario whereby all the informal sector is assumed to have incurred some level of loss and qualifies for income support.

With respect to SPJ damage, while there is limited data on the status of social protection programs in the East, the storm damaged several institutions, including physical facilities and infrastructure. Out of the twenty municipalities covered in the assessment, only five have social protection and jobs institution. These five municipalities were in fact the most impacted by the floods.[126] This implies that these institutions cover a wide geographic scope and, potentially, as a result of the floods, SPJ services and benefits were interrupted beyond these five municipalities. A summary of SPJ sector institutions in these five municipalities is given in Table 18.

122 Libyan Bureau of Statistics and Census. 2022. "Preliminary Results for National Labor Force Survey".
123 World Bank. September 2022. Libya economic monitor. *https://www.worldbank.org/en/country/libya/publication/libya-economic-monitor-september-2022*.
124 Based on Libya Vulnerability, Shocks, and Coping Mechanisms Survey (VSCM-S) conducted in 2021.
125 Ibid.
126 According to WB calculations.

With respect to SPJ damage, around 26 percent of SPJ sector infrastructure was either destroyed or partially damaged across the five most impacted municipalities, with no damages reported in the 15 other municipalities covered under this RDNA. While partially destroyed SPJ offices and facilities maintained functionality post-catastrophe, destroyed infrastructure resulted in the complete loss of functionality in nine percent of SPJ institutions, and a partial reduction in functionality in another nine percent. The bulk of SPJ damage was in the municipality of Derna, where two SSA buildings were destroyed and an employment center was partially damaged; followed by Soussa where a SSA building was partially damaged and maintained partial functionality. Damage and functionality of SPJ infrastructure in the five municipalities are depicted in Figure 28, and the estimated costs of this damage are given in Table 19. Additionally, many Libyans lost their national ID and identification numbers, making registration and assistance more difficult. However, the Civil Registry Administration under the Ministry of Interior has responded quickly to replace identification papers.

Figure 28: Status of 25 SPJ Buildings



Source: Assessment team.

Table 18: SPJ Damage Inventory Table

Asset Types	Baseline	Partially Damaged	Completely destroyed	Total Cost (US$ millions)	Total (LYD millions)
DAMAGE					
SSA offices	16	1	2	US$ 343,357	1,650,000 LYD
MOL employment centers	3	1		US$ 31,214	150,000 LYD
Total	**19**	**2**	**2**	**US$ 374,571**	**1,800,000 LYD**

Source: Assessment team.

Table 19: SPJ Damages by Municipality[127]

#	Municipality	Total Damage	
		US$	LYD
1	Derna	343,357	1,650,000
2	Soussa	31,214	150,000
Total		**374,571**	**1,800,000**

Source: Assessment team.

127 Other municipalities covered under the geographic scope of the RDNA have reported no damages to the SPJ-related assets.

Impact of Floods

The floods have deepened household challenges at many levels, causing displacement, food insecurity, poverty, and loss of livelihoods and income. As a result, many households were faced by compounding crises and became unable to cope. At a time when increasing numbers of IDPs were returning to their municipalities and towns, the catastrophe reversed this trend and swelled the number of IDPs by 42,045 individuals[128] who needed assistance. Derna (40 percent), Al Bayda (12 percent) and Shahaat (10 percent) bore the brunt of displacement.[129] Food insecurity, which was prevalent prior to the disaster, was exacerbated as thousands of families were left without access to food or shelter, especially in Derna, according to the WFP. Additionally, at a time when unemployment in Libya was 15.3 percent prior to the floods,[130] the floods have caused the loss of productive assets of many households and disrupted wage employment for many more. Finally, the floods have affected education and health.

Sectoral Recovery Strategy and Needs Assessment

An estimated 6,657 households were displaced, which constitutes 15 percent of Libya's population, with Derna and Soussa experiencing the brunt of housing damage and destruction, and as a result the highest number of displaced populations. Most displaced households currently reside with relatives in neighboring municipalities, in schools or rental units, while awaiting the reconstruction of their houses. At the same time, while the majority of breadwinners in these municipalities are employed in the public sector (86.5 percent)[131], 11.2 percent of the labor force is in the informal sector and are at higher risk of livelihood and income loss.[132] Finally, most of the municipalities within the scope of this RDNA also experienced mild to severe destruction of community assets across all sectors which is impacting access to essential services such as health, education, water, etc., and potentially increasing multidimensional poverty and eroding human capital. Based on the estimated value of community assets, the five most impacted municipalities are Shahaat, Soussa, Benghazi, Derna, and Al Bayda.

The Social Protection recovery strategy should provide poor households with assistance, requiring US$ 112 million. During early recovery, the proposed SPJ interventions provide households affected by multidimensional poverty and loss of livelihood and income with larger cash transfers to ensure emergency conditions are addressed and children are protected. These amounts are reduced in the second year, i.e., during the subsequent 12 months, before they are phased out entirely after 24 months as households regain essential services and re-establish their livelihoods. The proposed SPJ intervention for displaced households is proposed for one year only, given the prioritized focus on reconstructing and rehabilitating houses under the Urban sector proposed interventions. These households will also receive income or consumption support (the other two SPJ interventions) based on their economic activities (wage employment or informal sector). The interventions will consider the specific needs of diverse households, such as those that may include a higher proportion of vulnerable individuals, including female-headed households, given that women are often disproportionally affected by poverty and livelihood disruption; and the differential impact of such interventions based on gender dynamics within households.

Below is a detailed description of the three proposed interventions:

i. **Emergency cash transfer (ECT) to displaced households to address aspects of fragility resulting from loss of shelter.** Based on existing levels provided by humanitarian agencies, US$ 180 is proposed for each of the 6,657 displaced households for a period of 12 months. Cash will ensure that displaced households are able to prioritize their needs, recover essential items they may have lost, and cope with displacement while reducing the risk of negative coping mechanisms. Based on the number of displaced households, the cost is estimated at **US$ 14,163,934**.

128 International Rescue Committee. *https://www.rescue.org/eu/press-release/flooding-libya-emblematic-climate-change-and-conflict-vulnerable-communities-warns.*

129 International Organization of Migration. *https://dtm.iom.int/reports/libya-storm-daniel-flash-update-7-30-september-2023?close=true%20%5d.*

130 Ibid.

131 Libya Employment Survey (2022). Libya Bureau of Statistics and Census.

132 Informality is broadly based on social security pension contributions estimated at 11.2 percent by the Bureau of Statistics and Census (2022).

ii. **Income support to address livelihood and income loss for households who presumably lost their productive assets as a result of the catastrophic floods.** A cash transfer of US$ 180 for 12 months that is reduced to US$ 150 in the subsequent 12 months is proposed to provide households with income support until they can replace their productive assets. Data on the number of households who have experienced livelihood loss is not available. Therefore, the size of the informal sector was used as a proxy for those who may have lost their productive assets and livelihoods as a result of the flooding. According to social security data, 11.2 percent of those who are active do not make social security contributions. Based on the average household size in Libya, roughly 19,009 households rely on income from the informal sector. The estimated needs to provide income support for the informal sector is **US$ 75,274,505** (US$ 41,058,821 income support in the first year and US$ 34,215,684 income support in the second year). These payments will also cover informal employees who have been displaced; so, in other words, IDPs may receive income support on top of the 12-month fragility ECT (first intervention). In addition to this support, the Libyan Government may consider targeted[133] in-kind support to help households restore their livelihoods (through, for instance, physical rehabilitation of facilities, replacement or repair of assets etc.).

iii. **Consumption support for formal wage earners (in the public and private sectors) to address the increase in multidimensional poverty**. From partial damage to the complete destruction of community assets in all municipalities within the scope of the RDNA, residents of these municipalities are highly likely to experience major disruptions of essential services under vital sectors such as Health, Education, WASH, etc. In order to ensure that households are able to secure food and clean water and seek essential services in neighboring municipalities, consumption support to all wage earners, i.e., those who make social security contributions (88.8 percent of the labor force) is proposed. The proposal is for US$ 100 for 12 months and US$ 50 in the subsequent 12 months. The estimated need to provide consumption support for the formal sector is **US$ 22,606,791** (USD 15,071,194 to cover the consumption support during the first year and US$ 7,535,597 to cover consumption support for the second year). Similar to the informal sector support, these payments will also cover wage employees who have been displaced.

Figure 29: Short Term Needs (0–12 months)

Intervention	Description	Total (US$)
Emergency cash transfers to displaced households	US$ 180 to the 6,657 displaced households for twelve months	14,163,934
Income support for households in the informal sector	US$ 180 to households in the informal sector (i.e., not contributing to social security), for twelve months	41,058,821
Consumption support for households in the formal sector	cash top-up of US$ 100 to heads of households who are wage employed in the public and private sectors	15,071,194
Total		**70,293,949**

Source: Assessment team.

133 The design of such intervention requires data on the impact of the storm on the most vital economic industries in the covered areas, particularly in the informal economy.

Figure 30: Medium Term Needs (13–24 months)

Intervention	Description	Total (US$)
Income support for households in the informal sector	The cash transfer to households in the informal sector is reduced to US$ 150 for the next twelve months	34,215,684
Consumption support for households in the formal sector	The cash top-up to wage-employed is reduced to US$ 50 for the next twelve months	7,535,597
Total		**41,751,281**

Source: Assessment team.

Linkages with Cross-Cutting Themes[134]

As Libya increasingly becomes more vulnerable to a multitude of climate threats, including an increasing trend in the frequency and intensity of disasters such as droughts, (flash) floods, sandstorms, storm surges and desertification due to climate change, the role of the SPJ sector becomes crucial in building resilience capacity through disaster management, warning, and response. Besides the need to adopt a poverty-targeting model for social assistance to tackle poverty and vulnerability among Libyans in a more impactful manner, the SPJ system can benefit from a national social registry that is geospatially linked to climate conditions which would enable the system to alert households based on their geographic locations and respond to disasters swiftly. Contingency funding to prepare for such a response ought to be made available in advance, along with disaster preparedness protocols, roles, and responsibilities, that are pre-established with other public institutions.

Limitations

The most significant limitation under the SPJ sector is the lack of baseline data on poverty and vulnerability in Libya, which would be the starting point for social assistance. Similarly, the design and implementation modality of the proposed interventions needs to be discussed with the relevant Libyan institutions to validate the respective assumptions and ensure that they build on and complement ongoing efforts. Finally, delivery systems that support social protection operations, from registration to assessment of needs and benefits and payments, need to be developed.

134 Cross-cutting themes include: FCV, Climate Change, Gender, Governance, and Social Inclusion.

CULTURAL HERITAGE

Libya's Cultural Heritage provides a window to understanding the country's unique history, influenced by the Greek, Roman, Byzantine, and Islamic periods. The country is home to notable heritage sites, of which five are inscribed as UNESCO World Heritage sites, and three are on the Tentative List. The sites in East Libya, which include archeological and historical sites, museums, places of worship, and monuments, are all an essential part of Libya's Cultural Heritage and the formation of local identities, offering places for religious, recreational, and other activities which bind people together.

Various archaeological, historical, and religious sites are located in eastern Libya. Overall, 687 cultural properties have been identified, including 619 religious sites (485 mosques, eight churches, 126 sites of religious importance[135]), 14 monuments, 27 archaeological sites,[136] 20 historical sites[137] and four museums.[138] The 'Archaeological Site of Cyrene', a UNESCO World Heritage site, is a Greek colony that became one of the principal urban centers of the Hellenic world. Apollonia, a Greco-Roman city, is known for its archaeological remains, including a theater and Odeon. Other sites include Ptolemais, a historical city with a Roman theater and bathhouse, and Tocra, a Greco-Roman archaeological site with extensive city walls, Roman baths, and a necropolis. Derna is an ancient coastal town with archaeological finds belonging to the ancient colony of Darnis, such as Roman baths, Byzantine churches, and Ottoman-era architecture. Properties of historical and cultural significance include the Great Mosque of Derna, one of the oldest mosques in North Africa, and the Mosque of Al-Sahaba. The city also boasts sites of importance for Islamic heritage, including shrines of notable leaders and religious schools and institutions (madrasas).

Despite the rich cultural diversity, Libya's heritage is neglected and decaying. In 2016, the UNESCO World Heritage Committee placed Libya's five World Heritage sites on its List of World Heritage in Danger due to the prevailing conflict at the time.[139] Weaknesses in the rule of law in the country, particularly in the wake of conflict, created a market for stolen archaeological artifacts. Furthermore, environmental conditions and expanding human settlements have affected archaeological sites. Lack of law enforcement and the absence of planning permission processes have enabled the clearance of important sites for construction and agricultural expansion and the demolition of heritage buildings for new developments. Various museums and archaeological sites across the country have been victims of looting and vandalism.[140]

At an institutional level, Cultural Heritage is overseen by the Department of Antiquities (DOA), which coordinates with local municipalities to manage these sites. However, DOA faces various challenges in managing cultural sites in Libya. The DOA requires additional financial resources to protect the sites and support restoration efforts. Technical assistance and training are required for the department's staff to conserve archaeological sites, develop institutional mechanisms to safeguard cultural heritage, and emergency preparedness and response. Institutional coordination is required to manage properties in remote areas and protect them from looting and vandalism. [141]

135 This includes tombs, cemeteries, religious schools, and institutions (madrasas) and facilities attached to mosques.
136 This includes sites with archaeological remains.
137 This includes palaces, castles, and sites of historical significance.
138 This includes museums and cultural facilities.
139 *https://whc.unesco.org/en/decisions/6769*.
140 *https://www.brookings.edu/articles/heritage-democracy-and-development-in-libya/*.
141 *https://malichproject.wordpress.com/emergency-reponse-eastern-libya/*.

Assessment of Disaster Effects: Damage and Loss Estimates[142]

Storm Daniel has had a devastating impact on Cultural Heritage, causing damage of US$ 108.7 million (LYD 530.7 million). Seven of the 20 municipalities impacted by the storm had cultural properties affected. It has been estimated that around 10 percent of identified cultural properties have been affected, with 62 cultural properties (9 percent) partially damaged and five completely destroyed (1 percent). The storm has also left 11 percent of cultural properties partially or not functioning, with 45 partially functioning (6.5 percent) and 32 not functioning (4.5 percent) (Table 1). Regarding religious sites, total damages of US$ 10.7 million (LYD 52.4 million) have been recorded. Of the 485 mosques identified, 31 were partially damaged, and five were completely destroyed, incurring damage of US$ 10.4 million (LYD 50.9 million). For churches, one out of eight identified was partially damaged, incurring damage of US$ 0.3 million (LYD 1.5 million). For monuments, archaeological and historical sites and museums, a total damage of US$ 98 million (LYD 478.2 million) has been recorded. The storm damaged none of the 14 monuments identified, while archaeological sites have been severely impacted, whereby 20 of 27 have been partially damaged, incurring damage of US$ 80 million (LYD 390.4 million). For historical sites, eight of 20 have been partially damaged, incurring damage of US$ 16 million (LYD 78.1 million). Two of the four recorded museums were impacted by the flooding, incurring damage of US$ 2 million (LYD 9.76 million).[143]

Losses from Storm Daniel are estimated to be US$ 64.5 million (LYD 314.7 million). The storm has increased the vulnerability of many of these cultural properties and exposed them to further risks. In particular, archaeological and historical sites have become more vulnerable to looting and vandalism. The floods have also uncovered new sites and artifacts, which require urgent documentation and protection. Therefore, the calculation of losses considers the costs of emergency intervention and documentation, equivalent to US$ 13 million (LYD 63.7 million),[144] as well as those for mitigating new risks and increased vulnerabilities, equivalent to US$ 49.6 million (LYD 242.1 million). Losses also include loss of revenue associated with temporary closure or non-availability of sites, equivalent to US$ 1.8 million (LYD 8.9 million).[145]

Damage was distributed across seven municipalities. The floods affected Shahaat municipality the most (70 percent), followed by Al Bayda (11 percent), Al Marj (eight percent), Benghazi (five percent), Derna (three percent) and Soussa (three percent) (Table 2). In Al Bayda, 11 mosques and two archaeological sites were partially damaged, while ten mosques and two archaeological sites were partially functioning. It has been noted that rubble lining the streets outside the mosques has hindered access to religious sites. Al-Marj is a historically significant city in East Libya, which was founded on the site of the ancient city of Barca. It is home to numerous religious sites (mosques and churches) as well as archaeological and historical landmarks, including the Monumento Mussolini and Almnejrat Ancient Cemetery, which dates to the pre-Byzantine era. Two archaeological sites were partially damaged and are partially functional, including an Italian castle. As for Benghazi, nine mosques were partially damaged, with eight mosques partially functioning and 18 not functioning.

Derna, which has been at the epicenter of the floods, has seen damage of US$ 3.1 million (LYD 15.2 million). Four mosques have been completely destroyed, and three partially damaged. Heavy damage was recorded in Al-Sahaba Mosque and its library, which has immense religious importance. Damage was also recorded to Al-Ateeq mosque, one of Derna's most significant Islamic heritage sites. The mosque dates to the 7th century, rendering it one of North Africa's oldest mosques. Flooding has also damaged four mosques and two Quran teaching centers in the Abu Mansour and Al-Jubaila neighborhoods. Mosques do not only hold religious significance but also act as shelters and distribution points during crises. In Derna, two mosques are used to shelter flood survivors, and several are used across the city to distribute non-food aid and emergency response supplies. The flood

142 Damage may be classified as **Partially Damaged** if less than 40% of the cultural property is damaged, structure is still sound and repair cost would be less than 40% of the total cultural property value. Damage may be classified as **Completely Destroyed** if more than 40% of the cultural property has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the cultural property.

143 Damage could have occurred internally, affecting artefacts and movable cultural property.

144 Takes into account costs associated with implementing temporary emergency measures to prevent further damage to culture properties.

145 The calculation takes into account functionality of the sites. Due to the security situation, tourism has not been taken into account in revenue losses. The majority of the sites in the assessment do not have entry tickets/ access costs associated to them, therefore costs are considered to be conservative.

Figure 31: Damage and Loss Inventory Table

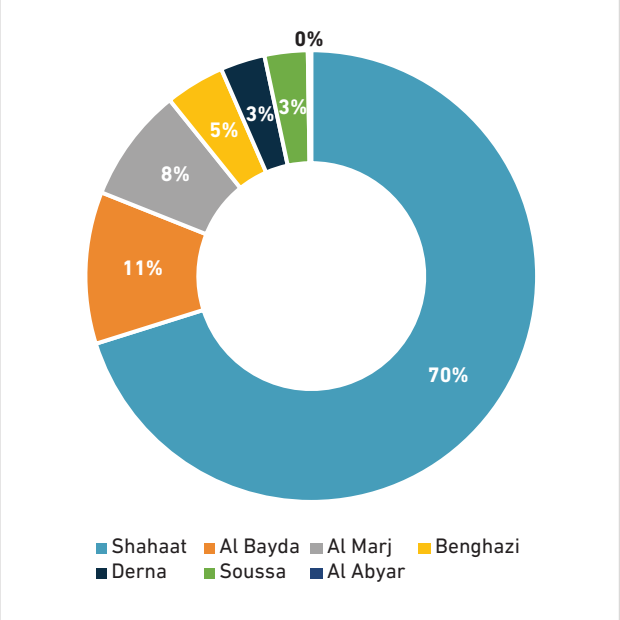
	Baseline	Partially Damaged	Completely Destroyed	Total (US$ million)	Total (LYD million)
DAMAGE					
Religious Sites	619	32	5	10.74	52.41
Mosque	485	31	5	10.44	50.95
Church	8	1	-	0.30	1.46
Other sites of Religious Importance	126	-	-	-	-
Monuments	14	-	-	-	-
Archaeological Sites	27	20	-	80.00	390.40
Historical Sites	20	8	-	16.00	78.08
Museums	7	2	-	2.00	9.76
Total	**687**	**62**	**5**	**108.74**	**530.65**
LOSSES					
Cost of emergency intervention and documentation				13.04	63.67
Costs to mitigate new risks and increased vulnerabilities				49.61	242.13
Loss of revenue associated with temporary closure or non-availability				1.82	8.89
Total				**64.48**	**314.70**
TOTAL DAMAGES AND LOSSES				**173.23**	**845.36**

Source: Assessment team.

has also exposed archaeological remains in Derna, including fortifications dating back to ancient Darnis, which require urgent physical and legal protection.[146]

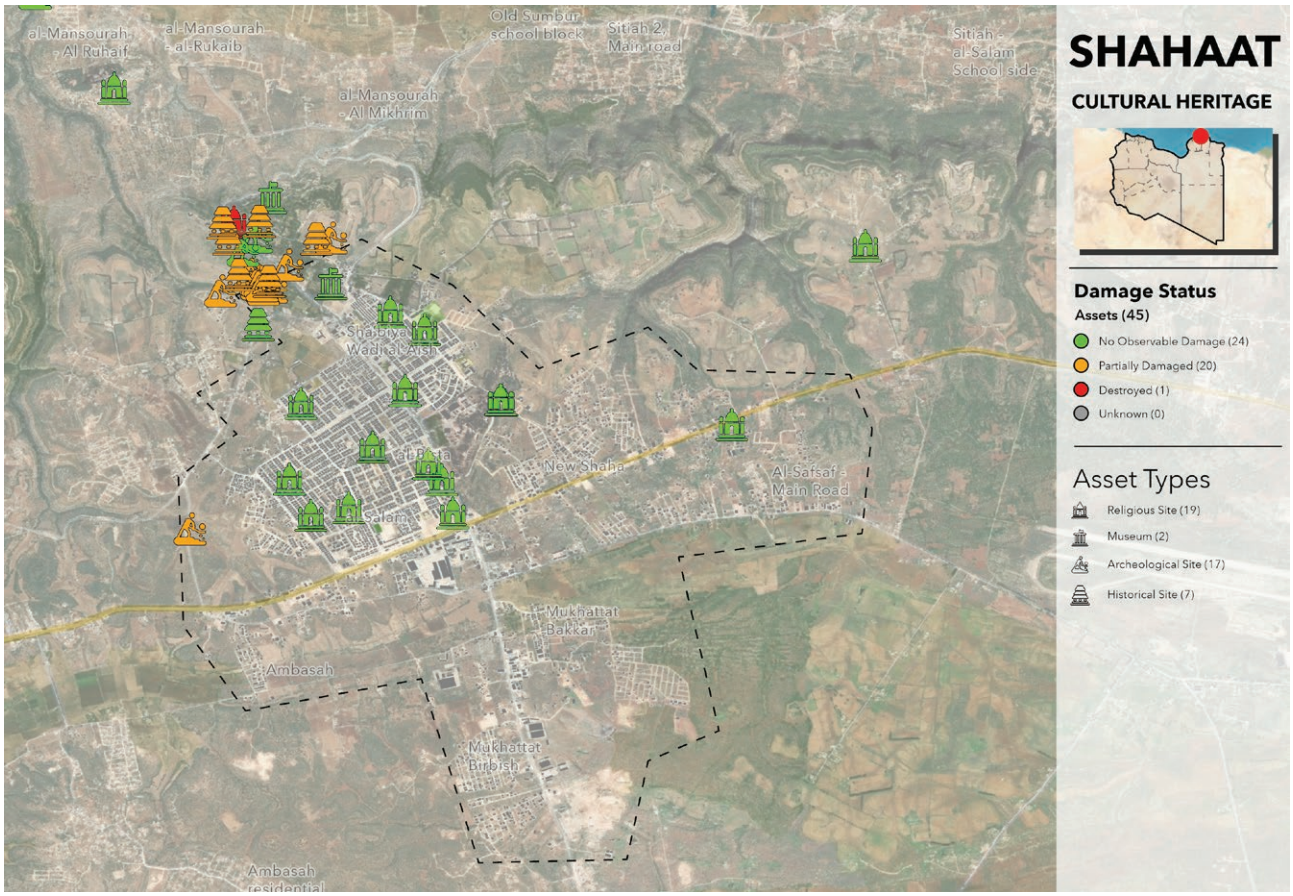
Flooding in Soussa affected various sites, causing damage of US$ 14 million (LYD 68.2 million). Soussa, a small port town dating back to 630 BC, is home to the Apollonia archeological site, which includes Roman Baths, an amphitheater, and a Central Basilica church. The city sustained partial damage to seven mosques, one church, two museums, two archeological sites and two historical sites, all of which are partially functioning. While the archaeological sites were partially damaged, the site museum building was flooded, putting various artifacts at risk. The flooding also partially damaged the Sinyara Italian Castle. The storm uncovered new archeological features, which should be cataloged and preserved. The Old Mosque in the city is being used for aid storage and distribution.

Figure 32: Damage by Municipality



146 https://malichproject.wordpress.com/emergency-reponse-eastern-libya/.

Figure 33: Damage to Cultural Assets in the city of Shahhat



Source: Assessment team.

Seventy percent of the damage was recorded in Shahaat municipality, at around US$ 68.6 million (LYD 334.8 million). Shahhat is home to ruins from the ancient city of Cyrene, a UNESCO World Heritage site dating back to 631 BC. Of the 45 cultural properties identified in the city, nearly half were damaged (44 percent) or destroyed (2.2 percent), of which most are part of the ancient city of Cyrene. Flooding destroyed one religious facility and partially damaged 14 archeological sites, and six historical sites. Most of the sites affected are part of the UNESCO-designated site, the 'Archaeological Site of Cyrene', which includes the Museum of Sculptures, the Temple of Zeus, the Spring of Apollo, the Sanctuary of Apollo, and the Baths of Augustus, which were all damaged by the floods. The floods carved furrows in the site, undermining the foundations of some structures which could lead to collapse if not treated with utmost urgency.[147] The flooding has also caused debris to partially cover some sites, requiring specialized clearing. In addition, the floods uncovered a canal near Marcus Aurelius' arch, which provides an opportunity to explore and learn more about the ancient city. However, the canal will need to be stabilized to prevent further damage.

Linking Effects to Human Impacts

The recent floods have had cascading effects beyond tangible and built cultural heritage, affecting the living conditions of those using and benefitting from these cultural properties. The destruction or damage to historical sites, monuments, and artifacts not only erases a community's tangible connection to its past but can also disrupt related livelihoods. Damage to religious sites can create disruptions beyond the physical impacts; these sites often serve as community centers, providing essential services and support. This was particularly evident in the aftermath of the floods, whereby many mosques

147 https://malichproject.wordpress.com/emergency-reponse-eastern-libya/.

Table 20: Damage and Losses by Municipality

Municipality	Total Damage (US$ millions)		Total Loss (US$ millions)		Total Damage + Loss (US$ millions)	
	US$	LYD	US$	LYD	US$	LYD
Al Abraq	-	-	0.17	0.81	0.17	0.81
Al Abyar	0.24	1.17	0.14	0.68	0.38	1.85
Al Bayda	10.64	51.92	5.90	28.79	16.54	80.72
Al Marj	8.00	39.04	4.86	23.72	12.86	62.76
Al Qayqab	-	-	-	-	-	-
Al Qubah	-	-	-	-	-	-
Benghazi	4.16	20.30	2.34	11.41	6.50	31.71
Derna	3.12	15.23	1.21	5.88	4.33	21.11
Gemienis	-	-	-	-	-	-
Jardas Al Abid	-	-	-	-	-	-
Medouar Al Zetoun	-	-	-	-	-	-
Ra's Al Hilal	-	-	-	-	-	-
Sahel Al Jabal	-	-	-	-	-	-
Shahaat	68.60	334.77	41.87	204.33	110.47	539.10
Soussa	13.98	68.22	7.91	38.61	21.89	106.84
Suloug	-	-	0.10	0.48	0.10	0.48
Toukara	-	-	-	-	-	-
Umar Al Mukhtar	-	-	-	-	-	-
Umm Arazam	-	-	-	-	-	-
Wardam	-	-	-	-	-	-
Total	**108.74**	**531.00**	**64.49**	**314.71**	**173.23**	**845.36**

Source: Assessment team.

were being used as shelters by the displaced or points to access non-food aid and emergency response supplies. The floods have also affected facilities, tools and offices related to cultural heritage, which are needed by culture professionals and government officials to monitor and safeguard heritage. The damage caused to these facilities is likely to affect livelihoods and the operation of culture-related institutions. The consequences of such damage are not gender-neutral, as women in Libya often play essential roles in cultural production, safeguarding and religious communities. Furthermore, one of the greatest yet least quantifiable losses is the stifling of creative expression among affected communities. Though harder to quantify, important damage has also been observed in the cultural and creative industries, notably in the city of Derna, including the destruction of the Derna Cultural House, thus affecting the livelihoods of artists and cultural professionals, and overall community access to cultural life. Cultural traditions and practices are not just a means for making a living. They foster a sense of identity, belonging, and continuity, helping communities connect with their past and shape their future. Preserving cultural heritage not only maintains a link to shared history but also promotes social cohesion, cultural diversity, and the wellbeing of individuals and societies, contributing to a deeper understanding of the human experience and our collective heritage.

Recovery Needs and Strategy

The recovery investment needs for Cultural Heritage are estimated at US$ 169.6 million (LYD 827.8 million), which were calculated based on recovery needs, including: the reconstruction of destroyed and partly damaged cultural properties, surveying and safeguarding uncovered archaeological remains and artifacts, implementing temporary measures and restoring fundamental services while reparation works are completed, and technical assistance. When estimating the costs for recovery, a premium (30 percent) was factored in for BBB, considering the current technical and institutional context of Cultural Heritage in Libya. The total investment needs for infrastructure reconstruction are estimated at US$ 141.4 million (LYD 689.9 million), and US$ 28.3 million (LYD 138 million) for service delivery restoration, which considers physical restoration (US$ 13.3 million/ LYD 98.7 million), and technical assistance (US$ 15 million/ LYD 135.9 million). (Table 21)

A phased approach is recommended to recover and rebuild Cultural Heritage. Prioritization of interventions has been structured so that urgent assistance is provided where needed, while secondary measures are aimed towards long-term recovery and resilience against future climate-induced disasters. (Table 22)

In the short term, the recovery must focus on immediate needs to protect the cultural properties from further damage and/or collapse, emergency protection of newly uncovered sites and artifacts, and ensure continuity of services, particularly those regularly accessed by local communities. In terms of infrastructure reconstruction, this would cover the following: (1) implement emergency measures such as shoring, propping, sheltering, structural reinforcements, evacuation of damaged and recently exposed cultural properties and artifacts to prevent further damage and/or collapse; (2) carry out emergency management and conservation measures and inventories to document the extent of damage to existing and newly uncovered cultural properties and artifacts, identify areas that are at risk of further collapse, and ensure adequate storage of artifacts; (3) repair cultural properties as feasible to restore function and ensure their preservation, particularly for sites regularly accessed by local communities. In terms of service delivery, recovery must cover the physical restoration of fundamental services provided by cultural properties, and technical assistance to local authorities and professionals for emergency response to restore governance and legal arrangements to ensure the physical and legal protection of cultural properties. Estimated recovery investment needs for the short-term has been estimated at US$ 50.8 million (LYD 248.3 million).

Table 21: Cultural Heritage Restoration Costs

Category	Total (US$)	Total (LYD)
Infrastructure Reconstruction	**141.36**	**689.85**
Implement emergency measures to prevent further damage and/or collapse	5.94	28.97
Carry out management measures, develop inventories, and conservation to avoid loss	15.83	125.55
Repair cultural properties as feasible to restore function and ensure their preservation and restoration	119.59	1,018.21
Service Delivery Restoration	**28.27**	**137.97**
Physical Restoration	13.29	98.65
Restoring fundamental services provided by cultural facilities	6.36	31.04
Repair cultural properties as feasible to restore function	6.93	67.60
Technical Assistance	14.98	135.90
Re-establishment and strengthening of governance and technical capacity	9.19	83.47
Enforce adequate legal measures to prevent demolition	3.82	33.11
Development of a DRR Strategy for Cultural Heritage	1.98	19.32
Total needs	**169.63**	**827.82**

Source: Assessment team.

In the medium term, the recovery must focus on infrastructure reconstruction to ensure the repair of assets to restore function, as well as technical assistance to the governmental institutions to improve the management and protection of Cultural Heritage. In terms of infrastructure reconstruction and service delivery, efforts should focus on (1) repairing cultural properties to restore function and ensure their preservation, and where applicable, ensuring their integration into the city's urban fabric. There would still be a need to (2) continue shoring, propping, sheltering, structural reinforcements, evacuation, and other protective measures and (3) carry out further management and conservation measures and inventories as excavations continue.

Technical assistance would be required to: (1) re-establish and strengthen the governance arrangements and technical capacities of institutions and culture professionals involved in the protection of Cultural Heritage, including the integration of culture and cultural heritage in urban recovery plans and strategies, (2) revise and enforce legal measures to prevent future demolition of Cultural Heritage, and (3) develop a DRM strategy for Cultural Heritage, which ensures emergency preparedness and response for protection in the event of future occurrences. Estimated recovery investment needs for the medium term have been estimated to be US$ 118.7 million (LYD 579.4 million).

Table 22: Prioritized and Sequenced Interventions for Reconstruction of Cultural Heritage

Category	Short Term		Medium Term		Total cost in US$ million	Total Cost in LYD million
	US$ million	LYD million	US$ million	LYD million		
Infrastructure Reconstruction	**42.41**	**206.95**	**98.95**	**482.89**	**141.36**	**689.85**
Implement measures to prevent further damage and/or collapse	5.94	28.97	-	-	5.94	28.97
Carry out management measures, develop inventories, and conservation to avoid loss	5.94	28.97	9.90	48.29	15.83	125.55
Repair cultural properties as feasible to restore function and ensure their preservation and restoration	30.53	149.01	89.06	434.60	119.59	1,018.21
Service Delivery Restoration	**8.48**	**41.39**	**19.79**	**96.58**	**28.27**	**137.97**
Physical Restoration	6.36	31.04	6.93	33.80	13.29	98.65
Restoring fundamental services provided by cultural facilities	6.36	31.04	-	-	6.36	31.04
Repair cultural properties as feasible to restore function and ensure their preservation and restoration	-	-	6.93	33.80	6.93	67.60
Technical Assistance	2.12	10.35	12.86	62.78	14.98	135.90
Re-establishment and strengthening of governance and technical capacity	1.27	6.21	7.92	38.63	9.19	83.47
Enforce adequate legal measures to prevent demolition	0.85	4.14	2.97	14.49	3.82	33.11
Development of a DRR Strategy for the Culture Sector	-	-	1.98	9.66	1.98	19.32
Total	**50.89**	**248.34**	**118.74**	**579.47**	**169.63**	**827.82**

Source: Assessment team.

The lack of monitoring and looting have contributed to the damage of many of the cultural properties, which are further exacerbated by weak institutional arrangements and legislation that safeguards Cultural Heritage. When developing future technical assistance activities, it is essential to consider both site-specific management challenges and protection, as well as national cultural heritage protection. At the site level, it is recommended to develop and update management plans, comprising emergency preparedness and risk management, for each site, to include measures to protect sites from further erosion, manage visitor access and monitor threats. For sites that have been designated as UNESCO World Heritage properties or are on Libya's Tentative List for potential future nomination, this should be done in consultation with UNESCO and its Advisory Bodies, including the International Council on Monuments and Sites (ICOMOS), International Center for the Study of the Preservation and Restoration of Cultural Property (ICCROM) and International Union for the Conservation of Nature (IUCN). At the national level, there is a need to review and strengthen subordinate legal authorities and governance structures for cultural heritage, which would work across various national departments and sub-national governments (municipalities). There would also be a need to review the current legislation on cultural heritage and, if necessary, update it in order to ensure the protection, conservation, and safeguarding of cultural heritage. This would also require defining cultural heritage in the context of Libya.

At a broader level, technical activities should consider wider capacity-building and awareness activities beyond the institutions mentioned above. The profession of cultural heritage in Libya is quite limited, and capacity building would support the strengthening of the profession as a whole. It is also essential to engage local communities in protecting cultural heritage as it fosters a sense of ownership, stewardship, and pride in preserving their heritage. Communities possess valuable traditional knowledge and practices that can be sustainable in safeguarding cultural artifacts and historical sites and strengthening social cohesion and identity. Furthermore, cultural heritage could also offer economic opportunities through heritage tourism, and their local involvement could raise awareness about the importance of protecting cultural property against illicit activities such as looting and trafficking, which have previously been recorded in Libya.

Linkages with Cross-Cutting Themes

Conservation of Cultural Heritage has been neglected since the deterioration of the security situation in Libya. The instability caused by conflict has not only diverted resources away from the conservation and protection of cultural heritage but weakened the ability to physically protect archaeological sites, resulting in the theft of artifacts and illicit trafficking of cultural property. Museums and archaeological and historical sites are victims of looting and trafficking, resulting in the loss of countless cultural artifacts. Over the past 12 years, maintenance and restoration efforts for historical sites have been hampered, leading to further deterioration. Many experts, archaeologists, and champions of cultural heritage have been forced to flee conflict-affected areas, resulting in the loss of local expertise essential for preserving cultural heritage. Furthermore, conflict-induced displacement of local communities has disrupted the cultural continuity and social fabric of many areas, potentially leading to the disruption and loss of intangible cultural heritage, which is demonstrated through traditional practices, knowledge, and cultural identity. The effects are further damaging to minority groups, who may have their own, unique means of cultural expression. Moreover, there is a need to improve governance arrangements in the sector to support the protection and safeguarding of Cultural Heritage, particularly towards integrating resilience to disasters and future climate related risks. In Libya, climate change is a threat multiplier, and the effects of climate change can exacerbate existing stresses, such as floods, sandstorms, storm surges, and desertification. If not integrated, this could lead to loss of various sites of heritage value since many are made from materials subject to increased weathering and accelerated decay.

Limitations

There are several limitations to the analysis conducted for Cultural Heritage. First and foremost, the damage assessment is only limited to the physical status of buildings and to specific categories of cultural properties. It does not consider the damage to movable and immovable cultural heritage, including that housed in museums, libraries, and archives, which could have been impacted by damage, looting and/or vandalism. The culture and creative industries, the spaces of cultural expression (workshops, shops/souks,

theaters), and the impact on artists and cultural professionals are not included in the analysis due to the lack of data. Intangible cultural heritage has not been considered. Therefore, a more comprehensive assessment needs to be conducted, covering culture in all its forms, and for all types of cultural and culture-related institutions. Secondly, the overlaps between Cultural Heritage and other sectors imply damage beyond what is included in this assessment. For example, buildings of historical interest could be assessed under housing, and departmental offices that hold cultural value and artifacts could be assessed under municipal services and/or governance. Thirdly, there is limited baseline data, especially for revenue and contribution to the GDP. Thus, the losses estimated are conservative. Cultural Heritage has been severely affected over the last ten years, and tourism has been limited, affecting the potential revenue from sites. Finally, unit costs for the assessment have been standardized to calculate total damage and needs. For a sector like Cultural Heritage, this is a limitation, as cultural properties have very different values and restoration costs.

