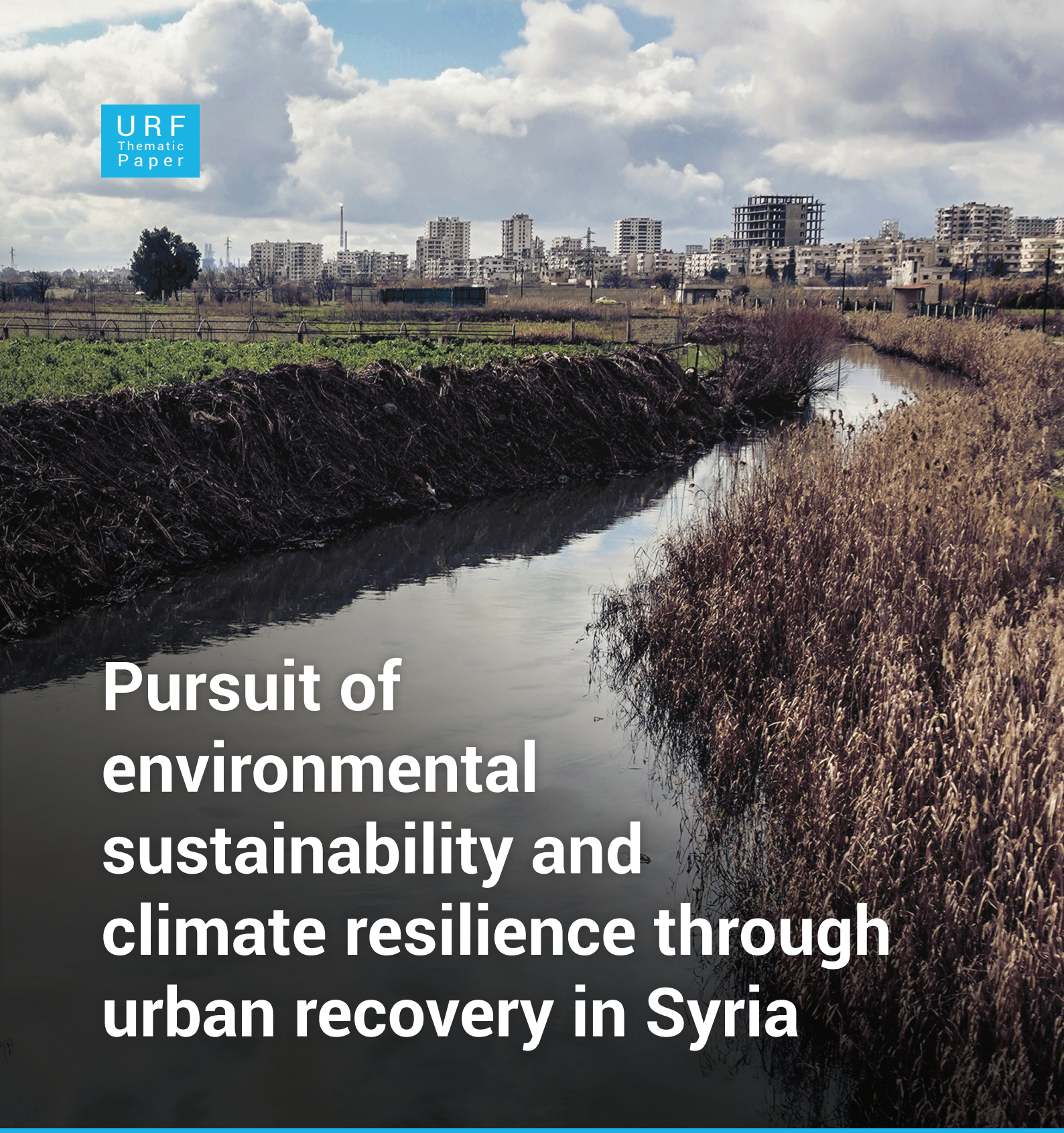
URF
Thematic
Paper



Pursuit of environmental sustainability and climate resilience through urban recovery in Syria

URBAN RECOVERY FRAMEWORK | JANUARY 2022

URBAN
RECOVERY
FRAMEWORK

UN HABITAT
FOR A BETTER URBAN FUTURE

URF
Thematic
Paper

Pursuit of environmental sustainability and climate resilience through urban recovery in Syria

URBAN RECOVERY FRAMEWORK | JANUARY 2022

URBAN
RECOVERY
FRAMEWORK

UN HABITAT
FOR A BETTER URBAN FUTURE

Disclaimer

This product was developed through a multi-stakeholder consortium, under the Urban Recovery Framework (URF) project funded by the European Union. It intends to inform current humanitarian and resilience programming in Syria.

The information and views set out in it are those of the authors and do not necessarily reflect the views or official opinion on the part of the European Union, the United Nations, or their Member States.

The boundaries and names shown, and the designations used on the maps in this product, do not imply official endorsement or acceptance by the United Nations, UN-Habitat or its Member States.

Copyright

Table of Contents

Abbreviations

CBS	Central Bureau of Statistics
FAO	Food and Agriculture Organization of the United Nations
HNO	Humanitarian Needs Overview
IDP	Internally Displaced Person
INRM	Integrated Natural Resource Management
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
LDN	Land Degradation Neutrality
MIS	Municipal Information System
MoAAR	Ministry of Agriculture and Agrarian Reform
MoLAE	Ministry of Local Administration and Environment
MoWR	Ministry of Water Resources
MPWH	Ministry of Public Works and Housing
NDC	Nationally Determined Contribution
NDVI	Normalised Difference Vegetation Index
OCHA	United Nations Office for the Coordination of Humanitarian AffairsO
PICC	Planning and International Coordination Commission
RCP	Representative Concentration Pathway
RPC	Regional Planning Commission
SDG	Sustainable Development Goal
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFPA	United Nations Population Fund
UN-Habitat	United Nations Human Settlements Programme
URF	Urban Recovery Framework
UXO	Unexploded Ordinances
WASH	Water, Sanitation and Hygiene
WoS	Whole of Syria
WWTP	Waste-Water Treatment Plants
WFP	World Food Programme

01

Executive Summary

In the years leading up to the Syrian crisis, while multiple factors defined the incidence of poverty and social unrest, environmental and climate change challenges were significant contributing factors to increased poverty, degraded living condition and rural–urban migration and. This was among others a consequence of unsustainable management and increased competition over water and fertile land, and a severe three-year drought prior to the crisis that had severe implications for agriculture and associated livelihoods. Over decades, environmental hazards have increased in frequency and magnitude. Droughts, less rain and higher temperatures leading to increasing water scarcity, land degradation, desertification, and forest fires are some of the stressors that impact both rural and urban Syria with accelerating effects. The sensitivities of population groups and systems to the adverse effects of these stressors due to poor housing and infrastructure systems are amplifying the impacts of environmental challenges.

Moreover, the prolonged crisis has further resulted in destroyed and damaged essential environment-related public services, such as supply of clean portable water, solid waste and wastewater management. Also, the challenge of electricity shortage further undermines provision of such public basic services. Institutional capacities for recovery are limited, including limited data, assessments, planning and budgets. Strategies and regulations to recover in a green sustainable and resilient way are not in place. Environmental risks and climate change challenges thus continue to threaten displaced people's prospects of return to their homes, and the restoration of livelihoods and access to basic services, as well as economic growth, among other factors.

Fostering urban recovery and resilience in Syria, including improving people's well-being, food security, productivity and stability in the long-term, will therefore depend on an urban recovery path that promotes environmental sustainability and climate change resilience. Moreover, a post-crisis recovery approach also needs to consider potential future environmental and climate change risks, as these risks pose a major threat to public health, the economy, and stability itself.

This thematic paper uses an environmental entry point to analyse urban recovery needs and options in Syria, guided by the premise that urban recovery needs can only be addressed by understanding and addressing root causes to current challenges – where environmental stressors are key underlaying factors. It explores how the environmental exposures, sensitivities and impacts have had a critical impact on the Syrian cities both prior and during the crisis and therefore must be regarded as a key pillar to any urban recovery framework, and which opportunities are present to progress urban recovery if an environmental and climate adaptive lens is applied. The paper thus aims to outline considerations and make recommendations on how to respond to environmental and climate change-related challenges through urban recovery, identifying recovery steps that lead to transformative change in the long run, laying the foundation for identifying concrete interventions and projects at national to local levels.

By analysing climate change trends, the impacts of environmental and climatic challenges on Syrian cities coupled with the reinforcing impacts of the crisis, as well institutional challenges, regulatory environment and potential institutional entry points – a policy design for embedding environmental considerations in an Urban Recovery Framework is outlined.

The following key messages summarizes a policy design for an environment-oriented URF:

Policy goals: For Syrian cities, ultimate recovery policy goals include improving people's well-being, economic recovery, food security, and stability in the long-term through a building back better/green

recovery approach, and specifically for:

- Reducing pressure on urban services systems (clean water, sanitation, waste, and pollution management, backed up with sustainable energy supply, etc.) and managing resources efficiently by establishing urban -rural linkages with introduction of green technologies including application of renewable energy.
- Enhancing social cohesion and reducing social tension around (scarce) natural resources, especially water and land.
- Increasing the sustainability and climate change resilience of livelihoods (especially agriculture) and in that way support productivity and food security.
- Reducing environmental degradation-related migration push factors.

Prioritised policy options through a phased recovery ladder. Achieving recovery goals for urban areas is made possible by pursuing activities that support progress against the environmental-related SDGs following a recovery ladder that prioritizes recovery options. This will facilitate both forward-looking sustainable solutions in addition to current short-term solutions centred around humanitarian response in managing scarce natural resources and mitigating current and future tensions arising from competition around these.

The first recovery steps should enable people to return to their homes and communities (by managing rubble / debris and major pollution issues). After that, the focus should be on regaining livelihoods and to further connect communities to basic services with introduction of renewable energy where possible. This would require responding to long-term threats, such as water scarcity.

This will require:

- Considering future risks and challenges such as population growth, urbanization, droughts, heat stress, etc. and support low carbon/ energy efficient development.
- Considering wider systems, such as urban- rural eco-/ water systems, through an area-based assessment and planning approach.
- Applying data collection, assessments, planning, urban design and landscaping considering above, including local level capacities need strengthening to monitor and address environmental issues, which should be operationalized through and reported against a strong SDG-based framework.
- Supporting long-term capacity strengthening needs, including improved public service provision, processes to engage communities, establishment of coordination mechanisms and management of environment data and monitoring and reporting against SDGs.

Ensuring a due focus on the environmental challenges impact on Syrian Cities in any urban recovery framework from the outset will, if the above principles are applied, allow for addressing immediate needs of vulnerable displaced and host populations, yet also offer an opportunity to embed climate change adaptivity and green recovery at the centre of any planning framework going forward. This will be critical to translate the notion of the Humanitarian-Development-Peace Nexus at the local level, and to ultimately progress any people-centred resilience and reconstruction agenda.

02

Introduction

Risks associated with environmental challenges and climate change jeopardise the improvement of people's well-being, food security, economic development, and stability in Syrian cities and urban areas. One such major risk is a water crisis. The drought between 2006 and 2010, which resulted in a country-wide loss of crops and migration of farmers to urban areas, suggests that climate change has already increased pressure on water availability and access. The pressures on water resources and systems have been further exacerbated due to the conflict, including water and soil pollution caused by damages and reduced institutional capacities to manage water resources efficiently. While this adds strains on water supply services together with the limitation in electricity supply for water supply system and the sustainability of water-dependent livelihoods, especially agriculture, it also fuels food insecurity and instability in the country. Other environmental challenges in Syria include poor solid waste, debris and wastewater management, air pollution, land degradation, deforestation (linked to recent forest fires), loss of natural habitats and biodiversity. These compounded environmental challenges negatively affect multiple sectors and urban systems, jeopardising recovery, and development. Post-crisis urban recovery and programming aiming to restore the resilience of both inhabitants and cities in the long-term, therefore, cannot be achieved without a recovery path that promotes environmental sustainability and climate change resilience as integral to its design.

This paper has been developed as part of a series of thematic papers initiated under the Urban Recovery Framework (URF) project led by a multi-stakeholder consortium, and funded by the European Union. The papers seek to explore conditions and options for recovery under a set of thematic areas, seen as interlinked pillars to any urban recovery. The URF approach acknowledges the interlinked geographical scales that must be considered to prompt any urban development; from the community and neighbourhood scale, to the city scale, and up to a regional and inter-city level, and finally the national scale. As such the URF considers both actions involving affected populations and communities, city-wide systems and government, as well as national level policies and regulations. The URF further considers interventions across the humanitarian-development continuum, and thus actions to drive urban recovery from absorptive measures to respond to immediate needs, adaptive efforts to prompt recovery, and transformative interventions and bounce-forward measures to foster future resilience.

Considering these geographical and time scales, the series of thematic papers aims to inform priority interventions and policy priorities that addresses both root causes and emerging needs. While this paper addresses emerging and accelerating environmental challenges in Syria, and how these are both amplifying and amplified by the conflict impacts, the proposed policy design should be seen as integral to a comprehensive, area-based urban recovery framework that identifies priority interventions with the most transformative effect across sectors and scales.

The paper is structured along three main sections: a contextual analysis of environmental challenges, and climate change and crisis impact, an analysis of the institutional and regulatory context, and a policy design section discussing policy options, goals, and policy prioritisation along a recovery ladder. Finally, the paper discusses possible implementation and monitoring mechanisms, as well as summary key messages. Further analysis of environmental challenges facing three cities is included in Annex 1: Case Studies.

03

Environmental challenges and a changing climate in urban Syria

Between 2006 and 2010, an unprecedented three-year long drought vastly depleted water resources in Syria. The ensuing land deterioration severely affected agricultural productivity and income levels across most of the country.[1] An associated degradation of available water sources and livelihoods contributed to internal migration, especially to urban areas, which in turn contributed to a process of 'urbanization of poverty' and increasing social unrest.[2] This was compounded by the influx of about 1.2 to 1.5 million Iraqi refugees.[3] After 2010, another round of massive rural-to-urban displacement - brought about by the conflict and its consequences, such as a destroyed housing stock and service infrastructure, continued social tensions, and reduced access to basic services - led to a rapid expansion of informal urban settlements. As a result, since 2010, the proportion of the urban population grew from 55 per cent to 75 per cent by 2020.[4]

The interruption of basic services and the destruction of infrastructure has hampered the recovery of economic and agricultural activities.[5] Even though domestic economic activities increased to some extent from 2017, and a return of farmers and internally displaced persons (IDPs) has been observed since 2017, environment-related challenges still loom large: 15.5 million people require safe water and sanitation; at least 50 per cent of the sewage systems are not functional and some 70 per cent of the sewage is untreated (leading to pollution of river streams and the groundwater). This poses health risks to local communities and deteriorating the living conditions in densely populated areas. In February 2021, the World Food Programme (WFP) reported that nearly 60 per cent of the population, 12.4 million Syrians, were food insecure – a new record high,[6] At the same time the population living below the poverty line exceeded 90 per cent.[7]

Syria was already before the current crisis categorised as water scarce.[8] The accelerating pace of land degradation and desertification, more frequent and intensified forest fires, projected reductions of the water resources and limited electricity supply for water supply systems will further aggravate water access and resource management problems in the country. Below, the main implications from environmental and climate change challenges on urban recovery trajectories are elaborated. Further, the population patterns, geographic areas (i.e., Syria's five agro-ecological zones[9]), and systems affected by these hazards are identified and discussed, showing which areas have suffered the most from environmental challenges.

Climate change trends

The climate in Syria is characterized by cold winters with rain and hot and dry summers, separated by relatively short transitional seasons. The annual average precipitation (300 mm) is low compared to global average (720 mm). Temperatures rise to more than 30°C in most regions during the summer, and

1 United Nations, Human Rights Council. Special Rapporteur on the Right to Food, Olivier De Schutter, Mission to the Syrian Arab Republic. 11 January 2011. A/HRC/16/49/Add.2.
2 Colin P. Kelley, Shahrzad Mohtadi, Mark A. Cane, Richard Seager, and Yochanan Kushnir, "Climate change in the Fertile Crescent and implications of the recent Syrian drought", in PNAS, vol. 112 (11) 3241-3246, 2015.
3 Ibid.
4 European Union. State of Syrian Cities 2016 – 2017. October 2017.
5 FAO, Special Report: FAO/WFP Crop and Food Security Assessment Mission to the Syrian Arab Republic. Rome, 2019.
6 World Food Programme, "Twelve million Syrians now in the grip of hunger, worn down by conflict and soaring food prices", Reliefweb, 17 February 2021.
7 OCHA, Humanitarian Needs Overview – Syrian Arab Republic. March 2021.
8 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria", in Weather, Climate, and Society, vol. 6 (3), 331– 340, Pacific Institute, Oakland, California, July 2014.
9 In the Coastal area, central areas/Orontes basin, eastern area, north-eastern area and southern area.

can at times go above 40°C, or recently even 50°C. The weather during this season is usually very dry, with a high evaporation level (about 1200 mm/year on the coast and more than 2600 mm/year in the eastern area). Climate change trends measured by precipitation, temperatures, and droughts suggest that these characteristics are becoming more pronounced, with Syria turning even dryer and hotter in the last four decades. This trend is projected to continue in the coming decades, according to the Intergovernmental Panel on Climate Change (IPCC).[10]

IPCC uses the Representative Concentration Pathway (RCP) to show changes in greenhouse gas concentration over time. To show current trends and model future scenarios for climate changes in Syria, data has been downscaled from three different global climate models (CNRM-CM5,[11] EC-EARTH,[12] and GFDL-ESM2M[13]) at a 50-km grid scale, and bias-corrected using historical re-analysis data to minimize some inherent model biases. The modelling uses historical data to represent an ensemble mean (the 3 models averaged over a 20-year period) from 1986-2005. Two scenarios have been produced for 2021-2040, one using RCP 4.5 (representing a moderate climate scenario) and one for RCP 8.5 (representing an extreme climate scenario). RCP 8.5 can be considered a 'business as usual' scenario as it assumes little-to-no mitigation efforts globally.

The current trends and forecasted scenarios can be summarised as follows (Table 1 uses the model to forecast changes in a select number of cities)

Precipitation

- Rainfall patterns have declined over the past four decades.[14] Nearly all rainfall occurs during winter (November – April). While there are significant year-to-year variabilities, data show record lows in the past three decades, especially in the northern and north-eastern zones of Syria. This has implications on some of the most important agricultural regions and food security, and on sustained livelihoods in agriculture and interlinked agro-value chains in these regions and beyond, such as cities like Ar-Raqqa.
- Precipitation is highest in the west, particularly in the north-west near the Mediterranean Sea, and in the north-east (Al-Malikeyyeh district), and lowest in the south, particularly in As-Sweida and Salkhad districts.
- Annual rainfall is expected to decline by 5–25 per cent in 2040–2069.[15] The number of rainy days may decrease by 5–15 days by mid-century. Until 2030, precipitation is expected to increase (up to 3.6 mm/month in Jisr-Ash-Shugur district) everywhere other than the south-west, where decreasing precipitation is expected in the near-term (up to -1.7 mm/month in Az-Zabdani, At Tall, and Yabroud districts) (Figure 1).

