WORLD TELECOMMUNICATION
DEVELOPMENT CONFERENCE

ITU WTDC
BAKU2025
17–28 November 2025
Baku, Azerbaijan

Broadcasting in the National Early Warning and Resilience Strategy

Role of Broadcasting in Effective Early Warning Dissemination

20th Asia Media Summit (AMS) 2025

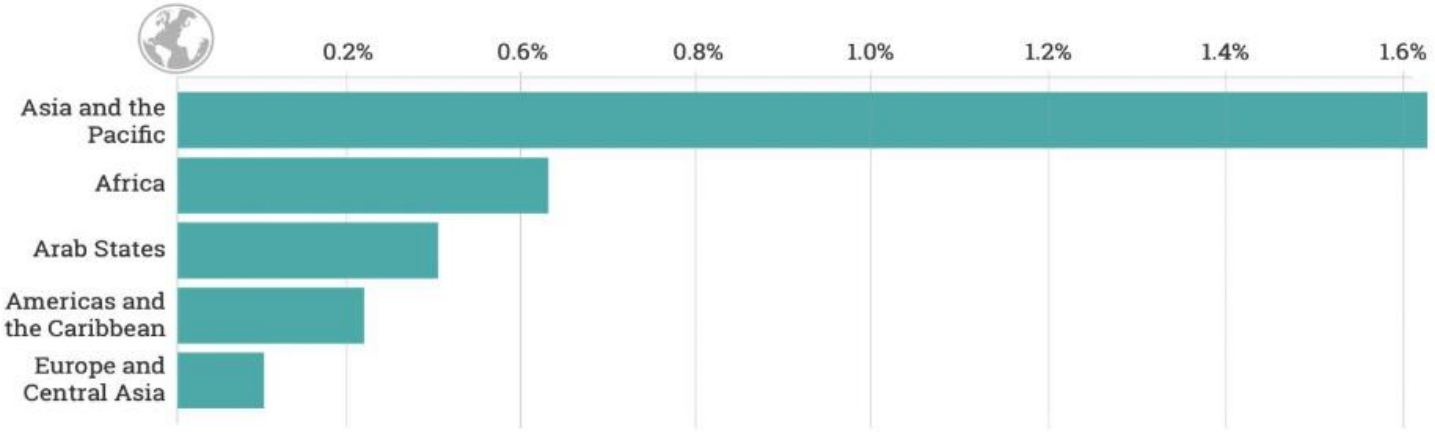
21 July 2025

Scope

- EW for DRR and ASP region
- Role of Broadcasting and telecoms
- EW4ALL and MHEWS solutions
- Conclusion and Cooperation

Asia-Pacific: Disaster Impact Scenario

- Asia-Pacific remains the most disaster impacted region. Since 1970, two million people have lost their lives, equivalent to 105 lives being lost to disasters every day.
- The LDCs/SIDS accounts for mortality five times as compared to the rest of the Asia-Pacific
- The cost of inaction is on the rise, regression on SDG 13, Sendai targets off the tracks



The highest share of economic loss by region is borne within Asia-Pacific, where countries lose on average 1.6% of GDP to disasters
Source: GAR 2021

ESCAP

Early warning as a Proven Adaptation Measure

Early warning saves lives.

Early warnings provide more than a tenfold return on investment[1].

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EW4All Return on Investment

- The World Bank has estimated that universal access to early warning systems would lead to **annual global reductions in asset losses of $13 billion**. In addition, socioeconomic conditions would be improved by reducing wellbeing losses by up to $22 billion per year, resulting in total avoided annual losses of $35 billion.

- The WFP-led Emergency Telecommunications Cluster undertook a study to quantify the cost-benefit returns in emergency telecommunications in 2022-2023. The findings demonstrated that for every one US dollar of invested resources, there is a monetary return of almost **three times the value of original investments** made (for assessed countries).

- The Global Commission on Adaptation found that just 24 hours warning of a coming storm or heat wave can **reduce the potential damage by 30 percent**, and an investment of $800 million in early warning systems in developing countries could prevent losses ranging from $3 to $16 billion annually, resulting in higher returns on investment than any other climate adaptation measure, with benefit/cost ratios of at least ten.

