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THE SCIENCE OF WHERE™

GIS for a Sustainable World:
Building a Resilient Future

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

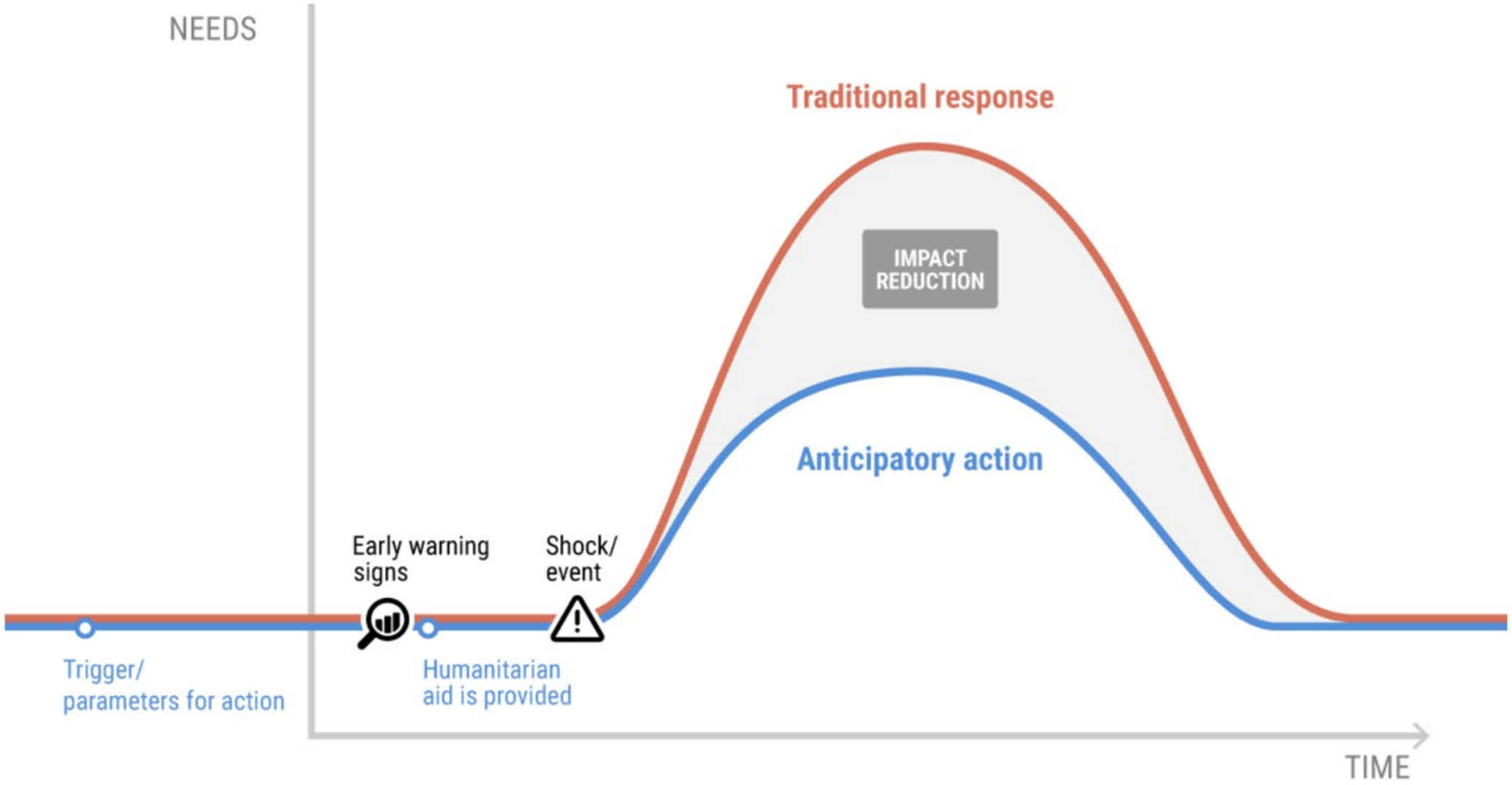
esri | THE SCIENCE OF WHERE

Community Lightning Talks and Panel Discussion on Anticipatory Action

Leonardo Milano, Moderator

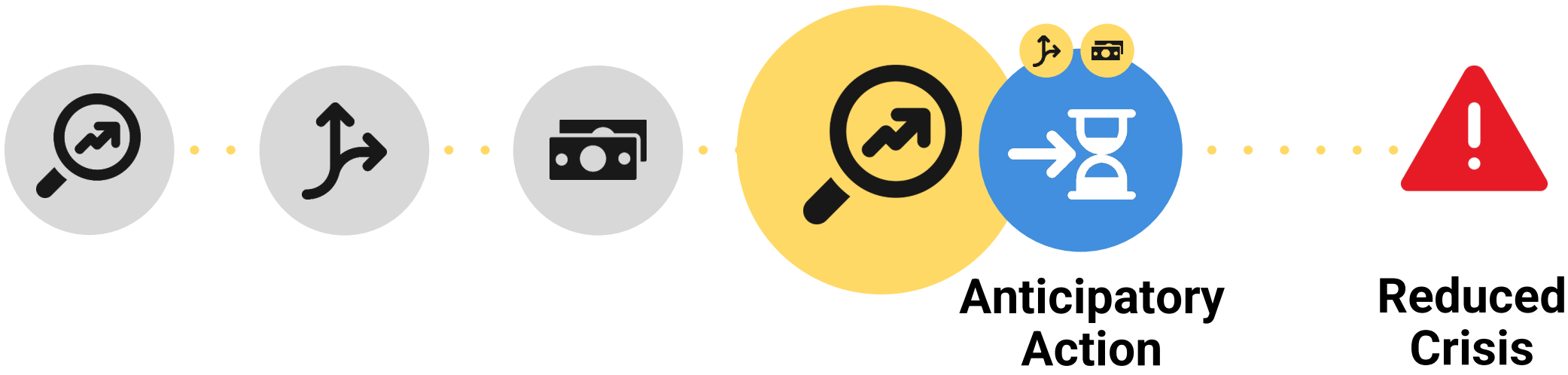
GIS for a Sustainable World Conference

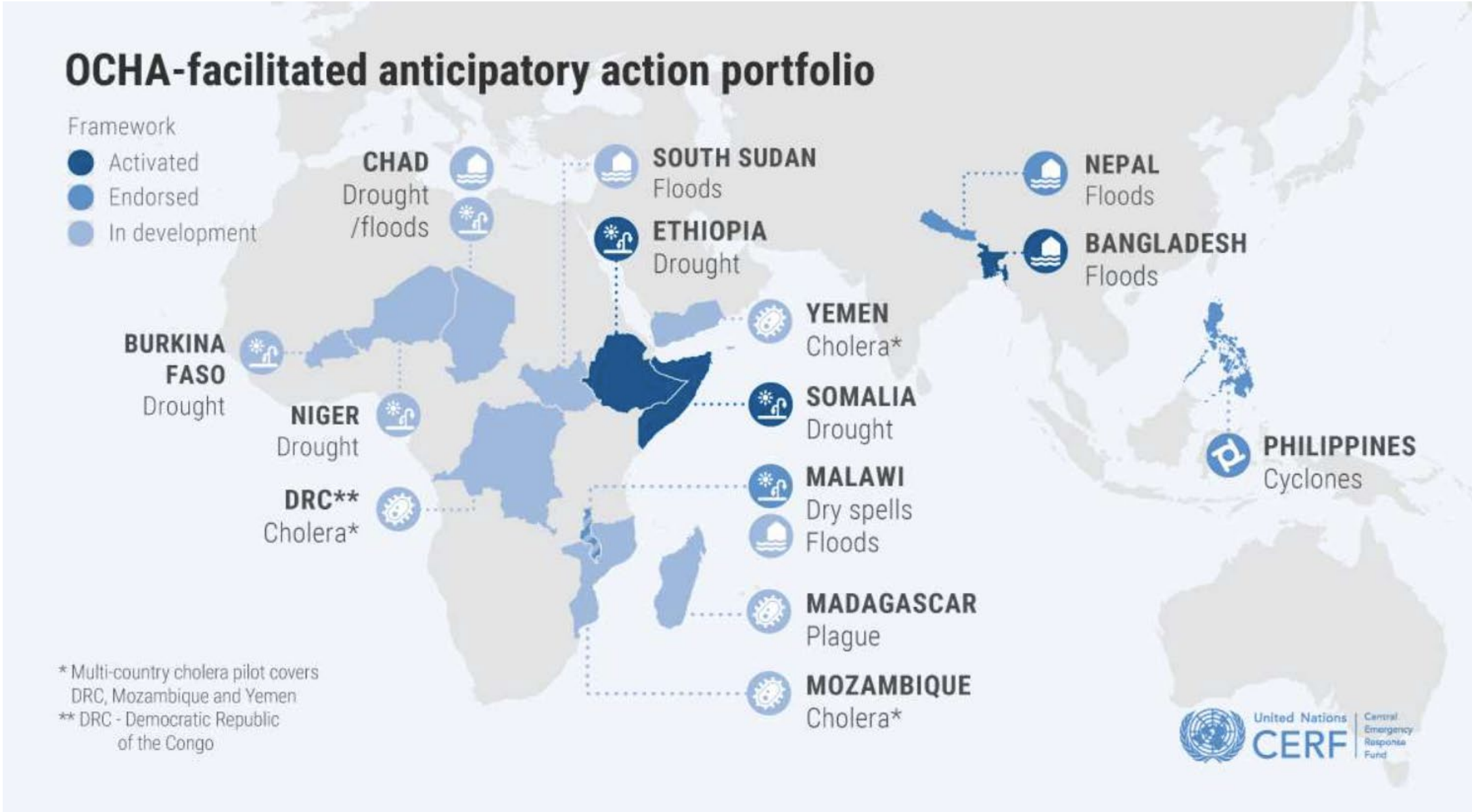
Anticipatory Action



Three Key Elements of Anticipatory Action

1. A robust forecasting embedded in a clear decision-making process (the model).
2. Pre-agreed action plans that can fundamentally alter the trajectory of the crisis (the delivery).
3. Pre-arranged finance (the money).





https://centre.humdata.org/anticipatory-action/

Data gaps are a persistent challenge.

Type of Data		Ethiopia (drought)	Malawi (dry spells)	Nepal (floods)	The Philippines (typhoons)
Hazard / Shock	Current and historical data about a hazard or shock			Not machine readable	
Impact	Data about the historical and expected impact of the hazard or shock	Not sub-national	Partial-geographic coverage		Not machine readable
Forecast	Global forecasts				
	National and regional forecasts			Not machine readable	Not machine readable

Data Complete Data Incomplete No Data

Presenters

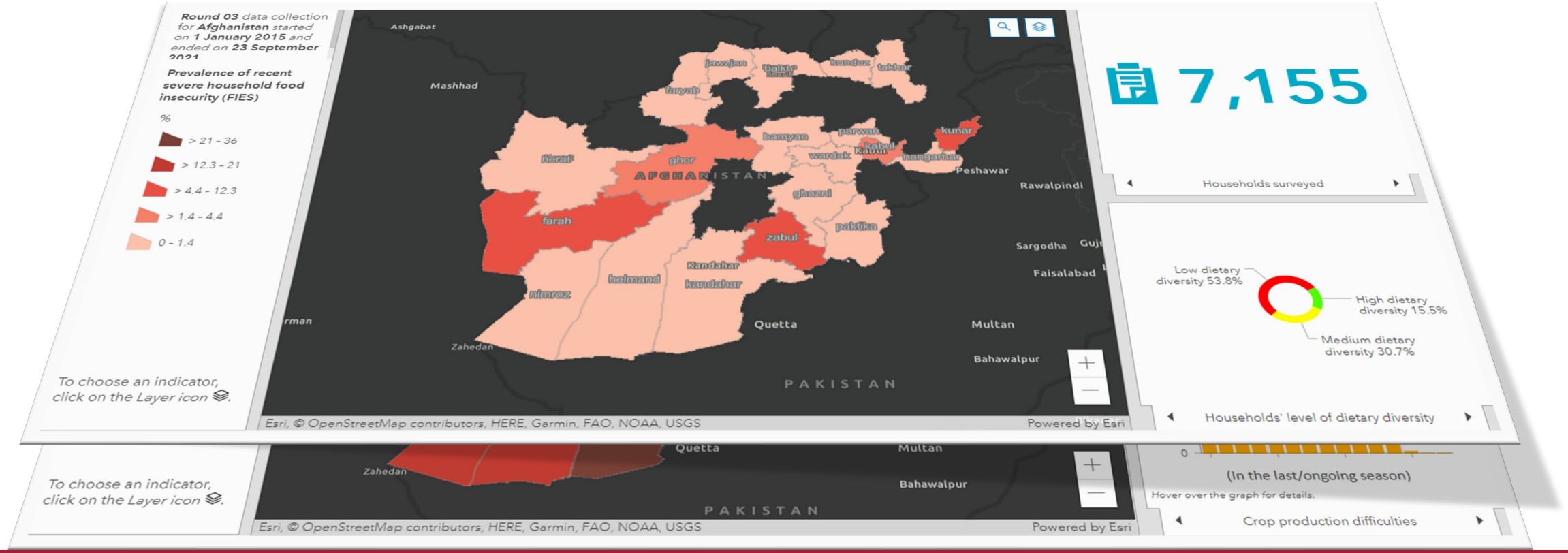
- Data in Emergencies Hub (DIEM Hub)
  - Josselin Gauny, Needs Assessment Team Leader, Office of Emergencies and Resilience, FAO and Neil Marsland, Senior Technical Officer, Office of Emergencies and Resilience, FAO
- Population Data for Action: A Population Data Portal
  - Dr. Rachel Snow, Chief, Population and Development Branch, UNFPA
- Hazard, Vulnerability and Risk Assessment for Anticipatory Action
  - Rahim Dobariya, Programme Manager Geospatial Information, Emergency Management Department, Aga Khan Agency for Habitat
- Guyana's National FEWS and Lessons Learned from 2021 Floodings
  - Imra Hodzic, Research Associate at the Disaster Risk Management and Climate Resilience Section, UNOSAT
- Ensuring Water Security
  - Michael Natschke, Director of Business Development, Central & North Europe, Xylem

Data in Emergencies Hub (DIEM Hub)

Josselin Gauny, FAO and
Neil Marsland, FAO

Food and Agriculture Organization of the United Nations

Data In Emergencies Hub (DIEM)



https://data-in-emergencies.fao.org/

Setting the scene

Why?

- Evidence for programming (emergency response, anticipatory action)
- Food security well covered, not agricultural livelihoods
- Lack of reliable, granular and timely data (essential to agriculture interventions)
- Data collection challenges in emergency situations
- Data dissemination challenges

What?