Rainfall and floods

- Heavy and very heavy rain days (> 10 mm and > 20 mm, respectively) have been historically highest near the western border, particularly where the border meets the Mediterranean Sea.
- Number of heavy and very heavy rain days will generally remain the same for the near term, however with an increase of 0.5 - 1.8 days per year of days with very heavy rainfall (> 20 mm) expected in the north-western corner. Figure 2 shows the two projected flood patterns in 2030, in a moderate and extreme scenario respectively.

Temperature

- Average temperatures have increased steadily in the past century, with a sharp rise since 1980 and most extreme increase in the summer months.[16] In addition to higher average temperatures, the number, intensity, and length of heat waves have increased.
- Temperatures have historically ranged from 12-21°C, with the lowest temperatures in the mountains in the central-western part of Syria (Jabal el Sharq) and highest in the south-west.
- Temperatures are expected to increase by 2030, with the smallest increases near the Mediterranean Sea and the highest temperature

10 IPCC, "Impacts of 1.5ºC Global Warming on Natural and Human Systems", in Global Warming of 1.5°C [..]. In Press, October 2018.
11 Elsa Sánchez Gómez and others, "The CNRM-CM5.1 global climate model: description and basic evaluation", in Climate Dynamics, vol. 40, 2012.
12 EC Earth, "EC-Earth - A European community Earth-System Model". Available from: http://www.ec-earth.org/. Accessed 12 January 2022.
13 John P. Dunne and others, "GFDL's ESM2 Global Coupled Climate–Carbon Earth System Models. Part I: Physical Formulation and Baseline Simulation Characteristics", in Journal of Climate, vol 25. (19): 6646-6665. October 2012.
14 Ibid.
15 Rainfall reduction is however less certain in period up to 2040. Source: IPCC, "Climate Change 2013: The Physical Science Basis", Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2013.
16 Colin P. Kelley et. al, "Climate change in the Fertile Crescent and implications of the recent Syrian drought" (see footnote 2), 2015.

increases in the north-east corner (up to 1.3°C compared to 1986 - 2005). Average summer temperatures will gradually increase 0.5 - 0.9°C per decade and will be higher than the global average (Figure 3).

Heat stress

- The number of hot days has historically been lowest in the west and increased towards the east, with the lowest number of hot days (> 35 °C) near the Mediterranean Sea and the highest number inland.
- The number of warm days will increase by 50–60 additional days a year by the end of the 21st century, with heat-wave days also likely to increase, and drastically so by the end of the century.
- The greatest increase in the number of hot days (> 35°C) for the near term is projected in the As-Sweida and Salkhad districts (~24 days/year), while the number of very hot days (> 40°C) is projected to increase the most inland and in the south-east corner of the country (Deir-ez-Zor, Dayr Az Zawr, and Abu Kamal districts). Figure 4 shows how projected increase of hot days will translate as heat stress across the country with the moderate and extreme scenarios modelled.

Droughts

- The combination of rising average temperatures and declining rainfall increases both water stress and risks of droughts. In Syria, droughts are already recurring climatic events. Multi-year (>3 years) droughts that are especially devastating have occurred four times since 1930; one around 1960 and then three in rapid succession since 1990 with the latest just before the crisis (2007-2010).[17] This drought was notably the longest and the most intense in the last 900 years.[18] Century-long data and climate forecasting suggest a probability of increased severe and persistent droughts in the region, and the occurrence of a drought as severe as that of 2007–2010 two to three times more likely.
- North-West Syria (Afrin district in particular) has historically had the shortest period of consecutive dry days (~50-60 days/year), whereas south-west (especially Salkhad, As-Sweida and Duma districts) has been more drought-prone, with the longest period of consecutive dry days (~130-160 days/year).
- Until 2030, South-West Syria is expected to continue to be particularly prone to droughts, with an increase also in the eastern districts (especially Deir-Ez-Zor) (Figure 5).

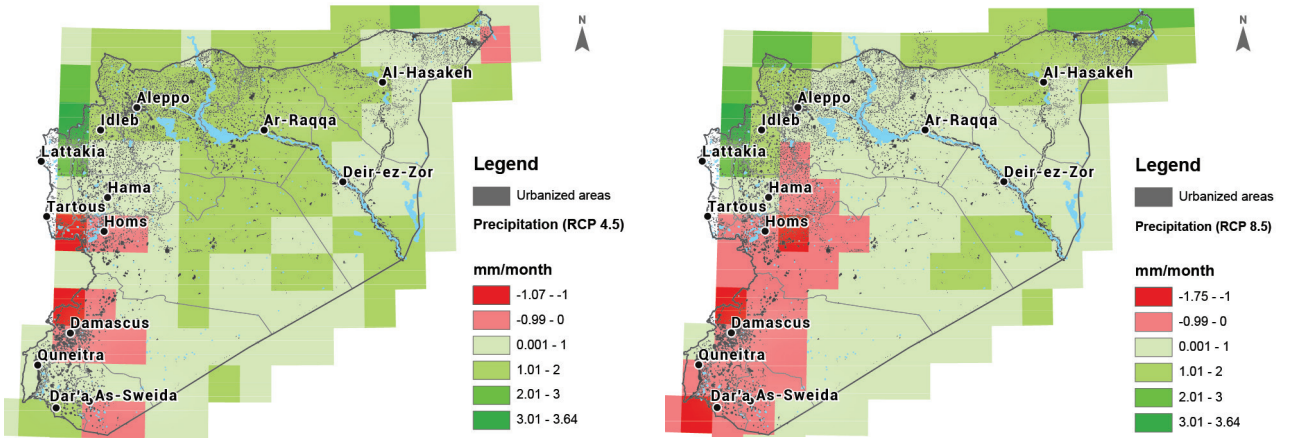


Figure 1: Moderate and extreme scenarios for precipitation Syria in 2030. Source: iMMAP, 2021.

17 Ibid.

18 The potential evolution of drought conditions under 1.5°C/2°C warming can be analysed by comparing the 2008 drought (high temperature, low precipitation) with the 1960 drought (low temperature, low precipitation). Though the precipitation deficits were comparable, the 2008 drought was amplified by increased evapotranspiration induced by much higher temperatures (a mean increase of 1°C on the 1931-2008 period on Syria) and a large population increase (from 5 million in 1960 to 22 million in 2008). Source: IPPC, "Impacts of 1.5ºC Global Warming on Natural and Human Systems", in Global Warming of 1.5°C, p. 41-42, 2018.

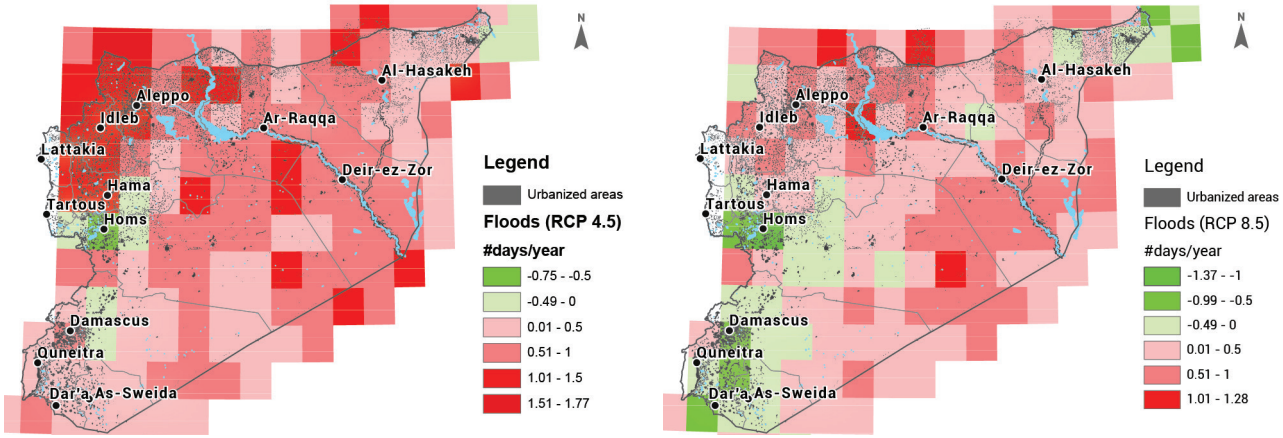


Figure 2 Moderate and extreme scenarios for flood patterns in 2030. Source: iMMAP, 2021.

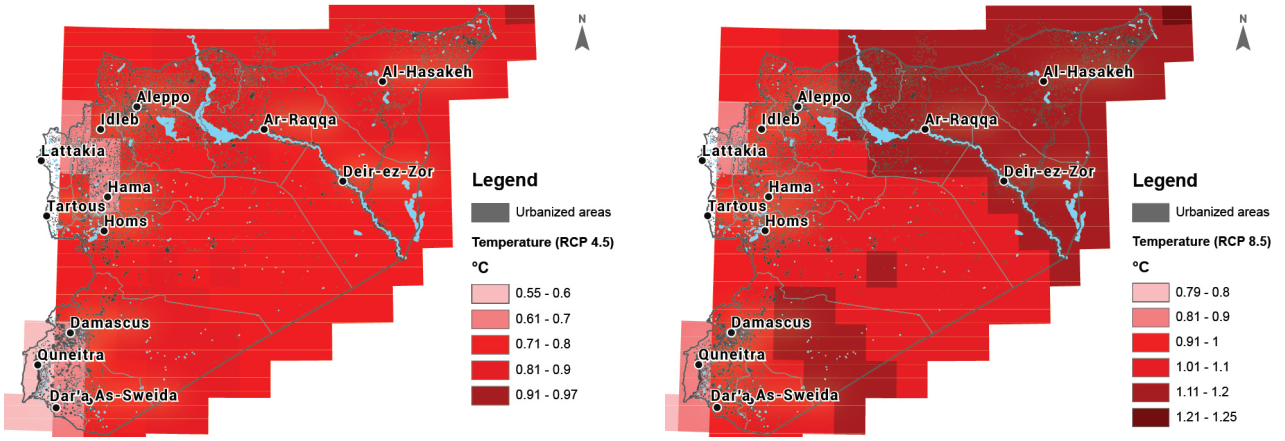


Figure 3 Moderate and extreme scenarios for temperatures in 2030. Source: iMMAP, 2021.

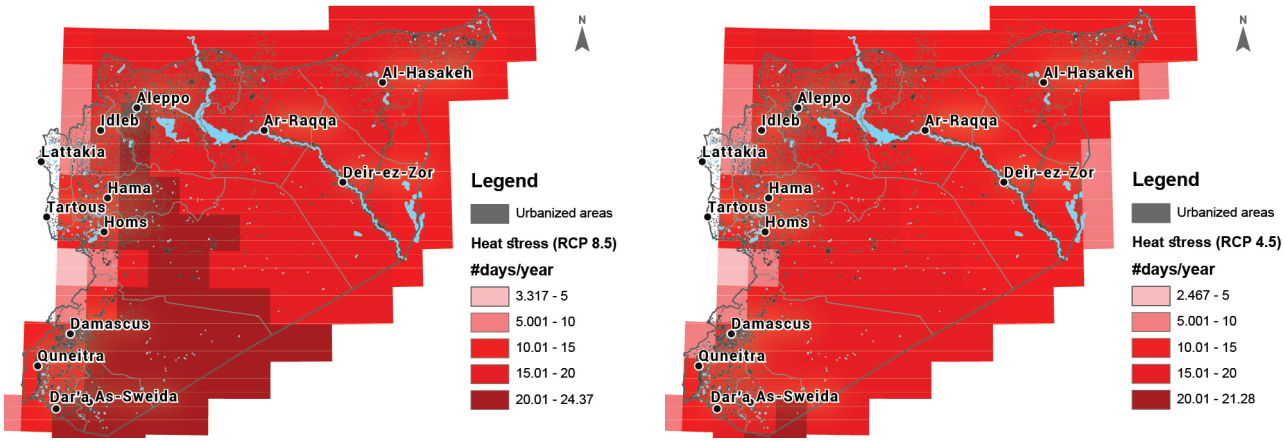


Figure 4 Moderate and extreme scenarios for heat stress in 2030. Source: iMMAP, 2021.

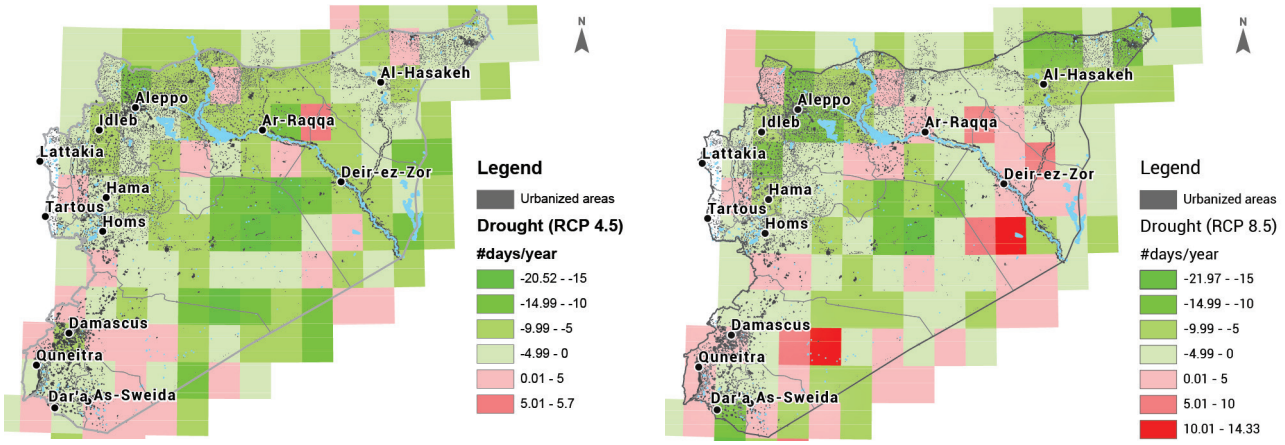


Figure 5 Moderate and extreme scenarios for droughts in 2030. Source: iMMAP, 2021.

Impacts of environmental and climatic challenges

The environmental challenges arising from natural hazards and climate change impacts, are impacting the Syrian regions and rural-urban continuum in different manners. However, while the natural and rural areas, for instance, are experiencing land deterioration, forest fires, and depleted water resources with critical impacts on food production and livelihoods within the agriculture sector, the impacts of these trends also have direct ramifications for urban Syria. Similarly, rapid (informal) urban growth due to rural-urban migration and waves of displacement, are adding strains on urban eco-systems and natural resources with implications in the rural hinterlands.

The further impacts on sensitive systems from the crisis both worsen and are worsened by climate change related events. For example, water resource scarcity and pollution, perhaps the main environmental challenges in Syria, are caused by a combination of damaged and non-functional infrastructure and increasing droughts and less rain, resulting in a lack of access to water and loss of crops, which in turn has led to migration, increased poverty, and health issues. Desertification, deforestation (and loss of other natural habitats and biodiversity), and land/soil degradation are other major concerns in Syria. Caused by a combination of weak land and resource management, as well as the need for firewood and increasing droughts, this result in loss of productive lands and ecosystems, which in turn lead to more pressure on the sustainability of agriculture and forest-related livelihoods.

The main impacts from natural hazards and climatic changes and further implications of the conflict can be summarised as follows

Natural and rural areas

- **Continued reduction of forest areas due to forest fires and poor forest protection.** Loss of forest coverage in Syria has been a trend prior to the current crisis, and significantly exacerbated during the crisis. At the beginning of the last century, 32 per cent of the Syrian land area was covered by forests.[19] By 2007, the forest coverage had been reduced to just 3 per cent and is still decreasing. As illustrated in Figure 6, from 2012 to 2019, Syria lost around 20 per cent of all tree cover,[20] mostly in the north-west. This was caused by a combination of fires (caused by traditional burning and wildfires potentially increased due to climate change) as well cutting of trees. Over a few weeks in August and September 2020, forest fires affected around 9,000 hectares in the Governorates of Hama, Lattakia, and Tartous.

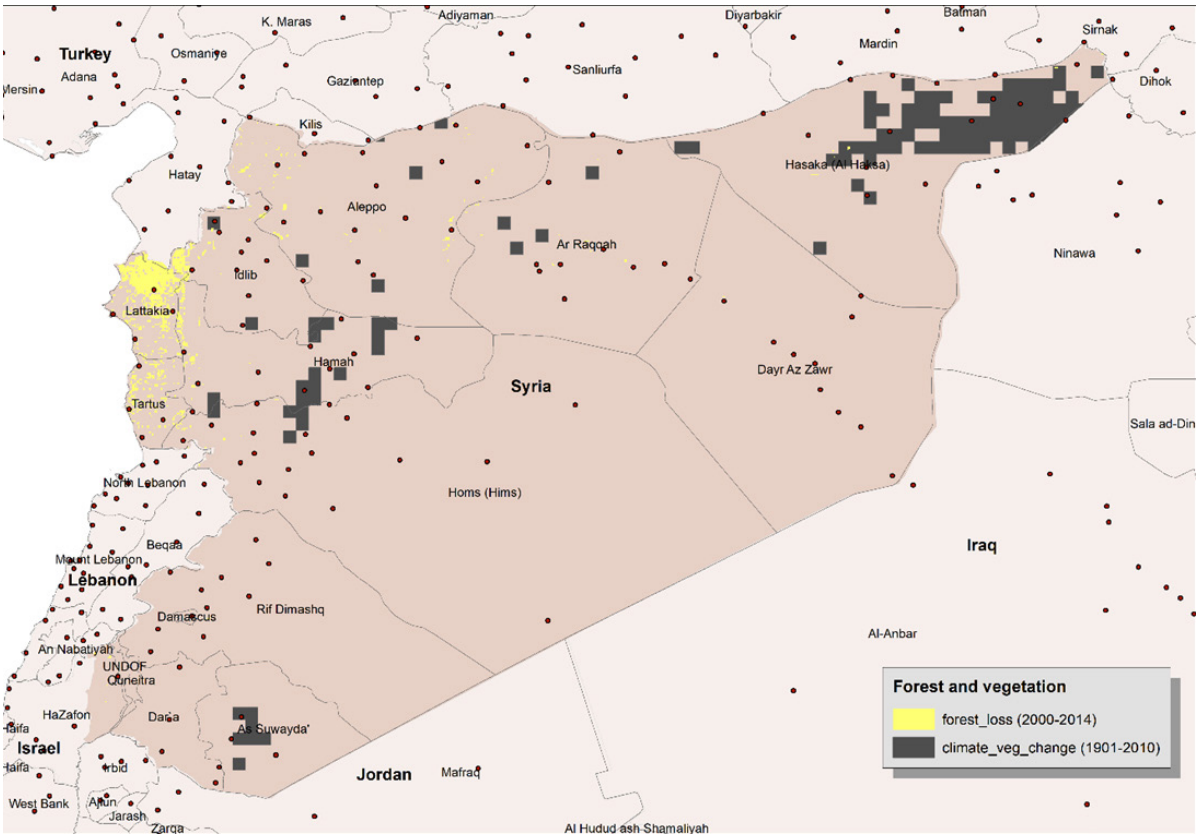


Figure 6 Forest loss and vegetation change. Source: JRC

19 Ministry of State for Environment Affairs, Initial National Communication of the Syrian Arab Republic, submitted to the United Nations Framework Convention on Climate Change. Damascus, April 2020.