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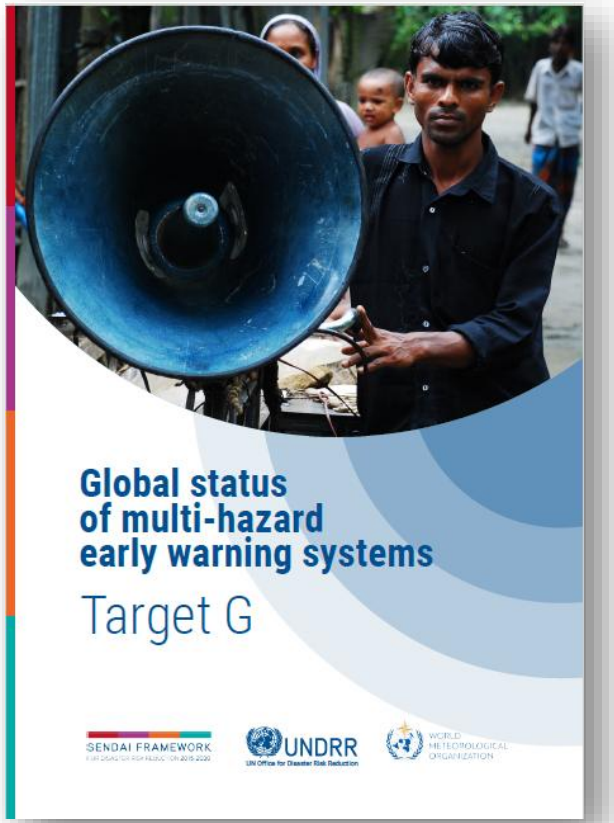
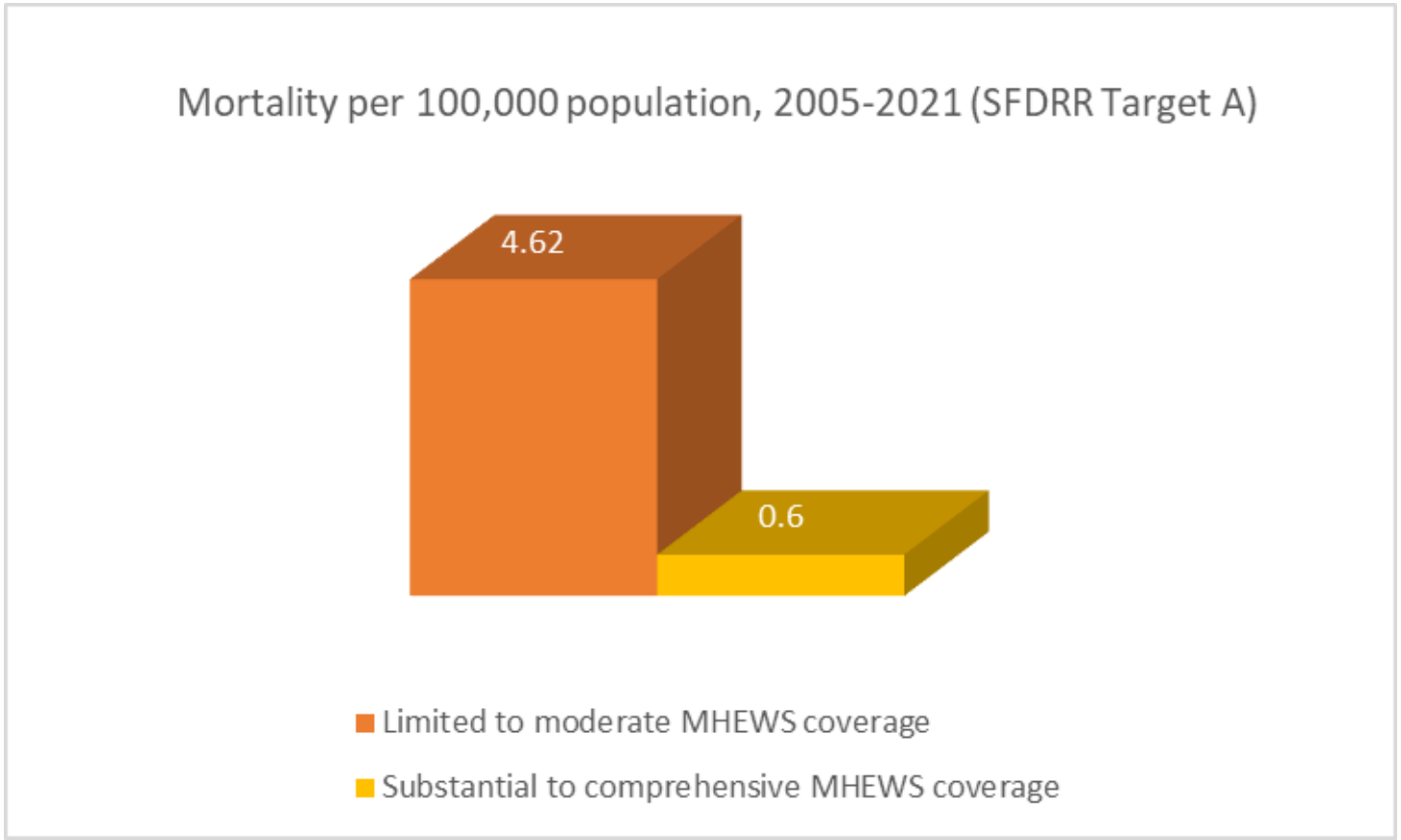

