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GIS for a Sustainable World:
Building a Resilient Future

May 10 - 11, 2022 | InterContinental, Geneva, Switzerland

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The Geographic Approach to Resilience

May 10 - 11, 2022 | InterContinental, Geneva, Switzerland

“Geography is the study of places and the relationships between people and their environments.

Geographers explore both the physical properties of Earth’s surface and the human societies spread across it. They also examine how human culture interacts with the natural environment and the way that locations and places can have an impact on people.

Geography seeks to understand where things are found, why they are there, and how they develop and change over time.”

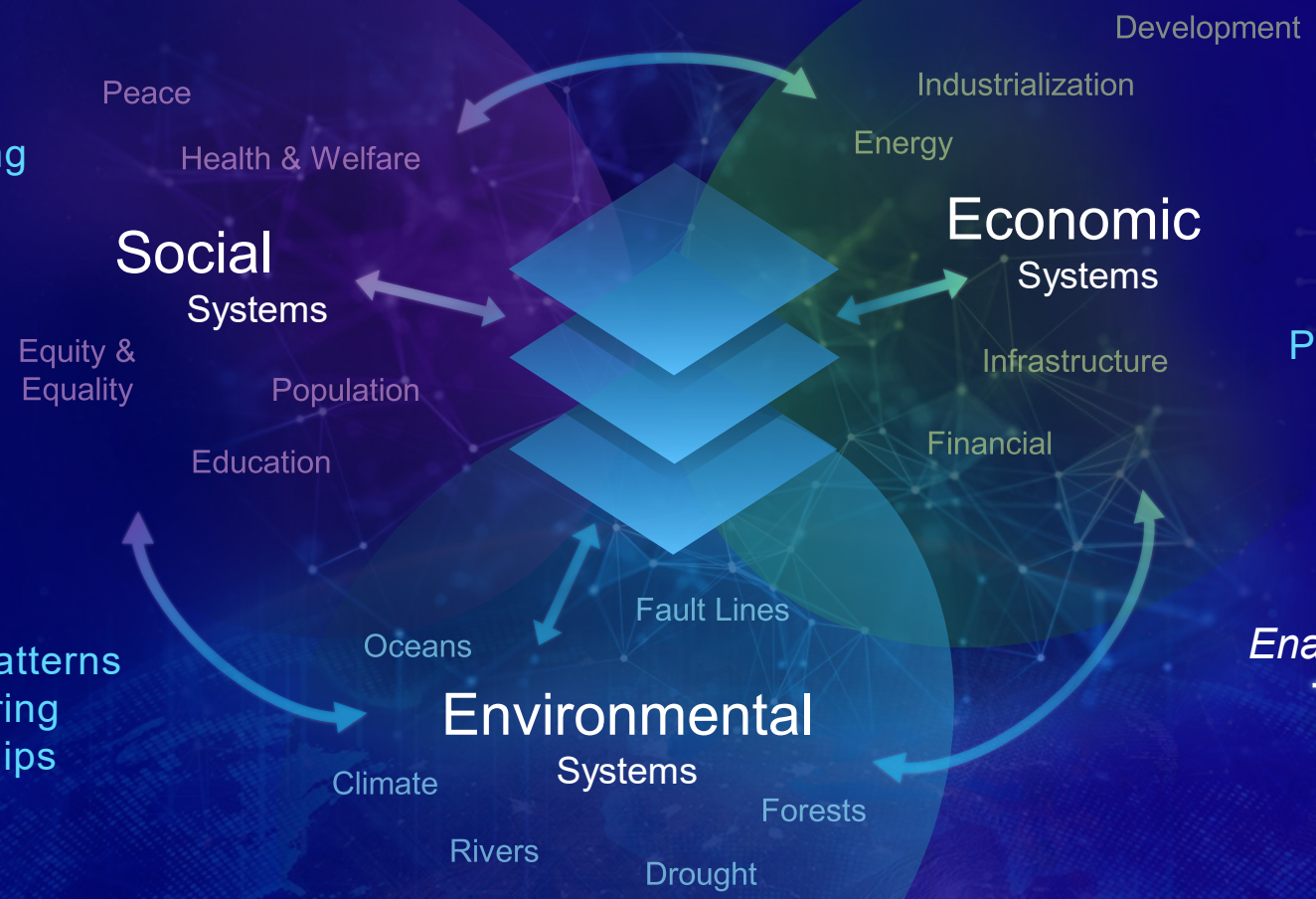
National Geographic

Resilience Requires . . .

That We See Our Whole Community, Not Just Parts

Geography Provides the Science & Language to Do This

Organizing & Integrating
All the Factors



Providing a Framework for
Understanding and Applying
Our Collective Knowledge

Illuminating Patterns
& Discovering
Relationships

Enabling
The Geographic
Approach

A geographic approach supports

- Operationalising the Triple Nexus and interconnected SDGs
- Localisation
- Anticipatory action
- Area-based coordination
- Systems thinking

(look out for the launch of the 'Guide to Systems Engineering for Humanitarian Information Management' by the GICHD. Tuesday 17th May 16h CET!)

The Geographic Approach

A Way of Thinking and Problem Solving
That Integrates Geographic Science & Information
Into How We Understand and Manage Our Communities

Science Based

Integrated

Holistic

Spatial Understanding

Supporting Multi-Objective Solutions

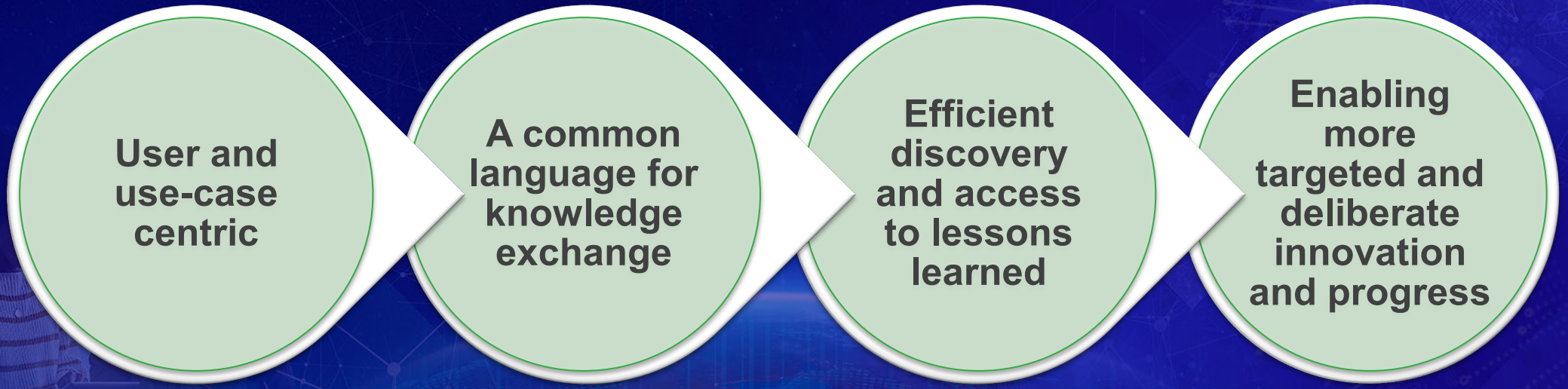
Collaborative

GeoScience and Understanding

. . . An Inclusive and Multi-Disciplinary Process Impacting Our Safety and Security

The Language of Humanitarian GIS

A framework for collective learning and knowledge exchange



The Language of spatial ANALYSIS

vocabulary

making
PREDICTIONS

26. Predicting what-if.
25. Predicting where phenomena will move, flow, or spread.
24. Predicting how and where objects affect wave propagation.
23. Predicting how and where objects spatially interact (attraction and decay).
22. Interpolating a continuous surface and trends from discrete sample observations.
21. Finding the factors that explain observed spatial patterns and making predictions.
20. Given a success case, identifying, ranking, and predicting similar locations.

detecting and quantifying
PATTERNS

19. Are spatial patterns changing over time?
18. Which features/pixels are similar, and how can they be grouped together?
17. What are the local, regional, and global spatial trends?
16. Where are the significant hot spots, anomalies, and outliers?

finding
THE BEST LOCATIONS AND PATHS

15. Finding the best supply locations given known demand and a travel network.
14. Finding the best route, path, or corridor across open terrain.
13. Finding the best route, path, or flow along a network.
12. Finding the best allocation of resources to geographic areas.
11. Finding the best locations that satisfy a set of criteria.

determining
HOW PLACES ARE RELATED

10. Determining overlapping relationships in space and time.
9. Determining what is visible from a given location(s).
8. Determining what is closest.
7. Determining and summarizing what is within an area(s).
6. Determining what is nearby or coincident.

