Commercial Satellite Imagery and Applied Remote Sensing & GIS for Humanitarian Operations:

Perspectives from the U.S. Department of State

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Humanitarian Information Unit (HIU)
U.S. Department of State

2019 JACIE Workshop
24 September 2019

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HUMANITARIAN INFORMATION UNIT

- Identifies, creates, and disseminates multi-disciplinary information and analysis to U.S. Government decision makers and humanitarian partners
- Produces written and visual analytics on a range of current and enduring humanitarian challenges and complex emergencies worldwide
- Employs geographic methods and technologies, serves as an information-sharing node, and manages projects that facilitate the creation of geospatial data

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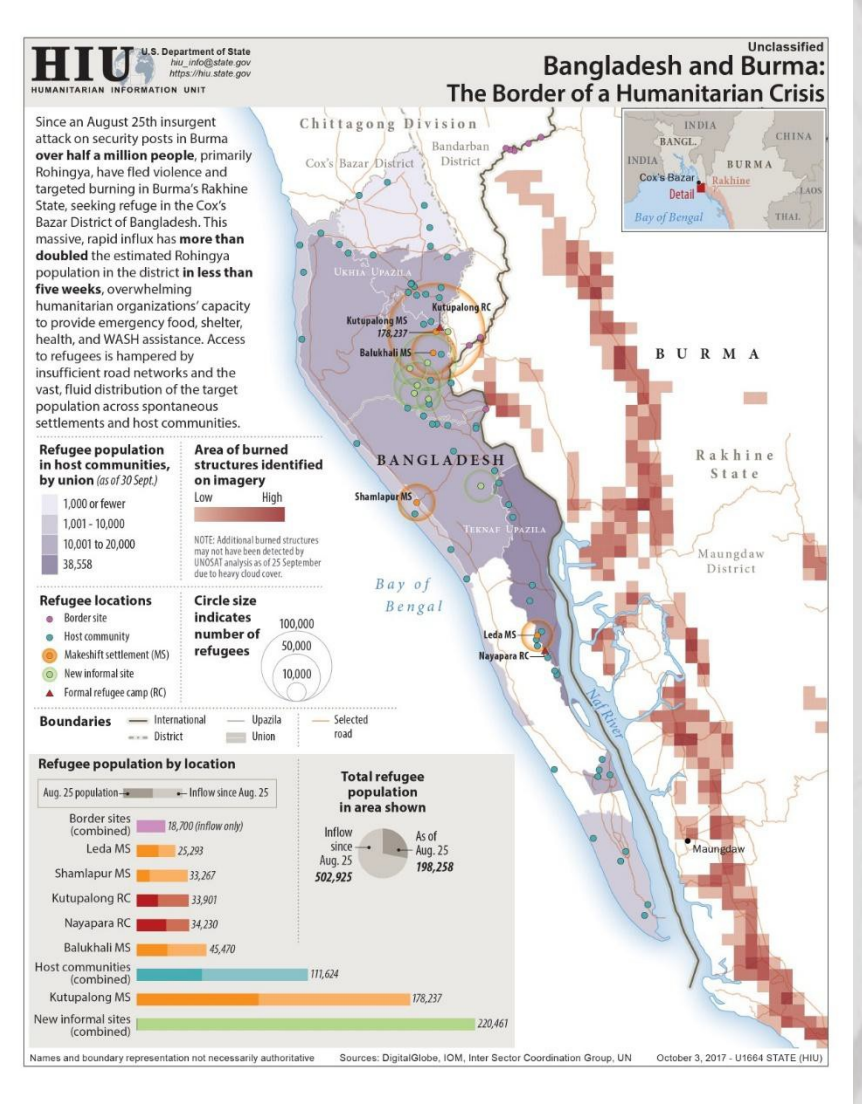
Promoting a Geographic Approach

- **Key Products**
  - Written Assessments
  - Visual Infographics
- **Analytic Methods**
  - Secondary data review and "all-source" analysis
  - Geospatial methods (e.g. geostatistical analysis)
  - Imagery observation
  - Structured imagery analysis and remote sensing techniques
- **Special Projects**
  - MapGive
  - Secondary Cities



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Yemen: A Severe Food Security Crisis

IPC acute food insecurity phase
mapped by district, Dec '18 – Jan '19

- 5: Catastrophe
- 4: Emergency
- 3: Crisis
- 2: Stressed
- 1: Minimal

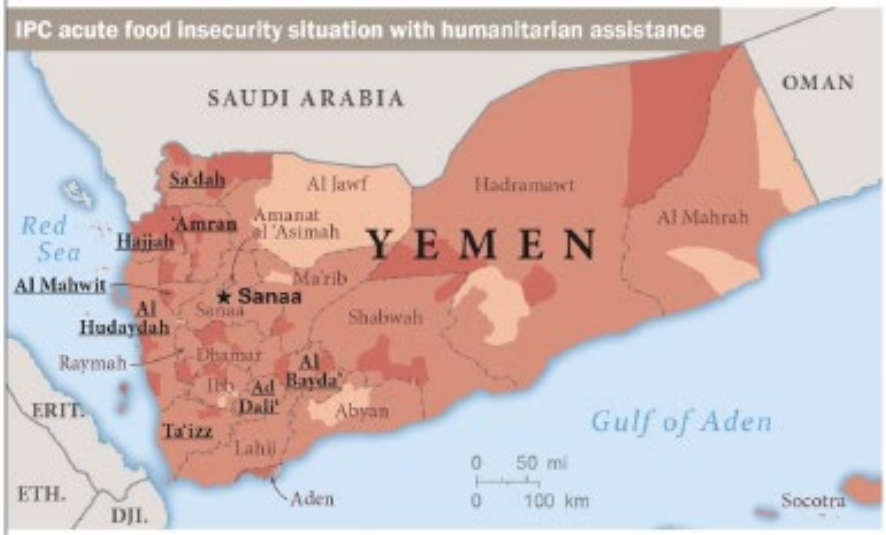
Name Governorate with people in IPC Phase 5 **(underlined, bold)**

An estimated 53% of the population in Yemen is facing severe acute food insecurity (IPC Phase 3 or higher), even with ongoing humanitarian assistance. Without assistance the situation is projected to deteriorate further with 67% of Yemenis in IPC Phase 3 or higher.