- Monitoring of shocks, agricultural livelihoods, value chains and food security
- > 25 countries, ~75 rounds and ~150k household interviews per year
- Data processing and visualization through a geospatial platform (ESRI environment)
- Dashboards, maps gallery, open data
- Dashboards published 3 weeks after data collection
- Public good

Population Data for Action: A Population Data Portal

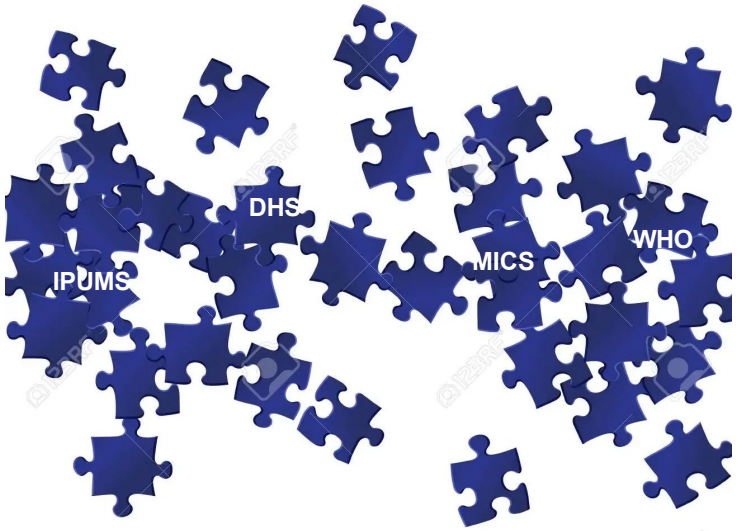
Dr. Rachel Snow, UNFPA

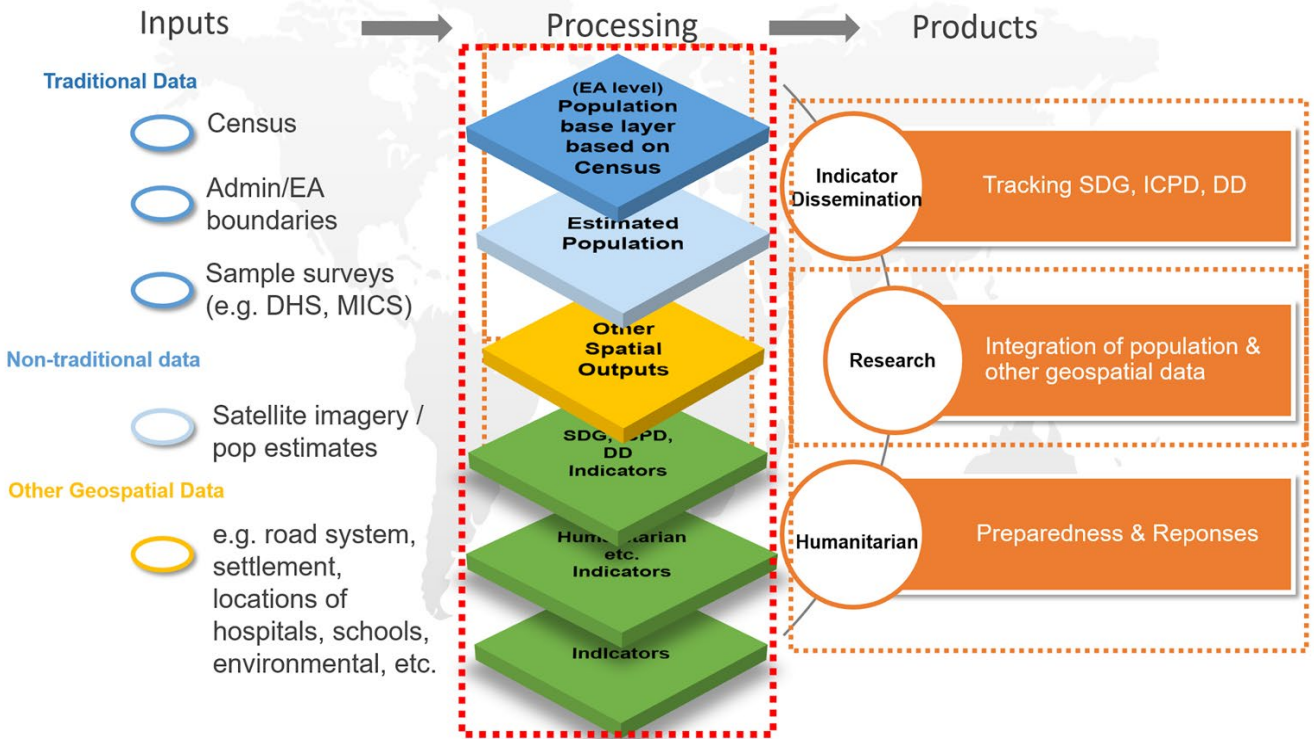
Population Data for Action: A Population Data Portal

GIS for a Sustainable World
ESRI Global Conference
Weds,11 May, 2022

Population data field...

Where we are → **Where we want to go**





PDP - data

The DHS Program
Demographic and Health Surveys

MICS

Household Surveys

GGP Generations & Gender Programme

National surveys

IPUMS INTERNATIONAL

Sample Census

Full count Census

National Statistics Authorities

Harmonization SDMX

WorldPop

World Health Organization

Global datasets

Population Division
United Nations Department of Economic and Social Affairs

UNESCO

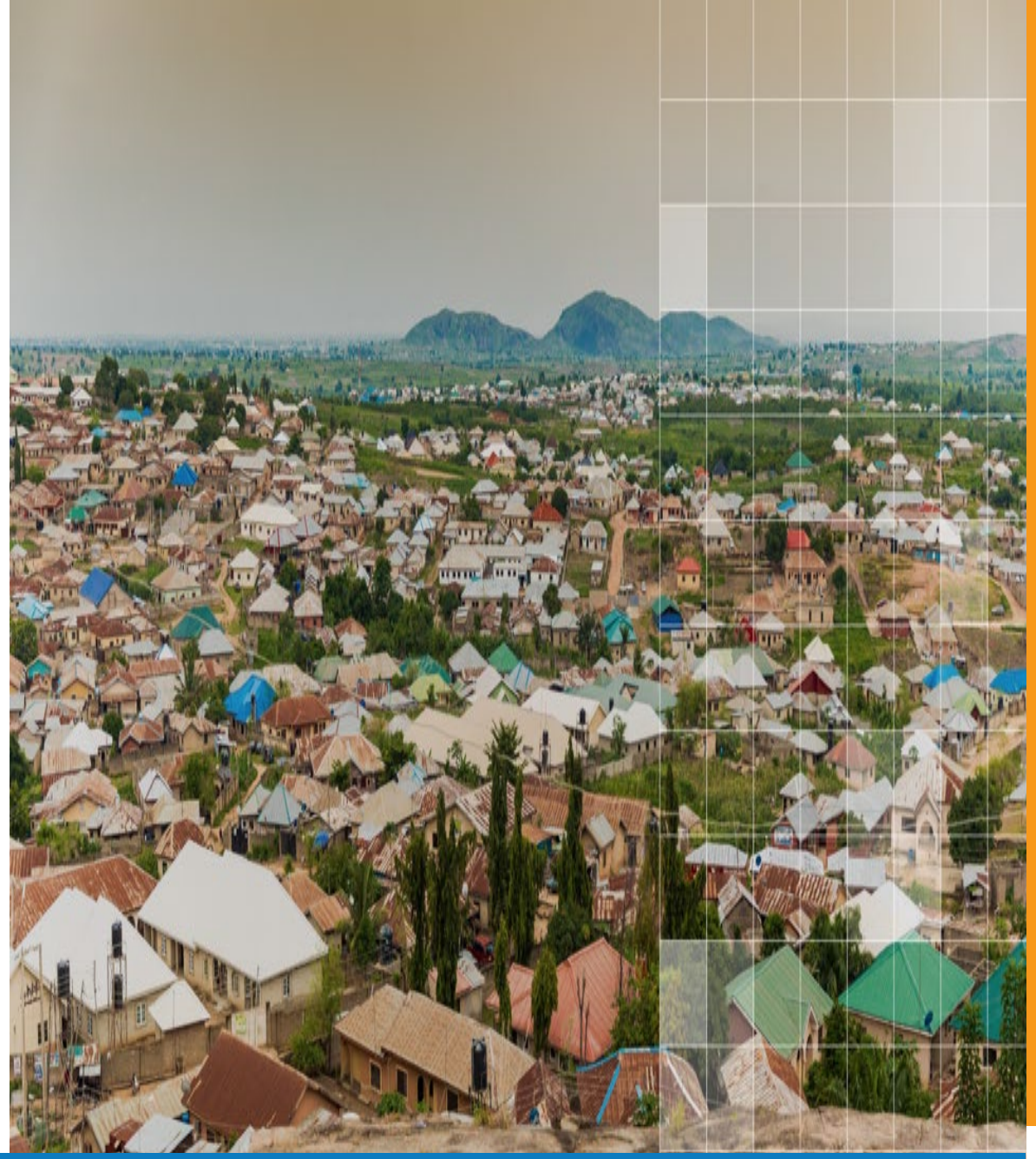
Geospatial data

200+ Indicators

Population
SRH
Gender

What is Unique?

- Geospatial dimension - highest quality GIS attributes
- Combine population data with development indicators to map Leave No One Behind (LNOB)
- Combine population data with service locations to evaluate coverage



Advances in Availability, Quality & Usability of CODs

164

Countries reporting CODs

153

Countries with fully usable administration boundaries

131

Countries with fully usable population statistics

127

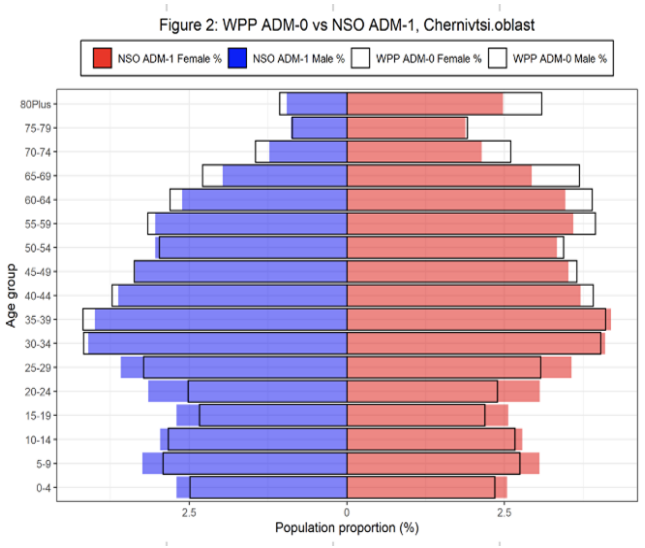
Countries with administration boundary and population statistics linked

COMMON OPERATIONAL DATASETS

Administrative Boundary Evaluation

Population Statistics Evaluation

COD-PS data challenges + opportunities in Ukraine



Last Population Census:
2001

High-quality vital statistics compiled national civil registration data, **2001-2020**

<u>Up-to-date</u>, age/sex/geo disaggregated **COD-PS**

CENTRE OF EXCELLENCE
for CRVS Systems

UNFPA

Hazard, Vulnerability and Risk Assessment for Anticipatory Action

Rahim Dobariya, Aga Khan Agency for Habitat

Aga Khan Agency for Habitat

an agency of the
Aga Khan Development Network
www.akdn.org

Hazard, Vulnerability and Risk Assessment for Anticipatory Action

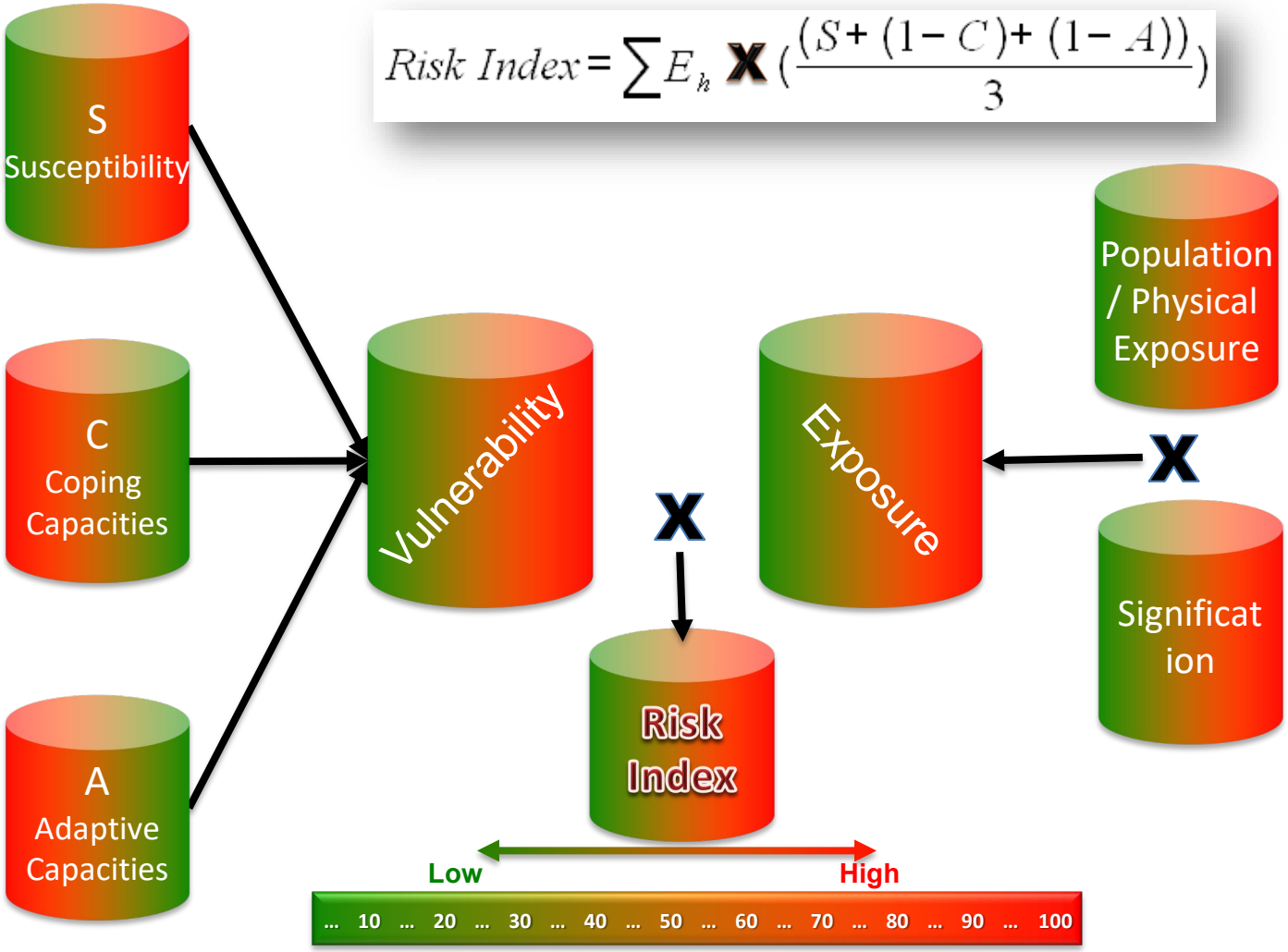
Rahim Dobariya, Programme Manager Geospatial Information

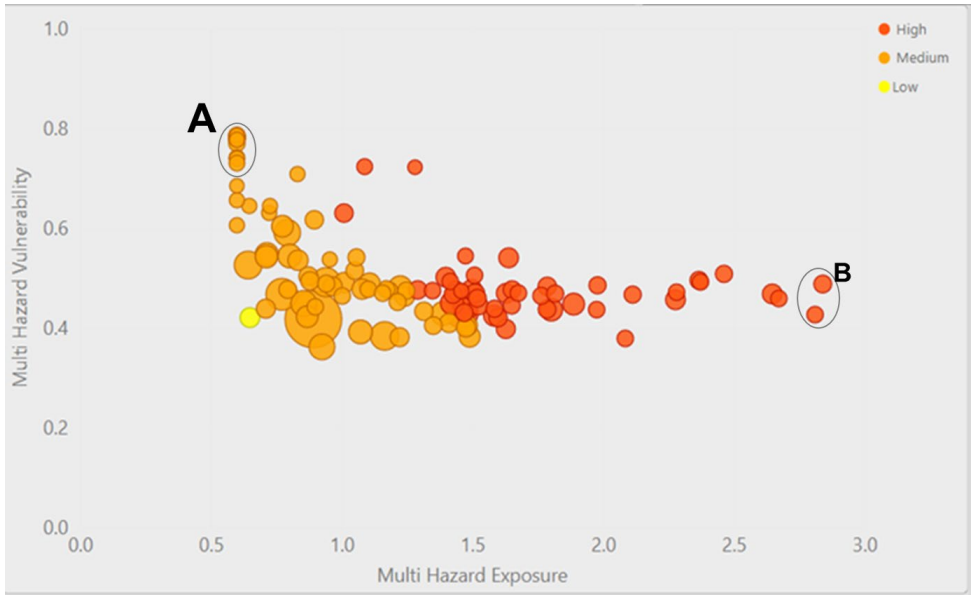
Introduction

- HVRA is a systematic approach to identify hazards and its risks at local community level using GIS
- HVRA completed for over 2500 settlements across 5 countries
- HVRA framework developed around GIS technology is fundamental and first step of AKAH's work for DRR interventions
- GIS based HVRA has become the backbone for AKAH DRR interventions