PRODUCTIVE SECTORS

© Seraj Elhouni/Shutterstock.com

AGRICULTURE

In 2022, the share of the agriculture sector (crop, livestock, fisheries, and forestry)[148] in Libya's GDP was 1.6 percent down from 4.1 percent in 2019.[149] In 2021, the agriculture sector employed around 16.3 percent of the total active population of Libya.[150] The total area of Libya is estimated at 1,760,000 km2. Under two percent of the land is arable and about four percent is suitable for grazing livestock. Most arable land is in the Jebel Akhdar region near Benghazi and the Jifara Plain near Tripoli. The annual rainfall goes from 100 mm to 600 mm per annum. Some areas have an underground aquifer, enabling well-driven irrigation. Between the arable land along the coast and the inland desert, there is a 50 km land strip with enough scrub vegetation to support livestock. The desert dominates the south with occasional oasis cultivation.[151]

Crops

Overall, only about 12 percent of the total area of 15.4 million hectares is arable. Although 470,000 hectares are suitable for irrigation, only some 240,000 hectares are currently irrigated due to concerns over the depletion of underground water.[152] Given the arid nature of Libya, irrigated farming systems have always been of crucial importance in generating much of the country's agricultural output. About 50 percent of cereal production and about 90 percent of fruit and vegetable production originates from irrigated agriculture.[153] The most cultivated crops are wheat, barley, olives, dates, citrus, and a large variety of vegetables, peanuts, and soybeans.[154]

In the 20 affected municipalities, the overall cropland is around 377,778 ha, of which 27,922 are irrigated. The crops are season-specific; during winter, wheat and barley are planted. In summer (when the flood occurred), chili, carrots, tomatoes, beans, cucumber, pepper, eggplant, peas, onions, potatoes, cabbage, corn, millet, melons, watermelons, and cantaloupes are grown. These products are mainly for internal consumption but are sometimes also exported to neighboring countries.

Cereal crop production in 2022 was estimated at 209,000 MT. The country relies heavily on imports (up to 90 percent) to cover its consumption requirements, and therefore, domestic production has a limited impact on the import requirement. In 2022 / 2023 the import requirement was estimated at 3.2 million MT, which is close to the average.[155]

Livestock

The animal population of Libya is estimated around 150,000 cattle, 6,500,000 small ruminants, 110,000 camels, 12,000 horses and donkeys and 15 million poultry. Diseases of major economic importance, and zoonotic diseases, are endemic to the country, but there is little information about their epidemiology, prevalence, and distribution. Most animal products are for domestic consumption; even so, demand is not covered and needs to be supplemented by imports. Most Veterinary Services are carried out under the responsibility of the National Centre of Animal Health (NCAH), which is part of the Ministry of Agriculture and Livestock. Aside from their HQ and the different regional offices, there are around 50 local NCAH offices and 300 public veterinary clinics. The overall system may include around 1,000 veterinarians and 2,000 paraprofessionals or support staff, although only partial data are available, and are not always accurate.[156] In the affected area the pre-disaster

148 **For this assessment, the agriculture is composed of crops and livestock only, forestry and fisheries being included in the environment chapter.**

149 *Libya - share of economic sectors in the gross domestic product 2012-2022 | Statista*.

150 *Libya - Employment in Agriculture (percent Of Total Employment) - 2023 Data 2024 Forecast 1971-2021 Historical (tradingeconomics.com)*.

151 *Land | Free Full-Text | A Review of Libyan Soil Databases for Use within an Ecosystem Services Framework (mdpi.com)*.

152 *FAO GIEWS Country Brief on Libya –*.

153 *http://www.fao.org/nr/water/aquastat/countries/libya/index.stm*.

154 *Land | Free Full-Text | A Review of Libyan Soil Databases for Use within an Ecosystem Services Framework (mdpi.com)*.

155 *FAO GIEWS Country Brief on Libya –*.

156 *Libya_REMESA RECOMSA Com Plan Final___.pdf (fao.org)*.

livestock number recorded for cattle was 60,325, goats 558,114 and sheep 1,731,291.[157]

Challenges

Following the ceasefire agreement in October 2020, the security situation in the country has improved, facilitating farmers' access to fields, but the risk of military clashes remains. Farmers report that power cuts and high prices of inputs, including seeds, fertilizer, and machinery, continue to constrain their ability to cultivate land. At the same time, the reduced level of investment into the agriculture sector and the inefficiency in production systems means that young people are not interested in farming and move to cities in search of better lives.[158] Pre-existing water scarcity is further compounded by climate change with shifts in precipitation patterns and increased evaporation rates. Although Libya depends on imports of most food items[159], changes in temperature and rainfall patterns will also disrupt crop growth cycles, and crop yields may decrease by up to 30 percent at 1.5–2°C warming in Libya, seriously limiting already constrained domestic food production.[160]

Deforestation in the Al-Jabal Al-Akhdar region - much of which appears to be caused by the expansion of agricultural land - contributed to land degradation and lowered the capacity of the land to avert runoff and absorb rainfall. Studies indicate that the highest rates of deforestation in the area occurred after the 2011 revolution. This is likely due to the ensuing conflict and lower capacity and ability of authorities to protect forested areas. It is estimated that some 513 ha a year were lost between 2010 and 2017.[161]

Assessment of Disaster Effects[162]

The agricultural sector was less affected than other sectors, as the storm had a more devastating impact along the coastline and less in the upland hinterland. Nevertheless, the following two components were affected, and considered in the RDNA: crop production (annual and perennial) and livestock production. The main cause of the floods was the high rainfall (up to 414 mm in 24 hours), which left a silt layer on the affected agricultural land. The localized strong winds (up to 80 km/h) uprooted perennial crops, and grapes and fruit trees (citrus, olives, pomegranates, plumbs, dates) to a lesser extent.

In total, 16,209 ha of annual crops (mainly vegetables and some cereals) were affected and lost their harvest, with a value of losses of US$ 8.53 million. In addition, a total of 487,078 grapes and fruit trees were affected, wherefrom 5,011 trees were uprooted with a value of damages of US$ 1.03 million and have to be replanted. On the other hand, this year's whole grape and fruit production of the remaining affected grapes / fruit trees was totally lost, and the losses of production of the uprooted trees until replanting and maturity are valued at US$ 2.78 million.

In terms of livestock, a total of 74,363 animals were reported dead[163], representing approximately 3.2 percent of the affected region's herd, of which 2,112 were cattle (80 percent cows), 53,632 sheep and 18,619 goats. In addition to the value of the dead animals, damage estimated at US$ 21.73 million, herders have also lost their animal products (milk[164], offspring and wool[165]) until the time restocking will be completed, and for the animals to reach maturity again, with a loss of production estimated at US$ 42.12 million. The physical constitution of the remaining livestock is also affected, due to the reduced quality of pastureland or depletion of rangeland resources

157 No data were available for poultry.

158 *FAO GIEWS Country Brief on Libya –.*

159 Libya imports about 75% of its food and relies heavily on irrigation due to its limited renewable water resources (source: *https://reports.unocha.org/en/country/libya/card/2r82XSjHkw/*).

160 *https://openknowledge.worldbank.org/entities/publication/98508814-21c5-53e6-b36c-912a4ecf9da7.*

161 Alawamy, Jamal Suliman, Siva K. Balasundram, Ahmad Husni Mohd. Hanif, and Christopher Teh Boon Sung. 2020. "Detecting and Analyzing Land Use and Land Cover Changes in the Region of Al-Jabal Al-Akhdar, Libya Using Time-Series Landsat Data from 1985 to 2017" Sustainability 12, no. 11: 4490.

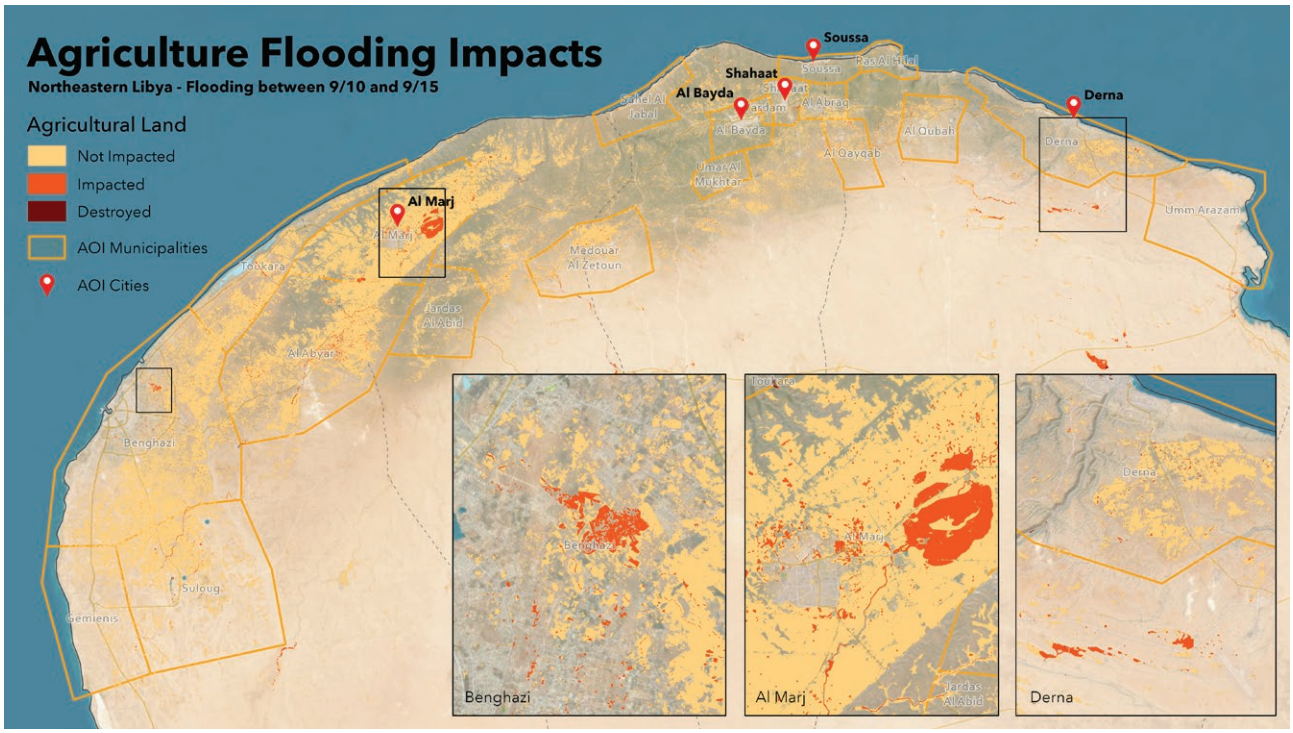
162 Only crops and livestock included no data available related to agriculture infrastructures, buildings, or equipment / machinery.

163 Data on poultry was not available.

164 Milk and off-spring only for female animals, an assumption was taken that out of the total number of all the types of livestock affected, 20 percent were male, and 80 percent were female.

165 even when wool is not sold directly, it has still a value as it **is mainly for own use – as filling for mattress or pillows, or yarn for carpet making – which** might **be sold thereafter.**

Figure 34: Agriculture Land and Flooding Impact in Northeast Libya



Source: Assessment team.

Table 23: Agriculture Damage and Loss Inventory

Asset Types	Partially affected Units	Completely destroyed units	Total Cost (in LD million)	Total Cost (in US$ million)
DAMAGE				
livestock (heads)		74,363	106.03	21.73
perennial crops (plants)		5,011	5.01	1.03
Total Damage			**111.04**	**22.75**
LOSSES				
livestock (heads)		74,363	205.56	42.12
annual crops (Ha)	16,209		41.61	8.53
perennial crops (Ha)	1,218		13.57	2.78
Total Losses			**260.73**	**53.43**
Overall damages and losses			**371.77**	**76.18**

Source: Assessment team.

after the storm, leading to higher risks of epidemic outbreaks.

No data was available on damage to farm buildings / facilities or equipment / machinery, and therefore, the estimates of these effects were not included in the table below under damages. Effects on irrigation were included in the Water & Water-Sanitation sectoral report, and forestry / fisheries were included in the Environment sector report.

Table 24: Agriculture Damages and Losses by Municipality[166]

#	Municipality	Total Damage		Total Loss		Total Damage + Loss	
		In US$ million	In LYD million	In US$ million	In LYD million	In US$ million	In LYD million
1	Al Abraq	25,327.87	123,600	52,235	254,909	77,563	378,509
2	Al Abyar	3,547,027.73	17,309,495	8,502,984	41,494,563	12,050,012	58,804,058
3	Al Bayda	658,190.24	3,211,968	1,264,617	6,171,329	1,922,807	9,383,298
4	Al Marj	4,632,578.46	22,606,983	11,118,524	54,258,398	15,751,103	76,865,381
5	Al Qayqab	363,493.85	1,773,850	811,104	3,958,189	1,174,598	5,732,039
6	Al Qubah	1,179,825.82	5,757,550	2,389,977	11,663,088	3,569,803	17,420,638
7	Benghazi	3,285,976.37	16,035,565	7,197,592	35,124,249	10,483,568	51,159,813
8	Derna	1,075,706.70	5,249,449	2,170,746	10,593,240	3,246,453	15,842,689
9	Gemienis	396,516.39	1,935,000	834,420	4,071,969	1,230,936	6,006,969
10	Jardas Al Abid	195,245.90	952,800	452,174	2,206,609	647,420	3,159,409
11	Medouar Al Zetoun	756,723.16	3,692,809	1,765,002	8,613,208	2,521,725	12,306,017
12	Ra's Al Hilal	42,971.31	209,700	85,475	417,119	128,447	626,819
13	Sahel Al Jabal	265,789.06	1,297,051	529,119	2,582,102	794,908	3,879,152
14	Shahaat	202,172.13	986,600	430,443	2,100,562	632,615	3,087,162
15	Soussa	663,324.50	3,237,024	1,273,366	6,214,025	1,936,690	9,451,049
16	Suloug	1,502,100.41	7,330,250	3,608,429	17,609,133	5,110,529	24,939,383
17	Toukara	2,072,924.99	10,115,874	4,462,475	21,776,879	6,535,400	31,892,753
18	Umar Al Mukhtar	70,799.18	345,500	146,073	712,836	216,872	1,058,336
19	Umm Arazam	785,676.23	3,834,100	1,574,201	7,682,102	2,359,877	11,516,202
20	Wardam	319,784.84	1,560,550	625,932	3,054,549	945,717	4,615,099
21	outside municipal areas	711,889.51	3,474,021	4,132,730	20,167,721	4,844,619	23,641,742
	Total	**22,754,044.65**	**111,039,738**	**53,427,619**	**260,726,779**	**76,181,663**	**371,766,517**

Source: Assessment team.

166 *Outside municipal area = areas that are outside the perimeter of municipal borders, where agriculture cropland has also been affected by the floods.*

Linking Effects to Human Impacts

In 2023, the WFP estimated that over 324,000 individuals were in need of food assistance. This number has drastically increased since storm Daniel.[167] Based on the Multi-Thematic Rapid Needs Assessment, 76 percent of respondents mentioned that food prices increased since the floods, 67 percent reported that the quantities of food in markets have decreased, and 53 percent mentioned that some essential food items are no longer available.[168]

In Libya, the Monthly Expenditure Basket (MEB) has increased since the Russian invasion of Ukraine by 32 percent. As Libya relies significantly on imports, the purchasing power of vulnerable households reduced their ability to afford nutritious foods and food staples, raising concerns about the overall food security situation, leading some to adopt negative coping strategies, including reducing food consumption to a limited number of meals per day and relying on lesser quality food items.[169] This situation has been aggravated since storm Daniel. According to the Food Security sector's latest survey, the MEB continues to increase[170] while 99 percent of households report difficulties obtaining their daily food due to high food prices.[171]

The labor-force has also been affected indirectly by storm Daniel. The agricultural activities are done either by household members or, more often, by hired migrant wage workers (domestic or foreign). Therefore, the destruction of large areas of annual and perennial crops leads to a lack of employment opportunities for these wage workers (during harvest, etc.). On the other hand, in the coming years, the replanting of the perennial trees and the land clearing will require additional wage workers.

Recovery Needs and Strategy

The main objective of the recovery process is to reactivate the agricultural and livestock activities in the affected regions in the shortest possible time. This should support household consumption, generate surpluses for markets, and contribute to national food self-sufficiency. Special focus will be given to BBB aspects, leading to a more sustainable and resilient sector in the face of climate change.

The recovery plan should directly address the needs of the affected farming and livestock households and communities through the implementation of the proposed recovery interventions while working with the relevant public institutions to strengthen national systems, thereby contributing to stability, peace, and the progressive building of individual and institutional resilience. The UNSDCF ensures close partnerships with the all stakeholders, and serves as an integrated strategic framework for recovery, development, and peacebuilding efforts, reflecting a humanitarian-development-peace nexus approach that addresses the root causes of vulnerability of the most vulnerable population groups.[172]

The replanting of annual crops will be done through a cash+ transfer modality, which allows farming households to select inputs, especially in terms of crop species (seeds) and the quantity and type of fertilizer. This intervention is time-bound and related to the seasons, and therefore should be prepared in advance so that farming households are able to acquire the inputs in time.

A similar package is foreseen for the affected perennial trees that have lost their fruits and require land preparation (to break the silt cover and improve aeration).

Replacement of the dead animals will be based on a cash transfer replacement approach (based on the average value of the type of animal lost, so that each beneficiary household can select the preferred type of animal from their own known sources (markets). This approach also reduces transport costs and puts an emphasis on localization.

The vaccination campaign to strengthen herds indirectly affected by the floods (low quality of pasture or grazing land) will be carried out by 50 local NCAH offices, in close collaboration with and under the supervision of the regional NCAH offices. It will target areas with high epidemiological pressure or animals to be used for restocking.

---

167 *WFP Libya Country Brief, June 2023 - Libya | ReliefWeb*.
168 UNDAC, REACH, 2023, Northeastern Libya Floods 2023, Multi-Thematic Rapid Needs Assessment (MTRNA).
169 *Libya Humanitarian Overview 2023 (December 2022) - Libya | ReliefWeb*.
170 Food Security Sector, Libya Market Update, October 2022.
171 2 IOM DTM Round 42 August 2022.
172 *United Nations Sustainable Development Cooperation Framework | UNSMIL (unmissions.org)*.

Table 25: Total Cost of Livestock and Crop Recovery

Needs Type	Total Cost (in US$ million)	Total Cost (in LYD million)
replanting perennial crops	1.32	6.43
supporting recovery of impacted perennial crop assistance package	0.24	1.19
replanting annual crops	2.56	12.49
restocking livestock	27.90	136.14
reinforcing animal health, vaccination campaign for livestock (ruminants)	1.05	5.14
SMART agriculture training	3.16	15.41
Total Needs	**36.23**	**176.79**

Source: Assessment team.

The training on SMART agriculture will provide a knowledge base to the farming households on how to face the challenges of climate induced events and adapt their agriculture / livestock rearing practices in order to increase their sustainability. The training will also provide innovative techniques to move towards a more commercially oriented agriculture.

As no data were available for damage to infrastructures, buildings, equipment, and machinery, a field assessment is needed to estimate the costs for their reconstruction or rehabilitation and to add these costs to those for recovery needs.

The most vulnerable affected households (with a special focus on women / youth-headed households) will be targeted i.e., those with crop production or livestock as their main source of income.

The following criteria to prioritize interventions were considered:

1. Time bound activities (not to miss the next planting season; replanting annual crops).
2. Reduce further losses / damages (vaccination campaign for livestock).
3. Value for money (vaccination campaign for livestock).
4. Number of beneficiaries targeted (annual crops).
5. Availability of inputs (saplings for wine and fruit trees).
6. Preparatory work (livestock market survey).

To some extent, the prioritization criteria have been considered in the sequencing of the interventions, aside from the estimated market supply potential, and in particular for the restocking and replanting of perennial trees intervention and the need for operational preparation (logistic).

The recovery process could be led and coordinated by the Ministry of Agriculture and Livestock (MoAL) and related institutions at the regional and municipality levels. Activities may also be implemented by international or national humanitarian / development stakeholders present in the field. The involvement of the private sector and other local farmers or livestock keepers' associations or cooperatives should be promoted, where available.

The above-mentioned recovery interventions vary between in-kind assistance, cash transfers, and services provided by specific MoAL departments. Particular attention should be paid to the localization principle, which will ensure ownership of the recovery process by local partners and therefore its long-term sustainability. The whole sectoral recovery process should reflect links between emergency - recovery - development interventions and should be consistent with the National Development Plan,[173], while working towards the Sustainable Development Goals of the 2030 Agenda.

The way forward could be to link business with agricultural activities, which could create employment opportunities and help alleviate some

173 *United Nations Sustainable Development Cooperation Framework | UNSMIL (unmissions.org).*

Table 26: Total Cost of Needs by Municipality for Agriculture

District	All type of intervention listed in needs table (see above) (except * no replanting of perennial trees)	total costs (in LYD million)	total costs (in US$ million)
Al Abraq	*	0.284	0.058
Al Abyar		27.871	5.711
Al Bayda		4.249	0.871
Al Marj		35.100	7.193
Al Qayqab	*	2.695	0.552
Al Qubah	*	7.836	1.606
Benghazi		25.429	5.211
Derna		7.440	1.525
Gemienis	*	3.248	0.666
Jardas Al Abid	*	1.802	0.369
Medouar Al Zetoun		5.847	1.198
Ras' Al Hilal	*	0.297	0.061
Sahel Al Jabal		1.795	0.368
Shahaat	*	1.402	0.287
Soussa		4.240	0.869
Suloug	*	12.271	2.515
Toukara		14.595	2.991
Umar Al Mukhtar	*	0.585	0.120
Umm Arazam	*	5.223	1.070
Wardam	*	2.072	0.425
outside municipal areas		12.512	2.564
Total		**176.79**	**36.23**

Source: Assessment team.

of the food security concerns, not only focusing on production (crops and livestock) but also strengthening the whole supply/demand chain. This would require the identification of SMART climate-resilient agricultural production systems (e.g., plastic tunnels or greenhouses, hydroponics, vertical farming), training in new technologies, facilitated access to credit and institutional support to establish agriculture-business start-ups. However, to achieve this, it is essential to facilitate communication between the public and private sectors, including key local investors who can disrupt the status quo of the agriculture sector in Libya.

The objectives of monitoring and evaluation are to measure results systematically, periodically, and objectively; by producing reports with reliable information contributing to transparency of the process. This can be done by using existing systems of UN agencies and local systems, strengthening them or, if necessary, setting up a specific system related to the recovery process, with particular emphasis on the disbursement and use of financial resources.

Communication campaigns are carried out through institutional networks, the website, and social networks to reach beneficiaries and the general public, mainly to provide information on recovery operations (dates and places of assistance to be provided, transfer modalities and composition of the package, criteria for the selection of beneficiaries and operational/administrative requirements to be met) in order to operate in full transparency. In addition, the various implementing actors must submit progress reports and financial updates on the disbursement and use of funds in accordance with the format and timetable previously defined by the donor.

Linkages with Cross-Cutting Themes

Libya's neglected agricultural sector has shrunk over the years, making it more vulnerable to the many challenges it faces. The effects of climate change have been felt through droughts, floods and more frequent dust and sandstorms, which have had a direct impact on the sector. Inadequate policies and protracted conflict have made the country even more vulnerable to these climate-related events. The economic instability of the agricultural sector has led many of its workers to seek alternative occupations, mainly in towns. In the context of gender, women often play pivotal roles in agricultural activities, and the adverse effects of climate change can have differential impacts on them. The conflict and frequent road closures have also drastically reduced agricultural activity and supplies to urban areas. In addition, there are no active agricultural associations or government programs to support farmers, resulting in limited production and access to investment.[174] In addition to food insecurity and malnutrition, Libya continues to struggle with multidimensional poverty, income inequality, low agricultural productivity, and climate change. In addition, challenges, such as limited access to resources and opportunities, should be considered for women who may be disproportionately affected by the instability in the sector. While the challenges and risks are numerous and significant, there are also many opportunities for national and international actors to work in partnership to overcome the obstacles on Libya's path to inclusive, sustainable, and peaceful development.[175]

Limitations

Key limitations for data assessment and verification were largely related to time and access constraints. Most of the impact data were derived from satellite imagery and should therefore be considered approximate, as there were limited ground cross-checks of the remote-sensing analysis. In the agricultural sector, some areas were classified as outside the municipality because they were not properly assigned to a specific municipality. No data were available / provided on effects on agriculture/ livestock related to buildings/facilities or equipment/ machinery, even when requested to partners in the field. Therefore, this must also be considered in the overall estimate reported here.

Table 27: Prioritized and Sequenced Interventions for Agricultural Recovery

Priority	Type of intervention	Short-term early recovery* (1-12 months)		medium-term* (1- 3 years)		Total Cost in US$ in million	Total Cost (in LYD million)
		US$	LYD	US$	LYD		
1	annual field crop package in cash (seed + fertilizer)	2,558,902	12,487,441	-		2.56	12.49
2	preventive vaccination campaign livestock (ruminants)	1,052,459	5,136,000	-		1.05	5.14
3	impacted perennial crop assistance package (contribution to rent tractor (land prep) & fertilizer)	243,499	1,188,275	-		0.24	1.19
4	replanting perennial crops	791,079	3,860,465	527,386	2,573,643	1.32	6.43
5	restocking livestock	16,738,637	81,684,549	11,159,091	54,456,366	27.90	136.14
6	SMART agriculture training	947,213	4,622,400	2,210,164	10,785,600	3.16	15.41
Total interventions		**19,772,887**	**108,979,129**	**13,896,641**	**67,815,610**	**36.23**	**176.79**

Source: Assessment team.

174 *Challenges Remain for Agricultural Sector in Libya: Ways Forward - The Tahrir Institute for Middle East Policy (timep.org).*
175 *Libya country strategic plan (2023–2025) (wfp.org).*

FINANCIAL SECTOR

The Libyan Financial sector is not sufficiently developed. Decades of central planning and the dominance of oil revenues have led to a highly centralized economy with a predominantly state-owned banking sector (with the shareholder being the CBL), financing government projects. As a result of this structure, Libyan banks did not develop modern banking tools and approaches, especially in client strategy, risk management, and financial intermediation and inclusion.

The banking sector has also been negatively impacted by the decade-long split of the CBL into western and eastern branches during the civil conflict.[176] After 2014, the competing authorities were financed by their respective branches of the CBL. The Tripoli-based government was financed by the CBL branch in Tripoli, which had access to both oil revenue and control of foreign currency reserves. Financing for the eastern-based government, beyond salaries and subsidies approved in the 2014 budget, was provided by the eastern branch of the central bank (CBL al-Bayda). As CBL al-Bayda received no revenue, expenditures were financed through bonds issued by the eastern government's Minister of Finance, which were purchased by CBL al-Bayda who would capitalize on them by providing credit lines to Libyan commercial banks. However, commercial banks were unable to translate these credit lines into hard currency. The fact that hard currency transactions could only take place with CBL Tripoli led to a drawdown in commercial bank reserves in Tripoli and an increase in reserves in CBL al-Bayda, with an increasing number of cheques that could not be cleared.

In addition, the banking sector was impacted by the imposition of laws in 2013, which overnight forbade interest on loans and deposits. Non-bank financing is particularly limited, with few alternatives to bank financing and almost no capital markets. Private property is severely limited and formal financing of private sector activities almost nonexistent. Modern tools to aid wide distribution and information sharing, such as mobile banking and fintech, are embryonic.

In terms of pre-flood financial sector infrastructure in impacted areas, a total of 114 bank branches were identified that are mainly concentrated in Benghazi (53.5 percent), Al Bayda (11.4 percent) and Derna (9.6 percent). Other municipalities have on average two bank branches.

Assessment of Disaster Effects

Similar to other sectors, the floods devastated the financial sector. Based on triangulation of Ipsos research and analysis from satellite imagery, ground interviews, and PAI (including social media analytics), the analysis identified 114 bank branches in flooded municipalities, of which eight (seven percent) were partially damaged and five (4.3 percent) destroyed. Derna is the most affected municipality with five partially damaged branches and five destroyed, which is 77 percent of total flood damages to financial infrastructure across all impacted municipalities. The remaining three partially damaged bank branches outside of Derna are in Al Bayda, Shahhat, and Benghazi.

Banking services operate in all municipalities except in Derna where they are limited. According to Ipsos ground partner findings, "banks in Derna operate as usual in unaffected areas, while some affected banks have opened temporary branches within the city to provide financial services and procedures. These banks are North African Bank, Sahara Bank, and the Commercial Bank". As such, the financial sector has received limited support, and those living in Derna continue to face obstacles in accessing financial services. In other municipalities, banks distribute pensions and operate normally, occasionally having problems due to a lack of access to cash.

Total damage cost estimates amount to US$ 2,559,567 (LYD 12,300,000) based on unit cost estimates of US$ 312,142 (LYD 1,500,000) per bank branch, and assuming that partially damaged assets are destroyed at 40 percent. The damage assessments in the financial sector are partial due to limited data. Indeed, while information was collected on bank branches, there was no data available on ATMs, Points of Sale machines, and other financial sector institutions beyond the banking sector such as insurance and leasing companies, post offices, microfinance institutions, etc.

176 The Central Bank of Libya was reinstated as a unified sovereign institution in august 2023.

Table 28: Damage and Loss Inventory for Banks

Asset Types	Baseline	Partially damaged	Completely destroyed	Total Cost (In US$ million)	Total (In LYD million)
DAMAGE					
Bank Branches	114	8	5	2.5	12.3
Money exchanges / transfer offices	1	0	0	0	0
Total Damage				**2.5**	**12.3**
LOSS					
Bank Branches	114	8	5	0.4	1.9
Money exchanges / transfer offices	1	0	0	0	0
Total Loss				**0.4**	**1.9**

Source: Assessment team.

Table 29: Damage and Losses by Municipality[177]

		Total Damage		Total Loss		Total Damage + Loss	
#	Municipality	US$	LYD	US$	LYD	US$	LYD
1	Derna	2,184,996	10,500,000	327,749	1,575,000	2,512,746	12,075,000
2	Al Abraq						
3	Soussa						
4	Al Bayda	124,857	600,000	18,729	90,000	143,585	690,000
5	Al Marj						
6	Sahel Al Jabal						
7	Shahaat	124,857	600,000	18,729	90,000	143,585	690,000
8	Jardas Al Abid						
9	Medouar Al Zetoun						
10	Al Qayqab						
11	Ra's Al Hilal						
12	Wardam						
13	Umar Al Mukhtar						
14	Toukara						
15	Benghazi	124,857	600,000	18,729	90,000	143,585	690,000
16	Gemienis						
17	Suloug						
18	Umm Arazam						
19	Al Qubah						
20	Al Abyar						
Total		**2,559,567**	**12,300,000**	**383,940**	**1,845,000**	**2,943,502**	**14,145,000**

Source: Assessment team.

177 Cost estimates are based on IPSOS unit costs of LYD 1,500,000 per bank branch.

Linking Effects to Human Impact

While in most municipalities financial services delivery is restored, restoration is incomplete in Derna; thus, preventing some of the city's inhabitants from accessing their funds, and isolating them from the rest of the world. Residual governance issues in the recently unified CBL are negatively impacting banks in eastern provinces such as Derna, putting them at a disadvantage for a speedy recovery and consequently reducing social and financial inclusion of impacted households, businesses, and communities.

Recovery Needs and Strategy

The key short-term priority need in the financial sector is to repair and rebuild damaged and destroyed bank branches to restore financial services. Existing constraints and the impaired functioning of the financial sector in channeling financing will impede reconstruction and recovery efforts if left unaddressed, especially in Derna, where damages and service disruption are greatest and need to be addressed as a priority. Further consolidating the announced Central Bank reunification and supporting all financial institutions regardless of their geographic location is crucial for the stability and integrity of the financial sector. Beyond the immediate recovery priorities in the medium-term, the continued efforts by authorities to reunify the CBL would mitigate liquidity risks, boost confidence in the banking sector, and foster private sector development.

Beyond repairs, in the immediate-to short-term, emergency financing support could be carefully targeted at certain households and businesses directly impacted by the floods for: (i) rebuilding and repairing housing units and rental housing support for vulnerable groups, and (ii) supporting viable businesses and preserving jobs and livelihoods. The insurance sector could benefit from technical support and engagement to settle claims for large assets and in claim settlement policies for more standard claims. Solvency issues need to be carefully monitored, given the potential for a large number/value of claims, and limited absorbing capacity of the insurance sector. Limited direct support to the most vulnerable policyholders in the event of insurer failure may be considered.

Medium-term recovery will require broader stabilization, covering notably the strengthening of the AML/CFT framework, ensuring adequate bank capitalization, reinforcing credit infrastructure including the re-opening of the credit registry, closed since 2011, divesting holdings of the CBL in commercial banks over the longer run to allow them to operate independently, strengthening the Islamic finance framework and reinforcing data adequacy and statistical capacity.[178] Financial sector reconstruction should further emphasize digital transformation and digital financial services, including the latest payment technologies that help reduce costs, increase access to the unbanked, and reduce reliance on cash. In addition, initiating the greening of the financial sector to finance green transition adaptation and mitigation. Finally, diversifying financial offerings beyond the banking sector would also greatly improve financial intermediation and inclusion.

Table 30: Total Cost of Banking Sector Needs

Needs Type	Total Cost (in US$ million) - including costs for BBB, etc.	Total Cost (in LYD million) - including costs for BBB, etc.
Need type 1 - rebuilding destroyed bank branches, cost of materials, etc.	1.9	9.2
Need type 2 - rebuilding a modern, inclusive, and resilient financial system	1.9	9.2
Total Needs	**3.8**	**18.4**

Source: Assessment team.

178 International Monetary Fund, Article IV, June 2023.

Table 31: Total Cost of Needs by Municipality

#	Municipality	Needs category[179]	Cost (In US$ million)	Cost (In LYD million)
1	Derna	Repair and rebuild bank branches	3.3	15.7
2	Al Abraq	Repair and rebuild bank branches		
3	Soussa	Repair and rebuild bank branches		
4	Al Bayda	Repair and rebuild bank branches	0.2	0.9
5	Al Marj	Repair and rebuild bank branches		
6	Sahel Al Jabal	Repair and rebuild bank branches		
7	Shahaat	Repair and rebuild bank branches	0.2	0.9
8	Jardas Al Abid	Repair and rebuild bank branches		
9	Medouar Al Zetoun	Repair and rebuild bank branches		
10	Al Qayqab	Repair and rebuild bank branches		
11	Ra's Al Hilal	Repair and rebuild bank branches		
12	Wardam	Repair and rebuild bank branches		
13	Umar Al Mukhtar	Repair and rebuild bank branches		
14	Toukara	Repair and rebuild bank branches		
15	Benghazi	Repair and rebuild bank branches	0.2	0.9
16	Gemienis	Repair and rebuild bank branches		
17	Suloug	Repair and rebuild bank branches		
18	Umm Arazam	Repair and rebuild bank branches		
19	Al Qubah	Repair and rebuild bank branches		
20	Al Abyar	Repair and rebuild bank branches		
Total			**3.8**	**18.4**

Source: Assessment team.

Table 32: Prioritized and Sequenced Interventions for Banking Sector Reconstruction

Intervention/Activity	Short-term early recovery* (1–12 months)		medium-term* (1–3 years)		Total Cost US$ million	Total Cost LYD million
	US$	LYD	US$	LYD		
Establish temporary banking services and repair damaged bank branches	1.9	9.2	-	-	1.9	9.2
Strengthen Financial sector resilience	-	-	1.9	9.2	1.9	9.2
Total Needs	**1.9**	**9.2**	**1.9**	**9.2**	**3.8**	**18.4**

Source: Assessment team.

179 Copied from table above.

Linkages with Cross-Cutting themes[180]

Strengthened governance within the recently unified CBL will be key to addressing the necessary repairs and reconstructions in the banking sector infrastructure and enabling the sector's rapid response to emergency financing needs of businesses and vulnerable groups.

In the medium term, the recent disaster underlines the importance of initiating the greening of the financial system to improve its resilience to disaster/climate risk. Finally, despite the lack of baseline information on financial inclusion, ensuring the inclusion of women and vulnerable groups needs to be monitored in the context of recovery efforts.

Limitations

There are considerable data limitations on baseline and post-disaster financial infrastructure and service delivery in the impacted areas. As such, the assessment of damages and needs in the financial sector is partial and would benefit from an update when data are available.

180 Cross-cutting themes include: FCV, Climate Change, Gender, Governance, and Social Inclusion.

© Seraj Elhouni/Shutterstock.com

INFRASTRUCTURE SECTORS

ENERGY

Libya's electricity (power) sector has relied heavily on government investments based on the country's rich endowment in oil and gas (O&G), the mainstay of its economy. The country has reported high rates of access to electricity for its people and businesses, following decades of investment in electricity infrastructure. However, multiple factors have contributed to the degradation of Libya's electricity system and reliability of services since 2011, including the lack of maintenance of existing infrastructure, improvements in energy efficiency, the addition of new electricity generation capacity, incentives to rationalize electricity use, and investment in renewable energy.

The availability of infrastructure has thus not been matched by the reliability of service. As a result, the provision of electricity in recent years has been rationed by the practice of load shedding – to avoid system-wide grid failure. Despite all the efforts, power outages often lasted ten or more hours per day, turning the city's streets dark at night and leaving residents without air conditioning.[181] It is also worth mentioning that Libya consumes two to four times more electricity per capita than its neighbors.[182]

Libya has a total nameplate installed electricity generation capacity of about 10–11 Gigawatts (GW), but the capacity effectively available is reported to be ~8 GW and fails to meet the demand of ~9 GW. The availability of generating capacity is, in turn, constrained by unreliable fuel supply, with repeated cut-offs of fuel sources (refined petroleum products as well as gas) supplying power plants. Besides the generation facilities, the electric power grid needs strengthening, including repairs of lines and substations damaged in past conflicts.

The state-owned electricity utility company, the General Electricity Company of Libya (GECOL), while still struggling to meet the country's growing demand for electricity, has reported significant progress in reducing the duration and frequency of power outages since 2022. To maintain momentum, GECOL needs to resume constructing power stations after disruptions following the 2011 revolution. It also needs to commission new gas turbine power plants and maintain its current fleet of power stations.