Global status
of multi-hazard
early warning systems
Target G
SENDAI FRAMEWORK
UNDRR
UN Office for Disaster Risk Reduction
WORLD METEOROLOGICAL ORGANIZATION


Mortality per 100,000 population, 2005-2021 (SFDRR Target A)
4.62
0.6
Limited to moderate MHEWS coverage
Substantial to comprehensive MHEWS coverage

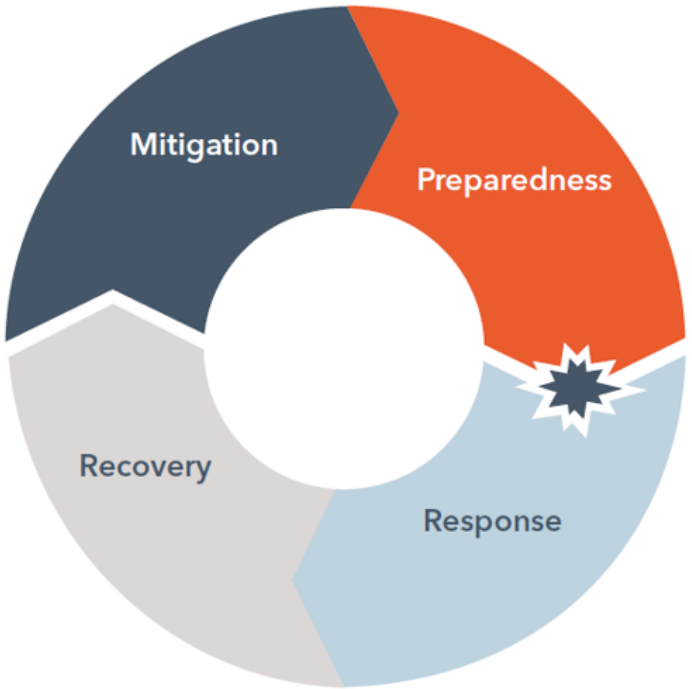
However,

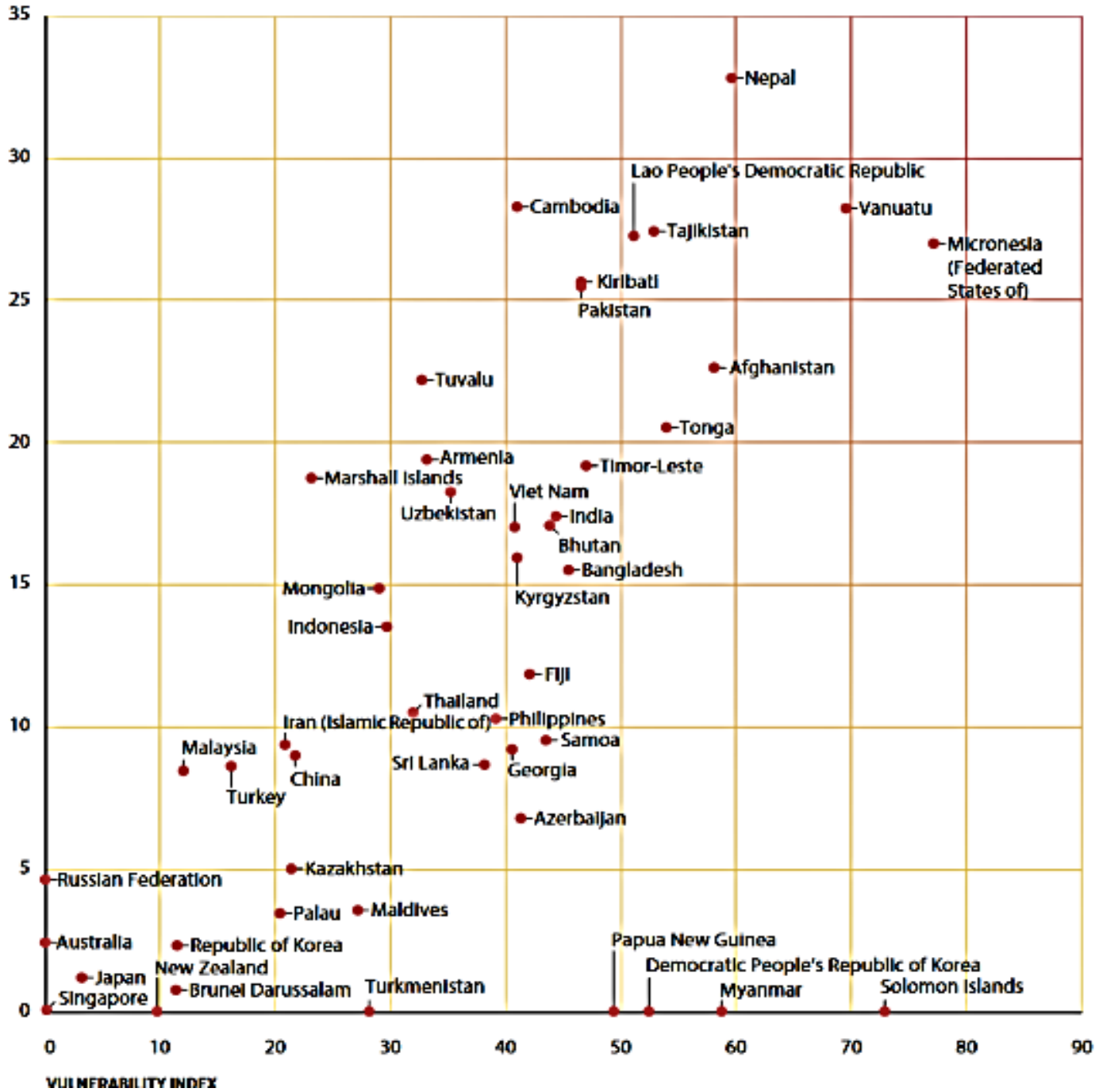
Only half of the world is covered by multi-hazard early warning systems (MHEWS).