HVRA Standardized Methodology

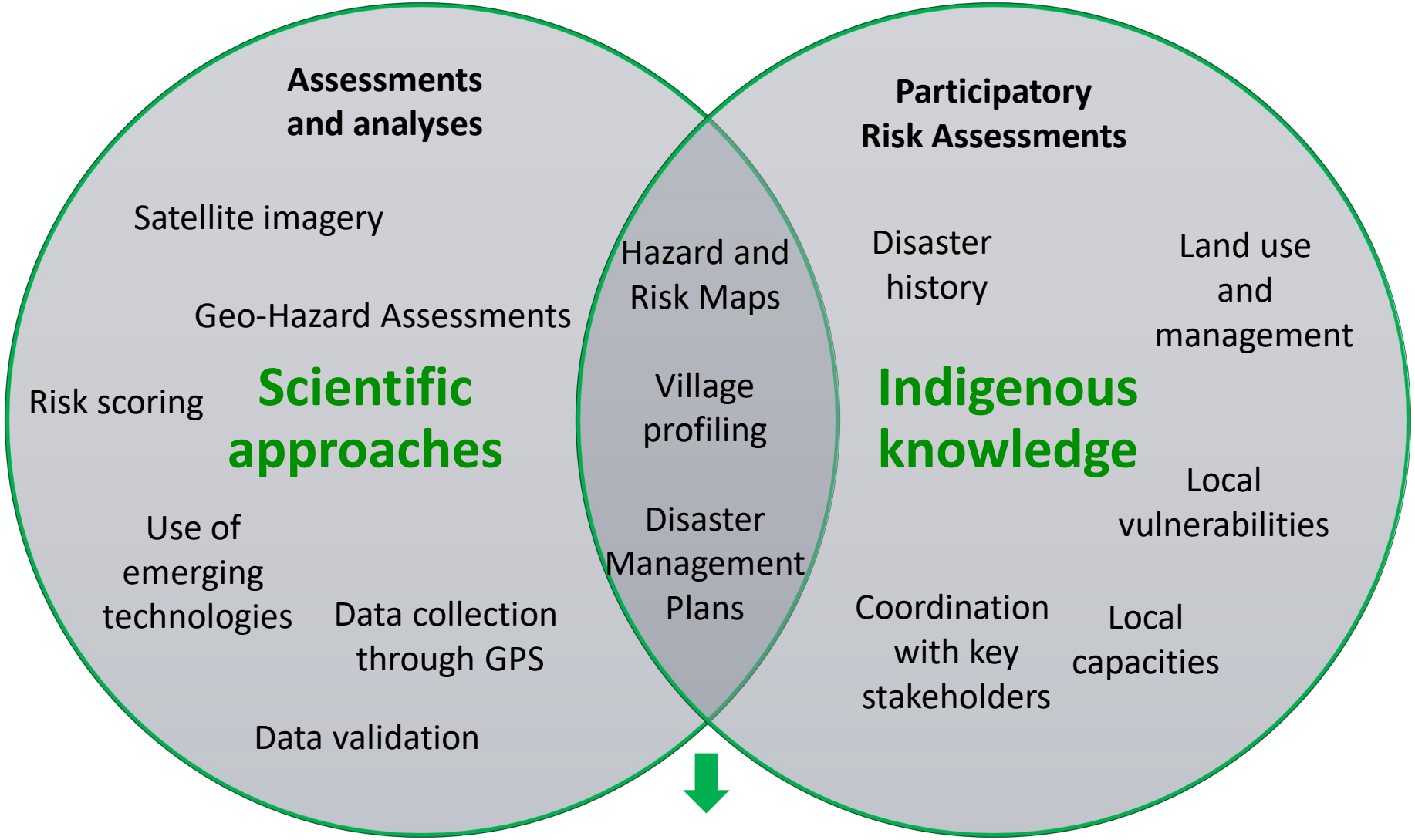
$$Risk\ Index = \sum E_h \times \left(\frac{(S + (1 - C) + (1 - A))}{3}\right)$$





Key innovation: Hazard and Vulnerability Risk Assessments (HVRAs)

Helping communities understand and adapt to climate and natural hazard risk

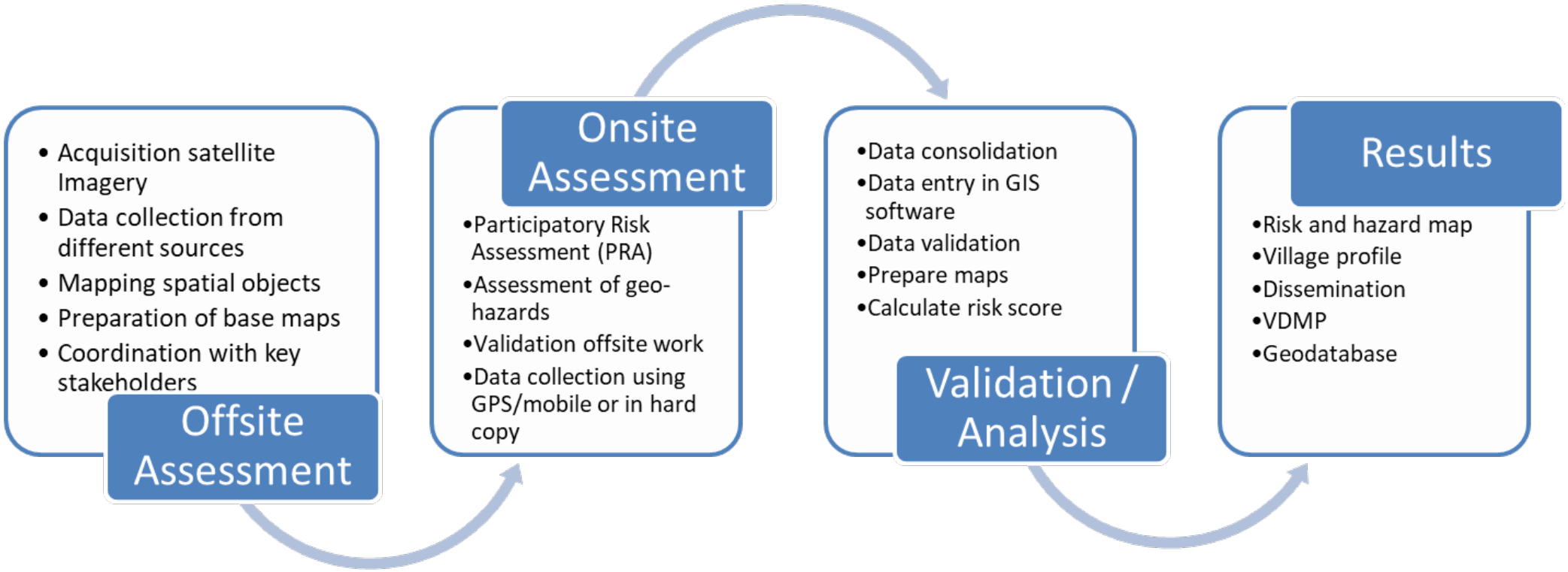


Factoring in international best practices into planning process

Building local capacities and increasing local ownership for ensuring sustainability

Planning safe and climate resilient habitats, helping people thrive

Standard Procedures



Data Collection



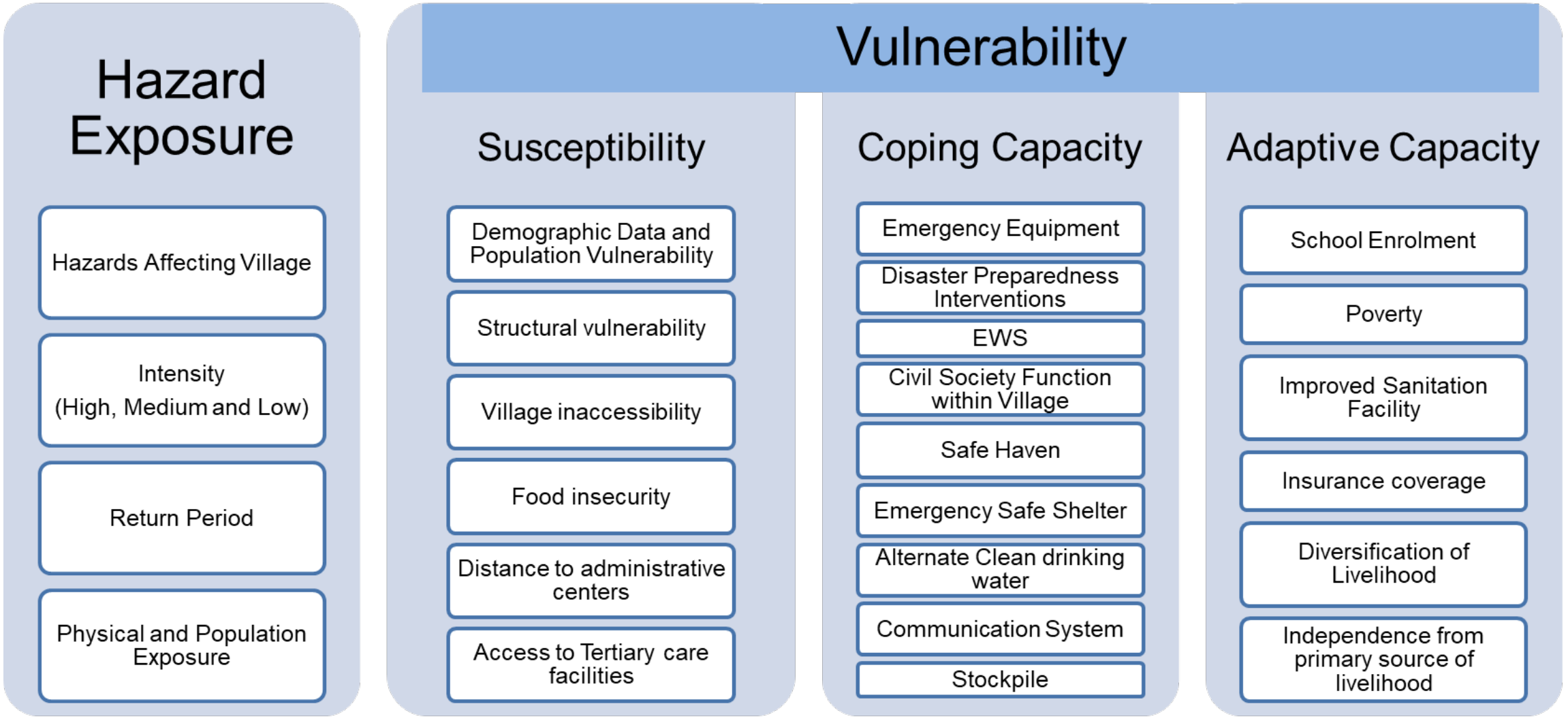




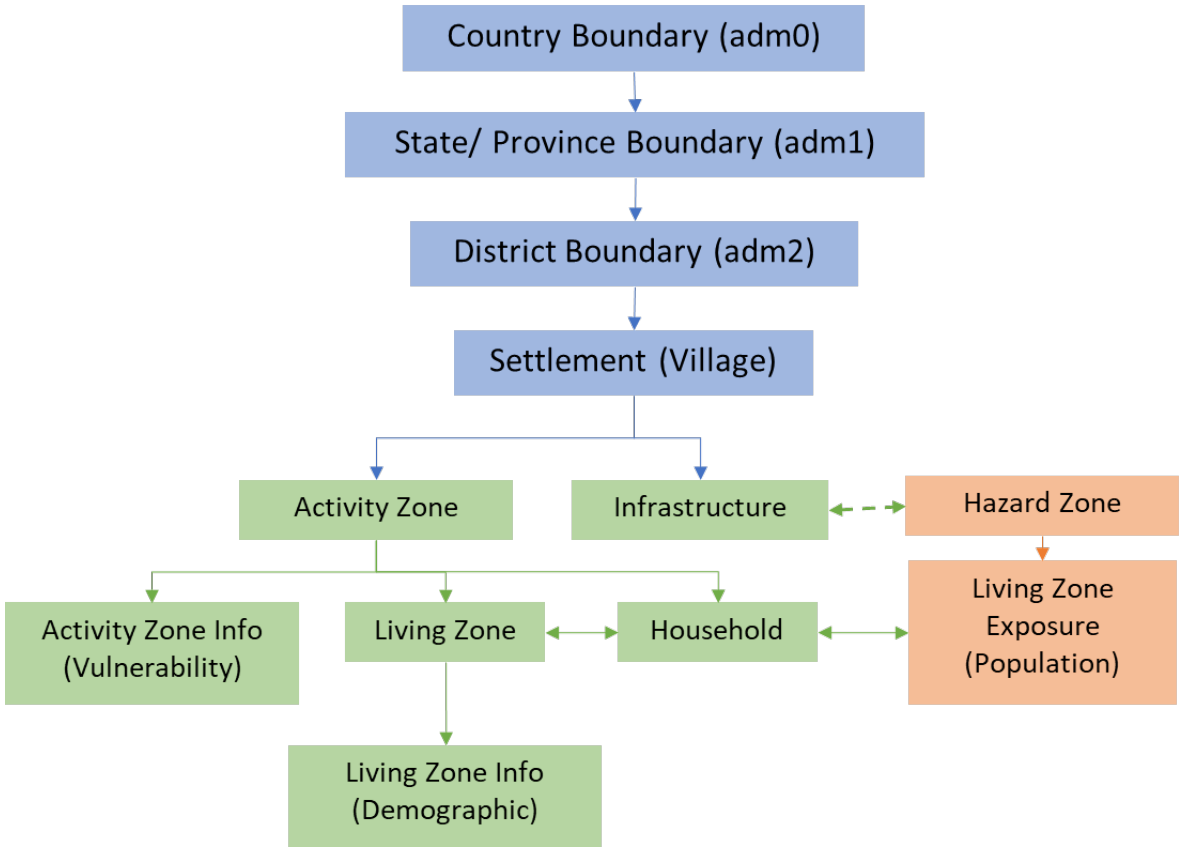


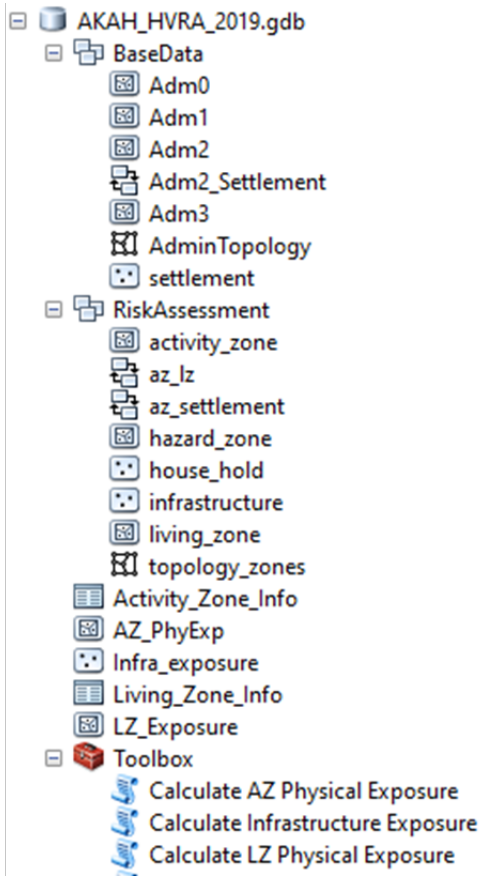


High level Indicators (Data Point)