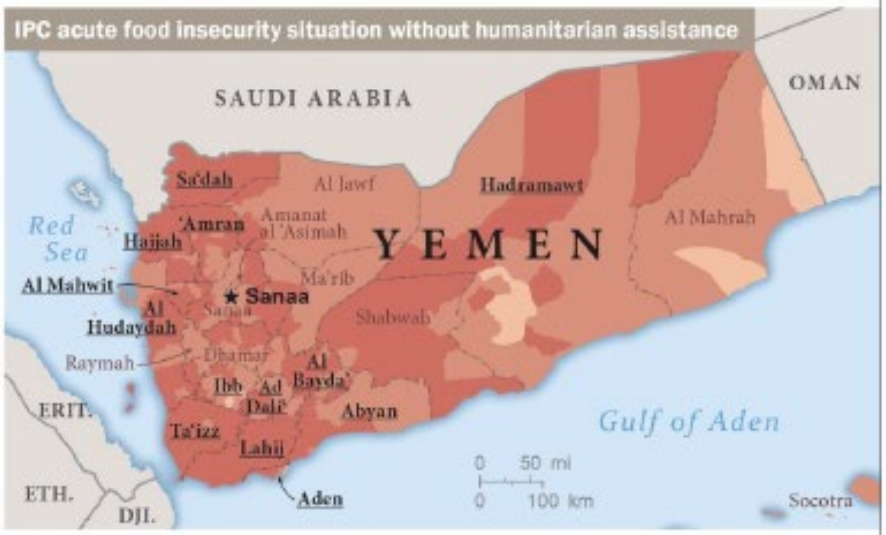
Number of people in IPC Phase 3 or higher
(with and without humanitarian assistance)

With humanitarian assistance	IPC phase	Without humanitarian assistance
63,500	5: Catastrophe	238,000
4.96 million	4: Emergency	9.65 million
10.88 million	3: Crisis	10.24 million
15.9 million	**Total**	**20.1 million**

IPC acute food insecurity situation with humanitarian assistance

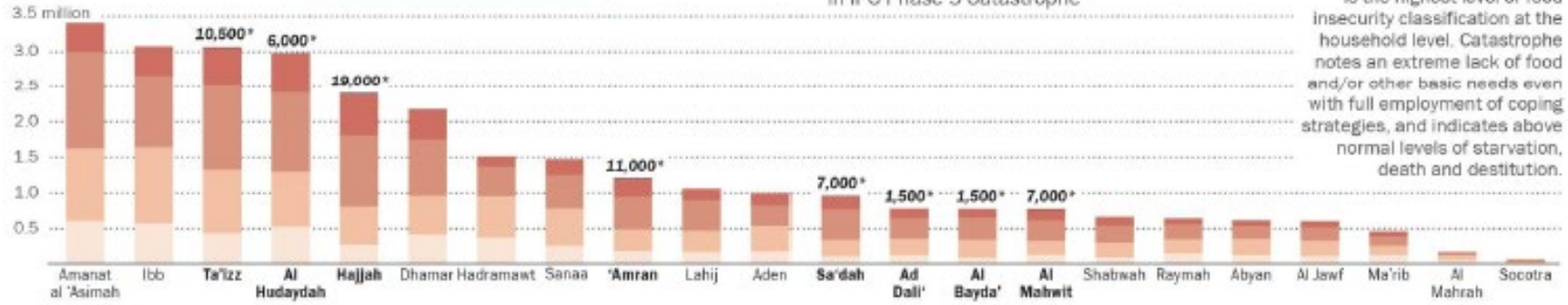


IPC acute food insecurity situation without humanitarian assistance



Number of people per IPC phase with humanitarian assistance *by governorate*

* Indicates ***number of people*** in IPC Phase 5 Catastrophe



NOTE: IPC 5 Catastrophe is the highest level of food insecurity classification at the household level. Catastrophe notes an extreme lack of food and/or other basic needs even with full employment of coping strategies, and indicates above normal levels of starvation, death and destitution.

Names and boundary representation are not necessarily authoritative

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Source: Yemen Integrated Food Security Phase Classification (IPC) preliminary findings report by the Global IPC Steering Committee

December 17, 2018
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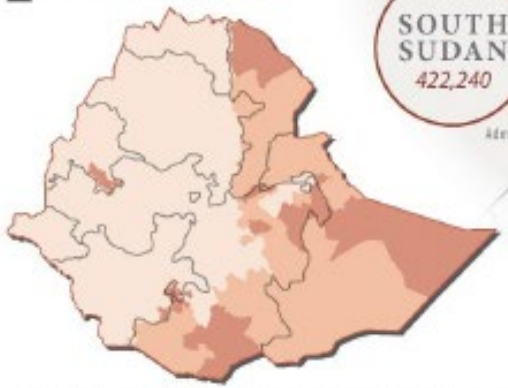
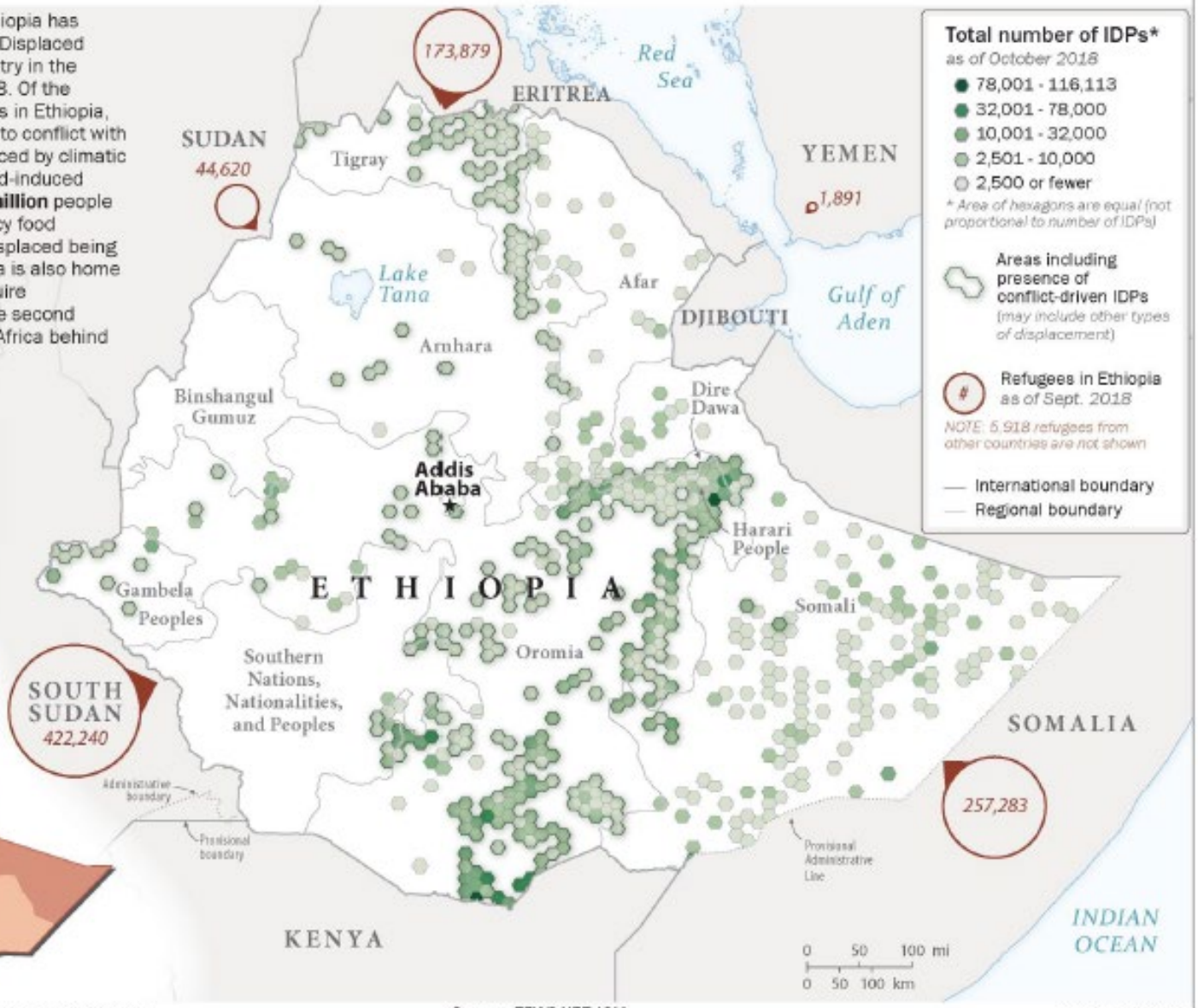
Ethiopia: Displacement and Food Security

Since the beginning of this year Ethiopia has more new conflict-driven Internally Displaced Persons (IDPs) than any other country in the world, with over **1.4 million** in 2018. Of the approximately **2.8 million** total IDPs in Ethiopia, over **2.2 million** are displaced due to conflict with the over **500,000** remaining displaced by climatic shocks, including drought- and flood-induced food insecurity. An estimated **7.9 million** people in Ethiopia are in need of emergency food assistance, with those internally displaced being some of the most affected. Ethiopia is also home to over **900,000** refugees that require humanitarian assistance, and is the second largest host nation for refugees in Africa behind Uganda.