20 PAX, Living under a black sky: Conflict pollution and environmental health concerns in Iraq. November 2017. 21 Colin P. Kelley et. al, "Climate change in the Fertile Crescent and implications of the recent Syrian drought" (see footnote 2), 2015.

- **Degradation of land and associated water-sensitive livelihoods.** The Syrian state agricultural model has traditionally focused on self-sufficiency heavily subsidised for both consumption and production. Production subsidies have centred on strategic cash crops to lower imports. The focus on certain crops has however drained water resources which is further constrained by limited electricity supply and contributed to land degradation. When a severe drought broke out in 2006/2007, the agriculture production in the north-eastern "breadbasket" region, which produced over two-thirds of the country's crop yields, collapsed.[21] More than one million inhabitants in North-East Syria were affected by the agricultural failures between 2006 and 2009. Most of them lost their livelihoods and basic food supports,[22] leading to rural-urban migration, and increased poverty levels in the cities of arrival.[23] Agricultural productivity has mostly decreased in the north-east, but also in the north-west and around Damascus (Figure 7). Moreover, land degradation has led to an increase of dust, sandstorms, and desertification.

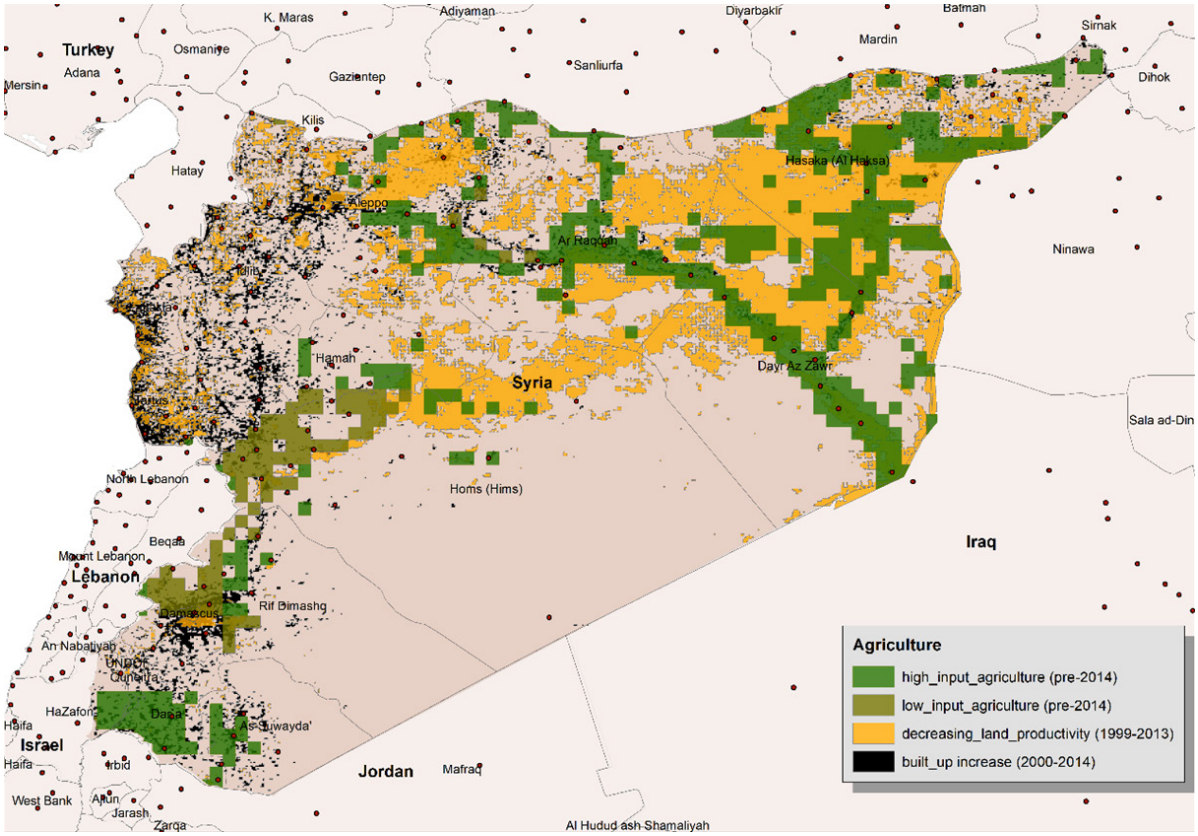


Figure 7 Agriculture and land productivity. Source: JRC

21 Colin P. Kelley et. al, "Climate change in the Fertile Crescent and implications of the recent Syrian drought" (see footnote 2), 2015.
22 Francesca De Châtel, "The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution", in Middle Eastern Studies, vol. 50 (4), 521-535, 2014.
23 Henry Fountain, "Researchers Link Syrian Conflict to a Drought Made Worse by Climate Change", The New York Times. 2 March 2015.

- **Fragmentation of land ownership has contributed to deterioration of productive land.** Historic land reforms and redistribution policies have resulted in a situation where, within three generations, agricultural ownership fragmented to the point that rural families could no longer rely on agriculture as a primary source of income leading to a migration of rural residents to urban areas – and often into informal settlements. The disintegration of agricultural property led to a significant decrease in productivity, a decline in mechanization, unequal irrigation, and loss of initiatives to modernize, in turn leading to the deterioration of agricultural lands.
- **Dramatic rise of food insecurity and decreased water availability.** From 1950-2012, Syria's renewable water availability per capita receded from more than 5500m^3 per person per year in 1950 to less than 760m^3 by 2012.[24] In 2008, the national water deficit[25] stood at around 2.4 billion cubic meters, mainly caused by an increasing demand for surface and ground water for agricultural use (80-90 per cent of water was used for agricultural irrigation before the crisis).[26] Two-thirds of the cultivated land in Syria is rain-fed, and the remainder relies upon irrigation mainly through groundwater. In recent years however, groundwater has become increasingly scarce due to over-extraction, affecting land productivity: 78 per cent of groundwater withdrawals is estimated to be unsustainable - pumped at a rate exceeding replenishment. This represents the third-highest figure among 39 water stressed nations across the globe, according to a 2012 research.[27] The north-eastern region, most affected by the drought prior to the crisis, is projected to be both subject to drought impacts as well as affected by a decrease of annual discharge from the Euphrates River.
- **Water scarcity with cross-national ramifications.** As per Figure 8, Syria is most water stressed in the middle and eastern parts of the country, characterized by an arid/desert landscape. The limited supply of electricity post further pressure in water supply as many water pumping stations,

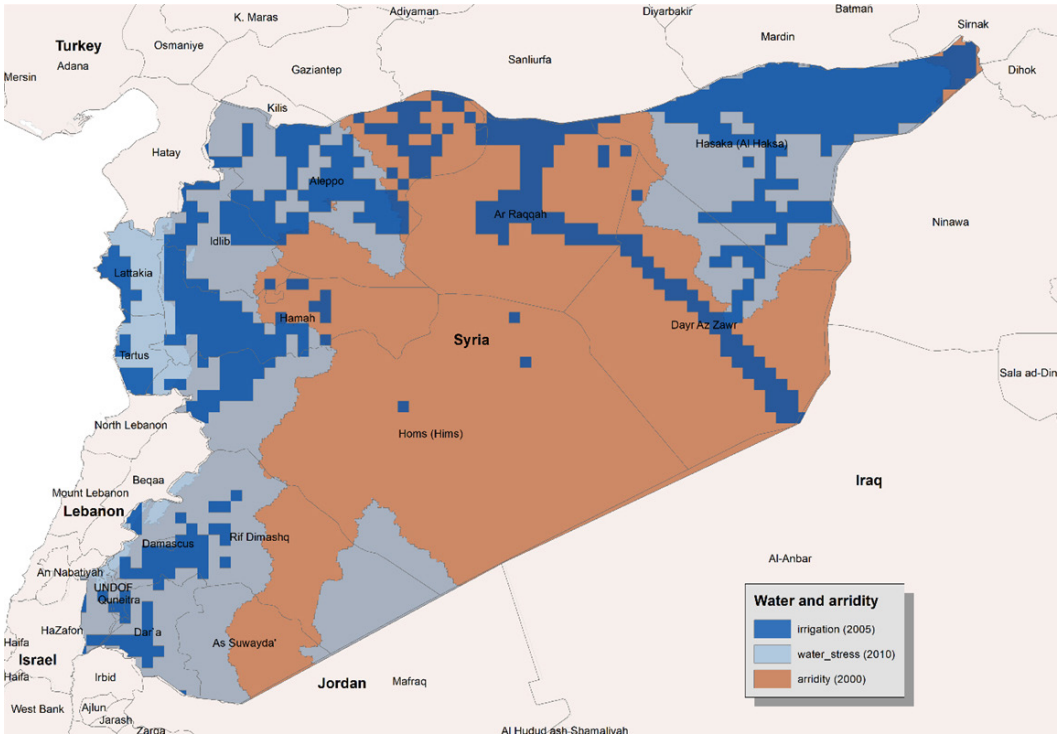


Figure 8 Water stress and aridity. Source: JRC.

24 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria", (see footnote 8), 2014.
25 Overextraction due to consumption versus renewable resources.
26 Government of the Syrian Arabic Republic, Third National MDGs Progress Report, Damascus, 2010.
27 Yoshihide Wada, L.P.H. van Beek, and Marc F.P. Bierkens, "Non-sustainable groundwater sustaining irrigation: A global assessment", in Water Resources Research, vol. 48 (6). American Geophysical Union, 2012.

that are also damaged by the conflict, are not able to fully operate. The western part of the country has a mix of water stressed areas and areas less water stressed where irrigation is functional. With the demand for water exceeding available resources, of the total renewable water available, nearly 60 per cent originates from outside Syria's borders (mainly Turkey), putting a strain on international relations for access to water.[28] Increasing intra and international political tensions can be expected because of decreasing groundwater levels in Syria's water basins. Water stresses will likely lead to a hardening of political stances regarding the apportionment of water resources from shared trans-boundary water courses, while within the country tensions may increase between authorities and citizens over unlicensed extractions from the groundwater.

- **Increased flood risk and heat stress due to climatic changes.** A progressive trend of increasing average annual temperatures and decreasing rainfall in the Middle East[29] will likely further affect natural, rural and urban areas. With an expected higher number of heavy and very heavy rain-days, flood risks, in particular in North-West Syria, are expected to increase. An increase in heat stress and temperatures, especially in the north-west (up to 1.3°C compared to 1986-2005) and east of Damascus is projected. These climatic changes will translate into substantial shifts in areas planted, productivity, and yields in most of the major agro-ecological zones due to variations in the amounts and timing of rainfall coupled with exposure to heat stress.
- **A reduction in the length of time that rangelands can be grazed.**[30] The projected lower rainfall in the Eastern Mediterranean, Turkey, Syria, and northern Iraq is likely to further disrupt rain fed agriculture in vast areas. 2030 climate change projections foresee a reduction in precipitation in the South-West Syria (up to -1.7 mm/month in Zabadin, At-Tall and Yabroud districts), increasing frequencies of droughts east of Damascus and in the north-east.

Urban and peri-urban areas

Syria's population has grown from around 3 million in 1950 to 18,3 million in 2021.[31,32] Rapid urbanization and urbanization of poverty into informal settlements has resulted in a significant increase of poor and displaced populations exposed to the adverse effects of environmental challenges as manifested in urban areas, in particular from fragile water, waste, and sanitation systems.

Moreover, due to competition over water between different water-intensive sectors (agriculture, industries, household usage etc.), as well as competition between urban and rural areas, most Syrian cities currently have a water supply deficit. For example, while the agriculture sector is one of the dominant contributors to the economy and represents a critical safety net for over 6 million Syrians, its high-water consumption affects the availability of water for household consumption, and water over-extraction for agriculture is known to have resulted in water shortages in some urban areas.[33] Other challenges in urban and peri-urban areas include:

- **A significant dislocation and migration of rural communities to cities** due to climate variability-associated economic degradation. Rural-to-urban migration and displacement have added to the challenges already posed by the huge number of people displaced from Iraq after the 2003 war. The migration has also further contributed to increased pressure on basic services, urban unemployment, economic downturn, and social unrests.
- **An increased urban-rural competition over water** due to the increasing water use in cities, which continue to grow and are already operating at a water deficit. During the crisis, urban-rural migration has increased the pressure on potable water in urban areas,[34] especially in the (new informal) outskirts of the cities. The worsening of water scarcity will aggravate challenges related to water resource management and put pressure on authorities to formulate and

28 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria", (see footnote 8), 2014.
29 IPCC, "Climate Change 2013: The Physical Science Basis", (see footnote 12), 2013.
30 Jason P. Evans, "21st century climate change in the Middle East", in Climatic Change, vol. 92, p. 417–432. February 2009.
31 UNFPA, "World Population Dashboard: Syria". Available from: https://www.unfpa.org/data/world-population/SY. Accessed 10 January 2022.
32 The population has decreased since the start of the crisis, from a total population of almost 22 million prior to the crisis.
33 FAO, Special Report: FAO/WFP Crop and Food Security Assessment Mission to the Syrian Arab Republic. Rome, 2019.
34 Ahmad L., "Reshaping Suburbs in the Framework of Sustainable Environmental Neighbourhoods". Presentation at the 1st engineering conference on Development Priorities and Reconstruction. Lattakia, Syria, 16-18 August 2015 (In Arabic).

implement policies related to the apportionment of water between urban and rural areas.[35] Such apportionments will implicitly or explicitly be made through policies concerning a variety of sectors seemingly unrelated to water.

- **A limited level of electricity supply hampers the functionality of water supply system.** The average daily availability of electricity for public services was less than 8 hours per day.[36] The water pumping stations and pumping facilities for wells faces the issue of lack of electricity.
- **An increase of heat stress and heat island effects** in cities due to rising temperatures and the loss of tree cover, mostly in the south-west.
- **Threats to the health of urban populations due to the breakdown of water/wastewater and solid-waste management systems.** The conflict has exacerbated pre-crisis challenges and led to a collapse of solid waste and debris management.[37] Furthermore, the destruction of sewerage networks in damaged areas and the mismatch of network capacity and real loads due to population displacements have continued adverse effects on the health of urban populations (see Box 1: The cost of pollution in Syrian Cities).
- **Major issues in cities concerning war remnants and a large tonnage of debris,** in the case of Homs this amounts to about 25 years of waste collection. There is no national plan to deal with the rubble file in general. Efforts so far have focused on enacting relevant legislations (e.g., Law No. 3 (2018) the "Law of Rubble") to deal legally and procedurally with the rubble from damaged houses and the role of municipalities in its clearance. The absence of national efforts exposes cities' inhabitants to environmental risks, with the burden particularly on returnees in rubble-affected neighbourhoods. At the city level, ruins resulting from military operations, the spread of rodents, and general pollution contributes to a further deterioration of urban space. At the regional level, the challenge of processing rubble lies in identifying suitable sanitary dumps without compromising agricultural land while keeping the groundwater free from external pollutants. In the long run, there is a risk that the accumulated debris in public spaces and private housing units will restrict recovery efforts of public infrastructure networks and housing rehabilitation. A lack of knowledge in how to apply the legal framework around debris management has also hindered the access to damaged houses and public water and sewage networks.
- **The degradation of "green-blue networks".** Syrian cities are combating droughts and deterioration of their natural components such as rivers, farming lands and green areas, due to high and speedy urbanization and challenges associated with the crisis. In particular in Hama, Damascus, Raqqa, and Deir-Ez-Zor, the rivers were heavily impacted, with decreasing water levels and increasing challenges of sewerage drainage and pollution, affecting their surrounding ecosystems and agriculture production. Pre-crisis, Damascus was a pioneer city in pursuing a city-wide blue-green network planning[38] approach, based on the network of existing natural systems, and public spaces, but has now experienced severe setbacks.

Table 1 provides a summary of current and future environmental impacts on major cities in Syria. Figure 10 illustrates the environmental challenges in Syria related to conflict damages and climate changes, and the reciprocal impact of these challenges between cities and their surroundings.

35 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria", (see footnote 8), 2014.
36 UN Syria, 2021 Multi Sector Needs Assessment (MSNA)
37 PAX, Amidst the debris: A desktop study on the environmental and public health impact of Syria's conflict, October 2015.
38 Green-blue network planning is a tool to protect the ecological and hydrological values of urban landscapes as measures to address climate change.

Box 1: The cost of pollution in Syrian Cities

The failure to address environmental pollution in Syrian cities have had severe ecological, human health, and cost implications, as demonstrated by the case of Deir-Ez-Zor. The 435 km long sewage network which covered about 90 per cent of the city, has been severely damaged during the crisis. Currently operating at a reduced functionality of about 50-60 per cent, it has also suffered from increased quantities of wastewater due to the influx of displaced persons, sometimes increasing the loads two-fold on the network. Now, up to 40 per cent of the city's population is relying on septic tanks, threatening the pollution of nearby water wells, and leading to the deterioration of public health and the spread of diseases. In the Deir-Ez-Zor Urban Profile, a cross-sectoral assessment and recovery plan, UN-Habitat has estimated[39] that about 70 per cent of drinking water pollution could be ascribed to poorly designed or dysfunctional networks. Furthermore, there is currently no wastewater treatment plant serving Deir-ez-Zor (a previously contracted Canadian company to implement a treatment plant stopped its work completely due to the crisis) and approximately 30,000 m3 of untreated wastewater is discharged daily into the Euphrates River. This river, rich in biodiversity including 24 endemic fish species, the Anser Bird, and striped-necked terrapins (turtles) is increasingly suffering from the contamination, which has been intensified by industrial and agricultural waste pouring into the river valley. UN-Habitat's study estimated the cost of this pollution through its effects on land degradation, treatment of contaminated water, soil pollution, and the treatment of diseases to about 15 to 35 billion Syrian Pounds (12-27 million dollar) annually, while the implementation of a functional sanitation system could provide, in addition to priceless environmental protection, more than 800 job opportunities in the city. In another city studied by UN-Habitat (Dar'a), it was estimated that the cost of pollution reached about 8-20 billion Syrian Pounds.[40]

39 UN-Habitat, Deir-Ez-Zor Urban Profile, 2020.
40 UN-Habitat, Dar'a Urban Profile, 2020.

			Env. Challenges					2030 challenges								
		Agricultural zone	Water resources and scarcity	Desertification	Deforestation/ fires	Land degradation	Waste / debris and pollution	Drought risks	Heat stress	Flood risks	Reducing precipitation	Increasing temperature	Increasing evapotranspiration	Total	Current	Future
Zone	**Major cities**		**6**	**15**	**15**	**7**	**12**	**13**	**13**	**13**	**-**	**-**	**-**	**-**	**-**	**-**
South	East of Damascus	3	1	1			1	1	1			1		6	3	3
North-west	Aleppo city	1b		1		1	1			1			1	5	3	2
East	Der-Ez-Zor	5						1	1			1	1	4	0	4
Mid-west	Homs	1				1	1				1			3	2	1
South	Damascus	3	1			1					1			3	2	1
West	Lattakia	1			1	1							1	3	2	1
North-east	Al Hasakeh	3		1				1				1		3	1	2
North-west	Idlib	1b	1							1			1	3	1	2
South west	As Sweida	2	1						1		1			3	1	2
Mid	Al Raqqa	4						1		1		1		3	0	3
West	Tartous	1			1	1								2	2	0
South	Dar'a	2							1		1			2	0	2

Table 1 Summary of current and future environmental impacts on key cities, sorted by total unique impacts per city. 2030 projected stresses are based on intersection of city location and 2030 climate stress projections shown in this chapter previously. The number of risks for a city reflects current and future challenges to urban areas, in which a large number suggests actions need to be taken urgently for preparedness and resilience.