The power sector in Libya faces many other challenges, including cost recovery through tariffs. Libyan electricity rates are among the lowest in the region, at 0.040 dinars (one US cent) per kilowatt-hour for individuals, and 0.080 dinars for businesses.[183] Subsidized electricity tariffs are closely linked to the entrenched practice of fossil fuel subsidies. The prices paid by Libya's electric power utility for fossil fuels such as natural gas, light fuel oil, and heavy fuel oil are a small fraction of the market value of these fuels on the international market for energy commodities. The low prices erode incentives for GECOL's operational efficiency, with its commercial losses in 2022 reported at 45 percent.[184]

Libya also has the highest GHG emissions per capita on the African continent, at approximately 11.1 tons of carbon per person per year.[185] The primary source of these emissions (90 percent) is the energy sector, with fuel combustion for electricity generation, fuel refineries, and flaring of methane accounting for the majority of these emissions. [186] Libya's eastern regions have four major power generation plants: 1) Benghazi North, 2) Derna, 3) Tobruk, and 4) Zweitina (see Figure 35). The installed capacity of these plants amounts to 2.8 GW, or about a quarter of the total installed capacity in Libya (see *Table 37* for details). Despite its huge potential for renewable energy due to its location in the heart of the sun belt, and the creation of the Renewable Energy Authority of Libya (REAOL) in 2007, Libya has not yet built a single utility-size solar power plant.

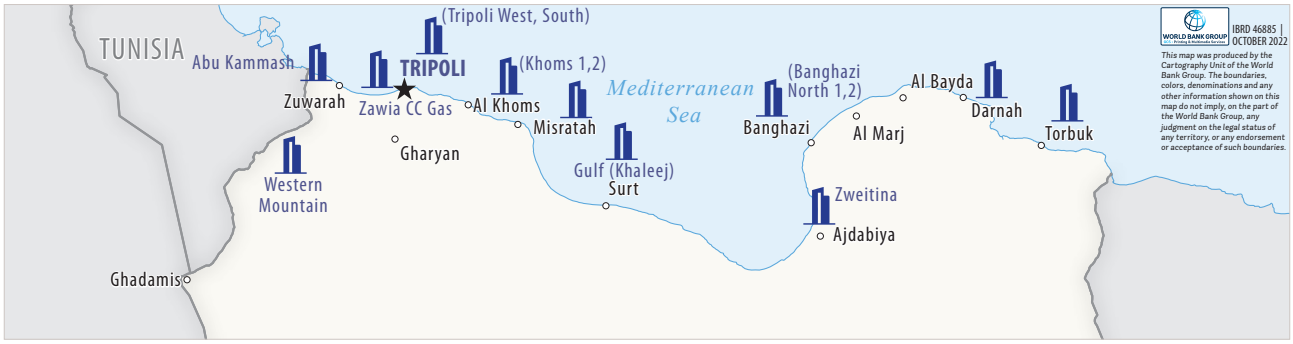
Tobruk is also the site of a new gas-fired power plant.[187] Once completed, the plant will have a total

181 *https://www.arabnews.com/node/2366326/middle-east*.
182 *https://ourworldindata.org/*.
183 *https://www.arabnews.com/node/2366326/middle-east*.
184 *chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://pdf.usaid.gov/pdf_docs/PA00ZVSX.pdf*.
185 *https://ourworldindata.org/co2/country/libya*.
186 Libya NDC White Paper.
187 *https://libyaobserver.ly/inbrief/work-continues-tobruk-gas-fired-power-plant-project-gecol-reports*.

power output of more than 740 MW and dual fuel (natural gas and light fuel oil) capability.

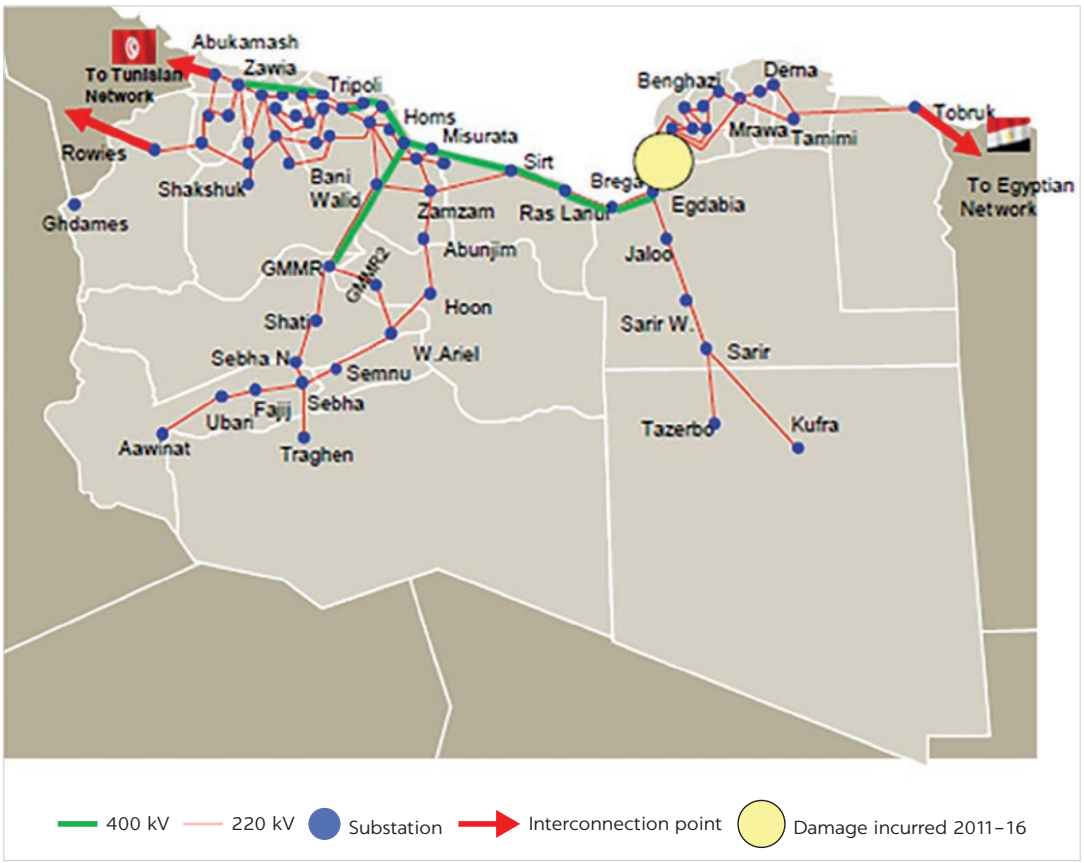
Libya's electricity transmission system (including transmission substations, which are an important part of the damage assessment in this RDNA) has been fairly robust and has withstood many incidents of vandalism resulting from civil strife since the 2011 revolution. The most severe and longest-lasting damage was in Benghazi city in 2014–15 (yellow circle on map 3), which led to the separation of the network into Eastern and Western sections, load shedding in Benghazi, and shortages in generation in the Western network and consequent load shedding there, too. GECOL eventually repaired the damaged parts of the network.

Figure 35: Libya's Power Generation Assets



Source: *Libya Sourcebook of Challenges and Needs (World Bank 2023).*

Figure 36: Libya's Electricity Transmission System



Source: *Libya Sourcebook of Challenges and Needs (World Bank 2023).*

Assessment of Disaster Effects[188]

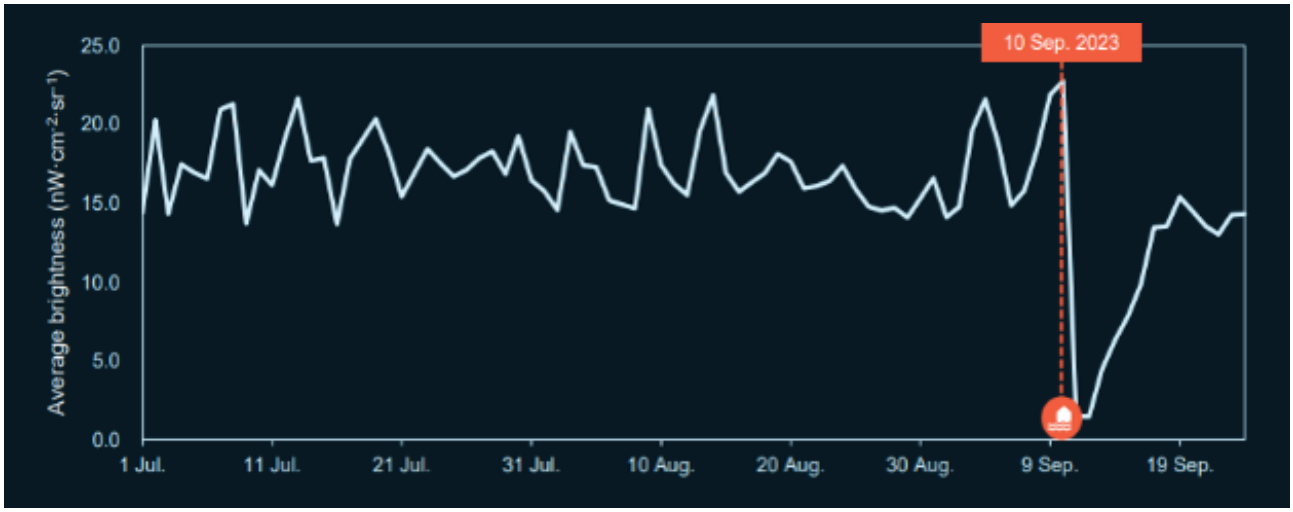
The floods revealed many weaknesses in the country's electricity sector. The electricity infrastructure would have been better able to withstand the impact of the floods had it been better maintained. The impacts of a decade of insecurity and institutional fragility have been important contributors to the deterioration of the electricity sector and infrastructure prior to the damage caused by the recent disaster.

This RDNA has assessed the condition of the energy (electricity) facilities located in 20 municipalities potentially affected by the floods, including power generation plants, electric transmission substations, and administrative office buildings associated with electricity provision to the municipalities. VIIRS[189] technology was used to detect the power outages and their duration in each affected area. Figure 37 shows the sharp drop in night-time brightness recorded by satellite imagery in Derna. Power supply estimated from night-time lights of Derna dropped by more than 90 percent after the floods. By 24 Sept. 2023, the power supply of Derna was restored to 80 percent of pre-floods levels.

It is clear that the power outage was most severe in the first day or two, with after-effects lasting for weeks. Similar power outages occurred in Al Bayda. In Benghazi, only a few areas east of the city lost power, and their supply returned to the pre-flood level by 24 September 2023.[190] It is hard to isolate the impacts specific to damage to the electricity sector from those due to electricity consumption resulting from other effects of the floods. Indeed, the loss of night-time brightness may be partially due to an outflow of people from the area rather than from electricity infrastructure failure.

In addition to the satellite data, information on the degree of damage to specific electricity infrastructure facilities has been collected by a team working on the ground in Libya. In the area assessed, 42 facilities were identified (see Table 33). Of these, six have been partially damaged, all of which are electrical substations. Furthermore, one substation is completely destroyed.

Figure 37: Average Night-Time Brightness in Derna Before and After the Floods



Sources: *International Charter Space and Major Disasters*; *UN Satellite Centre; Power Supply Assessment in Benghazi using Night-time Light Imagery*[191]

188 Damage is classified as **Partially Damaged** if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage is classified as **Completely Destroyed** if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

189 VIIRS = Visible Infrared Imaging Radiometer Suite.

190 Ibid.

191 *https://reliefweb.int/map/libya/power-supply-assessment-benghazi-libya-using-night-time-light-imagery-27-september-2023*.

Table 33: Damage and Loss in the Energy Sector

Asset Types	Baseline	Partially Damaged	Completely destroyed	Total Cost in US$ million	Total Cost in LYD million
DAMAGE					
Power Plant	10	0	0	0	0
Electrical Substation	22	6	1	34.0	163.4
Admin Office	10	0	0	0	0
Total Damage	**42**	**6**	**1**	**34.0**	**163.4**
ECONOMIC LOSS DUE TO POWER OUTAGES					
Total Loss				**40.9**	**196.5**

Source: Assessment team.

The damage caused by the floods to the electricity infrastructure is estimated at US$ 34 million in terms of replacement costs of the assets. Furthermore, the impact on the assets caused additional running costs of power supply to the affected communities, since severe power outages forced households and businesses to resort to more expensive ways to generate electricity, such as local diesel-fired generators. The economic losses due to the power outages in September 2023 are estimated at US$ 40.9 million. The total damages and losses are estimated at US$ 74.9 million (Table 33) – a conservative estimate given that some of the losses may have lasted through October 2023 and possibly longer until the grid power supply was fully restored.

Restoration of power supply to the affected communities was done as a matter of emergency response and through mobilization of resources from other parts of the power grid. This meant redirecting electricity flows to alternative paths through the transmission and distribution network. This is essentially a temporary fix to a power system with fundamentally (albeit partially) damaged capital assets, which still need to be restored. The current situation is all the more unviable given that the Libyan power system was already strained by the shortage of available generating capacity, even prior to the storm (refer to pre-storm context above).

Table 34: Damages and Losses by Municipality in the Energy Sector

#	Municipality	Damage, US$	Damage, LYD	Loss, US$	Loss, LYD	Total Damage + Loss, US$	Total Damage + Loss, LYD
1	Derna	4,000,000	19,222,000	6,581,924	31,629,434	10,581,924	50,851,434
2	Al Abraq	-	-	-	-	-	-
3	Soussa	14,000,000	67,277,000	877,590	4,217,258	14,877,590	71,494,258
4	Al Bayda	-	-	13,163,847	63,258,868	13,163,847	63,258,868
5	Al-Marj	-	-	7,313,248	35,143,816	7,313,248	35,143,816
6	Sahel Al Jabal	4,000,000	19,222,000	1,462,650	7,028,763	5,462,650	26,250,763
7	Shahaat	4,000,000	19,222,000	5,484,936	26,357,862	9,484,936	45,579,862
8	Jardas Al Abid	-	-	-	-	-	-
9	Medouar Al Zetoun	-	-	36,566	175,719	36,566	175,719

#	Municipality	Damage, US$	Damage, LYD	Loss, US$	Loss, LYD	Total Damage + Loss, US$	Total Damage + Loss, LYD
10	Al Qayqab	-	-	-	-	-	-
11	Ra's Al Hilal	4,000,000	19,222,000	73,132	351,438	4,073,132	19,573,438
12	Wardam	-	-	-	-	-	-
13	Umar Al Mukhtar	-	-	-	-	-	-
14	Toukara	4,000,000	19,222,000	36,566	175,719	4,036,566	19,397,719
15	Benghazi	-	-	5,850,599	28,115,052	5,850,599	28,115,052
16	Gemienis	-	-	-	-	-	-
17	Suloug	-	-	-	-	-	-
18	Umm Arazam	-	-	-	-	-	-
19	Al Qubah	-	-	-	-	-	-
20	Al Abyar	-	-	-	-	-	-
Total		**34,000,000**	**163,387,000**	**40,881,059**	**196,453,929**	**74,881,059**	**359,840,929**

Source: Assessment team.

In Table 34, the allocation of damages across the municipalities is based on the number of affected facilities and estimated capital costs per facility,[192] with the numbers of affected facilities as per Table 33. The allocation of losses, however, is proportional to the number of people affected by the floods in each municipality. The number of affected people is a proxy for the number of electricity consumers affected by the power outages, with no distinction made between households and businesses. The information on the number of affected people combines publicly available sources with that from the team on the ground.

Linking Effects to Human Impacts

The impact of the power outages on the communities is profound, even if power was restored in a relatively short time. The majority of the population in the affected areas relies heavily on the public power grid for electricity. Households, businesses, and public facilities, including healthcare, have to resort to expensive private generators to sustain operations during power outages.

Recovery Needs and Strategy

The assessment shows that most flood-damaged assets are electricity transmission substations. These should be a priority in the short term, in order to resume reliable electricity service to all affected areas. As noted above, the emergency response to the outages may have fixed the immediate problem but left the power system stretched for resources and vulnerable to future failures. In the longer term, GECOL should prioritize closing the gap in available generation capacity by resuming the delayed power plant construction disrupted by past conflicts and continue to address overhaul and maintenance requirements. The policy framework improvements, while not the immediate focus in the current crisis management environment, should aim at improving GECOL and sector financial sustainability by reducing subsidies on fossil fuel tariffs for electricity generation, which would also create incentives for energy efficiency and renewable energy development.

To fully recover from the September 2023 flood damage, Libya's electricity sector will need to apply the BBB principle. This means not only restoring its

192 Default average replacement costs per facility have been adopted in the absence of facility-specific cost information. The default cost per substation is US$ 10 million.

Table 35 : Total Cost of Needs in the Energy Sector

Needs Type	Total Cost (in US$ million) - including costs for BBB	Total Cost (in LYD million) - including costs for BBB
Restoration of Damaged Substations	44.2	212.4
Recovery of Losses from Power Outages in September 2023	53.1	255.4
Total Needs	**97.3**	**467.8**

Note: Building Back Better (BBB) premium of 30% is adopted.
Source: Assessment team.

Table 36: Prioritized and Sequenced Interventions for Reconstruction Needs

Intervention/Activity	Short-term early recovery (1–12 months)		Medium-term recovery (1 to 3 years)		Total Cost	
	US$ million	LYD million	US$ million	LYD million	US$ million	LYD million
Restoration of Damaged Substations	13.3	63.7	30.9	148.7	44.2	212.4
Recovery of Losses from Power Outages in September 2023	53.1	255.4	-	-	53.1	255.4
Total Needs	**66.4**	**319.1**	**30.9**	**148.7**	**97.3**	**467.8**

Source: Assessment team.

facilities to pre-disaster conditions but also ensuring that facilities are reconstructed to meet modern standards of safety and reliability, including the ability to withstand severe shocks, such as weather events of the scale of Storm Daniel (See Table 35 and 36).

Linkages with Cross-Cutting Themes

The political turmoil following the 2011 revolution has had substantial impacts on the energy sector, structure, and governance. The unresolved governance issues have left eastern Libya less prepared for the challenges in the electricity sector, among others. Derna, a coastal city with approximately 120,000 residents, grapples with inadequately maintained infrastructure and its vulnerable low-lying terrain, rendering it particularly prone to disaster.

The disaster has also revealed the weakness of a power sector that is vertically integrated and based practically entirely on fossil fuels. Distributed generation based on solar power, for example, could have saved the affected communities from the need to resort to more expensive and polluting local power supply options, such as diesel generators.

Limitations

The number of facility types covered in the assessment is limited to power generation plants, electric transmission substations, and administrative office buildings. This leaves out other types of facilities, notably electric power lines, which may have been damaged as well. Also, the assessment does not include O&G assets, such as the gas pipeline system passing through Libya's coastal zone, due to the lack of access to data.

Energy facilities mentioned in the Libya Sourcebook of Challenges and Needs,[193] possibly damaged but not covered by this RDNA, include the 220 kV transmission lines in Derna and its proximity to an oil refining facility east of Derna. In addition, it should be noted that it is hard to isolate the impacts specific to damage to the electricity sector from those due to electricity consumption resulting from other effects of the floodings. For example, the loss of night-time brightness may be partially due to an outflow of people from the area rather than from electricity infrastructure failure.

Table 37: Libya East Region's Power Generation Capacity

Power station name	Plant type	No. of units	Year in service	Planned retirement	Unit/ turbine type	Nameplate rating MW	Total installed capacity MW	Total available capacity in 2017, MW	Fuel type
Benghazi North 1	Combined cycle	3	1995	>2030	Gas	150	450	220	LFO/ Gas
		1	2002	>2030	Gas	165	165	140	LFO/ Gas
		2	2007	>2030	Steam	150	300	-	N/A
Subtotal		**6**				**465**	**915**	**360**	
Benghazi North 2	Combined cycle	2	2010	>2030	Gas	285	570	460	LFO/ Gas
		1	2013	>2030	Steam	250	250	105	N/A
Subtotal		**3**				**535**	**820**	**565**	
Total Benghazi North 1 and 2		**9**				**1,000**	**1,735**	**925**	
Tobruk	Steam (oil-fired)	2	1985	2019	Steam	65	130	-	HFO
Total Benghazi North, Derna, and Tobruk		**13**				**1,130**	**1,995**	**925**	
Zweitina	Gas (main)	4	1994	2026	Gas	50	200	35	LFO/ Gas
		2	2010	>2030	Gas	285	570	220	LFO/ Gas
Total Benghazi North, Derna, Tobruk, and Zweitina		**19**					**2,765**	**1,180**	

Source: Assessment team.

193 https://www.worldbank.org/en/country/libya/publication/the-long-road-to-inclusive-institutions-in-libya-a-sourcebook-of-challenges-and-needs.

Table 38: Total Cost of Needs by Municipality

#	Municipality	Needs category	Cost (in US$ million)	Cost (in LYD million)
1	**Derna**	Restoration of Damaged Substations	5.2	25.0
		Recovery of Losses from Power Outages in September 2023	8.6	41.1
	Derna subtotal		**13.8**	**66.1**
2	**Al Abraq**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Al Abraq subtotal		**-**	**-**
3	**Soussa**	Restoration of Damaged Substations	18.2	87.5
		Recovery of Losses from Power Outages in September 2023	1.1	5.5
	Soussa subtotal		**19.3**	**92.9**
4	**Al Bayda**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	17.1	82.2
	Al Bayda subtotal		**17.1**	**82.2**
5	**Al Marj**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	9.5	45.7
	Al Marj subtotal		**9.5**	**45.7**
6	**Sahel Al Jabal**	Restoration of Damaged Substations	5.2	25.0
		Recovery of Losses from Power Outages in September 2023	1.9	9.1
	Sahel Al Jabal subtotal		**7.1**	**34.1**
7	**Shahaat**	Restoration of Damaged Substations	5.2	25.0
		Recovery of Losses from Power Outages in September 2023	7.1	34.3
	Shahaat subtotal		**12.3**	**59.3**
8	**Jardas Al Abid**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Jardas Al Abid subtotal		**-**	**-**
9	**Medouar Al Zetoun**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	0.0	0.2
	Medouar Al Zetoun total		**0.0**	**0.2**
10	**Al Qayqab**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Al Qayqab subtotal		**-**	**-**

#	Municipality	Needs category	Cost (in US$ million)	Cost (in LYD million)
11	**Ra's Al Hilal**	Restoration of Damaged Substations	5.2	25.0
		Recovery of Losses from Power Outages in September 2023	0.1	0.5
	Ra's Al Hilal subtotal		**5.3**	**25.4**
12	**Wardam**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Wardam subtotal		**-**	**-**
13	**Umar Al Mukhtar**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Umar Al Mukhtar subtotal		**-**	**-**
14	**Toukara**	Restoration of Damaged Substations	5.2	25.0
		Recovery of Losses from Power Outages in September 2023	0.0	0.2
	Toukara subtotal		**5.2**	**25.2**
15	**Benghazi**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	7.6	36.5
	Benghazi subtotal		**7.6**	**36.5**
16	**Gemienis**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Gemienis subtotal		**-**	**-**
17	**Suloug**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Suloug subtotal		**-**	**-**
18	**Umm Arazam**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Umm Arazam subtotal		**-**	**-**
19	**Al Qubah**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Al Qubah subtotal		**-**	**-**
20	**Al Abyar**	Restoration of Damaged Substations	-	-
		Recovery of Losses from Power Outages in September 2023	-	-
	Al Abyar subtotal		**-**	**-**
Total			**97.3**	**467.8**

Source: Assessment team.

TRANSPORT

Before the storm, Libya's transport sector had been hindered by many challenges, including inadequate planning, neglect of maintenance, and political instability. Shortages of skilled personnel in road construction and maintenance have impacted the effectiveness of transport projects, which is crucial for sustaining the sector's infrastructure. Challenges in accessing foreign currency to pay foreign contractors have affected the country's ability to access essential equipment and technology needed for the sector's development. Desertification and extreme climate change patterns have had significant impacts on transport infrastructure, particularly in the southern regions. The recent storm is a testimony to Libya's vulnerability to climate change patterns.

Globally, transport systems contribute nearly 23 percent of global GHG emissions. Libya ranks 67th among global emitters, with a total share of 0.16 percent[194] of total global emissions. In 2020, Libya emitted 75.37 Metric tons of carbon dioxide equivalent (MtCO2e), out of which 64.45Mt (85.51 percent) came from the Energy production and Transport sectors. In 2020, Libya's per capita share of emissions was 10.97tCO2e. Libya is a party to the Paris Agreement, which requires countries to outline their climate actions, known as Nationally Determined Contributions (NDCs) to reduce national emissions and adapt to the impact of climate change. In the BBB scenario, the transport sector can play an important role in reducing national emissions and addressing the root causes of climate change.

Inadequate public transport infrastructure, insecurity and safety issues, hinder women's mobility and limit their access to economic opportunities. Unreliable public transport options led to extended commutes, diminishing the time available for work and education. These complex issues underscore the need for comprehensive improvements in transport systems to enhance women's economic prospects in Libya.

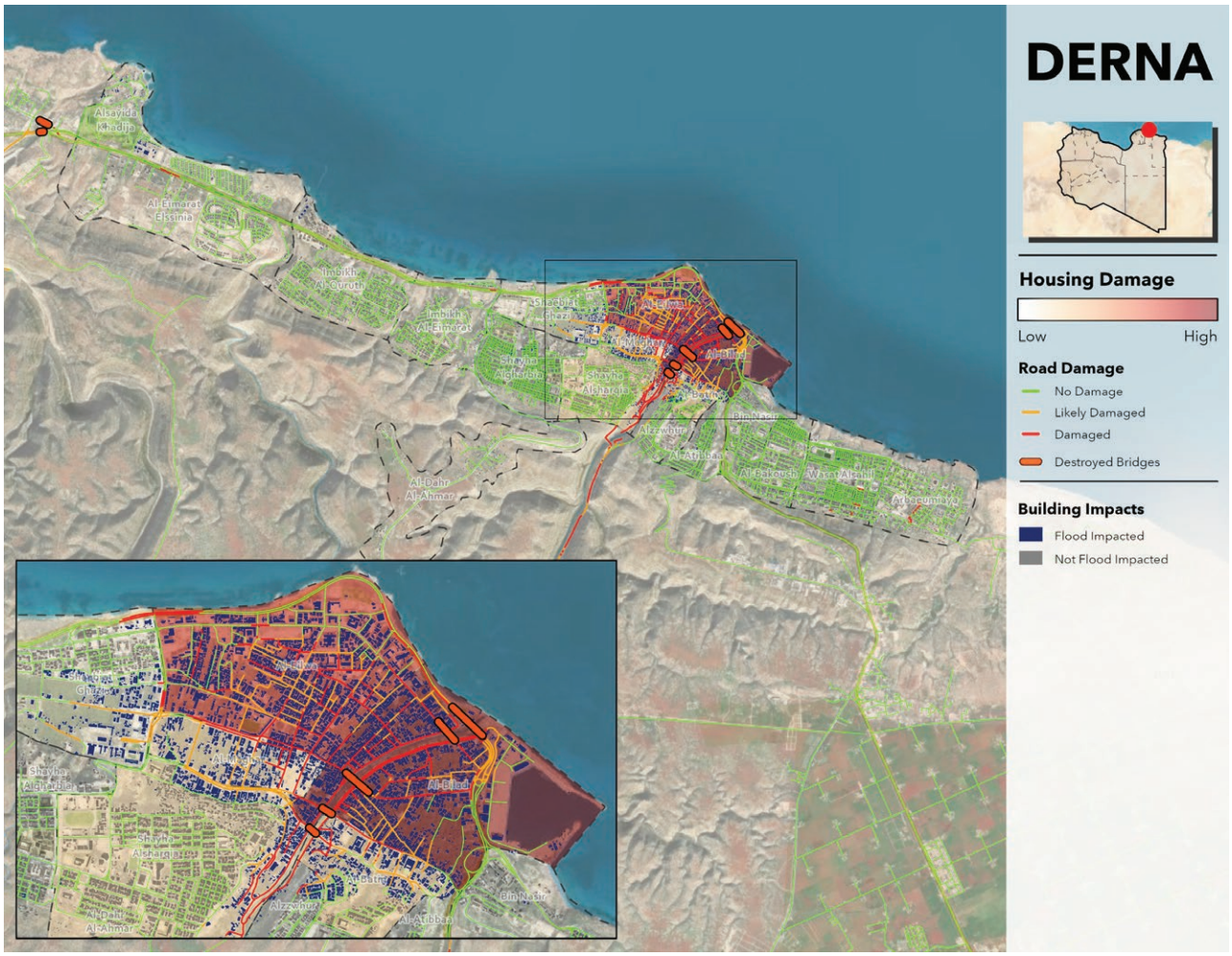
Libya's score in the Logistics Performance Index LPI (1.9)[195] is among the ten lowest-ranking countries affected by conflict and extreme climate change events. The LPI performance is a measure of the country's logistics and transport infrastructure, customs efficiency, ease of arranging shipments, quality of logistics services, ability to track and trace consignments, and timeliness of shipments. Political instability coupled with the impact of extreme climate events have adverse effects on these logistics performance indicators. The state of transport infrastructure, roads, ports, and airports, along with the non-operational railway network, contribute to inefficiencies in the sector. It is also affected by the institutional and capacity challenges facing the country.

Libya's road infrastructure is approximately 34,000 km of paved roads, 15,500 km of primary roads, and 18,000 km of secondary roads. Libya has a total of 23 airports and 16 ports. The Road and Bridge Authority (RBA) is responsible for the overall operation and maintenance of Libya's roads and bridges network. Its responsibilities also include improving connectivity and road safety. The total length of roads in the Eastern affected region of Libya is 14,561 km. A total of 32 km of primary roads, 44 km of secondary roads, 544 km of residential and *"Others"*[196] are damaged. Out of the five ports in the region, one port in Derna was partially impacted by the storm.

The status of service delivery and institutional capacity in Libya's transport sector is significantly challenged by various developmental issues. One major issue is the aging and deteriorating state of much of Libya's transport infrastructure, which includes roads, ports, airports, and public transport. Decades of underinvestment, due in part to complications in approving development spending and neglect of maintenance, have led to inefficiencies in the sector. As a result, roads and urban public transport are in poor condition and ports and airports are less efficient than their potential. This not only affects the overall capacity of the transport sector but also hinders its efficiency and safety. Additionally, the railway network in Libya, which spans approximately 600 km, with only 110 km in the East, has not operated since 1965.

194 *https://www.climatewatchdata.org/countries/LBY?end_year=2020&start_year=1990#ghg-emissions.*
195 https://lpi.worldbank.org/international/global.
196 Unclassified road, those are usually small roads that are neither tertiary nor secondary.

Figure 38: Road, Bridge and Housing Damage in the City of Derna



Source: Assessment team.

Insufficient allocations of funding have hindered the development and expansion of transport infrastructure. Libya relies heavily on expatriate workers, and shortages of skilled personnel in areas such as road construction and maintenance have impacted the effectiveness and sustainability of transport projects. Desertification and extreme climate change patterns have significantly impacted transport infrastructure, particularly in the southern regions. The recent storm is a testimony to Libya's vulnerability to climate change patterns.

Assessment of Disaster Effects: Damage and Loss Estimates[197]

The damage to all transport infrastructure in the region is 673 km, representing five percent of the total road network in the region. They include primary roads, secondary roads, tertiary and residential roads. 625 km of roads were partially damaged, and around 48 km were totally damaged. Public Transport assets and infrastructure are not covered in this assessment. The most impacted municipalities are Benghazi, Al Bayda, Soussa and Derna, which account for 80 percent of the total damage (partial and total damage) to the road network in the region.

197 Damage may be classified as Partially Damaged if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage may be classified as Completely Destroyed if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

The damage to the road infrastructure is highest in Benghazi at 219km, followed by Al Bayda at 150km, Sousa at 88km and Derna at 86km. The total damage in these four municipalities is 543km. It is notable that Benghazi was not directly hit by the storm. However, the damage to Benghazi's Road network refers to its rural and suburban road network. Out of the 104 bridges in the region, only 14 bridges were reported damaged by the storm; two are primary bridges, six tertiary bridges, five trunk bridges and one service bridge. Thirteen bridges were damaged by the storm in Derna, and one bridge in Al Bayda municipality. There are 19 airports in Libya, and no damage was reported to Airports in the region. Out of the five ports in the region, only one port in Derna is reported damaged.

The loss in the transport infrastructure includes widespread disruption to traffic movement, access, and mobility of the people in the region. Following the storm, nearly 50 percent of the region's road network became impassable,[198] therefore impacting access to essential services such as health centers, markets, and schools, and forcing people to take lengthy detours and travel time. The accumulation of water, debris from washed-away buildings and vehicles, and mud compounded the already difficult situation. These infrastructures were not built to withstand such pressure, and nor were the authorities prepared for such devastation.

The destruction of the road network, including damage to public and private vehicles, has caused major disruptions in people's lives. It has severely hindered access and mobility of people, goods and services in the affected area. Blocked roads, falling debris from destroyed buildings, and accumulation of water and mud have forced people to take long detours, leading to congestion, longer travel times, higher transport costs, and lower productivity.

The economic losses due to the damage to roads and bridges are estimated at US$ 21 million. Due to the lack of data on the number of registered vehicles, data on the number of vehicles damaged, traffic flow speed before and after the storm, as well as lack of data on the overall condition of the road network before and after the storm, it is hard to quantify the economic losses from disruptions in the sector. Therefore, the team estimates the economic loss as a percentage of the total damage in the sector.

The economic losses include losses resulting from longer travel time, higher Vehicle Operating Costs (VOC), losses of revenues from fuel sales, despite the fact that fuel is heavily subsidized in Libya and vehicle registration fees. The economic losses also include higher vehicle emissions due to poor road conditions. The bad roads pose major road safety risks and human loss, leading to higher economic costs. The team estimates the economic losses at 15 percent of the total damage in the sector.

Due to several challenges, including the absence of data on road conditions, traffic data before and after the disaster, and overall data uncertainty, the team chose to use a percentage of the total damage as a proxy for economic loss and a simplified approach which assumes that 15 percent of the total physical damage incurred would translate into economic loss.

Due to the storm, nearly 50 percent of all roads in the impacted area were inaccessible.[199] The following municipalities have been impacted most, comprising 80 percent of the total damages in the 20 municipalities:

1. Benghazi is the second-largest city in Libya and an important economic center. It is known for its port, which handles a substantial portion of the country's exports, including oil. Benghazi is a central hub for trade and transport in Libya. It hosts a significant commercial port, which handles a substantial portion of the country's exports and imports, including oil and other goods. The city's location on the Mediterranean coast makes it a crucial gateway for international trade. Benghazi was severely impacted by the storm. Damage to its transport infrastructure accounts for 33 percent of the total damage reported in the 20 municipalities. Nearly 220 km of its road network was partially damaged.

2. Al Bayda serves as the capital of the Cyrenaica region. It has economic significance due to its role as a regional administrative and trade center. Al Bayda serves as an administrative and trade center in the eastern part of Libya. While not as prominent as Benghazi, it plays a regional role in trade and transport, connecting the Cyrenaica region to other parts of the country. Al Bayda was impacted by the storm. Nearly 145 km of its road network was partially damaged, and 5 km was totally damaged.

198 Libya new Agency- Roads and Bridges authority reveals percentage to infrastructure in east of the country. 2023-09-23.
199 Libya new Agency- Roads and Bridges authority reveals percentage to infrastructure in east of the country. 2023-09-23.

3. Sousa is located along the Mediterranean coast, making it a significant trade and transport hub. The city was impacted by the storm. A total of 88 km of the city's road network were damaged due to the storm.

4. Derna is located along the eastern Mediterranean coast; it has a role in coastal trade and transport. The city's port facilitates the movement of goods and connects to other regional coastal cities. Derna was severely impacted by the storm. A total of 86 km of its road network was severely damaged. Nearly 30 km of its road network was completely damaged, the highest among the 20 municipalities. The City's port was partially damaged, and 14 bridges suffered damage.

The challenges facing Libya's transport sector can have profound implications at the community and household level. Deteriorating transport infrastructure and limited access to reliable public transportation can significantly affect living

Table 39: Damage and Loss Inventory for Transport Infrastructure

Asset Types	Unit	Baseline	Partially Damaged	Completely Destroyed	Total Damage Cost (In US$ million)	Total Damage Cost (In LYD million)	Total Loss Cost (In US$ million)	Total Loss Cost (In LYD million)
Airport	**L.S.**	19	0	0.0	0.0	0.0	0.0	0.0
Port	**L.S.**	5	1	7.2	10.0	48.1	1.5	7.2
Primary Bridge	**L.S.**	20	0	5.8	8.0	38.4	1.2	5.8
Secondary Bridge	**L.S.**	9	0	0.0	0.0	0.0	0.0	0.0
Tertiary Bridge	**L.S.**	13	2	6.9	9.6	46.1	1.4	6.9
Residential Bridge	**L.S.**	5	0	0.0	0.0	0.0	0.0	0.0
Path Bridge	**L.S.**	2	0	0.0	0.0	0.0	0.0	0.0
Service Bridge	**L.S.**	1	0	0.1	0.2	1.0	0.0	0.1
Trunk Bridge	**L.S.**	51	1	0.3	0.4	2.1	0.1	0.3
Other Bridge	**L.S.**	3	0	0.0	0.0	0.0	0.0	0.0
Primary Road	**km**	702.6	29.5	3.1	16.4	78.9	2.5	11.8
Secondary Road	**km**	453.7	18.9	2.6	9.1	43.9	1.4	6.6
Tertiary Road	**km**	702.4	28.9	14.8	18.5	88.7	2.8	13.3
Track Road	**km**	230.2	3.2	0.1	0.1	0.4	0.0	0.1
Trunk Road	**km**	950.5	26.2	2.7	4.1	19.8	0.6	3.0
Residential Road	**km**	8,680.6	431.3	20.6	60.3	289.7	9.0	43.4
Others Road	**km**	2,841.5	87.9	4.2	2.9	13.8	0.4	2.1
Total					**140**	**671**	**21**	**101**

Source: Assessment team.

conditions and livelihoods. With inadequate public transportation options, such as buses and light rail or Bus Rapid Transport (BRT) in major cities, individuals may struggle to access job opportunities, healthcare services, and educational institutions, ultimately limiting economic prospects and social well-being. In addition, food security can be compromised as transport issues disrupt the timely delivery of agricultural and food products, impacting both production and access to food, leading to potential shortages and increased costs.

A comprehensive recovery strategy that prioritizes infrastructure rehabilitation, improved governance, and the resilience of the transport sector is critical. Such efforts can enhance living conditions and livelihoods by ensuring better access to jobs and services, promoting gender equity through equal access to opportunities, and safeguarding food security by facilitating the efficient flow of goods. It also fosters social inclusion by connecting communities and reducing disparities in access to essential resources, thereby improving the well-being of households and individuals across Libya.