Integrated Food Security Phase Classification (IPC) in assessed areas
FEWS NET food security projections for October 2018–January 2019

- 1: Minimal
- 2: Stressed
- 3: Crisis
- 4: Emergency (not yet reached)
- 5: Famine (not yet reached)





Total number of IDPs*
as of October 2018

- 78,001 - 116,113
- 32,001 - 78,000
- 10,001 - 32,000
- 2,501 - 10,000
- 2,500 or fewer

** Area of hexagons are equal (not proportional to number of IDPs)*

Areas including presence of conflict-driven IDPs *(may include other types of displacement)*

(#) Refugees in Ethiopia *as of Sept. 2018*

NOTE: 5,918 refugees from other countries are not shown

— International boundary
— Regional boundary

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Sources: FEWS NET, IOM, USAID, WFP, UN HCR, UN OCHA

November 16, 2018
U1952 STATE (HIU)

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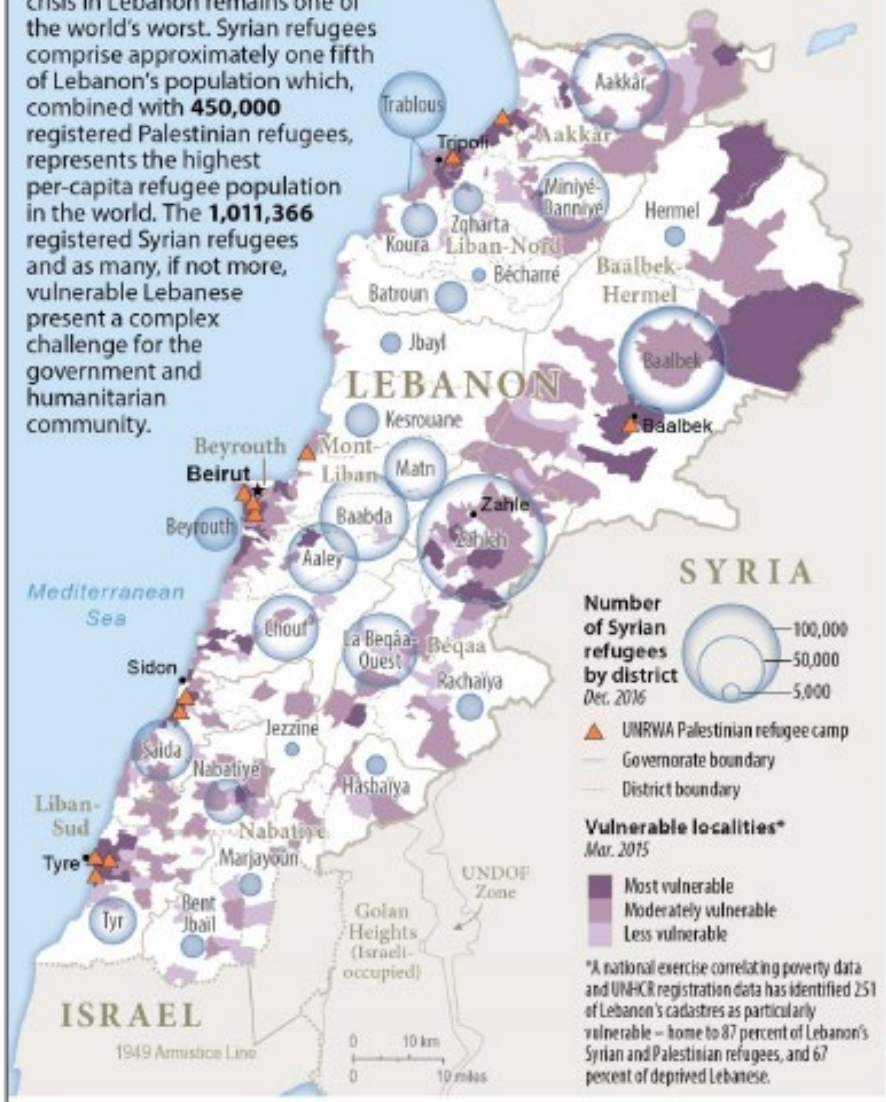
Lebanon: Refugee Snapshot

As the Syrian conflict enters its seventh year, the humanitarian crisis in Lebanon remains one of the world's worst. Syrian refugees comprise approximately one fifth of Lebanon's population which, combined with **450,000** registered Palestinian refugees, represents the highest per-capita refugee population in the world. The **1,011,366** registered Syrian refugees and as many, if not more, vulnerable Lebanese present a complex challenge for the government and humanitarian community.

Refugees and Vulnerable Localities



Number of Syrian refugees by district
Dec. 2016
100,000
50,000
5,000

UNRWA Palestinian refugee camp
Governorate boundary
District boundary

Vulnerable localities*
Mar. 2015
Most vulnerable
Moderately vulnerable
Less vulnerable