HVRA Database

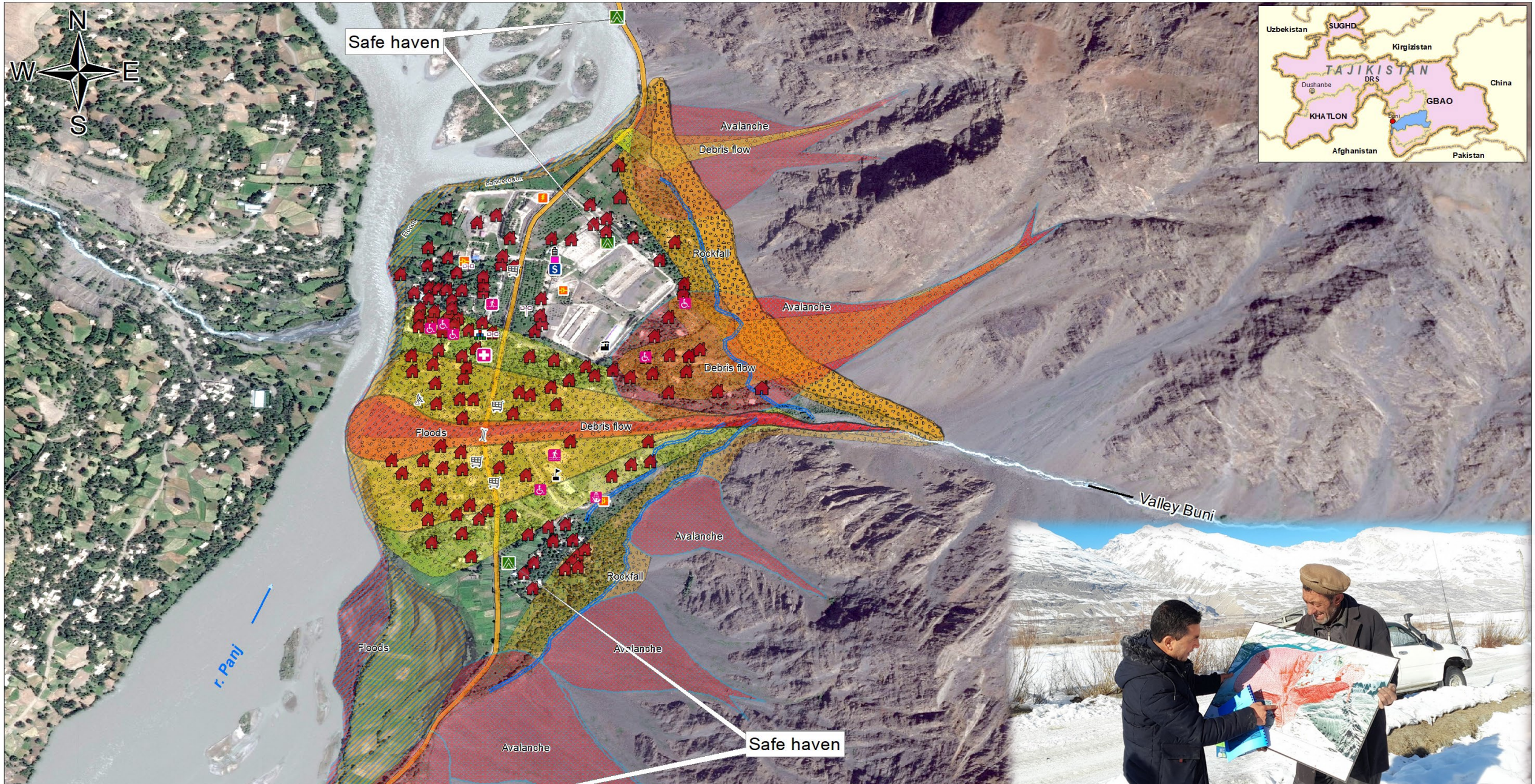


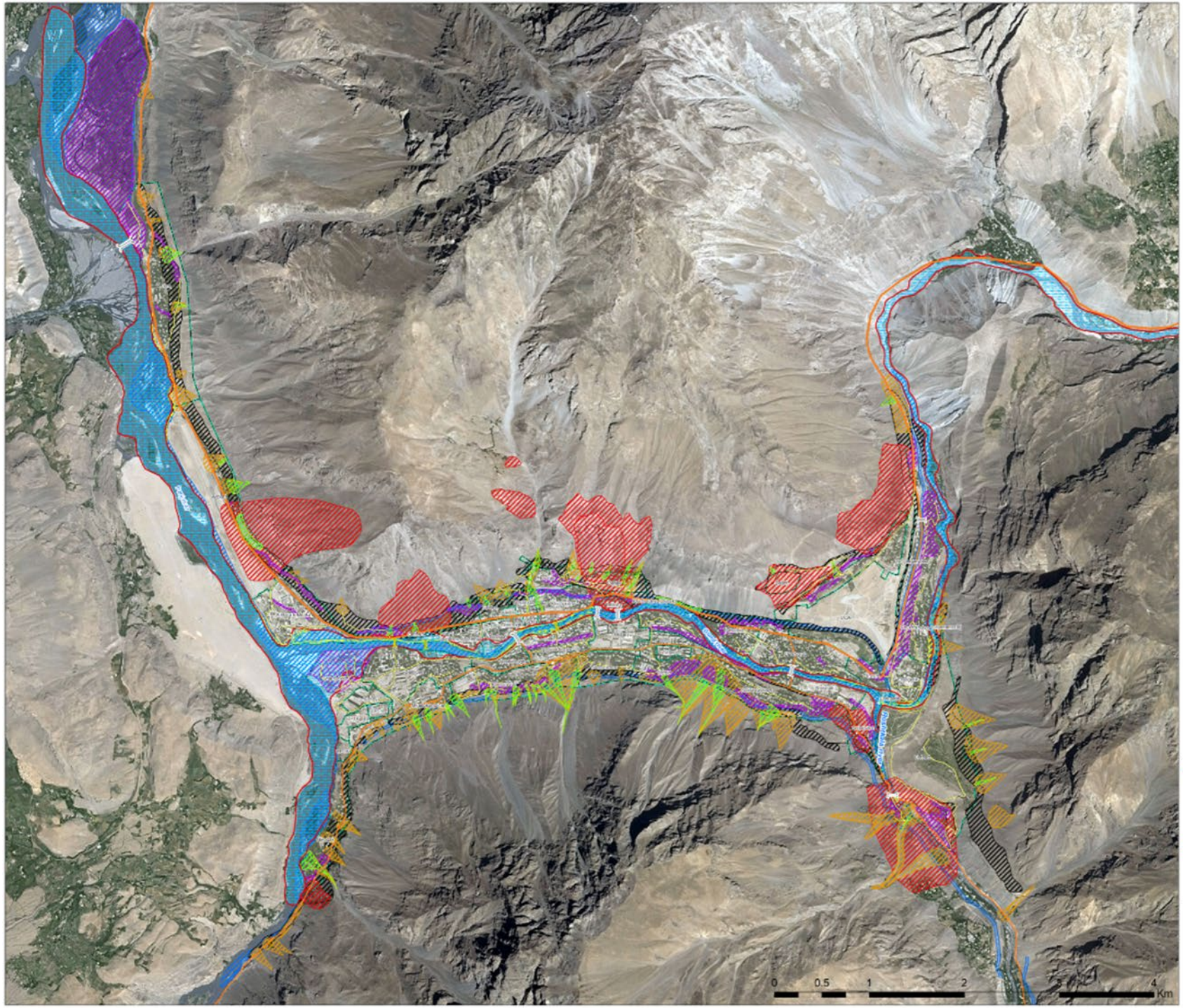


Application of GIS and HVRA in AKAH's DRR Interventions

- Saving lives and protecting assets and livelihoods from natural disasters
- Advocate community for effectively implement mitigation measures
- Streamline disaster preparedness and response efforts
- Identify safe haven, stockpile location, safe place for Helipad, evacuation route, etc.
- Weather monitoring and forecasting
- Understand and predict disaster triggering factors and cascading immediate and long-term impacts
- Develop a people-centric early warning system
- Connect international science community knowledge with the local community
- Promote fail-safe communication as an integral part of community preparedness for response
- Vegetations and green cover area/ Tree plantation

Village Level Product – Hazard Map





Aga Khan Agency for Habitat

Hazard Map

Scale A1 1:18,000

LEGEND

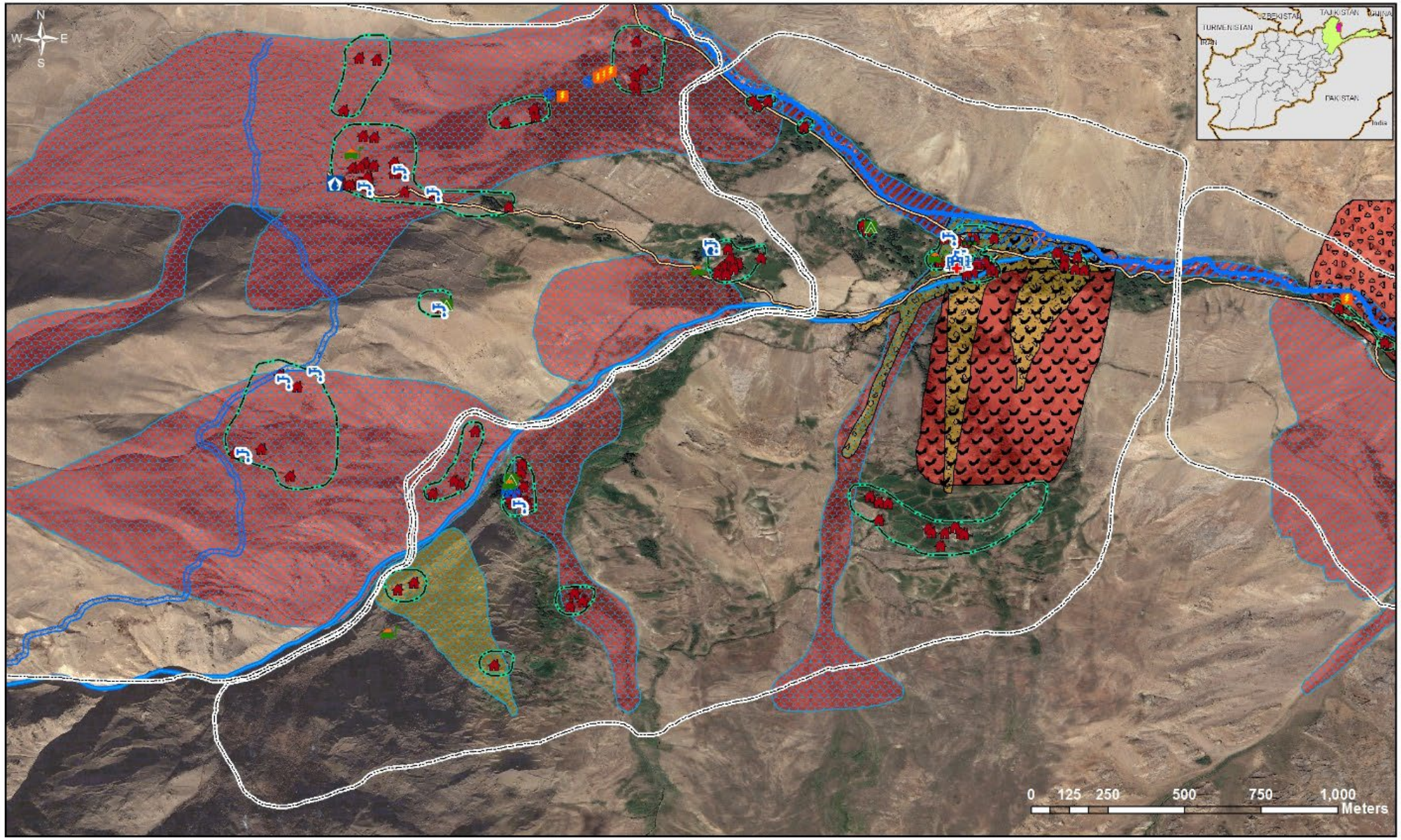
- Car Bridge
- Pedestrian Bridge
- Canal
- Main Road
- Secondary Road
- Lane Road
- Microdistrict

HAZARDS

- Debris flow hazard zone
- Underground flood zone
- River bank erosion zone
- Landslide hazard zone
- Rock fall hazard zone
- Flooding hazard zone
- Avalanche hazard zone
- Remote hazard zone

Date Created: 09 June, 2016

Datum/Proj: UTM/Geographic



RISK MAP

Aga Khan Agency for Habitat, Afghanistan

Scale in A3: 1:11,000

Legend

- Clinic
- Culvert
- Jamatkhana
- Micro Hydro Power Station
- Mill
- Reservoir
- Safe haven
- School
- Shop
- Stockpile
- Water tap
- Household
- Activity Zone
- Living Zone
- Main Road
- Stream
- Canal
- Irrigation Canal
- River

Hazard Name

- Avalanche (snow / ice)
- Debris flow
- Flood
- Landslide
- Rockfall

Intensity

- High
- Medium

General information

Total population: 1216
Total houses: 113

Households at risk

Avalanche: 29
Debris flow: 20
Landslide: 18

Date Created: 6/24/2021

Datum/Proj : WGS84/Geographic

Disaster Response Map

Response Map

Scale at : 1:8,000

NOTE: DISTRICT HUNZA FALLS IN MEDIUM – HIGH(2B-3) SEISMIC ZONE.

Aga Khan Agency for Habitat
www.akd.org/akah

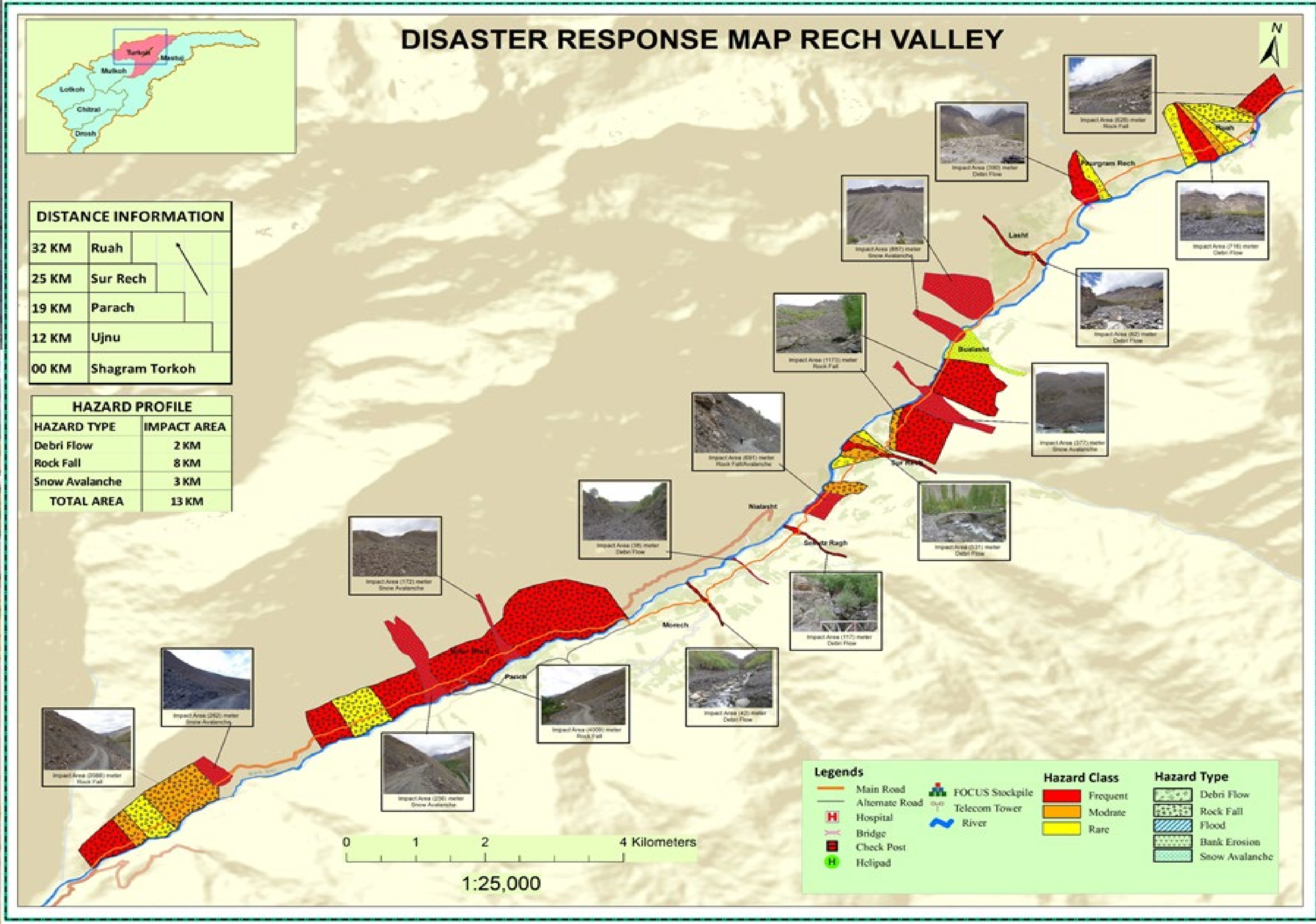
Legends
- KKH
- Stream
- Evacuation Route (Road)
- Evacuation Route (Pony trail)
- Activity Zone
- Active River Bed
- At Risk Area
- Assembly Area

Hazard Class
- High
- Medium
- Low
- No Known Hazard

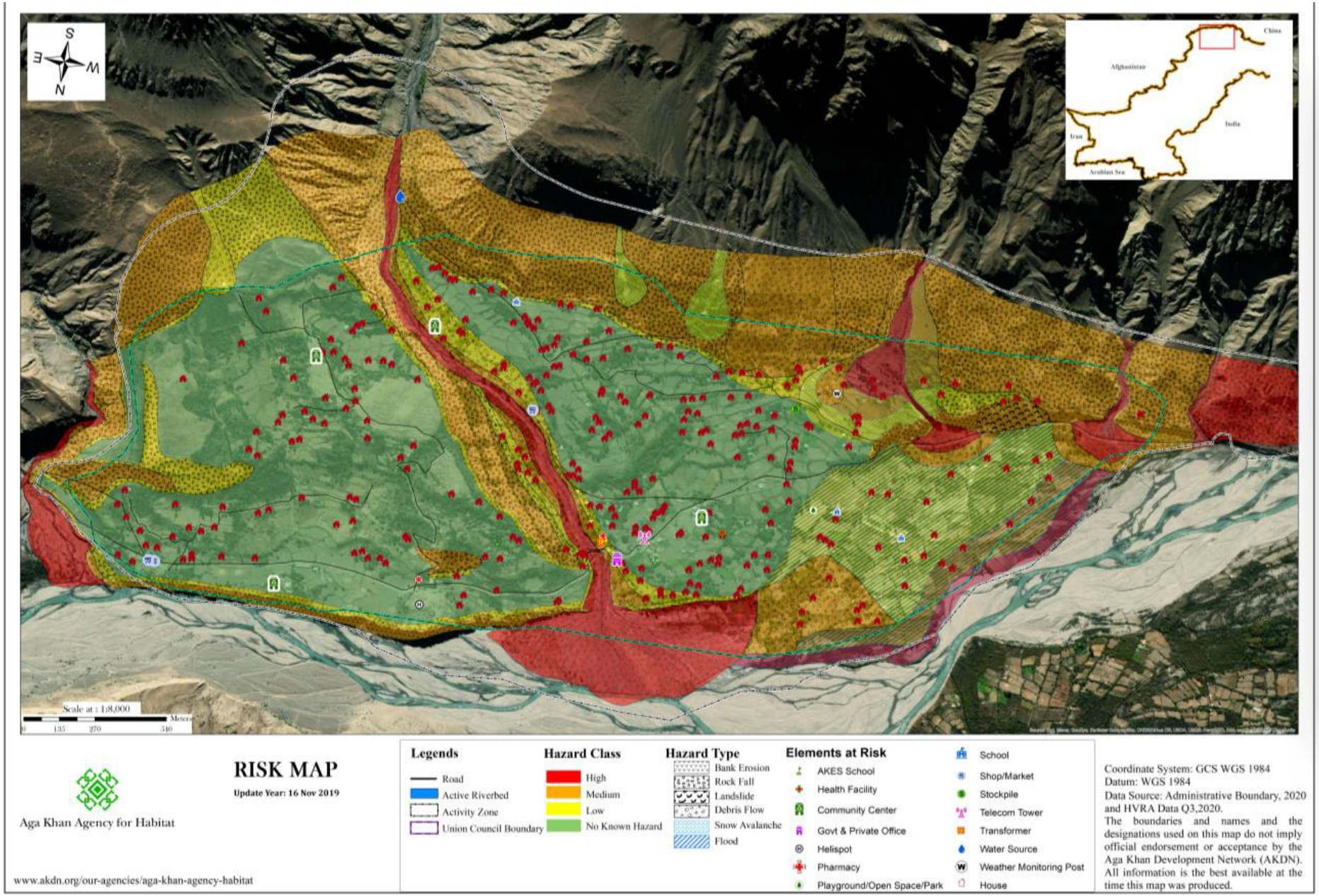
Elements at Risk
- House
- AKES School
- Bridge