Table 40: Damages and Losses by Municipality

Municipality	Total Damage		Total Loss		Total Damage + Loss	
	In US$ million	In LYD million	In US$ million	In LYD million	In US$ million	In LYD million
Al Abraq*	0.0	0.1	0.0	0.0	0.0	0.1
Al Abyar	3.7	17.6	0.5	2.6	4.2	20.2
Al Bayda	23.4	112.4	3.5	16.9	26.9	129.2
Al Marj	3.1	14.9	0.5	2.2	3.6	17.1
Al Qayqab	0.2	1.0	0.0	0.2	0.2	1.2
Al Qubah	1.1	5.1	0.2	0.8	1.2	5.9
Benghazi	27.8	133.4	4.2	20.0	31.9	153.4
Derna	53.7	258.0	8.1	38.7	61.7	296.7
Gemienis	0.5	2.4	0.1	0.4	0.6	2.7
Jardas Al Abid	0.6	2.8	0.1	0.4	0.7	3.3
Medouar Al Zetoun	0.7	3.5	0.1	0.5	0.8	4.1
Ras Al Hilal	0.1	0.5	0.0	0.1	0.1	0.6
Sahel Al Jabal	0.4	1.9	0.1	0.3	0.5	2.2
Shahaat	1.0	4.8	0.2	0.7	1.2	5.6
Soussa	16.8	80.7	2.5	12.1	19.3	92.8
Suloug	3.2	15.5	0.5	2.3	3.7	17.8
Toukara	0.8	3.8	0.1	0.6	0.9	4.4
Umar Al Mukhtar*	0.0	0.1	0.0	0.0	0.0	0.2
Umm Arazam	0.1	0.7	0.0	0.1	0.2	0.8
Wardam	2.4	11.7	0.4	1.8	2.8	13.4
Total	**140**	**671**	**21**	**101**	**161**	**772**

*Al Abraq's total damage = US$ 20,000; Umar Al Mukhta's total damage =US$ 30,000.
Source: Assessment team.

Linking Effects to Human Impact

The transport sector contributes nearly 3.5 percent to Libya's GDP.[200] Before the storm, Libya's transport sector suffered from governance issues, lack of investment and years of neglectful maintenance. The storm severely compounded the already exhausted situation of the sector. The condition of the transport infrastructure has direct impact on people's ability to access employment opportunities, health care, education, and public services, especially for women and girls. Safe and efficient transport promotes gender equality and improves livelihoods. Climate change events, such as the recent devastating storm and desertification, pose significant threats to the Libya's transport infrastructure. Improved sector governance, better coordination, and properly planned and well-maintained transport infrastructure are critical to enhancing resilience to extreme weather events and climate change risks.

The damage to the transport sector has a significant impact on production and access to goods and services. Supply chain disruption has led to travel time delays, increased costs of materials, and increased cost of production. Disruption of the road network has led to higher transport costs which are often passed to consumers in the form of higher commodity prices. The damage also impacted people's quality of life and gender equality. Road damage also disproportionately affects women, who face additional security risks.

Climate change and fragility may worsen the condition of transport in Libya. These challenges can cause damage to roads and supply chain disruptions, and hinder access to critical basic services, markets, and economic opportunities. These impacts can be particularly acute for the most vulnerable and marginalized communities, including IDPs. Lack of maintenance can also increase the sector's vulnerability to such events. Governance issues and lack of coordination hinder timely and effective response to climate change events, making it challenging to address vulnerability and enhance the sector's resilience. In addition, shortages of human resources and skilled personnel have led to delays in the maintenance and rehabilitation of the sector, making the sector more vulnerable to damage.

Recovery Needs and Strategy

Libya's transport sector recovery strategy involves several objectives. It focuses on the recovery and rehabilitation of damaged infrastructure, enhancing institutional capacity, building climate resilience, improving efficiency and safety, and promoting inclusive and multimodal transport. It should also emphasize resilient infrastructure, technological integration, and sustainable transport modes. Service delivery improvements should encompass effective project management, regulatory frameworks, workforce development, and creating the enabling environment for private sector engagement through Public-Private Partnerships (PPP). Technical studies, including climate resilience assessments, feasibility studies, and capacity building, are crucial for good planning.

The recovery and construction of Libya's transport sector will require significant amounts of resources, good governance, and increased coordination. It will also require significant planning to repair and upgrade the transport infrastructure to ensure reliable and efficient connectivity. The costs for recovery and reconstruction in the 20 municipalities amount to US$ 209 million. It includes short-term recovery and medium-term rehabilitation and reconstruction efforts to restore the roads and transport infrastructure facilities to pre-disaster standards. It also includes an annual amount of US$ 63 million for the maintenance, upkeep and management of the sector over four years. This needs to account for technical considerations to BBB to enhance the sector's resilience to the adverse effects of climate change shocks.

The recovery strategy for the transport sector comprises several crucial components to ensure its revitalization. In the short and medium terms, there is a need to prioritize investments that enhance the reliability and efficiency of connectivity within the sector. Strengthening the governance and institutional capacity of the transport sector is essential to improve planning, project management, and overall performance. Furthermore, it is vital to develop climate-resilient infrastructure and transport systems that can withstand extreme weather events and natural disasters. Additionally, enhancing the efficiency and safety of transport operations, promoting multimodal transport systems, and aligning planning with environmental considerations are key elements of this recovery strategy.

200 Libya National Account, Ministry of Planning 2022.

Several BBB factors have been considered in the analysis to change damaged infrastructure into a more resilient, sustainable, and efficient system. They include developing sustainable funding for the maintenance and operation of the infrastructures to ensure their continued functionality and resilience over the long term and to accommodate future growth in traffic and economic activities.

Flood protection approaches should be adaptable to changing conditions and should be designed to accommodate variations in water levels, potentially incorporating adjustable barriers, flood gates, and drainage systems to manage floodwaters effectively. In the context of recovery and reconstruction strategy for the transport sector, the critical aspects for BBB are providing flood protection measures and drainage structures. These measures provide a proactive response to the immediate and evolving flooding threats, helping to protect lives and critical infrastructure.

Flood protection measures should be geared towards adaptation to the impacts of climate change by using climate-resilient materials and eco-friendly, nature-based, and green solutions to absorb and redirect floodwaters. Additionally, future flood protection infrastructure should be designed and implemented to minimize disruptions to transport systems during floods, allowing for swift recovery and service continuity.

Before planning and constructing flood protection infrastructure, it is essential to conduct a comprehensive flood risk assessment. The assessment should take into account historical flood data, potential flood sources, and the vulnerability of transport assets to flooding. Early Warning Systems (EWS) and adaptive design elements should aim to mitigate the adverse effects of climate change on transport systems and communities. Advanced technology and communication systems can provide real-time data on flood conditions, enabling timely responses and safe evacuation of people in flood-prone areas.

As part of a BBB approach, the strategy recommends investing in resilient and integrated urban transport design during the reconstruction of cities. This includes incorporating climate-resilient features to protect transport infrastructure against flooding and landslides. Modern technologies for transport management, eco-friendly and sustainable transport modes, and the consideration of environmental and social concerns in transport projects are crucial elements for building a more robust transport sector. Encouraging eco-friendly and sustainable transportation modes like public transport and electrification, implementing regulatory frameworks, and investing in workforce development and asset management are also important aspects. Additionally, seeking financial and technical support from development banks and donors is a vital step to fund infrastructure projects and capacity-building initiatives in the Transport sector.

The team has taken the above considerations into account for BBB, even though it is difficult to quantify the need for protection works across the sector's infrastructure. However, the team estimates the total cost of needs, including BBB, as an additional 30 percent of damage and loss costs for all infrastructure categories.

In addition, it is necessary to conduct criticality assessments within the sector. This assessment helps authorities identify the most important transport assets, allowing them to allocate resources more effectively. Furthermore, a crucial element of the recovery strategy involves strengthening emergency preparedness for the transport sector and its institutions so the sector can respond effectively and minimize disruptions during disasters and emergency events. The recovery strategy should also emphasize the importance of timely maintenance practices, especially by aligning these practices with the results of criticality assessments.

Recovery and reconstruction efforts should focus first on emergency removal of debris, repair of essential infrastructure, and the restoration of service delivery of the sector. Medium-term interventions should then focus on the rehabilitation and reconstruction of the most impacted municipalities, mainly Benghazi, Al Bayda, Sousa, and Derna. The recovery and reconstruction should be well coordinated and concentrate on the transport infrastructure that is most important for the economy of the impacted region, as well as modernizing the sector and encouraging private sector investment in the operation and maintenance of critical transport infrastructure such as roads, ports, and airports. This effort will require diligent planning, coordination among all relevant entities, and efficient use of resources. Structural and legal reforms will also be required to modernize the sector and ensure its sustainability and efficient performance, climate change and Paris Agreement considerations should be at the heart of Libya's medium-long transport sector strategies.

Table 41: Total Cost of Needs

Needs Type	Total Cost (in US$ million) - including costs for BBB, etc.	Total Cost (in LYD million) - including costs for BBB, etc.
Airport	0.0	0.0
Port	15.0	71.8
Primary Bridge	12.0	57.5
Secondary Bridge	0.0	0.0
Tertiary Bridge	14.4	69.0
Residential Bridge	0.0	0.0
Path Bridge	0.0	0.0
Service Bridge	0.3	1.4
Trunk Bridge	0.7	3.2
Other Bridge	0.0	0.0
Primary Road	24.5	117.9
Secondary Road	13.7	65.6
Tertiary Road	27.6	132.6
Track Road	0.1	0.7
Trunk Road	6.2	29.7
Residential Road	90.1	433.0
Others Road	4.3	20.6
Total	**209**	**1,003**

Source: Assessment team.

The recovery and reconstruction of Libya's transport sector require a strategic and holistic approach. Prioritizing critical infrastructure projects in the most impacted areas, such as Derna, enhancing governance, and involving local communities in decision-making is critical. It will also require good governance and coordination among relevant government agencies and stakeholders for efficient project management.

To secure funding, mobilizing funds from the government's budget and partnerships with development banks and private partners through PPPs is essential. In the short term, focus on emergency recovery, while in the medium term, should emphasize BBB, infrastructure rehabilitation, and climate resilience. The long-term involves capacity building and sustainable development to create a more resilient, efficient, and sustainable transport network.

Linkages with Cross-Cutting themes

Institutional shortcomings not only undermine the sustainable development of transport in Libya, but also impair disaster risk reduction preparedness. Effective governance is important for disaster risk planning and the development of the sector. Improved coordination is important to promote inclusive policies and equality between women and men. Modern and efficient transport infrastructure can create job opportunities for marginalized groups, including youth and women. Climate change and extreme weather patterns seen recently in Libya, including desertification, directly impact the performance of the transport infrastructure. Resilient and sustainable design practices are essential to mitigate climate change risks, safeguard investments and improve livelihoods.

Limitations

The damage assessment is limited to road transport infrastructure, mainly roads and bridges, and ports. Support facilities, logistics, private and public vehicles, such as vehicles and trucks, and airports are excluded from the analysis. The data were collected from satellite imagery and were difficult to verify from ground sources. No amount has been assigned to the airport category, but airports may need to maintain operational capacity in the short and medium terms.

The team was provided with two sets of data - low estimate and high estimate. Because of the large disparity between the two data sets, the team used the average of the two values as the "Low Estimate", and the most likely scenario as the "High Estimate". By using this approach, the team acknowledges the inherent data limitations, and that data were used largely to give a range for the estimated damage and need cost estimates. The team believes this approach provides a more comprehensive view for allocating resources, adapting to availability of funds, and to making informed decisions.

Table 42: Prioritized and Sequenced Interventions for Transport Reconstruction

Intervention/ Activity	Short-term early recovery* (1–12 months)		Medium-term* (1–3 years)		Total Cost	
	US$ (million)	LYD (million)	US$ (million)	LYD (million)	US$ (million)	LYD (million)
Airport	0.0	0.0	0.0	0.0	0.0	0.0
Port	4.5	21.6	10.5	50.3	15.0	71.8
Primary Bridge	3.6	17.2	8.4	40.2	12.0	57.5
Secondary Bridge	0.0	0.0	0.0	0.0	0.0	0.0
Tertiary Bridge	4.3	20.7	10.0	48.3	14.4	69.0
Residential Bridge	0.0	0.0	0.0	0.0	0.0	0.0
Path Bridge	0.0	0.0	0.0	0.0	0.0	0.0
Service Bridge	0.1	0.4	0.2	1.0	0.3	1.4
Trunk Bridge	0.2	0.9	0.5	2.2	0.7	3.2
Other Bridge	0.0	0.0	0.0	0.0	0.0	0.0
Primary Road	7.4	35.4	17.2	82.5	24.5	117.9
Secondary Road	4.1	19.7	9.6	45.9	13.7	65.6
Tertiary Road	8.3	39.8	19.3	92.8	27.6	132.6
Track Road	0.0	0.2	0.1	0.5	0.1	0.7
Trunk Road	1.9	8.9	4.3	20.8	6.2	29.7
Residential Road	27.0	129.9	63.1	303.1	90.1	433.0
Others Road	1.3	6.2	3.0	14.4	4.3	20.6
Total	**63**	**301**	**146**	**702**	**209**	**1,003**

Source: Assessment team.

TELECOMMUNICATIONS AND DIGITAL DEVELOPMENT

The post-revolution conflict in Libya has destroyed an estimated US$ 1 billion in telecom infrastructure. But despite a security context that is still not completely stabilized, the country has shown great resilience in facing the complex and costly task of rebuilding the economy, infrastructure, institutions, and responding to the demands of the population. The Libyan pre-revolution era was market by an ICT sector which possessed backhaul capabilities that were more substantial compared to most countries in the region. Libya's crude oil reserves mean that income levels in the country are relatively high compared to other countries in North Africa, and with a mobile penetration rate that is amongst the highest in the continent, the potential of ROI in the telecom sector has encouraged many international private companies to express interest. However, the conflict and political instability have delayed essential sectoral reforms. Despite the COVID-19 pandemic accelerating the adoption of digital tools in Libya like many other countries in the world, digital literacy in the country remains low. Most internet users are more accustomed to social media and less to more advanced digital tools such as online payments and e-government services. Significant gender gaps persist in digital literacy and use of mobile accounts.

Competition in the telecom sector remains unchanged and is still dominated by the state. The telecom sector is entirely controlled by the "Libyan Post, Telecommunication and Information Technology Company (LPTIC)" holding, which is fully owned by the State which owns 100 percent shares in all market players. The mobile market is divided between the two mobile operators Libyana and Al-Madar, both holding respectively 60.5 percent and 39.5 percent of market shares.[201] The two players operating in the fixed segment are: (i) Hatif Libya, a company established by the board of LPTIC in 2008, and owns the 15,000 km national fiber optics backbone, and possesses a subscriber base of over 1.3 million; and (ii) Libya Telecom & Technology (LTT), a fixed-line operator serving approximately 80,000 subscribers. The telecommunications market contains two additional players: (i) the Libyan International Telecom Company (LTIC), a subsidiary of LPTIC in charge of international connectivity, and which owns the 425 km Silphium cable connecting Libya to Greece and co-owns (with other actors) both the Italy-Libya and the EIG international cables; and (ii) Aljeel Aljadeed, a multi-play and MVNO operator that provides integrated communications services, television broadcasting and network services.

Regulation of the telecom sector is through the General Authority for Communication and Informatics (GACI), an entity created by the transitional government following the revolution in Libya to replace the former General Telecommunications Authority (GTA). The GACI has a mandate to oversee the LPTIC and its subsidiaries and be the national authority for information and documentation. The GACI has had difficulties driving competition and improving services across the country. Conflict and political instability have disrupted the regular legislative processes, delaying much-needed updates to laws governing the sector[202], and the challenging political situation imposes further difficulties for the GACI to operate, especially in certain areas of the country where it has little or no control of telecommunications infrastructure.[203]

Mobile subscriptions in Libya stood at an impressive 205 percent in 2022, among the highest on the continent, showing a substantial reliance on mobile services and abundant usage, with ownership of two or more SIM cards being common practice. The fixed segment on the other hand has a less substantial penetration rate, with fixed-broadband subscription standing at a mere 4,79 percent (or 326k subscriptions).[204] The telecom sector sustained the impact of the long civil conflict in

201 Source: Broadband, Cloud and Data Assessment in the Mediterranean Region (IFC and Roland Berger, 2020).
202 Including the Telecommunication Act of 2011.
203 Source: *Digital Economy Country Assessment (USAID, November 2022)*.
204 Source : *ITU, Datahub 2022*.

Libya, and the difficult political context. Broadband availability and usage have been lagging behind other countries in the region, and the absence of a broadband national plan did little to effectively improve coverage and drive usage of broadband services. Despite the substantial potential of the telecom sector in Libya, and the strong interest by international operators to integrate the market, private investments in the telecommunications sector have been very limited, mainly due to a weak regulatory framework. Furthermore, the lack of engagement of strong international market players has constrained compliance with international best practices and standards. No data on mobile applications for public and municipal service delivery are available.

There have been national efforts to improve the sector following the revolution in Libya. These involved a number of initiatives such as the recent adoption in May 2023 of the ICT sector strategy 2023–2027; the launch of 4G services by the two mobile operators Libyana and Al-Madar in 2018 to cover a number of municipalities including Tripoli, Zawiya, Sabha, Benghazi and Misrata; the upgrade of the Hatif Libya FTTP access from 800 in 2010 to 200,000 premises in 2014; and the launch of an LTE-Fixed broadband network by LTT to complement its DSL, WiMax, WiFi, fiber, and satellite portfolio of services. Nonetheless, and despite these efforts, mobile subscriptions have been concentrated mostly in the 2G and 3G portions, covering 78 percent of the population compared to a 4G coverage that does not exceed 40 percent. A stable and reliable 4G mobile network is sufficient to introduce public and municipal digital service delivery. Network performance has also been rated at below average, standing at less than 40 points (out of 100) in the GSMA index score.[205] In addition to the connectivity aspects, the digital sector in Libya lacks other structural infrastructure, with no IXPs or Data Centers identified in the country to date.

Assessment of Disaster Effects[206]

The preliminary damage assessment of the telecommunications sector in Libya shows that floods had a limited impact on mobile digital infrastructure in the 20 affected municipalities. Damage assessment was limited to the access network and mobile communication in particular, due to limited data on fixed and backhaul communication assets. The assessment was conducted on a baseline of 82 radio towers covering the 20 municipalities. The overall damage to radio communication due to the floods was observed on approximately 10 percent of the radio towers in the target area. Out of the 82 radio communication towers in the flooded area, six were partially damaged, while two were completely destroyed, representing respectively 7.3 percent and 2.4 percent of the baseline. The damage was concentrated mainly in the three municipalities of Wardam, Soussa and Al Bayda as shown in the figures below:

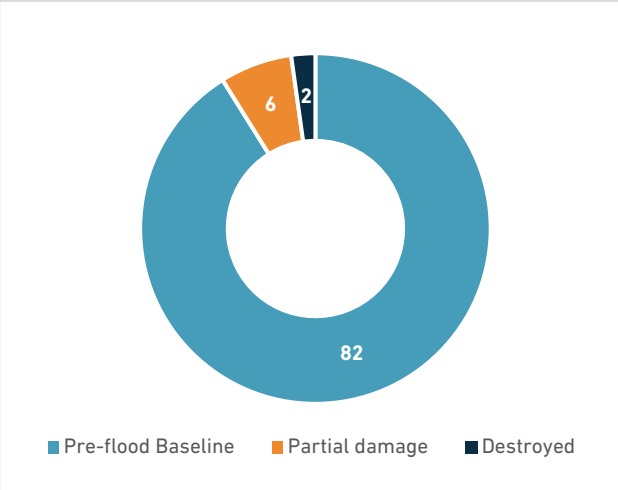
Losses due to downtime from damaged mobile communication towers were minimal, as was the overall impact on service delivery for mobile communication services in the affected municipalities. However, when combining loss of revenue to telecom operators and losses to other businesses that depend mostly on the internet to operate, in addition to the social impact due to the lack of means for communication during a crisis, and the impact on rescue efforts and their coordination in the areas where communication services were momentarily unavailable, and other implications on the livelihood of citizens of the affected area (outlined in the following section), the effects become much more acute.

The overall impact on the ICT sector cannot be assessed without factoring in damages to the fixed network. Losses from damage to copper and fiber optic infrastructure are expected to be much more significant. Fiber optic assets were deployed across the coastline and throughout the flooded area, making them more susceptible to damage not only from the floods but from rescue efforts and accidental damage. Moreover, in addition to enabling fixed services (phone and internet services), fiber optic

205 Source : *GSMA intelligence 2023.*

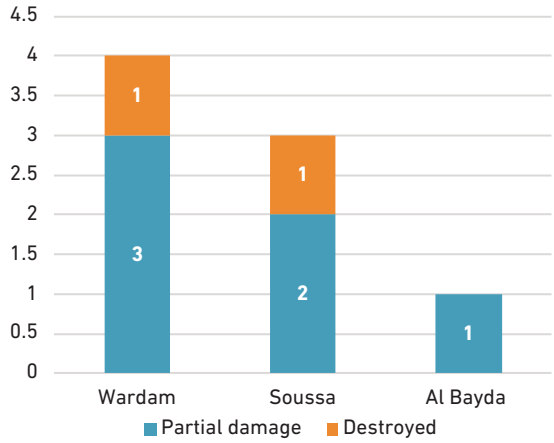
206 Damage may be classified as **Partially Damaged** if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage may be classified as **Completely Destroyed** if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

Figure 39: Damaged Radio Towers and Baseline



Source: Assessment team.

Figure 40: Damage to Radio Towers as of October 2023*



*No damage was observed in the other municipalities not represented in these figures.
Source: Assessment team.

cables are also used for the intra-urban transport and distribution of phone and internet traffic from fixed and mobile networks, which would cause impact on services from damages to these assets to affect a much larger area. Communication outages in Libya have been reported by media outlets following the floods. The LPTIC has attributed this to a cut on fiber optic cables that was restored the same day. Unfortunately, and given that fixed infrastructure is mostly deployed underground, city-level damage to them could not be assessed for the purposes of the RDNA using remote analytics (satellite imagery).

Moreover, all attempts by the RDNA team to receive data from the telecom operators on damage to copper and fiber optic assets were unsuccessful.

The losses in Table 1 were calculated based only on the damages to radio communication towers. To that end and considering the qualitative report which indicates that no major impact was noticed on communication services in many of the affected areas, a modest factor of .05 was used to calculate losses in the three affected municipalities:

Table 43: Damage and Loss - Telecommunications

Asset Types	Baseline	Partially damaged	Completely destroyed	Total Cost (in US$)	Total Cost (in LYD)
DAMAGE					
Mobile communication towers	82	6	2	448,854	2,156,968
Total Damage				**448,854**	**2,156,968**
LOSS					
Loss of revenue due to downtime of mobile communication towers	82	6	2	22,443	107,848
Total Loss				**22,443**	**107,848**

Source: Assessment team.

Table 44: Telecommunications Damage and Loss by Municipality

#	Municipality	Total Damage		Total Loss		Total Damage + Loss	
		US$	LYD	US$	LYD	US$	LYD
1	Wardam	224,427	1,078,484	11,221	53,924	235,648	1,132,408
2	Soussa	183,622	882,396	9,181	44,120	192,803	926,516
3	Al Bayda	40,805	196,088	2,040	9,804	42,845	205,892
Total		**448,854**	**2,156,968**	**22,443**	**107,848**	**471,297**	**2,264,816**

Source: Assessment team.

Linking Effects to Human Impact

The disruption of ICT services was brief. Based on assessment of radio communication towers, it appeared localized. Despite this, the impact of the disruption of communication services has broad and sometimes severe consequences on the livelihood of citizens, social inclusion, and living conditions of communities and households. In addition to the early warning systems that rely on communication networks to reach their targeted population, damage relief coordination and rescue efforts, which all use communication services to have a strong impact on the ground, suffer downtime as a direct effect of communication service disruptions.

Citizens who rely on internet services for remote employment, for trading goods and services, for access to administrative or financial services (banking, bills payment or mobile money etc.) will face added difficulties in conducting business. The effects are even more challenging and exacerbate an already difficult situation for people with disabilities and women. Women, who are generally less connected to mobile communication, will be particularly effected by the disruption of ICT services. Women are also likely to see their opportunities, which are already constrained, further reduced due to the lack of connection availability, impacting areas such as online education and remote work.

Recovery Needs and Strategy

The floods exposed the urgent need for systematic changes to address vulnerabilities to natural hazard and climate risks, and to adopt a more realistic approach to improve resilience to natural shocks in assessing, planning, and implementing digital infrastructure projects. The recovery strategy must consider the cost for BBB, and make a paradigm shift at the sectoral level to mainstream the disaster resilience of investments. The reconstruction and rehabilitation needs of the ICT sector following the floods were calculated based on the sum of damage and loss estimates in the three affected municipalities of Wardam, Soussa and Al Bayda. A 70 percent increase of this value was made to reflect the increase in the value of telecommunication equipment and take stock of the inflation levels witnessed globally, as well as to account for the incidental costs of shipment, transport, and installation of replacement equipment. The complex situation in Libya might also impose security premiums that could further increase the cost of reconstruction and restoration, albeit limited mostly to the acquisition of goods and services from outside the country and excluded in hiring local labor.

Given the high dependence of the telecom sector in Libya on mobile communication, the most immediate recovery need would be to rebuild and gradually repair/upgrade the damaged radio communication towers. In the short-term, the destroyed towers in the two municipalities of Wardam and Soussa would have to be completely rebuilt. This was considered an immediate need and factored into the short-term needs assessment of the two municipalities given that the rebuilding and assembly of the equipment should take less than 12 months to complete. The cost of a radio tower includes the combined costs of the antennas, the transceiver station, the power generator, and the digital tower, and was estimated at US$ 120,012 (490,220 LYD equivalent). Repairs are needed so that services to nearby populations in the three affected municipalities are able to resume. The repair costs were reflected in the short-term estimate

by including 30 percent of the total need of each municipality to cover the first phase of reparations to the partially damaged towers in Wardam, Soussa and Al Bayda. Low-interest financing would be the most appropriate financial support approach. The communication towers' repair/upgrade will create a reliable platform for experimentation with digital municipal service delivery.

In the medium-term, the repair and upgrade of the partially damaged towers needs to be completed. To this end, the remaining 70 percent of the total needs for each of the three affected municipalities could be used to complete the reparation efforts and ensure the complete restoration of the damaged towers up to climate and disaster resilience standards, especially given the critical role of telecommunication infrastructure in enabling efficient early warning systems and emergency response measures both at national and subnational levels. Structural reforms of the telecom sector in Libya could help to realize its potential and boost its benefits to the economy and the wellbeing of the population. Reforms can include (i) regulatory reforms to update the laws and regulation of the telecom sector, drive transparency, accountability, fair access and competition; (ii) private sector resource mobilization to address the large investment needs of digital infrastructure projects, and to greatly reduce the timeframe for the development of the sector once the political and economic situation is stabilized ; and (iii) the adoption of a national broadband plan to improve the coverage of high-speed internet and promote the use of internet services, particularly in underserved areas, reduce the digital divide, and promote inclusion for women and persons with disabilities.

Table 45: Telecommunications Cost by Municipality

#	Municipality	Needs category[207]	Cost (in US$)	Cost (in LYD)
1	Wardam	Rebuild/repair radio communication towers	400,602	1,925,094
2	Soussa	Rebuild/repair radio communication towers	327,765	1,575,077
3	Al Bayda	Repair radio communication towers	72,837	350,017
Total			**801,204**	**3,850,188**

Source: Assessment team.

Table 46: Prioritized and Sequenced Interventions for Reconstruction - Telecommunications

Intervention/Activity	Short-term early recovery* (1–12 months)		medium-term* (1–3 years)		Total Cost in US$	Total Cost in LYD
	US$	LYD	US$	LYD		
Rebuild radio communication towers	801,204	3,850,188	0	0	801,204	3,850,188
Repair Data Centers	0	0	0	0	0	0
Total Needs			**801,204**	**3,850,188**	**801,204**	**3,850,188**

Source: Assessment team.

207 Copied from table above.

Linkages with Cross-Cutting themes

The rebuilding and restoration of damaged assets must be preceded by the removal of debris and rubble clearance, and the safe disposal of electronic and communication equipment in full compliance with environmental and social standards. The restoration efforts do not appear to be labor intensive; however, the hiring of local consultants, contractors, and semi-skilled and skilled workers could help create much needed employment for the local population. The reconstruction efforts could also be an opportunity to improve the design of communication equipment, and to deploy more modern assets that are more capable, more resilient to climate shocks, and employing greener construction material and more innovative and climate aware solutions for power generation and heat dissipation, while also supporting more inclusive systems for women and other minorities.

Limitations

There have been some major challenges to acquire data on the ICT sector in Libya during the preparation of the RDNA. The limited involvement of donors and private actors in the telecom sector in Libya has caused a significant scarcity of reliable and accessible sector information. This has made it very challenging to establish a pre-revolution baseline or acquire information on the deployment of telecommunication assets, their specifications and condition. Additionally, all attempts to consult with telecom operators to acquire updated information and to try and evaluate the proportion of the damage have been unsuccessful. Despite the use of remote analytics to assess damage to radio communication towers, damages to the fiber optics network (which is responsible for the transport and distribution of phone and internet traffic) have been impossible to determine remotely. Further ground corroboration of the damage data during the recovery planning and implementation phase is advisable.

WATER AND SANITATION, AND WATER RESOURCE MANAGEMENT

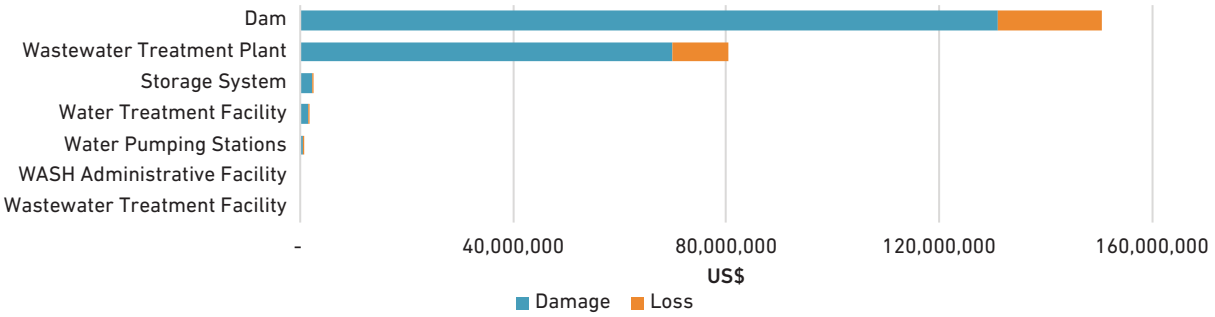
Libya faces significant challenges in managing its water resources due to its arid climate and limited water availability. Libya is among the most water-scarce countries in the World, with an annual water availability of roughly 100 cubic meters per capita, far below the absolute water scarcity threshold of 500 cubic meters per capita.[208] The country relies on four main sources of water: intermittent surface water along ephemeral wadis, shallow groundwater, deep groundwater, and desalinated seawater. However, most water resources in Libya come from non-renewable groundwater in ancient aquifers, with little to no recharge taking place, and over 95 percent of water supplies rely on groundwater, a large portion of which is sourced from fossil aquifers in the south and transferred to the population-dense northern part of the country, with the remaining water supplies depending on desalination, wastewater reuse and surface water.

Water supply and sanitation services in Libya face several challenges and constraints. The share of the population with access to safe drinking water was estimated to be 95 percent in 2011. [209] However, this had declined to an estimated 64 percent in 2019, with domestic supply supplemented through a combination of water trucking and private vendors who desalinate brackish water. Access to sanitation remains a persistent challenge, with only 24 percent of the population estimated to have access to safely managed sanitation, and eight percent having no access to basic sanitation.[210] The number of people without access to basic sanitation increased from 490,000 in 2015 to 540,000 in 2022,[211]and only 69 percent of the population is connected to the sewer system. Only 10 percent of the wastewater is treated, with the remainder discharged into the sea, pits, or tanks, posing significant environmental and health concerns for many of Libya's coastal cities.[212]

Water institutions suffer from fragmentation and a number of management challenges, including insufficient financial and human resources, among others. All of this combines to undermine the development and maintenance of vital water related infrastructure. The is compounded by tariffs and a rate of collection, encouraging excessive consumption and depriving service providers of the revenue needed for operation, maintenance, and development. Along with shortages in electricity, fuel and other supplies, these factors have led to numerous cuts in water and wastewater services, especially in urban centers like Tripoli and Benghazi, where the duration of water supply services has declined from 24 to eight hours or less per day.[213] Furthermore, water and wastewater network losses are high (estimated at 35 to 50 percent),[214] and many facilities operate at only partial capacity or have been rendered out of service.[215] As a result, previous gains in water security and sanitation access have stagnated or declined. This has fueled ongoing grievances about unequal access to water across Libya. As a result, previous gains in water security and sanitation access have stagnated or declined.

208 FAO, 2020. AQUASTAT.
209 WHO and UNICEF, 2023. https://washdata.org/data/household#!/.
210 WHO and UNICEF, 2023. https://washdata.org/data/household#!/.
211 WHO and UNICEF, 2023. https://washdata.org/data/household#!/.
212 WHO and UNICEF, 2023. https://washdata.org/data/household#!/.
213 World Bank, 2023. Libya Country Engagement Note.
214 UNICEF Libya Water Scarcity and Climate Change: an analysis on WASH enabling environment in Libya.
215 Many facilities operate at only partially their design capacity, on average 50 percent for water treatment plants and distribution networks, 35 percent for the man-made river project, 29 percent for desalination plants, and 20 percent for wastewater treatment plants, as estimated based on information from the General Authority for Water Resources.

Figure 41: Damage and Loss by Asset Type (high estimates) - Water and Sanitation



Source: Assessment team.

The municipalities in the affected regions also face significant challenges in providing consistent water supply and wastewater treatment. This is exemplified by the situation in Derna, which has 11 municipal branches sourcing their drinking water from a mix of groundwater wells, springs, surface wells, and a desalination plant which last operated in 2018. Only three branches can meet their water requirements without relying on trucking services. The daily public network supply is limited to a few hours, and almost all branches experience occasional outages lasting several days, with infrastructural damage and partial operation being common issues. Furthermore, only some of Derna's municipal branches are serviced by wastewater facilities, which are either partially operational or completely non-operational, reflecting a broader issue of inadequate WASH infrastructure. Similar challenges are also evident in other municipalities like Al Marj, Al Bayda, Shahaat, and Soussa. Several water (and wastewater) indicators are below the national average, highlighting the urgent need for improved water management and infrastructure repair at the municipal level.[216]

Assessment of Disaster Effects: Damage and Loss Estimates[217]

Disclaimer. *Since this RDNA relies on satellite images to estimate damages to and losses from water assets, information is limited to larger, above ground infrastructure, including that listed in Table 1. While other assessments and reports indicate widespread and significant damage to and losses from smaller infrastructure elements – notably underground facilities such as water wells, (waste)water networks and stormwater drainage systems – such damage can only be quantified through on-the-ground detailed measurements. Hence, smaller infrastructure elements are excluded from the quantitative estimations below and only described in qualitative terms based on secondary information.*

Damage Estimates from satellite data

The total damage to the water sector is estimated at between US$ 127 million and US$ 146 million - average US$ 136 million (Table 1). This damage figure is almost exclusively constituted by the complete destruction of three major assets (US$ 55–60 million and US$ 9–11 million for the Bou Mansour and Derna dams, respectively; and US$ 60-70 million for the wastewater treatment plant in Al Bayda). Partial or complete destruction of several smaller assets such as storage systems, treatment facilities and pumping stations make up the remainder, while no damage has been observed to most assets considered (Table 47). This is also apparent from the costs per municipality (Table 28), where most municipalities have no observed damage to the waste and sanitation infrastructure considered, while significant costs apply in the municipalities mentioned above. An estimated additional US$ 19 million to US$ 22 million (Average US$ 20.4 million) will be incurred (Table 47).

216 UN-Habitat (2022) Derna City Profile, Cario : UN-Habitat Regional Office for Arab States.

217 Damage may be classified as Partially Damaged if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage may be classified as Completely Destroyed if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

Table 47: Damage and Loss Inventory for Water and Sanitation

Asset Types	Baseline	Partially Damaged	Completely destroyed	Average Total Cost (in US$ million)	Average Total Cost (in LYD million)
DAMAGE					
Dams	2	0	2	67,500,000	324,371,250
Storage Systems	47	3	2	2,400,000	11,533,200
Facilities, Desalination Plants	13	1	1	1,190,000	5,718,545
Water Pumping Stations	8	1	0	380,000	1,826,090
Wastewater Treatment Plant	1	0	1	65,000,000	312,357,500
Wastewater Treatment Facilities	3	0	0	0	0
WASH Administrative Facility	1	0	0	0	0
Total Damage				**136,470,000**	**655,806,585**
LOSS					
Dam	2	0	2	10,125,000	48,655,688
Storage System	47	3	2	360,000	1,729,980
Water Desalination Plants	13	1	1	178,500	857,782
Water Pumping Stations	8	1	0	57,000	273,914
Wastewater Treatment Plant	1	0	1	43,249,500	46,853,625
Wastewater Treatment Facility	3	0	0	-	-
WASH Administrative Facility	1	0	0	-	-
Total Loss				**20,470,500**	**98,370,988**
Total Average (High-level estimate) for damage and loss				**156,940,500**	**754,177,573**

Source: Assessment team.