measuring
SIZE, SHAPE, AND DISTRIBUTION

5. Calculating geometries and distributions of feature collections.
4. Calculating individual feature geometries.

understanding
WHERE

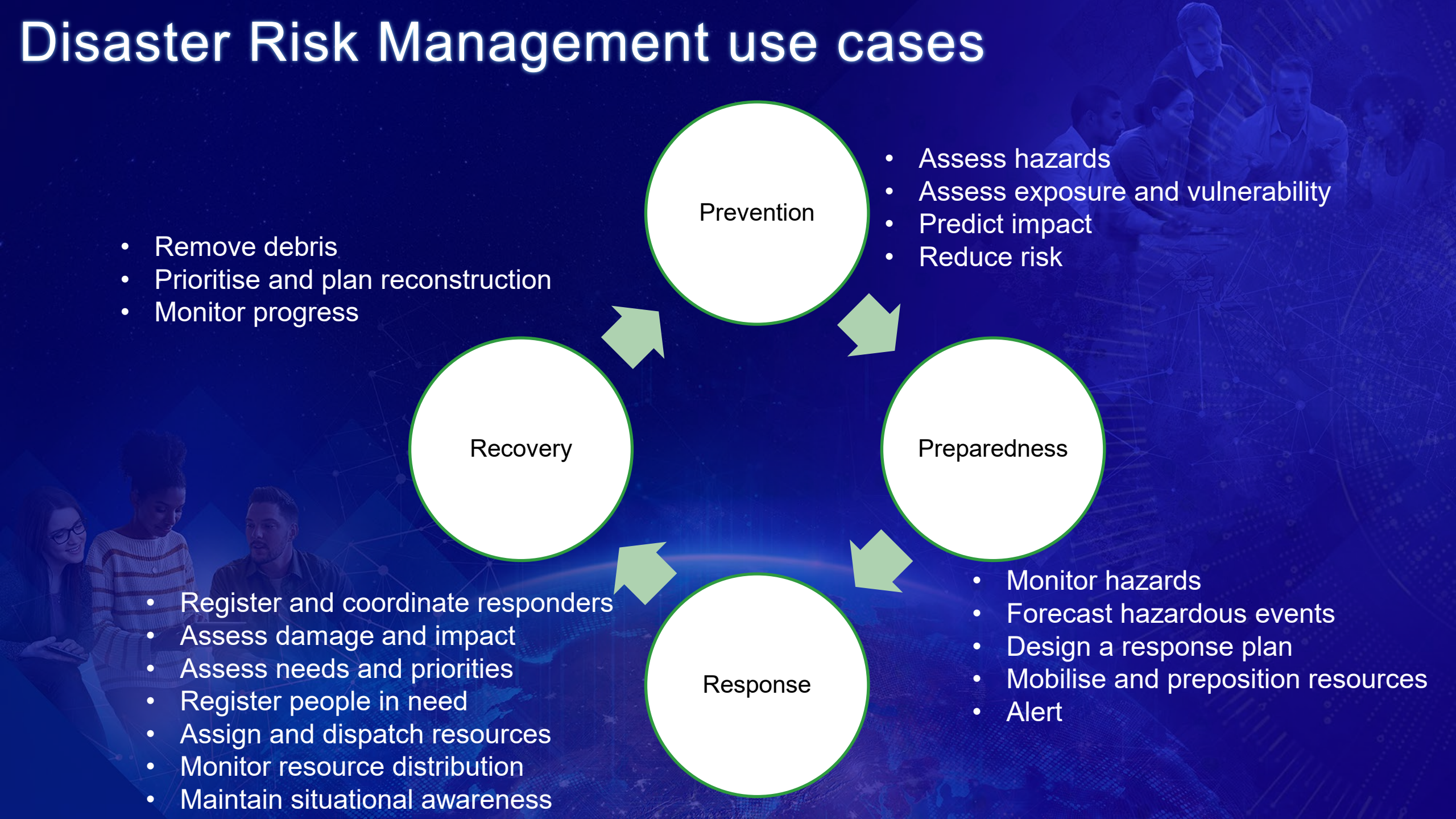
3. Understanding where and when things change.
2. Understanding where the variations and patterns in values are (comparative maps).
1. Understanding where things are (location maps).

how we understand our world—
mapping where things are,
how they relate, what it all means,
and what actions to take

The Language of Spatial Analytics

https://www.esri.com/content/dam/esrisites/sitecore-archive/Files/Pdfs/library/books/the-language-of-spatial-analysis.pdf

Disaster Risk Management use cases



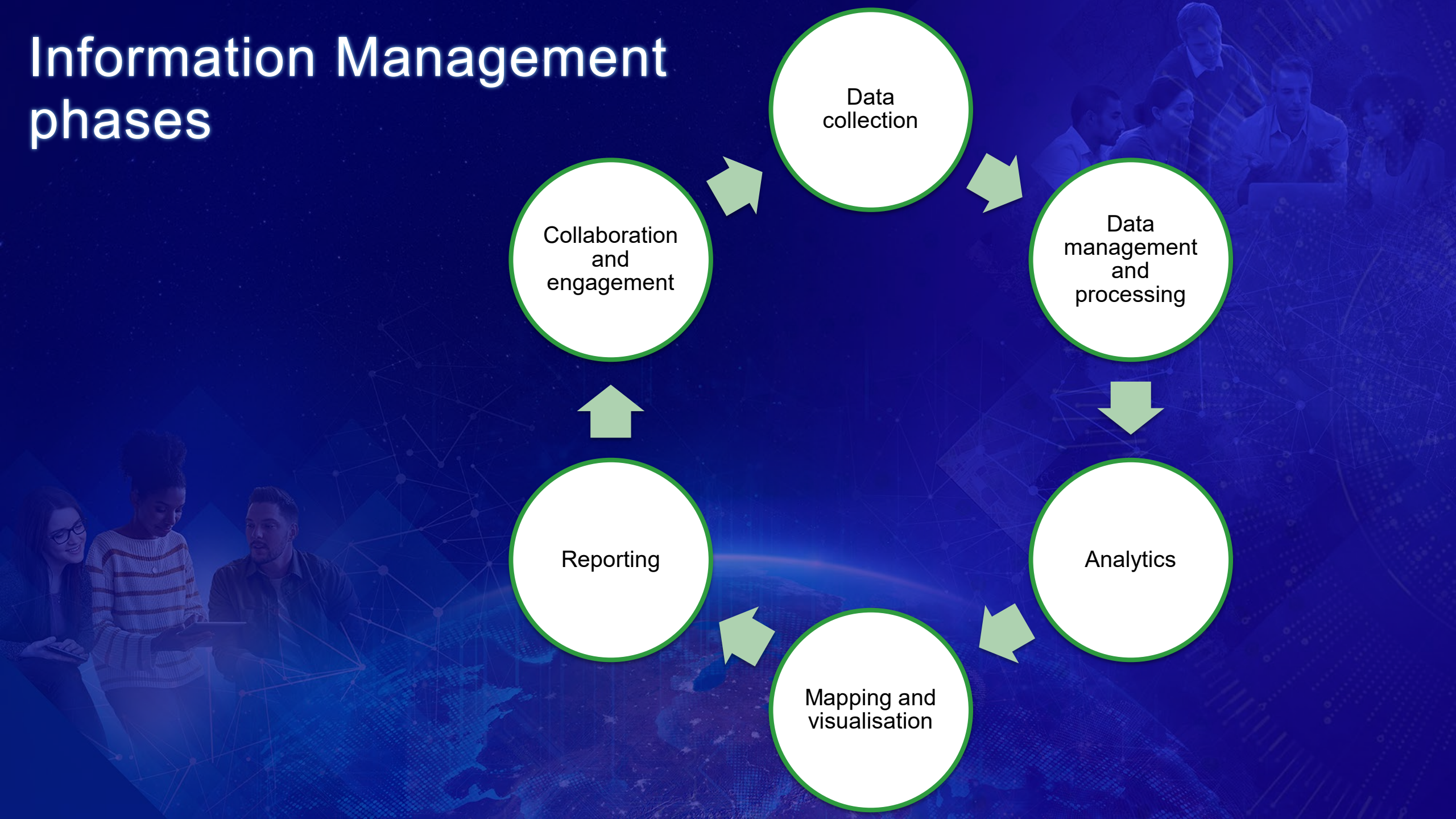
- Assess hazards
- Assess exposure and vulnerability
- Predict impact
- Reduce risk

- Monitor hazards
- Forecast hazardous events
- Design a response plan
- Mobilise and preposition resources
- Alert

- Register and coordinate responders
- Assess damage and impact
- Assess needs and priorities
- Register people in need
- Assign and dispatch resources
- Monitor resource distribution
- Maintain situational awareness

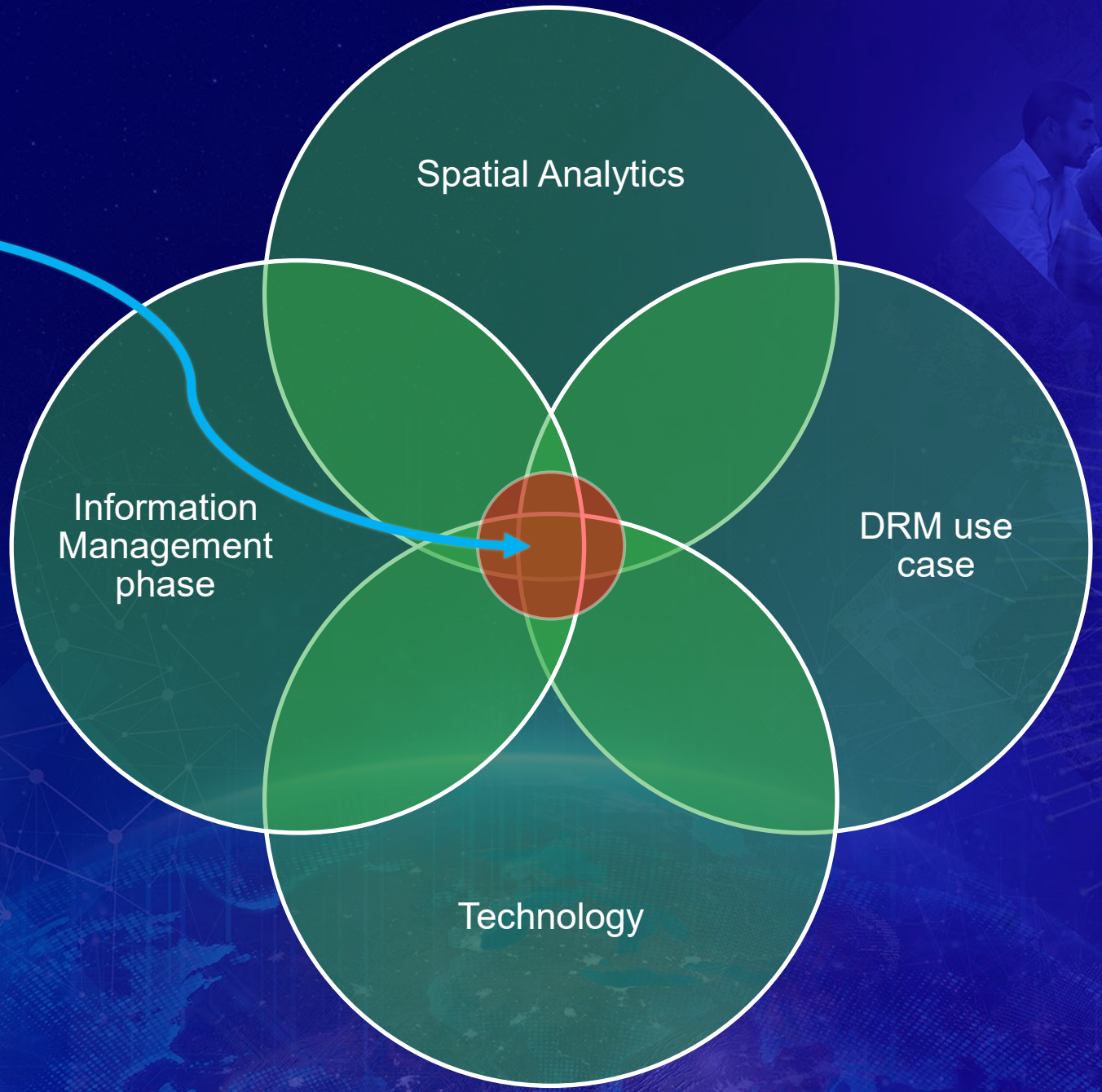
- Remove debris
- Prioritise and plan reconstruction
- Monitor progress

Information Management phases




3D analysis
Dashboards and BI
Routing and networks analysis
Geodesign
Webapps
GeoAnalysis
Image analysis
StoryMaps
Notebooks
Field apps
Hubs and portals
geoAI
Drone

“What is my specific humanitarian GIS challenge?”