Global incapacity to translate early warning into early action.

Extreme weather events continue to cost the countries billions of dollars in economic losses.

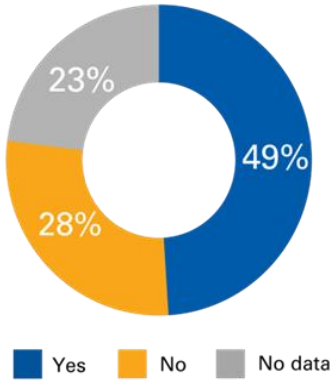
Vulnerability v/s Exposure



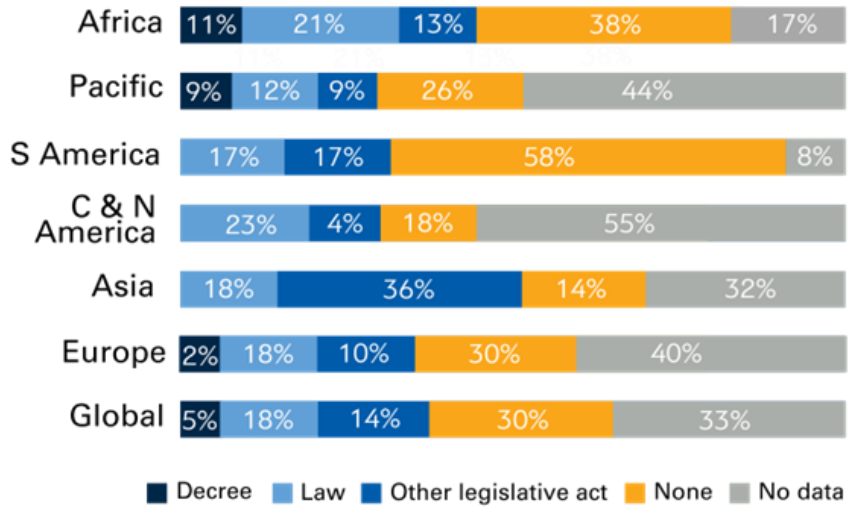


Source: ESCAP

State of Multi-hazard Early Warning Systems (MHEWS) Globally



Percentage of WMO Members reporting to have MHEWS



Percentage of Members reporting to have legislation on MHEWS

An enhanced data collection campaign through WMO Performance Monitoring System conducted (since March 2022) shows that significant gaps remain globally.