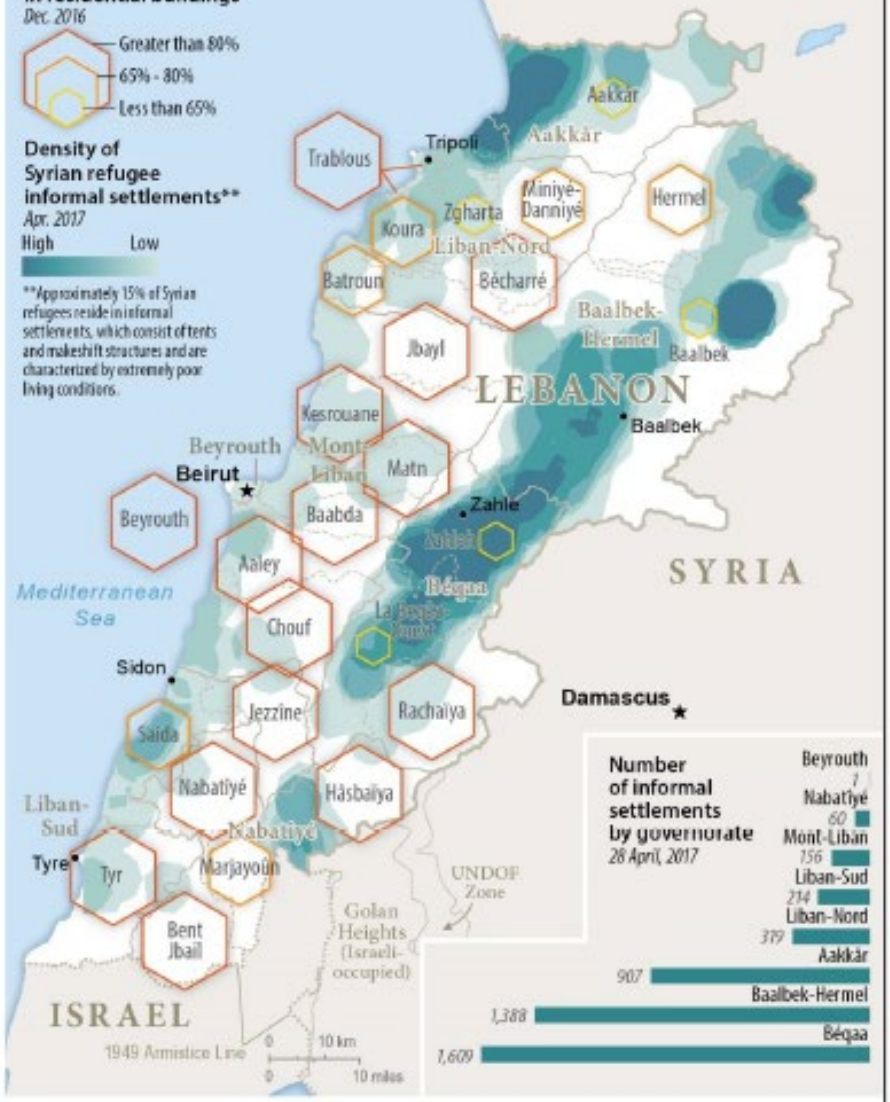
*A national exercise correlating poverty data and UNHCR registration data has identified 251 of Lebanon's cadastres as particularly vulnerable – home to 87 percent of Lebanon's Syrian and Palestinian refugees, and 67 percent of deprived Lebanese.

Shelter and Informal Settlements

Percentage of Syrian refugee households in residential buildings
Dec. 2016
Greater than 80%
65% - 80%
Less than 65%

Density of Syrian refugee informal settlements**
Apr. 2017
High Low

**Approximately 15% of Syrian refugees reside in informal settlements, which consist of tents and makeshift structures and are characterized by extremely poor living conditions.



Number of informal settlements by governorate
28 April, 2017

Beyrouth	1
Nabatiyé	60
Mont-Liban	156
Liban-Sud	214
Liban-Nord	379
Aakkâr	907
Baalbek-Hermel	1,388
Béqaa	1,609

Names and boundary representation are not necessarily authoritative

Sources: UNHCR, UNICEF, UNRWA

May 18, 2017 - U1591 STATE (HIU)

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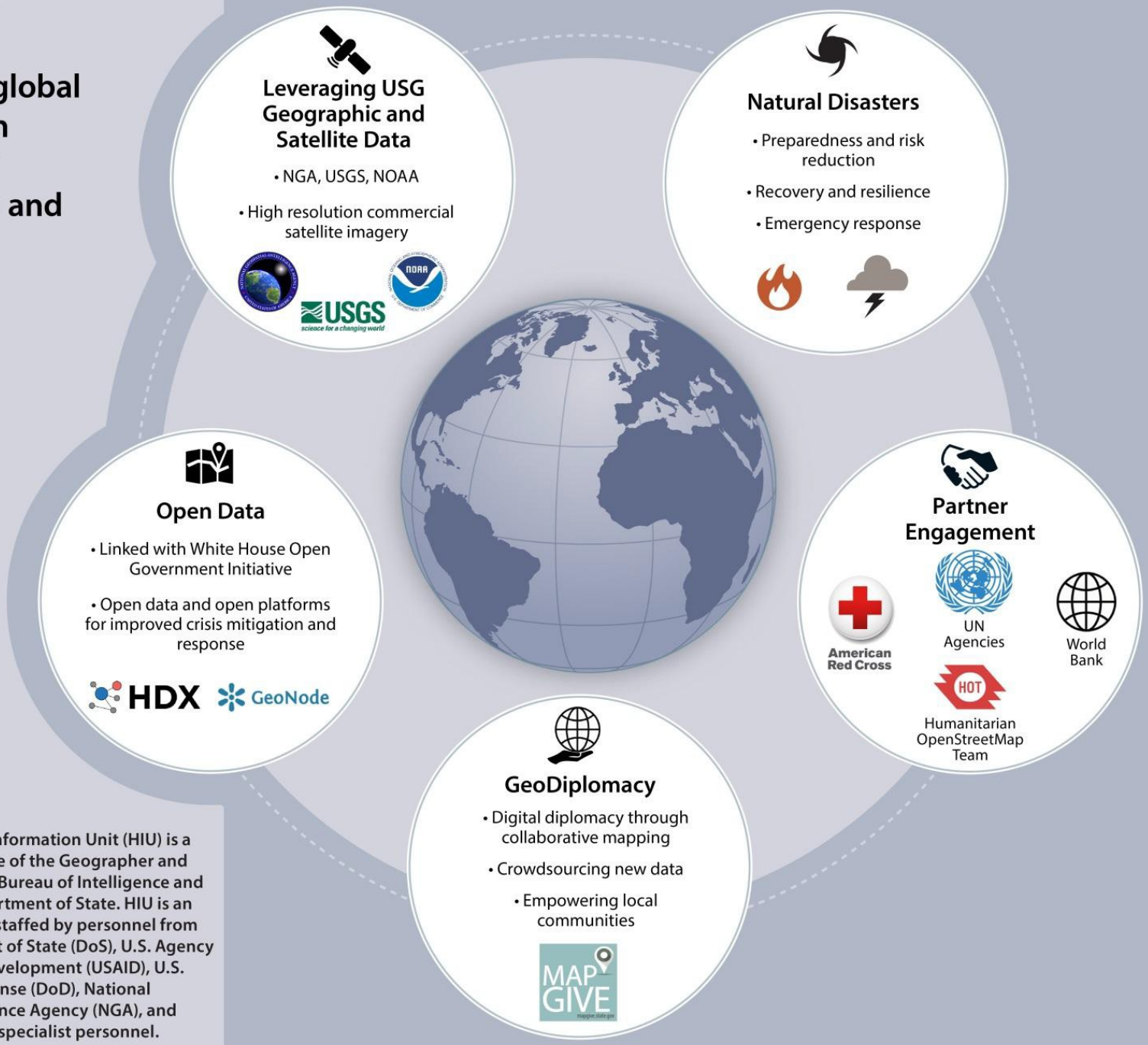
Building a global information network of institutions and individuals



The Humanitarian Information Unit (HIU) is a division of the Office of the Geographer and Global Issues in the Bureau of Intelligence and Research, U.S. Department of State. HIU is an interagency center staffed by personnel from the U.S. Department of State (DoS), U.S. Agency for International Development (USAID), U.S. Department of Defense (DoD), National Geospatial-Intelligence Agency (NGA), and other technical and specialist personnel.