The Humanitarian GIS Hub

https://explore-humanitarian.hub.arcgis.com/

Andrew Spezowka

UN Office for Disaster Risk Reduction (UNDRR)

Camille Wallen

HALO Trust

United Nations Office for Disaster Risk Reduction (UNDRR)

GIS for a Sustainable World Conference

Opening Plenary:

Geographic Approach to Resilience

Andrew Spezowka
Programme Management Officer
Global Risk Analysis & Reporting Unit
UNDRR
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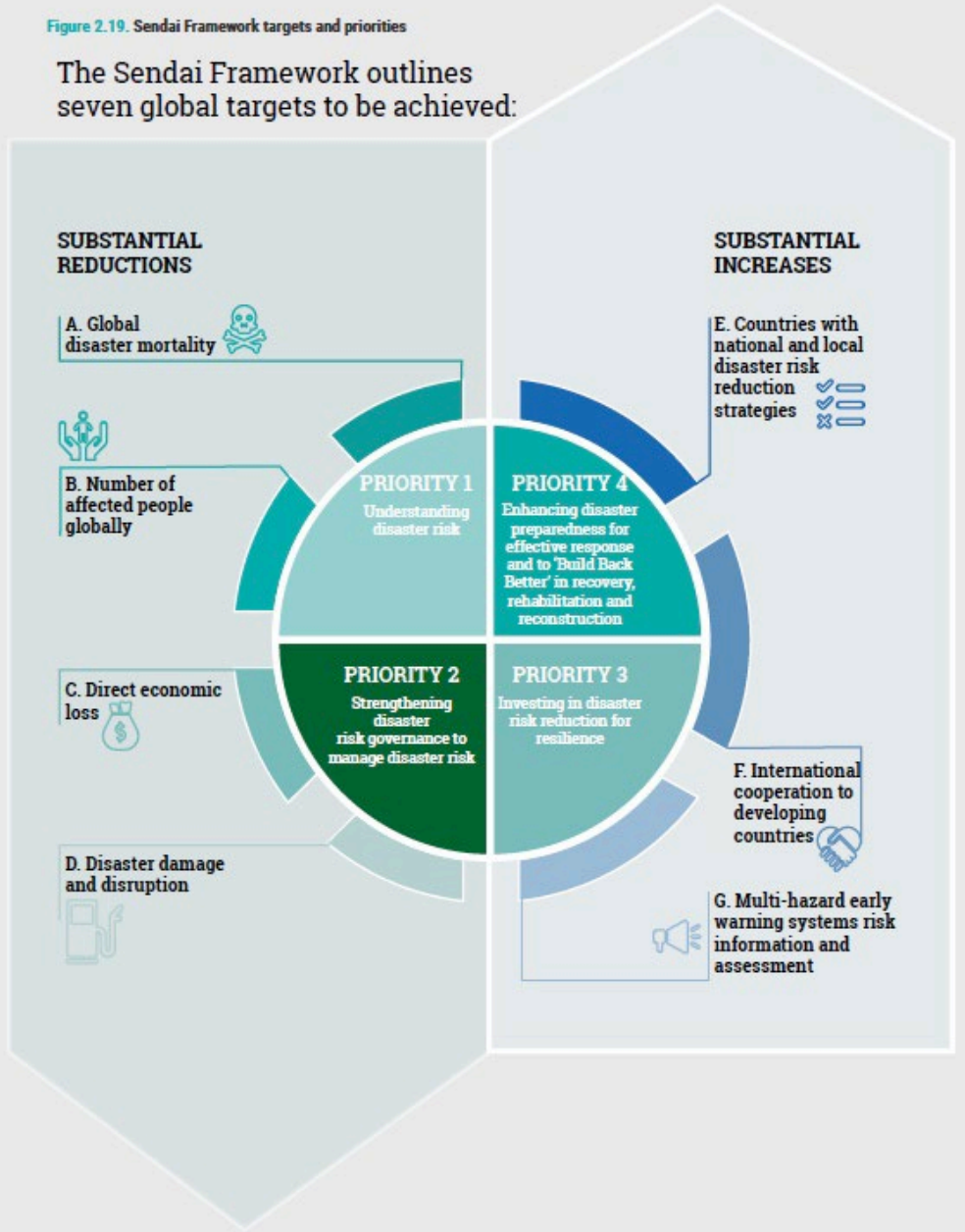
UNDRR
UN Office for Disaster Risk Reduction

Figure 2.19. Sendai Framework targets and priorities

The Sendai Framework outlines seven global targets to be achieved:



Custodian for disaster related data, standards and statistics

110 countries

recording disaster-related losses and damages at national and local levels

155 countries

reporting on disaster losses and damages and progress in reducing disaster risks

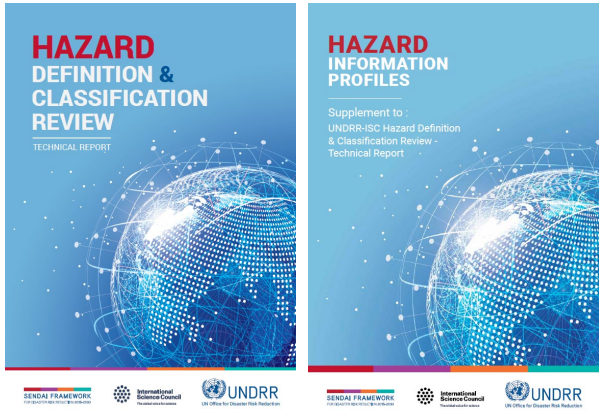
inventar
Disaster Information Management System

SENDAI FRAMEWORK MONITOR

SUSTAINABLE DEVELOPMENT GOALS

Disaster-Related Statistics Framework

Bringing disaster and statistical communities together



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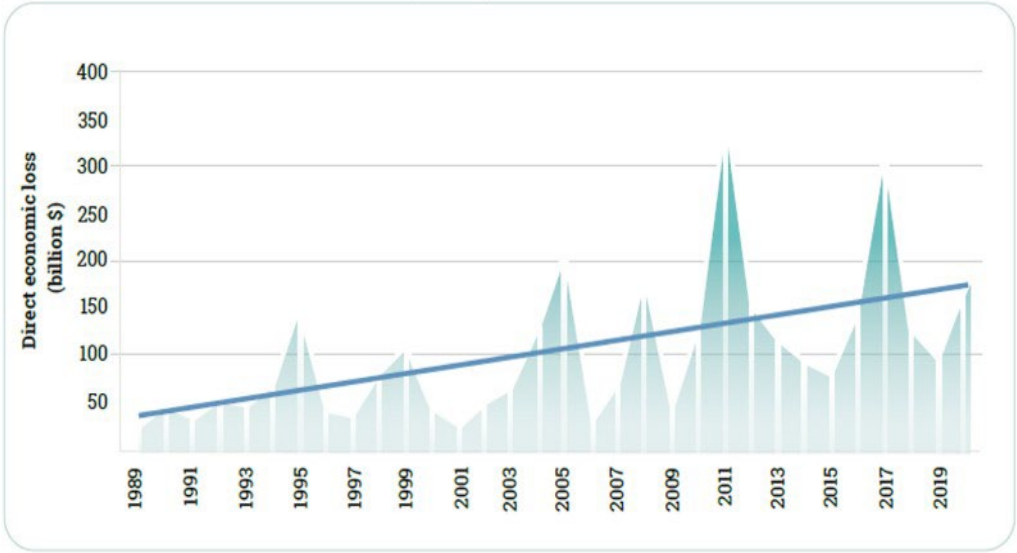
Human choices are driving vulnerability and exposure and increasing losses

- Average annual direct economic loss from disasters has more than doubled over the past three decades, showing an increase of approximately 145% from an average of around $70 billion in the 1990s to just over $170 billion in the 2010s.

- However, impacts of disasters stretch further than economic losses; they also fundamentally undermine social and ecological systems.

Figure S.4. Direct economic loss from disasters (billion $), 1989–2020



Source: UNDRR analysis based on EM-DAT (CRED, 2021)

GAR

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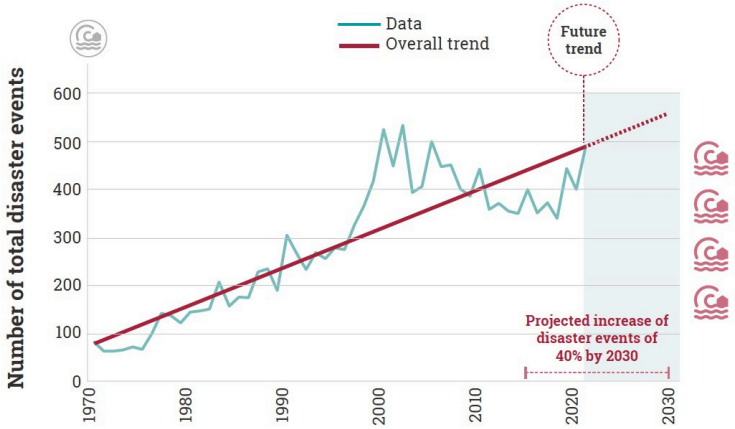
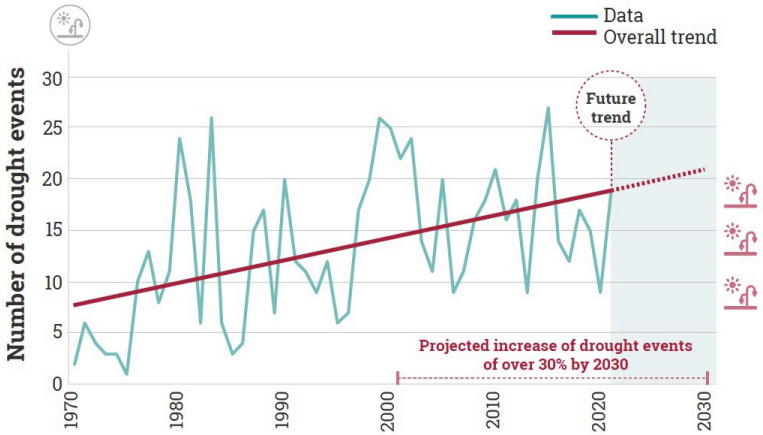
Number of disaster events (1970-2020) and projected increase (2020-2030)