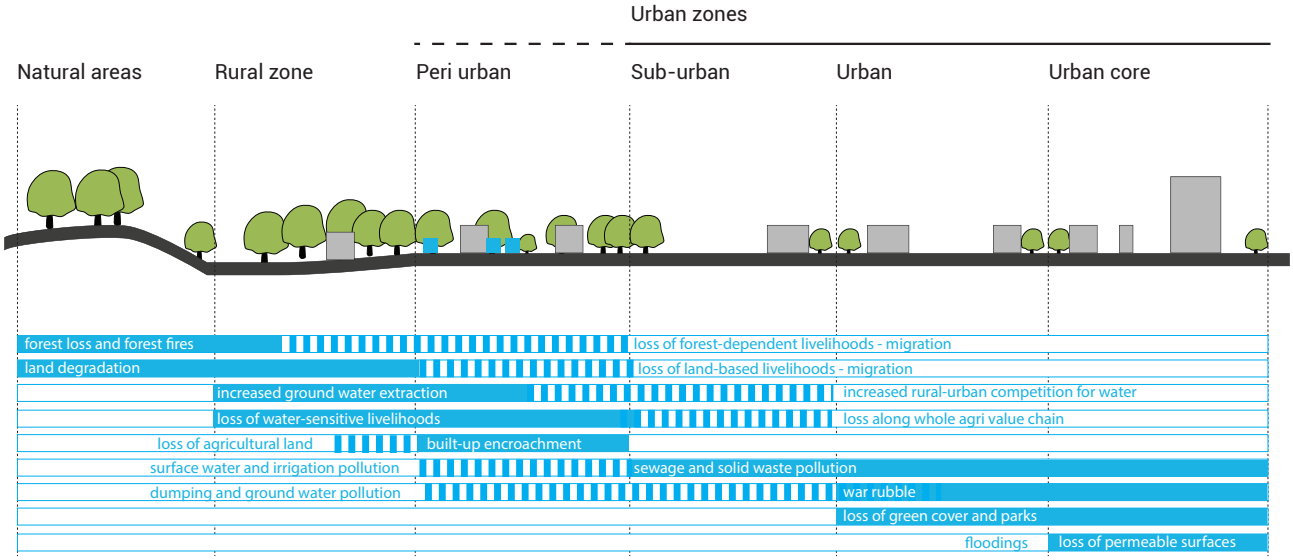


Figure 9 Interlinkages of environmental challenges within urban and rural areas arising from the conflict and climate variability, mapped on an urban-rural transect. Source: UN-Habitat 2021.

Exposure of basic urban services to environmental challenges and crisis impact

In cities, the compounded effects of environmental and climatic changes and the crisis are hampering the performance of basic urban services and infrastructure systems. Affecting both economic sectors and inhabitants, poor population groups and displaced living in informal or semi-informal areas – often settled in recent urban (informal) expansions – are particularly exposed to the underperforming services and environmental stressors. The deficiencies of water, wastewater, as well as solid waste systems can be summarised as follows:

Sewerage

a. Prior to the crisis, 42 sewage treatment plants served mainly major urban areas, covering up to 70 per cent of the population, according to the Water, Sanitation and Hygiene (WASH) sector needs analysis informing the Humanitarian Needs Overview (HNO) for 2021.[41] The remaining parts of the country relied on simpler technologies or lacked adequate sanitation systems.
b. Due to the damage caused by the crisis as well as unavailability of repair parts, many of the wastewater treatment plants are now not in operation. Some 85 per cent of sewage is estimated to be untreated due to non-functional wastewater treatment plants.[42]
c. Household data collected as part of the WASH sector HNO analysis, showed 11 per cent of assessed households also experienced sanitation challenges caused by blocked connections to sewage, blocked internal pipes, overflowing of sewage in the neighbourhoods, septic tanks not dislodged due to financial constraints, or a general unavailability of services.[43]
d. The combined deficiencies of the wastewater management and poor access to safe potable water poses severe health risks, including high prevalence of waterborne diseases in some areas. This is reported Al-Hasakeh and Deir-ez-Zor governorates, parts of Aleppo (Afrin, Al Bab, Jarablus and Menbij districts), Ar-Raqqa (Sabka, Karama, Mansura and Jurneyyeh sub-districts) and Idleb (Sarmin and Mhambal sub-districts).[44]
e. Finally, existing treatment facilities often do not meet international standards and many wastewater pipes are leaking. Although water quality standards were in place before the crisis, the permitted pollution levels were high compared to international standards.

Drinking water

f. Access to safe water is constrained not only by water scarcity, but also by poor water quality. Reuse of untreated wastewater in agriculture is a common practice polluting surface and groundwater sources, with implications on the quality of potable water and contaminating rivers used for irrigation.
g. 36 per cent of the population[45] rely on alternatives to piped water to meet or complement their water needs – often through unsafe alternatives.[46]
h. Lack of operational support and maintenance backlogs are other constraints to water access. For instance, in North-West Syria, it is reported that 43 per cent of water systems are not functional because of shortages in operational support and maintenance issues.[47] Out of the 57 per cent of the water system that is operational, 21 per cent is operated without any water disinfection. Testing of potable water samples at the point of use has showed that water mostly is treated with chlorine-based products, where traces of chlorine was found in 94 per cent of the water received from networks and 75 per cent of the water delivered by trucking.[48]

41 WASH sector (Whole of Syria (WoS)), "HNO 2021 WASH Needs Overview". Available from: https://unicef-my.sharepoint.com/:w:/g/personal/udaraz_unicef_org/ERPe2HtTEFmF9SOfU5nLABaHRVkP6eYxrUpcgmBxFwwQ?rtime=aqJReMvT2Ug. Accessed 10 January 2022.
42 Ibid.
43 Ibid.
44 Ibid.
45 Not including people living in camp-like settings.
46 WASH sector (WoS), HNO 2021 WASH Needs Overview. 2021.
47 Ibid.
48 Ibid.

Solid Waste

i. According to a desk study conducted by Pax on the environmental and public health impact of the crisis, domestic solid waste (85 per cent of the total volume) was collected in all Syrian towns and most rural villages by municipalities or private companies prior to the crisis. Yet, an estimated 80 per cent of the waste was subsequently dumped in the outskirts of urban areas. Open-air incineration was reported as a common practice to reduce waste volumes, releasing dioxin and other gases contributing to a hike in air pollution levels.[49,50]

j. The crisis has exacerbated waste management challenges with damages to infrastructure and increase in uncontrolled burning and dumping, resulting in pollution of soil and water sources. This has in turn posed risks to public health, as well as the agriculture and fishing sectors.[51] Damages to waste collection equipment, such as trucks and bins/containers, treatment facilities (e.g., sorting and composting facilities), and sanitary disposal sites, has resulted in the disruption of entire waste management systems.

k. According to the WASH HNO study, four per cent of generated solid waste remains in public areas, 8 per cent is buried or burned, and 11 per cent is served with a low frequency collection. Only 69 per cent of garbage was reported dumped in the formal dumping locations. The inadequate waste management is considered a potential contributor to a prevalence of leishmaniosis recorded in some areas of northern Syria since the beginning of 2018.[52]

l. Furthermore, medical waste management also remains an issue. In many facilities, medical waste management remains insufficient, with 35 per cent of surveyed functional public hospitals lacking waste management services.[53]

m. 8 out of 10 of the major Syrian cities suffer from damage to their urban fabric. Aleppo, the largest Syrian city with an urban area of more than 17,000 hectares, has the highest per centage of damage.[54] Damage assessments indicate that more than half of the city's area from the eastern side suffered damages of varying severity (slight to severe). According to preliminary estimations, the volume of all rubble in Aleppo, is around 50 million cubic meters, needing technical treatments that will cost the Syrian treasury hundreds of millions of dollars, if not billions. Currently, there is a great threat that this debris will not be transported to sanitary landfills, but rather to green spaces and agricultural lands, posing risks of harming the environment. As for the city of Damascus, the Syrian capital with a built-up area of about 7000 hectares, the share of the damages experienced by the eastern and southern regions was estimated at more than 1700 hectares (21 per cent of total urban area).

49 PAX, Amidst the debris (..) (see footnote 33), 2015.
50 Delegation Of The European Commission To Syria, Country Environmental Profile for the Syrian Arab Republic, April 2009.
51 Sweep-net, Country report on the solid waste management in Syria, July 2010.
52 WASH sector (WoS), HNO 2021 WASH Needs Overview. 2021.
53 Ibid.
54 UN-Habitat, Aleppo Urban Profile, 2020.

04

Institutional challenges

A 2016 Stanford study[55] showed that the water management and land use practices in Syria have changed over the course of the conflict, resulting in various environmental challenges. However, a number of these challenges are not directly linked to, or resulting from the crisis, but rooted in long-existing weaknesses in environmental planning and management. This includes limited progress in implementation of policies and regulations, as well as water management decisions that have exacerbated water scarcity. While several national strategies, policies and legal provisions, as well as ratifications of key international environmental conventions and agreements have been in place before 2011, weak national environmental governance contributed to major deficiencies in environmental planning and management, noting specifically the following:

- ***The Regional Planning Commission developed a national framework for regional planning, however, this was short-lived, mainly owing to the crisis.*** The initial concept for the framework revolved around the coordination of national projects: major investments of the state should be distributed fairly across all regions to foster demographic stabilization, with an emphasis on linking the peripheral regions through transport infrastructure, and adopting a local development model that considered the comparative advantage of seven regions with varying agricultural land concentrations.
- ***Historic water management decisions prioritized food security over reducing water demands.*** Despite growing water scarcity and frequent droughts, from 1970 the government promoted policies to further increase agricultural production including large scale irrigation projects that doubled the irrigated areas nationally to 1,2 million hectares between 1989-2000.[56] This is demonstrated by the approximately 15 per cent[57] of total public investments that went to irrigation alone between 2001-2010. Irrigation was also subsidized indirectly through the price of diesel, and directly through price arrangements of water-intensive 'strategic' crops, such as wheat and cotton. Combined with the still prevalent highly inefficient flood irrigation methods, this has contributed to the gradual decline in groundwater levels.[58]
- ***The environmental management regulations and plans are still based on the pre-crisis situation.*** From 2012, virtually no environment management plans, rules or regulations have been updated, with the exception of Law No. 3 (2018, related to debris removal), while the political and physical context has changed drastically. Even though the recently published Nationally Determined Contribution (NDC 2018 – which specifies the national contribution to the Paris agreement) represents a cautious re-engagement with this issue (along with the State of Environment report by UNEP), updated practical guidelines, institutional arrangements, plans and strategies to address the severe environmental impact of the conflict are yet to emerge.
- ***The conflict has led to a general deterioration of the capacities of the institutions responsible for environmental management in cities.*** However, already in 2010[59] the Syrian government stated an urgent need for "technology transfers", training and capacity building for the purposes of environmental management.

55 Marc Francois Muller, Jim Yoon, Steven Gorelick, Nicolas Avisse, and Amaury Tilmant, "Impact of the Syrian refugee crisis on land use and trans-boundary freshwater resources", in Proceedings of the National Academy of Sciences, vol. 113 (52): 201614342. Stanford University, December 2016.
56 Aden Aw-Hassan, Fadel Rida, Roberto Telleria, Adriana Bruggeman, "The impact of food and agricultural policies on groundwater use in Syria", in Journal of Hydrology, vol. 513, p. 204-215. May 2014.
57 20-25 per cent of the total public investment budget in this period went to agriculture, of which 70 per cent was designated for irrigation, coming to an approximate 15 per cent for irrigation alone (Aw-Hassan et al. 2014).
58 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria", (see footnote 8), 2014.
59 UNDP Bureau for Development Policy, National Capacity Self-Assessments – Results and Lessons Learned for Global Environmental Sustainability, New York, 2010.

- ***The implementation of adopted legislation and strategies have historically been poor.*** Even though many provisions for environmental protection exist in laws adopted before the crisis (e.g., a policy to rationalize groundwater and river water use operationalized through Law No. 31 (2005), stipulates irrigation fees, allocates maximum groundwater extractions, and proposes a program of installing flow meters), very few of these are enforced or implemented. See Table 2 Key environment plans and adopted legislations.
- **Environmental management functions within cities suffer from complicated distributions of responsibilities between different ministries and municipal departments.** For example, the mandates related to implementation and rehabilitation projects and management of wastewater, and the prevention of its polluting impacts, is distributed over no less than eight different entities (see Box 2 Implementing sanitation in cities and their environments and Table 3 Main institutional responsibilities in the context of addressing environment in urban recovery). Without active management frameworks that can coordinate actions around such challenges, effective recovery and management strategies are severely hampered. Critically, it also affects regional natural resources such agricultural fields, orchards and rivers (e.g., Euphrates in Aleppo). This also includes a lack of a common data bank and the current limited role of the environment observatory as a coordination link between sectoral ministries and the overall spatial planning function.
- **Limited budgets and technical/managerial personnel at municipal level for environmental management functions.** A general lack of human resources, technical capacities, and funding, limits both sound urban planning and management (including direct and indirect areas relevant to environmental management such as infrastructure systems, zoning, and protection of green/natural areas etc.).

Table 2 Key environment plans and adopted legislations

Environmental challenges	Key actors	Existing institutional plans and regulations
	Ministry	
Water resource scarcity and pollution	MoLAE MoWR MoAAR	Law No. 12 (2012) on Environment Law No. 26 (2010) on Regional Planning Law No. 31 (2005) on water resources protection and efficient water consumption and supply. Decree No. 107 (2011) on Decentralisation (under review) 10th Five-Year Plan (2007-2011) which set out to establish 200 water treatment plants Standard No. 3474 (2009) to prevent disposal of treated water in watersheds. Standard No. 2580 (2008) to prevent treated water in the general sewerage network. National strategy and action plan for the environment (2003)
Desertification	MoLAE	National plan to combat desertification (2002)
Deforestation and loss natural habitats and biodiversity	MoLAE	Law No. 6 (2018) on Forestry – imposes penalties on anyone found to have deliberately started wildfires. Decree No. 25 (2007) for the protection of forests National biodiversity strategy (2002)
Land / soil degradation and agriculture		The Third National MDG Progress Report (2010) Act No. 91 (2005) to support modernization of irrigation system Agrarian Reform Law No. 161 (1985) and its amendments
Waste / debris / rubble and air pollution		Law No. 3 (2018) regulates removal and utilization of debris / rubble in view of disposal. Law No. 26 (2010) on Regional Planning Law No. 50 (2002) recommended to set develop strategic plans for a green economy and clean energy, while considering environment measures in implementation of projects in cities
Climate change adaptation and mitigation, incl. droughts, heat stress, floods, GHG reduction.		Forthcoming- National Action Plan (UNEP) Nationally Determine Contribution (2018) Initial National Communication (2010) National drought management strategy (2009) Decree No. 73 (2005) ratifying accession to the Kyoto protocol

Box 2: Implementing sanitation in cities and their environments.

The distribution of responsibilities for sanitation projects between many different entities, including ministries represented by the General Company for Water and Sewage, the Directorate of Technical Services, and the municipalities, has complicated coordination between the various authorities in managing this area. The responsibilities are divided as follows:

- The Ministry of Water Resources announces projects to implement main treatment plants.
- The General Company for Water and Sanitation in the governorate announces the studies and implementation of sanitation projects within cities.
- The Technical Services Directorate announces the studies of drainage networks, estuaries, and point treatment plants. The directorate also announces the implementation of point sewage stations.
- The municipalities announce studies of networks and point treatment plants as well as their implementation.
- The General Sewerage Company operates treatment plants and maintain sewage networks within cities.
- Municipalities maintain networks within the population centres (vill ages etc.).
- The Ministry of Water Resources is responsible for the water discharged from the treatment plants.
- The Ministry of Agriculture is responsible for water use in agriculture.
- Real estate departments are responsible for acquiring lands or the stations.

Table 3 Main institutional responsibilities in the context of addressing environment in urban recovery

Ministry of Local Administration and Environment (MOLAE)	Responsible for approving plans at all levels (national, regional, municipal), the development of plans has since Decree No. 107 (2011) been devolved to municipalities and governorates.
Ministry of Water Resources (MoWR)	Management of all affairs related to water resources.
Ministry of Agriculture and Agrarian Reform (MAAR)	Management for all affairs related to agriculture, including land management.
Planning and International Coordination Commission (PICC)	Among others, responsible for reporting on the SDGs (including climate-related goals) and progress to international organizations. Monitors plans in their contributions to the SDGs. All ministries report to PICC for this goal. Develops visions and strategies for economic and social development. Reporting directly to the PM office.
Regional Planning Commission (RPC) (Under MoH)	Responsible for the development of studies and assessments to feed into regional plans.

Institutional entry-points to address environmental challenges

Despite the institutional obstacles outlined above, there exist various institutional entry-points to address the environmental challenges described in the contextual analysis and environmental management issues. These are found in the existing institutions, made commitments and current rules and regulations adopted before and during the crisis. Some relevant entry-points include:

- **Include considerations for the wider impacts on people and the environment in the budget allocation decisions for urban recovery plans.** The Ministry of Local Administration and Environment (MoLAE) reviews plans and assigns budgets based on the impacts of projects on people. However, most environmental functions (water resources, land, ecosystem services) that affect the regions, are served by regional facilities (e.g., wastewater treatment plants serving multiple cities) and will have an impact beyond the city that develops a recovery plan. Developing improved methodologies that consider this impact from city to region will be critical for better prioritization of projects.
- **Strengthen and activate existing regional facilities in support of a National (regional) Spatial Planning Framework.** Various frameworks for regional collaboration on environmental challenges exist, but many of the committees lie dormant due to a reduced capacity and therefore are unable to conduct sectoral studies and to integrate them into plans.
- **Strengthen accountability for the implementation and follow-up of environmental impact assessments in plans on all scales through MoLAE.** Environmental impact studies are often omitted as a way to save money into urban development studies, such as master plans, expansion plans or housing studies. Even if environmental impact studies are conducted, a division between planning and implementing jurisdictions precludes follow-up on environmental impact, its monitoring, and the required maintenance plans.
- **Set-up thematic cross-sectoral environmental taskforces for specific environmental challenges that coordinate various ministries and anchor them at municipal levels.** Many environmental challenges, such as land degradation, are a downstream effect of decisions made by a variety of actors along the urban-rural continuum. Addressing all the factors that lead to land degradation requires the activation and incorporation of many sectors in regional plans. For example, the Land Degradation Neutrality (LDN) Target[60] suggests the formation of a national committee incorporating several departments to mainstream the principle of LDN in all plans.
- **Strengthen local communities to address specific urban local environmental challenges such as the recycling of debris (supported by Law No. 3 (2018)) and the upgrading of maintenance of public spaces.** While practices for debris disposal largely is done without environmental considerations, such as the disposal of rubble in rivers or public spaces, the benefits of safe and sanitary debris removal is both important for communities in clearing rubble from properties etc. and to reduce negative effects from the unsafe management practices. Empowering local communities to take an active role in safe debris management, while keeping accountability at the lowest possible level is therefore critical to address such challenges.