Data Sharing and Coordination

- HIU analysts work to identify data gaps, and produce/discover relevant data sets to share with non-USG humanitarian organizations
  - Refugee and IDP camps
  - Burned villages
  - Damage assessments
- Increasingly, UN agencies and humanitarian NGOs are bolstering in-house capacities for remote sensing and geospatial analysis to support their field operations
  - Sharing data to enable cutting-edge analysis brings significant benefit to USG-funded efforts

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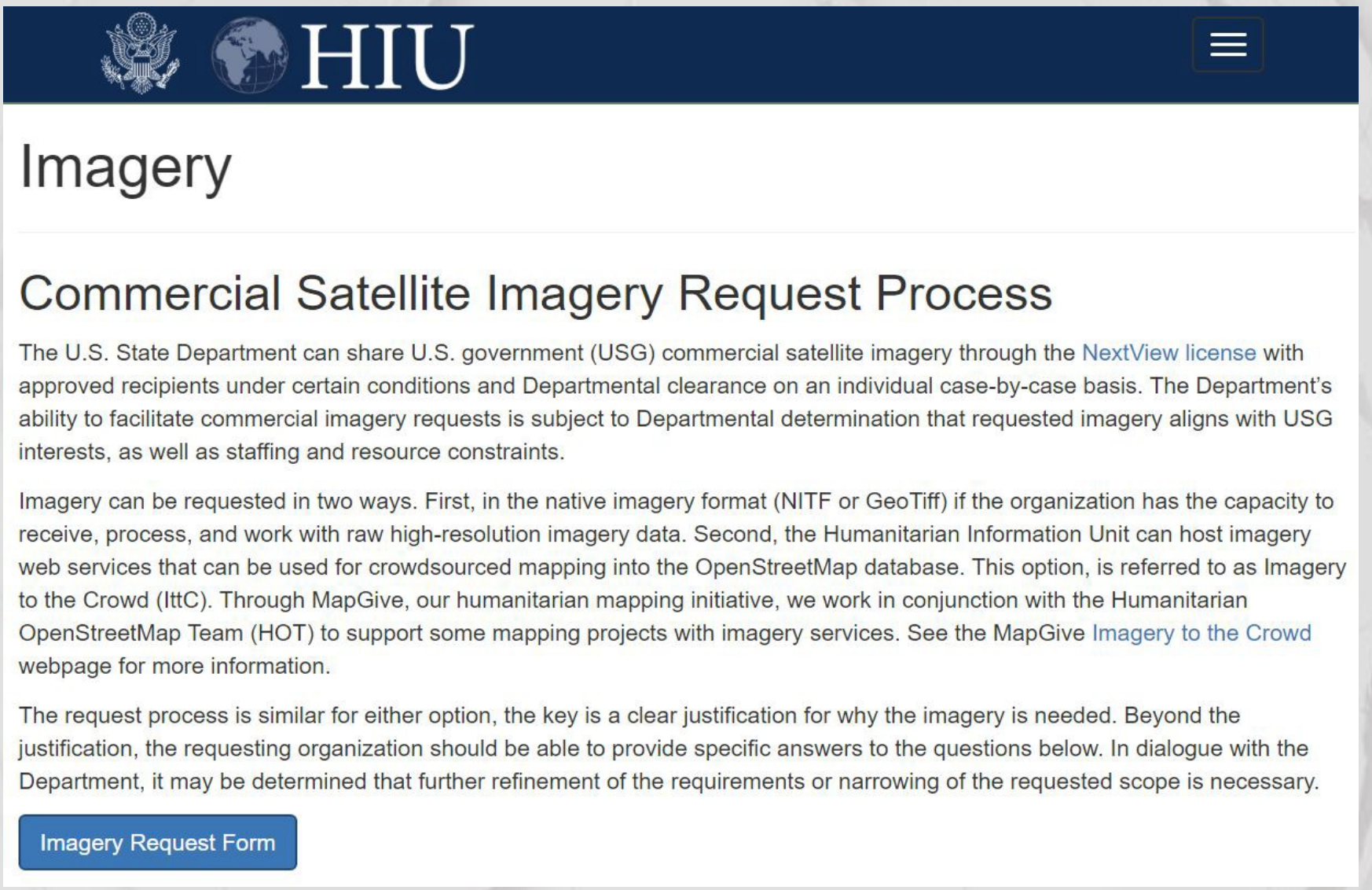
Sharing Commercial Imagery



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Putting NextView to Work

- HIU works across State to increase awareness of capabilities offered through commercial imagery and to socialize its impact on State's broad mission set
  - Every imagery request undergoes vetting to confirm end-user capabilities and consistency with U.S. foreign policy
  - Building up a body of evidence and use-cases
  - Imagery sharing is a multiplier-effect for USG-supported activities
- Not solely focused on humanitarian emergencies:
  - Human rights (UNOHCHR)
  - Cultural heritage (UNESCO)
  - Weapons removal and abatement (UNMAS)

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Our End-Users are the “Power Users”

- Primary themes and use-cases for commercial imagery across emergency humanitarian response:
  - Damage assessments
  - Rapid assessments of settlements and displaced populations in hard-to-access locations
  - Refugee camp management and coordination
  - Natural disaster response and hazard assessments