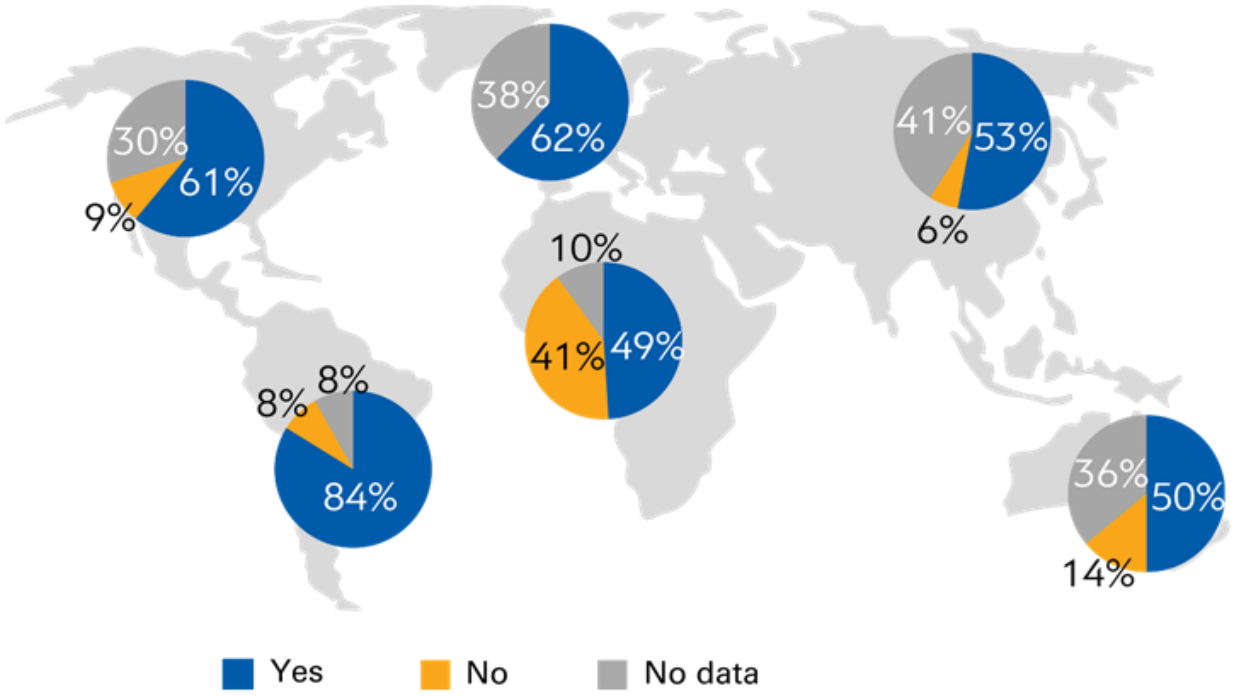
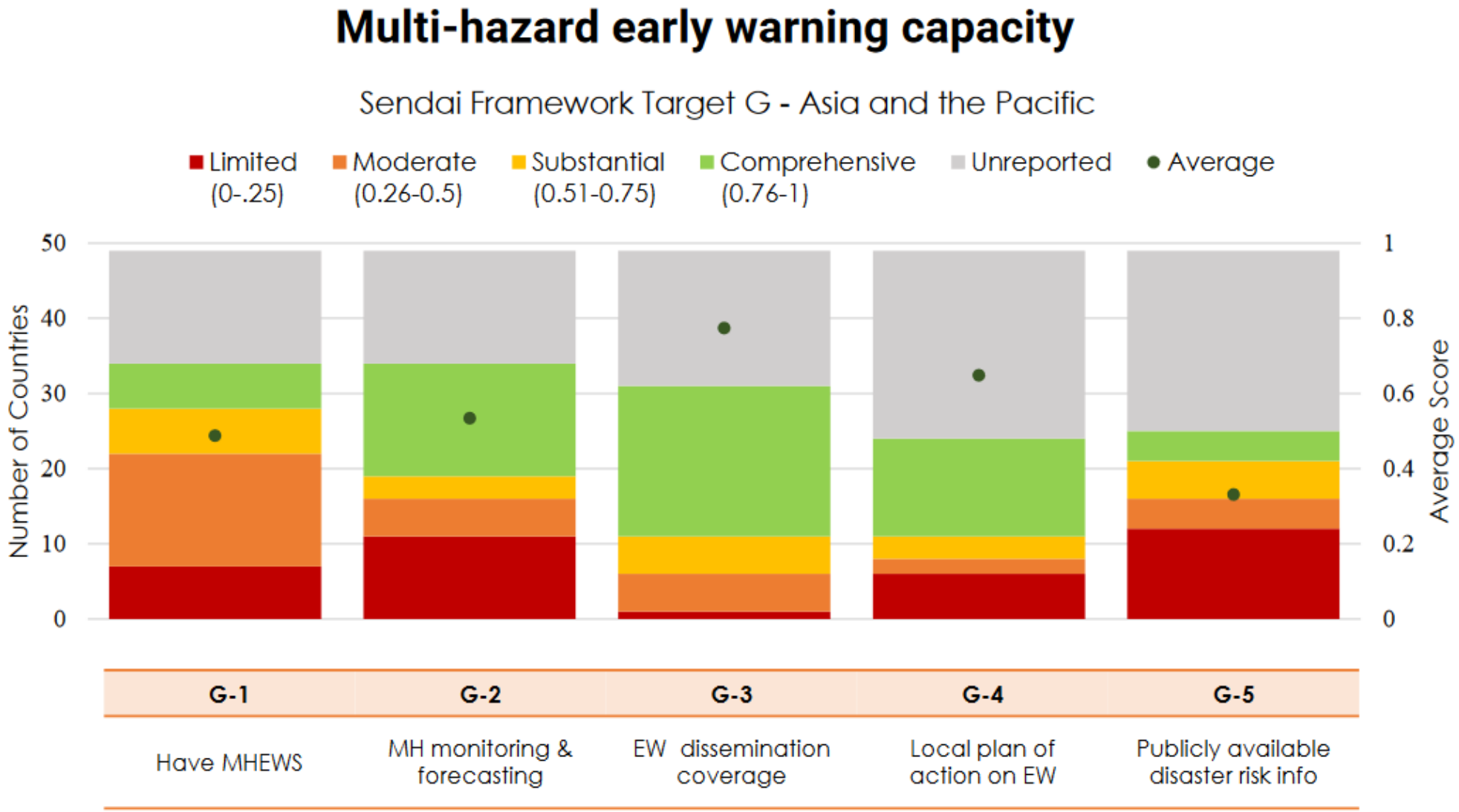