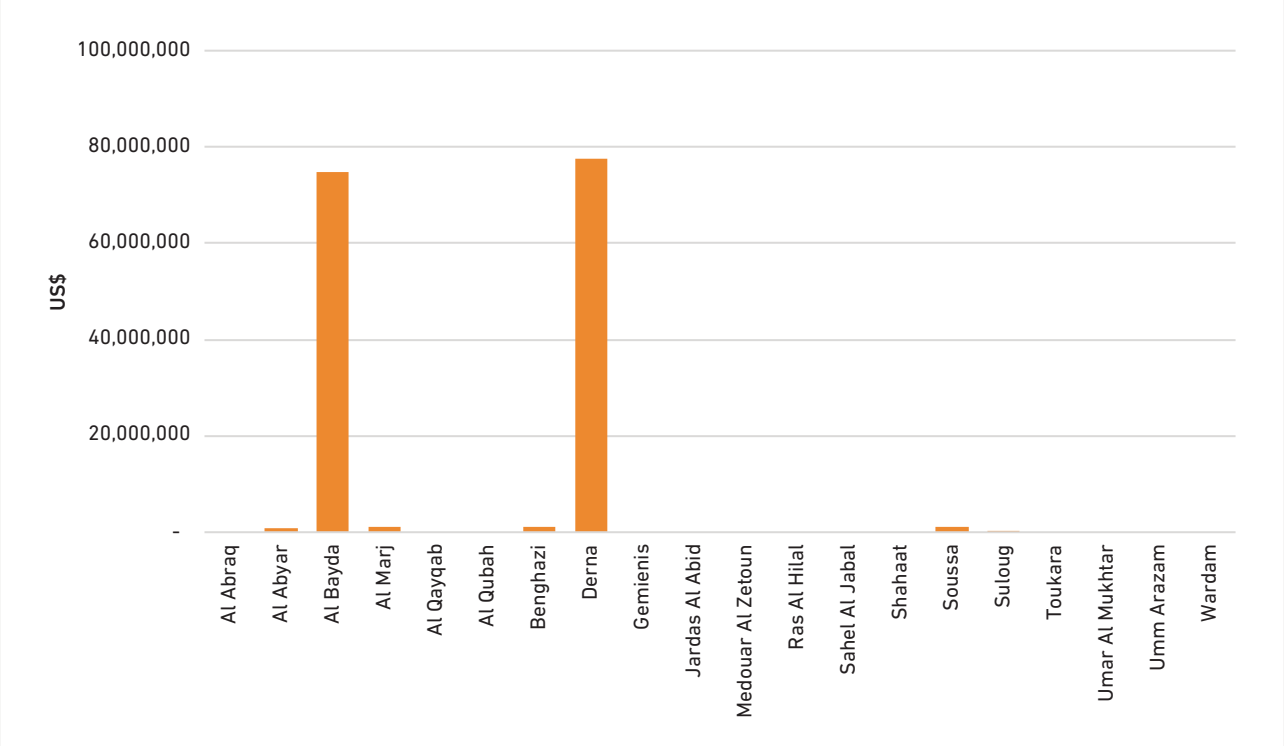
Table 48: Average Damages and Losses by Municipality – Water and Sanitation

Municipality	Total Damage		Total Loss		Total Damage + Loss	
	US$	LYD	US$	LYD	US$	LYD
Al Abraq	-	-	-	-	-	-
Al Abyar	750,000	3,604,125	112,500	540,619	862,500	4,144,744
Al Bayda	65,000,000	312,357,500	9,750,000	46,853,625	74,750,000	359,211,125
Al Marj	1,050,000	5,045,775	157,500	756,866	1,207,500	5,802,641
Al Qayqab	-	-	-	-	-	-
Al Qubah	-	-	-	-	-	-
Benghazi	1,020,000	4,901,610	153,000	735,242	1,173,000	5,636,852

Municipality	Total Damage		Total Loss		Total Damage + Loss	
	US$	LYD	US$	LYD	US$	LYD
Derna	67,500,000	324,371,250	10,125,000	48,655,688	77,625,000	373,026,938
Gemienis	-	-	-	-	-	-
Jardas Al Abid	-	-	-	-	-	-
Medouar Al Zetoun	-	-	-	-	-	-
Ra's Al Hilal	-	-	-	-	-	-
Sahel Al Jabal	-	-	-	-	-	-
Shahaat	-	-	-	-	-	-
Soussa	850,000	4,084,675	127,500	612,701	977,500	4,697,376
Suloug	300,000	1,441,650	45,000	216,248	345,000	1,657,898
Toukara	-	-	-	-	-	-
Umar Al Mukhtar	-	-	-	-	-	-
Umm Arazam	-	-	-	-	-	-
Wardam	-	-	-	-	-	-
Total	**136,470,000**	**655,806,585**	**20,470,500**	**98,370,988**	**156,940,500**	**754,177,573**

Source: Assessment team.

Figure 42: Total Damage and Loss by Municipality – Water and Sanitation



Source: Assessment team.

Storm Daniel resulted in the catastrophic failure of two of Libya's 18 large dams. This included the Bou Mansour Dam, a 75 m high embankment dam with a clay core and a storage capacity of about 18–22 Million Cubic Meter (MCM), located roughly 13 km upstream of the Derna Dam, which is a 45 m high embankment dam with a clay core and a storage capacity of about 1.5 MCM, situated roughly 1 km upstream of the city of Derna. Both dams are located along the 60 km long Wadi Derna and were constructed between 1973 and 1977 for the primary purpose of flood control.[218] Their construction followed a series of major floods in 1941, 1959 and 1968, and was based on studies conducted after the catastrophic consequences of the 1959 floods. In addition to flood protection, the project reportedly also catered for irrigation and water supply to Derna and surrounding communities.[219]

The hydrological characteristics reflect the highly variable hydro-meteorological conditions of the ephemeral Wadi Derna. The catchment area is roughly 575 square km, with an annual average rainfall of around 217 mm.[220] This typically falls in the months of October and November. It is estimated that rainfall over the catchment area was 400 mm in 24 hours on September 10 compared to the long-term average daily precipitation of 1.5 mm for the month of September. The return period for such an event has been estimated to be a 1 in 300 to 1 in 600 years.[221] The resulting inflow exceeded the dams' flood and spillway capacity, reported to be 350 cubic metres per second (cumecs) for the Bou Mansour dam and 170 cumecs for the Derna dam. The combination of the flood event, coupled with the reservoir volume of the Bou Mansour and the Derna dams resulted in an estimated 30 million cubic meters reaching the city shortly before 03:00 am (UTC+2:00) on September 11, 2023.

The failure of the dams in Wadi Derna and the tragic downstream consequences are the result of several compounding and cascading factors. There are a number of potential failure modes, with the current working hypothesis being that the failure is likely due to the high rainfall intensity, resulting in high inflow, a rapid increase in the reservoir level of the upper Bou Mansour Dam culminating in overtopping and a subsequent dam breach. The breach of the Bou Mansour Dam released a torrent of water and sediment which then overwhelmed the downstream Derna Dam. It would have taken an hour at most for the water to reach Derna Dam, a distance of roughly 11 km with a gradient of one percent. Eyewitness accounts report a sudden rise in water level between midnight and 2 am. The dam reportedly failed after about 40 minutes of overtopping, which is within the normal duration, as the downstream shoulder of the dam slowly erodes, and the clay core then suddenly collapses resulting in the rapid release of water from the reservoir.

The tragic consequences resulted in more than 4,300 reported fatalities, with more than 8,000 people still missing. This is the result of the failure of the dams in Wadi Derna and the downstream consequences, both of which are the culmination of several factors. Among them, these include: (i) underestimated design flood due to limited hydrological information available in the 1970s (with unique ephemeral systems with highly variable hydrology); (ii) limited operation and maintenance affected by the conflict, competing resource demands, and governance issues. The consequences of the failure were accentuated by several factors including, (i) increased downstream consequences due to population growth and economic development over the last ~50 years; (ii) limited forecasting of hydro-meteorological hazards and risk informed flood management measures; and (iii) inadequate Early Warning Systems to ensure people are evacuated. All of these factors are likely to have been accentuated by climate change, with the World Weather Attribution group finding that human-induced climate change made this event up to 50 times more likely and up to 50 percent more intense compared to a 1.2 C cooler climate[222].

---

218 Hidrotehnika-Hidroenergetikaby is a Serbian company from the former Yugoslavia: *https://www.hidrotehnika.rs/*.

219 Including a pump station at Maquarr and water tank with capacity of 208 m^3, water tanks at Fatayah with capacity of 2 x 7.000 m^3, Derna-Bou Mansur Road 24 km long with 10 bridges with total length of 350 m.

220 *https://hikersbay.com/climate-conditions/libya/darnah/alzrwf-almnakhyh-fy-drnh.html?lang=ar*.

221 Zachariah, M et al. (2023) Interplay of climate change-exacerbated rainfall, exposure and vulnerability led to widespread impacts in the Mediterranean region. Report by World Weather Attribution.

222 This exceptional weather event is estimated to hit northern Libya once every 643 years. In a hypothetical, 1.2oC cooler world, this would be an even rarer event with a return period of 1900 years. (source: *https://spiral.imperial.ac.uk/bitstream/10044/1/106501/14/scientific%20report%20-%20Mediterranean%20floods.pdf*).

Figure 43: Landscape Context of Derna Floods, September 10, 2023

Source: The Washington Post: *https://www.washingtonpost.com/world/2023/10/05/libya-derna-floods-disaster-government/* based on original sources: UNOSAT, Planet Labs PBC, Google Earth.

In addition to the failure of the dams in Wadi Derna, damage was caused to several other water related assets with: at least four water and wastewater facilities completely destroyed, another five partially damaged, with the status of another seven unknown and requiring further investigation:

- **Al Bayda's** water supply and sanitation sector sustained significant damage through the destruction of a wastewater treatment plant, posing risks to groundwater supplies which have been uncontaminated and suitable for drinking to date. Areas devastated by the flood, such as Ganien, Al Tuffah, and New Al Bayda, have a shortage of drinking water and poor sanitation. This, coupled with damage to infrastructure in specific neighborhoods, has led to the large displacement of these residents.
- **Al Marj's** water supply and sanitation and water resource sectors sustained minor damage, with one storage system destroyed, and one partially damaged and partially functional.
- **Benghazi city's** main source of water supply is the Man-Made River Project (MMRP), which is providing two million cubic meters a day along a 1,200 km pipeline from As-Safir and Tazerbo to Benghazi and Sirte, via the Ajdabiya reservoir. The assessment shows that at least one storage system, one water treatment facility and one water pumping station were partially damaged.
- **Soussa**'s desalinization plant is non-functional, with the distillation plant out of service due to the storm and the water purification unit *has been destroyed,* forcing people to rely on other sources

Figure 44: Al Belad (Derna) Dam, Prior (Left) and Post (Right) Flood

Source: Assessment team.

of water that are of poor quality and contaminated due to mixing of sewage and drinking water.[223]

- **Al Abyar** and **Suloug** have experienced damage to storage facilities that have limited access to safe water supplies.
- Wastewater treatment facilities and water supply administration buildings were reportedly unaffected by the flood, despite many reports that poor sanitation management and widespread wastewater spillage would foster the spread of diseases. A precise assessment of the damage to underground facilities is required to clarify these conflicting statements and better inform people and the authorities of the status of water supply and sanitation facilities.

223 OCHA Flash Update No. 4.

Figure 45: Bou Mansour Dam Prior (Left) and Post (Right) Flood

Source: Assessment team.

Damages to Water Supply and Sanitation infrastructure more broadly, from secondary information. 70 percent of Derna's water pipes are estimated to be at least partially damaged. Piped water networks in al-Bilad and Jubaila neighborhoods were destroyed; the wells in al-Bilad and Jubailah neighborhoods are contaminated with sewage and are no longer fit for use. The city's Eastern Coast neighborhoods have not had water access since the crisis started. Consequently, those living in high-impact areas have limited access to clean water. According to the National Center for Diseases, the wells of Al Bilad and Jubailah are contaminated with sewage. The wells in these neighborhoods are surface wells with a 6–10-meter depth and are no longer fit for use. The response to addressing this damage and carrying out necessary repairs is challenged by a shortage of spare parts, all of which must be imported.

Linking Effects to Human Impact

A substantial proportion (40 percent) of the population in the affected areas did not have access to safe drinking water prior to the flood, depending on public water tanks (US$ 50 cost for each family of five persons) and are now more vulnerable to health emergencies and likely to face greater difficulties in case of future disasters.

The challenges faced by women in securing water for their households are even more significant and merit special attention in the recovery. Even if water is available, it may not always be safe, accessible, or affordable. People draw drinking water from a variety of boreholes, water trucks, tap stands, springs, rainwater, and surface water, many which may be damaged and/or unprotected.[224] The lack of sufficient and clean water resources, combined with potential damage to sewage networks and sanitation facilities, and city-wide disruption in access to healthcare, poses significant risks of disease outbreaks and disproportionately affects women's health and hygiene needs[225] .

Additional losses for the water sector may be related to the loss of service delivery and revenue collection. However, since the beginning of the conflict, most users have not been paying their water utility bills,[226] instead relying on alternative private supplies. The number of pre-crisis subscribers in the impacted area is not documented. Although these subscribers may not pay until service delivery quality improves again to pre-crisis levels, it is very difficult at this stage to assess the corresponding financial losses. More clarity on the governance structure and regulations of the water sector is first required.[227]

Recovery Needs and Strategy

The tables below provide prioritized and sequenced needs for infrastructure restoration and rehabilitation in the first year of the recovery. This includes storage systems, water pumping stations, wastewater treatment facility and WASH administration buildings; however, the service delivery restoration will be accurately assessed once information is provided on household connections, water meters, length of water supply network and sewerage network, etc. The infrastructure needs to explore a range of options to manage the risks associated with exposure to floods and covers the reconstruction of water treatment facilities and wastewater treatment plants, during the first three years. Fixing the water supply and sanitation service delivery entails the replacement of the damaged household connections and length of networks and wells in the first year; this needs to be assessed on the ground since satellite images do not provide any information on underground assets. However, the rehabilitation of the water supply and sanitation networks and the replacement of damaged water meters require more attention and shall be covered in the medium term so that it can be integrated with the reconstruction of the water supply systems and the wastewater treatment plant.

Flood risk is a function of hazard, exposure, and vulnerability. Hence, flood risk can increase if the frequency and intensity of extreme events increase, for example due to climate change, and if more economic developments occur in the flood-prone areas (or a combination of both). Managing flood risks therefore requires considering all three dimensions (hazard, exposure, and vulnerability) in an integrated manner, through a combination of "protection", "prevention", and "preparedness" measures. These can include a range of structural measures, including dam reconstruction using improved data and design criteria, floodwalls, embankments, and river training works, aimed at regulating water levels and redirecting flow paths. Non-structural measures complement structural interventions and focus on reducing the vulnerability and exposure of communities to flood hazards through floodplain zoning, land-use planning, and building codes that require flood-resistant designs, among others. Education and awareness campaigns are also vital to inform individuals and communities

224 UNFPA Flash Appeal.

225 OCHA Libya Situation Report 4 Oct.

226 The water fee per subscriber covers water supply, wastewater operations and maintenance, and taxes.

227 The REACH survey of households shows that most of the households are connected to the public network without an official subscription to the General Company for Water and Wastewater (GCWW) and don't pay water fees to access water from the public network due to frequent water outages even the fees do not match the current water consumption of households (that water fees are lower than the value of the service). In addition, most households do not have a meter and 46% are not willing to get one. Many of the households create a connection without notifying the GCWW, which may have negative impacts on the functionality of water infrastructure, and regularly cause leaks. REACH: Informing more effective humanitarian action. *LBY_Water-scarcity Report_final2_toshare.pdf*.

Table 49: Asset Costs – Water and Sanitation

Intervention/Activity	Short-term early recovery* (1–12 months)		Medium-term* (1–3 years)		Total Cost	
	US$ (million)	LYD (million)	US$ (million)	LYD (million)	US$ (million)	LYD (million)
Dams	9,082,125	43,644,152	91,830,375	441,290,867	100,912,500	484,935,019
Water Treatment Facility (Desalination Plants)	533,715	2,564,767	1,245,335	5,984,457	1,779,050	8,549,225
Wastewater Treatment Plant	8,745,750	42,027,702	88,429,250	424,946,761	97,175,000	466,974,463
Infrastructure Reconstruction Total	18,361,590	88,236,621	181,504,960	872,222,085	199,866,550	960,458,706
Storage System	1,076,400	5,172,640	2,511,600	12,069,494	3,588,000	17,242,134
Water Pumping Stations	170,430	819,001	397,670	1,911,003	568,100	2,730,005
Wastewater Treatment Facility	-	-	-	-	-	-
WASH Administrative Facility	-	-	-	-	-	-
Service Delivery Restoration Total	1,246,830	5,991,642	2,909,270	13,980,497	4,156,100	19,972,139
Combined total	**19,608,420**	**94,228,262**	**184,414,230**	**886,202,582**	**204,022,650**	**980,430,845**
Institutional strengthening, CB, Master Planning, Technical and feasibility studies, water related studies, etc.	2,754,306	13,235,816	27,849,092	133,828,810	30,603,398	147,064,627
Total	**22,362,726**	**107,464,079**	**212,263,322**	**1,020,031,393**	**234,626,048**	**1,127,495,471**

Source: Assessment team.

about flood risks, preparedness, and response strategies, and can be coupled with insurance programs and financial incentives for flood-resilient building practices. Holistic approaches that include both structural and non-structural measures and leverage the continuum of grey to green options are required to build resilience and promote a more sustainable reconstruction.

Early Recovery Needs. The RDNA team ascertained early recovery priorities based on the existing available information and data on affected people. Short-term interventions included providing semi-permanent and intermediate structures to support water and sanitation of affected people. There is also an urgent need to conduct a national dam safety assessment and detailed dam safety site inspections to determine structural integrity and provide a list of dams that require repair and rehabilitation before the next wet season.

Reconstruction needs for water supply and sanitation include infrastructure replacement and support for implementation. To meet daily water demands, there will be a need for rapid repair of damaged distribution systems, provision of temporary filtration facilities and water delivery by tankers. In the short term, priority should be given to rehabilitation of the damaged water distribution networks, which can be accompanied by sanitation

improvements and hygiene education programs. Thus, the early recovery needs should focus on rehabilitation of partially damaged infrastructure. In addition, there is a need to monitor and assess potential groundwater contamination due to damage to sanitation facilities.

Short-Medium-term Recovery and Reconstruction Needs. The short-term needs and associated strategy should focus on: (i) providing water distribution networks for existing communities and for selected new communities following land readjustment and small-scale relocation schemes; (ii) provision of drainage and/or sewerage for reconstructed neighborhoods; and (iii) upgrading of sector facilities for improved disaster preparedness. These should be accompanied by investments in water supply and sanitation infrastructure, facilitating the transition from short-term emergency response to longer term, sustainable water supply and sanitation services. These measures will need to be accompanied by efforts to strengthen the institutional arrangements for sustaining services. The rapid dam safety assessment should be expanded to include more detailed site-specific assessments and an investment program to support physical rehabilitation, monitoring and surveillance, and institutional measures to improve the safety of dams and downstream communities. The Table below shows a matrix for both short- and medium-term support that would be needed for both institutional and infrastructure perspectives.

Table 50: Costs by Municipality – Water and Sanitation

#	Municipality	Short-term early recovery (1–12 months)	Medium-term (1–3yrs)	Total Needs (0–3 years) in US$	Total Needs (0–3 years) in LYD
1	**Al Abraq**	-	-	-	-
2	**Al Abyar**	336,375	784,875	1,121,250	5,388,167
3	**Al Bayda**	8,745,750	88,429,250	97,175,000	466,974,463
4	**Al Marj**	470,925	1,098,825	1,569,750	7,543,434
5	**Al Qayqab**	-	-	-	-
6	**Al Qubah**	-	-	-	-
7	**Benghazi**	457,470	1,067,430	1,524,900	7,327,907
8	**Derna**	9,082,125	91,830,375	100,912,500	484,935,019
9	**Gemienis**	-	-	-	-
10	**Jardas Al Abid**	-	-	-	-
11	**Medouar Al Zetoun**	-	-	-	-
12	**Ra's Al Hilal**	-	-	-	-
13	**Sahel Al Jabal**	-	-	-	-
14	**Shahaat**	-	-	-	-
15	**Soussa**	381,225	889,525	1,270,750	6,106,589
16	**Suloug**	134,550	313,950	448,500	2,155,267
17	**Toukara**	-	-	-	-
18	**Umar Al Mukhtar**	-	-	-	-
19	**Umm Arazam**	-	-	-	-
20	**Wardam**	-	-	-	-
Total		**19,608,420**	**184,414,230**	**204,022,650**	**980,430,845**

Source: Assessment team.

Table 51: Matrix of Short-Term and Medium- Term Needs – Water and Sanitation

Type of support	Short-term	Medium-term
Institutional	• Support funding of operations and maintenance costs (staffing, equipment, materials). • Interim service arrangements for the General Company for Water and Wastewater (GCWW) to supply tankers for emergencies. • Support mechanism to pay salaries for staff at the GCWW. • Stop-gap energy provisions (fuel/diesel and generators). • Interim service arrangements for the GCWW to supply tankers. • Spares to tackle O&M backlog. • Security to protect critical intakes and wells. • Developing a prioritized recovery plan.	• Improve the capacity for planning, communications, citizen engagement, and financial sustainability of the water sector. Include the opportunity to BBB (for example, by reducing energy use). • Improve the enabling environment to encourage private sector participation. • Improve the efficiency of existing infrastructure and infrastructure planning, considering the capital and operational costs in the financial analysis. • Support re-establishing the customer database and billing system. • Water resources assessments. • Support to implement recovery plan.
Infrastructure	• Conduct an in-depth ground assessment of water sector infrastructure (i.e., treatment plants, reservoirs, sewerage networks, water supply networks, connections etc.), rapid assessment of dam safety and irrigation infrastructure. • Make emergency repairs and rehabilitate water sector infrastructure to restore services. • Back-up power generation systems (i.e., renewable energy). • Cleaning and disinfection of public wells, network and unblocking sewers. • Emergency repairs to treatment plants, production facilities and network (water and sewer). • Replacement of broken equipment.	• Reconnecting water company with grid electricity. • Rehabilitating treatment plants, production facilities and network (water supply and sewerage). • Rehabilitation of dams and irrigation infrastructure. • Leakage control and preparing a non-revenue water program. • Drilling new production boreholes or rehabilitation of existing ones. • Developing laboratories and monitoring plans for water quality.

Source: Assessment team.

Recommendations and Limitations

The rapid assessment relies on a combination of quantitative data derived from remote sensing and a qualitative desk top review of reports available in the public domain for the water sector. To better estimate the damage there is a need for more specific, ground trusted data and information to provide more robust estimates about the infrastructure and to understand the baseline conditions, the extent and coverage of piped drainage, sanitation, water distribution networks, and investment requirements for safe dams and maintenance of irrigation services. In addition, a description of existing water treatment plants and associated infrastructure would be important to understand baseline conditions and allow more robust cost estimates. The recommendations for the recovery/ reconstruction in the water sector are to:

Assess damage to the drainage, sewerage, and water distribution network. The extent of damage to these networks remains largely unknown. The significant impact on land movement due to the flood has presumably disrupted the underground piped networks, causing severe damage and disruption to services. However, it is difficult to determine these damages based on remote sensing, and a more

detailed assessment of these networks is needed to develop reconstruction plans:

- **Water supply network**. The networks constitute a very important and expensive component of the overall water system infrastructure. Besides, their status in terms of number and size of leaks determines the size of water losses. A more detailed investigation on the ground will be needed to assess damage to networks and to develop reconstruction plans.

- **Sewerage network and construction of new wastewater treatment plant**. Work on the ground will be needed to ascertain the specifications of the networks and treatment plant. Many critical infrastructure components will probably need maintenance that has been deferred during the crisis. This could be a substantial cost.

National dam safety assessment. A rapid risk assessment of all other Libyan dams should be carried out using remote sensing to geolocate individual dams and assess potential downstream consequences using population data and surrogates of economic activity (such as night lights). Based on this exercise, a prioritized list of dams can be used to rank physical inspections and investment requirements for rehabilitation needs. While the remote sensing assessment of dams is sufficient to detect catastrophic dam failures, a more detailed, structured process based on physical inspections is needed to evaluate and confirm the structural integrity of the national portfolio of dams. This should be completed prior to the next rainfall period. A longer-term rehabilitation program to ensure the safety of dams and downstream communities is needed to identify and finance structural works required to protect assets, sustain the provision of water for related services; as well as non-structural measures, such as institutional capacity and emergency plans to strengthen preparedness in case of subsequent dam failures. This would require at least six to ten years to implement effectively.

Rehabilitate critical infrastructure. Reductions in functionality are primarily for non-technical reasons and therefore, given appropriate conditions, much of the critical infrastructure is expected to return to functional status. However, storage systems and wastewater treatment plants received the brunt of the damage and should be assessed and rehabilitated quickly to provide safe drinking water and sanitation services.

Irrigation infrastructure status. Most larger irrigation schemes in the affected areas typically consist of steel pipe networks buried in the ground. These underground networks may have become dislocated and broken. Satellite imagery may be suitable to identify wet areas. However, to fully assess damage would involve specific on-ground investigations such as pressure tests and other leakage detection techniques.

Rehabilitation of water storage system. Water storage tanks bore the brunt of the damage. These are smaller projects that are distributed over a large area yet will be a priority for short-term reconstruction.

Rehabilitation of existing wells and water monitoring. The extent of damage to water wells remains largely unknown. Many wells were drilled during conflict without considering the effect of increased abstraction on groundwater levels, and groundwater resources are as a result over-exploited. Rehabilitation of these wells after the flood should be done strategically based on an informed understanding of the longer-term sustainable yields. Undertaking water resources management studies, developing water resources management plans, developing a regulatory framework for groundwater management, and obtaining the equipment necessary to monitor water resources will be a critical part of the reconstruction plan.

Strengthening sectoral capacity. In addition to the reconstruction and rehabilitation of infrastructure, substantial non-structural investments will be required to BBB. This will include, for example, a detailed stocktaking of water resources management capacity, assessment of the human capital available and necessary to restore functionality, and hydrological studies to strengthen water resources management capacity, in addition to investment in early warning systems to detect possible climate change events. Since the onset of the conflict in Libya, there has been little engagement with customers; and billing systems, fees and their collection would need to meet both customer and water authority needs. Currently, a lack of revenue hampers the water authority's ability to operate and maintain water related infrastructure and services.

MUNICIPAL SERVICES

The desk review conducted as part of the municipal service sector assessment has concluded that while a reasonable level of information is available on the evolution and qualitative assessments of the legislative and institutional arrangements of municipal governance in the country, the sector suffers from a serious lack of quantitative data on the level of municipal services provided by central and local governments. Due to the divergent delivery of services by municipalities and the absence of regular municipal asset auditing and reporting systems, it is difficult to assess satisfactorily the flood-related effects experienced by the sector based on the pre-and post-disaster municipal service conditions. Since this sector continues to experience functional uncertainties, it is desirable to place the sectoral damage and effects and recovery interventions within an institutional framework for formulating a sustainable recovery strategy.

Institutional Context

The conceptual framework for a decentralized governance structure in Libya evolved after the 2011 revolution. During the revolution, many municipalities played key roles in the provision of basic services as well as managed local affairs[228] by establishing Local Councils, Military Councils, Neighborhood Councils, and Committees for networking and managing key municipal functions. These initiatives laid the foundation for the current local governance structure of municipalities.[229] Under Law 59 municipalities are responsible for the provision of an array of services such as health and social affairs, water and sanitation services, lighting, local roads, public hygiene, gardens, public markets, creation facilities, civil registry, and issue of construction permits, local police, local markets, slaughterhouses, promoting and managing business incubators and enforcing municipal regulations. They will also need to enforce municipal and environmental regulations and prepare and implement urban plans and development regulations.[230] Under Law 59 which MOLG is currently studying an amendment for, municipalities are responsible for the provision of an array of services such as health and social affairs, water and sanitation services, lighting, local roads, public hygiene, gardens, public markets, creation facilities, civil registry, and issue of construction permits, local police, local markets, slaughterhouses, promoting and managing business incubators and enforcing municipal regulations. They will also need to enforce municipal and environmental regulations and prepare and implement urban plans and development regulations.[231] However, many services continue to be provided by centralized State-Owned Enterprises which have not yet devolved authority to the municipal level. There also continues to be an absence of a streamlined municipal administrative framework, *and many Municipal Councils lack the requisite technical expertise* in different capabilities such as management skills, experience of best practices and digital literacy, which was flagged by several stakeholders.[232] The municipal service sector recovery strategy should address these institutional and technical challenges experienced by the local governments through inclusive and sustainable coordination with levels of government and partnerships with CSOs. Importantly, while Law 59 sets out the competencies of local government, the political devolution of power has not been clearly addressed in any of the constitutional arrangements.

---

228 For example, during the revolution, Benghazi and Misrata cities formed Local Councils, Military Councils, Neighborhood Councils, and multiple other Committees for networking and managing key functions.

229 European Union Delegation to Libya, Libyan Local Governance Case Studies, 2017.

230 GNC Law No. (9) of March 28, 2013, amending Law No. (59) of 2012 on the local administration system. Available From: http://www.log.gov.ly/downloads/add07-2013.pd.

231 For example, the municipalities of Sirit are responsible for public services within their jurisdiction. In addition, they give the authorizations for touristic and investment projects and oversee local civil records, local police, local markets and slaughterhouses, local roads and bridges, local business licenses, local control of environment and health, and creation and management of small business incubators (UN-HABITAT, City Profile of Sirit, Benghazi, 2018, page 25.

232 Article 25 of the Law gave municipal councils primary authority in civil registration, control of the municipal guards (health and safety), local markets, and slaughterhouses, management of local transport infrastructure, Issuance of licenses at the local level, monitoring of environmental and health issues, the Law No. 9 increased the responsibilities of municipalities by legally transferring several provincial powers to municipal councils. However, none of these powers has been transferred and Mayors and Councils struggle to serve the growing needs of their citizens through ad hoc personal initiatives to garner support from patrons inside or outside the central government World Bank, The Long Road to Inclusive Institutions in Libya, 2023, page 406.

Table 52: Damage Assessment of Municipal Assets

Municipal Assets[233]	Total Units	Total Damaged Units	Destroyed Units	Partly Damaged Units	% of Assets Damaged
Town/City Hall	32	3	0	3	9.4
Police Station	79	10	3	7	12.7
Fire Station	6	0	0	0	0.0
Community Market	40	7	3	4	17.5
Entertainment (theatre)	63	6	2	4	9.5
Municipal Building	46	8	1	7	17.4
Total Assets	**266**	**34**	**9**	**25**	**12.8**

Source: Assessment team.

Assessment of Disaster Effects: Damage and Loss Estimates[234]

The assessment has attempted to review the damage impacts to the following municipal assets - town/city hall, police and fire stations, entertainment, community market, municipal building - irrespective of their domain responsibilities. It is important to note that many of these municipal assets may have been affected in previous years by the impacts of conflict, as well as fragile and fragmented institutions. Since some of the major municipal infrastructure and services such as water and sanitation, waste collection, and roads and transport are planned and maintained by their respective sectoral ministries and agencies, they are covered in their respective sectoral assessments. While the damage and loss and cost for reconstruction of destroyed and partly damaged municipal service assets will be discussed based on the assessment outcomes, it is important to recognize that their functionalities will be determined by the level of physical damage. Information based on social analytics indicates that most of the partly damaged public assets are functional. In the absence of any ground-level assessments of the structure and form of the multiple services being provided within these buildings, it is assumed that all those services being provided before the disaster will be resumed after the rehabilitation and reconstruction of these municipal assets. Damage to the municipal assets listed above (Table 52) is estimated for the 20 municipalities. Nearly 13 percent of the total municipal assets assessed are damaged, however, only 3.4 percent are destroyed. Police stations, municipal buildings and entertainment facilities experienced higher levels of destruction as compared to other service facilities.

Damage costs of the municipal assets affected by the flood are calculated based on the average physical surfaces[235] of these assets and the unit cost for reconstruction and rehabilitation, including basic furnishings.[236] Based on the assumptions that partly damaged assets are functional, additional costs for rehabilitating the functions are included as part of the service costs. The total damage cost of the municipal service assets assessed is estimated at US$ 11.7 million (LYD 56.4 million) at the replacement value prices prior to the disaster (Table 53).

The damage cost estimation of municipal assets across various municipalities suggests that Derna, Soussa and Al Bayda municipalities incurred relatively higher damage costs compared to other municipalities (Table 54).

233 Debris removal cost is assessed as part of the infrastructure recovery cost.

234 Damage is classified as Partially Damaged if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage is classified as Completely Destroyed if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

235 Average surfaces used in square meter for each asset were the following: 660 for Town/City Hall, 3,800 for Police Station, 2,500 for Community Market, 795 for Entertainment, 500 for Municipal Building.

236 The basic construction cost applied for estimating the damage cost is US$ 300/sq.m.

Table 53: Damage Cost by Municipal Assets

Municipal Assets	Damage Cost of Destroyed Assets - US$	Damage Cost of Partly Damaged Assets - US$	Total Damage Cost -US$	Total Damage Cost – LYD (1 US $ = 4.8055 LYD)
Town/City Hall	-	237,600	237,600	1,141,787
Police Station	3,420,000	3,192,000	6,612,000	31,773,966
Fire Station	-	-	-	-
CommunityMarket	22,50,000	12,00,000	34,50,000	1,65,78,975
Entertainment (theatre)	4,77,000	3,81,600	8,58,600	41,26,002
Municipal Building	150,000	420,000	570,000	2,739,135
Total	**6,297,000**	**5,431,200**	**11,728,200**	**56,359,865**

Source: Assessment team.

Table 54: Damage Cost per Municipality for Municipal Services

Municipalities	Baseline Units	Destroyed Units	Partly Damaged Units	Damage Cost (US$)	Damage Cost (LYD)
Al Abraq	6	0	0	-	-
Al Abyar	18	1	0	699,667	3,362,248
Al Bayda	17	1	5	1,785,907	8,582,174
Al Marj	20	0	0	-	-
Al Qayqab	3	0	0	-	-
Al Qubah	16	0	0	-	-
Benghazi	81	0	5	1,086,240	5,219,926
Derna	11	7	1	5,114,915	24,579,722
Gemienis	8	0	0	-	-
Jardas Al Abid	0	0	0	-	-
Medouar Al Zetoun	2	0	0	-	-
Ra's Al Hilal	0	0	0		
Sahel Al Jabal	1	0	0	-	-
Shahaat	17	0	2	434,496	2,087,971
Soussa	16	0	11	2,389,728	11,483,838
Suloug	31	0	0	-	-
Toukara	10	0	0	-	-
Umar Al Mukhtar	1	0	0	-	-
Umm Arazam	7	0	0	-	-
Wardam	1	0	1	217,248	1,043,985
TOTAL	**266**	**9**	**25**	**11,728,200**	**56,359,865**

Source: Assessment team.

Loss: Since most of the municipal services are being delivered by relevant public authorities at the national level, primarily by the GNU's Ministry of Local Government, the level of services provided by the Municipalities is limited and hence the loss to Municipalities is considered limited after the flood. Besides, due to the lack of any credible municipal asset service auditing, it is not realistic to estimate changes in the level and quality of services and incremental increase in the capital and revenue expenditures expected to be incurred by the Municipalities after the disaster. In the absence of any user charges levied by the Municipal Councils for the services provided by them, the financial loss due to the damage and discontinuation of service provision is also insignificant, except in the case of property registry revenue loss.[237] Hence this assessment did not estimate the economic loss incurred by the municipal service sector in the disaster-affected regions.

Linking Effects to Human Impact

Quality of Life: Irrespective of which agency provides the public and municipal services, the quality of life of people and the ease of rehabilitating economic activities in cities and towns are determined by the quality and level of basic services. Although, technically most of the municipal services listed in the Law 59 come under the functional domains of the municipalities, mostly the relevant Ministry Departments and Agencies, directly or indirectly operating through the Ministry of Local Government at the national level, provide much of these services. Basic infrastructure such as roads and transport, water supply and sewerage, and effluent treatments are provided by the respective Line Ministries. In the absence of functional and fiscal devolution and the lack of technical capacity municipalities currently function as the delivery arms of Ministries and Agencies, although during times of emergencies, their level of cooperation is more effective as compared to normal times.

Recovery Needs and Strategy

The recovery investment needs are estimated based on the following recovery needs, such as cost of repairs of partly damaged assets, reconstruction of destroyed assets, service cost of improved provision of these services either by the government and municipal agencies, or through contracted vendors/ community agencies, and technical support cost for strengthening the delivery capacity of service providers. Since restoration of damaged assets and service provisions are managed by Government Agencies and Municipal Bodies, it is assumed that the investment multiplier could be about 1.3 for covering financial and physical contingencies (15 percent) and BBB practices (15 percent). Security and insurance premiums are not included in the investment multiplier due to the nature of government interventions involved in the municipal service sector recovery, and for internalizing the security risks through government security mechanisms. The total recovery investment need from the Municipal Service sector for the rehabilitation of partly damaged and reconstruction of destroyed assets is estimated at US$ 15.2 million (LYD 73.3 million) at current prices (Table 54). While nearly US$ 3.7 million is required towards service costs for making the damaged facilities operational, about US$ 1.5 million is required for providing technical assistance supports, including on climate change. The total recovery investment need of the municipal service sector is estimated at US$ 20.5 million (LYD 98.6 million).

Sequencing Investment Needs: Since access to basic services is critical for improving quality of life and livelihoods of disaster-affected families and reviving economic enterprises, it is assumed that 80 percent of the partly damaged assets will be restored during the short term and the rest over the medium and long terms. Although a large part of the reconstruction of destroyed assets will be taken up during the medium and long terms, it is assumed nearly 20 percent of destroyed assets that are critically required for the safety and security of citizens will be reconstructed during the short term, for example police stations. It is also assumed that nearly 30 percent of the service costs and 40 percent of the technical assistance financing will be allocated for the short term and the rest over the medium and long terms. Based on these assumptions, the short-term investment need is estimated at US$ 9 million (LYD 43.3 million) and US$ 11.5 million (LYD 55.3 million), which would be required for the medium and long terms (Table 56). However, it is important to recognize that due to a large number of unknown factors affecting the pace and effectiveness of recovery investment planning – including as it relates to financing reconstruction efforts, potential access constraints, and the fluid security context – the sequencing of recovery needs should be perceived as an iterating and flexible processes, with midterm revisions. Application of rolling work plan strategy is a desirable operating

237 This loss is taken into consideration in the housing damage economic loss estimation.

Table 55: Total Recovery Investment Needs for Municipal Services

Recovery Interventions	Recovery Investment - US$	Recovery Investment - LYD
Repair of Partly Damaged Assets	7,060,560	33,929,521
Reconstruction of Destroyed Assets	8,186,100	39,338,304
Service Costs	3,755,388	18,046,517
Technical Capacity Building	1,524,666	7,326,782
TOTAL	**20,526,714**	**98,641,124**

Source: Assessment team.