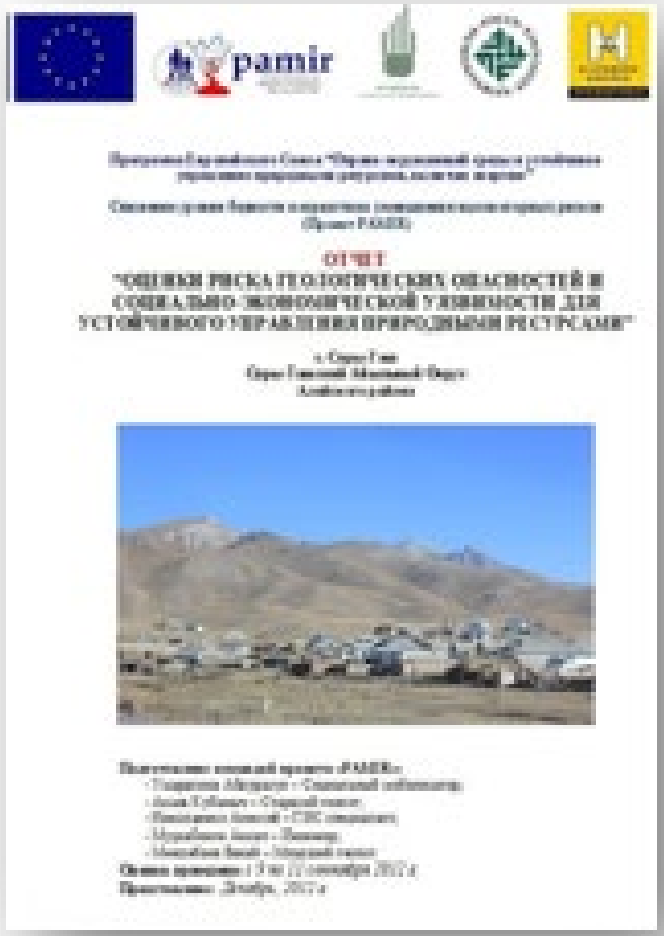
Datum/Proj.: WGS84/Geographic

The boundaries and names and the designations used on this map do not imply official endorsement or acceptance by the Aga Khan Development Network (AKDN). All information is the best available at the time this map was produced.


DISASTER RESPONSE MAP RECH VALLEY
N
Torkoh
Mastuj
Mulkoh
Lotkoh
Chitral
Drosh
DISTANCE INFORMATION
32 KM Ruah
25 KM Sur Rech
19 KM Parach
12 KM Ujnu
00 KM Shagram Torkoh
HAZARD PROFILE
HAZARD TYPE IMPACT AREA
Debri Flow 2 KM
Rock Fall 8 KM
Snow Avalanche 3 KM
TOTAL AREA 13 KM
0 1 2 4 Kilometers
1:25,000
Legends
Main Road
Alternate Road
Hospital
Bridge
Check Post
Helipad
FOCUS Stockpile
Telecom Tower
River
Hazard Class
Frequent
Modrate
Rare
Hazard Type
Debri Flow
Rock Fall
Flood
Bank Erosion
Snow Avalanche

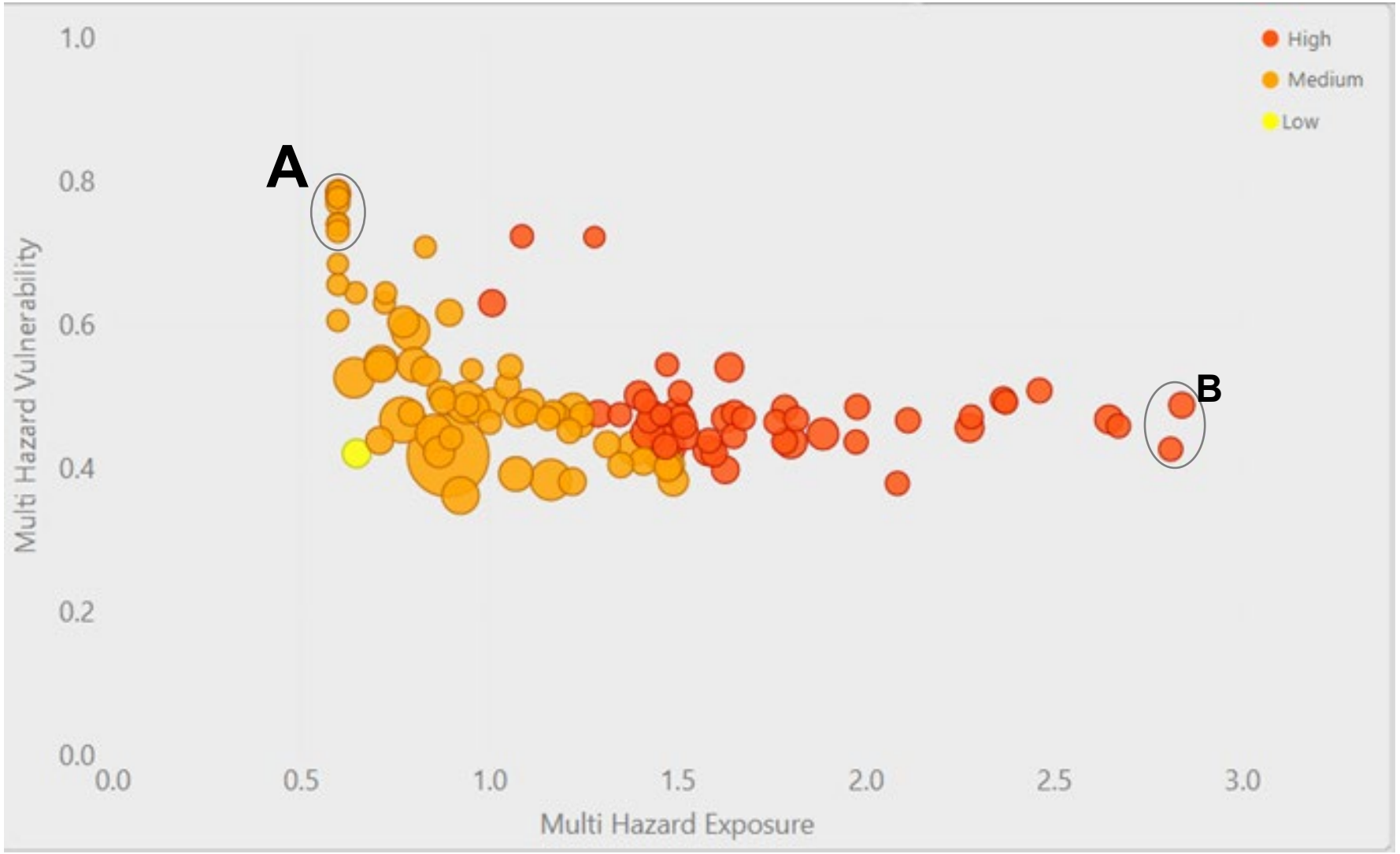
HVRA ➔ Village Disaster Management Plan



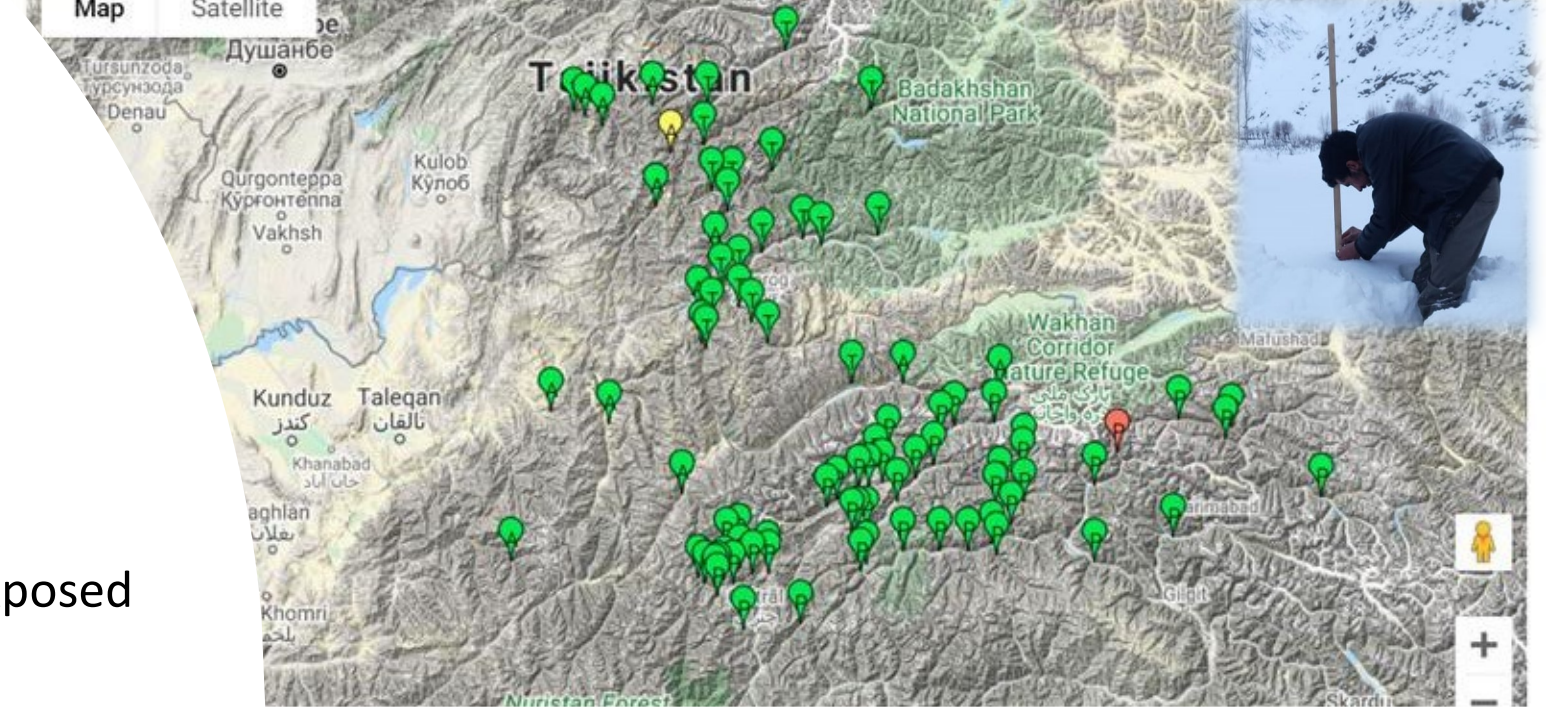


Information Dissemination - Village Disaster Management Plan

Multi-hazard risk profiling and prioritization of DRR interventions



Avalanche Monitoring and Forecasting



- Over 600 settlements are identified exposed to avalanche
- 88 WMPs are installed in remote mountain terrains
- Local community are trained how to use info and monitor local condition during winter
- Avalanche expert analyze daily observation data receive from WMP and remote sensing and issue the early warning if necessary

Avalanche Incidents & Impacts

Building capacity of the community

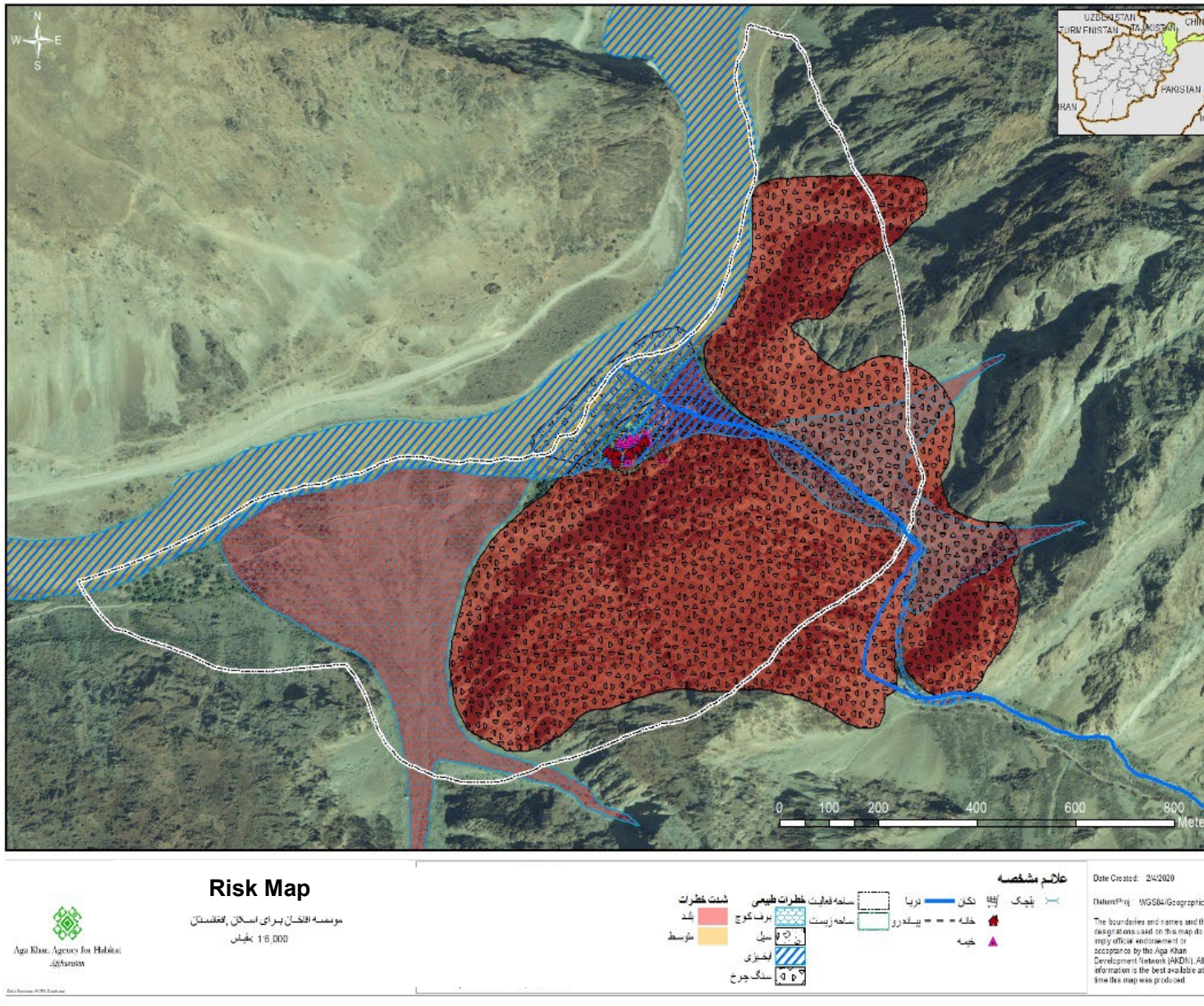
Trained CERT and SART volunteers help communities prepare for avalanches.