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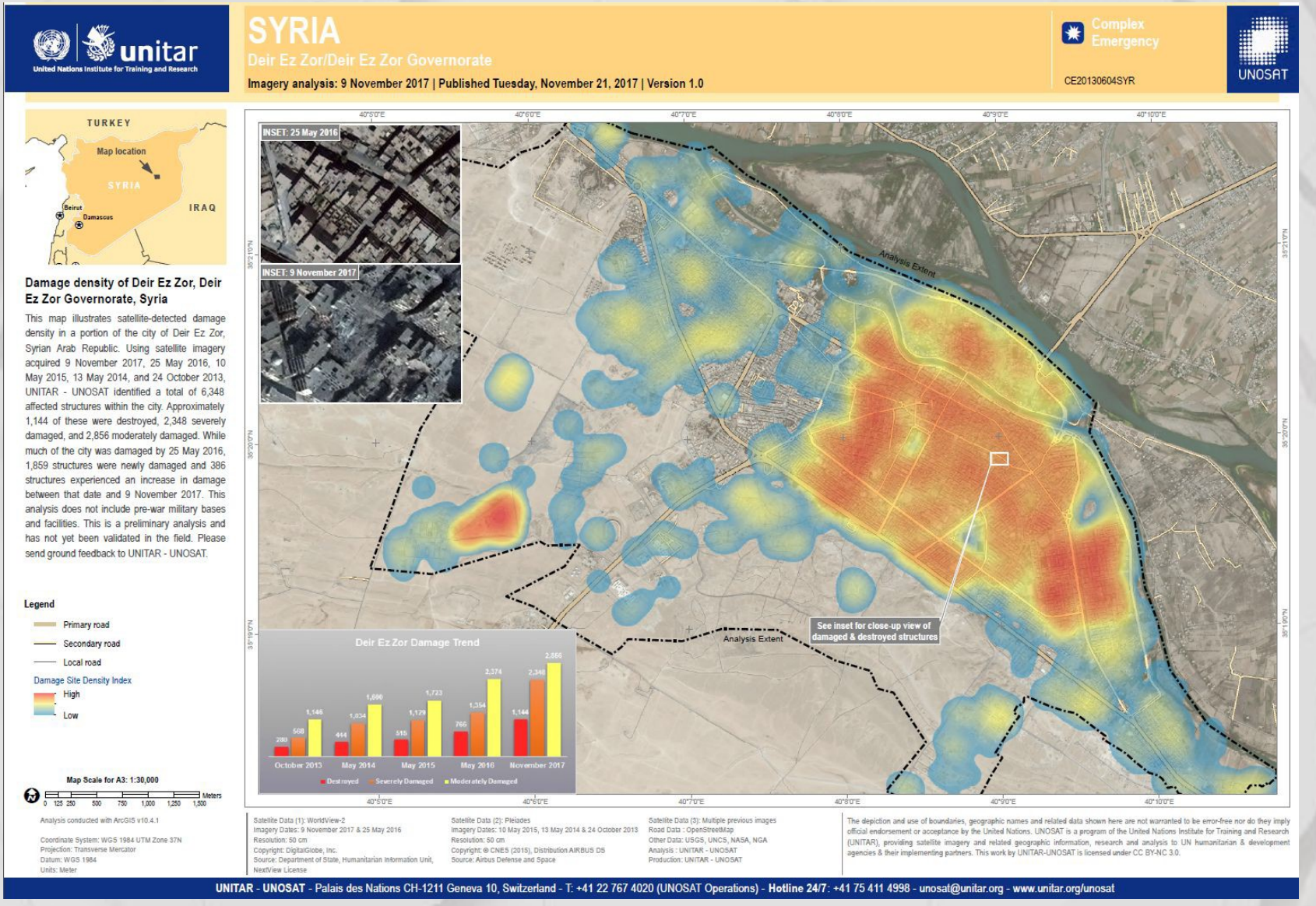
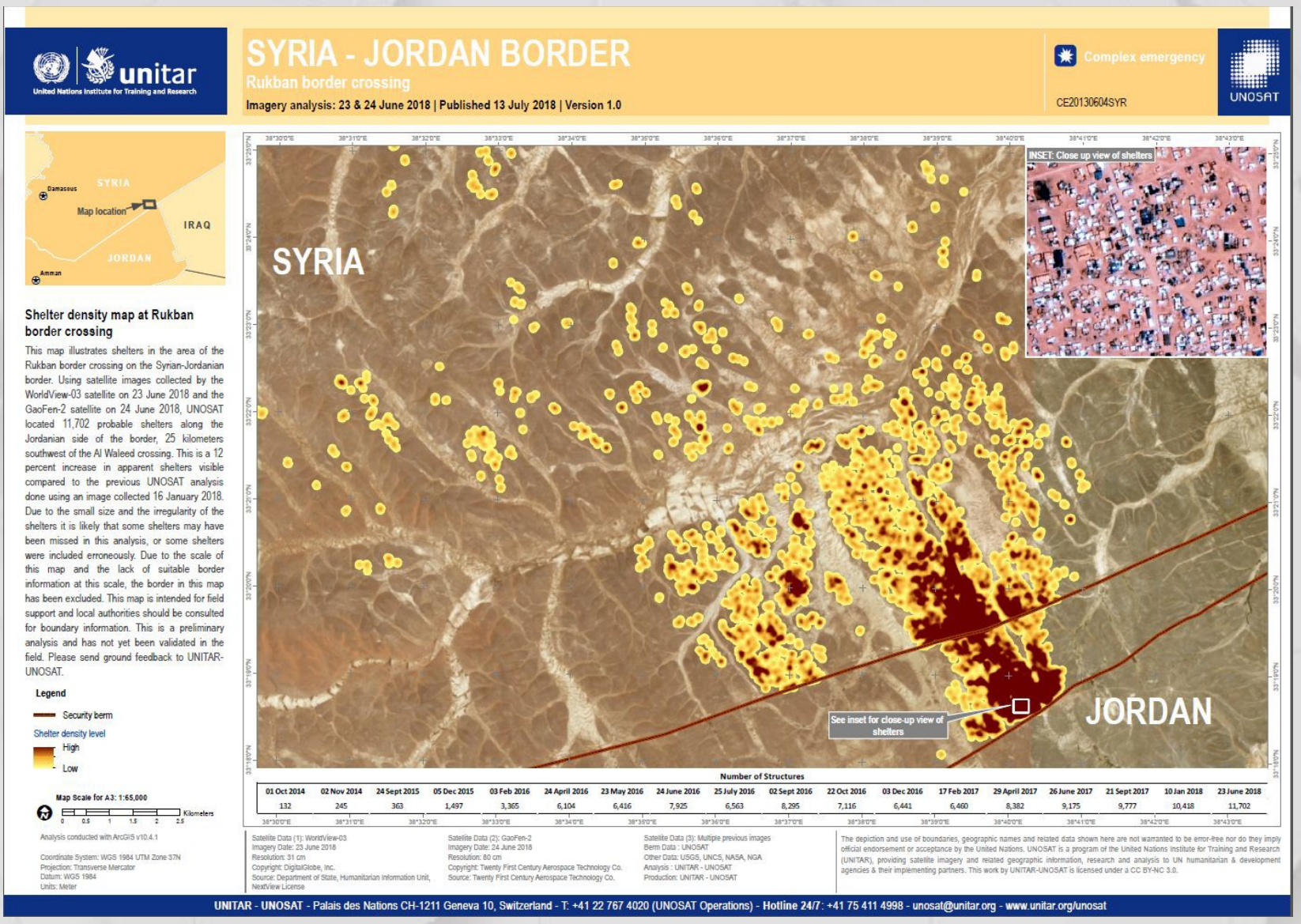
Damage Assessments