60 Government of the Syrian Arab Republic (MOLAE), Land Degradation Neutrality Target Setting Programme: Final Country Report. March 2010.

05

Policy Design

The foregoing contextual analysis has outlined some of the many and interlinked environmental and climate change challenges that Syria is faced with. These encompass concerns such as water resource scarcity, desertification, deforestation, land degradation and pollution caused by deteriorated public services such as water supply, solid waste and wastewater management, combined with increasing risks of droughts and heat stress. At the same time, the limited capacities of national government institutions and especially decentralised authorities is a major barrier to recovery efforts addressing these challenges. This includes limited data availability on which recovery decisions can be made, the lack of up-to-date strategies and regulations, and available financing to support sustainable and climate change responsive recovery. To achieve an urban recovery that will address current needs as well as contribute to cities' resilience in the longer term, it will be essential to address environmental hazards and the effects of climate change, as these issues conversely pose risks of reversing the positive effects of other recovery efforts and exacerbate needs. Therefore, measures to mitigate the negative impacts of environmental and climate issues needs to be embedded in urban recovery plans, including strategies to finance concrete interventions at decentralised levels. As for concrete interventions, the first step is to create minimum conditions for people to return and regain livelihoods, among others, by stopping the main sources of pollution due to damaged or non-functional infrastructure, and removing debris that is blocking water systems, as well as addressing overuse of natural resources and solid waste management.

Prioritizing Policy Options - Transformative Actions for Urban Recovery - Recovery options, priorities, and steps

Based on the foregoing, the following logic and principles will guide the policy design to ensure due environmental considerations within an Urban Recovery Framework:

1. Environmental stressors and risks are exacerbated due to a combination of crisis impacts (i.e., damages and pollution), population growth and urbanization, and climate change impacts. Any holistic urban recovery plan needs due consideration to these challenges if results towards a longer-term resilience agenda should be achieved.
2. The safe and dignified return of IDPs and refugees, restoring (or establishing) safety-nets for urban poor, and securing the livelihoods of those working in the agriculture sector, will depend on resources that are now under threat – such as water and productive land. Considerations to these and other vulnerable groups needs attention in the policy design, underpinning the need to engage these groups in assessments and planning processes.
3. Successful environmental and climate adaptive urban recovery require inter-ministerial buy-in, and horizontal and vertical coordination among national and decentralised government, including mainstreaming of assessments, planning, regulations and monitoring.
4. Interventions should be informed and planned based on a sound evidence-base.
5. Current environmental and climate change strategies, plans (e.g., NDC) and regulations are limited, but could be built upon in combination with other initiatives and projects. Successful integration of climate and environmental considerations in urban recovery plans will

require support and advocacy to further develop national level policies and regulations.

6. Interventions should be anchored into master and urban recovery planning. The need of planning processes that intersect several levels of engagement is crucial. In fact, the missing active role of the Regional Planning Commission (RPC) creates a challenge to act on many environment related recovery areas. This includes, for example, the water management system from source to point of use and models of water reuse. It also includes renewable energy policies from energy generation on the regional level and its distribution at local levels, and solid waste management from neighbourhood units to the transferring and recycling stations. The overall goal of these practices is to enhance environment recovery considerations and activities, and to adopt the spatial planning and area-based approach, from bottom-up to top-down. A strengthened role of the RPC also facilitates the coordination between specialized departments which are represented at the level of the Planning and International Coordination Commission (PICC) and spatial multi-sectoral process managed by RPC and administrative units (municipalities).

The below outlines possible policy options, priorities, and steps to embed an environmental lens within urban recovery and area-based approaches.

Policy goals

The ultimate recovery policy goals include improving people's well-being, economic recovery, food security, and stability in the long-term through a building back better and green recovery approach, and specifically to:

a. Recover and reduce pressure on urban service systems (clean water, sanitation, waste, and pollution management, etc.) and natural resources.
b. Enhance social cohesion and reduce social tension around (scarce) natural resources, especially water.
c. Increase (agricultural) productivity, sustainability and climate change resilience of livelihoods and food systems.
d. Reduce the migration flows that result from a loss of livelihoods or wellbeing, including from the impacts of environmental hazards or climatic events on agriculture, and e.g., heat stress and lack of water in urban centres.

Progress towards these goals will both support the overall objectives of an Urban Recovery Framework, as well as support progress against the environmental-related SDGs. These include responding to a) water resource scarcity and pollution (SDG 6/11/12), b) desertification (SDG 15), c) deforestation and loss of natural habitats and biodiversity, including fires (SDG 15), d) land and soil degradation and crop failure / reduced productivity (SDG 15), e) waste / debris and pollution (SDG 7/11/12), and f) risks to increasing droughts, heat stress and in some areas, floods (SDG 11/13).

Policy design – prioritization through a Recovery ladder

The policy design will consider recovery steps along both time and geographical scales. The time scale/ phases will guide a three-tier approach and recovery ladder which activities can be prioritised by:

- **Absorptive** (immediate rehabilitation measures): the focus will be on urgent issues of functionality to assist people to have access to basic services and regain their livelihoods. Design should be durable / sustainable and climate change resilient.
- **Adaptive** (medium term, 2-5 year-perspective): Identify and initiate projects to develop and (re) construct infrastructure and environmental-related services by integrating local area-based interventions, and system-wide concepts including building capacities of local government entities in environmental and climate resilient planning.
- **Transformative** (initiated within a 2–5-year perspective but with longer-term, 10-year goals): Re-defining and implementing Syria's national environmental-related strategies, including disruptive and bounce forward measures. The objective is to create enabling conditions for implementation of strategies that both considers sustainability needs, climate change effects and fragility challenges, and at the same time seek to identify measures that would leverage local capacities, innovation, and opportunities to help leapfrog forward.

Table 4 provides an overview of the main environmental challenges and recovery response options and priorities, divided into 'concrete' interventions and supporting soft and institutional activities required for recovery. To ensure the recovery approach is environmentally sustainable and climate change resilient, these elements should be considered as shown in the last column of the table. Five areas for priority interventions have been identified to accelerate urban recovery. These can be summarised as follows:

1. Water resource scarcity: give priority to stopping pollution of water resources and to ensure water flow through critical (clean) channels. This can be done by cleaning and rehabilitating channels by removing debris and enhance waste management, protect critical clean water sources which include rehabilitation of broken wastewater management systems, rehabilitate critical wastewater treatment plants (often sources of pollution) and rehabilitate other critical water-related infrastructure and services. Also, securing adequate electricity supply in the water supply system are required and introduction of renewable energy should be considered. Besides that, the agriculture sector should be modernised to respond to current and future risks, with a focus on mechanization, rationalization and preservation of renewable resources, including regulations to manage water consumption.

2, 3 and 4. Desertification, deforestation, land / soil degradation, and crop failures: prioritize halting current desertification trends that consume valuable lands (e.g., productive or potential productive / agriculture land), halt forest fires and rehabilitate critical existing irrigation channels. This can be done by establishing buffer zones for fires against desertification through soil regeneration and replanting. Moreover, critical clean water resources need to be protected, as well as existing irrigation channels and wells rehabilitated. A regulatory framework should be considered to ensure the preservation, protection and sustainable exploitation of forests and woodlands.

5. Waste, debris, rubble and air pollution, and wastewater management: prioritize removing debris in areas where the recovery of basic services and housing is needed, combined with identifying appropriate waste treatment facilities and locations. This can be done through a local community-based approach with small disposal sites, temporary storage sites, and recycling sites as well as through the green-blue network strategies design and practices. In addition, incorporate ecosystem services in these urban green-blue networks, rethink flood and drainage design, target the pollution of water resources, update water management systems, apply green building codes and promote investment for nature-based protection. Moreover, there is a real need for an in-depth analysis of the legislation related to the debris file in order to determine the level of decentralization and the role of local communities in dealing with the debris from several aspects (legal, environmental and investment). This can be done by evaluating the relationship between the Environmental Law No. 12 (2012), Hygiene Law No. 49 (2005) and Local Administration Law No. 107 (2011).

In line with the three-tier phases of interventions, the policy goals within each of the areas are suggested along the three phases, from short to longer-term (see Table 5 Overview main environmental challenges and recovery response options and priorities). After the initial recovery steps, priority activities should focus on initiating transformative interventions that support progress against environmental-related SDGs, including making sure the initiatives have a sustainable impact, while improving climate change resilience. This would require integrated assessments and planning processes, combined with establishing a supporting planning and regulatory framework. This could entail a post-crisis national water strategy, including a climate change sensitive integrated resource management strategy looking at protection of the water-basin and watershed systems and strategies to reduce water consumption and waste (e.g., local level management and waste recycling, debris and wastewater management plans.

Table 4 Overview main environmental challenges and recovery response options and priorities

Environmental challenges	Main issues		Recovery Activities
Water, including water scarcity, flooding and pollution.	a. National water deficit, exacerbated by: b. Water pollution, also due to non-function treatment plants. c. Restricted water supply due to damage to distribution networks. d. Damage to the infrastructure networks of the sewage system and drinking water supply in cities and towns (breakdown, blockage, lack of maintenance, old and inefficient networks). e. Debris blocking various supply and drainage channels. f. Non-protection clean water sources, Failure to link national land use plans to available natural resources and the weak institutional framework for water; enforcing water laws; The absence of a participatory approach to managing water resources. g. Sanitation and sewerage channels blocked by debris. h. Irrigation (high-cost diesel pumping) and Inefficient old irrigation systems. i. Waste-water treatment. j. Electricity shortage in water supply system	Short	• Demining and removal of waste and debris from critical water supply channels. • Fast-tracking rehabilitation and upgrading of critical water supply facilities including water pumping station, water treatment station and wastewater treatment plants. • Implementation of existing legislation related to the protection of critical clean water sources from pollution • Rehabilitation of other critical water-related infrastructure, such as water networks, securing electricity supply to the pumping station/wells with renewable energy.
		Medium	• Conduct assessments and planning processes and initiate water-related projects (e.g., Integrated watershed management to use water as efficient as possible) to support progress against SDGs. • Wholistic improvement of wastewater treatment system. • Capacities strengthening, especially at the municipal level, to support locally led data collection assessments, planning and management of the water sector. • Post crisis national water strategy, incl. Integrated Natural Resource Management Plans (looking at basin / watershed systems). • Develop sustainable methods for the use of wasted rainwater that take into account the local peculiarities of rural areas.
		Long	• Climate change adaptation principles that include responding to reduced rain, increasing droughts. • Develop strategies / plans to manage water in an efficient, sustainable and climate change resilient way at system level. • Mainstream urban design principles that integrate water management into urban design, such as infiltration zones and surfaces, and water buffer areas in greenspaces. • Developing the specialized monitoring and supervision system for drinking water and the main supply networks through the establishment of specialized observatories at three levels (national, governorate, municipal) which monitor the status and quantity of water.

Desertification	k. Loss of productive land. l. Lack of proper management of water, land, and urban areas. m. Lack of National awareness measures and central Government monitoring. n. Increasing the internal migrations to big urban localities for job opportunities which impact the land management for all Syria.	Short	• Conduct required assessments and planning processes, and initiate projects to support progress against SDGs. • Support the rehabilitation of irrigation channels, especially the critical ones connecting agriculture areas to water sources. • Develop Localised Recovery Plans responsive of current, future, and potential risks for desertification.
		Medium	• Set-up remote sensing-based desertification monitoring platforms feeding into the critical environmental layer of regional urban observatories for consideration for urban development plans. • Support the local production to prevent the migration, credits systems, taxation exemptions, other models of financing support. • Create new job opportunities around the desertification impacts, mitigations response modalities.
		Long	• Establish buffer zones to mitigate desert encroachment. • Support the rehabilitation of previously or potential productive land (soil regeneration). • Develop regional integrated "combat desertification" plans. • Integrate landscape design principles in new master/ development plan processes that include the mitigation of desert encroachment.
Deforestation and loss of natural habitats and biodiversity incl. forest fires	o. Deforestation through forest fires. p. Loss of habitats and biodiversity supporting the ecosystems and livelihoods. q. Damages to electricity and energy infrastructure and services, resulting in use of wood for cooking/heating (and need for wood collection). r. Lack of proper management of water, land, and urban areas, including mitigating and reducing fire risks. s. Damages and pollution to natural habitats and cultivated land. t. Lack of protection of natural habitats and biodiversity. u. Urban extensions on natural and forests land and not controlled master plans expansion. v. Lack of urban ecology knowledge and green-blue networking. w. Limited capacity on risk fire management and need for urban observatory activation. x. Local community engagement in biodiversity protection (agriculture policies, innovative solution and renewal energies for irrigation water management).	Short	• Stop forest fires, by municipal and related institutions capacity building and community engagement and training programs. • Urgent elaboration of potential risk plans for immediate, medium and longer-term initiatives. • Continue the monitoring of forest fires through locally led early warning systems. Same as above, in addition to the activation of environment observatory at governorate level in term of monitoring the risks and Capacities strengthening to support locally led data collection and analysis, assessments
		Medium	• Action plans for bio-diversity units' definition at local level, in linkages to urban localities for better planning and management of land issues and natural habitats preservation • Joint elaboration of post-crisis biodiversity strategy urban densification and local communities' practices and enhancing awareness • Coordination and sharing of information to prevent risks and better protection through enhancing the role of environment observatory in connexion to community-environment centres at local levels.
		Long	• Establish buffer zones to mitigate risk of spread of forest fires in relation to regional studies, definition of natural protected components and elaboration of regional land uses plans. • Restoration of damaged fire areas and protection activities such as, Tree replanting campaigns, restoration of biodiversity eco-systems and promoting the natural reserves. • Landscape design considering future needs and risks, promoting bottom-up full process (community environment centres, environment observatory and central government, MoLAE and PICC).

Land and soil degradation, and crop failure and reduced productivity	y. Loss of productive agriculture, land, and livestock. z. Damages to irrigation infrastructure. aa. Using old and tradition facilities and infrastructure for agriculture. ab. Weak monitoring and harmonisation of the land market, especially of adjacent urban and agriculture farms/lands. ac. Risk of Investment attraction on agriculture and natural units. ad. Informality production and extension on agriculture semi-rural lands especially surround the big cities. ae. Lack of proper management of water, solid and liquid wastes and land. af. Lack of rehabilitation and maintenance of surface (channel) water used to irrigate ag. Abandoned farms and wells out of services	Short	• Rehabilitate critical irrigation channels and wells in agricultural areas • Learning and enhancing local knowledge about new agriculture practices and potential areas of productivity enhancement • Coordination platforms with concerned parties on specific critical detected areas for immediate mitigation modalities.
		Medium	• Conduct required assessments and planning processes, and initiate agriculture recovery projects to support progress against SDGs (e.g., soil regeneration). And mitigate the pollution coming from cities (sewerage, solid waste, industrial, etc.). • Support the preservation of semi-rural lands and reconfiguration of wider land uses accordantly, especially for new master plans expansion areas. • Conducting land market assessment and defining the needed measures for agriculture protection productivity. • Directing the potential investment on specific areas trough the land management at regional level. • Establishing a agriculture networks between localities in specific areas (naturally linked), to enhance the water irrigation management, productivity distribution to local markets (strengthening local agriculture economy). • Support efficient use of water and promote conservation farming practices to reduce water and fertilizer needs. • Support to transition to water- efficient/drought-tolerant crops cultivation and minimize high water intensity crops • Rehabilitate previously or potential productive land (soil regeneration). • Supporting agriculture farmers organisations with innovative learning methods and applications post-crisis agriculture (regeneration plan – potentially through land management).
		Long	Develop strategies / plans to manage agriculture in an efficient, sustainable, and climate change resilient manner through the regional plans. Creating aand branding agriculture production items and rank them as regional identity in markets and exportation. Improve the land management system for big cities and deal with informal expansion and housing projects in best sustainable land management approaches. Enhance the green architecture and environment neighbourhoods' concepts which support the perma culture practices.

Waste / debris / rubble / wastewater and air pollution	ah. Limited waste management leading to pollution (air, soil, water) and health and livelihood issues ai. Management of rubble in destroyed neighbourhoods in urban areas. aj. General deterioration of waste management infrastructure and final disposal solutions. ak. Virtually non-existent air pollution management and strategies towards reduction of greenhouse gasses (GHGs)	Short	• Assess waste management issues and needs in high-risk / damaged areas. • Remove debris and wastes, identify appropriate waste treatment facilities / locations and manage these in a sustainable way, for instance through locally community-run disposal sites, temporary storage sites, and/or recycling sites. • Involve communities in waste / debris management, e.g., by using emergency employment programs. • Identify suitable waste disposal and treatment sites in accordance with improved land-use plans. • Implement debris management guidelines (e.g., UNDP 2013) and management plans that include recycling options.
		Medium	• Conduct required assessments and panning processes and initiate projects to support progress against SDGs and to reduce GHG emissions, especially related to recycling rubble (i.e., low carbon recovery path). • Improve waste collection system with enhanced capacity of transportation (allocation of budget for workers and purchase of waste collection trucks and collection bins). • Rehabilitate waste sorting facilities and composting facilities. • Transform final disposal sites to controlled sanitary landfills with improved capacity (including allocation of required budgets for facilities, heavy machines etc.). • Rehabilitate all damaged wastewater collection pipes and wastewater treatment plants with improved capacity (including allocation of required budgets for facilities and O&M). • Implement Law No. 3 and update / develop laws that support green recovery (i.e., building codes). • Develop the capacities of municipalities and relevant authorities in the field of developing logistical plans for the implementation of urban recovery policies.
		Long	• Establish improved integrated solid waste management systems in cities based on the city development plan with detailed sector analysis (demand analysis, technical analysis, etc). • Establish improved wastewater management system in cities based on the city development plan with detailed sector analysis. • Develop strategies / plans to manage waste appropriately on the long run. • Capacities strengthening to support locally led data collection and analysis, GHG inventories and reduction commitments. • Introduction of regulation related to air pollution control and its enforcement.