Figure 4: Percentage of countries reporting to have Standard Alerting Procedures (SAPs)

Asia-Pacific: MHEWS Capacity

Early warnings capacity gaps are critical in high risk developing countries, LDCs, SIDS

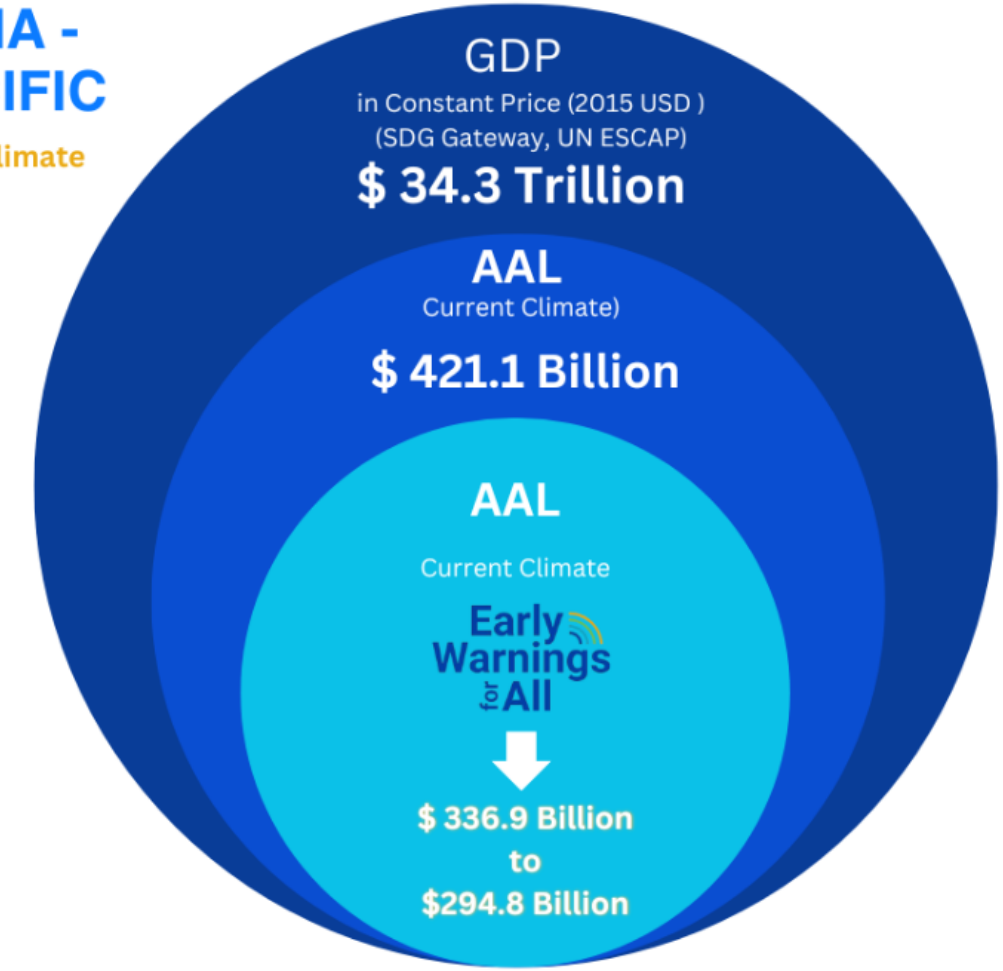


Source: ESCAP

Asia-Pacific: Average Annual Losses

ASIA - PACIFIC

Current Climate



Preventable AAL

$84.2 Billion to $126.3 Billion

Studies have outlined how only a **24-hour warning** of an oncoming storm or heatwave **could reduce damages by**