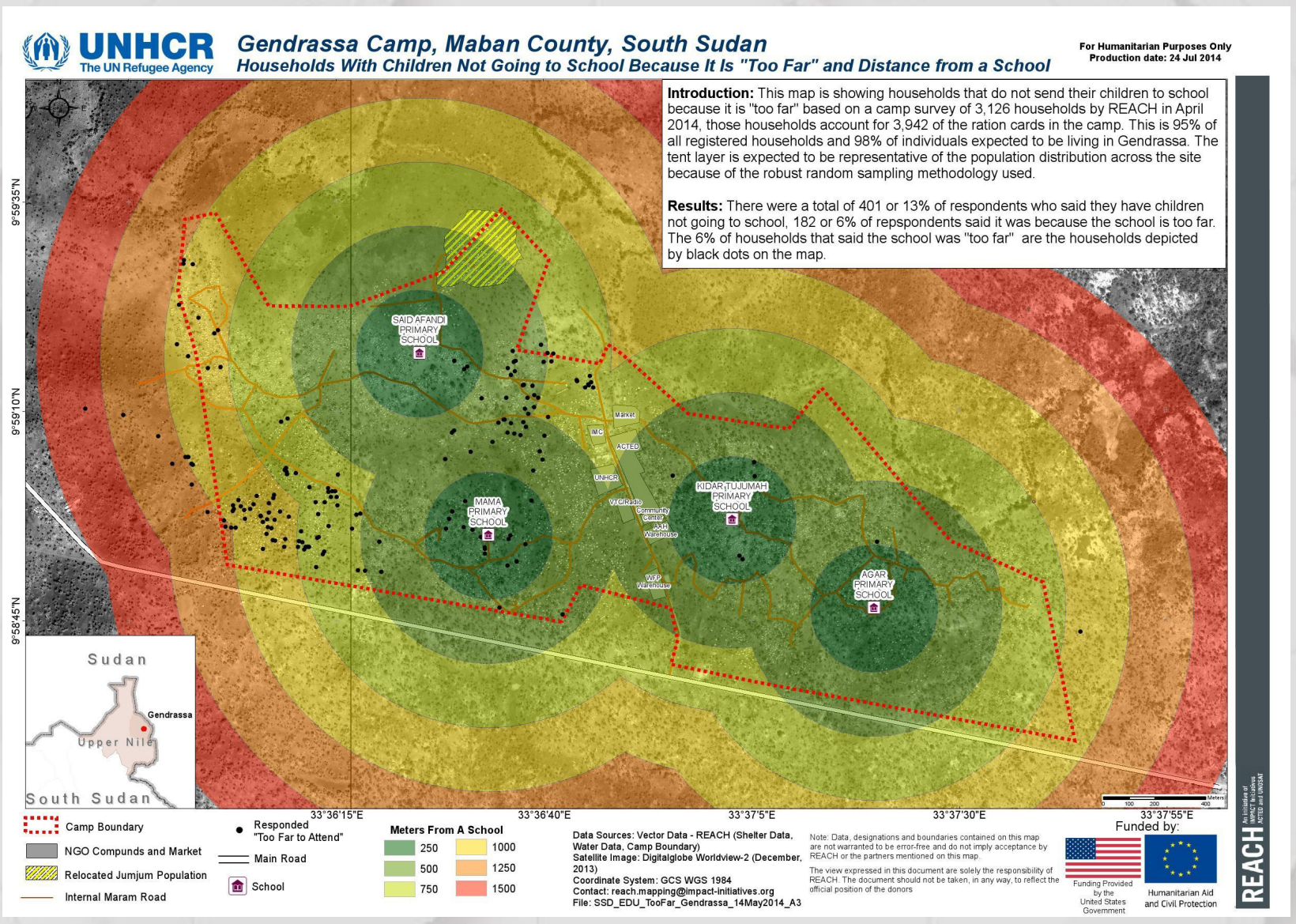
Source: UNOSAT

Rapid Assessments



Source: UNOSAT

Refugee Camp Management



Source: REACH Initiative

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Refugee Camp Management

South Sudan : Flood Potential at Growing Refugee Settlement

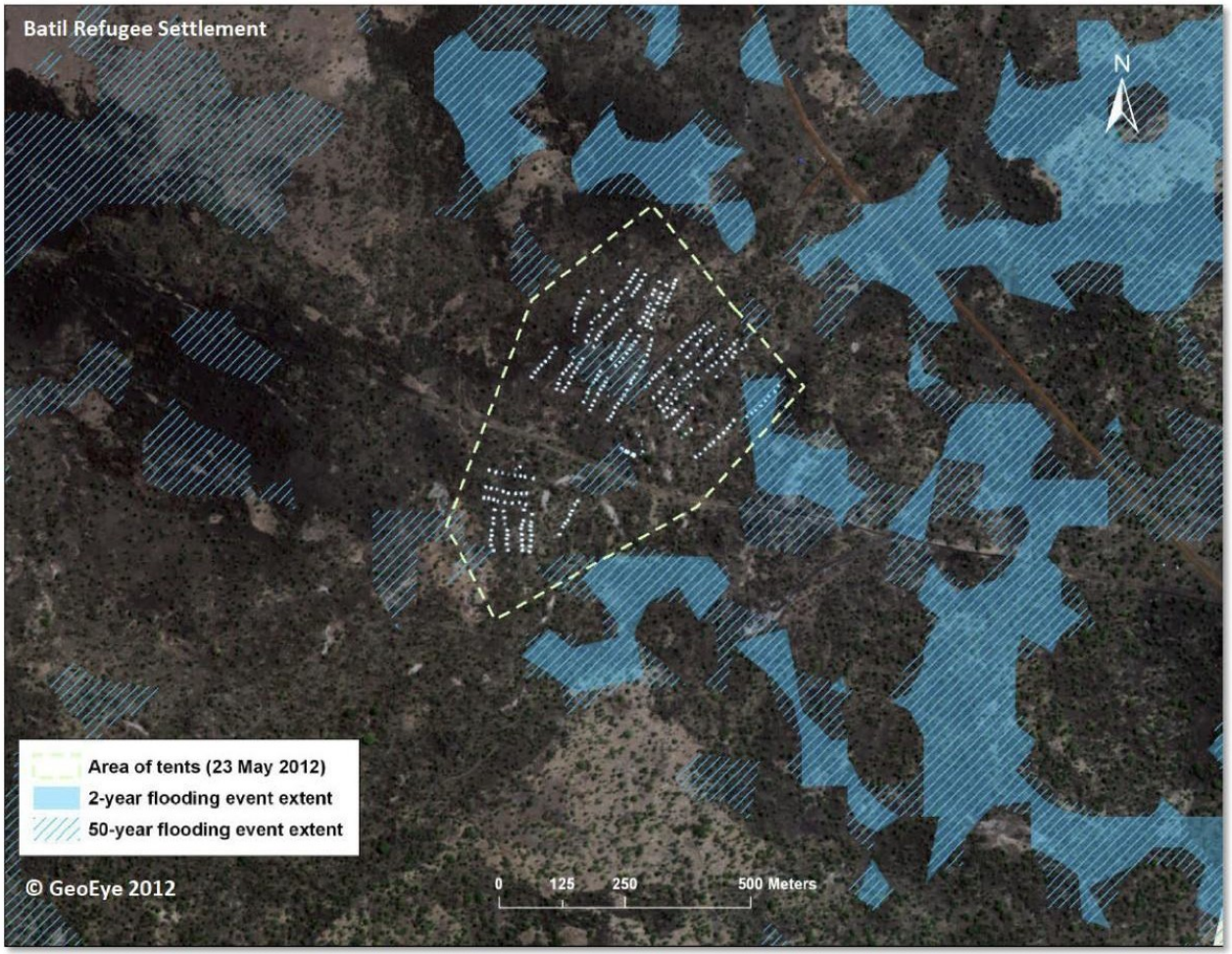
- Areas east of Batil Refugee Settlement would be flooded during a 2-year rain event, according to hydrologic analysis.

