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Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions **Updated Fact Sheet -** December 2015

BACKGROUND

In September 2014, the Ministry of Environment (MoE), with support from the European Union (EU) and the United Nations Development Programme (UNDP), published the *"Environmental Assessment of the Syrian Conflict (EASC) & Priority Interventions"*, which provided an extensive analysis of the incremental environmental impacts of the Syrian conflict[1].

The main objective of this Updated Fact Sheet in 2015 is to provide an overview of the environmental situation vis-à-vis the impact of the Syrian conflict on the environmental resources one year after the assessment of 2014. The update is based on previous methods and findings presented in the EASC of 2014.

Similarly to the EASC of 2014 which was in line with Lebanon's response to the Syrian conflict according to the *"Lebanon Roadmap of Priority Interventions for Stabilization from the Syrian Conflict"*, published by the Government of Lebanon in November 2013, this Updated Fact Sheet is in line with the *"Lebanon Crisis Response Plan (LCRP)"*, published by the Government of Lebanon in December 2015[2].

In the LCRP, the Government of Lebanon has projected that Lebanon will host a total of 1.8 million displaced persons in 2016, including 1.5 million displaced Syrians, 320,174 Palestinian refugees, covering Palestinians Refugees from Syria (PRS) as well as Palestinian Refugees in Lebanon (PRL), and 35,000 Lebanese Returnees from Syria.

Given that the EASC of 2014 has used a similar projection for displaced population as that of the LCRP (around 1.8 million as shown in Table 1), the Updated Fact Sheet has reported the same findings as those identified in the EASC 2014 in the sectors in which displaced population figures were used as a basis of the environmental assessment of the conflict. The sectors in which a different basis for the environmental assessment was used have shown changes in the environmental situation in 2015 as reflected in this Updated Fact Sheet.

Finally, it should be noted that in both years 2014 and 2015, Lebanon accounted over 1 million registered displaced persons, which constituted around 25 per cent of the Lebanese population and represented the world's highest number of refugees per inhabitant[3].

Table 1. Displaced populations projections in the EASC 2014 and the LCRP 2015

	Displaced Projections (EASC, 2014)[1]	Displaced Projections (LCRP, 2016)[2]
Displaced Syrians	1,730,000	1,500,000
Palestinian Refugees	55,000 (PRS)	320,174 (including PRL)
Lebanese Returnees	50,000	35,000
Total	**1,835,000**	**1,855,174**

METHODOLOGY OF THE ENVIRONMENTAL ASSESSMENT IN 2014 AND OF THE KEY CHANGES IN 2015

The Environmental Assessment of the Syrian Conflict in 2014 covered four key environmental sectors, namely:

i) Solid Waste Management,

ii) Water and Wastewater Management,

iii) Air Quality, and

iv) Land Use and Ecosystem Management.

[1] MoE/EU/UNDP (2014). Lebanon Environmental Assessment of the Syrian Conflict and Priority Interventions. Available [online]: http://www.moe.gov.lb/The-Ministry/Reports/Lebanon-Environmental-Assessment-of-the-Syrian-Con.aspx

[2] Lebanon Crisis Response Plan 2015-2016, Year Two (2016). Available [online]: (http://lcrp.gov.lb/pdf/brochure-en.pdf

[3] UNHCR/WFP/UNICEF (2015). Vulnerability Assessment of the Syrian Refugees in Lebanon 2015 Report. Available [online]: https://data.unhcr.org/syrianrefugees/documents.php?page=1&view=grid&Org%5B%5D=123

The EASC has provided a better understanding of the environmental conditions caused by the Syrian conflict and established a baseline for 2014 which qualified the incremental impacts of the crisis on the different environmental sectors and the associated environmental pressures, compared to the environmental pre-crisis situation in 2010 or 2011. The assessment has determined the incremental impacts of the Syrian conflict at the level of all four areas and did not account for the cumulative impacts since the onset of the conflict. Moreover, the assessment proposed an Environmental Management Plan for each area including recommendations of priority interventions and their timeframe.

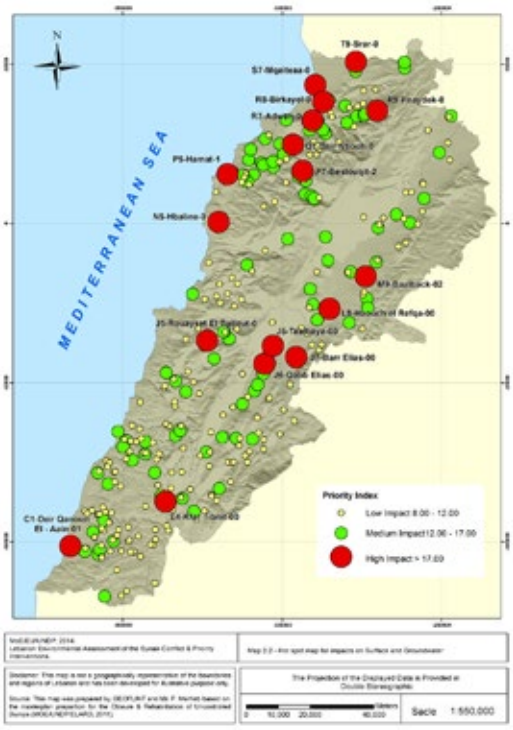
SECTORS WITH LIMITED CHANGES IN THE INCREMENTAL ENVIRONMENTAL IMPACTS SINCE 2014