06

Policy Implementation and Monitoring

The policy design proposes actions across national level policies and regulations, decentralised systems and spatial planning including capacity strengthening of decentralised authorities, and direct implementation through the engagement of local communities. Embedding these environmental-related activities within overarching Urban Recovery Frameworks, ensures the identified challenges are addressed in a holistic manner considerate of possible priorities under other thematic challenges (e.g., within housing, or heritage). It also helps identifying interventions that will address issues spanning several sectors, and interventions that would have the greatest multiplier effect and contribute towards transformative changes for the cities and residents to (re)gain resilience. As such, the recovery activities outlined in the previous chapter could be supported through the following means linked to a URF programme:

a. **Urban Recovery Plans.** Address environmental related challenges through city-level urban recovery plans. The plans are anchored and formulated with local authorities and stakeholders setting the course for priority recovery interventions across the respective cities and sectors. To do so, local representatives should be presented with environmental data and analysis, deliberation on negative trends and scenarios if environmental challenges are un-checked, as well as engaged in the identification of opportunities to adopting environmental and climate change adaptive planning.
b. **National policies and regulations.** Advocate towards national level authorities, engage and contribute to policy discussions and in shaping and reformulating related regulations. Support the update of national environmental plans and strategies. Promote accountability of national and decentralised authorities in keeping checks and balances on environmental changes and the upholding of regulations.
c. **Community planning and contracting.** Engage local communities in identifying and addressing environmental related needs and impacts through for instance community contracting mechanisms. Ensure strong community participation from different community groups, with special attention to creating enabling environments for the return of displaced populations.
d. **Municipal Information Systems.** Embed environmental and climate change indicators as part of municipal information systems entailing data collection, analysis, and planning at the local levels to monitor environmental trends and climate change impacts and influence on urban areas and related sectors, identify specific needs, and interventions.
e. **Through urban and environmental observatories,** strengthen environmental monitoring functions and ensure reporting lines of environmental indicators into regional planning processes. To ensure a sustainable and climate change resilient approach is taken, environmental-related goals and targets (SDGs) should be harmonized across cities and regions, with the aim of developing a uniform approach for assessments and planning processes. Proposed recovery actions at both city and regional levels can then be assessed against these environmental targets and compared across different locations. SDG11+ has been developed as a concept (see Box 3 SDG11+) to support the monitoring of urban recovery frameworks. The SDG11 builds on SDG11 – Sustainable Cities and Communities, and provide a further elaborated indicator framework embedding indicators from other relevant goals, including environment related indicators. Annex 2 - Environment urban recovery SDG monitoring framework provides a full overview of the main environmental-related challenges in Syria and relevant SDG indicators against which progress can be monitored on the following three main administrative levels:

    - **City-level:** Through municipalities generally supported by MoLAE, this level should at least address project-level monitoring,

in particular related to performance of urban recovery projects with an important environmental recovery component. This minimal SDG-focused environment recovery indicator package could become part of each city-level recovery plan.

- **Regional level:** Through regional and national environmental observatories, this level should at least include land-related monitoring, including monitoring of activities concerning land degradation, pollution and management of water bodies consolidated in various "environmental layers" for planning. This minimum indicator package should be included in (integrated) regional plans, in addition to aggregated numbers from the city-level indicators mentioned above.
- **National level:** Through PICC, this level has a focus on the consolidation of indicators above to feed into reporting towards international climate change mitigation and adaptation commitments in the context of urban recovery.

Box 3: SDG11+

SDG11+ is suggested as a complementary monitoring and evaluation framework to humanitarian monitoring frameworks, streamlining the tracking of urban recovery specifically in the context of increasing adoption of 'area-based approaches'. It comprises a selection of 38 indicators suitable for the monitoring of recovery in urban areas. As such, it aims to support:

1. Improved identification of urban recovery interventions for both international organizations and local authorities (analysis).
2. To promote a standardized language of communicating access to services in urban areas, facilitating data exchange between administrative levels (communication).
3. As a way to identify areas lagging in urban recovery that should be prioritized by local authorities and international organizations (coordination).

Indicators related to environment in SDG11+ are:

3.9 Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.
11.6 Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.
7.b Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries.
7.1 Ensure universal access to affordable, reliable, and modern energy services.
13 Support and strengthen the participation of local communities in improving water and sanitation management
6.2 Achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
6.3 Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
6.4 Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity.

07

Conclusions

Syrian cities have and will continue to be directly and indirectly impacted by severe environmental challenges and climate change impacts. To prevent further environmental degradation and its related implications on health, services, livelihoods, and peace building, urban recovery needs to take an approach that supports a transition towards sustainable and climate change resilient development. This is especially relevant as natural resources will be in high demand in the recovery phase. The challenge will thus be to identify environmental recovery interventions that will address current needs while progressing towards longer-term resilience.

Water and land management are key challenges to be considered for sustainable and climate change resilient recovery. Through enhanced water and land management, persistent challenges related to water scarcity, desertification, deforestation and land degradation can be addressed, including enhancing social cohesion (i.e., avoid tension over scarce resources) and improving people's livelihoods and well-being. Recovery efforts need to carefully consider the root causes of environmental challenges and the social and environmental consequences of proposed actions. Strategies and plans should link to environment-related SDGs and natural resources management. Regulations should be put in place to reduce environmental risks. This will require holistic (e.g., watershed level) assessments, planning and management of natural resources, including making urban–rural linkages, and responding to the specific needs of people relying on livelihoods dependent on scarce resources (i.e., farmers) and people that need support to regain livelihoods and access to basic services, especially IDPs, returnees, women and youth.

Applying a building back better and green recovery approach, embedded in any urban recovery effort, interventions will support the ultimate policy goals centred on improving people's well-being, economic recovery, food security, and stability in the long-term. In the short term, absorptive and adaptive measures will need to enable people to return to their homes and communities through area-based planning and concrete interventions to reconnect communities to basic services and enable them to live and work safely.

To do so, the following principles are proposed as part of the recovery approach:

Water

1. Use water resources as efficient as possible, e.g., through an area-based assessment and planning approach, making urban–rural linkages and managing water and land in an integrated way at the watershed level.
2. Minimize water and soil pollution by identifying and stopping sources of pollution/contamination such as damaged wastewater treatment plants.
3. Maximize use of unconventional/innovative water supply options (e.g., treating sewage and wastewater to be used for irrigation) while reducing irrigated agriculture.
4. Water-energy nexus in rehabilitating water supply systems

Debris, solid waste and wastewater management

5. Assessing waste management issues and needs in high-risk/damaged areas.
6. Manage waste locally: create local solid waste programs in targeted neighbourhoods to remove, sort and recycle waste and identify legal dump sites, establish inclusive wastewater management system.
7. Use emergency employment programs to initiate above outlined activities.

Agriculture

8. Maximize efficient use of water and promote conservation farming practices to reduce water and fertilizer needs
9. Maximize water-efficient / drought-tolerant crops and minimize high water intensity crops.

Low carbon development

10. Identify sources of GHG emissions and related to that, maximize reuse of rubble.

11. Support design and planning that considers climate conditions, including housing design suitable for high temperatures, water collection systems, etc.

Going forward, pursuing the policy goals and outlined principles, environmental considerations need to be mainstreamed across several levels of engagement – from the national policy and institutional level, to the regional and city level planning, and finally to the local community and neighbourhood levels. Across these levels national and decentralised government, relevant central and local institutions and service providers, civil society, and communities needs to be sensitised on environmental stressors and potential responsive urban recovery trajectories, as well as resourced (technically and financially) to bolster these stakeholders' capacities in leading inclusive and transformative recovery planning and implementation. For international donors and organisations, this means considering environmental streamlining as a key safeguarding principle in immediate response actions, and, when the situation allows, in any reconstruction efforts. Moreover, international stakeholders could play a role in initiating and contributing to dialogue and planning efforts in support of regional and cross-border water management.

08

Annex 1: Case Studies

The environmental and climate change risks faced by Syrian cities vary depending on their location in Syria's agro-climatic zones, and the level of damages caused by the recent crises. This annex presents common challenges facing three cities located in governorates with various degrees of urbanisation: Aleppo (urban/Aleppo governorate), Eastern Ghouta (sub-urban/Rural Damascus governorate) and Qadmous (rural/Tartous and Hama governorates). It also presents UN-Habitat's work in these cities in developing urban profiles and recovery plans, exemplifying how environmental challenges can be addressed through multi-sectoral urban recovery approaches.

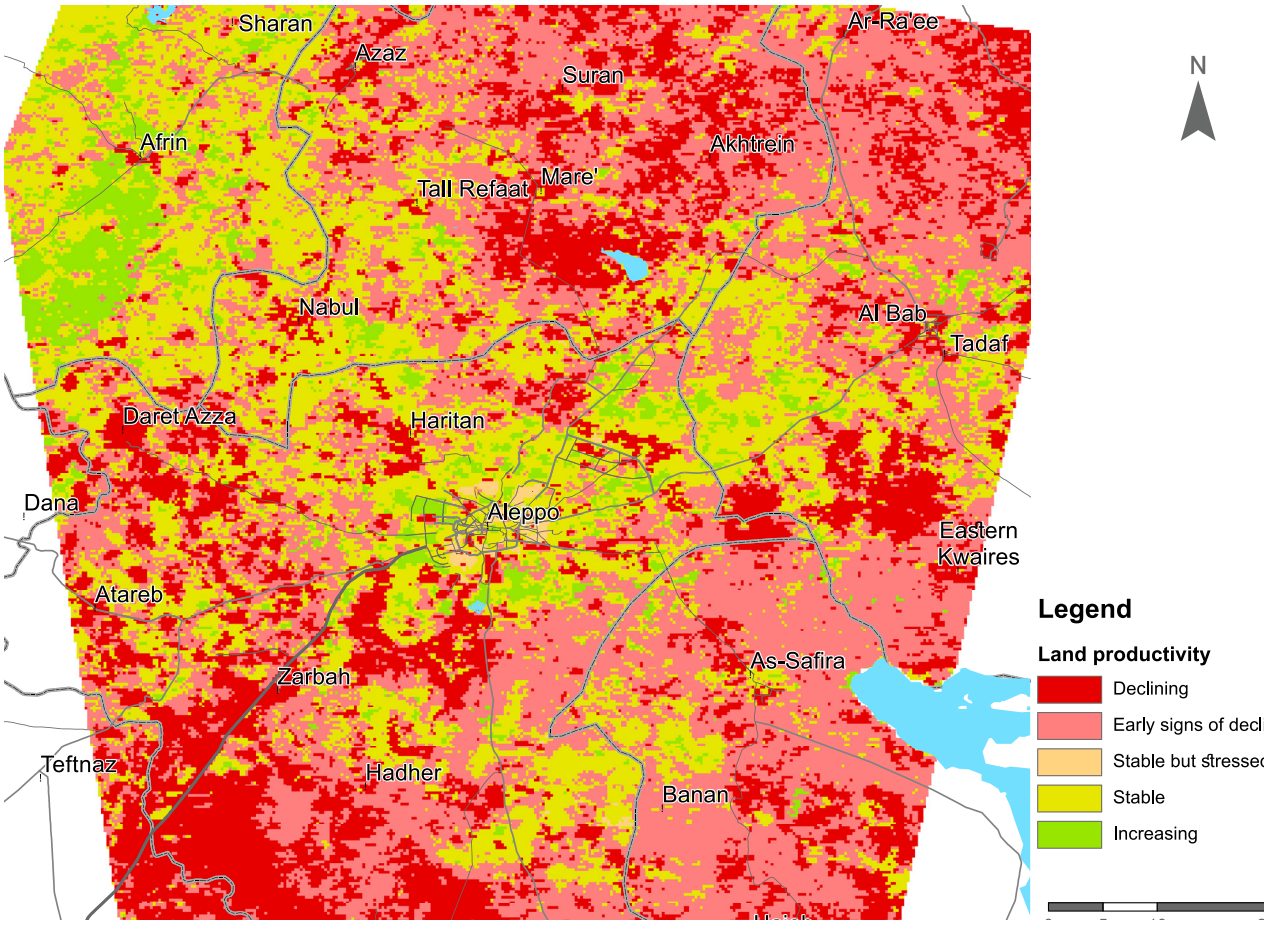


Figure 10 Land productivity Aleppo. Source: iMMAP

Aleppo City

Aleppo is the capital of Aleppo governorate, which is the most populous governorate in the country. The city is known for its immense cultural and historic significance, and for being the most prominent national economic centre of industry and commerce. Located approximately 45km east of the Turkish border, the city is surrounded by agricultural areas. Being the home of 2.8 million people in 2011, Aleppo was the largest city in Syria before the crisis, 40 per cent of which lived in informal settlements. Aleppo city is also estimated to be the most damaged city in Syria; 46 per cent of its neighbourhoods are severely damaged, 14 per cent partially damaged and 40 per cent slightly damaged. Figure 10 show land productivity degradation in Aleppo, while Figure 11 show the land cover degradation.

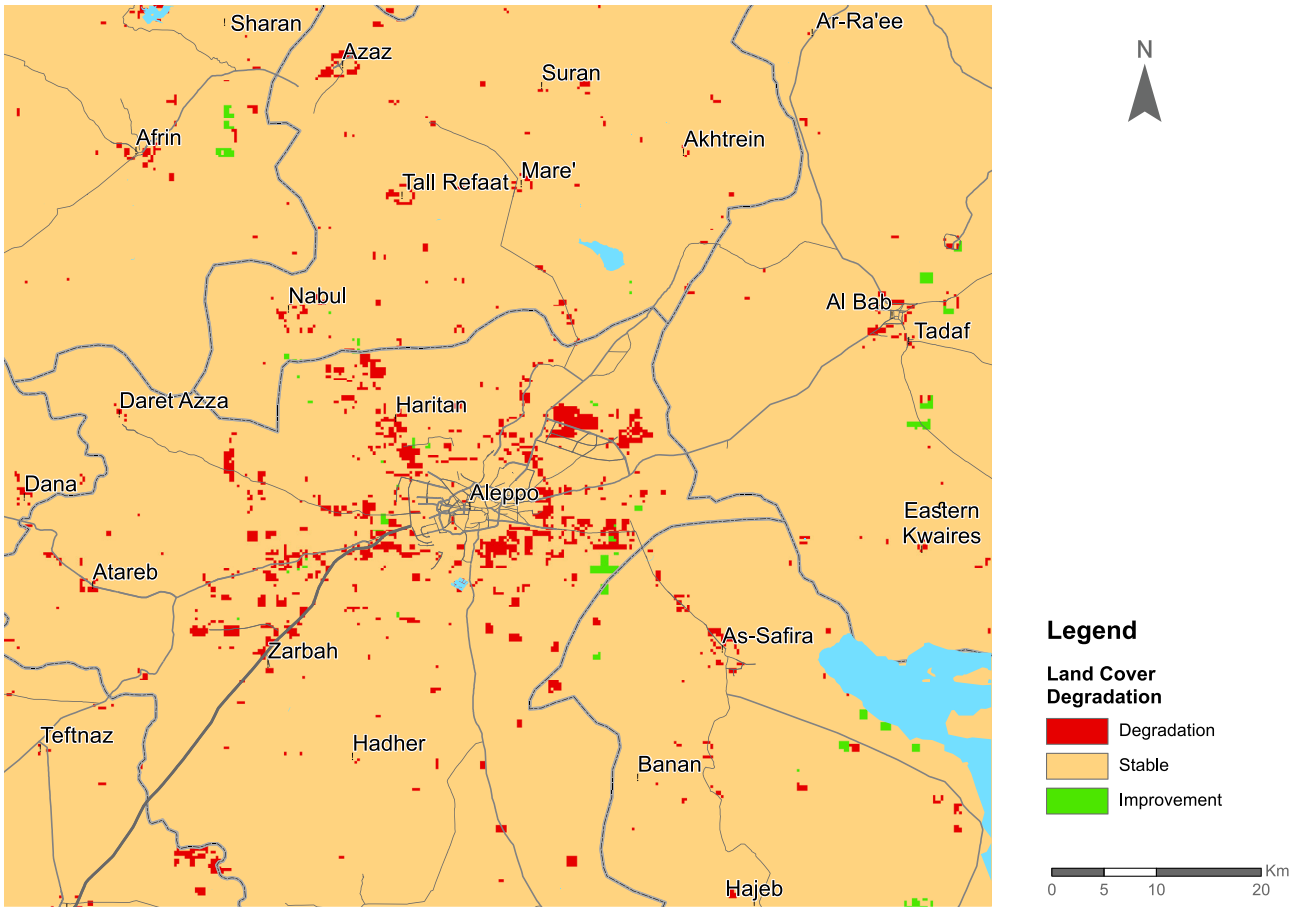


Figure 11 Land cover degradation Aleppo. Source: iMMAP

61 UN-Habitat, Aleppo Urban Profile, 2020.

Recovery planning process

In order to assess damages in Aleppo, UN-Habitat developed an urban profile of Aleppo in 2018, and updated it in 2019 with a Recovery Plan.[61] The recovery plan addresses the key areas seen as pillars to the Urban Recovery Framework approach, including local planning and community engagement, local economic development, infrastructure and services, housing, cultural heritage and environment. Several challenges related to the deteriorated environmental condition of Aleppo city are identified in the plan (see Figure 12 for an example of developed action plan for the city centre sector), including issues related to solid waste management, green public spaces, and WASH infrastructures, as one of the main areas of concern. It also supported the development of detailed action plans in each technical service directorate, to the effect of including solid waste management, debris removal, rehabilitation of gardens, and rehabilitation of sewage as a part of the city's intervention priorities, these included:

a. **Sewage and sanitation**
The sewage system suffered great damage during the crisis, compounding existing challenges brought about by long institutional neglect and a lack of maintenance, which had resulted in service gaps in the eastern neighbourhoods between 2012-2016. Following the assessment done by the General Company after 2016, the Aleppo Urban Profile identified the following needs and priorities of sewage network rehabilitation:

1. Removal of damaged network lines, treatment of wastewater, and the removal of debris and sediments caused by lack of use.
2. Rehabilitation of minor damages to network lines, manholes and storm water manholes which were destroyed or blocked during the crisis.
3. Repair of malfunctions in the pipe and manhole network. The damage assessment of sewage lines is ongoing (2021) in line with the rubble removal programme set by the city council.
4. Coordination with donor organizations to replace inefficient sewage lines, maintenance of the damaged machinery, support to the technical labour force, and the provision of machinery.
5. Implementation of an advanced treatment plant with sustainable treatment methods considering future expansion and the issue of industrial drainage in response to the destruction of the two main treatment and pumping stations of the city. This destruction is a main contributor to continued pollution of Aleppo's southern plains.

b. **Solid Waste Management**
The profile identified a limited capacity of the municipality to provide sanitation services. This included a shortage of machinery and equipment and more than 75 per cent reduction of sanitation workers (from 1800 workers pre-crisis to 400 post-crisis). The key findings and priorities identified in the profile were:

6. The city's official landfill, which is located 60km away from the city in the Tal Daman area, was severely damaged during the crisis. The governorate has rehabilitated a part of the landfill.
7. There is an intermediate dumpsite in the Sheikh Saeeb area. Due to its distance to the final landfill site, and a limited capacity of transportation trucks, the transportation cost remains high.
8. The crisis generated a large volume of debris and waste, some of which was dumped in the outskirts and surroundings of the city together with solid waste. It is estimated that there is more than one million cubic meters of solid waste in such informal dumpsites.
9. There is a need for the city to develop an integrated plan for solid waste management in the city, which would include removal of temporary dumpsites. This would entail identifying new locations for disposal sites for rubble, debris and solid wastes. In addition, the establishment of recycling facilities for the production capacity of 1.5 tons per day is also proposed.

c. **Water supply linked to climate change impacts**
10. The profile highlights WASH-related risks (including health risk such as leishmaniasis) due to a lack of access to safe water, affecting in particular IDPs and populations living in informal settlements. The water scarcity in the region resulting from climate change will likely influence the water supply capacity in the city, requiring further monitoring.

d. **Community engagement**
11. Supporting maintenance of public areas, especially around public green spaces,

to enhance access to safe public and recreational areas.