- Approximately 25,000 refugees were at Batil Refugee Settlement as of 30 June 2012.
- Precipitation Amounts Used in Analysis:

24-hour Total Rain Rate:

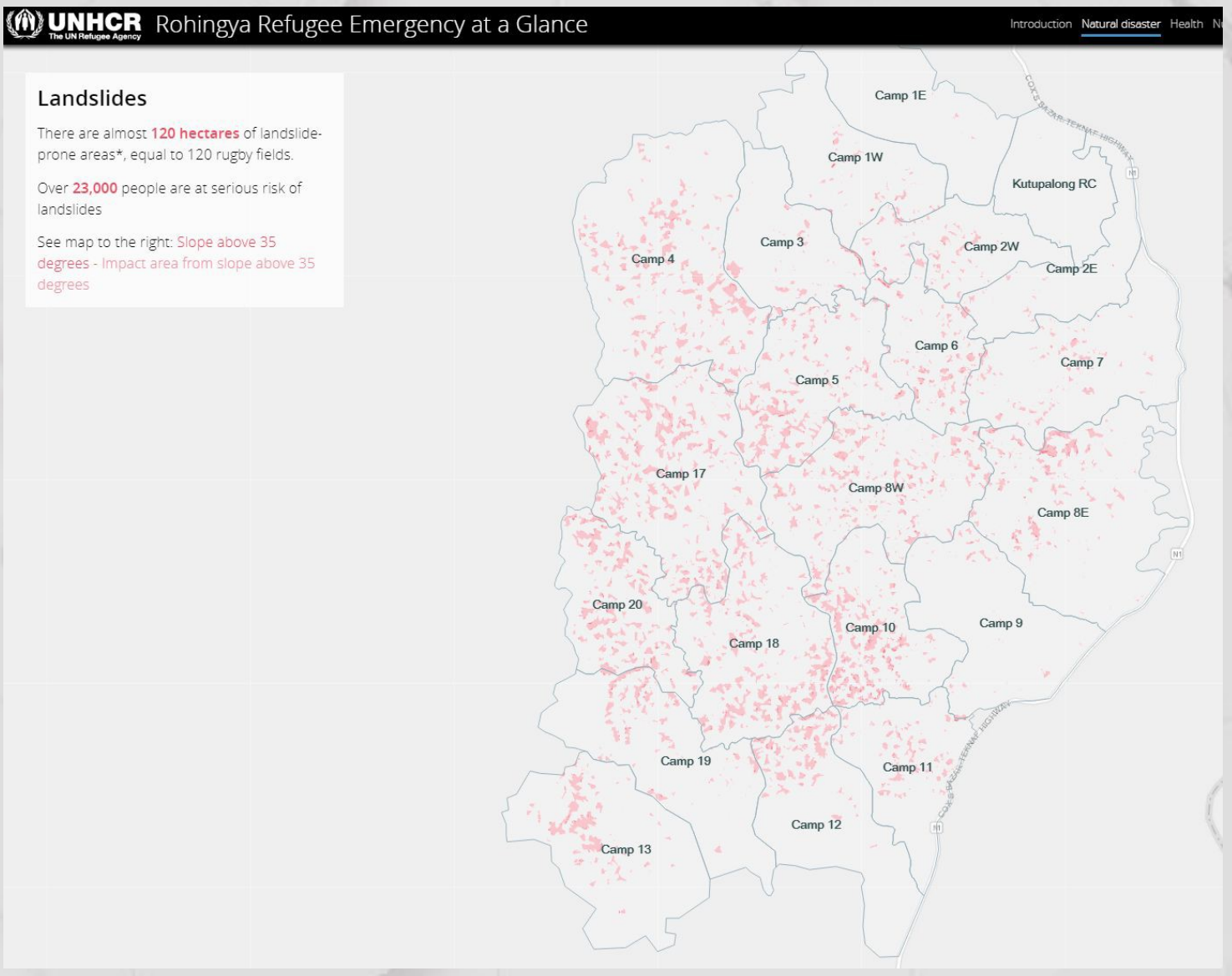
2-year	70.1 mm
50-year	98.3 mm
100-year	103.9 mm

Hydrologic analysis is based on the best available data and may not necessarily reflect conditions on the ground



Source: Department of State

Hazard Assessments



Source: UNHCR

OpenStreetMap & VGI

- International response to 2010 Haiti earthquake demonstrated utility of crowdsourcing, OSM, and more generally the power of Volunteered Geographic Information
- Significant USG and international investment in facilitating outreach and contributions to OSM via mapathons and remote mapping
- Increasingly, machine learning and AI are assisting these efforts, pushing human efforts more towards validating data created through automated detection

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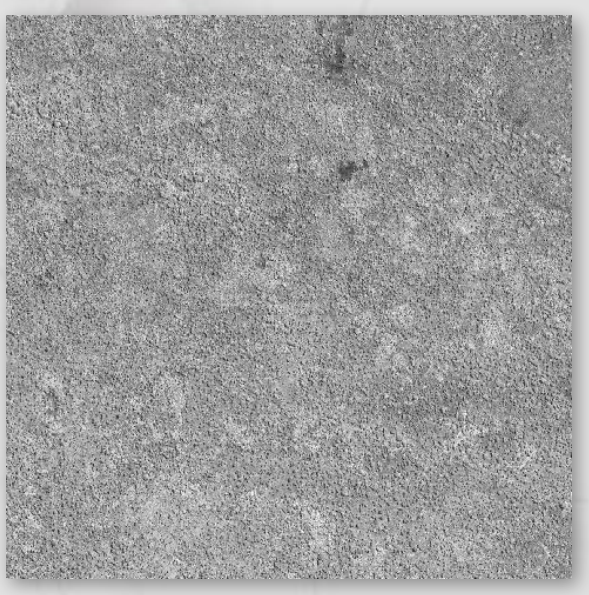
Imagery to the Crowd

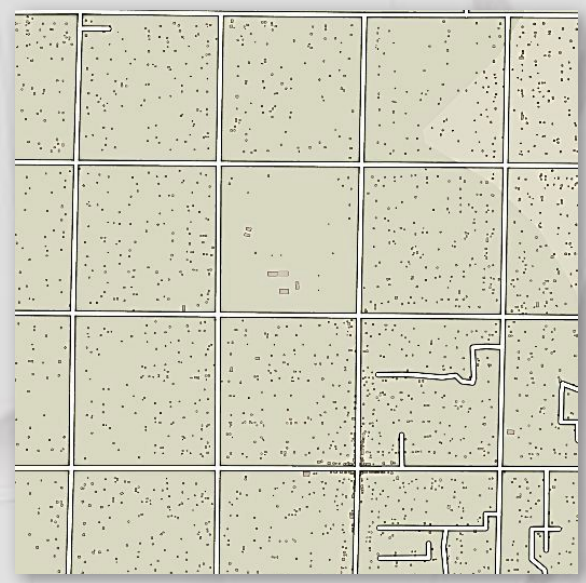
Recently captured imagery fills a unique void for projects in remote areas that are lacking in current satellite imagery – e.g. rapid onset refugee crises.

These examples are from a refugee settlement in northern Uganda. MapGive-published imagery (middle) enabled mapping in OSM (right).



Mapbox imagery

MapGive imagery



OpenStreetMap Screenshot

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Imagery to the Crowd

Since 2012 we have helped provide updated imagery services for more than 250 OSM-based mapping projects!

MapGive

A U.S. Department of State initiative that encourages and increases volunteer participation in the global mapping community and facilitates the creation of open geographic data to support humanitarian relief and development programs.

Satellite imagery for OSM mapping

Public diplomacy, outreach, and education

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“Digital” Diplomacy

US Consulate Lahore @USCGLahore · Jun 4

Thanks you all for making #Map4Nepal #LahoreMapathon a huge success. @MapGive goo.gl/f0QEL7 @OpenGov

Usman Latif, Arshia Bano, Coca-Cola Pakistan and 7 others

Summary

- State/HIU: a willing consumer and facilitator of your data, research, and products!
- Remote sensing is being brought into the mainstream of the humanitarian sector, thanks to increased capacity of operational organizations (and thanks to USG sharing capabilities)
- Machine learning and AI will increasingly improve rapid data creation and crowdsourcing for humanitarian response

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Thank you!

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https://secondarycities.state.gov
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