Since the projected displaced population numbers used in the EASC of 2014 did not change from those of the LCRP (both projections converge at 1.8 million displaced), the incremental environmental impacts of the displaced population which are based on population numbers, including solid waste, water and wastewater and air quality, did not experience changes in the incremental impacts in 2015. As such, the following sections summarize the yearly incremental impacts of the Syrian crisis expected to be maintained in 2015 based on the results identified in the EASC of 2014.

Limited Changes In The Incremental Impacts On The Solid Waste Sector Since 2014

According to the EASC of 2014, the incremental quantity of Municipal Solid Waste (MSW) attributed to displaced population is about 324,000 ton/year, which is equivalent to 15.7% of the total solid waste generated in Lebanon prior to the crisis. The impacts of the incremental quantity of Municipal Solid Waste can be summarized as follows:[4]

- Overstressing of existing solid waste management infrastructure, as collection, sorting and disposal facilities become overstretched. Spending on MSW by municipalities has increased by 40% between 2012 and 2013.
- Deterioration of health and safety conditions around dumpsites, as open dumps become insect and rodent breeding grounds and can transmit vector-borne diseases.
- Increased risks from healthcare waste; especially that 18% of this waste is disposed of without any treatment.
- Increase in open dumping and open burning, leading to increased contamination of land and soil in addition to surface and groundwater pollution (refer to Map 1).



Map 1. Hotspot map for impacts of Municipal Solid Waste on surface and ground water

Limited Changes in the Incremental Impacts on the Water and Wastewater Since 2014

According to the EASC of 2014, the increase in domestic water demand for displaced population was estimated between 43 to 70 Million Cubic Meter by the end of year 2014, equivalent to 8-12% increase in the national water demand.

The impact of the Syrian conflict on water resources included:

- **Aggravating current stress on water resources**, specifically on groundwater resources. Between April 2013 and April 2014, a decrease of 1-20 meters of the water level was recorded in a number of wells in different Lebanese regions.

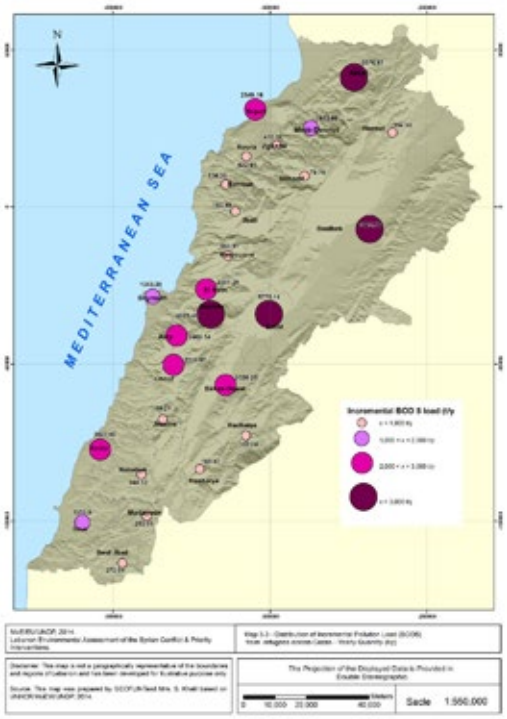
- **Water quality deterioration**; wherebyhigh levels of contamination (ten times higher than the WHO guidelines for some chemicals) were observed. A sharp rise in communicable diseases such as measles and the emergence of previously absent diseases such as Leishmaniasis were also reported among displaced population communities and transmitted to close Lebanese hosting communities.

[4] The Updated Fact Sheet did not account for the changes in the MSW management situation in Lebanon since July 2015 following the closure of the Naameh sanitary landfill leading to a national crisis in the sector.

The EASC of 2014 estimated that the increase in wastewater generation from displaced population will reach between 34 to 56 Million Cubic Meter by the end of year 2014, corresponding to an increase of 8-14% in the national wastewater generation rate.
The impact of the Syrian conflict on wastewater management included:

- **Increased pollution load from wastewater discharges**; the incremental pollution load of wastewater generated by displaced population is estimated to be around 40,000 tons of BOD5 per year, equivalent to around 34% of BOD_5 load at the national level.The increase in the amounts of organic material is mainly observed in the Cazas of Baalbeck, Akkar, Zahleh and Baabda (refer to Map 2).