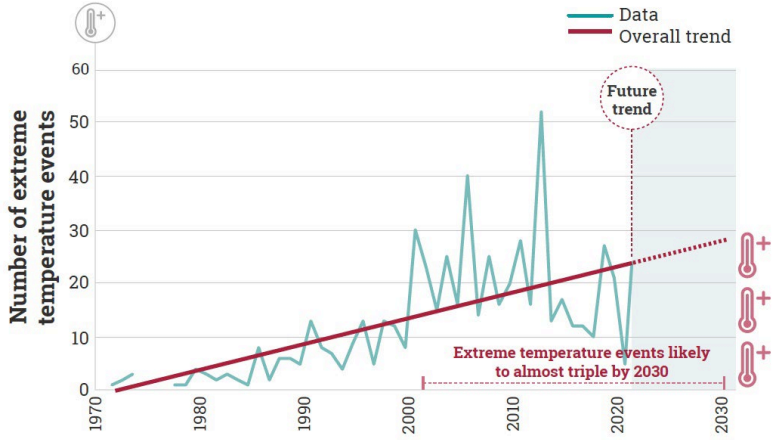
Source: UNDRR analysis based on EM-DAT (CRED, 2021)

Number of drought events (1970-2020) and projected increase (2020-2030)



Source: UNDRR analysis based on EM-DAT (CRED, 2021)

Number of extreme temperature events (1970-2020) and projected increase (2020-2030)



Source: UNDRR analysis based on EM-DAT (CRED, 2021)

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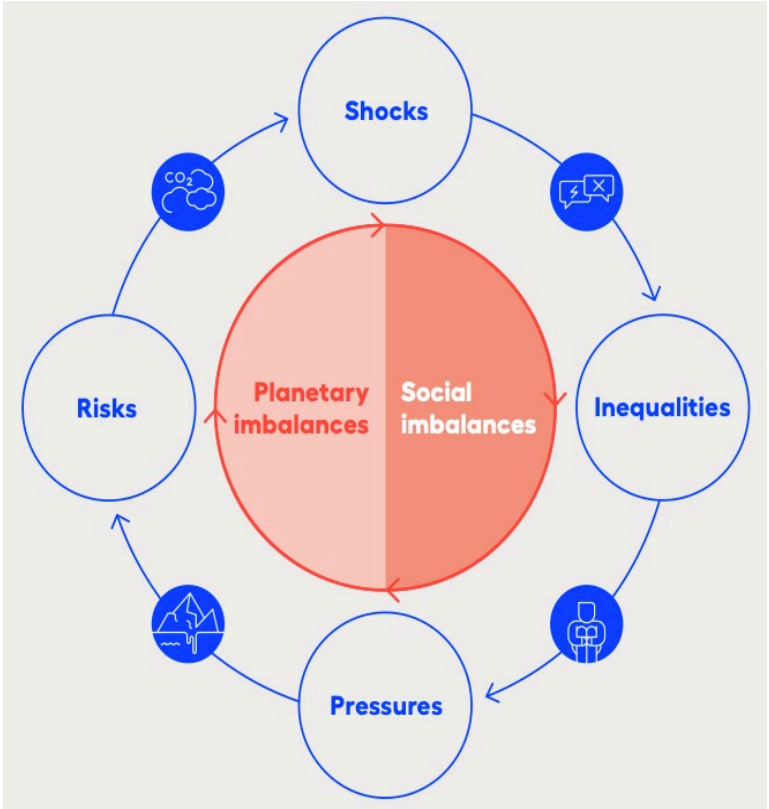
Resilience in the Anthropocene

- Warning lights — for our societies and the planet — are flashing **red**.
- **Planetary and social imbalances reinforce each other:** Human choices, shaped by values and institutions, have given rise to the interconnected planetary and social imbalances.
- **Inequalities in human development are increasing**
- **Climate change**, among other dangerous planetary changes, will only make them worse.



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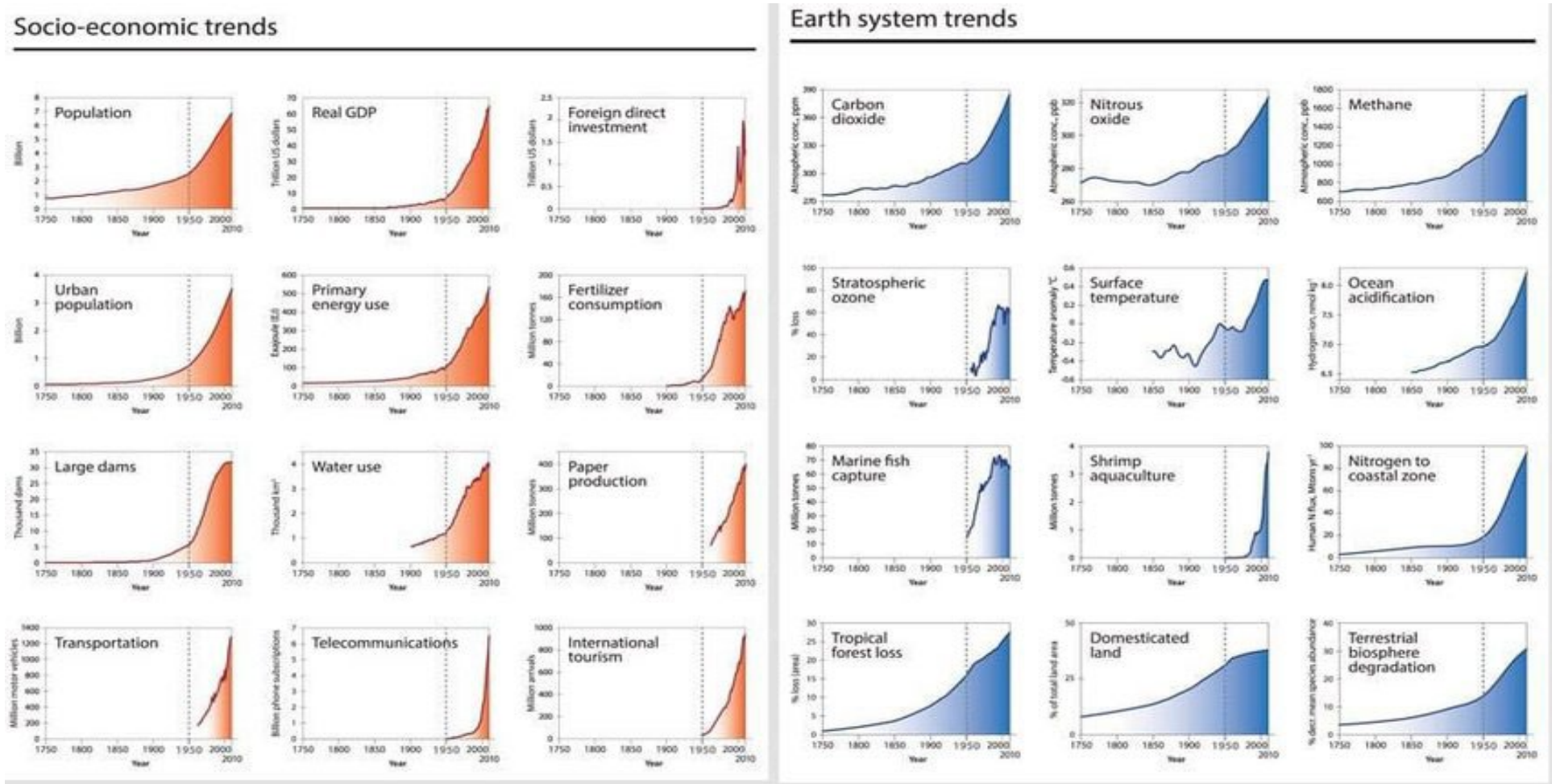
Drivers of Systemic Risks



Updated Great Acceleration Graphs

Source: Will Steffen et al. "The trajectory of the Anthropocene: The Great Acceleration." The Anthropocene Review, March 2015

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Geographic Approach to Resilience

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Transformation is needed in environmental, financial and governance systems

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GIS Community & Systemic Risk

- **Relationship of the elements within a system**
- **Scale of the system**
- **System understanding**
- **Outcomes of systemic risk.**
- **Transboundary effects**

Relationship
- Feedback loops
- Interactions
- Interconnections
- Interdependencies
- Interlinkages
- Intertwined

Scale
- Global
- National
- Regional
- Local

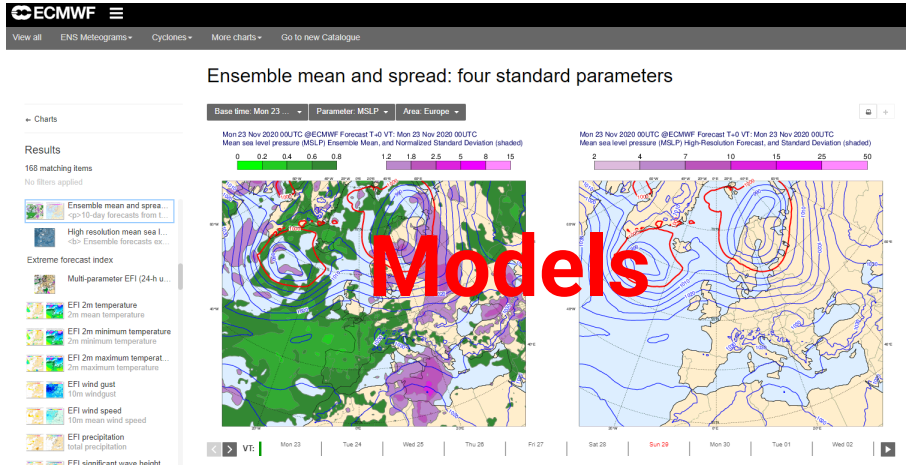
Outcomes
- Breakdowns
- Collapse
- Critical services to society
- Disruption of systems and essential services
- Failure of economic, financial or social systems
- Impacting/affecting an entire system
- Serious negative consequences
- Threats to system survival
- Unbound damage

System understanding
- Unknown
- Lack of knowledge
- Unpredicted
- Uncertainty
- Ambiguity
- Underestimated
- Tipping points/events
- Stochastic effects

Transboundary effects
- Cascading effects
- Complexity (Complex causal structures)
- Contagion
- Indirect impacts
- Knock-on effects
- Nonlinearity (Nonlinear cause–effect relationships)
- Ripple effects
- Spillover effects
- Wider effects