Environment friendly disaster risk reduction

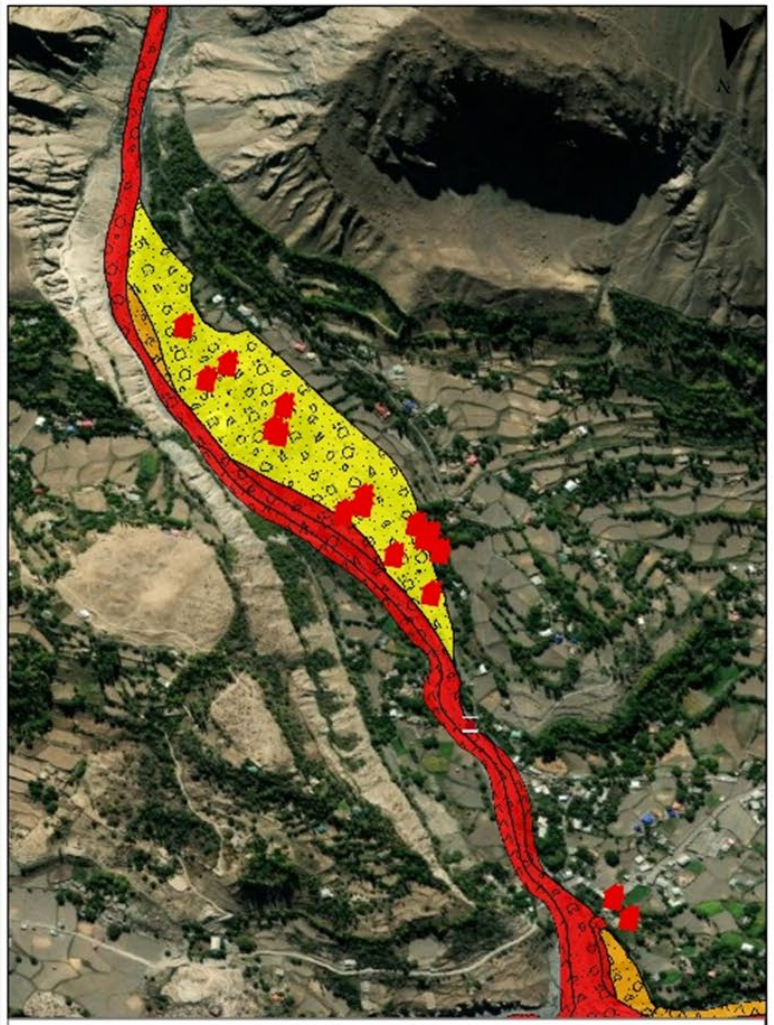
Tree plantation initiative for flood and avalanche protection

Resilience Building

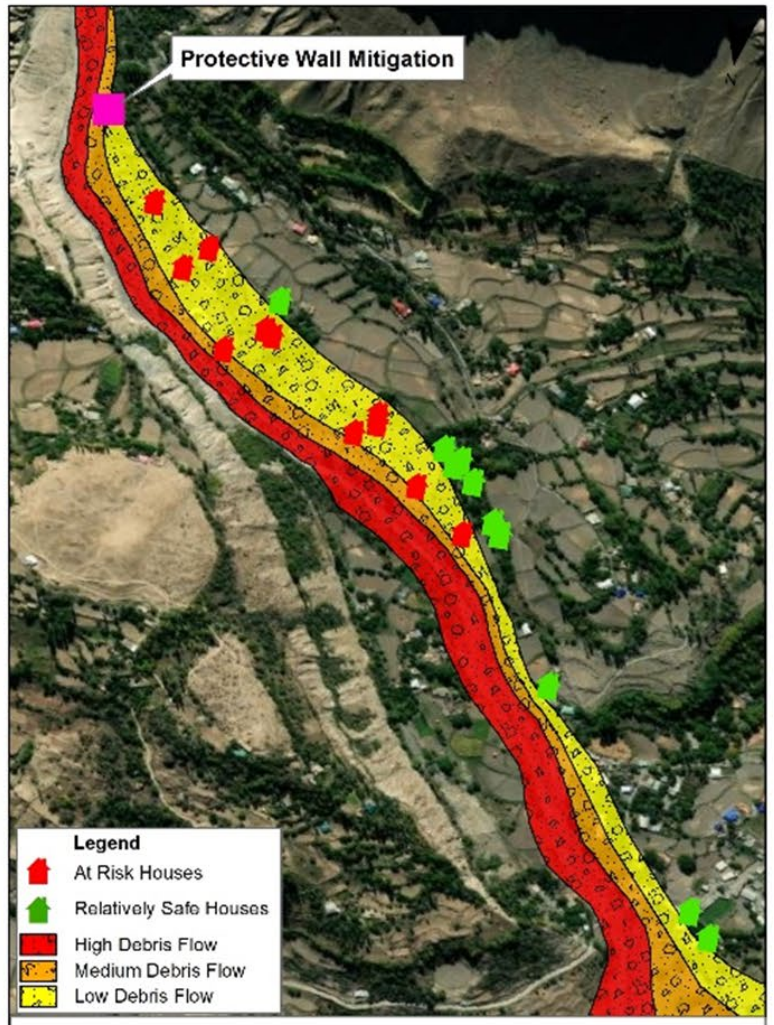
Terracing – Avalanche Protection



Flood Protection Wall

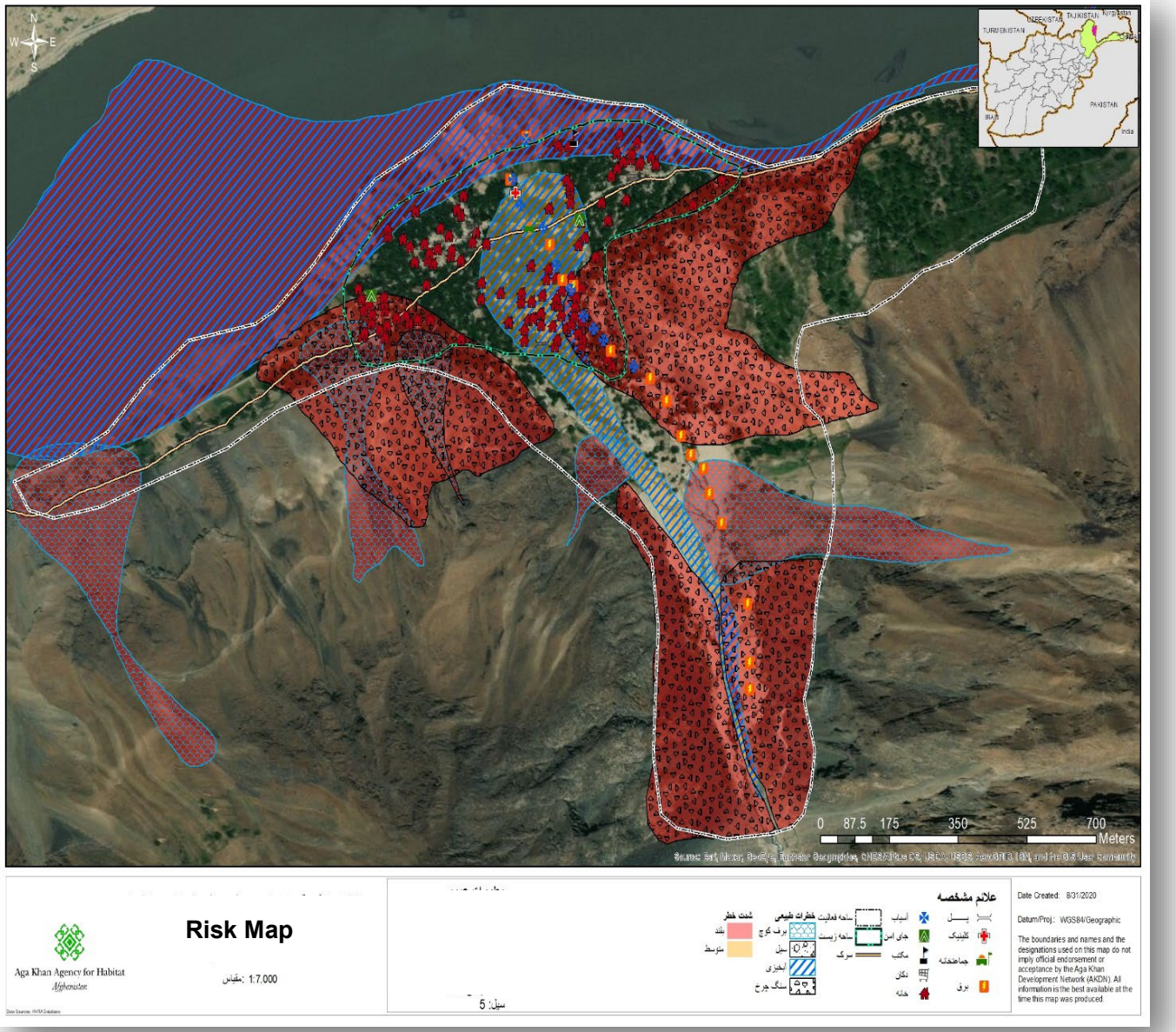


Pre - Mitigation Hazard Situation 2017



Post - Mitigation Hazard Situation 2018

Flood Protection Wall



Fail-Safe Communication and EWS

VCN Bamyan province, Afghanistan

CODAN, Murgab, Tajikistan

AKAH- Early Warning System for flash flood in Ghizer, Pakistan

Way forward – Programmatic Priorities and Aspirations for the next five years

Priority 7: Improved Technology for Emergency Preparedness/ Response and Fail-Safe Emergency Communication

Virtual or Web-based EOC

E-Learning Platform

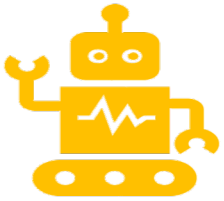
Improve forecasting of hazards

In-house capacity on hazard modelling for key hazards

Improve communication coverage (VSAT in Afghanistan)

Site-specific EWS for dominant hazards

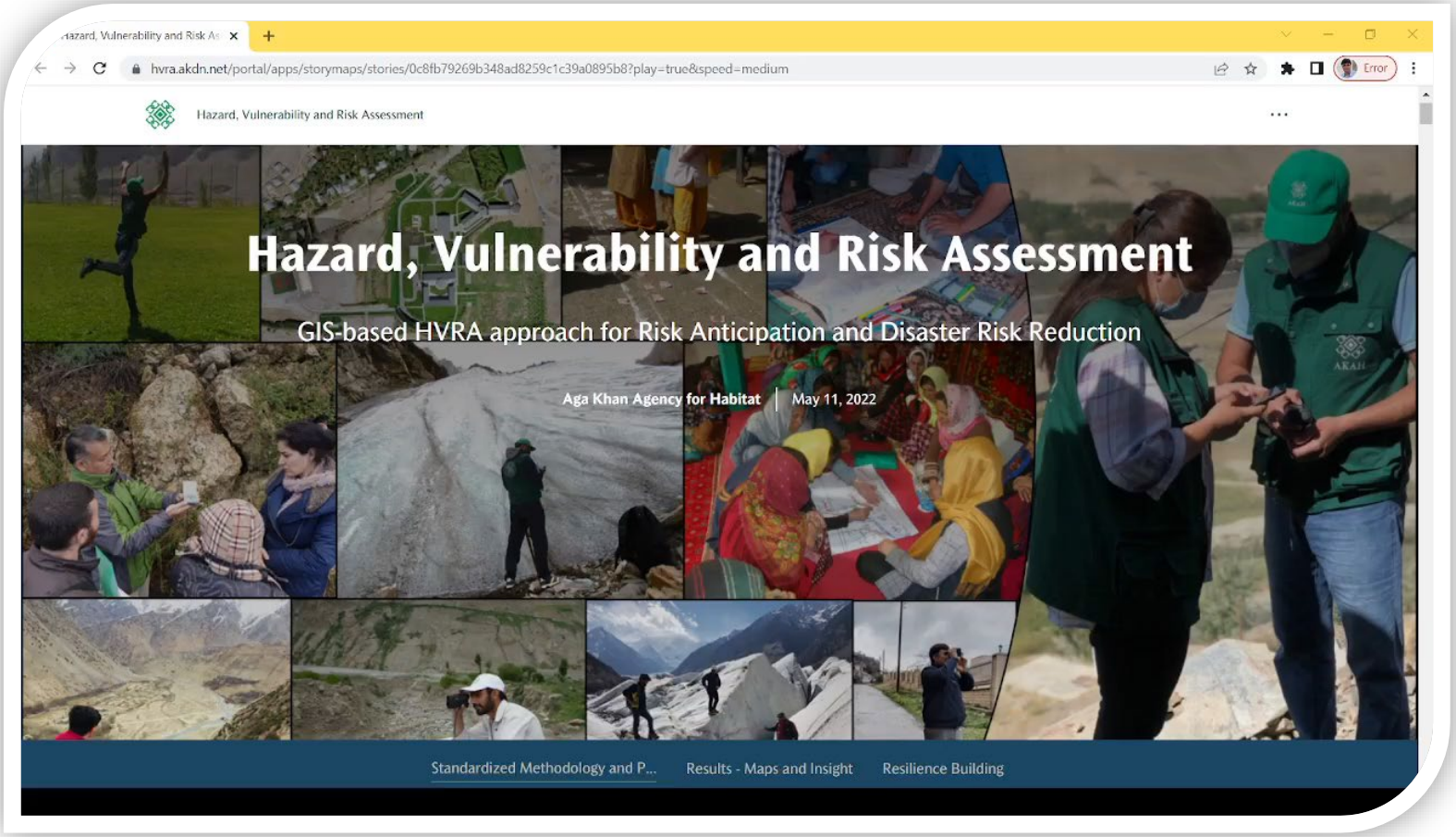
Improve information management system



Adopt evolving AI and IoT

Virtual reality (VR) education and simulation exercises

Drone/UAV for damage assessments



Scan Me

Thank You

Guyana’s National FEWS and Lessons Learned from 2021 Floodings

Imra Hodzic, Research Associate,
Disaster Risk Management and Climate Resilience Section,
United Nations Satellite Centre (UNOSAT)

UNOSAT

Strengthening Disaster Management Capacity of Women in the Cooperative Republic of Guyana an Dominica

Project	Guyana's National FEWS
Donor	Government of Japan
Time frame	2018 - 2021
Project management	UNDP Guyana
Project implementation	UNITAR-UNOSAT
Project partners	CIMA Research Foundation
Beneficiaries & Stakeholders	Ministry of Environment, national institutions, flood prone communities

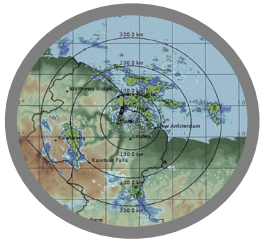
From the People of Japan

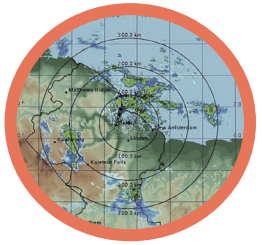
UNDP

UNOSAT

RESEARCH FOUNDATION cima OBSERVE TO PREDICT, PREDICT TO PREVENT.