- **Increased environmental and health impacts from wastewater discharges.** As only 8% of the wastewater generated at the national level is treated while the remaining is discharged into open lands or in watercourses, it is expected that additional wastewater from displaced population will lead to further water and soil contamination.



Map 2. Distribution of incremental pollution load (BOD_5) from Syrian refugees across Cazas

Limited Changes in the Air Quality Sector Since 2014

The EASC of 2014 estimated that the Syrian conflict has resulted in an increase of up to 20% in emission of air pollutants in Lebanon leading to a significant degradation of air quality. The main sectors affecting air pollution in Lebanon due to the Syrian conflict were the following:

- **On-road Transport.** An estimated 5% increase in traffic is expected to result from the Syrian conflict on the main national axes in Lebanon; this will lead to an increase in Nitrogen Oxide (NO_x) and Particulate Matter (PM).
- **Residential Heating.** The assessment has estimated a 5% increase in SO_2 emissions, which will add up to existing national SO_2 emission levels.
- **Open Burning of Solid Waste.** The release of very toxic and carcinogenic compounds including polychlorinated dibenzo-dioxins (PCDDs) and dibenzofurans (PCDD) due to increased open burning of waste will negatively affect the health of the population living in the vicinity.
- **Electricity Production.** The incremental quantities of air pollutants originating from private generators have been estimated to include around 10% for NOx and around 2% for the remaining pollutants.

SECTORS WITH SIGNIFICANT CHANGES IN THE INCREMENTAL ENVIRONMENTAL IMPACTS SINCE 2014

Significant Changes In Land Use And Ecosystems Since 2014

The main changes in the incremental impacts of the Syrian conflict concern the aspects related to land use and ecosystems and are presented in this section. The reason for these changes is the fact that the methodology adopted by the EASC in 2014 was not based solely on the numbers of displaced population but on other aspects which affect land use and ecosystems including the following:

i. the number of vulnerable communities and their geographical distribution, and
ii. the number of informal tented settlements and their geographical distribution.

Changes and stabilized conditions in 2015 compared to the situation in 2014 can be summarized as follows:

• Stabilization in the Increase of Urban Densification since 2014

According to the EASC in 2014, Lebanon's population density has increased by around 37% from 400 to 520 persons/km^2.

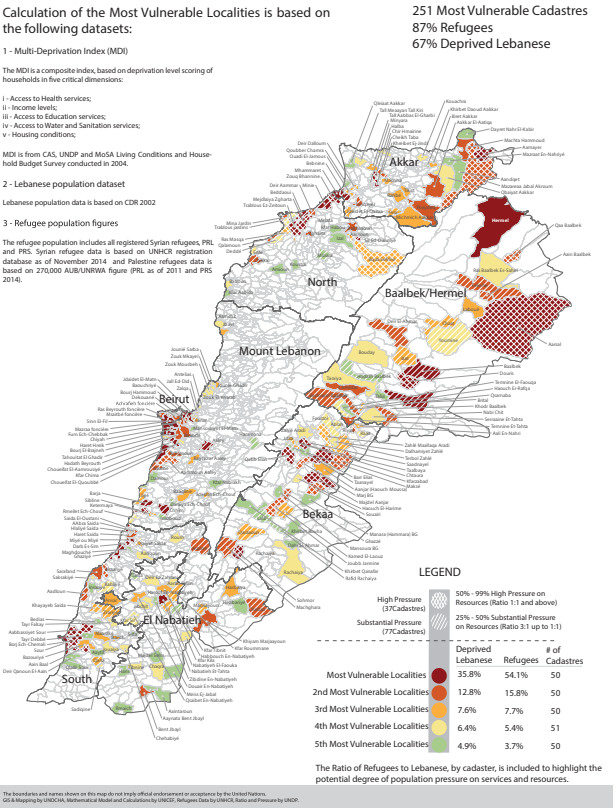
This rapid densification is leading to a saturation of the housing market in Lebanon and to haphazard and accelerated construction in all affected communities. Trends in urban densification in 2015 did not change from those in 2014 given that the total population number of displaced persons has remained the same in 2015. The location of displaced population is adjacent and similar to the settlement of the general Lebanese population, with around 80 per cent urbanized and around 18 per cent having found shelter in Informal Tented Settlements (ITSs)[5].

• Increased Impact of Vulnerable Communities on Land Use and Ecosystems since 2014

In 2014, for the identification of "Most Vulnerable Communities" wherein displaced populations are concentrated, two sets of criterion were adopted (i) high poverty levels and, (ii) number of displaced population is equal to or larger than the local population. The number of "Most Vulnerable Communities" was around 45 communities, representing around 8.6% of the Lebanese territory.