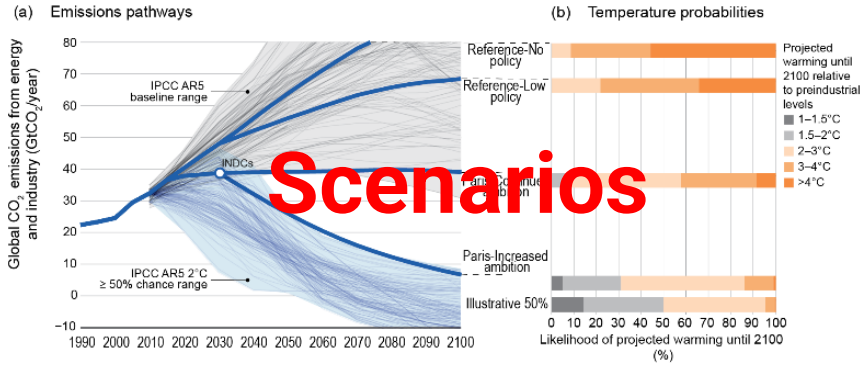
Source: Based on Sillmann et al. (2022)

Geographic Approach to Resilience

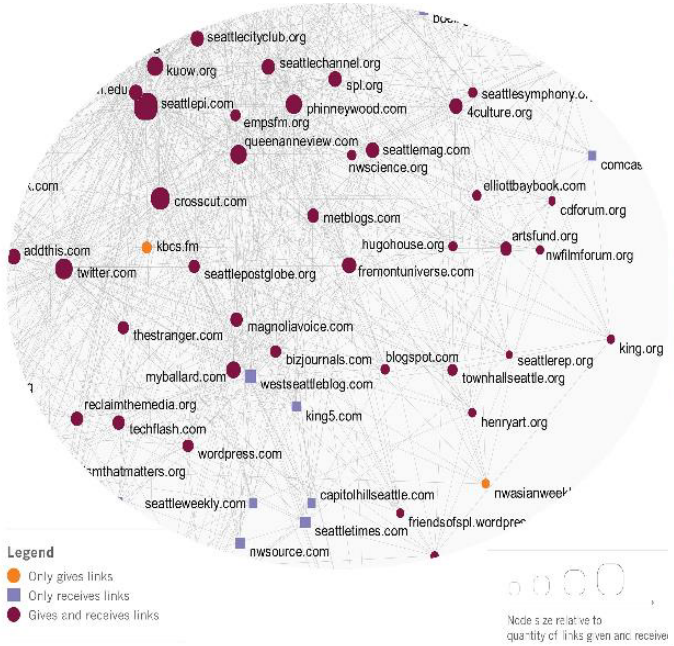


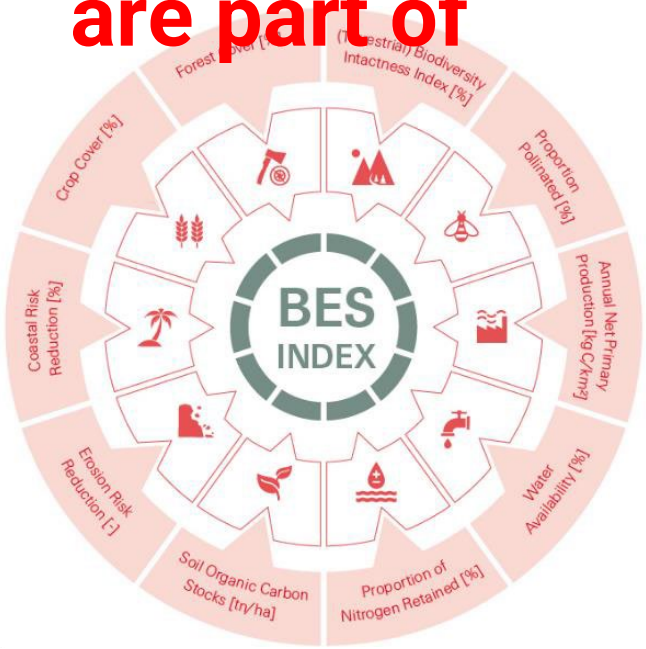
Models

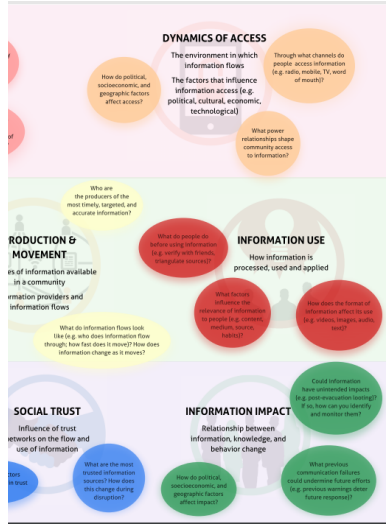
Scenarios



are part of







Information Ecosystems

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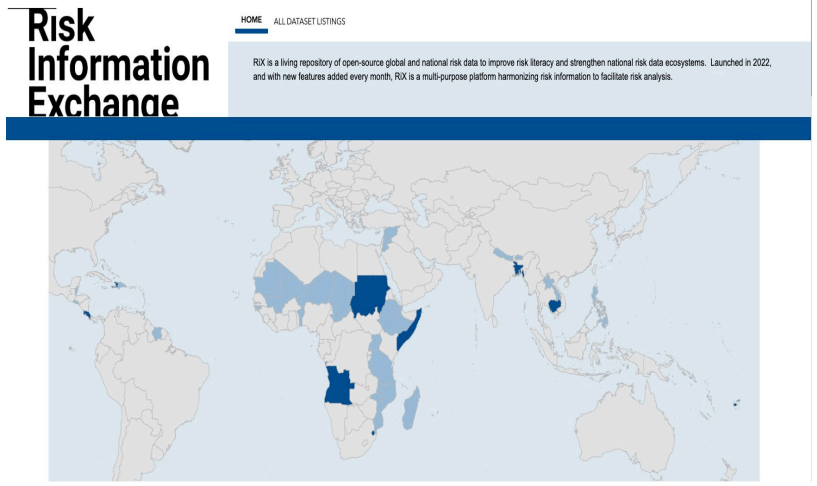
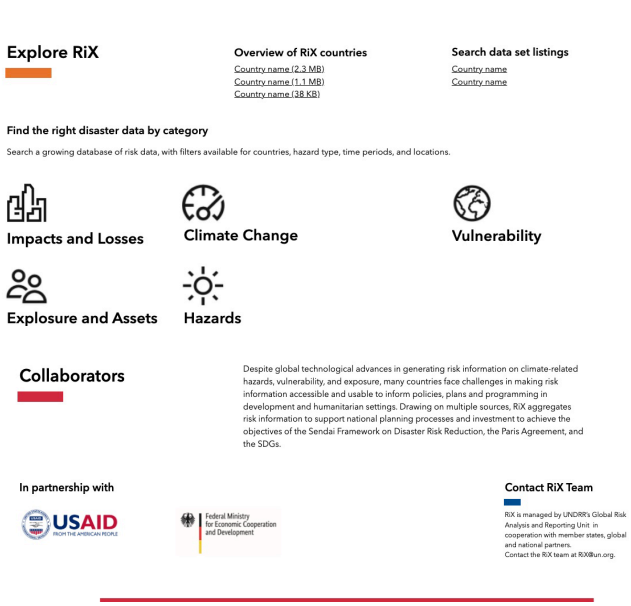
Aggregating Risk Information for Resilience

Risk Information Exchange (RiX)

RiX is a living repository of open-source global and national risk data to improve risk literacy and strengthen national risk data ecosystems. Launched in 2022, and with new features added every month, RiX is a multi-purpose platform harmonizing risk information to facilitate risk analysis





HAZARD INFORMATION PROFILES

Supplement to :

UNDRR-ISC Hazard Definition & Classification Review - Technical Report

SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030

International Science Council The global voice for science

UNDRR UN Office for Disaster Risk Reduction

MH0027 / METEOROLOGICAL AND HYDROLOGICAL / Marine

Storm Surge

Definition

A storm surge reflects the difference between the actual water level under the influence of a meteorological disturbance (storm tide) and the level which would have occurred in the absence of the meteorological disturbance (i.e., astronomical tide) (WMO, 2008, 2011, 2017).

References

WMO, 2008. Technical Regulations, Volume III: Hydrology, WMO No. 49. World Meteorological Organization (WMO). www.wmo.int/pages/prog/hwrp/publications/technical_regulations/49_III_E_supplement1.pdf Accessed 26 November 2019.

WMO, 2011. Guide to Storm Surge Forecasting, WMO No. 1076. World Meteorological Organization (WMO). https://library.wmo.int/doc_num.php?explnum_id=7747 Accessed 12 August 2020.

WMO, 2017. Regional Association IV – Hurricane Operational Plan for North America, Central America and the Caribbean, WMO-No. 1163. World Meteorological Organization (WMO). https://library.wmo.int/doc_num.php?explnum_id=3781 Accessed on 26 November 2019.

Annotations

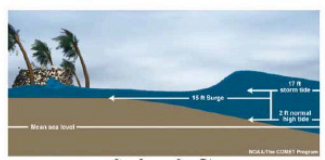
Synonyms

Not identified.

Additional scientific description

A storm surge is the rise in seawater level caused solely by a storm. It is the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. The surge is caused primarily by a storm's winds pushing water onshore. The amplitude of the storm surge at any given location depends on the orientation of the coast-line with the storm track, the intensity, size, and speed of the storm, and the local bathymetry (NOAA, 2019a). This is illustrated in the graphic below (NOAA, 2019a).

A storm tide is the water level that results from the combination of the storm surge and the normal (astronomical) tide. A 3-metre (9.8 feet) storm surge on top of a high tide that is 2 metres (6.6 feet) above the mean sea level will produce a storm tide that is 5 metres (16.4 feet) above mean sea level. Storm surge should not be confused with storm tide. This rise in water level can cause extreme flooding in coastal areas, resulting from storm tides reaching up to 6 meters (20 feet) or more in some cases (NOAA, 2019b).



