MOSUL DEBRIS MANAGEMENT ASSESSMENT

TECHNICAL REPORT

URP
URBAN RESILIENCE PLATFORM

Disaster
Waste
Recovery

UN HABITAT
FOR A BETTER URBAN FUTURE

UN environment

First published in May 2018 by the United Nations Environment Programme

United Nations Environment Programme
P.O. Box 30552, Nairobi, KENYA
Tel: +254 (0)20 762 1234
Fax: +254 (0)20 762 3927
E-mail: uneppub@unep.org
Web: www.unenvironment.org

Cover Image: *Al-Nineveh Street, the commercial centre of Mosul's Old City, lies in complete ruin.* ©UN Environment Programme

Photos: All images in this report were taken by Hassan Partow/UNEP, except photo 9 which is from DWR.

Design and layout: Antonia Mendes

Acknowledgements

This report commissioned by the UN Environment Programme (UNEP) was prepared by Aiden Short, Martin Bjerregaard, Cédric Ardoin-Raynaud, and Guilherme Marques Iablonovski from Urban Resilience Platform and Disaster Waste Recovery. The study was co-ordinated by Hassan Partow from UNEP, who also provided technical inputs and edited the report. Thaer Ghanim from UN-Habitat coordinated field data collection for the debris assessment survey with Mosul Municipality and assisted in liaison with national partners. Erfan Ali, Yuko Otsuki and Ivan Thun from UN-Habitat also helped facilitate the work.

UNEP would like to thank the following government officials for their assistance and contributions in carrying out this debris study: Dr. Muzahim Al-Khyatt, President, Committee Responsible for the National Effort to Restore Services in Ninewa Governorate; Abdulsattar Al-Habbow, Director of Mosul Municipality; Suhaib Al-Derzi, Head, Engineering Consultation Bureau, Mosul University; Ahmed Mahmood, Technical Advisor, Mosul Municipality; Adnan Mahmood, Deputy Director, Planning and Monitoring Branch, Mosul Municipality; Sabri Taher, Chief, GIS Unit, Mosul Municipality; Sinan Subhi, Deputy Director, Ninewa Environment Directorate; Ammar Saleem, Head Chemist, Ninewa Environment Directorate, and Yousif Muayaad, Manager, International Relations Department, Ministry of Health and Environment.

UNEP would also like to thank the following persons from the UN Integrated Coordination for Development and Humanitarian Affairs (ICODHA)/Resident Coordinator Office for facilitating the necessary logistical support: Bedreldin Mahmoud, Diyar Shekhani, Zina Aliback, and Aseel Alabdullah.

TABLE OF CONTENTS

TABLES

FIGURES

MAPS

1.0 STUDY BACKGROUND

Based on an official request from the Iraqi Government for support in assessing the environmental impacts from the ISIL conflict, the United Nations Environment Program (UNEP) is providing technical assistance since July 2017 to national partners in two main areas: i) assessment and management of conflict debris; and ii) assessment and clean-up of contaminated sites. Specifically, UNEP and UN-Habitat initiated an assessment to quantify the volume and distribution of debris in the city of Mosul. Furthermore, UNEP commissioned and partnered with Disaster Waste Recovery (DWR) and Urban Resilience Platform (URP) - two organisations with extensive experience in conflict debris management - to model different operational approaches available to the city of Mosul for debris removal.

The results of this debris assessment and modelling are provided in this document, and were discussed at a workshop held in Mosul University on 19-20 March 2018 organized by UNEP and UN-Habitat in collaboration with national partners. Key stakeholders participating in the workshop include the Committee Responsible for the National Effort to Restore Services in Ninewa Governorate, Mosul Municipality, Ministry of Health and Environment, judiciary, Ninewa antiquities inspectorate, civil protection authorities, civil society and private sector representatives, academia and UN and international development agencies.

The workshop sought to provide a central forum on debris management and achieve four main objectives:

1. Agree on the need for a multi-stakeholder city-wide debris management master plan;
2. Deliberate on the key issues that need to be addressed in a debris plan;
3. Establish a mechanism and process for the creation of this plan; and;
4. Define the success criteria for the plan including identifying key ways to impact desired results.

2.0 CONTEXTUAL ANALYSIS: DEBRIS IN MOSUL

2.1 What is Debris?

This Mosul debris assessment addresses the "debris" generated by the conflict in the city of Mosul until its liberation on 10 July 2017. Debris in this context includes damaged buildings, building materials, furnishings and other miscellaneous products. It specifically does not include the household waste produced on a daily basis by homes, markets, offices, industrial and commercial premises and public-sector offices.

Typical debris in Mosul from damaged buildings and infrastructure comprises concrete, masonry bricks, building stones, gypsum used in traditional mortar and plastering, tiles, reinforcement bars, corrugated iron sheets, timber, doors and window frames, pipes and tanks, electrical wires and cables, glass as well as furniture and fixtures. Due to Nineveh governorate's semi-arid climate, it is expected that a large amount of dust and fines will also be present in the debris. This issue will need due consideration in decision-making on debris management options.

International best practice is to reuse and recycle a high proportion of debris generated by conflicts and disasters. Indeed, it is common that following a conflict of this scale building owners reuse building materials themselves. In fact, this is reportedly already taking place in Mosul where the local population is using the debris to level uneven ground. These efforts need guidance and support to maximize the potential for debris reuse and recycling.

Recycling of debris requires more mechanical processes. Therefore, additional organisation and management is required to enable this activity. In the case of the Old City of Mosul, a potential constraint on debris recycling stems from the relatively high proportion of gypsum and lime used in traditional housing construction which may limit end use applications. Further study is required to determine debris composition and potential end use applications. Nevertheless, this should not discourage recycling efforts as a substantial volume of debris in Mosul does not contain gypsum.

Serious caution needs to be taken concerning the presence of Unexploded Ordnance (UXO) in the debris. Modern industrially manufactured weaponry is known to have a failure rate of up to 10 percent; meaning that one tenth of all launched weapons will remain viable in the debris after battles. In Mosul, where artisanal weaponry was extensively used, the failure rate is expected to be higher. More importantly, the unprecedentedly widespread use of intentionally placed booby traps and improvised mines - especially in the Old City - adds a major complication to debris recovery efforts.

Caution also needs to be taken with debris handling since it can pose a health risk to debris workers and the general public if it is mixed with hazardous wastes such as asbestos, oils and chemicals.

Photos 1 and 2: Decisions on the reconstruction of Old Mosul's many historical buildings will have important implications on debris reuse