In early 2015, a joint effort between the REACH Initiative and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) launched an assessment of community-level vulnerabilities[6] and developed a vulnerability map for vulnerable cadastres across the Lebanese territory based on a different methodology[7]. This has resulted in identification of a total of 251 "Most Vulnerable Cadastres" (Map 3). These 251 "Most Vulnerable Cadastres" represent a total surface of 1,075 km^2 which constitutes around 10.3% of the Lebanese territory, i.e. an increase of around 2% over the whole Lebanese territory within one year.

Based on the new identification of vulnerable cadastres developed in 2015, it was possible to identify the changes of the impact of displaced population on agricultural lands and ecological systems, by adopting the same approach as in the EASC of 2014, i.e. by overlaying the vulnerable cadastres on maps of agricultural areas and environmentally sensitive areas.



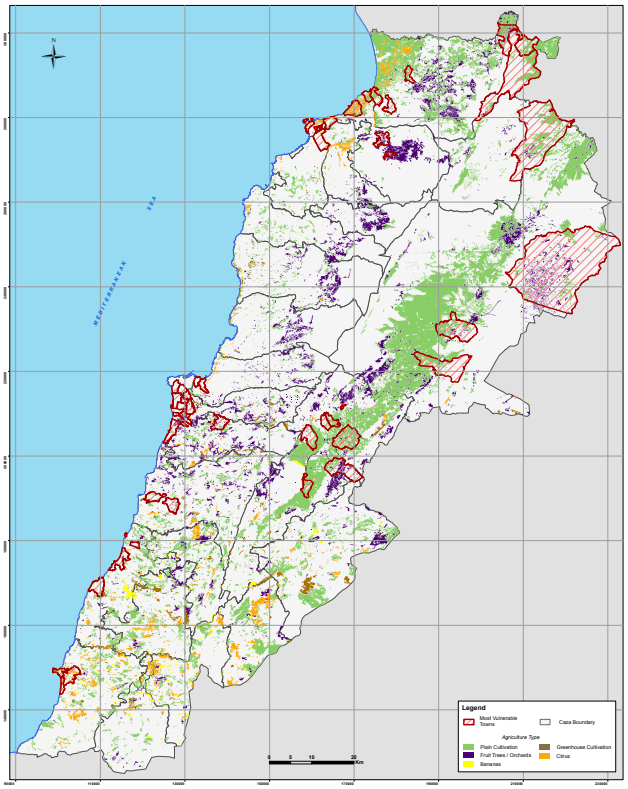
Map 3. Most Vulnerable Localities in Lebanon[8]

As presented in Maps 4 and 5, the large number of vulnerable cadastres, which has reached 251 in 2015, confirms the increased pressures on agricultural lands, witnessed between 2014 and 2015, due to a significant increase in encroachment of vulnerable communities on agricultural lands.

With regards to Environmentally Sensitive Areas, and as presented in Maps 6 and 7, there is also a considerable increase of the intrusion of most vulnerable cadastres on coastal areas in 2015, as well as an increase in the distribution of vulnerable communities in forest areas, important bird areas and around rivers and their catchment areas.Such trends confirm the increased pressure on Environmentally Sensitive Areas especially in light of an already highly urbanized coastal zone in Lebanon and fragile natural ecosystems.

The assessment of the "Most Vulnerable Cadastres" also showed that about 2 million vulnerable people are concentrated in the 251 cadastres and that these cadastres host 87% of displaced population. This significant increase in the population numbers of these "Most Vulnerable Cadastres" merits to be carefully addressed given the extensive environmental stress caused by this increase in population in terms of haphazard urbanization, unsanitary disposal of solid waste and wastewater as well as the overall pressure on natural resources and ecosystems.

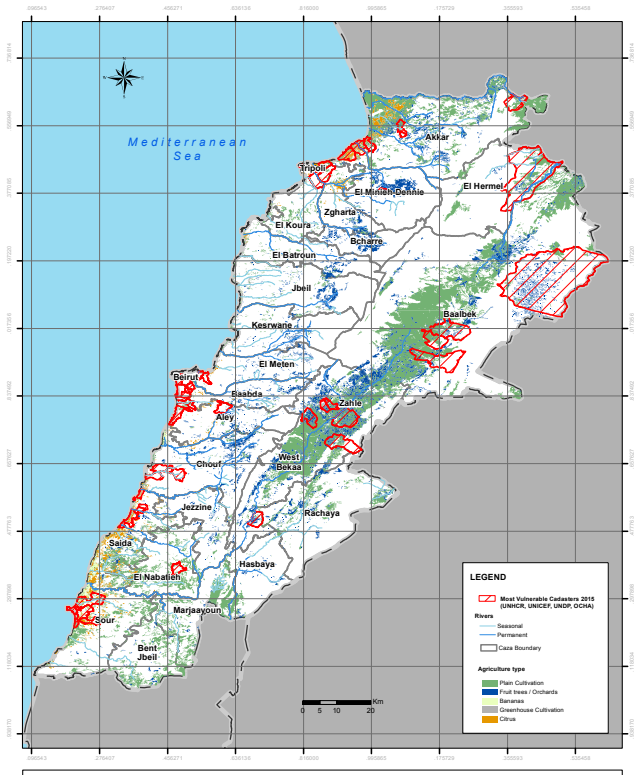
[5] Lebanon Crisis Response Plan, the Shelter Sector Strategy for 2016
[6] OCHA, REACH. 2015. Assessment of vulnerable cadastres across the Lebanese territory
[7] The methodology used to calculate the populations is based on the Multi-Deprivation Index (MDI) which is a composite index based on deprivation level scoring of households in five crucial dimensions: access to health services, income levels, access to education services, access to water and sanitation services; and housing conditions. The Lebanese population dataset is based on the CDR dataset, and refugee population figures are based on Syrian refugees, PRS, PRL (Syrian and PRS refugee figures are based on UNRWA, UNHCR registration figures and PRL based on UNRWA/AUB survey of 2010).
[8] Inter-Agency Coordination Lebanon. March 2015. Most vulnerable localities in Lebanon



Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions	Map 5.5 - Distribution of Vulnerable Towns on Agricultural Areas in Lebanon

Disclaimer: This map was prepared by ECODIT based on the Geo-Database of the National Land Use Master Plan (2004), Data from UNHCR (2014), Landuse Geo-Database of the Ministry of Agriculture (2004). This map is not geographically representative of the boundaries and regions of Lebanon and has been developed for illustrative purposes only.
The projection of the displayed data is provided in Lambert Conformal Conic.

Map 4. Distribution of Vulnerable Towns on Agricultural Areas in 2014



Update of the Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions (2015)

Disclaimer: This map was prepared by UNDP IM Unit, based on the Geo-Database of the National Land Use Master Plan (2004), Data from UNHCR (2015), Landuse Geo-Database of the Ministry of Agriculture (2004). Layers by unit officer: Richard.Shdeed@UNDP.org.
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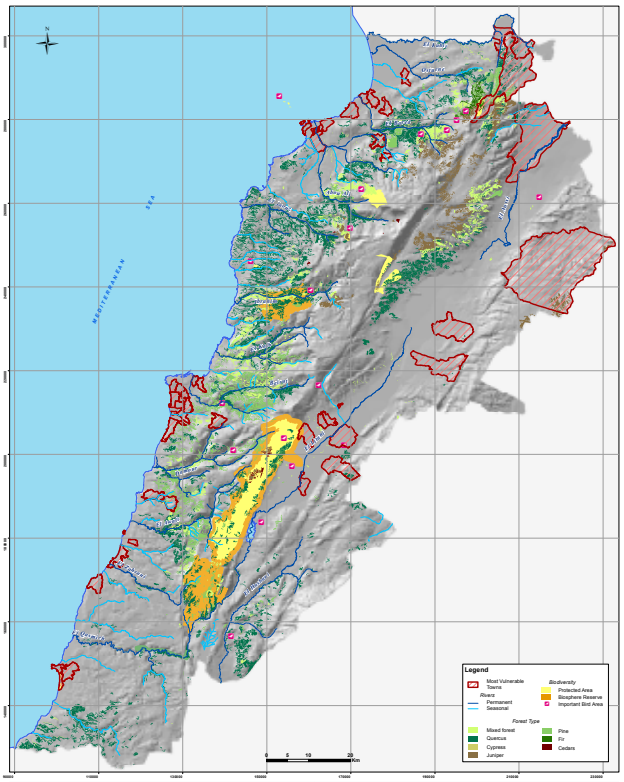
Map 5. Distribution of Vulnerable Cadasters on Agricultural Areas in 2015



Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions	Map 5.6 - Proximity of Vulnerable Towns to Environmentally Sensitive Areas in Lebanon

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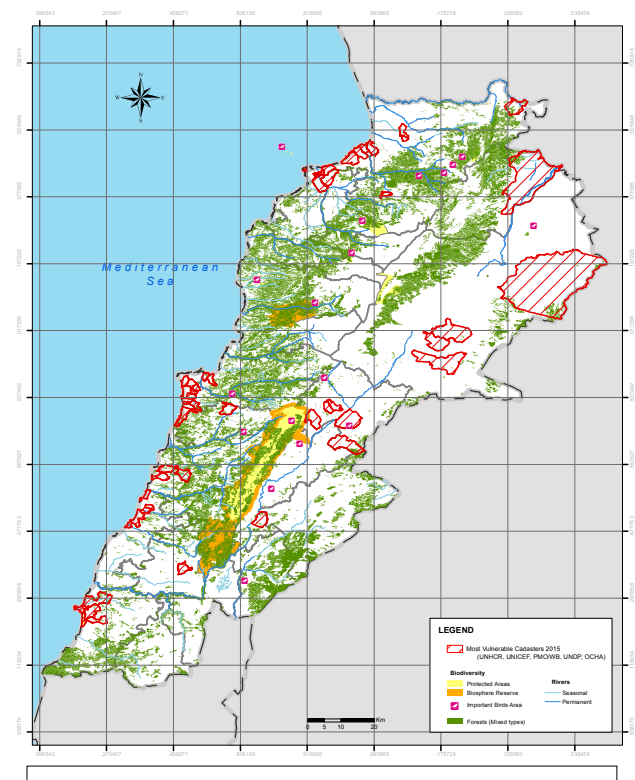
Map 6. Proximity of Vulnerable Towns to Environmentally Sensitive Areas in 2014