12. Strengthening the role of neighbourhood committees and Mukhtars in participating in identifying local needs and implementing projects in partnership with local communities.
13. Strengthening social cohesion and enabling local community engagement through associations and other community initiatives that undertake afforestation campaigns and rehabilitation of gardens and public spaces.

e. **Natural resource management**

14. Creating enabling conditions for the implementation of an integrated natural resource (water and land) management, considering climate change effects and social fragility challenges.
15. Taking stock of the city's green and blue networks, their preservation, and supporting the connectivity and fair distribution of green public spaces throughout the city.
16. Applying environmental measurements and experiments to increase the air, water and soil quality while adapting to climate change challenges.
17. Rehabilitation of the main plant nurseries as well as their irrigation networks.

Implemented urgent recovery projects

During 2019-2020, as a result of a collaboration between UN-Habitat, Aleppo Municipality and municipal neighbourhoods' sectors and neighbourhood committees, a set of seven project packages were implemented. One of these packages addressed environmental challenges and included: 1. Supply, installation, and commissioning of two medical waste incinerators in Aleppo municipality and 2. Monitoring of polluted gases and improving air quality.

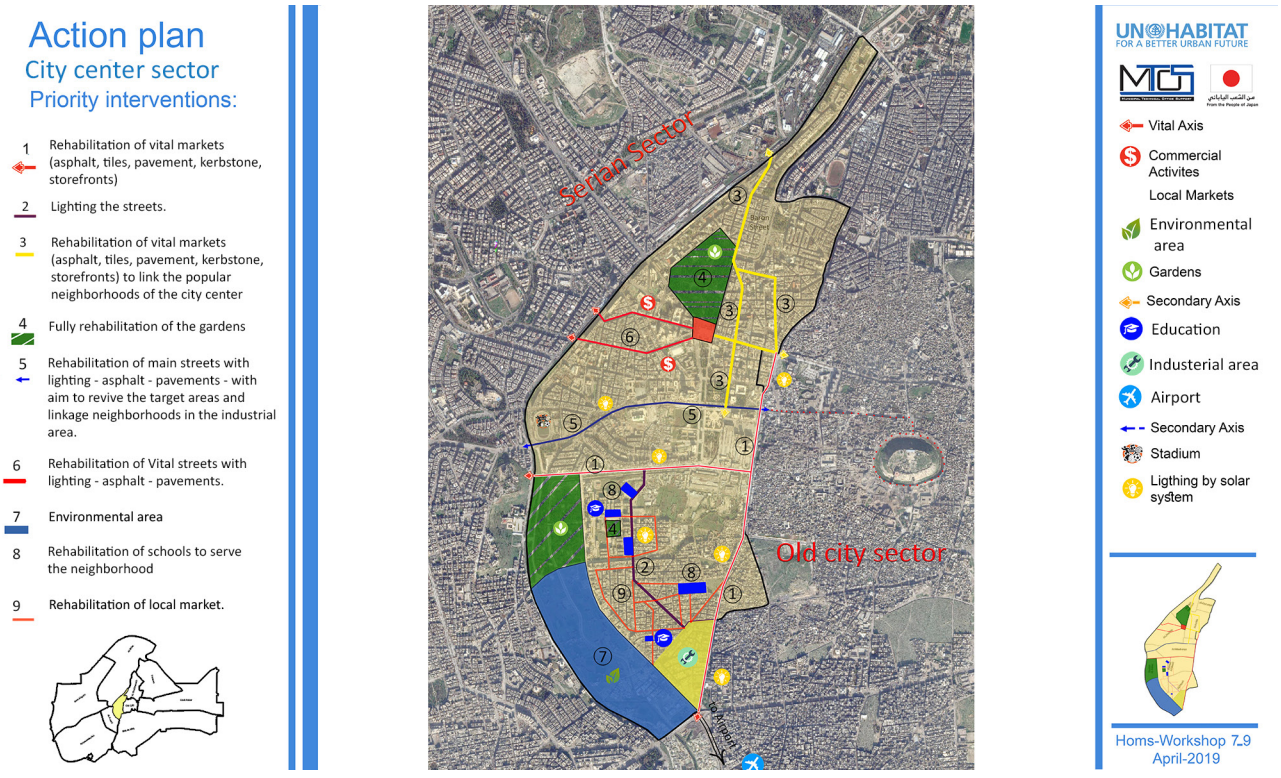


Figure 12 Aleppo city center neighborhood action plan, including main environmental issues. Source: UN-Habitat

Eastern Ghouta

Eastern Ghouta, a heavily fought-over area east of Damascus that includes a number of villages (including Douma, Harasta, Mleiha, Zebdine Arbin and Kafr Bana), had a pre-crisis population of approximately 225,000 inhabitants which dropped to 145,000 during the crisis, a loss of a third of its population. While return could be expected to these areas, environmental challenges will affect recovery efforts and restoring agricultural activities and livelihoods, and impact pull-factors for peoples return and options to re-establish their lives should they return. Pre-crisis, the economy of the sprawling area was significantly oriented around agriculture value chains. In the area at large, about 75 per cent of the population was dependent on agriculture. In Douma, one of the area's major cities, activities related to the agricultural sector are now almost totally absent and unemployment has risen to 80 per cent.

UN-Habitat supported more than eight cities, including Mleiha, Zebdine, Deier Alassafir, Marj Sultan and Harsta Alquntara and their villages along Barada east-southern branches, to produce action recovery plans in 2019-2020.[62]

The identified key challenges facing Eastern Ghouta from environmental stressors overlaid the crisis impact (Figure 13), includes:

a. *Water stress.* A combination of climate change-related stressors including reducing precipitation and increasing risk of droughts (see Figure 5 under climate change trends) and conflict related destruction of water services and infrastructure has already led to water scarcity. This is expected to increase in the future.
b. *Untreated wastewater* is streaming into the area from the west to the east, resulting in pollution of water streams and groundwater and soil. The Barada pipeline and Adra Wastewater Treatment Plant (constructed in 1997), both main facilities for Damascus and Eastern Ghouta, have only been partially functioning since the beginning of 2011. Sewerage pipes that ran through Eastern Ghouta's agricultural land from Damascus to the plant were known to leak into the groundwater causing soil and land degradation, and pose further harm to crops.
c. *Rural-urban* competition over land for water resources. The Barada River is one of the main water sources for the irrigation of the region. The source of the Barada stream is located west of Damascus and ends to the east of Damascus. Its water is both distributed naturally by the area's geography, as well as through canals and other irrigation systems that has historically supported the development of the agriculture sector in the region. However, due to rapid urbanization of both Damascus and its directly outer lying areas, an increasing amount of the water is being consumed in Damascus before reaching Eastern Ghouta. The proliferation of informal wells has compounded the diminishing water returns from this critical source and contributed to the lowering of ground water levels.
d. *Repairing the irrigation systems is risky due to presence of unexploded ordinances (UXOs)* that have been disposed of in irrigation gullies and canals. Programmes to detect and remove UXOs as well as to raise awareness regarding the risks associated with these ordinances will be necessary in support of irrigation network rehabilitation. The removal of debris would also be critical for the continuation of drainage and irrigation channels, so far this has been limited.
e. *Transportation networks have been severely damaged* between for example Douma and other towns in Eastern Ghouta and have not been rehabilitated yet are critical components of the agriculture value chains.
f. *Land degradation.* The above factors have greatly contributed to land degradation and land productivity in Eastern Ghouta (Figure 14 and Figure 15 respectively). Normalised Difference Vegetation Index (NDVI) analysis conducted for the whole of Rural Damascus Governorate suggested a notable reduction in irrigated and rain- fed crops around Douma from 2015 to 2016, and again from 2017 to 2018. This evolution roughly mirrors phases of sieges of the area in which water, food and fuel were increasingly scarce and infrastructure was destroyed, taking a heavy toll on the area's crop production and its famous fruit trees around Deir Al Asafir.

62 Adaptation Fund, "Increasing the climate change resilience of communities in Eastern Ghouta in Rural Damascus to water scarcity challenges through integrated natural resource management and immediate adaptation interventions", 2021.

Implemented pilot recovery projects

In July 2021 UN-Habitat signed an agreement with the Adaptation Fund to implement the project *'Increasing the climate change resilience of communities in Eastern Ghouta in rural Damascus to water scarcity challenges through Integrated Natural Resource Management (INRM) and immediate adaptation interventions.'* In partnership with UNPD and FAO, the project aims to reduce climate change vulnerabilities to water availability challenges in Easter Ghouta.[63] To manage water and land resources efficiently, also considering future climate change risks and population trends in this area, the project envisions to develop an integrated natural resource management strategy. Complementing the strategy, the proposed project will directly build the resilience of selected communities though the implementation of concrete no-regret adaptation activities including the treatment of wastewater, which is currently polluting water resources in the area, and the establishment of water efficient irrigation systems.

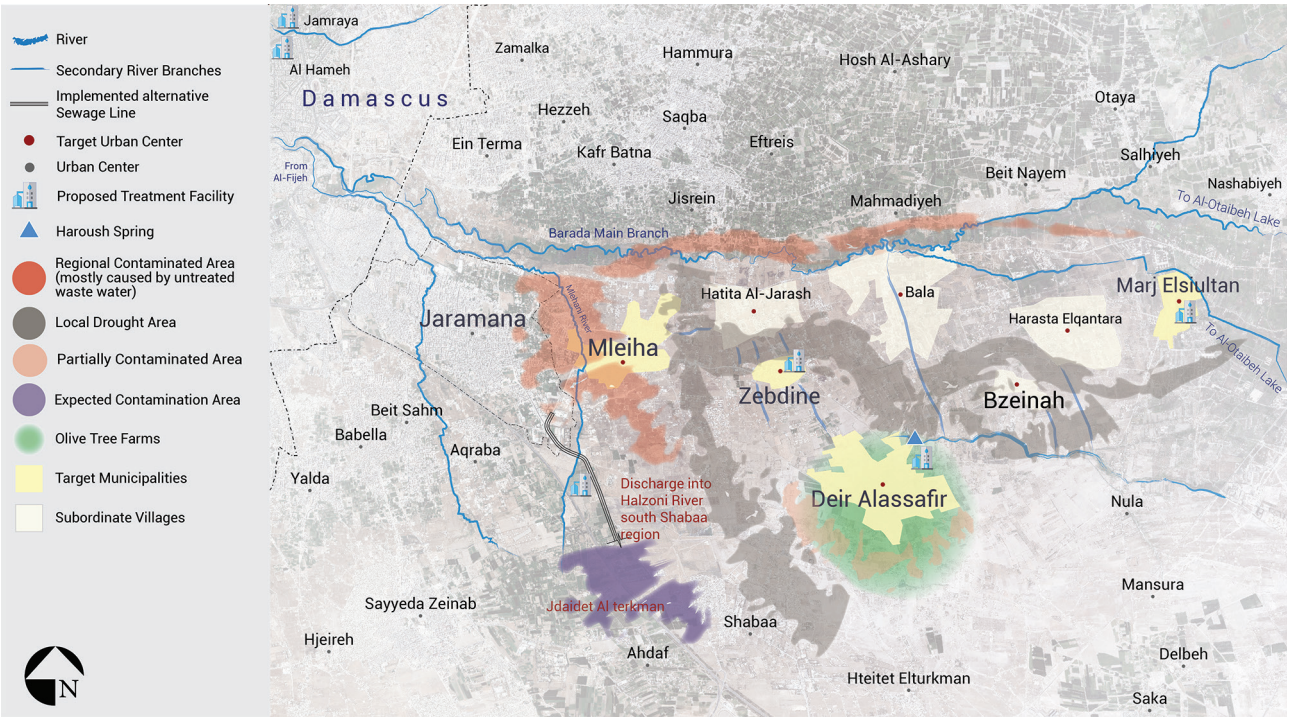


Figure 13 Eastern Ghouta main environmental issues. Source: UN-Habitat.

63 Adaptation Fund, "Increasing the climate change resilience of communities in Eastern Ghouta in Rural Damascus to water scarcity challenges through integrated natural resource management and immediate adaptation interventions." Available from: https://www.adaptation-fund.org/project/climate-change-resilient-communities-through-integrated-natural-resource-management-in-eastern-ghouta-in-rural-damascus-syria/. Accessed 8 January 2022.

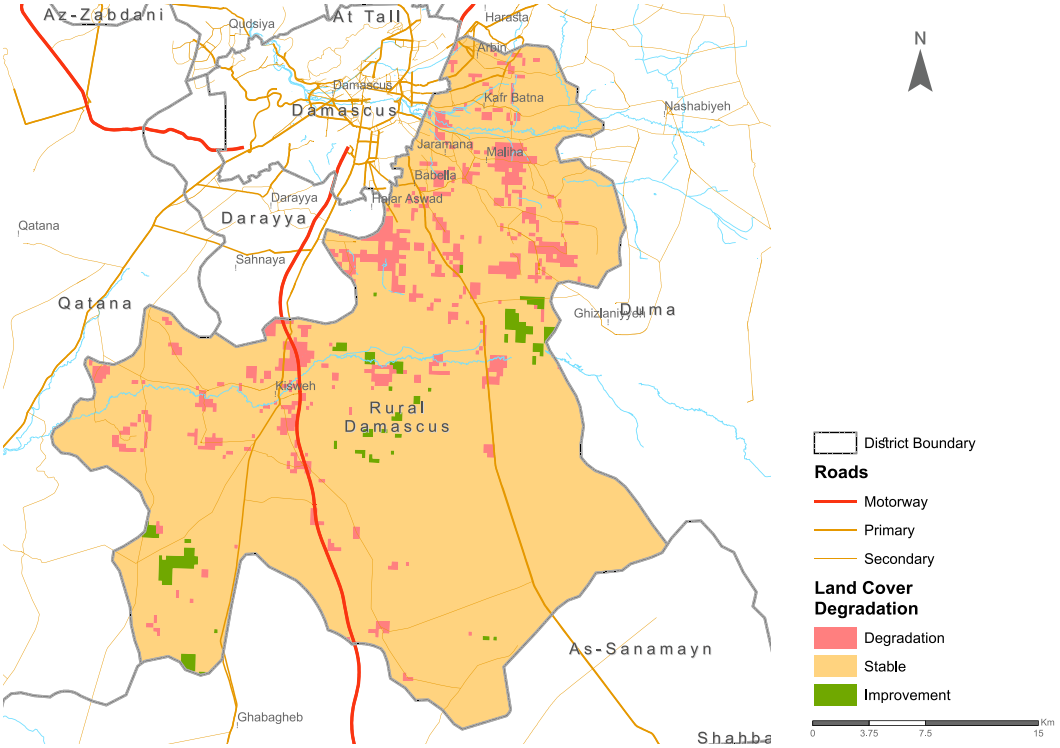


Figure 14 Land cover degradation Eastern Ghouta

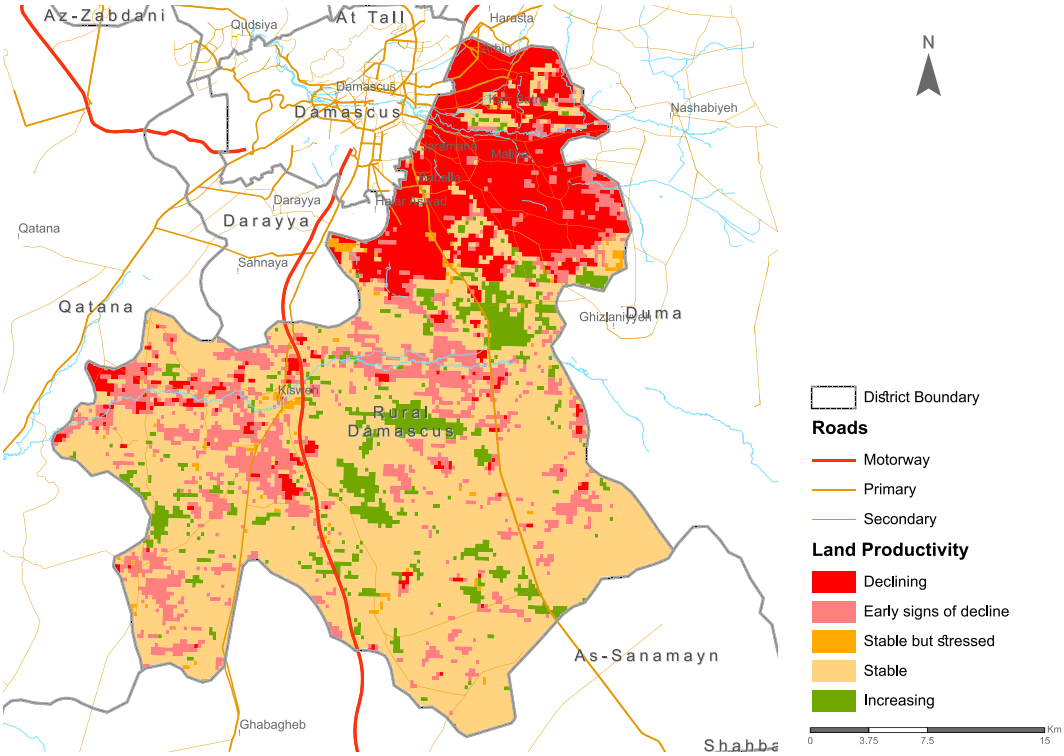


Figure 15 Land Productivity Eastern Ghouta. Source: iMMAP

Qadmous -Tartous, Hama Governorate

Qadmous is located on the coastal mountain area with deep and shallow valleys. The city is included in the first agricultural stability zone in Syria, zone 1, due to its high precipitation levels (heavy rain and snow rate of more than 700 mm/year). The area contains rich biodiversity of six natural reserve zones that covers 9,575 hectares from a total of 276,065 hectares nationally and forest land covering more than 12,300 hectares. In addition, mountain slopes are used as farmland for olive trees and tobacco. An area of approximately 4,000 hectares of slopes extends between Hama and Tartous governorates (the cities of Al-Qadmous and Sheikh Badr in Tartous and the Masyaf area in Hama).

The population of Tartous governorate grew dramatically during the crisis due to the high number of IDPs coming from Aleppo and other cities. Many settled in rural villages in Tartous, resulting in an increase of almost 4 per cent of the total population (from 4.8 per cent to 8,34 per cent in 2017). The population growth, coupled with climate change impacts have aggravated environmental challenges.

Recovery planning process

UN-Habitat in 2019, supported the three main cities in the area (Qadmous, Mousiaf and Sheikh Badr, see Figure 16) to produce a regional recovery plan and urban profile.

Based on the environmental data analysis, prioritised recovery interventions for each city, as well as for the regional level, was identified with the aim to enhance the regional socio-economic development, infrastructure and services, and environmental protection.

The profile identified the following environmental in the region:

a. **Land degradation and flooding:** Shifts in the rainy season has caused seasonable flooding which has contributed to land degradation and loss of agricultural productivity, while an immense 80 per cent of the population depends on agricultural activities related to the regions' green houses and farmlands.
b. **Loss in vegetation coverage:** Limited technical and land management capacities has negatively affected the protection of land from climate change impacts and agricultural practices that further aggravate soil erosion and land degradation - especially concerning farmland and crops in valley slopes (see Figure 17 for example from the Qadmous valley off land degradation from 2004 to 2020).
c. **Severe deforestation:** Climate change and drought in the last ten years resulted in a probability increase of forest fires because of higher temperatures and lower rainfall with active wind, as well as a higher frequency of drought cycles. Figure 18 shows the impact of the 2020 forest fires on a land example in Qadmous area south of Mousiaf. Moreover, there was a loss in forests and woodland cover due to informal cutting. This is exacerbated by the lack of regulations and enforcement to reduce illegal logging and protection of natural habitats.
d. **Water Stress:** There has been a reduction of the water level in rivers and streams due to environmental changes as well as the added demand on water due to population influx to the cities, such as Sheikh Badr and Qadmous which has received more than 224,000 IDPs, as well as increase of agricultural activities. Furthermore, urban expansion and increased economic activities, has added pressure on the wastewater network.