Table 56: Sequencing Recovery Investments for Municipal Services

Recovery Interventions	Short Term (<1 Year)		Medium/ Long Term (1–3 Years		Total Recovery Investment	Total Recovery Investment
	US$	LYD	US$	LYD	US$	LYD
Repair of Assets	5,648,448	27,143,617	1,412,112	6,785,904	7,060,560	33,929,521
Reconstruction Costs	1,637,220	7,867,661	6,548,880	31,470,643	8,186,100	39,338,304
Service Costs	1,126,616	5,413,955	2,628,772	12,632,562	3,755,388	18,046,517
Technical Assistance	609,866	2,930,713	914,800	4,396,069	1,524,666	7,326,782
TOTAL	**9,022,151**	**43,355,946**	**11,504,563**	**55,285,178**	**20,526,714**	**98,641,124**

Source: Assessment team.

strategy to mitigate technical and operational risks entailed in the recovery programming in the country.

Recovery Strategy: In the absence of fiscal and clear functional devolution, almost all Municipalities depend on fiscal transfers from the Central authorities to meet their revenue and capital expenditures, although some municipalities discretionally collect transit fees, rents for government buildings, and fees for issuing construction permits.[238] In the absence of any national policies and guidelines for fiscal and financial devolutions at the level of Municipalities, revenue generation by some of them is undertaken discretionally and in limited areas based on the pro-activeness and acceptability of Municipal Councils by the local population. Hence it is difficult to generalize the current practices for the provision of municipal services.

Damage assessment and prioritization of recovery needs should therefore recognize these institutional limitations while planning recovery investment programs. It is observed that the limitations of Law 59 to demarcate the functional and fiscal responsibilities of central and municipal councils is a serious lacuna to be addressed for making the Ministries and Municipal Councils accountable for the effective and sustainable provision of basic municipal services. Effective implementation of sector recovery and provision of sustainable public services cannot take place in the context of current ambiguous institutional arrangements between the Ministries and Municipalities. So, the first step for formulating a sustainable recovery strategy is to operationalize Law 59 through the required amendments and executive orders as well as conduct local elections to create effective and inclusive municipal bodies. Administrative and functional disparities in municipal services between institutions at the central and municipal levels could be addressed by embracing the principles of subsidiarity and sustainability. These structural issues shall be addressed through a combination of legislative, consultative, and participatory strategies. Besides, a space for prototyping selected digital municipal services in the affected municipalities should be ensured and maintained.

238 Some municipal councils can informally raise local taxes: for example, Zwara (crossing fee), Zliten (tax from company), Al Bayda (local taxes), World Bank, RPBA-Municipal Sector Report, 2023.

Linkages with Cross-Cutting themes

The increasing likelihood of development risks due to climate change (such as the floods) underscores the critical need for climate-informed planning. It is crucial to integrate climate considerations into municipal planning and provide capacity building going forward. For example, integrating climate change considerations into urban planning can help identify areas at risk of flooding or extreme heat, and develop strategies to adapt infrastructure and land use to minimize these risks. By incorporating climate change into their planning processes, municipalities can implement measures that enhance resilience while reducing Greenhouse Gas emissions. Moreover, in line with international frameworks like the Paris Agreement and SDGs, municipalities should align their climate actions with global objectives for sustainable development. In the context of protracted conflict and ongoing institutional fragmentation, the restoration of municipal services warrants streamlined institutional arrangements and devolution of fiscal authorities to ensure that service provisions are sustainable and effective. Application of partial cost recovery strategies and tools should be conceptualized and implemented not only as resource generation mechanisms but also as means to ensure sustainable use of resources. There is no uniform application of user charges, municipal taxes, and other cost recovery tools in place in the country. Some of the municipal bodies unofficially levy transit fees, building permit fees, and rents, although, this practice is not universally applied across all municipalities. Since one of the main challenges experienced by municipalities is the inadequate financial resources and their total dependency on transfers from the center of government for the appropriations of funds for capital and revenue expenditure through fiscal transfers, effective and sustainable provision of municipal services could be attempted only through a combination of resource mobilization, appropriate beneficiary targeting and efficient expenditure management. Given the context of high levels of exclusion and marginalization, it is critical to put forward integrated service management approaches with strong grievance redress mechanisms to ensure equitable and non-discretionary provision of services, including for vulnerable communities such as women, displaced populations, and migrants. In addition, municipalities should be encouraged/ trained on resource mobilization strategies that they can use to secure additional funding for climate resilience projects. Furthermore, addressing mental health and psychosocial support needed by families in affected areas calls for the integration of child-friendly public spaces in each residential area as part of the reconstruction efforts, which service could be provided by the municipal authorities (through the provision of available municipal buildings and/or the development of public spaces). The establishment of these public spaces for children and families is vital to restoring the social and mental well-being of families.

Limitations

An important limitation of this rapid assessment is the lack of verifiable baseline data on the number of municipal assets and quantification of the differential effects of the disaster on the level and quality of services. This is particularly important in a context in which the flood exacerbated pre-existing vulnerabilities due to legacies of conflict and institutional fragility, and where municipal assets and service delivery may have already been damaged or affected by insecurity. In the absence of such service mappings, the determination of the disaster impacts of municipal services would require further verification. In the absence of the verifiable baseline data[239], damage cost is estimated based on the number of municipal assets damaged during the disaster, and the pre- and post-disaster impacts on the quality and adequacy of these basic services could not be mapped satisfactorily. A second limitation is the assessment of the functionality of the assets damaged during the disaster. In the absence of verifiable functional status of the assets damaged during the flood, it is assumed that most of the partly damaged assets are functional. Third, itemized service costing could not be carried out due to the absence of localized information related to service provision. The proportional costing approach applied in the assessment could be improved with itemized costing during the recovery planning process.

239 The baseline data provided in this assessment is based on the projected service assets calibrated by the vendor, and hence should be treated as tentative. Field level assessment is required to validate the veracity of the baseline asset inventory.

CROSS-CUTTING SECTORS

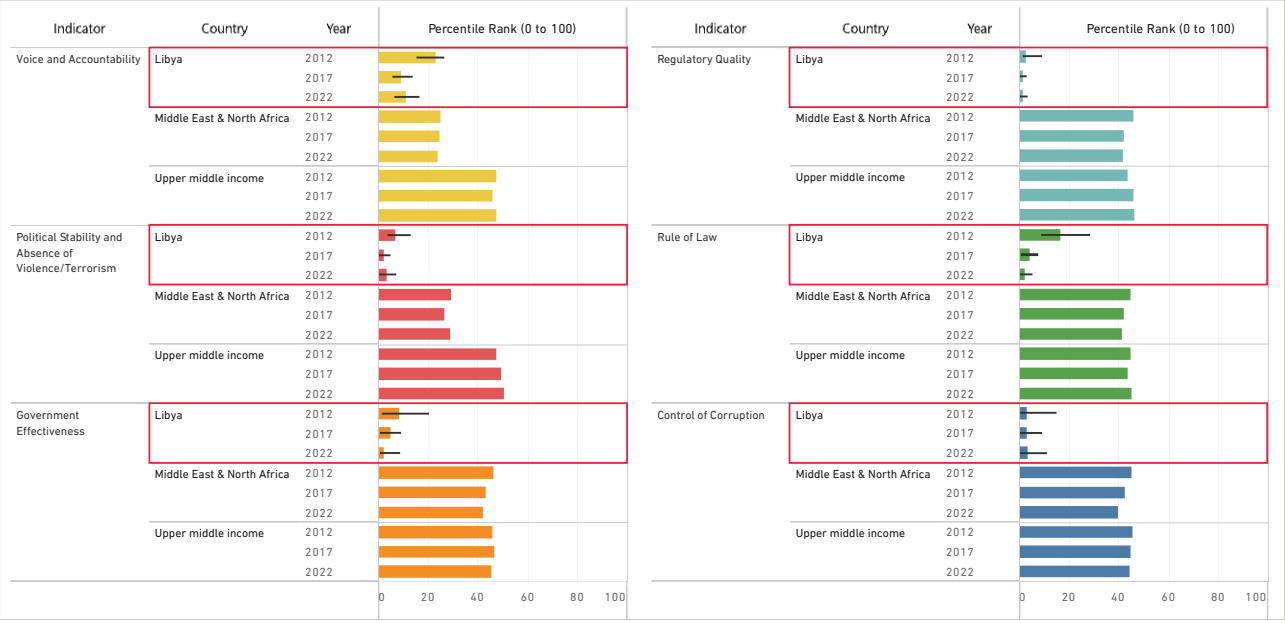
© Seraj Elhouni/Shutterstock.com

GOVERNANCE AND PUBLIC INSTITUTIONS

Since the 2011 revolution, Libya has faced significant challenges that have exacerbated fragility dynamics, including as they relate to governance challenges– all of which have been intensified by external and compounding shocks. As per the WB's Worldwide Governance Indicators (WGI), Libya's performance in all six areas, including rule of law, as well as voice and accountability, has deteriorated between 2012 and 2022, and lags behind the averages of both upper middle-income countries and other countries in the Middle East and North Africa region (see Figure 47). Libyan institutions face challenges due to limited accountability and capacity, thus exacerbating the drivers of fragility and conflict. Following a period of a relative decrease in conflict incidents, such institutional weaknesses pose a key challenge to recovery processes particularly after the devastating floods that took place in Eastern Libya.

Public finances in Libya have been heavily dependent on volatile hydrocarbon earnings, with almost the entire public budget financed by oil revenues (98 percent[240]). A particular aspect of the limited capacity of Libyan institutions is the weakness of the PFM systems. The State Financial System Law of 1967, and its amendments, and the Budgets, Accounts and Warehouse Regulations constitute the current Public Financial Management (PFM) legislation in Libya. Other relevant legislation includes Law No. (13) (2000) on planning, and Law No. (2) (2007) on controlling, and later amendments, which shape the practical steps for preparing and executing the budget. A critical limitation of the current PFM systems is the lack of regularly issued financial statements, whereby the latest set of consolidated financial statements submitted to the Libyan Audit Bureau (LAB) was for Fiscal Year 2009. And while municipal councils are audited individually, it is not clear whether any financial statements from local governments have been submitted.

Figure 46: Worldwide Governance Indicators: Libya (2012, 2017 and 2022)



Source: *https://info.worldbank.org/governance/wgi/Home/Reports (December 2023).*

240 World Bank, June 2023, Libya Economic Monitor Spring 2023.

Table 57: Central Bank of Libya (CBL) Data - January– December 2022

Ministry of Local Government and its affiliates	Chapter 1 Salaries and Wages	Chapter 2 Goods and Services	Chapter 3 Development expenditure	Chapter 4 Subsidies	Chapter 5 Contingency (Miscellaneous)	Total Spending	%
001 - Ministry of Local Government	175,948,835	125,569,659	0	747,744,656	0	1,049,263,150	66.5%
002 - Municipal Guard Device	292,719,703	6,000,000	0	0	0	298,719,703	18.9%
003 - General Secretariat of the Supreme Council for Local Administration	0	1,550,000	0	0	0	1,550,000	0.1%
004 - Historic Cities Authority	2,641,519	500,000	0	0	0	3,141,519	0.2%
005 - Ghadames City Development Authority - Ghadames	1,845,678	2,000,000	0	0	0	3,845,678	0.2%
006 - General Services Company - Tripoli	0	95,632,987	0	0	0	95,632,987	6.1%
007 - Municipal Council – Misurata	**0**	**13,000,000**	**0**	**0**	**0**	**13,000,000**	**0.8%**
008. Benghazi Municipal Council	**0**	**100,000,000**	**0**	**0**	**0**	**100,000,000**	**6.3%**
009. Jadu Municipal Council	**0**	**5,000,000**	**0**	**0**	**0**	**5,000,000**	**0.3%**
010. Zliten Municipal Council	**0**	**8,000,000**	**0**	**0**	**0**	**8,000,000**	**0.5%**
	473,155,735	**357,252,646**	**0**	**747,744,656**	**0**	**1,578,153,037**	**100.0%**
	30%	**23%**	**0%**	**47%**	**0%**	**100%**	

Source: CBL website - *https://cbl.gov.ly/en/revenue_and_expendit/* (Last accessed in May 2023during the World Bank-CBL workshop in Amman, Jordan).

Another complicating factor is the absence of a unified and officially promulgated national budget. In the absence of officially promulgated national budgets, the State Financial System Law allows for continued expenditures on Chapter one (Salaries), Chapter three (development and capital projects) and Chapter four (Subsidies) at a rate of one twelfth of the last approved budget. This approach continues to nominally justify the majority of public expenditures. Municipal personnel, as with all government personnel, receive salaries via the unified system of salaries administered by the central Ministry of Finance (MoF). Other budgetary allotments are provided on an ad hoc basis through 'Special Measures'. This includes allotments for the purposes of capital investment expenditures (Chapter three). These ad hoc measures used to circumvent limitations resulting from a lack of an official national budget are increasingly prevalent.

Although significant progress has been made in devolving fiscal responsibilities from the national to local government, the process remains incomplete and contested. Following the 2011 revolution, several laws, and decrees, most notably Law 59 (2012), officially established a three-tiered local government structure composed of governorates, municipalities, and central government deconcentrated units called Executive Offices (EOs).[241] So far only the municipalities have been established, and according

241 Including law No. 59 Concerning the Local Administration System, passed by the National Transitional Council in 2012, as well as the Executive Regulation of Law no. 597 and Cabinet Decree no. 130 of 2013 issuing the executive regulation of Law no. 598.

to Law 59, the municipality is responsible for the direct provision of several services to citizens. However, a critical challenge relates to municipal financial management, as not all government services and/or sectors operating within the municipality are part of the municipal financial management system. In fact, in many cases, certain government departments are directly under central line ministries, with no oversight nor control from the municipality on the activities of these departments. MoLG provides oversight of the municipalities, yet there remain challenges with regards to defining the roles and responsibilities between central and subnational authorities, which are further exacerbated by ongoing political contestation.

Given the limited nature of current financial resources and fiscal decentralization, there is insufficient information to determine the adequacy of fiscal resources currently made available to the affected municipal councils to fund the relief and recovery efforts needed to ensure smooth reconstruction of the flood-affected areas. It is also important to note here that there are no contingency funds for disaster or emergency conditions. This is exacerbated by the lack of institutional capacity to efficiently prepare and implement projects and deliver municipal services.

Prior to the flood, two Benghazi and Derna Construction funds existed. One was established by the GNU, called the Benghazi and Derna Construction Fund (BDCF), while another is managed by the Benghazi-based administration.[242] The BDCF was established to lead the reconstruction process of the cities and areas affected by conflict. After the recent disaster, the BDCF adopted an "Emergency Works Strategy" to develop a vision and priority projects. Implementation has been characterized by complex coordination among the multiple and fragmented channels for project funding across municipalities, line ministries, and the BDCF. Challenges relating to the independence of the Libyan Audit Bureau also poses risks, particularly with regards to transparency and accountability in the flow and use of recovery funds.

Assessment of Disaster Effects

Following Storm Daniel, four of the 33 provincial administration buildings and three out of 11 national administration buildings were partially damaged. The damage caused to public institution buildings has adversely affected the delivery of public services through road infrastructure damage, limiting access to facilities, and hindering service distribution. Internet connectivity is intermittent and continues to be a challenge for those living in neighborhoods devastated by Storm Daniel.

Table 58: Damage and Losses to Public Institutions[243]

Asset Types	Baseline	Partially Damaged	Completely destroyed	Total Cost (in US$ million)	Total (in LYD million)
DAMAGE					
Courthouse	20	4	0	0.599	2.880
Post Office	64	5	0	0.333	1.600
Provincial Administration	33	4	0	0.133	0.640
National Administration	11	3	0	0.125	0.600
Government Office	0	0	0	-	-
Total Damage				**1.190**	**5.720**
LOSS					
Courthouse	20	4	0	0.180	0.9

242 Note that the fund managed by the Benghazi-based administration's High Response and Emergency Committee held a donors' conference on November 1-2, 2023, in Benghazi.

243 Unit Cost - Courthouse $374, 571; Post Office $166,476; Provincial Administration $83,238; National Administration $104,047; and Government Office $62,428.

Asset Types	Baseline	Partially Damaged	Completely destroyed	Total Cost (in US$ million)	Total (in LYD million)
Post Office	64	5	0	0.100	0.4
Provincial Administration	33	4	0	0.040	0.2
National Administration	11	3	0	0.037	0.2
Government Office	0	0	0	-	-
Total Loss				**0.357**	**1.716**

Source: Assessment team.

Table 59: Damages and Losses to Public Institutions by Municipality

Municipality	Total Damage (in US$ million)		Total Loss (in LYD million)[244]		Total Damage + Loss (in million)	
	US$	LYD	US$	LYD	US$	LYD
Al Abraq	-	-	-	-	**-**	**-**
Al Abyar	-	-	-	-	**-**	**-**
Al Bayda	0.133	0.640	0.040	0.192	**0.173**	**0.832**
Al Marj	0.067	0.320	0.020	0.096	**0.087**	**0.416**
Al Qayqab	-	-	-	-	**-**	**-**
Al Qubah	-	-	-	-	**-**	**-**
Benghazi	0.108	0.520	0.032	0.156	**0.141**	**0.676**
Derna	0.441	2.120	0.132	0.636	**0.574**	**2.756**
Gemienis	-	-	-	-	**-**	**-**
Jardas Al Abid	0.033	0.160	0.010	0.048	**0.043**	**0.208**
Medouar Al Zetoun	-	-	-	-	**-**	**-**
Ra's Al Hilal	-	-	-	-	**-**	**-**
Sahel Al Jabal	-	-	-	-	**-**	**-**
Shahaat	-	-	-	-	**-**	**-**
Soussa	0.108	0.520	0.032	0.156	**0.141**	**0.676**
Suloug	0.150	0.720	0.045	0.216	**0.195**	**0.936**
Toukara	-	-	-	-	**-**	**-**
Umar Al Mukhtar	-	-	-	-	**-**	**-**
Umm Arazam	0.150	0.720	0.045	0.216	**0.195**	**0.936**
Wardam	-	-	-	-	**-**	**-**
Total	**1.190**	**5.720**	**0.357**	**1.716**	**1.547**	**7.436**

Note: Blank cells indicate municipalities with no reported damages.
Source: Assessment team.

244 Loss estimated at 30 percent of damage cost.

Linking Effects to Human Impact

Libya's vulnerability to conflict and fragility has led to development, governance, and institutional capacity indicators falling below those of comparable middle-income countries (MIC). Weak local government institutions and limited capacity pose significant risks to the recovery process, especially as it relates to the management of reconstruction and funds. This can potentially effect public confidence in state institutions. To this end, the Settlement-based Assessment (SBA) conducted by REACH in March 2023 noted that 33 percent of displaced respondents in the flood-affected areas reported not feeling represented by any government. Furthermore, a lack of representation of displaced persons at the municipal level was confirmed in the qualitative findings during the assessment of post-flood impacts. Activities that have been carried out following the floods, including emergency response, are understood to have been undertaken under ad-hoc arrangements, though there is a lack of clarity on the status and process of disbursements. These ad-hoc arrangements require scrutiny to ensure that the funds are used for their intended purposes and that transparency is signaled to all Libyans, especially amid the ongoing political and institutional fragmentation, and accumulating grievances of the affected populations.

The absence of an approved budget with contingency funding to provide for unforeseen events such as the flood poses significant challenges to the availability of predetermined funding options for disaster relief and recovery. Also, clear procedures are not in place to ensure accessibility, adequacy, and timeliness of relief and recovery funds. The chart of accounts currently in use is not adequate to effectively track disaster-related expenditure by event and nature (response, recovery, or reconstruction).

Libya's prolonged conflict and weak public administration have adversely impacted the relationship between the central public administration and subnational governments. In light of the political situation over the past decade, many regions and municipalities have de facto organically decentralized to and provide select basic public services. Moreover, frail intergovernmental coordination is expected to negatively impact the recovery process. This will have significant impacts on the Libyan government's ability to channel, manage, disburse, and monitor the reconstruction and recovery funds allocated to the eastern municipalities or institutions. In line with best practices and lessons learned from international experience, setting up parallel structures should be considered only as a last resort, as if such structures are designed to be non-inclusive, they may further erode public confidence and legitimacy in state institutions, and dilute the process of intergovernmental coordination and relationships between central and local authorities.

Women, youth, ethnic minorities, and Libyans from poorer households are often under-represented in decision-making processes.[245] For instance, women voter turnout in local elections was lower than men (28 percent vs. 39 percent for men) in 2017.[246] Nevertheless, municipalities were seen as the most legitimate local actors representing constituents (except in Ubari and Sebha, where tribal figures are predominant)[247] , and demands to participate in local public meetings remains high. With the legitimacy accorded by constituents, it will be important for recovery process to have strong citizen engagement, allowing local communities to express their preferences through participatory planning, budget preparation, and social audits.

Recovery Needs and Strategy

Unaddressed, the pre-flood PFM weaknesses will affect the effectiveness and fiscal transparency needed during the recovery and reconstruction process, as they would prevent the timely publication of disaster response plans, budget allocations, contracting information, financial reports and statements, implementation reports, and results. In this regard, technical assistance and capacity building interventions are proposed as part of the recovery strategy to ensure a more transparent and accountable reconstruction process. Recovery needs (Table 4) are calculated based on estimated needs of technical assistance, PFM diagnostics such as the Post-Disaster Public Financial Management (PD-PFM) review, capacity building, training, and recovery from the damages and losses.

245 UNDP. 2017. Core Government Functions Assessment, Critical Emerging Issues and Priorities for Local Governance in Libya - p.33.

246 UNDP. 2017. Op. cit., p.35.

247 International Republican Institute. 2016. Libyan Municipal Council Research, p.19.

Table 60: Reconstruction Costs

Needs Type	Short-term early recovery* (1-12 months)		medium-term* (1- 3 years)		Total Cost (in US$ million)	Total Cost (in LYD million)
	US$	LYD	US$	LYD		
1. Technical assistance and capacity building (see Table 60)	7.3	34.8	11.8	56.5	19.0	91.3
2. Removal of debris	0.5	2.4	0.0	0.0	0.5	2.4
3. Temporary rental of premises during rehabilitation	0.5	2.4	1.0	4.8	1.5	7.2
4. Reconstruction of the 16 partially damaged assets (damages + loss) x1.3	1.0	4.8	1.0	4.8	2.0	9.6
Total Needs	**9.3**	**44.5**	**13.8**	**66.1**	**23.0**	**110.5**

Source: Assessment team.

As the interventions to address the reconstruction needs focus on the quality of the processes, institutions, rules, and regulations that will be needed to ensure a transparent and accountable reconstruction process, the costing above does not require significant physical reconstruction requirements, particularly as only 16 (12 percent) of governance related assets were partially damaged. Therefore, considering the existing governance situation on the ground, the objectives of the proposed interventions in Table 5 below is to support Libyans in their efforts to plan, execute, and monitor overall reconstruction and the restoration of public services in a transparent and accountable manner. As noted in Figure 3, municipal councils do not receive a development budget; therefore, the institution(s) that will be assigned the responsibility to undertake the overall high-value reconstruction efforts will need capacity building and tools outlined in Table 5. To ensure a unified local government system, these interventions, once implemented in the flood affected areas, can be scaled-up with more country-wide training and change management processes to address the underlying challenges of the governance and PFM systems in Libya. The post-flood reconstruction efforts could therefore serve to address some of the main challenges in the current PFM and intergovernmental coordination systems, which could later be scaled-up on a regional and national level to address the more structural weaknesses in the overall system.

Various international partners have been supporting Libyan institutions in their transition from conflict and instability towards laying the foundations for improved service delivery and good governance practices.[248] The authorities can build on the foundations of these activities to undertake governance related capacity building at both central and local government level to support Libya's PFM systems to be resilient such that financial resources can be used to restore, redevelop, and revitalize natural and socio-economic (including governance) environments so that they are better able to withstand the impacts of current and future disasters in a transparent and accountable manner.

Proposed measures for cross-sector recovery and service delivery that would allow Libyan institutions to improve coordination, PFM and procurement processes, stakeholder/beneficiary consultation, and transparency, as well as BBB and establish resiliency include the following:

1. **Transparency in managing reconstruction funds.** Establishing a unified crisis management system will ensure effective reconstruction response and increase the resilience to address future disasters. A reinforced platform for improved overall recovery coordination may be needed that also employs existing mechanisms as an opportunity to strengthen country systems. However, mitigation measures including third-

248 For example, the World Bank's Governance Multi-Donor Trust Fund (MDTF) that was established in January 2016 and closed in June 2023.

Table 61: Costs of Prioritized and Sequenced Interventions for Reconstruction

Intervention/Activity	Short-term early recovery* (1-12 months)		medium-term* (1- 3 years)		Total Cost (in US$ million)	Total Cost (in LYD million)
	US$	LYD	US$	LYD		
1. Geo-Enabling Monitoring and Supervision (GEMS) tool.	0.2	1.0	0.8	3.8	1.0	4.8
2. Integrated strategic planning and PFM diagnostics.	0.3	1.2	0.8	3.6	1.0	4.8
3. Transparent rules-based intergovernmental fiscal transfers (IGFT).	0.1	0.5	0.4	1.9	0.5	2.4
4. Digitalization of financial management and payments.	1.0	4.8	2.0	9.6	3.0	14.4
5. Improving transparency and decision-making.	0.1	0.5	0.2	1.0	0.3	1.4
6. Sweep all public sector funds into the treasury single account (TSA).	0.1	0.5	0.1	0.5	0.2	1.0
7. Strengthen the post-audit capability by the Libya Audit Bureau (LAB).	1.0	4.8	1.0	4.8	2.0	9.6
8. Managing Reconstruction Funds.	0.5	2.4	0.5	2.4	1.0	4.8
9. Building Back Better (BBB) (20% of total needs).	4.0	19.2	6.0	28.8	10.0	48.1
Technical assistance and capacity building	**7.3**	**34.8**	**11.8**	**56.5**	**19.0**	**91.3**
Removal of debris	0.5	2.4	0.0	0.0	0.5	2.4
Temporary rental of premises during rehabilitation	0.5	2.4	1.0	4.8	1.5	7.2
Reconstruction of the 16 partially damaged assets (damages + loss)x1.3	1.0	4.8	1.0	4.8	2.0	9.6
Sub-total	**2.0**	**9.6**	**2.0**	**9.6**	**4.0**	**19.2**
Grand Totals	**9.3**	**44.5**	**13.8**	**66.1**	**23.0**	**110.5**

Source: Assessment team.

party monitoring (TPM), or Fiduciary Agent can be included and strengthened in the existing governance arrangements to further increase transparency and accountability of management of public resources. The Geo-Enabling method for Monitoring and Supervision (GEMS) can also be leveraged to gather digital data from the field, which can then automatically feed into a centralized system pinpointing the exact location and cross-checking data to help eliminate any double dipping from various sources of funding. GEMS can also help to ensure that planned cash transfers reach the right beneficiaries who will need to be pre-selected.[249] To ensure a unified response, a shared portal can be developed to aggregate funding and publish results for decision-makers and for communication to wider audiences. Where feasible and possible, in the short and medium term, the use of agreed and common systems, processes, and procedures should be promoted for procurement, financial management, management of environmental and social risks, M&E, etc. across recovery and reconstruction activities/investments. This will require the development of a coherent and well-coordinated multi-sector program for disaster recovery across the affected sectors and geographic areas to ensure recovery implementing agencies use similar or unified mechanisms for the implementation of recovery.

2. **Improving the publication of decisions and reporting.** Comprehensive, consistent, and PFM information related to the reconstruction process that is made accessible to the public, decision-makers, and service-delivery managers will be critical to ensure a transparent reconstruction process. This can be achieved through standard budget classification, transparency of all government revenue and expenditure including intergovernmental transfers. This would require publication of information on service delivery performance, especially as they relate to reconstruction and recovery efforts, and readily accessible and user-friendly Budget Execution Reports (BER) disaggregated by purpose, fund-source and geographic location using the BC-CoA. The Ministry of Finance can also issue "Financial Instruction" to bring into force the new business processes and improved reporting format to start timely publication of Budget Execution Reports (BER) to enhance transparency. This will contribute to increasing citizens' and international community's trust in the government's use of public funds. In parallel to the reconstruction process, the MoF can work closely with the Central Bank of Libya to complete the survey of all government bank accounts to formulate a Cash Management Policy and establish appropriate banking arrangements to operationalize the Treasury Single Account (TSA) with direct payment to suppliers. This will contribute to the predictability of available funds for budget execution and trust in the government payment system by suppliers. Technical assistance can be provided to either/both the MoF and MoLG to enhance the interim online portal that is being used by Finance Controllers to upload manual budget execution transactions. The enhancement of the interim portal will improve budget controls, cash management, and timeliness/accuracy of financial reporting with audit trails. Local radios and social media platforms can also be used to disseminate key public finance datasets to open space for citizen engagement. These efforts can help address public concerns regarding the misuse of public funds during the reconstruction process, ensure transparency and accountability, and help restore the trust in public institutions in all of Libya.

3. **Designing an accountable, rules-based intergovernmental fiscal transfers (IGFT)**. Transfers to support subnational governments' expenditures, particularly to address recovery and reconstruction needs in the flood-affected areas, can be made in the form of unconditional grants, in which their final use is determined by the subnational governments through their budgets, or through conditional (earmarked) grants to subnational governments to implement selected service delivery and expenditure responsibilities (for example, by function or program, typically in accordance with an agreed-upon regulatory or policy standard). The overall level of grants (the vertical allocation) will usually be determined by policy decisions at the central government's discretion or as part of constitutional negotiation processes. Clear criteria for the distribution of grants

249 Ideally, the geographic segment of the Budget Classification and Chart of Accounts (BC-CoA) can use the same values assigned by the Statistics Bureau so that it will be easier to link statistical surveys for strategic allocation of resources and to also facilitate Public Expenditure Tracking Surveys (PETS). Unique codes are available for the 667 District/Muhalla. This will be useful to strategically align response funds to specific geographic needs based on the RDNA and downstream track the actual use of funds.

among subnational governments—for example, formulae for the horizontal allocation of funds—are needed to ensure allocative transparency and medium-term predictability of funds available for planning and budgeting of expenditure programs by subnational governments. This will be critical to ensure the funds are allocated in a transparent and accountable manner to the municipalities that are facing large recovery and reconstruction needs following the floods.

4. **Integrated strategic planning.** There is a need for capacity building support to develop integrated strategic plans for recovery at the municipal level to raise and channel the necessary financial and non-financial resources to implement the plan. This will require strengthening the budgeting process of municipalities, including but not limited to re-engineering business processes and accounting (e.g., segregation of duties, unified chart of account, customer relations management, revenue management, internal controls system, etc.). Capacity building could be complemented with support for women leaders and vulnerable communities to encourage their participation in budgeting processes.

5. **Digitalization of financial management and payments.** Financial management processes at the local government level are primarily manual. A fit-for-purpose cloud-based local government financial management information system will be useful for the flood-affected cities to operate in a resilient manner. The system, once piloted in the affected cities, can be rolled out first to the affected 20 municipalities, then scaled up to the 102 municipalities in Libya. Libya currently uses bank accounts for disbursement of payments and can seize the opportunity to explore different forms of digital payments — G2G (government to government), G2P (government to person), and G2B (government to business) — through different channels, primarily focusing on mobile money to reach beneficiaries in remote areas. To implement this, financial inclusion among women (which lags with respect to men) needs to be prioritized, as well as inclusion of people living in more remote areas. In addition, digital solutions can be applied to strengthen the efficiency and accountability of cash transfers, drawing on the experience of partners such as the WFP in leveraging mobile financial service providers to ensure secure direct payments to beneficiaries. This offers an opportunity to also consider gender dimensions to ensure equitable and inclusive outcomes, by for example, accounting for the diverse financial inclusion needs of women and men, ensuring that emergency cash transfers are accessible, secure, and helpful to all beneficiaries. Exploring how to effectively leverage local mobile money solutions can also serve to enhance the reach of assistance.

6. **Place all public sector funds into the treasury single account (TSA):** Treasury may consider emergency measures to sweep large sums of idle government funds into the consolidated fund or TSA to meet the liquidity challenges and ensure transparency in the reconstruction process. Should international assistance be provided during the reconstruction process, ring-fencing donor funds within TSA will be critical to ensure they are used for the emergency response. A ring-fenced arrangement, under which donor funds are placed in a separate bank account but linked to and routed through the consolidated fund, is an option to mitigate risks, as was done in many operations in Africa during the Ebola crisis. This would be a stop gap exercice.

7. **Strengthen the post-audit capability of the Libya Audit Bureau (LAB):** Since many payments during the flood-response phase will likely go through expedited channels, and bypass many established controls, it is important for Libya to plan post-audits of these payments in partnership with internal, third-party independent agents, and external audit mechanisms. A Local Government Audit Manual in compliance with International Standards of Supreme Audit Institutions (ISSAI) has already been developed and covers financial audit, risk-based approach, and practical examples used for staff training. The LAB should prioritize audits of expenditure and revenues of the emergency transactions to address concerns related to the misuse of reconstruction funds and public resources. Additionally, the MoF, MoLG, and MoP would need to ensure that necessary audit trails are established and disseminated appropriately. The LAB can also take up performance audits of the government's flood response to strengthen systems for future emergencies and increased transparency. Additionally, these reports can provide valuable input into building resilience into the Libya PFM systems. Shifting the paradigm for how audits are conducted by involving citizens in the audit process will enhance public trust in the LAB as an independent accountability institution. The LAB can specifically use the standardized system for auditing disaster-related aid, ISSAI 5520, which addresses pre- and post-disaster phases.

8. **Looking further ahead, it will be important to undertake a Post-Disaster Public Financial Management (PD-PFM) review:** This will help Libya assess the capability of its PFM systems to respond to natural disasters by measuring the extent to which disaster-response considerations are integrated into key PFM functions and activities. The PD-PFM review is designed to provide a quick and robust overview of the strengths and weaknesses of a PFM system for disasters. It also identifies opportunities for reforms to laws, regulations, policies, and systems that can strengthen a country's capacity to manage disaster-related risks and sustain PFM functions after a disaster through recommendations on ways to strengthen identified vulnerable PFM areas. A key benefit of the review is that it will provide risk mitigation measures to ensure that the flood response funds are used for intended purposes in a transparent and accountable manner.

Linkages with Cross-Cutting themes

Libya's vulnerability to conflict and fragility, and its macroeconomic instability, is compounded by challenges related to climate change – that further intensify and widen fragility-related issues, and add to the socioeconomic vulnerability of Libyans, including the most marginalized communities. Political and institutional weaknesses remain challenging, including as they relate to recovery and reconstruction efforts. To this end it will be critical for the recovery process to agree on the roles and responsibilities expected to be performed by local governments and funders. To date, the eastern-based House of Representative (HoR) has allocated LYD 10 billion (US$ 1.9 billion) to an emergency committee for the response to the catastrophic floods, though there is a lack of clarity on the status and process of disbursements. Given the pre-existing governance challenges, key conflict-sensitive principles for sustainable reconstruction that can support a transparent, inclusive, green, and accountable post-disaster recovery and reconstruction process include the following:

1. *Leadership and coordination:* Continuous political leadership from the highest level of government will be essential, together with strong operational support for delivering results. This overarching function may be played directly by the central authorities or delegated to a permanent or ad hoc national recovery body, or a combination of both.
2. *Transparency, accountability, and rule of law:* It is important that funding for recovery efforts is fair and transparent.
3. *Multi-stakeholder engagement:* Effective collaboration is needed between national and international actors, including from the private sector, civil society, academia, and local government. Inclusiveness is critical in the recovery processes to provide space and opportunities for broad stakeholder participation, as an opaque process can contribute to heightened instability and weakened trust in government institutions. Gender-balanced local participation and ownership are particularly important for the recovery strategy to build a new social contract based on participation, inclusiveness, and accountability.
4. *Result-focused:* The recovery process should be measured against established targets/performance indicators and timelines. Moreover, it should be monitored within a transparent M&E system and process, including consultation with the most affected communities and stakeholders.
5. *Strategic communication:* To promote awareness of rights and entitlements during the recovery and reconstruction process, well-designed communication campaigns can be a strategic tool to educate, warn, inform, and empower people to take practical steps to minimize the impact of the disaster.
6. *Climate resilience:* in the longer term, and in order to mitigate the effects of climate change and ensure a gradual transition towards more environmentally conscious planning, relying on green public procurement (GPP) can help create an enabling environment for green investments, ensuring that policies and regulations are supportive of Libya's green recovery. By using their purchasing power to choose goods/works/services with a reduced environmental impact, governments can amplify the benefits of the green transition in high-impact sectors such as energy-using products, construction, and so on.

Limitations

The assessment of fiscal damage is limited by lack of in-year budget execution reports for local governments, and annual audited financial statements.

ENVIRONMENT

Natural Resources and Ecosystem Services

With 95 percent of its terrain comprising desert, Libya primarily consists of barren, flat to undulating plains. Coupled with the Mediterranean climate, this geographic composition makes large parts of the country vulnerable to floods, sandstorms, dust storms, and desertification. Climate change poses a significant threat to Libya's economic development and sustainability. Climate variability is likely to increase the impacts of natural hazards on agriculture production and the sustained delivery of ecosystem services. Projected increases in temperatures, increased frequency and intensity of extreme weather conditions, declining precipitation, and rising sea levels threaten the sustainability of water supplies and pose an existential risk to coastal population centers, where approximately 70 percent of the population resides. Climate change is compounding water scarcity – thereby reducing water availability for agricultural and domestic consumption. This in turn feeds into Libya's pre-existing fragility and conflict contexts, which are particularly vulnerable to the effects of compound risks because of a relative lack of capacity to cope with shocks caused by conflict, climate, and the mutually reinforcing challenges of both.

Agricultural Land Use, Including Livestock

The area in which the floods occurred is characterized by a relative abundance of rainfall and soil fertility, making it an area intensively used for agricultural activities. These activities include irrigated and rainfed crops, as well as livestock and extensive herding.

Forests and Woodlands

The flood-affected area is the only area in Libya with natural forests, Al-Jabal al-Akhdar, or the Green Mountain, stretches between Benghazi and Derna for about 350 kilometers along the Mediterranean coast and is known for its plant diversity. It hosts 70 percent of Libya's flora and several archaeological sites. The vegetation cover of the Al-Jabal al-Akhdar consist of a diverse combination of conifer and broad-leaved endemic trees and shrubs of the Mediterranean region, known as "Maquis vegetation," in the scientific literature.

Protected Areas

In the flood-affected area, there is one terrestrial national park – Al Kouf, and one marine protected area - Ain Al-Ghazalah.

- **Al Kouf National Park** (100,000 ha), situated 180 km north-east of Benghazi, west to the town of Al Bayda, includes a 20 km coastal stretch. The coastal section of the park consists of sandy beaches interspersed with rock outcrops and coastal cliffs. Behind the beach is a disjunction band of sand-dunes which are fringed on the landward side by shallow, seasonal brackish lagoons. The rest of the area is a mountain forest. Recognized as an Important Birds Area (IBA) in Libya, it is also considered a vital biodiversity hotspot in the South Mediterranean.