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Map 7. Proximity of Vulnerable Communities to Environmentally Sensitive Areas in 2015

• Increased Impact of Informal Tented Settlements (ITSs) on Land Use and Ecosystems since 2014

The EASC in 2014 has indicated an increasing trend in the number of ITSs in Lebanon, and showed that ITSs increased from 250 in June 2011 to 1,069 in April 2014.

As indicated in the EASC of 2014, the potential environmental stressors of ITSs on agricultural areas and environmentally sensitive areas can be summarized by the following:

i) encroaching on agricultural lands and putting those lands out of production;

ii) increased risk of water contamination due to incremental wastewater discharges, sludge disposal and waste disposal;

iii) increased risk of flooding from the clogging of waterways and river banks from accumulated waste; and

iv) abusive felling of forest areas to meet fuel needs of the refugees.

By December 2015, the number of ITSs has increased to an alarming level of 5,082[9] which is equivalent to an increase of around 80% compared to the 2014 figures, as shown in Figure 1.

This exponential increase of number of ITSs is also expected to continue as the conflict extends, and as the displaced population will grow and will resort to less expensive types of shelter than those available in housing market. In fact, the number of displaced population living in ITSs has increased from 160,894 persons in 2014 to 194,290 persons in 2015.

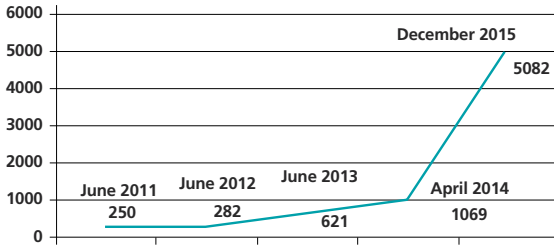


Figure 1. Changes in the number of ITSs (Data from UNHCR)

Using the same approach as the EASC of 2014, the overlay of ITSs on agricultural lands shows a significant increase of occupancy of ITSs in 2015 of agricultural areas as compared to 2014 (presented in Maps 8 and 9). Maps 8 and 9 also show a significant increase in the concentration of ITSs in the Beqaa and in Akkar, which represent Lebanon's largest agricultural regions, and thus confirm a higher risk of encroachment of ITSs on agricultural lands.

Similarly, for Environmentally Sensitive Areas, as shown in Maps 10 and 11, the increase in number of ITSs has also magnified the intrusion of ITSs on Environmentally Sensitive Areas, including protected areas, important bird areas, and other green areas as the ITSs have occupied more land than before.

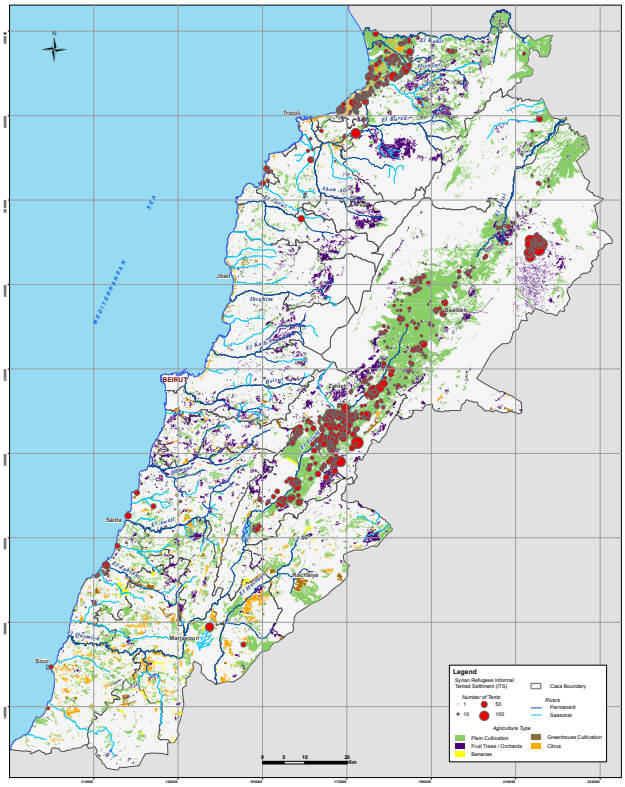
LCRP 2016 AS A BASIS FOR THE ENVIRONMENTAL RESPONSE TO THE SYRIAN CRISIS IN 2016

The EASC of 2014 and its update in 2015 were developed to understand the impact of the displaced populations caused by the Syrian conflict on the environmental sectors and to identify priority interventions needed to respond to these impacts.