30%

and how **flood warnings could alone avoid**

32.85 %

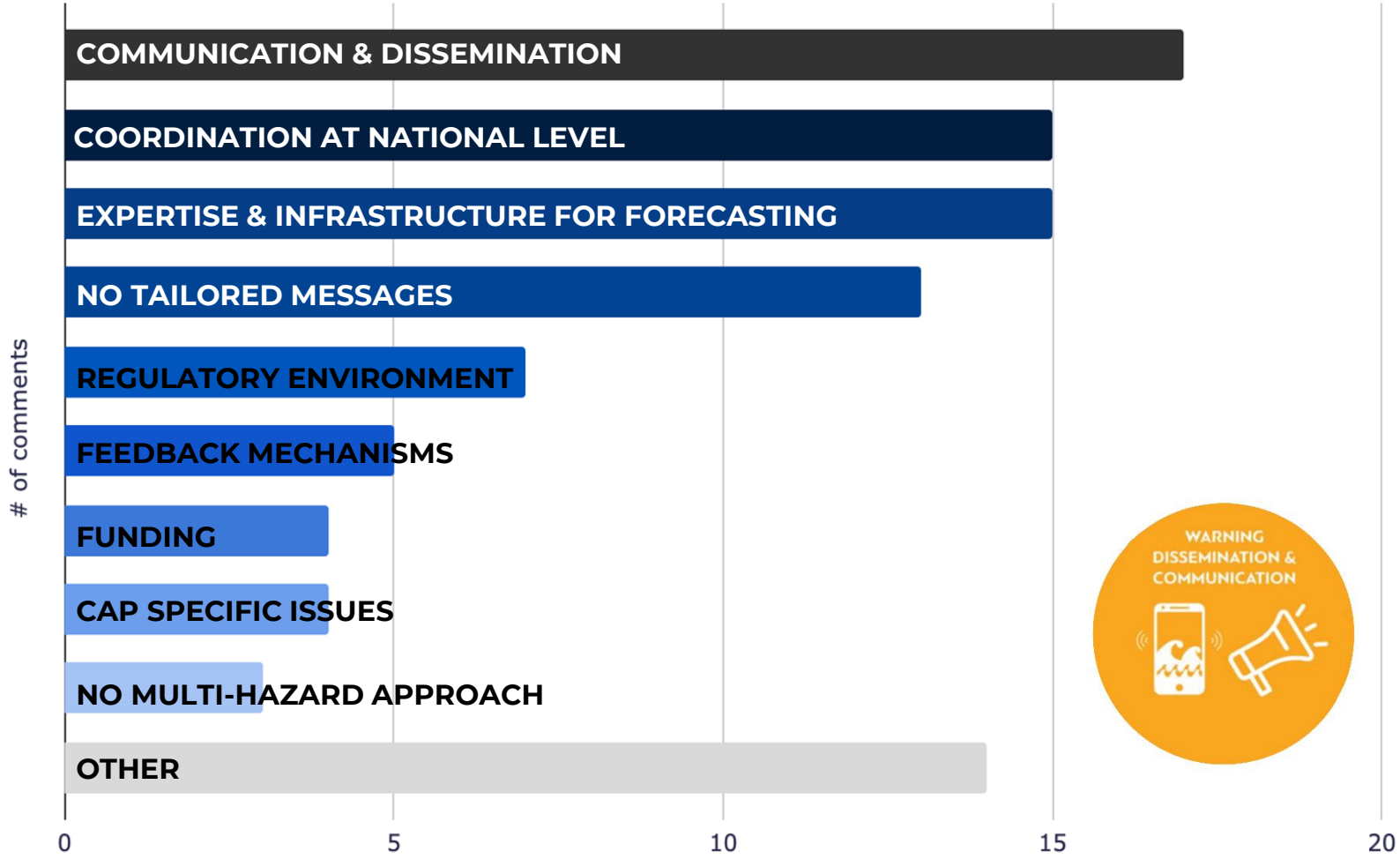
of damages

(Global Commission on Adaptation, 2019; Pappenberger and others, 2015).

Source: ESCAP

Warning Dissemination & Communication

-- **Is the main challenge for EWS,** according to research conducted in 13 countries in Africa & Caribbean



Scope

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How would you define BROADCASTING?

Broadcasting

1.38 *broadcasting service:* A *radiocommunication service* in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, *television* transmissions or other types of transmission (CS).

1.39 *broadcasting-satellite service:* A *radiocommunication service* in which signals transmitted or retransmitted by *space stations* are intended for direct reception by the general public. In the broadcasting-satellite service, the term "direct reception" shall encompass both *individual reception* and *community reception*.

1.85 *broadcasting station:* A *station* in the *broadcasting service*.

1.130 *community reception* (in the broadcasting-satellite service): The reception of *emissions* from a *space station* in the *broadcasting-satellite service* by receiving equipment, which in some cases may be complex and have antennas larger than those used for *individual reception*, and intended for use:
– by a group of the general public at one location; or
– through a distribution system covering a limited area.

Behavior - Need of Information

Information

In disaster situations, members of the public seek at first not to communicate, but to be informed, so that they may understand what is happening (or about to happen), and to assess whether and how they and their family and friends may be affected.

Personal Communication

Following the initial need for information, personal communication is then attempted as citizens seek rapid contact with family members and friends.

Broadcasting – Advantages during disaster 1/2

- **Architecture is simple and powerful**
  - If the main transmitter and the radio or television studios that feed it remain on the air, reception is available wherever there are working receivers
- **Robust**
  - geographical diversity of multiple radio and television services within a given country. If one or a few radio and television broadcasters are not able to remain in service, or suffer an outage, other broadcast signals are usually available.
  - Difficult to disrupt several or all sites of the DTT broadcasting network.
  - In addition, an attack on a DTT site can be brought only on the territory where the transmitter is located. Thus, a hostile action against DTT transmissions is less likely, because the source is more easily identifiable.