Storm Surge vs. Storm Tide

Risk Information Exchange

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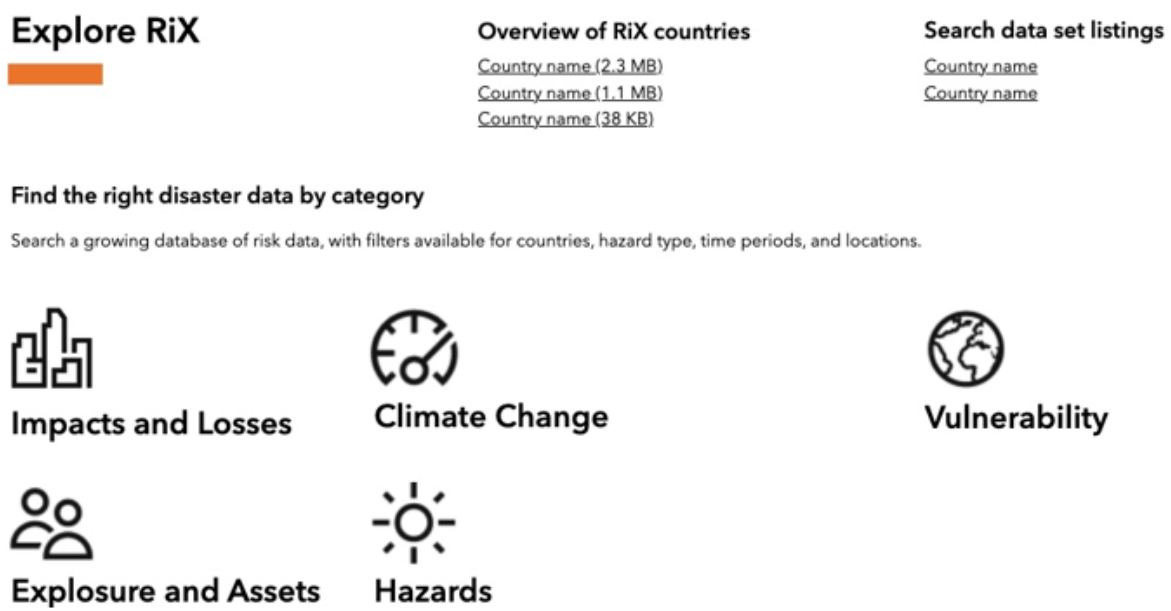
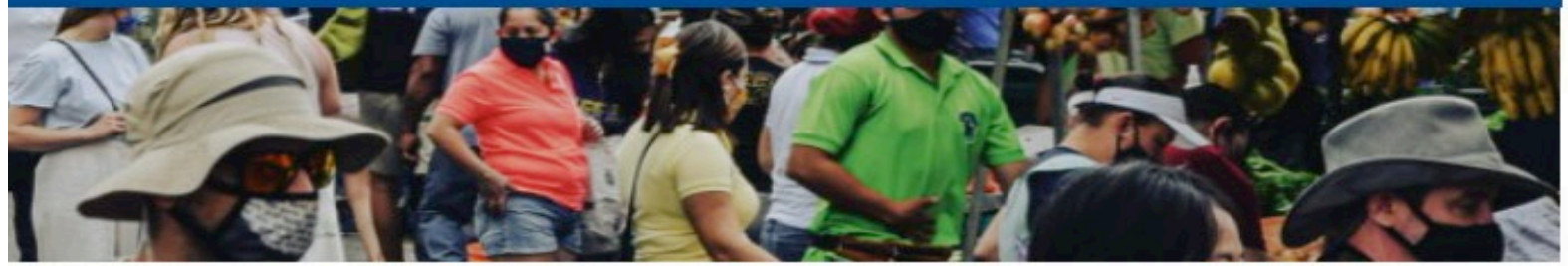


RiX

RiX: Coverage and data

RiX is designed for scaleable coverage across multiple countries, with the first cluster including Costa Rica, Somalia, South Sudan, Sudan, Eswatini, the Maldives, Bangladesh, and Fiji. Additional countries will be added to RiX, with a target of 52 countries by the end of 2022, and reaching 100 countries by the end of 2023. RiX is a key tool under the Global Risk Assessment Framework.

To support better access to and sharing of risk information, RiX draws from multiple sources to provide the best available risk, hazard, exposure, vulnerability, loss and damage, and climate data. RiX draws risk information that is high quality, reliable, and authoritative from government and UN sources, as well as global, regional, and third-party organizations.



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Thank you

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Andrew Spezowka

UN Office for Disaster Risk Reduction (UNDRR)

Camille Wallen

HALO Trust

The Geographic Approach to Resilience

Camille Wallen
Director of Strategy

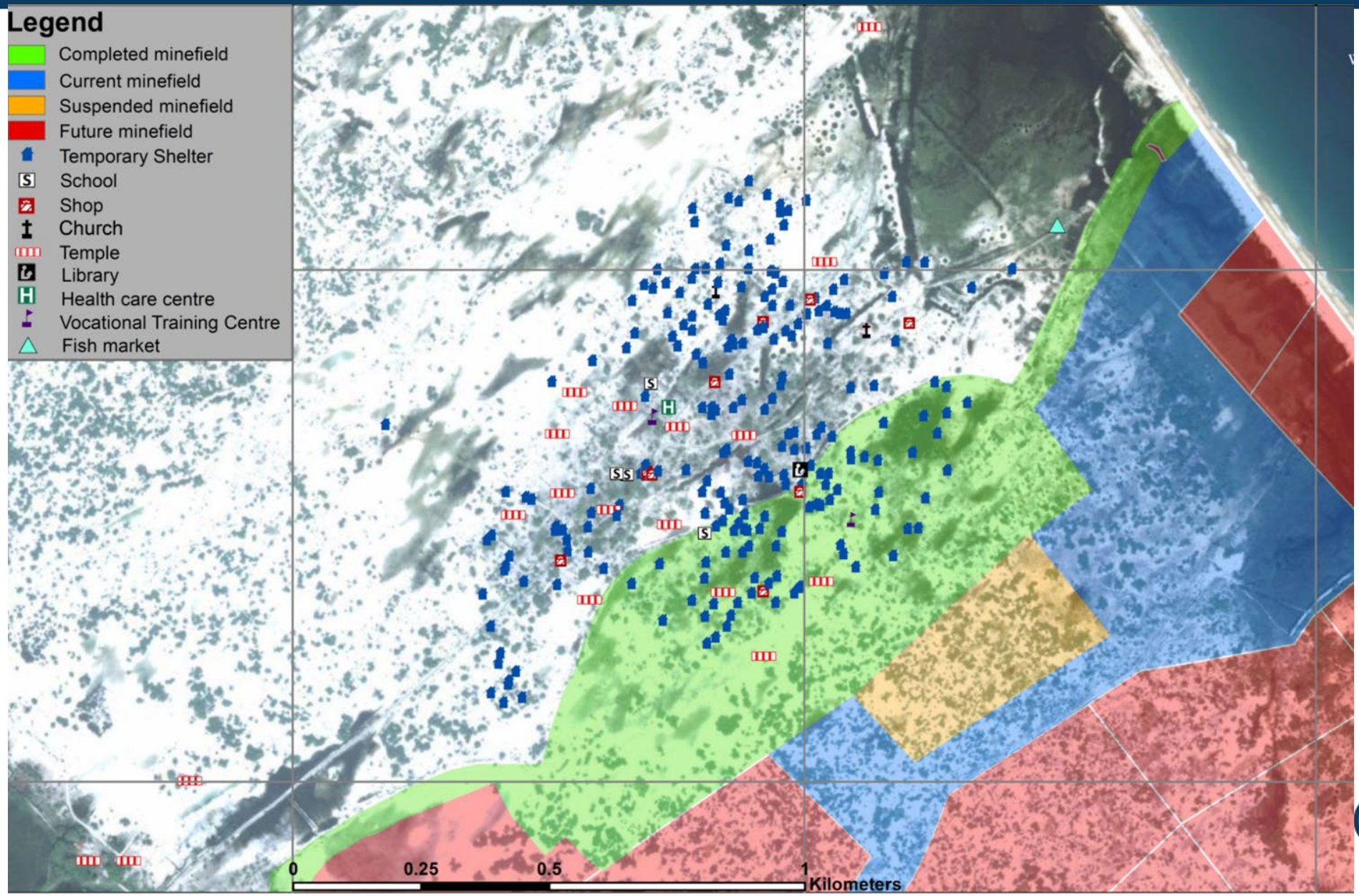
May 2022

The HALO Trust – Our work

The HALO Trust – Our work

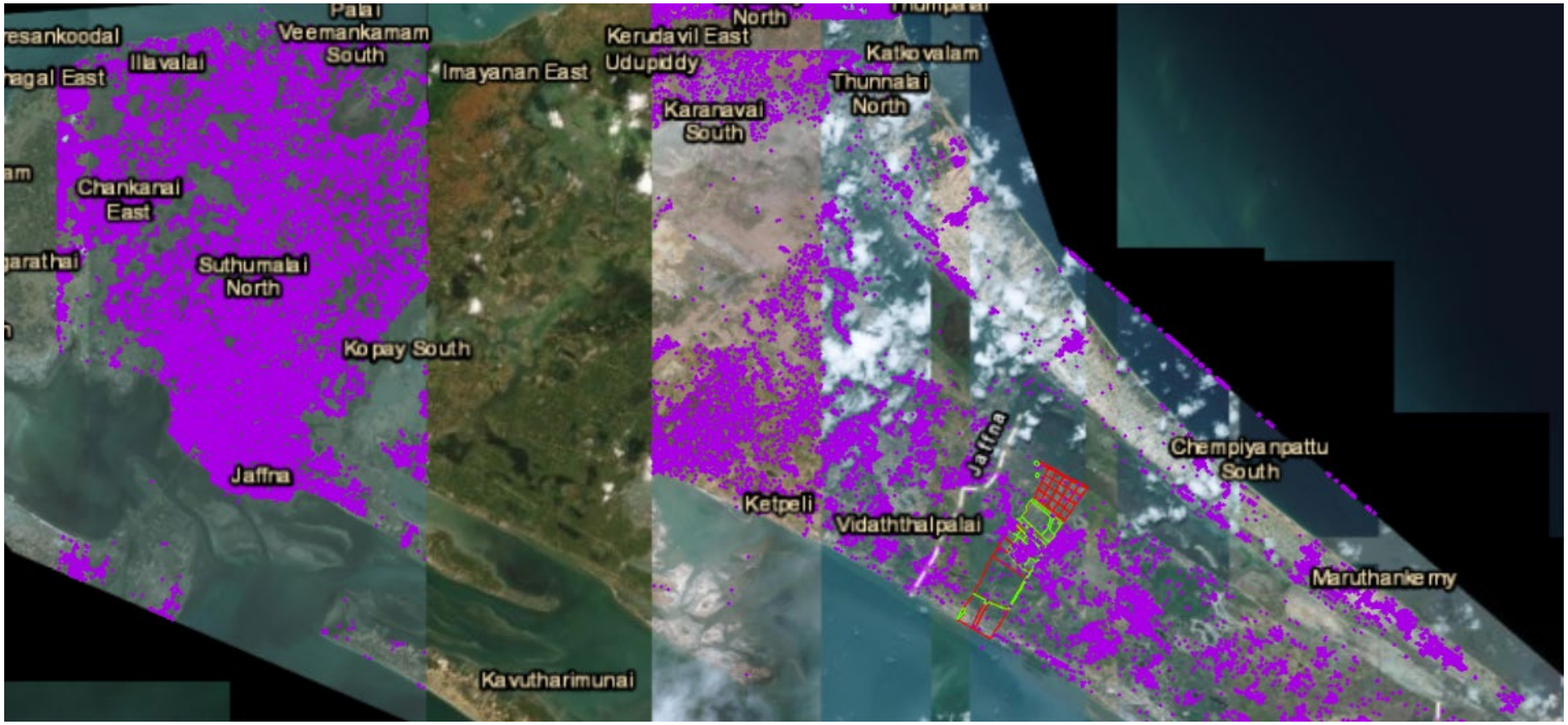
The HALO Trust – Our impact

The HALO Trust – Our impact



Buildings Detection (Sri Lanka)