METEOROLOGICAL FORCING





NWP-WRF

AWS

GSMap

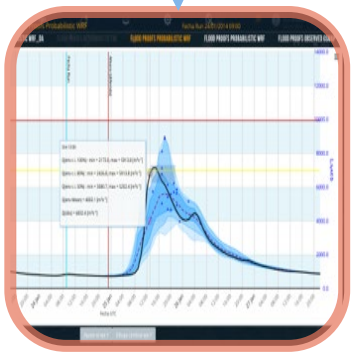
GFS Global Forecast System

Global Forecast

National Level

HYDROLOGICAL MODEL (coverage: entire country)

CONTINUUM
CIMA'S HYDROLOGICAL MODEL



Discharge Forecast

Local Level

HYDRAULIC MODEL (4 local communities)

HYDRA 2D

Flood modelling

Existing System

Designed FFS


dewetra
Hydromet
(user Hydromet)
Guyana National Flo...
Guyana National Flood E...
GFS 0,25°
02/03/2021 03:00 (Ru...
7 ore fa
DemeraraRiver,Saka
Area: 3750.00732 km²
Red Threshold 468 m³s⁻¹
Yellow Threshold 346 m³s⁻¹
Trinidad e Tobago
Maturín
Ciudad Guayana
Ciudad Bolivar
Sierra Imataca
Venezuela
Georgetown
Paramaribo
Parque Nacional El Caura
Parque Nacional Natural El Tuparro
Parque Nacional Canaima
Guyana
SÃO MARCOS - RR
Suriname
francese
Boa Vista
Parque Nacional Parima Tapirapecó
YANOMAMI
RORAIMA
PARQUE DO TUMUCUMAQUE
AMAPÁ
Macapá
ALTO RIO NEGRO
TROMBETAS/ MAPUERA
ZOE
MÉDIO RIO NEGRO I
WAIMIRI-ATROARI
Parque Nacional Natural Rio Purè
Parque Nacional do Jaú
Oriximiná
Santarém
Parintins
Alter do Chão
Itacoatiara
Manacapuru
Uruará
ALTO TURIAÇU
Ananindeua
200 km
Leaflet
01/03/2021 10:10 UTC
02/03/2021 10:10 UTC
Tuesday, March 2, 2021, 11:15:16 AM GMT+1
Lat:5.44 - Lng:-58.32
Google

JUNE 2021, FLOODS IN GUYANA

Flooding Cuyuni - Mazaruni Region, Guyana, June 2021. Photo: Office of the President of Guyana

Acquisition of satellite data and deliver of satellite imagery support and services provided by UNOSAT

FLOODS IN GUYANA

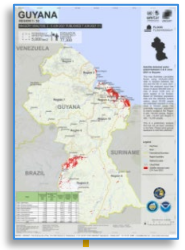
4 JUNE 2021 15:35 UTC
World Food Program requesting satellite imagery analysis support from UNOSAT

UNOSAT accepted the request

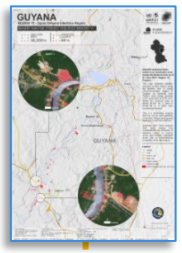
4 JUNE 2021
Meeting with UNDP, Hydromet and CDC

Review and confirm Areas of Interest

7 JUNE 2021 10:16 UTC
Activation of the International Space Charter by UNOSAT

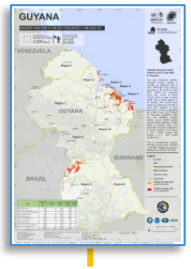


7 JUNE 2021 16:44 UTC
Satellite Detected Water Extent between 2 & 6 June Guyana

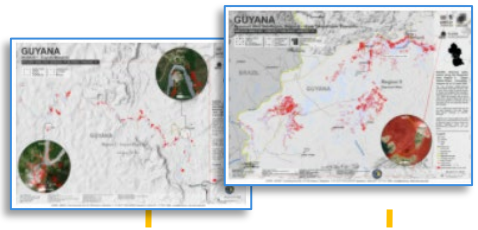


8 JUNE 2021 16:44 UTC
Satellite Detected Water Extent – Kwakwani town along the Berbice River

9 JUNE 2021 16:50 UTC
Preliminary Satellite Derived Flood Assessment Report - Guyana

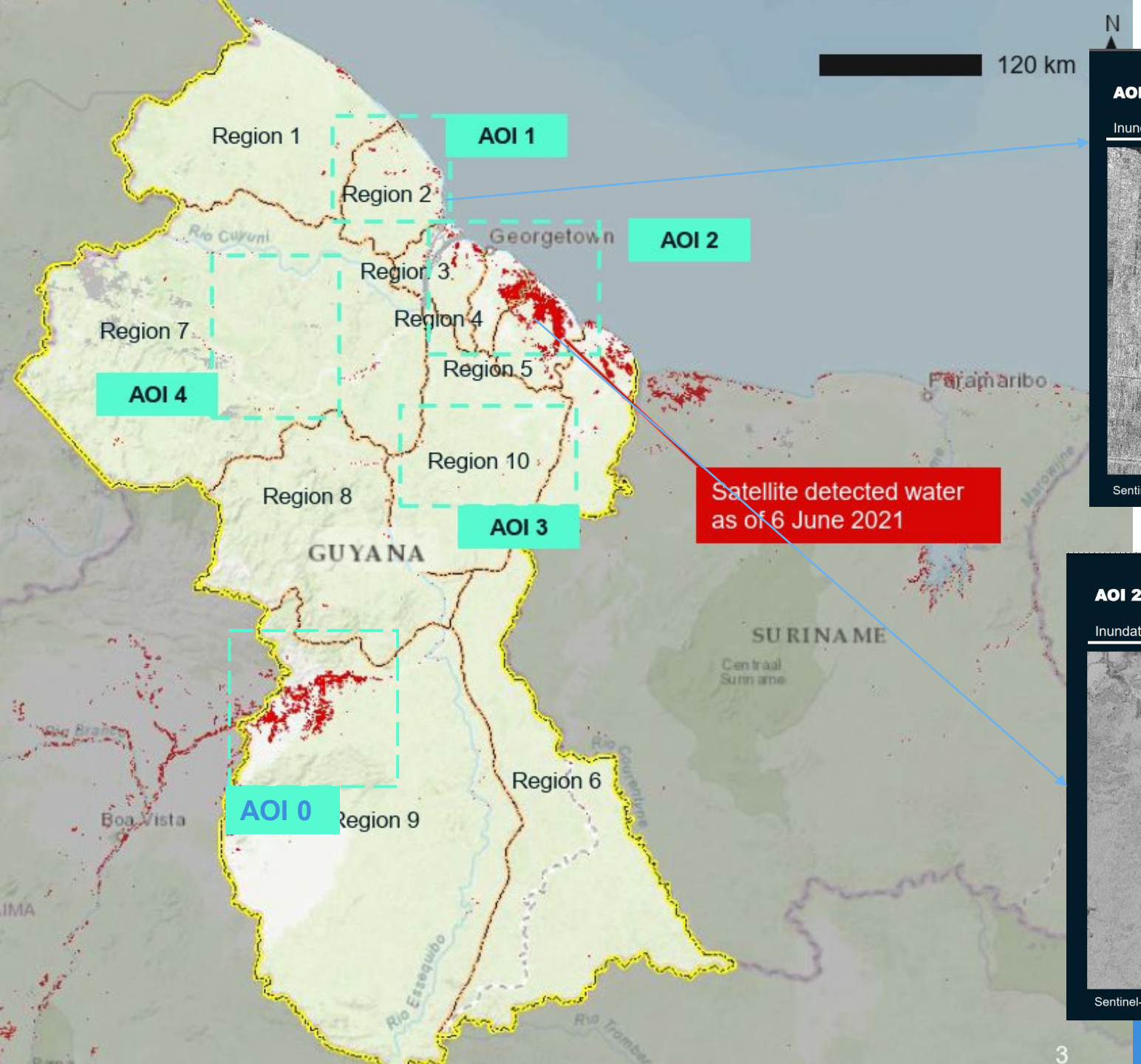


10 JUNE 2021 15:36 UTC
Satellite Detected Water Extent – Mazaruni river

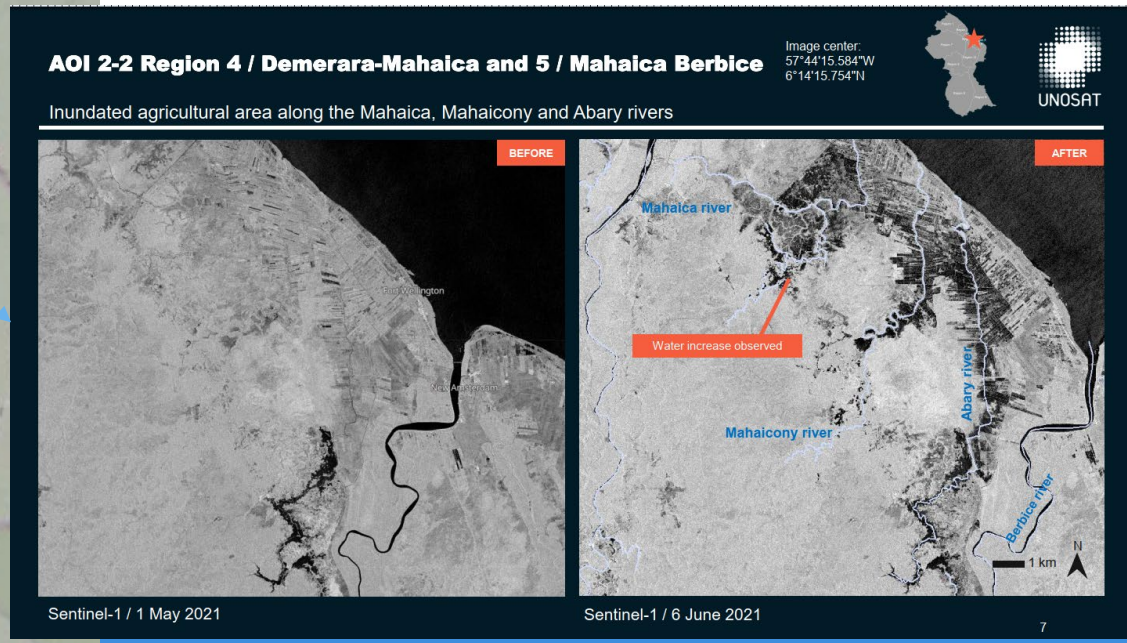


11 JUNE 2021 12:16 UTC
Satellite Detected Water Extent - Guyana

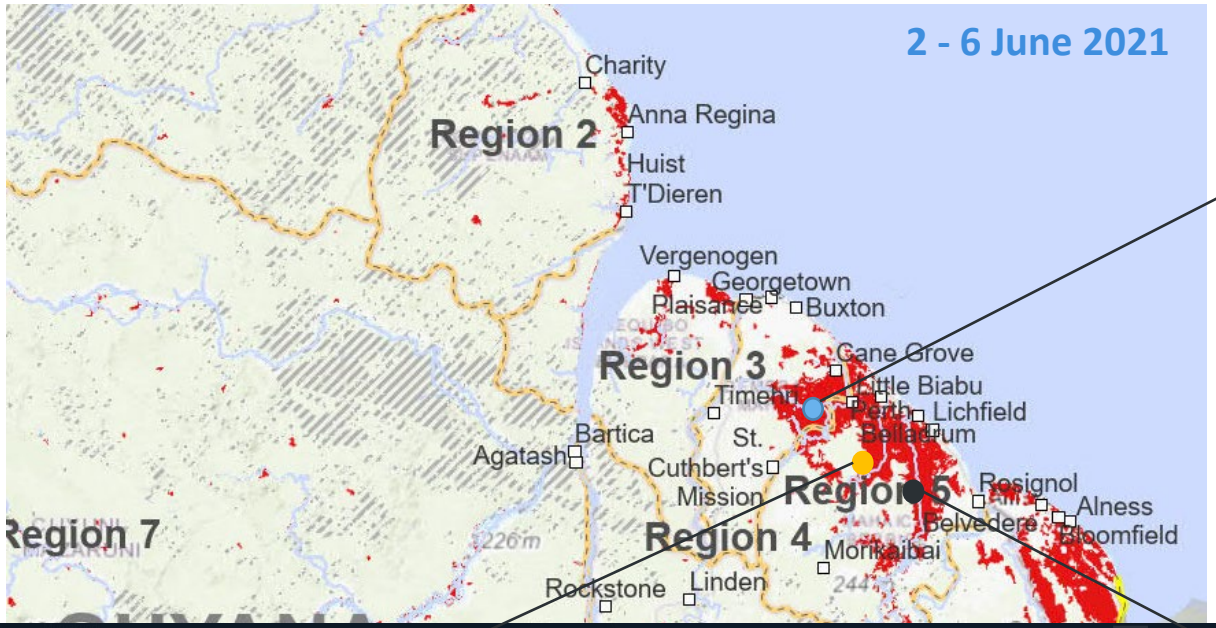
14 JUNE 2021 UTC
Satellite Detected Water Extent – Takutu-upper Essequibo

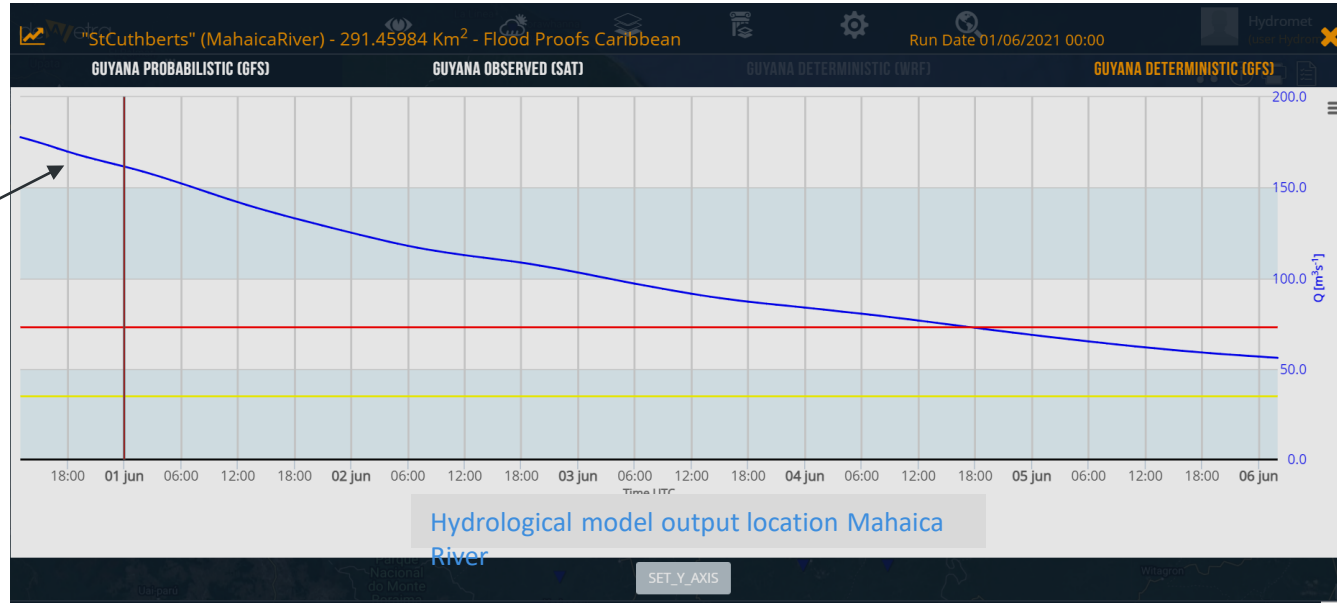

N
120 km
Region 1
AOI 1
Region 2
Georgetown
AOI 2
Region 3
Region 4
Region 7
Region 5
AOI 4
Paramaribo
Region 10
Region 8
AOI 3
GUYANA
SURINAME
Satellite detected water as of 6 June 2021
Region 6
AOI 0
Region 9
Boa Vista
Rio Essequibo
3


AOI 2-1 Region 3 / Essequibo Islands-West Demerara
Image center:
58°11'22.3"W
6°47'5.596"N
UNOSAT
Inundated agricultural area
BEFORE
AFTER
Georgetown
Demerara river
Inundated agricultural area
1 km
N
Sentinel-1 / 1 May 2021
Sentinel-1 / 6 June 2021
6

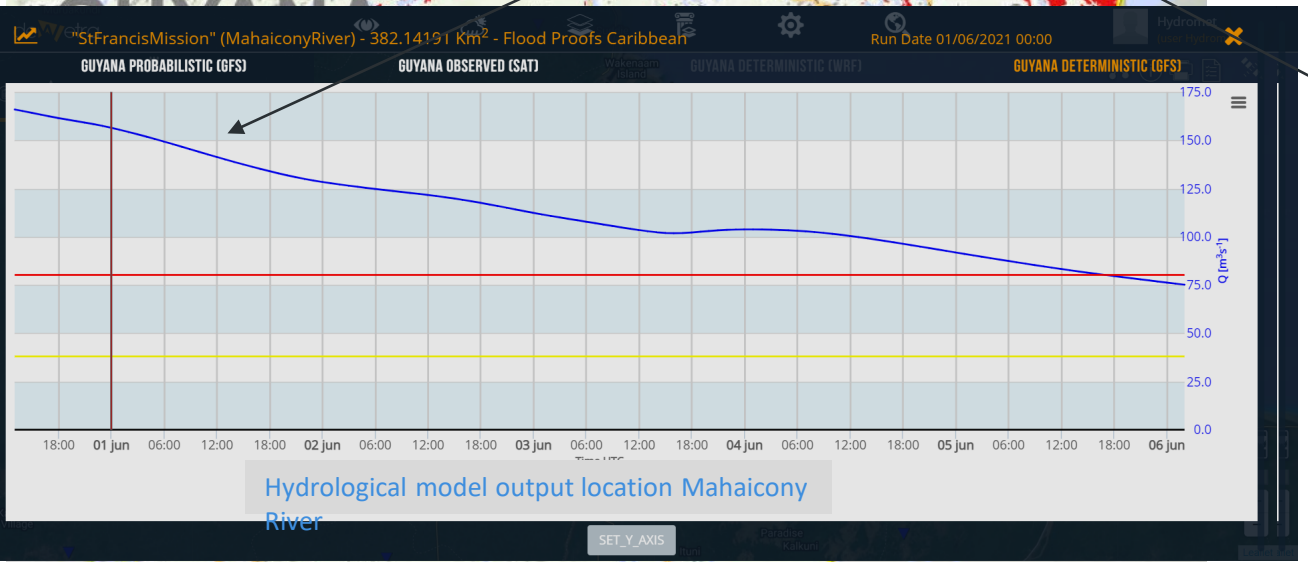

AOI 2-2 Region 4 / Demerara-Mahaica and 5 / Mahaica Berbice
Image center:
57°44'15.584"W
6°14'15.754"N
UNOSAT
Inundated agricultural area along the Mahaica, Mahaicony and Abary rivers
BEFORE
AFTER
Mahaica river
Water increase observed
Abary river
Mahaicony river
Berbice river
1 km
N
Sentinel-1 / 1 May 2021
Sentinel-1 / 6 June 2021
7