These proposed priority interventions have been integrated in the LCRP of 2016 under the Energy and Water (E&W) Sector; it is also planned to ensure proper integration and mainstreaming of environmental considerations across the LCRP of 2016 as well as in future planning processes.

In the 2016 LCRP, the **Outcome 4 of the Energy and Water Sector** was designed to address the environmental impacts of the Syrian crisis and aimed at ensuring a **"Sustainable and long-term environmental considerations taken into account in Lebanon's Crisis Response Plan"**. The objective is to mitigate the impact of the Syrian crisis on the environment in Lebanon assessed under the EASC related to solid waste, air quality, land use and ecosystems, while the environmental considerations for water and wastewater issues are addressed in the different outcomes under the Energy and Water Sector. The estimated budget for this outcome is $36 million as provided in the LCRP (refer to Table 2).

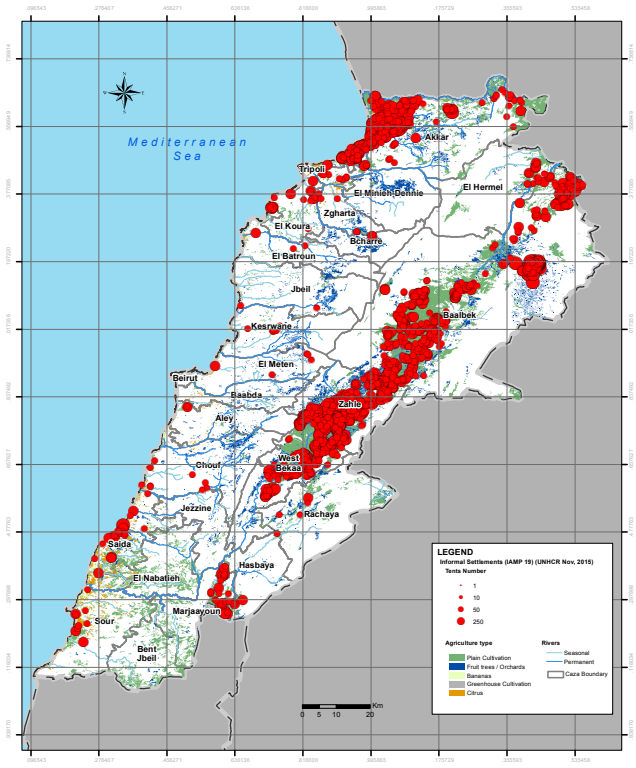
[9] Includes 1,303 inactive sites and around 1,700 ITSs with less than four tents. Noting that all ITSs require an environmental assessment to mitigate negative impacts on land-use and ecosystems.



Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions	Map 5.1 - Distribution of Informal Tented Settlement on Agricultural Areas in Lebanon

Disclaimer: This map was prepared by ECODIT based on the Geo-Database of the National Land Use Master Plan (2004), Data from UNHCR (2014), Landuse Geo-Database of the Ministry of Agriculture (2004). Layer of ITS was provided by GeoFlint. This map is not geographically representative of the boundaries and regions of Lebanon and has been developed for illustrative purposes only. The projection of the displayed data is provided in Lambert Conformal Conic.

Map 8. Distribution of ITS on Agricultural Areas in 2014



Update of the Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions (2015)

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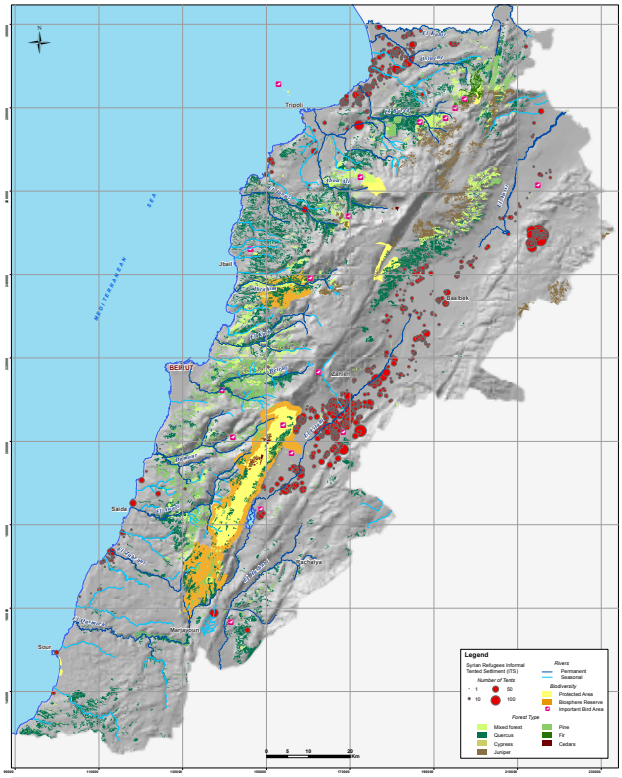
Map 9. Distribution of ITS on Agricultural Areas in 2015



Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions	Map 5.2 - Proximity of Informal Tented Settlement to Environmentally Sensitive Areas in Lebanon

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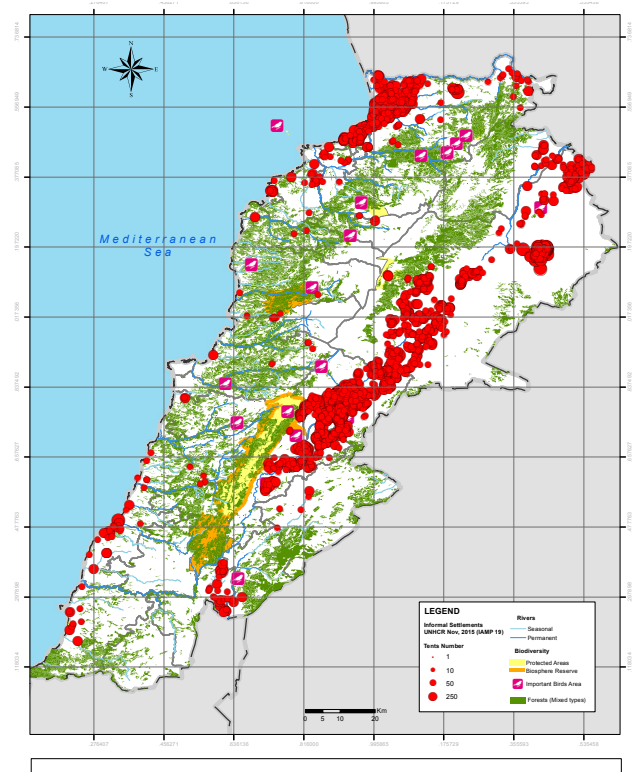
Map 10. Proximity of Informal Tented Settlements to Environmentally Sensitive Areas in 2014



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Map 11. Proximity of Informal Tented Settlements to Environmentally Sensitive Areas in 2015

Table 2. Outputs and activities for 2016 under the Environment Outcome of the LCRP

Outputs/ Activities	Description of Outputs and Activities	Costs (US$)
OUTPUTS/ ACTIVITIES	**Support to MoE and other concerned government institutions to strengthen the management and enforcement of measures that mitigate environmental impacts.**	**$1,000,000**

- Provide technical support for capacity building, training and awareness activities to mitigate the environmental impacts of the Syrian crisis
- Conduct environmental assessments and other relevant studies needed for identifying and mitigating the environmental impacts of the Syrian crisis.

OUTPUTS/ ACTIVITIES	**Provide needed Solid Waste Management systems to alleviate environmental impacts of solid waste generated from displaced Syrians and Palestinians and host communities most affected by the Syrian crisis.**	**31,700,000$**

- Support to local authorities in waste sorting, collection, recycling, transportation and storage including the provision of solid waste collection trucks and bins, plastic bags for sorting) including healthcare waste management
- Support to local authorities in the construction of new SW facilities and upgrade/rehabilitate existing SW infrastructure
- Support to local authorities to close and rehabilitate identified priority dumps in areas of high displaced population's concentration

OUTPUTS/ ACTIVITIES	**Mitigate the assessed deterioration of air quality associated with the Syrian Crisis affecting environmental and human health.**	**1,000,000$**

- Identify and implement priority measures for addressing environmental and human health considerations due to the deterioration of the air quality from the energy and transport sector (pilot projects related mainly to the use of renewable energy, etc.)
- Provide technical assistance, training and priority equipment to enforce environmental regulations related to reduce emissions from private generators for displaced population and host communities.

OUTPUTS/ ACTIVITIES	**Mitigate environmental risks of the Syrian crisis on Land use and Natural Resources Management.**	**2,300,000$**

- Support local authorities to implement urban planning in line with regulations for adequate construction permitting related to construction/housing of host communities and displaced populations
- Support local authorities to ensure an integrated ecosystem management approach and appropriate land-use planning tools are adopted to prevent potential encroachment of informal settlements on environmentally sensitive areas and to prevent haphazard urbanization.
- Support local authorities to strengthen forest management programs and reforestation activities in most vulnerable communities
- Strengthen environmental monitoring of water resources through enforcing Emission Limit Values (ELVs) in surface water, groundwater resources and water networks with special focus on areas of high risk on water resources in vulnerable communities.