- **Ain Elshakika Wetland,** a Ramsar-protected wetland within Al Kouf National Park, covers an area of 50 ha. The site consists of a hypersaline coastal sebkha with limestone rock formations to the south. The site, featuring hypersaline coastal sebkha, limestone rock formations, dunes, and mudflats with extensive shrubs from west to east, is a crucial wetland for migratory and resident waterbirds. Vegetation on the inland side consists of a fringe of Tamarix, mixed with freshwater-loving plants such as Juncus. Wetland, migratory and resident waterbirds include redshanks, curlews, dunlins and slender-billed gulls.

- **Ain Elzarga Wetland,** another Ramsar-site, was established in 2000 and covers an area of 33 ha. It is a small natural depression with at least one natural connection to the sea, wet all year round but with increasing water levels and salinity during summer. The depression has mudflats and salt marshes and is surrounded by dunes from east to west and rocky hills to the south and east. The site is one of the most important wetlands in the Al Kouf National Park for migratory waterbirds. Birdwatching and ecotourism potential is considerable but undeveloped. Unsustainable hunting and destruction of vegetation, especially during summer, are considered threats.

- **Ain Al-Ghazalah** (Al-Bomba Gulf) (29,278 ha) is a marine protected area located approximately 130 km east of Derna and 60 km west of Tobruk. The area, characterized by a lagoon, covers 180 ha and three islands distributed in the gulf. Sparse salt marsh vegetation covers the shores and there is ample fishing activity. Since the establishment of the protected area there is no management or administration to control the area to implement conservation processes.

Coastal Zone

The flood-impacted coastal zone (Cyrenaica) forms a 210 km long and 50 km wide crest between Benghazi and Derna of the 2000 km long coastal zone of Libya. This region faces escalating challenges due to heightened coastal erosion, a consequence of rising sea levels and increasingly severe winter storms—factors exacerbated by climate change. These phenomena compound the threats and damages experienced along the coastline and threaten local wildlife.

Current data indicates that 8–14 percent of coastal sites in Al Jabal Al Akhdar Libya have been affected by the erosion of the seashore. Predictive modeling suggests a concerning trajectory, with estimates projecting an increase to 25–26 percent affected by 2050, further escalating to 32–33 percent by 2100. The prevalence of illegal sand mining significantly amplifies the pace and severity of coastal erosion. Beaches, crucial components of the coastal ecosystem, are in critical condition due to high rate of sand removal. This not only detrimentally affects the immediate environment but also poses a threat to archaeology, resulting in the erosion of up to 15,680 metric tons of soil during the winter storm season.

The impact of industrial waste and seawater pollution on archaeology remains inadequately understood. Studies on the quality of seawater in Libya are scarce, leaving a critical knowledge gap regarding potential implications for archaeological sites. Addressing these gaps is essential for comprehensive coastal zone management, particularly in the face of ongoing environmental challenges and the need for sustainable practices.

The Wadi Derna is a river valley which leads down from the Jebel Akhdar mountains to the city of Derna. It is an intermittent Wadi bed for much of its length and contains water only when heavy rain occurs. It is 75 km long with a drainage basin of 575 km2. Derna's coastal region is distinguished by some of the finest beaches in the country, characterized by fine sand and complemented by urban features, including coastal roads.

Biodiversity

The affected coastline serves as critical habitat for significant biodiversity, providing essential areas for feeding and nesting for turtles, seabirds, and fish. Moreover, this region is renowned for hosting regionally important seagrass beds, which remain in near-pristine condition. Wadi beds were covered in alluvial soils and natural vegetation, but these were washed away in the flood.

Fisheries Sector

Despite abundant resources, the fishing sector is not fully exploited in Libya. The exploitation of substantial tuna and sardine supplies is hindered by the limited availability of trawlers, ports, and processing facilities.

The fishing fleet primarily consists of artisanal vessels (92.5 percent), the remainder of the fleet includes 135 lampara vessels and 15 tuna vessels, including purse seines and long liners. The 1 866 artisanal vessels land their catches in 135 landing places, with 76 being permanent and the remainder operating on a seasonal basis. Within the flood-affected area, one major port (Benghazi) and multiple landing sites cater for 415 (22 percent) artisanal fishing vessels (including Mamdo and Soussa).

Benghazi stands as a pivotal commercial harbor, boasting a diverse array of industries that contribute significantly to the region's economic vitality. Among its key features are oil refineries, food and salt processing facilities, cement production plants, breweries, tanneries, and a bustling fishing industry. Noteworthy is the presence of one of the world's largest water desalinization plants, a critical asset that provides fresh water to a majority of Libya's urban centers. Despite facing challenges, including infrastructure damage caused by flooding, the port continues to function. Its strategic location and robust connections to major cities via well-established road networks ensure its continued role as a vital hub for trade and economic activities in the region.

Waste Management

In Libya, solid waste management falls under the purview of both national and local public bodies, namely the Ministry of Local Government which supervises the General Services Company, but also the Municipality which has increasing authority

over waste management. The lack of clarity over the supervision and financing of the many waste management companies presents a considerable challenge. The lack of infrastructure to properly collect, treat and dispose of waste is an additional challenge, particularly in urban areas lacking most aspects of adequate waste management.[250]

In recent years, the Libyan Government has focused increasing attention on addressing the problem of solid waste management. Consequently, investment in technologies for waste collection and incineration of solid waste has become a priority. Within the flood-affected area, there are 20 official solid waste dumpsites — one for each municipality—alongside several illegal dumpsites.[251] Notably, there are currently no dedicated sites for the management of liquid and hazardous waste, construction & demolition (C & D) waste, and recycling.

The collection and separate treatment of solid waste is still neglected, as is city cleaning. As Libya undergoes rapid industrialization and urbanization, the volume of solid waste generated has surged. Collection is at approximately 40 percent, with urban areas achieving a collection rate of approximately 62 percent, while rural areas achieve less than 17 percent. This underscores the pressing need for comprehensive waste management strategies and resource management to align with the increasing demands posed by urban development and industrial expansion.

Threats to Natural Capital

Intensive agricultural use and population increase have degraded many ecosystem services, including habitats. Other drivers of degradation include overgrazing, the uncontrolled removal of shrubs and other woody plants, infrastructure development (without considering nature-based solutions), disposal of solid and liquid wastes, mining, and the overall mismanagement of natural resources.

Deforestation and forest degradation have seen an alarming loss of more than 20,000 hectares of forests between 2005 and 2019. Notably, the rate of loss accelerated after 2011, as more people were emboldened by the country's political instability to embark on unplanned construction and clear-cutting. The loss of forest and tree cover has dire consequences for ecosystem services such as water regulation and quality, soil retention, habitat services and carbon sequestration.

Coastal zone degradation. The predominant type of damage that has been recorded can be grouped into the following categories: coastal erosion/water action/recession of water, wind/water action, natural vegetation, land/rockslide, clearance/construction, reuse/structural alteration, agricultural crops/ploughing and vandalism in the form of looting, rubbish dumping, graffiti painting, or small fires.

Sea level rise. Seawater intrusion in coastal areas due to rising sea levels has resulted in high concentrations of salts in irrigation waters, adversely affecting soil productivity. With climate change, these dynamics will continue and worsen.

Waste Management. About 67 percent of the total waste generated is disposed of in open dumps controlled by local authorities in cities through very rudimentary operational processes, by dredging and covering them with a layer of sand or construction residues as an attempt to prevent them from being scattered by the wind. Even the healthcare waste is dumped in the same areas and treated by the same way of MSW. Each municipality has a landfill for all forms of waste, including industrial, municipal, solid, and other hazardous wastes. Organic and inorganic waste is also accumulating in informal landfills and dump sites in various areas around the country, especially in rural areas.

Combined with the increasing amounts of solid waste there are problems associated with leachate from improperly constructed and managed landfills. A study from 2009 suggests that 95 percent of the MSW generated in Libya is directly disposed of on land in an unsatisfactory manner, negatively impacting the environment, leading to soil and water contamination, and the destruction of habitats, with negative impacts on people's health and well-being, and loss of ecosystem services. There have been several significant obstacles facing cities in dealing with this issue, including limited documentation regarding generation, transport, handling, management, and disposal of waste. The private sector's role in waste management and recycling remains low, and the waste management sector is largely informal or ad hoc. The Ministry of Local Government (MoLG) has developed a national

250 Alkishriwi, 2021.

251 Logistics Cluster. *Libya - 3.7 Libya Waste Management and Recycling Infrastructure Assessment.* https://dlca.logcluster.org/libya-37-libya-waste-management-and-recycling-infrastructure-assessment. (Downloaded November 10, 2023).

roadmap and results framework for solid waste management as one of its key priorities.

Policies and Regulatory Frameworks

Laws, and legislation pertaining to the environment, including biodiversity conservation and natural resource protection, include:

- Law No. (33) of 1970 on the protection of agricultural land as amended by Law No. (4) of 1973
- Law No. (5) of 1982 on the protection of forests and pastures
- Law No. (7) of 1982 on environmental protection
- Law No. (22) of 1989 on industrial regulation
- Law No. (15) of 1992 on the protection of agricultural land and its addition to Law No. 6 of 1996 amending the provisions of the Agricultural Land Protection Act
- Law No. (15) of 2003 on the protection and improvement of the environment

Institutions and Environmental Governance

The Ministry of Environment (MoE) is responsible for implementing government policies and its vision for the environment. MoE provides a set of regulations and acts that support environmental protection and protect environmental heritage from violations.

MoLG is responsible for executing government policies and vision at local levels, improving municipalities' performance, and enhancing public services through enacting adequate and practical regulations.

Today Libyan state institutions, weakened by conflict and continued insecurity, have struggled to protect the environment. Weakened state regulatory bodies have relegated environmental protection to the background, e.g., the green belt along the coast has been the target of many violations in recent years, including deforestation and illegal buildings, despite efforts by the Agricultural Police.

Key weaknesses include:
- Uneven policing of laws passed by different parties dealing with vegetation.
- Limited equipment to assess damage, and to penalize and deter offenders.
- Most of the penalties were simple and limited to traditional penalties which do not include imprisonment, daily fines or fines for probation or suspension of factories and construction.

Regarding solid waste management, regulations were mostly enacted post-2011, assigning responsibility to local governments throughout the country. MoLG is responsible for solid waste management throughout the country, whereas local municipal authorities have little or no role in managing this service.

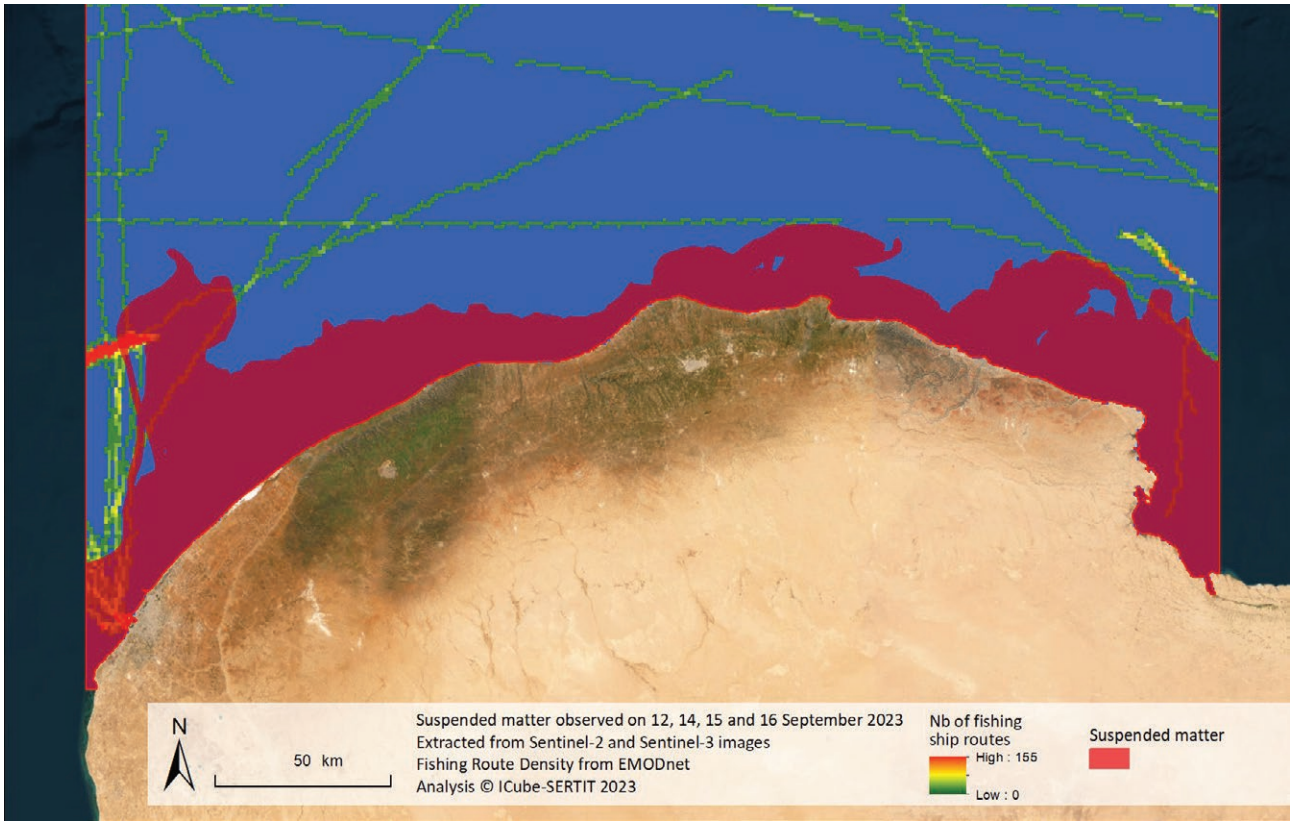
Assessment of Disaster Effects: Damage and Loss Estimates[252]

As in many disasters, the early action and attention of the government and the international community focused on the human impact and destruction of critical infrastructure, while environmental impacts have received so far insufficient attention. In Libya, environmental governance and management has been neglected for years, with the effect that the resilience of natural systems and infrastructure has slowly degraded, amplifying the impacts of the 2023 floods.

The environmental sector analysis focuses on losses, damages and restoration needs for (i) impacted ecosystems such as coastal areas, forests and woodlands, wetlands, and agricultural land (focus on topsoil loss); (ii) fisheries; and (iii) soil contamination due to point and non-point pollution from various sources. Needs are expressed in terms of short (1 year), medium (1–3 years) and long-term (4–10+ years) activities to be implemented to restore these systems, but also integrate climate change -related concerns in order to BBB. Financial needs are presented as actually assessed needs to restore damages and losses, but since the damage is estimated to be very high, financial needs for the short and medium term (years 1–3) and the longer term (years 4–10+) are proposed. The costs of damages and losses for the environment sector seem very high, especially those associated with the potential contamination with hazardous materials of soil in the six watersheds, and the damaged coastal zone, damaged wetlands, and potentially impacted agricultural lands (i.e., soil erosion and loss). For this reason, short, medium, and long-term goals offer a more manageable approach

252 Damage may be classified as **Partially Damaged** if less than 40% of the asset is damaged, structure is still sound and repair cost would be less than 40% of the total asset value. Damage may be classified as **Completely Destroyed** if more than 40% of the asset has been damaged or if the replacement cost of the damages would be more than 40% of the total value of the asset.

Figure 47: Fishing Routes Possibly Impacted by Suspended Matter Discharging into the Sea



Source: ICube-SERTIT, 2023.

to recovery of the environment. These numbers, which are based on an exhaustive analysis of available data obtained for the environment sector, should also serve as an opportunity to raise awareness in Libya on the importance of nature for the economy, society, and a healthy environment.

In terms of ecosystems and the services they provide, 3.64 percent of forests and woodlands, 62.89 percent of wetlands, 36.92 percent of coastal ecosystems and 4.59 percent of agro-ecosystems (topsoil loss) were damaged, with damage costs of US$ 59.13 million (LYD 284.13 million).

1,504.32 ha in six watersheds were assessed as potentially damaged by chemical spills (incl. petroleum products, agricultural chemicals), untreated sewage water discharge, leakage from solid waste management sites (formal and informal), and disaster waste. Other potential contaminant sources are residential properties, industrial areas, medical facilities, and fuel tanks in vehicles and storage facilities. If the area assessments can be verified, then remediation measures (including removal, bioremediation, soil washing and stabilization, chemical remediation) will need to be implemented at a cost of US$ 97.78 million.

The fisheries sector experienced damages and losses to equipment (12.5 percent of the landing sites and 80 percent of the artisanal fishing vessels were destroyed, equivalent to US$ 181,000), income (US$ 393,088 per month for fishermen – the number is actually higher since people involved in the fish value addition chain are negatively impacted as well), and affected fish stock (1,735 fishing routes were affected) due to the discharge of debris, sediments and potentially hazardous materials likely impacting the habitats of important biodiversity.

Apart from the income losses for the fishermen discussed above, the losses of ecosystem services for forests, wetlands and coastal ecosystems were assessed. The damages have caused US$ 21.06 million per month in lost ecosystem services, of which most are associated with coastal ecosystems.

In the absence of information on how formal solid waste sites were affected by the floods, no losses were estimated. However, if sites are unusable, monthly losses to manage a solid waste site would amount to US$ 50,000 per site.

Table 62: Environmental Damages and Losses

Asset Type	Baseline	Partially Damaged	Completely Destroyed	Total Cost (in US$ million)	Total Cost (in LYD million)
DAMAGE					
Watersheds (potentially contaminated soil - ha)	-	1,504.32	-	97.78	469.88
Forests and woodlands (area - ha)	21,520.19	319.87	463.07	1.4	6.79
Forests and woodlands (biomass - tons)	1,197,795.15	94,287.95	14,402.20	-	-
Wetlands (area - ha)	1783.47	1,119.50	2.20	3.67	17.63
Wetlands (biomass - tons)	116,370.93	65,159.16	47.35	-	-
Ramsar Sites (2)(area - ha)	83	31.09	1.32	-	-
Coastal Zone (area ha)	22,411	8,257.00	17	29.88	143.58
Coastal Waters (Suspended matter discharged - ha)	0	953,958.00	-	-	-
Topsoil (area - ha)	353,256.25	165.05	16,043.98	24.17	116.12
Solid waste management sites (i.e. open dump sites)	20	-	-	-	-
Ports and landing docks (number)	40	0	5	0.015	0.07
Artisanal fishing vessels (number)	415	0	332	0.17	0.80
Fishing ship routes (number)		1,629		-	-
Total Damage				**157.09**	**754.88**

Category	Unit Cost per month (in US$)	# of Months	Total Costs (Unit Cost x # of Months) (in US$)	Total Monthly Benefits Loss (in US$ million)	Total Monthly Benefits Loss (in LYD million)
LOSSES					
Loss of forest ecosystem services (per ha)	135.00	12	1,620.00	0.08	0.38
Loss of wetland ecosystem services (per ha)	1,183.00	12	14,196.00	0.53	2.56
Loss of coastal ecosystem services (per ha)	6,158.00	12	73,896.00	20.44	98.14
Managing solid waste management sites (per site)	50,000.00	12	600,000	-	-
Loss of revenue from artisanal fisheries (US$ income per fisherman)	296.00	12	3,552.00	0.39	1.89
Total Losses				**21.45**	**102.96**

Source: Assessment team.

Damage to watersheds negatively impacts important services they provide. While some damages and losses were assessed for specific ecosystems (forests, wetlands, coastal, agroecosystems/soil), other damages and losses have not been detailed due to lack of available data. Hence, damage to the six watersheds needs to be assessed on the ground (i.e., Environmental Impact Assessment) to confirm the damage and loss data.

Table 56 presents baseline data, damage (total and partial), and loss data for environmental assets.

Assumptions and Sources of Information

For the assessment of the damages and losses for environmental assets, the following assumptions were made, and sources of information used:

For watersheds:

- *Assumptions*[253]:
  - » To delineate the potentially impacted area, the size of the flooded area in each watershed was measured, assuming that most damage would be in these areas.
  - » The damage was calculated on the assumption that soils/surfaces were potentially impacted to 0.5 m deep and that 1 m3 would hold about 1.3 tons of soil.

For ecosystem services:

- *Assumptions* [254]:
  - i. Ipsos provided geo-referenced data to calculate the area of forests/woodlands, wetlands, coastal ecosystems, and agricultural *areas* (i.e., topsoil loss) impacted by the storm and resulting floods. It is assumed that the area does not overlap with the contaminated watershed area mentioned above.
  - ii. The costs of damages to ecosystems and losses of services were calculated based on the costs for restoring these ecosystems. Available literature provides a wide range of restoration costs for same ecosystem types – these costs vary due to the geographic location of the ecosystems, and their level of complexity (e.g., species composition, protection status, service provisions, level of destruction). In the absence of verified ground-data, the lowest available cost data for restoration was applied.
  - iii. It is assumed that by restoring an ecosystem, not only is the physical asset restored, but also the ecosystem's ability to provide services such as water regulation and purification, habitat services, carbon sequestration etc. Hence, the needs calculation reflects only the assessed damage values.
  - iv. Restoring an ecosystem is a long-term proposition which can take 10+ years. Hence, the needs data are sequenced to reflect a short/medium term need to initiate the restoration process (1–3 years) and complete the process over a longer period (4–10+ years). The restoration process requires management capacities, e.g., for the protection of new seedlings, pest and disease control, species reintroduction, irrigation, or erosion control measures.

253 The assumptions regarding watersheds in this section are based on information from various sources:
1. Ipsos used geo-referenced data to estimate the flooded area potentially affected by contamination, employing a global digital elevation model (DEM) with a spatial resolution of 12m.
2. The assessment of actual damage linked to soil contamination relied on consultation with various web-based sources. The costs associated with remediation were determined by considering country-specific circumstances such as pricing and the applicable technology. The proposed average remediation cost of USD100 per ton of soil reflects a consensus reached by the author and peer reviewers, deemed reasonable for the context of the study.

254 The assumptions pertaining to ecosystem services in this section are informed by the following sources:
1. Ipsos utilized geo-referenced data to assess the damaged ecosystem area, employing a global digital elevation model (DEM) with a spatial resolution of 12m.
2. Bayraktarov, E. et al. (2020) contributed insights into the priorities and motivations of marine coastal restoration research, which can be accessed at *https://www.frontiersin.org/articles/10.3389/fmars.2020.00484/full*.
3. Additional information on the cost and feasibility of marine coastal restoration was derived from Bayraktarov, E. et al. (2016), published in Ecological Applications, 26(4), 2016, pp. 1055–1074.
4. Values for ecosystem services were obtained from Kumar, P. and Wood, M. (2010), with a focus on the valuation of regulating services of ecosystems in the United Kingdom. The relevant source can be found at *https://www.ers.usda.gov/amber-waves/2015/may/wetlands-benefits-and-costs-vary-with-location/#:~:text=The%20study%20found%20that%20the,in%20major%20corn%2Dproducing%20areas*.
5. Additional insights into the causes and effects of soil erosion, as well as the associated costs and prevention methods, were gathered from *https://www.wri.org/insights/causes-and-effects-soil-erosion-and-how-prevent-it#:~:text=The%20cost%20of%20erosion%20prevention,could%20reach%20%2415%2C221%20per%20hectare* and *https://e360.yale.edu/features/ecosystem_services_whats_wrong_with_putting_a_price_on_nature*.

For the fisheries sector

- Assumptions[255]:
  - » The assessment assumed a cost of US$ 3000 to build a simple landing dock for artisanal fishing boats and US$ 500 to purchase a boat.
  - » The study used the amount of US$ 296 for a monthly salary for fishermen.

Linking the Effects to the Human Impact

Damages to forests and woodlands, fertile topsoil, wetlands, and coastal areas from the floods will mainly impact the poor, given their reliance on natural resources for their livelihoods and food security. Increased pressure on natural resources—illegal deforestation and forest degradation, agricultural activities, sand mining, protected areas without enforcement —will likely substantially increase as affected (i.e., displaced) people will exploit available resources for their subsistence. Exposure to contamination risks and overflowing or unmanaged industrial effluents from solid waste management sites have mainly occurred in and around industrial and urban areas, where poor people typically congregate.

Damaged infrastructure to protect people from floods, and the trend of more frequent disastrous events due to climate change, will likely increase the vulnerability of downstream communities, especially in Wadi Derna. The floods' impairment of the collection of large quantities of solid waste and the many carcasses of domestic animals have increased the risks of disease outbreaks. The loss of valuable land from landslides and debris flows will impact the livelihoods of local communities dependent on agricultural land use. Finally, the reconstruction will generate a significant demand for construction materials, which implies an increase in quarrying activities that will further deplete natural resources, including sand from the coastal zone, and potentially increase the risk of landslides, thereby further exacerbating underlying vulnerabilities.

The devastation of the coastal region, coupled with the contamination stemming from debris and chemical spills, poses a severe threat, particularly in Derna, where approximately 80 percent of the area is affected. This crisis significantly jeopardizes the livelihoods of the local population, comprising 90,000, and has a direct impact on crucial sectors such as fisheries and local recreational activities. This in turn risks playing a multiplying role in exacerbating the fragile conditions that affect waves of displaced and vulnerable populations.

Recovery Needs and Strategy

The overall costs to address the damage to the environment stemming from this disaster are estimated at US$ 243.80 million (LYD1.17 billion). Some measures to restore and rehabilitate the environment and BBB will need a long-term approach (up to 10 years), e.g., coastal zone restoration, wetland restoration, soil remediation and re- and afforestation. Hence, a more realistic approach to estimating the costs of measures to be implemented over a three-year period (Table 2) is suggested, proposing the provision of 40 percent of the actual needs for restoring ecosystems and their services (LYD 299.72 million; US$ 62.37 million). The remaining 60 percent (LYD 183.08 million; US$ 37.89 million) would need to be provided after year three for the full recovery and protection of the restored ecosystems. The full recovery needs for restoring the fisheries sector were applied for the same period (LYD 0.86 million; US$ 0.18 million). To avoid double counting, investments in climate-resilient infrastructure, such as roads, railways, irrigation works, and power lines, to withstand shocks from extreme climate impacts are assumed to have been separately captured in the respective sectors, as they are not easily apportioned. They are therefore not included under the recovery needs identified here. Environmental recovery actions primarily include rehabilitation of degraded lands (incl. those that lost topsoil), reforestation, coastal zone restoration (especially in Derna), revegetation of Wadi Derna, removal of debris flows in sensitive areas, building of nature-based structures to manage hill torrents and avoid landslides, soil conservation measures to reduce erosion, and reconstruction of protected area and environmental administration infrastructure. These measures will also help to protect critical infrastructure from environmental degradation (e.g., reduced sedimentation in the two dams in Wadi Derna, solid waste management sites) and extreme weather events.

---

255 The assumptions related to the fisheries sector in this section are based on information from the following sources:
1. Filogh A.M., 2019. "Libya Fishing Industry." Menba Su Ürünleri Dergisi, 5(1), 16-26.
2. FAO, 2005. "Libya Fisheries Profile."
3. FAO, 2006. "Fisheries Development Project (TCP/LIB/2902 (I) (NEPAD Ref. 06/46 E))."

Table 63: Environmental Restoration Costs

Needs Type	Total Cost (in US$ million) - including costs for BBB, etc.	Total Cost (in LYD million) - including costs for BBB, etc.
Need type 1: Reforestation and restoration of degraded forested lands	1.41	6.79
Needs type 2: Restoration of topsoil, erosion control	24.17	116.12
Needs type 3: Restoration of coastal zone	29.88	143.58
Needs type 4: Restoration of wetlands	3.67	17.63
Needs type 5: Soil Remediation and waste management	97.78	469.89
Needs type 6: Strengthening of environmental governance	10	48.06
Needs type 7: Restoration of fisheries sector	0.18	0.86
Total Needs	**243.80**	**1,171.58**

Source: Assessment team.

The cleanup of natural drainage systems and urban surface drains blocked with solid waste and silt is needed in high-risk areas vulnerable to urban flooding to reduce the risk of toxic industrial effluent overflow reoccurring during extreme weather events. The reuse of debris from damaged homes and roads should be promoted as best practice, and where possible, supported with supplies of sledgehammers, shovels and wheelbarrows. Demonstrations of debris recycling technologies should be carried out to strengthen debris management capacities. The reuse of recycled aggregate in making new building blocks and road foundations will also reduce the use of natural resources and address climate-related impacts of reconstruction.

Watersheds, especially soils impacted by chemical spills (incl. petroleum products, agricultural chemicals), untreated sewage water discharge, leakage from solid waste management sites (formal and informal), disaster waste and other potential contaminant sources would need to be remediated using removal, bioremediation, soil washing and stabilization, and chemical remediation. In the absence of ground data, it is suggested to start with identifying and ranking hotspots of soil contamination and proposed remediation measures. This would help to prioritize actions and allocate resources.

In facing this disaster and being prepared for future events, the Libyan institutions need to develop their capacity at both organizational and expertise levels. A much stronger focus is needed on governance in the three interlinked sectors of environment-energy-solid waste management. Key institutions, including municipalities, need to gain capacity to formulate strategies, legislation and policies, while supported by adequate technical assistance. A stronger engagement with the private sector and civil society organizations is needed, as financing needs cannot be covered only by the public sector.

Specific, prioritized, and sequenced interventions.

Recovery interventions are grouped into three main components:

1. **Ecosystem-based restoration and adaptation in vulnerable landscapes and watersheds:** This encompasses three area of interventions: (i) restoring damaged forests (urban and rural), rangelands, wetlands, and protected areas, including infrastructure; (ii) climate-smart coastal zone restoration (mainly Derna), including measures to address sea-level rise; and (iii) nature-based solutions for flood management and water retention to supplement "grey" infrastructure, and non-structural measures proposed by other sectors. Actions would include undertaking small-scale green civil works (e.g., gabion walls, flood torrent diversions, repair of the two dams in Wadi Derna) to slow stormwater and improve irrigation features for agricultural production.

Table 64: Prioritized and Sequenced Interventions for Environmental Restoration

Intervention/Activity	Short-term early recovery* (1–12 months)		Medium-term* (1–3 years)		Total Cost (3 years)		Long-Term Needs (4–10 + years)	
	US$ million	LYD Million	US$ Million	LYD million	US$ million	LYD million	US$ million	LYD million
Ecosystem-based restoration and adaptation in vulnerable landscapes and watersheds	6.37	30.61	14.86	71.41	**21.23**	**102.02**	37.89	182.08
Pollution management	11.73	56.38	27.38	131.56	**39.11**	**187.94**	135.39	650.62
Strengthening of environmental governance	2.00	9.61	8.00	38.44	**10.00**	**48.06**		
Investments in Fisheries Sector	0.05	0.26	0.13	0.61	**0.18**	**0.86**		
Total Needs	**20.16**	**96.86**	**50.36**	**242.02**	**70.52**	**338.88**	**173.28**	**832.70**

* To be agreed with the Government.
Source: Assessment team.

2. **Pollution management,** including soil remediation and addressing solid and wastewater management. There is an immediate need to identify hotspots of contaminated soils and remediation measures. Thereafter, the management of contaminated sites, including pollution containment and remediation measures need to be implemented. There is an immediate need to remove debris, including sediment and waste from blocked drainage channels and flooded areas and infrastructure. Improved collection and management systems for solid waste and debris are required. Dedicated facilities are needed for hazardous waste such as chemical products, medical waste, and agricultural products such as pesticides and fungicides.

3. **Strengthening of environmental governance:** Libya's capacity to manage environmental challenges is limited. Recovery interventions need to include strengthening environmental and climate change institutional capacities to respond to the floods, including through more detailed environmental assessments; oversight and enforcement of environmental regulations (EIAs) of the reconstruction; and improved data collection and monitoring systems.

4. **Investments in Fisheries Sector:** Fishermen need to be helped to buy new vessels, and landing docks need to be repaired or newly built. A detailed impact assessment of the discharge of debris, and hazardous materials on fish stocks and other marine species needs to be conducted to understand the full impact of the disaster on the fisheries sector and coastal and marine habitats, incl. sea turtles and sea grass.

Linkages with Cross-Cutting themes[256]

Libya's environmental sector has faced significant challenges, especially since the 2011 Revolution. Environmental governance has been inadequate due to limited institutional and human capacities, lack of enforcement of environmental laws and regulations, and the country's vulnerability to conflict and fragility . Countries like Libya, with persisting fragile and conflict-affected conditions have immediate priorities, but the environment is not one of them. The flood disaster further aggravates the situation as the government and the international community have primarily focused on the human impact, and the environmental consequences of this disaster – which can play a reinforcing role in exacerbating compound risk factors – have received insufficient attention.

Libya's ecosystems are fragile and highly vulnerable to the impacts of climate change. In the absence of

256 Cross-cutting themes include: FCV, Climate Change, Gender, Governance, and Social Inclusion.

sustainable use or management plans for natural resources, extension services to rural communities and enforcement of laws associated with protecting the environment from climate change impacts will further threaten these ecosystems.

Since mainly rural communities depend on the use of natural resources for their livelihoods, the further degradation of the natural resource base and ecosystem services will affect natural resource dependent people, especially women. In addition, the current waste disposal methods are negatively impacting the environment and delivery of ecosystem services, leading to soil and water contamination and the destruction of habitats with negative impacts on vulnerable people.

The BBB approach promoted in this report recommends not only upgrading or building new infrastructure (e.g., waste disposal sites) but also integrating climate change considerations in restoration and rehabilitation efforts. Since Libya is already grappling with the impacts of more than a decade of conflict, it has been pushed to the brink by the intensifying consequences of climate change. It is expected that climate change will further amplify extreme weather events, making them more frequent, prolonged, and severe, thus exacerbating the plight of vulnerable populations.

The convergence of climate-related disasters, protracted crisis, and economic instability in Libya creates a lethal cocktail that leaves people and communities grappling with minimal preparedness, inadequate infrastructure, and limited access to essential services. This triple burden of challenges makes it extraordinarily difficult for them to cope and recover. Hence, the integration of climate-related consideration in the restoration and rehabilitation efforts related to the environment is paramount.

Limitations

Key limitations on data assessment and verification were largely due to time and access constraints, accentuated by the geographic spread of the impact and flood conditions, which restricted the level and scope of data collection. This included:

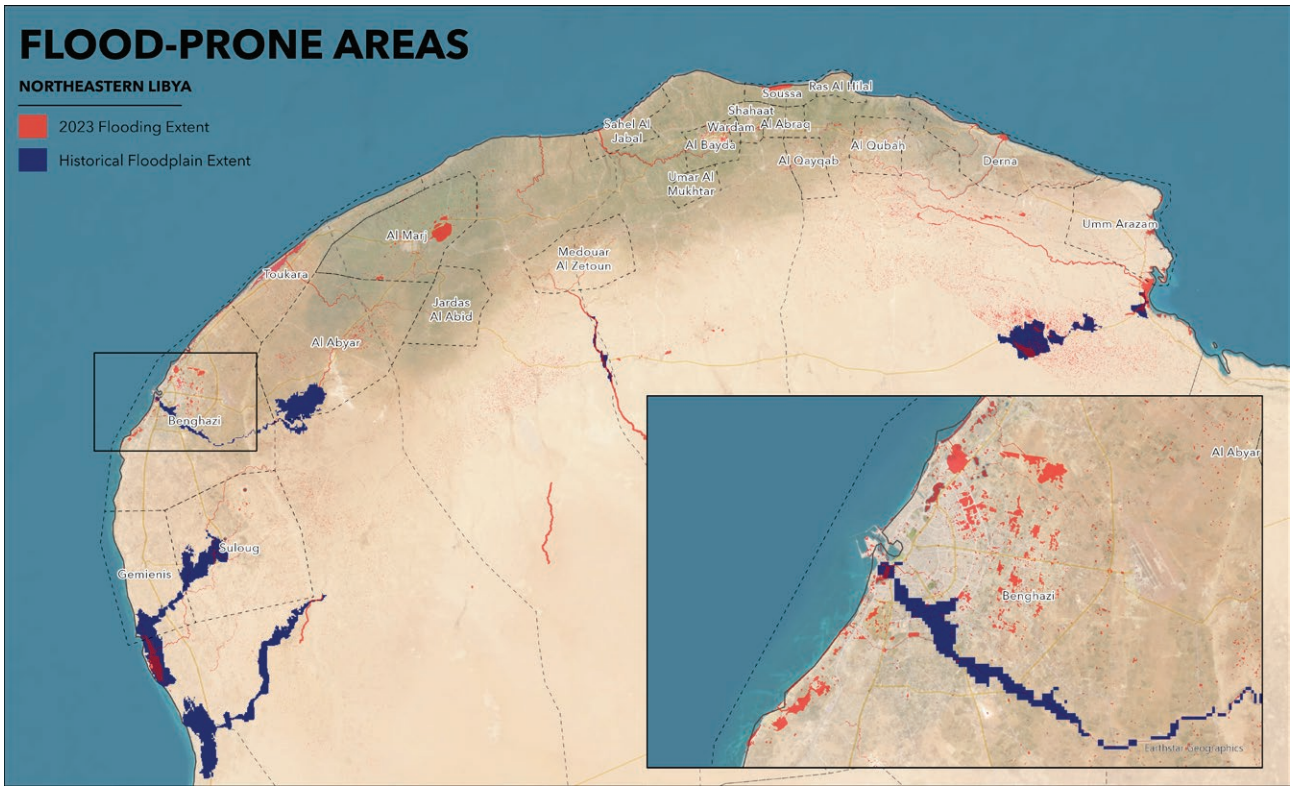
- Limited remote-sensing data to assess environmental damages.
- Inability to ground-truth findings from remote-sensing analysis.
- Difficulties in assessing chemical and other contaminant spills, especially where they were washed off during the flood.
- Challenges assessing losses for environmental services of all potentially impacted ecosystems (i.e., value of ecosystem services).

DISASTER AND CLIMATE RISK MANAGEMENT

Disaster and Climate Risk profile

Libya is exposed to a multitude of natural hazards, including floods, droughts, wildfires, tsunamis, earthquakes, extreme heat,[257] sandstorms, and desertification.[258] Data on historical disasters in Libya are scarce and incomplete.[259] In 1963, a 5.4 magnitude earthquake occurred in Al Marj, Northern Libya, causing at least 300 deaths and damage of US$ 5 million.[260] Other major flood events have reportedly struck the country in 1995 (city of Al-Khums, with damages totaling US$ 42.2 million), in 2013 (Tripoli, Az Zawia provinces), and 2019 (Ghat municipality, affecting 20,000 people).[261] Wadi Derna in particular is known to be prone to flooding, and experienced four major floods in October 1942, October 1959, October 1968, November 1986 and September 2011.[262]

Figure 48: Historically Flood Prone Areas



Source: Assessment team.