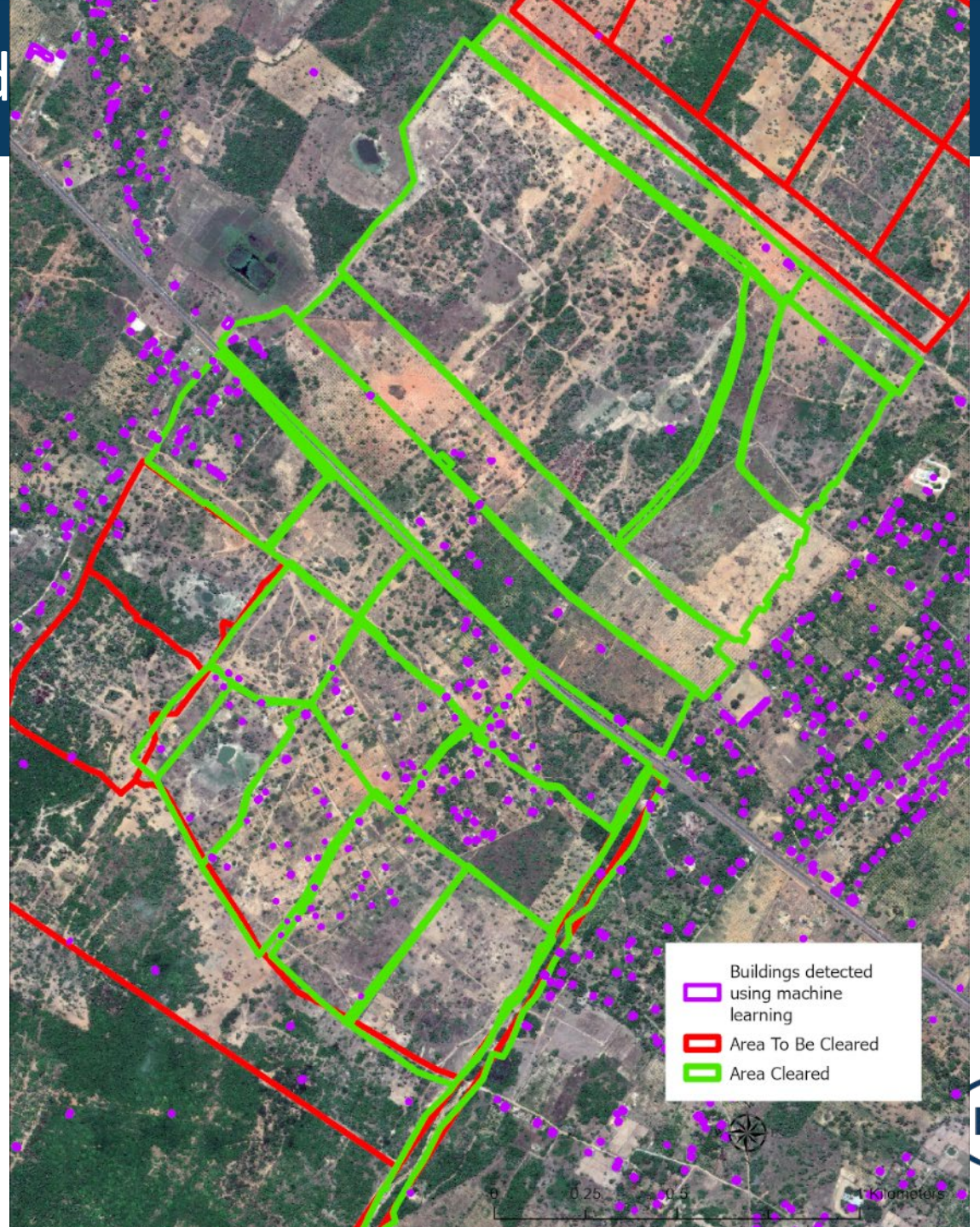
- # Buildings – 74,800 total
- Coverage – 80% of Northern Sri Lanka
- Accuracy - ~90%



Muhamalai Minefield

- Clearance started in 2012 and continues today

- 169 buildings detected inside minefield



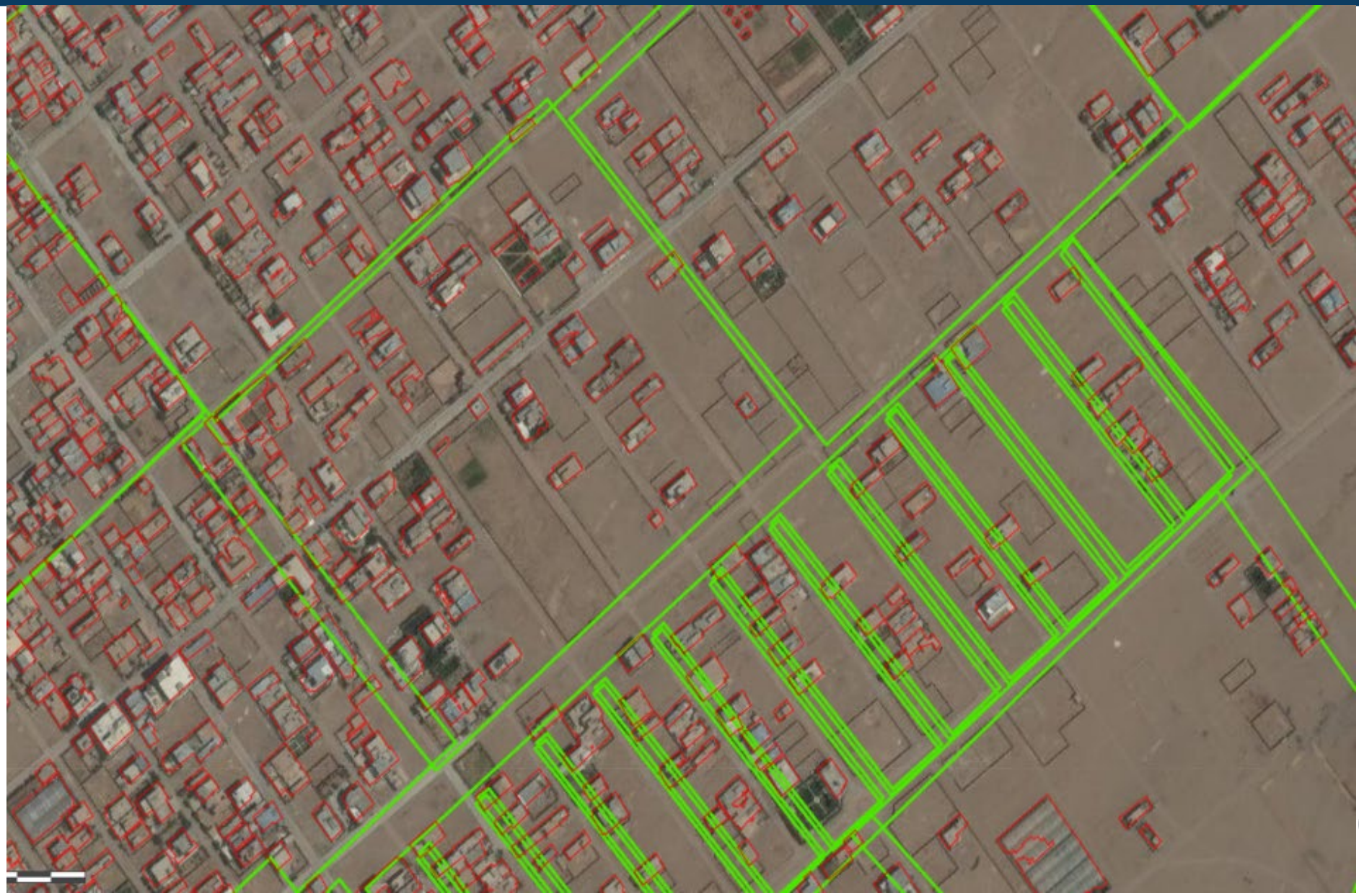
THE HALO TRUST

Landuse Detection (Sri Lanka)

Buildings Detection (Afghanistan)

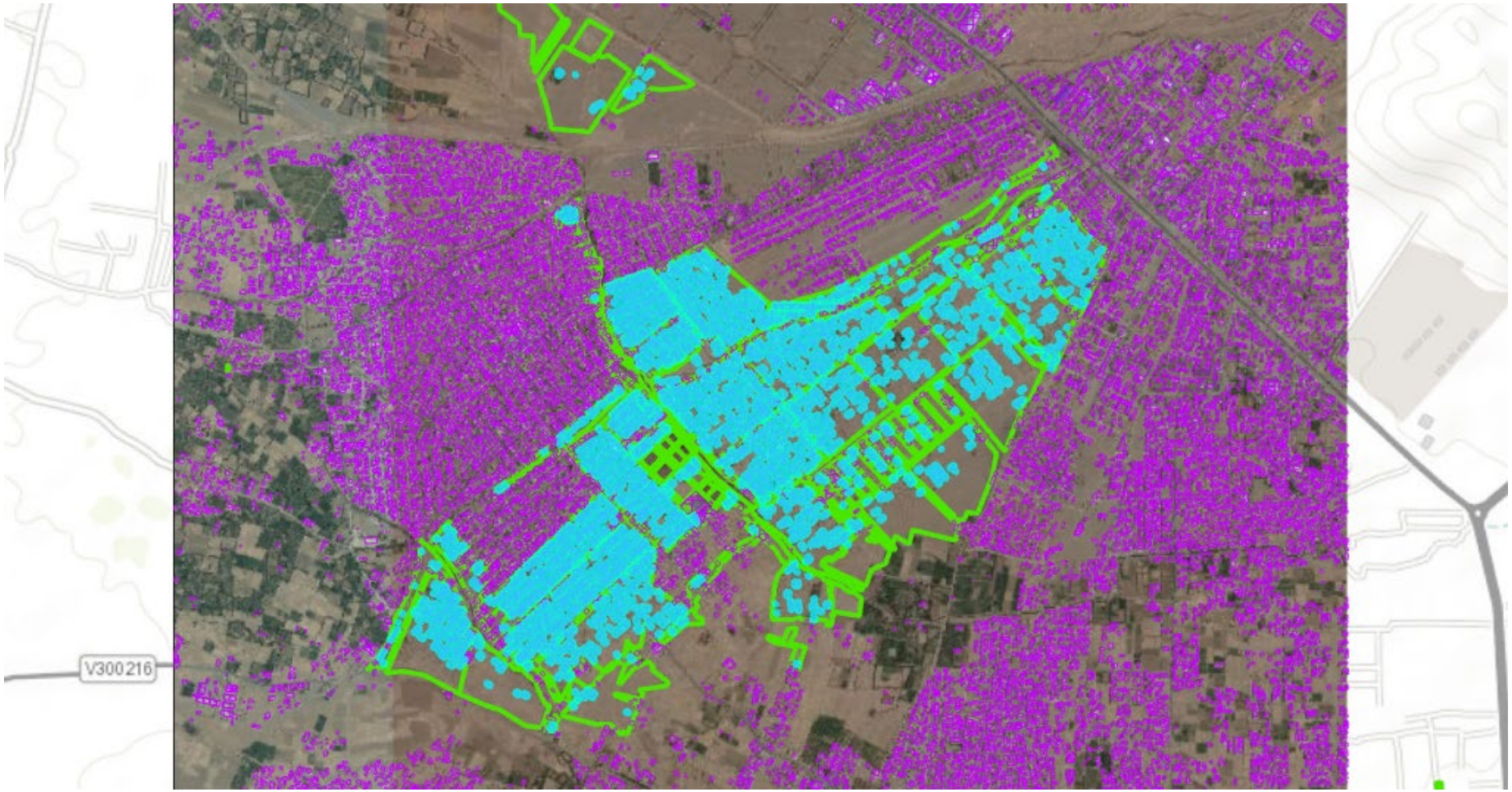
- # Buildings – 24,600 total
- Coverage – smaller area (Jebrail minefield NW of Herat – Clearance finished 2013 – many IDPs and refugees)
- Accuracy - ~90%