Guyana FFS results vs. Satellite Detected Flood Extents

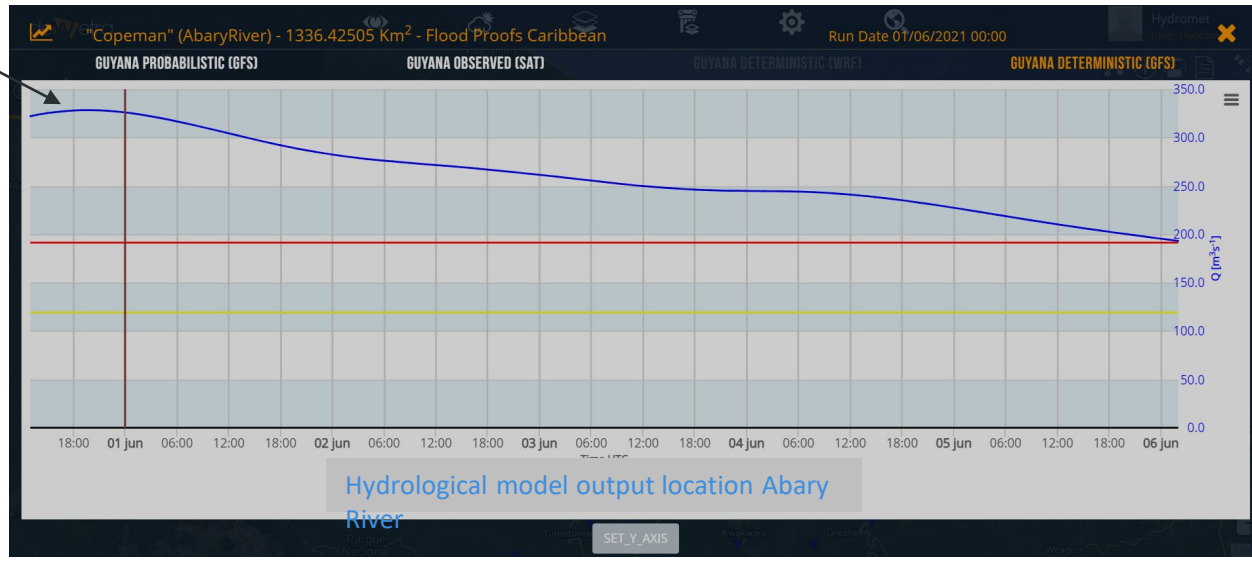




Hydrological model output location Mahaica River



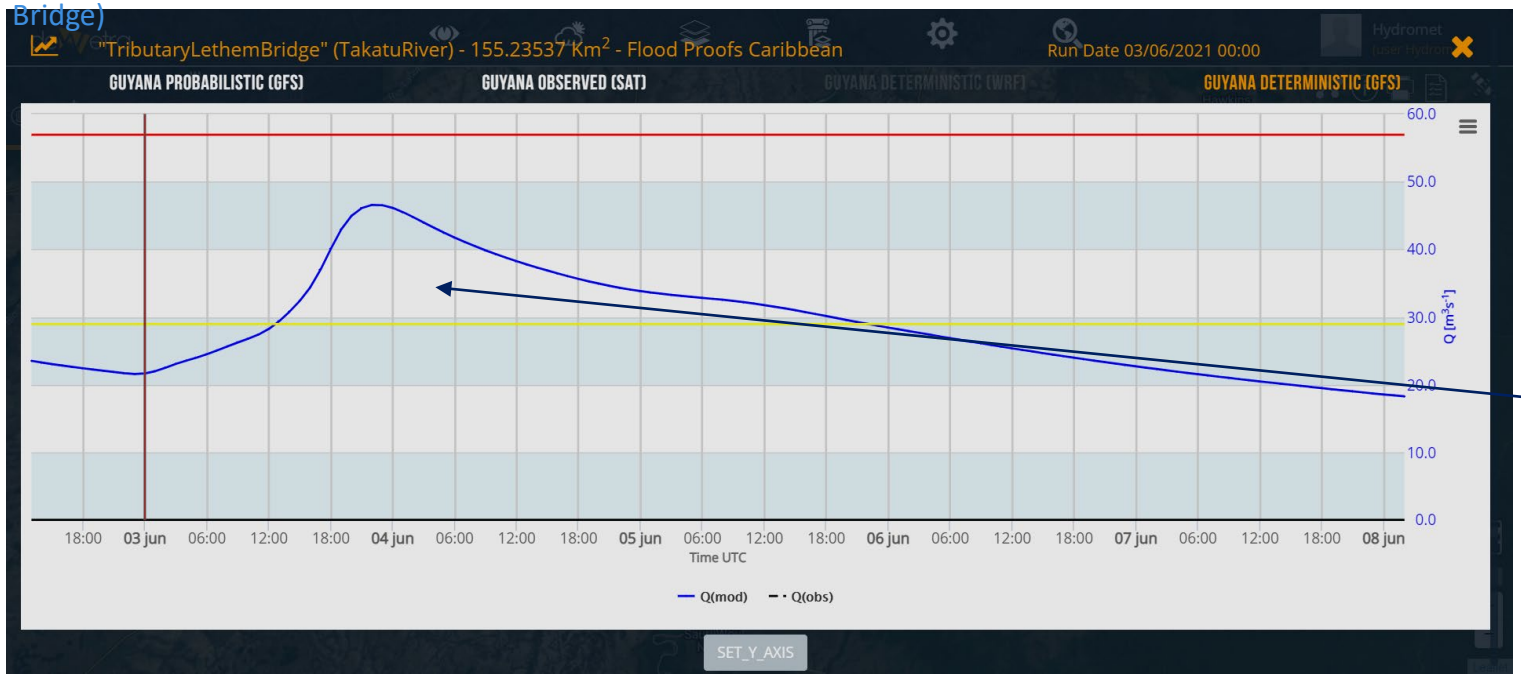
Hydrological model output location Mahaicony River

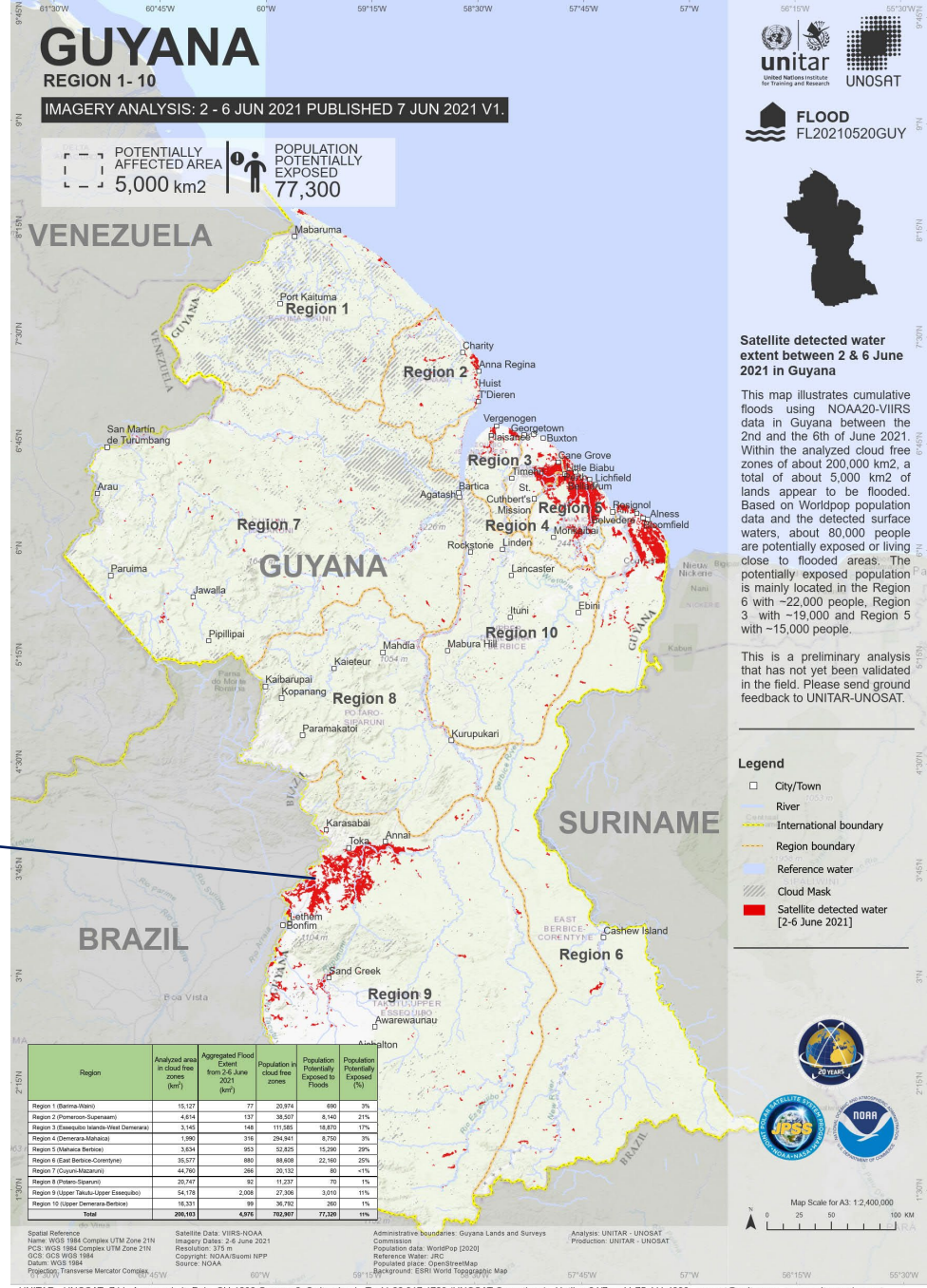


Hydrological model output location Abary River

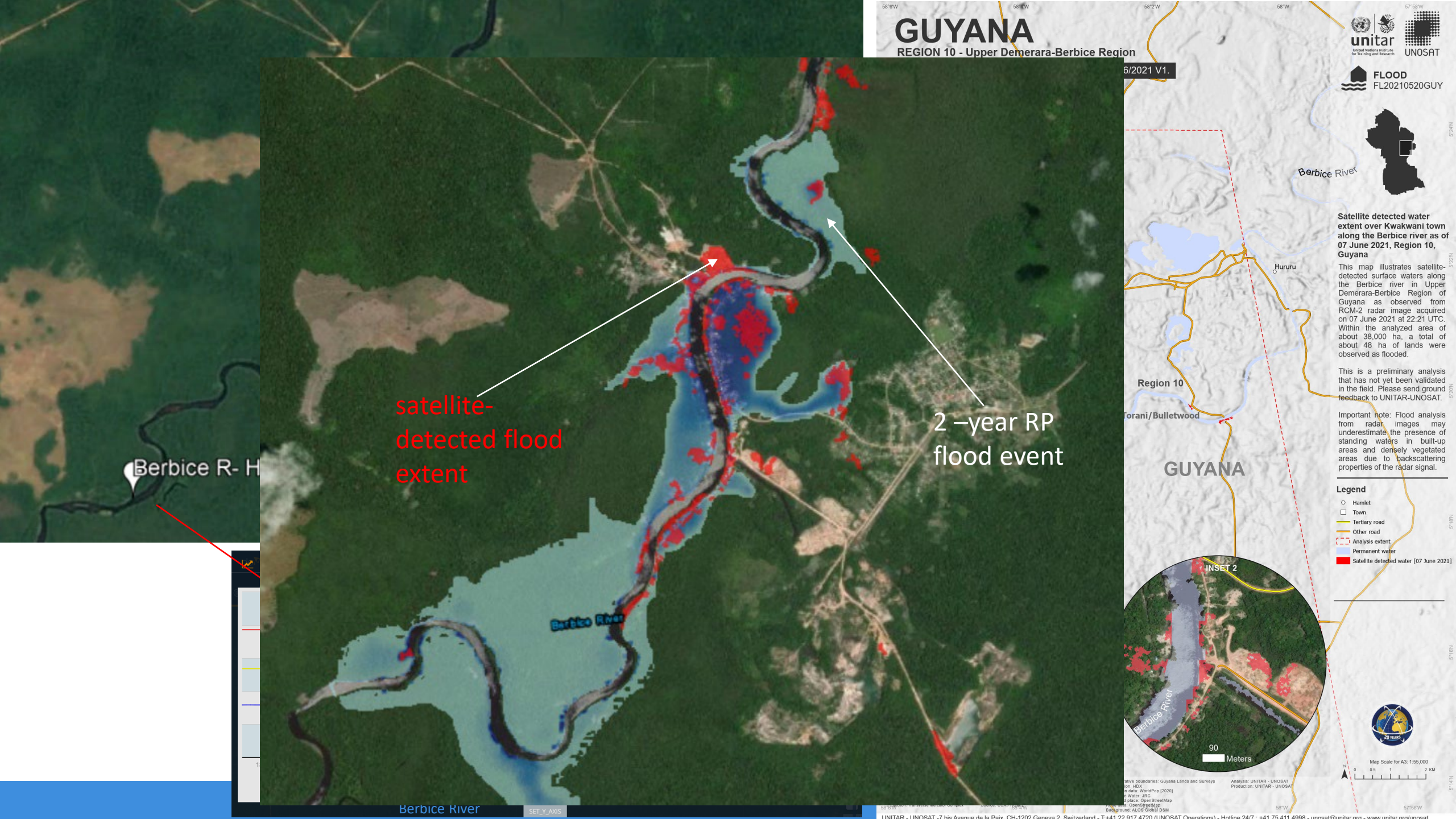
Guyana FFS results vs. Satellite Detected Flood Extents

Hydrological model output location Lethem (Tukutu Tributary, Lethem Bridge)





Region	Analyzed area in cloud free zones (km²)	Aggregated Flood Extent from 2-6 June 2021 (km²)	Population in cloud free zones	Population Potentially Exposed to Floods	Population Potentially Exposed (%)
Region 1 (Barima-Waini)	15,127	77	20,974	690	3%
Region 2 (Pomeroon-Supenaam)	4,614	137	38,507	8,140	21%
Region 3 (Essequibo Islands-West Demerara)	3,145	148	111,585	18,870	17%
Region 4 (Demerara-Mahaica)	1,990	316	294,941	8,750	3%
Region 5 (Mahaica Berbice)	3,634	953	52,825	15,296	29%
Region 6 (East Berbice-Corentyne)	35,577	880	88,608	22,160	25%
Region 7 (Cuyuni-Mazaruni)	44,790	266	20,132	80	<1%
Region 8 (Potaro-Siparuni)	20,747	92	11,237	70	1%
Region 9 (Upper Takutu-Upper Essequibo)	54,178	2,008	27,306	3,010	11%
Region 10 (Upper Demerara-Berbice)	16,331	99	36,792	260	1%
Total	200,103	4,976	702,907	77,320	11%


GUYANA
REGION 10 - Upper Demerara-Berbice Region
6/2021 V1.
unitar
UNOSAT
FLOOD
FL20210520GUY
Berbice River
Satellite detected water extent over Kwakwani town along the Berbice river as of 07 June 2021, Region 10, Guyana
This map illustrates satellite-detected surface waters along the Berbice river in Upper Demerara-Berbice Region of Guyana as observed from RCM-2 radar image acquired on 07 June 2021 at 22:21 UTC. Within the analyzed area of about 38,000 ha, a total of about 48 ha of lands were observed as flooded.
This is a preliminary analysis that has not yet been validated in the field. Please send ground feedback to UNITAR-UNOSAT.
Important note: Flood analysis from radar images may underestimate the presence of standing waters in built-up areas and densely vegetated areas due to backscattering properties of the radar signal.
Hururu
Region 10
Torani/Bulletwood
GUYANA
Legend
Hamlet
Town
Tertiary road
Other road
Analysis extent
Permanent water
Satellite detected water [07 June 2021]
INSET 2
Berbice River
90
Meters
Map Scale for A3: 1:55,000
satellite-detected flood extent
2 –year RP flood event
Berbice R- H
Berbice River
SET_Y_AXIS

Thank you!

@UNOSAT

@UNITAR.unosat

imra.hodzic@unitar.org

UNOSAT, United Nations Institute for Training and Research (UNITAR)
7 bis, Avenue de la Paix, CH-1202 Geneva 2, Switzerland

T +41 022 917 4720
E unosat@unitar.org
www.unosat.org

Our Agenda Today

Wednesday, May 11th

- 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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