257 GFDRR, 2020. https://thinkhazard.org/en/report/145-libya.
258 UNDRR, 2023. https://www.undrr.org/media/85834/download?startDownload=true.
259 Only five natural hazards had been recorded in the EM-DAT data base since 1944, prior the 2023 floods. CRED/UCLouvain, 2023, https://public.emdat.be/data.
260 Ibid.
261 https://reliefweb.int/disaster/fl-2019-000051-lby; CRED/UCLouvain, https://public.emdat.be/data.
262 https://sebhau.edu.ly/journal/index.php/jopas/article/view/2137.

Climate change is expected to contribute to increases in the intensity and/or frequency of hydro-meteorological events. The projected implications of climate change include the following:

- Temperature: While Libya is already experiencing increasing temperatures that exceed the global average,[263] this warming trend is set to continue. Temperatures are expected to rise up to 5°C by 2050, *with significant impacts on the occurrence of heatwaves, and increased evaporation rates.* In summer the average daily maximum temperature in the areas affected by flooding is projected to be 42°C by 2050. About half of the summer season will also surpass key Heat Index 35°C.

- Rainfall: Overall, changing climate is expected to reduce the rainfall by around six percent by mid-century in the affected regions. Importantly, climate change will also lead to increasingly long intervals between precipitation events. However, the intensity of the precipitation will increase for particular precipitation events leading to higher risk of pluvial and fluvial flooding. According to the sixth assessment report from the UN Intergovernmental Panel on Climate Change (IPCC), medicanes[264] are projected to decrease in frequency, but increase in intensity in the Mediterranean region. [265]

- Sea level rise and storm surges: *Sea levels are rising faster in Libya at 6.8 mm a year compared to 2.5 mm a year globally. This accelerated rise puts low-lying areas, including Benghazi, at significant risk.*[266] A much larger area will be affected by stronger storm surges which could cause infrastructure damage, including to Libya's vast oil infrastructure,[267] but also increasing the likelihood of groundwater salinization and coastal flooding. Given that the majority of the population (85 percent) lives in coastal zones, estimates indicate that approximately 76 thousand inhabitants or 31 percent of the coastal population are at risk of being affected.[268]

- Drought: Droughts are likely to increase, with more consecutive days experiencing < 1mm rainfall. Coastal areas will see a significant number of consecutive dry days at >300 days/year. Increasingly arid conditions will have obvious implications for availability of freshwater resources, but also may increase the likelihood of flash flooding events, as dry compacted soil has reduced absorption capacities and leads to run off.

- Flood: The occurrence of extreme precipitation events, that cause pluvial and fluvial flooding are projected to increase. Benghazi, for example, will see 1 in 25-yr events occur every ~21 years; 1 in 50-yr event occur every ~40-years.

---

263 source: *https://www.atlanticcouncil.org/programs/middle-east-programs/rafik-hariri-center-for-the-middle-east/empowerme/macromena/climate-profile-libya/#:~:text=Increasing%20temperatures&text=While%20global%20temperatures%20had%20already,Administration%20(NASA)%202021%20numbers*.).
Temperatures in the southern Mediterranean have increased by 1.5°C above pre-industrial levels.

264 A "medicane" is the name given to a storm originating in the Mediterranean Sea that has the physical features of a hurricane, a type of tropical cyclone characterized by a low-pressure center circled by thunderstorms with high winds. Carbon Brief, 2023, *https://www.carbonbrief.org/qa-how-are-libyas-medicane-fuelled-floods-linked-to-climate-change/*.

265 IPCC, Cross-Chapter Paper 4: Mediterranean Region. 2021. *https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_CrossChapterPaper4.pdf*.

266 Government of Libya. Libya NDC White Paper. 2022.

267 *https://climate-diplomacy.org/sites/default/files/2021-10/csen_risk_brief_libya*.

268 *https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-4901*.

Detailed climate projections (SSP3) in the affected region

Table 65: Maximum of Daily Maximum, Annual, Mean[269]

°C	2020–2039	2040–2059	2080–2099
Benghazi	40.60 (38.46, 43.31)	41.63 (39.36, 43.99)	43.76 (41.57, 46.43)
Sahel Al Jabal	39.56 (37.45, 42.26)	40.69 (38.36, 43.57)	42.69 (40.34, 45.88)
Derna	40.80 (38.88, 43.69)	41.86 (39.88, 44.75)	44.20 (41.82, 47.36)

Source: Assessment team.

Table 66: Precipitation Percent Change, Annual

Percent (%)	2020–2039	2040–2059	2080–2099
Benghazi	-3 (-11, 4)	-6 (-12, 4)	-12 (-21, -2)
Sahel Al Jabal	-3 (-12, 5)	-6 (-15, 4)	-13 (-24, -1)
Derna	-3 (-10, 6)	-5 (12, 5)	-9 (-18, 2)

Source: Assessment team.

Table 67: Changes in Flood Return Level

	2035–2064 center 2025	2070–2099 center 2085
1 in 25-yr event (Years)		
Benghazi	20.80 (9.72, 47.47)	20.20 (9.98, 50.30)
Sahel Al Jabal	22.18 (9.95, 56.19)	20.97 (8.27, 51.22)
Derna	21.78 (8.44, 101.25)	15.20 (8.51, 37.26)
1 in 50-yr event		
Benghazi	40.11 (16.80, 106.81)	37.65 (15.46, 117.59)
Sahel Al Jabal	43.63 (16.52, 144.80)	39.83 (12.10, 111.95)
Derna	40.59 (12.47, 323.16)	27.15 (12.78, 74.07)

Source: Assessment team.

269 Data presented as median, 10th and 90th percentile of the multi-model ensemble. All projections have uncertainty, as such it is important to present values with range. Range spread can also give insight into degree of uncertainty of model projections and model agreement.

Institutional and Policy Framework for Disaster and Climate Risk Management

Libya lacks a well-defined institutional and regulatory framework for disaster and climate risk management, leading to ambiguity in mandates, roles, and responsibilities. Lack of centralized leadership, institutional fragmentation and insufficient inter-ministerial coordination impede progress to strengthen resilience. As a result, Libya is considered as one of the least prepared countries to face the challenges of climate change according to the ND-Gain index, ranking third-last out of middle-income countries and 126 out of 185 assessed countries.[270] Libya is currently among the very few countries yet to develop a comprehensive climate strategy and National Determined Contribution as required by the Paris Agreement, although Libya signed the United Nations Framework Convention on Climate Change in 1992 and ratified the Paris Climate Accord in 2021.[271] In addition, Libya lacks disaster risk management laws, policies and strategies, as well as elaborate emergency management/ contingency plans.

The Conflict-Climate and Disaster Nexus

State fragility in Libya is one of the key factors which have prevented climate and disaster resilience from becoming a political priority. The fragility context not only hampered planning and coordination across sectors and regions but also resulted in underinvestment and inadequate maintenance of flood protection, dam, and drainage infrastructure.

In a context already characterized by insecurity and institutional fragility, climate and disaster shocks have the potential to exacerbate disputes and threaten social cohesion. With higher temperatures contributing to increasing electricity and water demand, they will also affect the ability of the government to provide these services, which can potentially result in heightened citizen grievances. Moreover, water scarcity – and the overuse of groundwater – is a key challenge that impacts local and regional fragility and conflict dynamics, particularly in terms of intensifying social fissures and competition over resources. Moreover, in the context of worsening climate-change induced drought, reliance on non-renewable water sources is projected to increase, while the availability of water will be further reduced due to the drought itself. Libya's excessive use of a water reserve shared with Egypt, Chad, and Sudan, also risks exacerbating cross-border and regional tensions.

Urban and Land-use Planning

Rapid unplanned urban development has significantly amplified the risk. As of 2020, Libya's population numbered 6,931 million, with 81 percent living in cities.[272] However, urban development and reconstruction in the last decade largely took place in the absence of updated urban master plans and building norms.[273]. Libya does not currently have a national building code. With the exception of Benghazi, only a limited number of cities have updated master plans.[274] This resulted in a high level of informal development taking place in cities - with many homes and companies escaping the building permitting processes and located in high-risk areas. The damage seen in Al-Marj is a case in point: the damage in this city was mostly confined to the Old Al-Marj neighborhood, where many homes and buildings are poorly constructed of thin iron sheets.[275] Another example is that of inadequate land use planning: in Al Bayda and Soussa, houses, companies and infrastructure located in the

270 The ND-GAIN Country Index is composed of two key dimensions of adaptation: vulnerability and readiness to cope with impacts. (Source: https://gain.nd.edu/our-work/country-index/rankings/. Libya is below Egypt, Morocco, Tunisia, Algeria, Lebanon, and Jordan, sharing the place with Iraq.).

271 Libya is in the process to develop its NDC and a white paper to contribute and structure the Libyan dialogue as it develops its first NDC has been published in 2022.

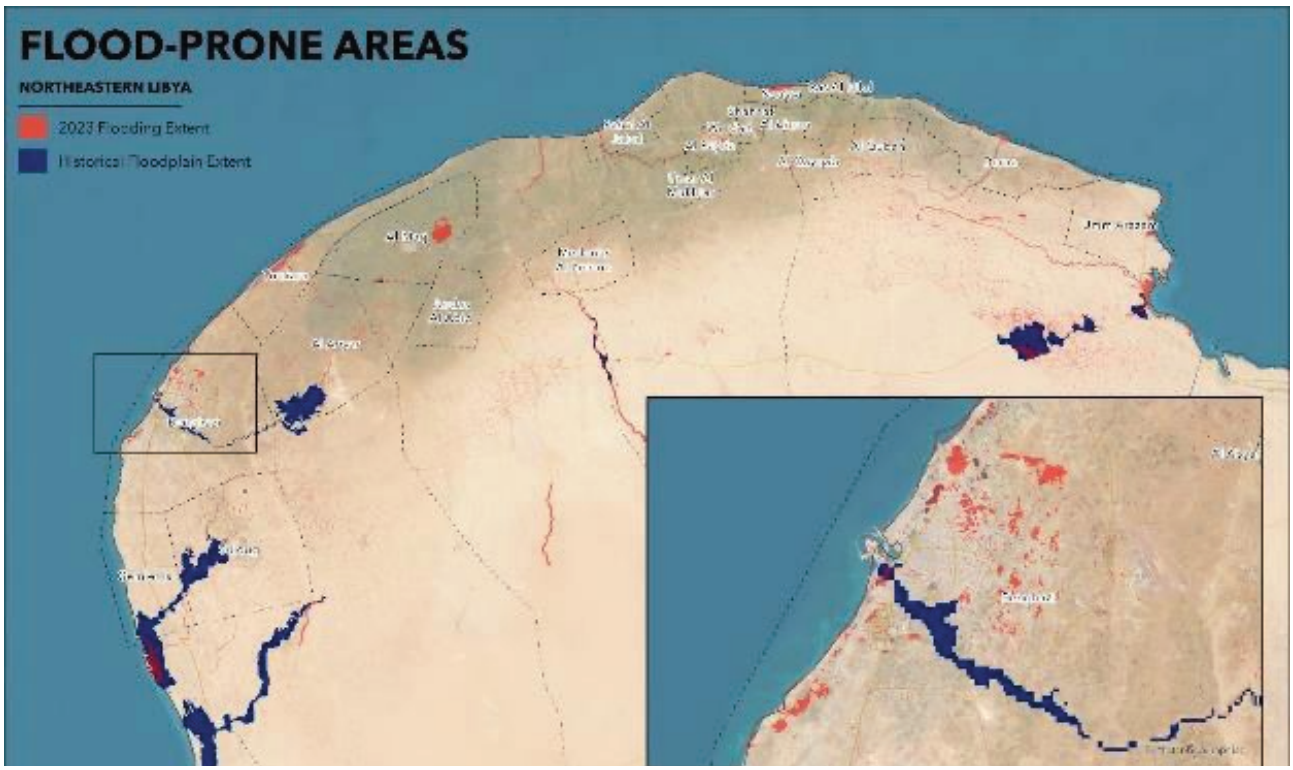
272 Bureau of Statistics and Census Libya.

273 A second planning generation (1980 -2000) led to the development of a national plan, regional and sub-regional plans as well as 244 urban master plans. However, the third generation of urban plans, initially planned to be developed for the 2000-2025 period was halted by the conflict started in 2011. Source: UN Habitat (2023), Land Administration and land rights for peace and development in Libya: analysis and recommendations.

274 In 2019, Benghazi commissioned the Greek company LED to produce urban master plan of Benghazi which was approved in 2023. Source : https://libyaninvestment.com/benghazi-signs-agreement-to-create-urban-masterplan-with-greek-company/.

275 IPSOS, Ground Partners, 2023.

Figure 49: Overlay of 2023 flooded Areas and Historically Prone Areas



Source: Assessment team.

floodplains sustained significant damage during the 2023 floods.[276]

Early Warning Systems

One of the key challenges impacting preparedness and early response to climatic shocks is the need for effective early warning systems. The Libya National Meteorological Center (LNMC) is a long-standing institution, with a significant number of staff.[277] Its network consists of 25 automatic weather stations (AWS), five upper-air stations, and five climate stations.[278] The LNMC also has a fixed weather radar and a mobile weather radar. However, the LNMC indicated that since 2011, a significant part of its network has been damaged by successive events. Prior to the floods, only a small number of weather, climate and hydrological stations located in the East were still operational, impairing weather monitoring and forecasting for localized flood early warning. Table 67 below summarizes operational weather, climate, and hydrological stations in affected areas prior to the floods.

276 UNEP/OCHA. October 2023. Environmental Challenges and Recommendations. Environmental Experts Mission. Libya Floods 2023.

277 It was established in 1950 under the supervision of the Ministry of Transport and has over 845 personnel. Source: The World Bank. 2023. Weather, Climate and Water Services in the Middle East and North Africa. Climate and Hydrometeorological Services Atlas in the Region.

278 Libya National Meteorological Centre, October 2023.

Table 68: Operational Weather and Climate Stations in the East Prior to the 2023 Floods

AWSs	**1 in Al-Marj 1 in Benghazi (+ one planned in Al Abraq Airport)**
Upper-air Stations	1 in Benghazi
Climate stations	1 in Al Bayda
Hydrological stations	Al Abraq, Al-Marj, Shahaat, Al Qayqab, Benghazi, Al Qubah, Al Abyar, Derna [279]

Source: Assessment team.

The LNMC also indicated that it lacks marine automatic weather stations.[280] In 2017 its budget was 18 million LYD (equivalent to approximately US$ 12,87 million),[281] which according to the LNMC is not sufficient to adequately monitor climate and weather, nor to produce location-specific hydrometeorological forecasts and impact-based warnings.[282] In addition, flood monitoring and forecasts also depend on quality hydrological data managed by the General Water Authority, on information-sharing between the two institutions and on joint modeling capabilities. Nevertheless, no analysis of these parameters has been carried out under this rapid assessment.

Disaster Risk Financing

A disaster contingency financial mechanism is in place in Libya: a compensation benefit was set up in 2002[283] to support victims of natural disasters who have suffered physical or material damage. Benefit levels are determined on a case-by-case basis, depending on damages incurred and the specific economic situation of the family. From its establishment in 2002 to the present day, the compensation benefit has supported around 11,245 households, with a total financial compensation over the period of LYD 30.7 million. While this mechanism aims to address the immediate needs of disaster victims, it is important to note that the emergency compensation benefit does not specifically target vulnerable populations. This lack of targeted assistance may result in these groups facing increased challenges in accessing the necessary resources to recover from the impact of the recent floods. Moreover, gaps in access to financial services place women at a disadvantage in safeguarding their funds from the adverse effects of disasters and accessing compensation benefits.

Emergency Response

In response to the disaster event, Libya's National Meteorological Center issued warnings to government authorities at least three days before the floods. Subsequently, the Libyan Government based in Benghazi announced a state of emergency in the eastern region on Sept 9 and formed an emergency room. However, the lack of a functioning end-to-end EWS hampered early action. Moreover, it is unclear whether the emergency warnings reached the entire population, including women, who are less likely to own a cellphone and utilize mobile internet services, and may not have received the alerts.

It was not possible to obtain information on the speed, effectiveness, and coordination of emergency responses, nor on whether the equipment, vehicles, and human resources for emergency response were adequate. Ground reports however indicate that engineering committees were set up by a number of municipal councils to carry out safety inspections in affected, partially damaged buildings.

279 The hydrological station managed in Derna is managed by Vision Foundation for Amateur Astronomers. All other stations are managed by LNMC.

280 Ministry of Transportation, 2022. The Status of the Infrastructure of the National Meteorological Centre After 12 Years of Successive Events. PowerPoint presentation.

281 Source: The World Bank. 2023. Weather, Climate and Water Services in the Middle East and North Africa. Climate and Hydrometeorological Services Atlas in the Region.

282 Ministry of Transportation, 2022. The Status of the Infrastructure of the National Meteorological Centre After 12 Years of Successive Events. PowerPoint presentation.

283 Now regulated by Decree No. 184 on Compensation to Citizens in Cases of Crises and Natural Disasters (2012)

Assessment of Disaster Effects: Damage and Loss Estimates

Apart from one hydrological station damaged by the flood, no additional reports were received regarding damages to buildings and equipment that could potentially hinder weather forecasting and flood warning capacity. Damages in the DRM sector typically include damage to buildings, facilities, equipment for emergency response, damages to buildings and equipment to monitor/forecast natural hazards and manage early warning systems, damages to disaster mitigation infrastructure, and destruction of disaster related records and documents etc. Losses include disruption of access to and service delivery of DRM knowledge services and resources, additional operational costs related to involvement of first responders in emergency and rescue operations etc. The analysis should also point to additional risks and vulnerabilities created as a result of the disaster. However, due to institutional fragmentation on the one hand, and the fact that disaster and climate risk resilience had not gained political traction, obtaining in-depth information was challenging. Damage incurred to emergency response facilities (namely fire stations, police stations) has been captured under the governance chapter/municipal services section.

Recovery Needs and Strategy

In light of the disaster, and considering climate projections, Libya would need to embrace disaster and climate risk resilience as guiding principles for recovery. A comprehensive approach should work across all strategic priorities of the Sendai Framework for Disaster Risk Reduction, namely: 1) Understanding disaster risk; 2) Strengthening disaster risk governance to manage disaster risk; 3) Investing in disaster risk reduction for resilience; and 4) Enhancing disaster preparedness for effective response and BBB in recovery, rehabilitation, and reconstruction. This multi-pronged approach calls for long-term engagement and political willingness. In addition, it will also be critical to embrace inclusivity in program design and implementation, and ensure that disaster preparedness and emergency response trainings, early warning systems, disaster risk reduction/climate change adaptation strategies etc. target the specific needs of the most vulnerable segments of the Libyan population, including women, children, youth, the elderly, IDPs and people with disabilities, and other vulnerable groups. Building systems and capacities at all levels should be central to all interventions.

In the short to medium-term, the recovery strategy centers around:

- Reinforcing the institutional and regulatory framework for climate and disaster risk management.
- Enhancing government and community disaster preparedness and response capacities.
- Improving climate and disaster risk knowledge.

Needs to strengthen climate and disaster risk resilience amount to US$ 27.7 million (US$ 11.7 million in the short-term and 16 million in the medium-term). Needs have been estimated against costs of similar studies and activities in other countries.

Table 69: Total Cost of Needs

Needs Type	Total Cost (in US$ million) - including costs for BBB, etc.	Total Cost (in LYD million) - including costs for BBB, etc.
Reinforce the institutional and regulatory framework for disaster and climate risk management		
Accelerate the ratification of the Paris Agreement for Climate Change, the development of associated strategies, including the country's first Nationally Determined Contribution and its National Adaptation Plan, with a specific focus on the adaptative needs of vulnerable populations	0	0
Map and review existing roles and responsibilities and national plans and strategies for Disaster and Climate Risk Management	0.02	0.10
Develop a Disaster Risk Management and Climate Change Adaptation Strategy	0.20	0.98
Finalize reforms to the building code, incl. code implementation support and training, communication, and outreach	0.80	3.90

Needs Type	Total Cost (in US$ million) - including costs for BBB, etc.	Total Cost (in LYD million) - including costs for BBB, etc.
Develop guidelines for the construction of climate resilient infrastructure and land-use planning	0.50	2.44
Bridge gaps on hydromet services, EWS, disaster preparedness and response		
Repair and upgrade equipment for hydro-meteorological observation, real-time monitoring, and forecasting	4.50	21.96
Strengthen capabilities and develop Standard Operating Procedures (SOPs) in weather and climate monitoring, forecasting, development, and dissemination of impact-based warnings	0.50	2.44
Develop preparedness and emergency response plans in seven pilot cities, informed by disaster scenarios, and organize simulation exercises	1.50	7.32
Upgrade equipment and facilities for emergency response	5.00	24.40
Strengthen capacities for emergency response and recovery	3.28	16.01
Organize community level awareness-raising campaigns on disaster risk and climate change	1.00	4.88
Undertake detailed flood hazard risk mapping and assessment in two large cities and five secondary cities	1.35	6.59
Undertake a lessons learned exercise of response and recovery processes following Storm Daniel	0.03	0.15
Improve climate and disaster risk knowledge		
Develop risk-informed urban development plans in two large cities and five secondary cities	4.00	19.52
Undertake feasibility studies for grey and green-blue infrastructure for flood protection	5.00	24.40
Total Needs	**27.68**	**135.08**

Source: Assessment team.

Table 70: Prioritized and Sequenced Interventions for Reconstruction

Category	Short Term		Medium Term		Total cost in US$ million	Total Cost in LYD million
	US$ million	LYD million	US$ million	LYD million		
Reinforcing the institutional and regulatory framework for disaster and climate risk management						
Accelerate the ratification of the Paris Agreement for Climate Change, the development of associated strategies, including the country's first Nationally Determined Contribution and its National Adaptation Plan, with a specific focus on the adaptative needs of vulnerable populations	0.00	0.00	0.00	0.00	0.00	0.00
Map and review existing roles and responsibilities and national plans and strategies for Disaster and Climate Risk Management	0.02	0.10	0.00	0.00	0.02	0.10
Develop a Disaster Risk Management and Climate Change Adaptation Strategy			0.20	0.98	0.20	0.98

Category	Short Term		Medium Term		Total cost in US$ million	Total Cost in LYD million
	US$ million	LYD million	US$ million	LYD million		
Finalize the reform of the building code, incl. code implementation support and training, communication, and outreach	0.40	1.95	0.40	1.95	0.80	3.90
Develop guidelines for the construction of climate resilient infrastructure and land-use planning	0.25	1.22	0.25	1.22	0.50	2.44
Bridging gaps on hydromet services, EWS, disaster preparedness and response						
Repair and upgrade equipment for hydro-meteorological observation, real-time monitoring, and forecasting	1.00	4.88	3.50	17.08	4.50	21.96
Strengthen capabilities and develop SOPs in weather and climate monitoring, forecasting, development, and dissemination of impact-based warnings	0.25	1.22	0.25	1.22	0.50	2.44
Develop preparedness and emergency response plans in seven pilot cities informed by disaster scenarios, and organize simulation exercises	0.75	3.66	0.75	3.66	1.50	7.32
Upgrade equipment and facilities for emergency response	3.00	14.64	2.00	9.76	5.00	24.40
Strengthen capacities for emergency response and recovery	1.64	8.00	1.64	8.00	3.28	16.01
Organize community level awareness-raising campaigns on disaster risk and climate change	0.50	2.44	0.50	2.44	1.00	4.88
Undertake detailed flood hazard risk mapping and assessments in two large cities and five secondary cities	1.35	6.59	0.00	0.00	1.35	6.59
Undertake a lessons learned exercise of response and recovery processes following Storm Daniel	0.03	0.15			0.03	0.15
Improving climate and disaster risk knowledge.						
Develop risk-informed urban development plans in two large cities and five secondary cities	1.00	4.88	3.00	14.64	4.00	19.52
Undertake feasibility studies for grey and green-blue infrastructure for flood protection	1.50	7.32	3.50	17.08	5.00	24.40
	11.69	**57.05**	**15.99**	**78.03**	**27.68**	**135.08**

Source: Assessment team.

Limitations

For the purposes of this assessment, access to information on Disaster and Climate Risk Management was found to be limited. This is because key institutional stakeholders at the central level based in the West, namely the Libya National Meteorological Service, the National Safety Authority, the Libyan Environment Ministry, the Department of Humanitarian Affairs and Assistance (GNU's Ministry of Social Affairs) have limited operational capacity in the East. In addition, DRM has not been a focus for international stakeholders to date – apart from EWS which have been strengthened with support from UNDP in 2000.[284]

284 The World Bank. 2023. *Weather, Climate and Water Services in the Middle East and North Africa. Climate and Hydrometeorological Services Atlas in the Region.*

SOCIAL SUSTAINABILITY AND INCLUSION

The 2023 floods resulted in 4,352 deaths, the displacement of 44,800 individuals and has affected an estimated 250,000 people, creating serious humanitarian challenges. These new affected populations have added to the already existing numbers displaced in the affected regions before the catastrophic floods. Among those affected, vulnerable populations including women (particularly lactating and pregnant, or female-headed households), children, migrants, and people with disabilities and people suffering from chronic illnesses have been disproportionally impacted. It is important to understand the specific needs of these populations and the challenges they face for a more inclusive and effective response. The RDNA aims to apply an inclusion lens to understand the differentiated impacts of the disaster on vulnerable populations and subsequently identify their needs. It uses and synthesizes data from multiple development partners and complements this with primary data when available.

Internally Displaced People and Migrants

The aftermath of the floods has led to the displacement of an additional 44,500 individuals[285], with 96 percent of IDPs already concentrated in the eastern municipalities. The remaining four percent of displaced individuals find themselves in Western Libya9, and the Office for the Coordination of Humanitarian Affairs (OCHA) notes that approximately 1,750 IDPs are being monitored in 18 centers repurposed from schools, resorts, and hotels, with plans for imminent relocation.[286]

The collective centers hosting IDPs, particularly in Derna, Al Bayda, and Soussa, face critical challenges in accessing safe drinking water due to flood and pre-flood damages, impacting the overall population.[287] To address this, ongoing early recovery efforts focus on rehabilitating boreholes, the desalination plant, water reservoirs, and pipes. The latest update indicates the installation of 10 water tanks at IDP collective centers, directly benefiting 960 people.[288] Despite these interventions, the needs of IDPs persist, as evidenced by the distribution of Core Relief Items (CRIs) and Non-Food Items (NFIs). Derna city, with its 16 distribution points covering affected neighborhoods, including IDP sites and families in unfinished buildings,[289] remains a focal point for assistance, with local authorities requesting support for a second round of NFI distribution to 25,000 IDPs (approximately 5,000 households), according to OCHA.

The floods have severely impacted a country already grappling with fragility and conflict. OCHA reports around 2,000 IDPs, 7,500 returnees, and 4,400 migrants in Derna, the epicenter of devastation. Primary data reveals that 85 percent of migrants face limited access to food, 77 percent to health services, 53 percent to shelter, 48 percent to NFIs, 21 percent to water and hygiene, and 11 percent to security and protection. The pre-existing conditions endured by these vulnerable populations underscore the acute challenges they face in the wake of the floods, demanding urgent and targeted assistance.[290]

Furthermore, there is a potential for long-term tensions between host communities and IDPs. While reports suggest initial positive sentiment towards Storm Daniel IDPs, such a response often is not sustainable. While conducting a detailed assessment of the potential social tensions between

285 OCHA, November 28, 2023.
286 Libya: Flood Response Humanitarian Update (as of 26 October 2023) *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-26-october-2023-enar*.
287 Libya: Flood Response Humanitarian Update (as of 26 October 2023) *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-26-october-2023-enar*.
288 Ibid.
289 Ibid.
290 Ibid.

host communities and IDPs is beyond the scope of this report, such analysis, which requires an in-depth examination, should be undertaken during the subsequent recovery phase.

Violence against Women and Men

In late October 2023, the situation in collective sites for IDPs was reported as "fluid".[291] While more information is becoming available on the situation and needs of IDP groups, existing reports lack an assessment of protection risks faced by women and children. Experience globally has shown that that risks for women and children escalate significantly in post-disaster contexts, necessitating a prioritized monitoring effort. The distress caused by disasters alters the gender power dynamic, undermines protection systems, and further exposes vulnerable populations to violence. Displacement and conflict add layers of distress that may expose women and girls to further risks, especially in the absence of on-site reporting, monitoring mechanisms and referral systems. These problems are made worse by flood-disrupted communications.

Amidst data gaps, the protection risks faced by vulnerable populations in affected areas remain unclear. However, the WFP receives numerous requests for protection, constituting 22 percent of the 6,623 calls received from September 12 to October 17.[292] Additionally, reports from development workers highlight the elevated risk of early marriage, sexual exploitation, and abuse faced by some women and girls, with concerns raised regarding the limited access to specialized services and activities, particularly for adolescents.[293]

Beyond this, disasters have a differentiated impact on women and girls in all aspects of life. The lack of access to water and hygiene supplies disproportionally affects women and adolescents during their menstruation, exposing them to multiple health risks and hindering their ability to participate in various facets of life. Furthermore, limited access to food has a disproportionate impact on women and children, with nutrition organizations managing and treating moderate and severe acute malnutrition, and reporting severe cases among children under five years of age, and lactating women.[294] International experience shows that girls in conflict and crisis-affected contexts are nearly 2.5 times more likely to be out of school than those in countries without crises.[295] While specific data on the differentiated impacts of the disaster on women and girls in Libya are unavailable, research and reports from analogous crisis situations underscore the disproportionate effect of disasters, especially in conflict situations, on these vulnerable groups.

Children's Safety

It is estimated that nearly 300,000 children were exposed to the storm that caused the floods in Libya. Of those, approximately 16,000 have been displaced.[296] According to the UNICEF Representative in Libya, "The aftermath of floods is often more deadly for children than the extreme weather event itself. Children are among the most vulnerable, and are at high risk of disease outbreaks, lack of safe drinking water, malnutrition, disruption in learning, and violence."[297] Cases of acute malnutrition have been reported among children under the age of five.

Furthermore, children who lose, or are separated from their parents and families are more exposed to violence and exploitation.[298] According to OCHA, there are an estimated 400 unaccompanied and

---

291 Libya: Flood Response Humanitarian Update (as of 26 October 2023) *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-26-october-2023-enar*.

292 Libya: Flood Response Humanitarian Update (as of 17 October 2023) *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-17-october-2023-enar*.

293 Ibid.

294 Libya: Flood Response Humanitarian Update (as of 26 October 2023) *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-26-october-2023-enar*.

295 Show Humanity for Her: Education Cannot Wait for Girls in Conflicts and Disasters *https://www.educationcannotwait.org/news-stories/directors-corner/show-humanity-her-education-cannot-wait-girls-in-conflicts*.

296 Yasmine Sherif, Director Education Cannot Wait (ECW) *https://www.unicef.org/press-releases/more-16000-children-are-displaced%E2%80%AFfollowing-libya-floods-unicef*.

297 Libya: Around 300,000 children affected by devastating floods, UNICEF, September 2023, *https://www.unicef.ch/en/current/news/2023-09-15/libya-around-300000-children-affected-devastating-floods*.

298 Ibid.

separated children in the flood affected areas.[299] These children require diverse forms of support, including family tracing and reunification services, or foster parenting placement. Delays in their registration[300] pose a significant risk, potentially exacerbating protection and health challenges. Immediate and effective measures are essential to address these complex issues and ensure the safety and well-being of these children.

Inclusion of Persons with Disabilities

Persons living with disabilities constitute part of the most vulnerable populations in disaster situations. According to the United Nations, "individuals with disabilities are disproportionately affected in disaster, emergency, and conflict situations due to inaccessible evacuation, response (including shelters, camps, and food distribution), and recovery efforts."[301] Despite this recognized impact, there is a paucity of data and information on the specific ramifications of the Libya floods on individuals with disabilities, and their inclusion in ongoing response efforts.

Post-disaster, the immediate provision of assistive devices, medication, and disposable materials is critical for the survival of those with severe disabilities. According to OCHA, collaborative initiatives involving UNHCR and Humanity and Inclusion (HI)[302] aim to work with local communities and authorities. Their collective goal is to identify, register, and refer individuals with disabilities to essential services.[303] This concerted effort strives to address the unique needs of this vulnerable group, ensuring their inclusion in broader response efforts and enhancing their resilience in the aftermath of the disaster. While facing challenges posed by limited data, prioritizing immediate and specialized support for persons with disabilities remains indispensable for their well-being and recovery.

Recovery Strategy for Increased Social Inclusion

The Libya floods present differentiated impacts on vulnerable groups, including migrants, women, children, and persons with disabilities, in addition to displacing tens of thousands. The existing post-2011 fragility and conflict challenges in Libya exacerbate these effects. In light of this, response and rehabilitation efforts must adopt an inclusive and responsive approach, prioritizing the needs of all, particularly the most vulnerable. Understanding the unique requirements of these populations and acknowledging their disproportionate vulnerability to the floods is crucial.

Despite data limitations in certain areas, insights from global disaster experiences guide a responsible way forward. To shape responses, an inclusion lens, which accounts for the distinct needs of the most vulnerable, is imperative. Building on this analysis, urgent measures include:

- Reducing limitations and barriers for the most vulnerable to actively participate in consultations and prioritization mechanisms, determining the nature and sequence of early assistance.
- Establishing and monitoring easily accessible complaint mechanisms and referral systems for gender-based violence (women and men) cases, including instances of human trafficking.
- Strengthening protection measures to safeguard vulnerable individuals.
- Scaling-up preventive and response activities for violence against women and men to create a safer environment.
- Strengthening protection mechanisms for children, especially against sexual abuse and child marriage.
- Registering and providing essential needed support to all unaccompanied children to address their unique needs.
- Identifying and accounting for the needs of people with disabilities in all phases of response efforts.

299 Libya: Flood Response Humanitarian Update (as of 17 October 2023), *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-17-october-2023-enar*.

300 Libya: Flood Response Humanitarian Update (as of 17 October 2023), *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-17-october-2023-enar*.

301 Disability-Inclusive Disaster Risk Reduction and Emergency Situations, Department of Economic and Social Affairs, *https://www.un.org/development/desa/disabilities/issues/disability-inclusive-disaster-risk-reduction-and-emergency-situations.html*.

302 Humanity & Inclusion (HI) is an independent aid organization that has been operating in Libya since 2011. HI works in situations of poverty and exclusion, conflict, and disaster.

303 Libya: Flood Response Humanitarian Update (as of 26 October 2023), *https://reliefweb.int/report/libya/libya-flood-response-humanitarian-update-26-october-2023-enar*.

IMPACT ON WOMEN AND MEN

The RDNA's needs assessment considers the sex-differentiated impact of the floods on women and men, emphasizing the necessity for appropriate mitigation and recovery interventions that address gender gaps. This section summarizes the evidence presented in the RDNA on the specific challenges women face to facilitate a better understanding of these differences and design better policies and programs to benefit all.

Each sector chapter outlines considerations for vulnerable populations, with a specific focus on women. Key considerations include women's unique health and biological needs, economic outcomes, financial inclusion, and access to services, as well as concerns about safety and security. Pre-storm and flood analysis shows that women in Libya were more vulnerable than men to shocks. Libyan women lag behind men in labor force participation by almost 20 percentage points, and 20 percent of adult women in Libya have no formal or only elementary levels of education. Lower economic participation limits women's economic freedom. Moreover, women in Libya have less access to savings accounts and are less likely to use a mobile phone to pay bills. Financial exclusion further compromises women's abilities to respond to crises.

While the climate and economic shocks may have disproportionately affected women, furthering the gap between women and men in the country, limited sex-disaggregated data post-disaster restricts a comprehensive analysis. Qualitative data from on-the-ground organizations and experiences from other disasters inform the analysis.

In the health sector, compromised infrastructure and limited access to services pose a significant threat to women's unique needs. For example, women require menstrual hygiene products, which are often ignored in the immediate disaster response, and have reproductive and maternal needs. Immediate actions are crucial, including access to specialized professionals and interventions for menstrual hygiene.

Education repercussions, such as prolonged school closures, exacerbate vulnerabilities among children and significantly affect women, who must balance care responsibilities with other duties like jobs and housework. This, in turn, exacerbates participation gaps between women and men, and reinforces traditional gender roles in terms of unequal distribution of work. Prioritizing children's access to learning will be key in the reconstruction period, as will psychosocial assistance.

Partial damages and complete destruction of community assets in affected municipalities disrupt essential services beyond education and health. This disruption particularly impacts vulnerable groups such as women, the elderly, and children. Their recovery will require women and vulnerable population sensitive approaches. Targeted consumption support, aided by tools like Geo-Enabling Monitoring and Supervision, can help identify the location and differentiated needs from those of the broader population. Enhancing financial inclusion among women and other vulnerable populations will also promote accessible and secure cash transfers.

Violence against women and men, intensified by economic shocks, also demands focused attention during recovery. While challenging to monitor, firsthand accounts from ground zero report cases of human trafficking. In addition, requests received by the WFP highlight the need for protection. Safeguards and support mechanisms to prevent violence against women, men and children are crucial for the well-being of vulnerable populations.

The floods have also disproportionately affected other aspects of women's lives, including livelihoods, mobility, and connectivity. Women play a key role in agricultural activities, which have been deeply impacted. Women-specific challenges, such as limited access to resources and opportunities, should be considered for the recovery period. In addition, mobility has become harder for all due to infrastructure damage and road closures. These damages disproportionately impact women, who face additional security risks of taking lengthy

detours. Moreover, other connectivity infrastructure, such as internet services, have also been impacted. Women, who are generally less connected to mobile communication, will become more isolated due to the disruption of ICT services. The reconstruction efforts pose an opportunity to improve transport and communication systems, while also supporting more inclusive systems for women and minorities.

Moving forward, an inclusive and effective response requires understanding the specific needs of women and other vulnerable populations. Ongoing monitoring of outcomes for women and men is critical to prevent exacerbating inequalities. Prioritizing the needs of women, children, and vulnerable groups across all sectors will contribute to a resilient and sustainable rebuilding process that fosters equality and community well-being.

Limitations

The assessment of Women and Men is limited due to the lack of comprehensive sex-disaggregated data, which has impacted the inclusion of a thorough gender analysis in the report.


GFDRR
Global Facility for Disaster Reduction and Recovery


Administered by
THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP


SPF
STATE AND
PEACEBUILDING
FUND