Buildings Detection (Afghanistan)

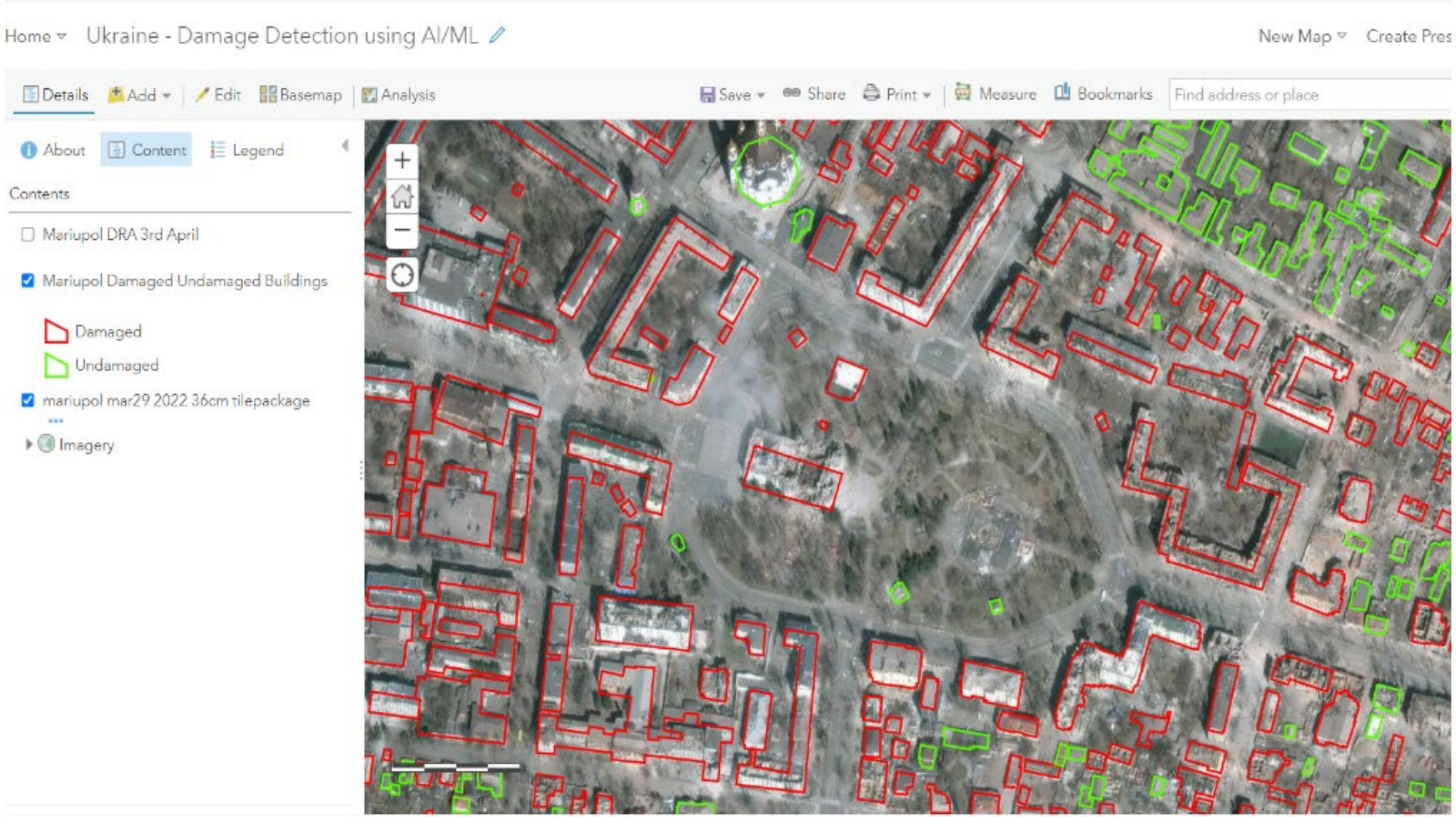


Buildings Detection (Afghanistan)

- 2798 buildings detected inside cleared area
- To send teams to do a census would be difficult

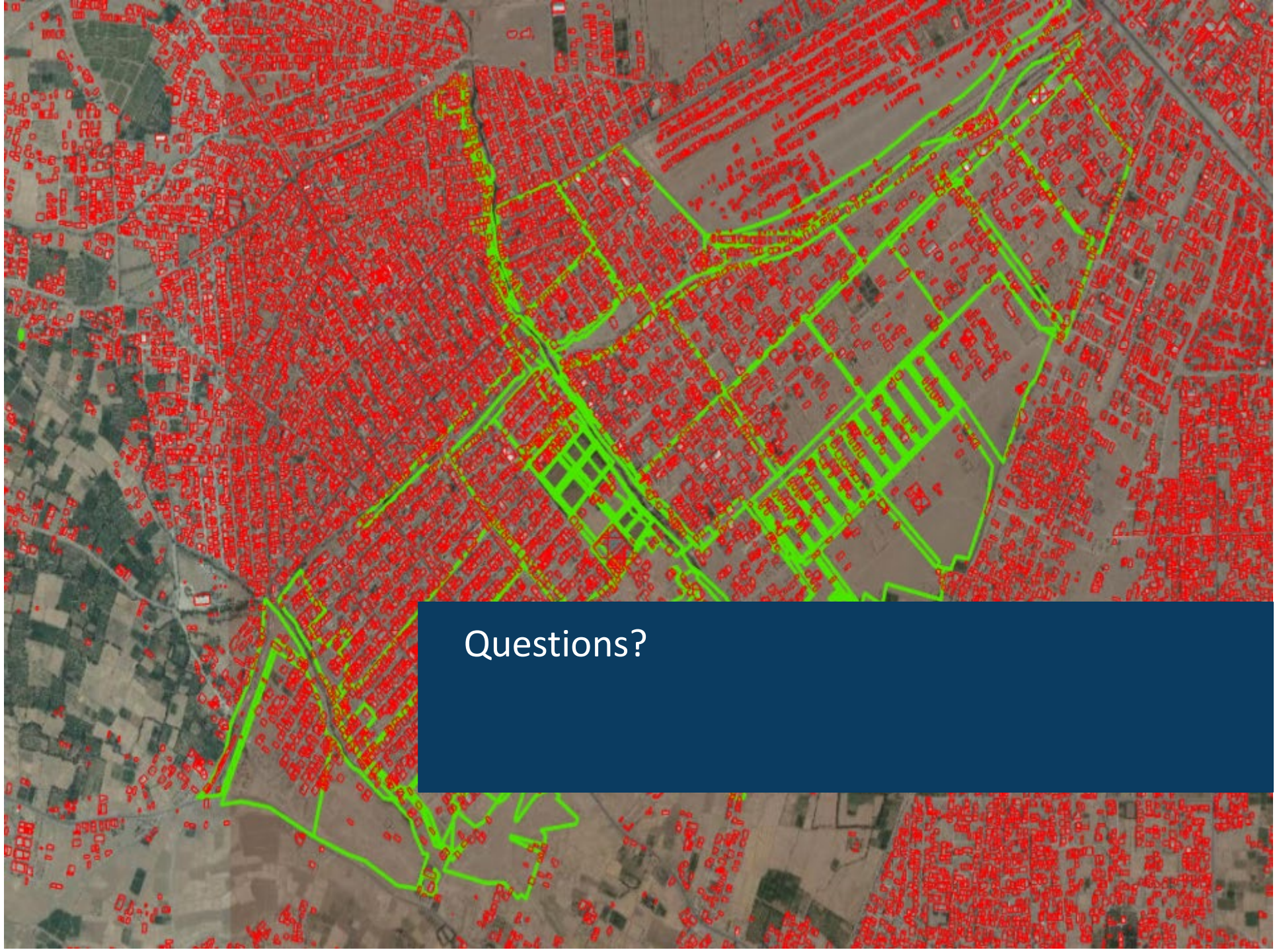


Ukraine – Mariupol – detecting building damage



Next steps

- Quantifying social, economic and environmental value of removing landmines
- Providing verifiable data for finance mechanisms, carbon credits etc.
- Layering with social and economic infrastructure and weather patterns to assess points of vulnerability and inform project planning


Questions?

Our Agenda Tomorrow

Wednesday, May 11th

- 8:00am – 10:00am: Breakfast and Networking in Expo
- 10:00am – 11:00am: Plenary – Applying GIS for Resilience
- 11:00am – 11:15am: Networking Break in Expo
- 11:15am – 12:30pm: Training Sessions
- 12:30pm – 1:30pm: Hosted Lunch in Expo
- 1:30pm – 2:30pm: Anticipatory Action Lightning Talks & Panel
- 2:30pm – 3:00pm: Networking Break in Expo
- 3:00pm – 4:15pm: Localization Lightning Talks & Panel
- 4:15pm – 5:15pm: Closing Social in Expo

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