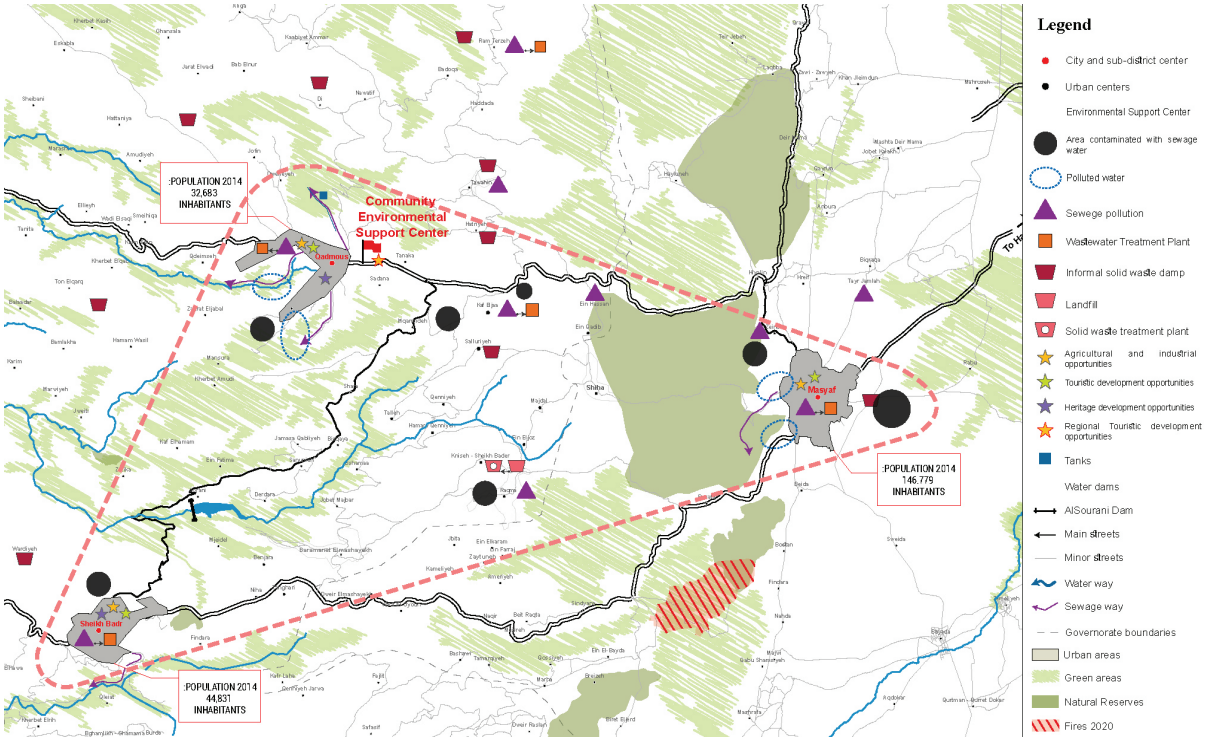


Figure 16 Map of Qadmous zones, covering Mousiaf, Sheikh Badr, and Qadmous

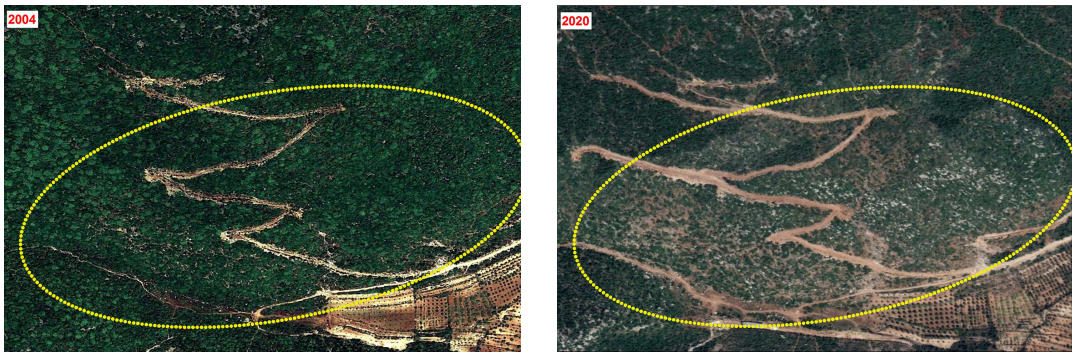


Figure 17 Aerial imagery of land degradation example in Qadmous valley area in 2020 compared to 2004. Source: UN-Habitat, 2021.

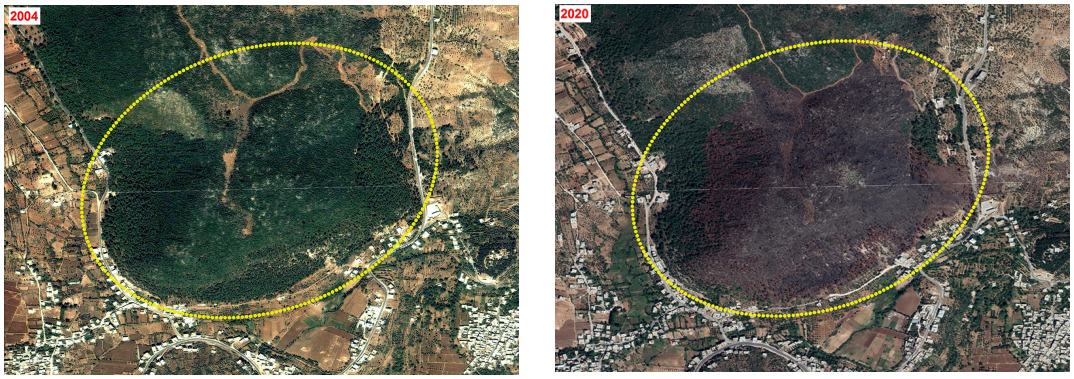


Figure 18 Aerial imagery of the 2020 forest fires impact on a land example in Qadmous area south of Mousiaf compared with the same area in 2004. Source: UN-Habitat, 2021.

Qadmous area Strategic Regional Recovery Plan for environment

Objectives of the strategic plan and regional study included addressing land degradation and flooding with the aim of reducing the impact of flooding on farmlands (leading to damages to the harvests) and fostering sustainable water uses. The quick response actions include:

e. Executing dams with a smaller water capacity and building water ponds (3,000 to 10,000 m3) generated for irrigation usages.
f. Protecting rivers' buffer zones, valleys and waterways from pollution (wastewater discharge).
g. Raising awareness on agricultural plans and greenhouses production resilient to climate change.
h. Prevent the area from loss in vegetation coverage and reduce the deforestation of natural and reserved zones by:

    1. Establishing an early warning system for forest fires.
    2. Building community and institutional capacities for forest protection and fire prevention.
    3. Solid waste collection, removal and treatment to reduce contamination of soil and ground water as a result of informal dumping of solid waste.
    4. Raising community awareness on the 5Rs principles of solid waste management (rethinking, refusing, reducing, reusing, and recycling) and boosting participation in household-level waste sorting.

e. To address water stress and a lack of institutional resources by:

    1. Rehabilitation and implementation of regional wastewater treatment plant and multiple mobile waste-water treatment plants (WWTPs) in the main cities.
    2. Storage of rainwater for spring water consumption.
    3. Improvement of technical resources and staff knowledge and expanding the use of innovative water technologies.

Implemented pilot recovery projects

During 2019-2020, as a result of a collaboration between the municipalities of Tartous and Hama, the relevant directorate in MoLAE and UN-Habitat, a regional-city recovery action plan was prepared and pilot recovery projects implemented.

A Qadmous environmental community centre was established in Qadmous city to act as liaison for coordination mechanisms between vulnerable communities, the governorate and the national government. The function of the centre is to 1) fill gaps in monitoring and collecting data at the local level, 2) implement environmental awareness raising program, and 3) developing visions with different actors to boosting social environment economy with small sustainable projects (e.g., boosting the local community income by implementing projects related to alternative energy sources and solid waste collection and sorting and throughout community contracting modality).

Applying the policy design for Eastern Ghouta and Qadmous-Tartous

Following the *policy prioritization and design* elaborated in this paper, and the summary description of environmental challenges facing Eastern Ghouta and Qadmous-Tartous, the below outlines possible recovery interventions designed in steps (i.e., recovery ladder) that will work towards transformative change with the ultimate policy goals in mind.

The priority in Eastern Ghouta should be to stop pollution of water resources through rehabilitation of wastewater treatment plants, to protect critical clean wells/groundwater and to remove waste/debris from critical channels and damaged urban areas, combined with community-level waste management plans. This will pave the way for livelihood recovery, including ensuring access to basic services, especially water and stopping desertification from the east. This can be done through rehabilitation of critical sewerage and irrigation channels (and to establish connection to WWTPs), to recover agriculture with water scarcity and heat resilient crops/trees and to establish a barrier or to regenerate

soil against desertification. This should be combined with an institutional capacity strengthening package and system-wide water and land management plans, considering mitigation measures towards the range of climate change impacts projected for the coming years.

The priority in Qadmous-Tartous would be to strengthen capacities to reduce fires and identify vulnerable and productive land, soil and forest areas to be protected. This would then be combined with fire management plans and forest, natural habitats and biodiversity protection and management plans for the long run, also considering climate change vulnerabilities.

Table 5 provides an overview of environmental challenges in the two areas, and potential recovery steps to be taken in line with the policy recommendations and prioritisation of this paper.

Table 5 Eastern Ghouta and Qadmous areas, the main environmental challenges, environmental categories and recovery needs and steps

Target areas	Main environmental challenges description	Recovery needs and steps		
		Step 1: short-term	**Step 2:** Medium-term	**Step 3:** Long-term
Eastern Ghouta	Barada river 60 days flow; less ground water; informal wells. • Water and soil pollution from west due to broken WWTP • Land degradation mostly at North-East (east of Damascus) • Crop failure / reduction fruit trees • Desertification from the east • Debris in urban areas	• Stop pollution of water resources through wastewater treatment plants • Protect critical clean wells / groundwater • Develop waste / debris management plans and remove debris / manage waste	• Conduct required data collection, assessment and planning processes so projects can be initiated / funded • Rehabilitate sewerage and irrigation channels (and connect to WWTP) • Recover agriculture with water scarcity and heat resilient crops / trees • Establish barrier or regenerate soil against desertification • Strengthen capacities for above	Develop national and sub-national strategies / plans to manage water in an efficient, sustainable and climate change resilient way at system level: • INRMP for Eastern Ghouta
Qadmous / Tartous	• Deforestation is high, also due to fires (relation with land use and winds) • Agriculture land use practices are not sustainable	• Strengthen capacities to reduce fires • Identify vulnerable land / soil and forest areas to be protected	• Conduct required data collection, assessment and planning processes so projects can be initiated / funded	Develop strategies / plans to manage water in an efficient, sustainable and climate change resilient way at system level: • Fire management plans • Forest / Natural habitats and biodiversity protection and management plans

09

Annex 2 - Environment urban recovery SDG monitoring framework

Level	SDG	Indicator	Challenge	Indicator description
City	6	6.4.1	Water efficiency	Change in water-use efficiency over time
	6	6.1.1	Water	Proportion of population using safely managed drinking water services
	6	6.3.1	Wastewater	Proportion of wastewater safely treated
	11	11.6.1	Solid waste	Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities
	6	6.2.1	Sanitation	Proportion of population using safely managed sanitation services
	11	11.7.1	Public green space	Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities
	1	1.6.2	Particulate matter	Annual mean levels of fine particulate matter (e.g., PM2.5 and PM10) in cities (population weighted)
	12	12.4.2	Hazardous waste	Hazardous waste generated per capita, and proportion of hazardous waste treated, by type of treatment (including war debris).
Regional	6	6.3.2	Waterbodies	Proportion of bodies of water with good ambient water quality
	6	6.4.2	Water stress	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
	6	6.5.1	Water management	Degree of integrated water resources management implementation (0-100)
	6	6.6.1	Water ecosystem	Change in the extent of water-related ecosystems over time
	11	11.b.2	Vertical alignment DRR strategies	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
	15	15.1.2	Protected biodiversity	Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
	15	15.4.1	Mountain biodiversity	Coverage by protected areas of important sites for mountain biodiversity
	15	15.3.1	Land degradation	Proportion of land that is degraded over total land area
	11	11.3.1	Land consumption	Ratio of land consumption rate to population growth rate
	15	15.2.1	Forest management	Progress towards sustainable forest management
	15	15.1.1	Forest area	Forest area as a proportion of total land area
	11	11.4.1	Expenditures cultural heritage	Total expenditure (public and private) per capita spent on the preservation, protection and conservation of all cultural and natural heritage, by type of heritage (cultural, natural, mixed and World Heritage Centre designation), level of government

Level	SDG	Indicator	Challenge	Indicator description
National	6	6.b.1	Water policies	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management
	6	6.a.1	Water assistance	Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
	12	12.5.1	Recycling	National recycling rate, tons of material recycled
	12	12.2.2	Material consumption	Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
	11	11.5.2	GDP loss	Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters
International	11	11.b.1	National DRR Strategies	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
	11	11.c.1	Financial support building materials	Proportion of financial support to the least developed countries that is allocated to the construction and retrofitting of sustainable, resilient and resource- efficient buildings utilizing local materials
	13	13.1.1	DRR strategies	Number of countries with national and local disaster risk reduction strategies
	13	13.2.1	Climate change policies	Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other
	13	13.3.2	Capacity building	Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions

10

Reference list

Adaptation Fund, "Increasing the climate change resilience of communities in Eastern Ghouta in Rural Damascus to water scarcity challenges through integrated natural resource management and immediate adaptation interventions." Available from: https://www.adaptation-fund.org/project/climate-change-resilient-communities-through-integrated-natural-resource-management-in-eastern-ghouta-in-rural-damascus-syria/. Accessed 8 January 2022.

Ahmad, L., "Reshaping Suburbs in the Framework of Sustainable Environmental Neighbourhoods". Presentation at the 1st engineering conference on *Development Priorities and Reconstruction*. Lattakia, Syria, 16-18 August 2015 (In Arabic).

Aw-Hassan, A., Rida, F., Telleria, R., and Bruggeman, A., "The impact of food and agricultural policies on groundwater use in Syria", in *Journal of Hydrology,* vol. 513, p. 204-215. May 2014.

Cane, M. A., Kelley, C. P., Kushnir, Y., Mohtadi, S., and Seager, R., "Climate change in the Fertile Crescent and implications of the recent Syrian drought", in PNAS, vol. 112 (11) 3241-3246, 2015.

Châtel, F. D., "The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution", in *Middle Eastern Studies,* vol. 50 (4), 521-535, 2014.

Dunne, J. P. and others, "GFDL's ESM2 Global Coupled Climate–Carbon Earth System Models. Part I: Physical Formulation and Baseline Simulation Characteristics", in *Journal of Climate,* vol 25. (19): 6646-6665. October 2012.

Evans, J. P., "21st century climate change in the Middle East", in *Climatic Change*, vol. 92, p. 417–432. February 2009.

Delegation Of The European Commission To Syria, *Country Environmental Profile for the Syrian Arab Republic,* April 2009.

Gómez, E. S. and others, "The CNRM-CM5.1 global climate model: description and basic evaluation", in *Climate Dynamics,* vol. 40, 2012.

Government of the Syrian Arabic Republic, Third National MDGs Progress Report, Damascus, 2010.
Government of the Syrian Arab Republic (MOLAE), Land Degradation Neutrality Target Setting Programme: Final Country Report. Damascus, March 2010.

EC Earth, "EC-Earth - A European community Earth-System Model". Available from: http://www.ec-earth.org/. Accessed 12 January 2022.

European Union. *State of Syrian Cities 2016 – 2017.* October 2017.

FAO, *Special Report: FAO/WFP Crop and Food Security Assessment Mission to the Syrian Arab Republic.* Rome, 2019. x|

Fountain, H., "Researchers Link Syrian Conflict to a Drought Made Worse by Climate Change", *The New York Times*. 2 March 2015.

Gleick, P. H., "Water, Drought, Climate Change, and Conflict in Syria", in *Weather, Climate, and Society,* vol. 6 (3), 331– 340, Pacific Institute, Oakland, California, July 2014.

IPCC, "Climate Change 2013: The Physical Science Basis". Contribution of Working Group I to the *Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp. 2013.

IPCC, "Impacts of 1.5ºC Global Warming on Natural and Human Systems", in *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the*

context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press, October 2018.

Ministry of State for Environment Affairs, *Initial National Communication of the Syrian Arab Republic,* submitted to the United Nations Framework Convention on Climate Change. Damascus, April 2020.

Muller, M. F., Yoon, J., Gorelick, S., Avisse, N., and Tilmant, A., "Impact of the Syrian refugee crisis on land use and transboundary freshwater resources", in *Proceedings of the National Academy of Sciences,* vol. 113 (52): 201614342. Stanford University, December 2016.

OCHA, Humanitarian Needs Overview – Syrian Arab Republic. March 2021.

PAX, Living under a black sky: Conflict pollution and environmental health concerns in Iraq. November 2017.

PAX, *Amidst the debris: A desktop study on the environmental and public health impact of Syria's conflict,* October 2015.

Sweep-net, *Country report on the solid waste management in Syria*, July 2010.

UNDP Bureau for Development Policy, *National Capacity Self-Assessments – Results and Lessons Learned for Global Environmental Sustainability,* New York, 2010.

UNFPA, "World Population Dashboard: Syria". Available from: https://www.unfpa.org/data/world-population/SY. Accessed 10 January 2022.

United Nations, Human Rights Council. Special Rapporteur on the Right to Food, Olivier De Schutter, Mission to the Syrian Arab Republic. 11 January 2011. A/HRC/16/49/Add.2.

UN-Habitat, Aleppo Urban Profile, 2020

UN-Habitat, Dar'a Urban Profile, 2020.

UN-Habitat, Deir-Ez-Zor Urban Profile, 2020.

Wada, Y., van Beek, L. P. H., and Bierkens, M. F. P, "Non-sustainable groundwater sustaining irrigation: A global assessment", in Water Resources Research, vol. 48 (6). American Geophysical Union, 2012.

WASH sector (Whole of Syria (WoS)), "HNO 2021 WASH Needs Overview". Available from: https://unicef-my.sharepoint.com/:w:/g/personal/udaraz_unicef_org/ERPe2HtTE-RFmF9SOfU5nLABaHRVkP6eYxrUpcgmBxFwwQ?rtime=aqJReMvT2Ug. Accessed 10 January 2022.

World Food Programme, "Twelve million Syrians now in the grip of hunger, worn down by conflict and soaring food prices", *Reliefweb*, 17 February 2021.

URBAN RECOVERY FRAMEWORK

UN HABITAT
FOR A BETTER URBAN FUTURE