Broadcasting – Advantages during disaster 2/2

- **Easier comparative access for alternative power solutions**
  - Radio receivers can be AC-powered, battery, or hand crank-operated, and are present in virtually all motor vehicles
- **Professional quality of the compilation and analysis**
  - Expert ability to interpret information and impact for their viewers in the local broadcast coverage area
- **Emergency broadcast mandated to be free**

Broadcasting during disaster - *Operational methods for continued service 1/2*

- **Redundant capabilities and signal paths for over the air and feeds**
  - High risk stations have “case-hardened” facilities that include multiple power feeds from diverse power generation stations, full backup power generators at the studio and transmitter sites, multiple signal paths from studio to transmitter sites, redundant transmitters/antennas and direct feeds to cable and satellite operators.
- **Temporary set ups**
  - **Radio in a suitcase** :kits on standby, which are used to re establish FM radio services when these are destroyed or damaged. Used in conjunction with a small petrol-driven generator,
  - **BBC Media Action –** Use of emergency equipment like satellite telephones and Broadband Global Area Network (BGAN) satellite modems to support emergency broadcasting in locations where the local telecommunications infrastructure has collapsed. It also describes BBC Media Action’s use of other emergency equipment, including suitcase radios and solar/wind-up radios.

Broadcasting during disaster - *Operational methods for continued service 2/2*

- **Temporary Setups … continued**
  - **Emergency Transmission Vehicles:** NHK uses this special vehicle that has the capability to drive up to the transmitting site and back up the transmitter and antenna.

The television source signals are obtained by receiving the signal from a neighbouring transmitting site by Yagi antenna.

The source signal may be fed to the transmitter in the format of an MPEG-2 Transport Stream, Radio Frequency, or Intermediate Frequency.

In cases where it is difficult to obtain the signal from a neighbouring transmitting site, a temporary microwave video link may be used instead. In the worst case, satellite broadcasts may be used as the source signal.

Broadcasting and telecoms – *Increasing overall resilience through sharing infrastructure 1/2*

In addition to traditional ENS and satellite outside broadcast vehicles, broadcaster have increased dependence on new tech for news gathering and the dissemination of emergency information

- *live and recorded mobile phone videos can be placed on the air, making it possible to use non-traditional broadcasting equipment to share important information;*
- *broadcasters are adapting small aperture satellite dish technology that allows for a more easily deployed satellite news gathering tool in a local market;*
- *diversity microwave receive sites that make it possible to use small vehicles equipped with microwave transmitters to drive and report on road and other conditions;*
- *Aerial vehicles to give overall views of an area-wide emergency;*
- *computer mapping software to quickly document and display details of an emergency to the public.*

Broadcasting and telecoms – *Increasing overall resilience through sharing infrastructure 2/2*

- **Japan:** the “One-Seg” mobile digital TV service is available in a large majority of mobile phones.
  - Feature also included in several Electronic dictionary, Car navigation system, Handheld game console (PSP and Nintendo DS), Portable devices, Set top box, Mobile Phones
- **Europe:** FM radio reception capability in mobile phones is commonplace

Broadcasting during disaster in HF 1/2

- **Short Wave** a crucial asset when local infrastructure is damaged or completely gone.

- International Radio for Disaster Relief (IRDR) programme under the umbrella of the High Frequency Co-ordination Conference (HFCC), which supports informal co-ordination of frequency channels for short-wave radio broadcasts.

- In 2022, updated **Recommendation ITU-R BS.2107 which lists 10 frequencies between 6 megahertz (MHz) and 26 MHz** that should be reserved globally for 24 hours a day, 365 days a year, for emergency broadcasts.

Broadcasting during disaster in HF 2/2

International radio for Disaster Relief - IRDR

IRDR frequencies for emergency broadcasts in the High Frequency (HF) bands

Band (MHz)	IRDR frequency (kHz)
6	5 910
7	7 400
9	9 430
11	11 840
13	13 620
15	15 650
17	17 500
19	18 950
21	21 840
26	26 010

The frequency channel adjacent to these frequencies should also be clear (±5 kHz).

In emergencies, frequencies are available for use in accordance with the Radio Regulations, the treaty maintained by ITU.

Recommendation ITU-R BS.2107-1
(12/2022)

Scope

- EW for DRR and ASP region
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Emergency Broadcast Example

Emergency Broadcast Example

Your insights on comparing the two responses?

Reaction

- ✓ **Need for time sensitive coordinated national approach**

What IF Question?

- ➢ **Someone is not listening/viewing the regular broadcast**

OR

- ➢ **Consumes information through another preferred medium?**

People Centric Approach - Design requirements

✓ Alerts reach in time

Timeliness

✓ Everyone gets the message

✓ Message communicated through preferred comms channel

Inclusiveness

Clarity

✓ Alerts are understandable

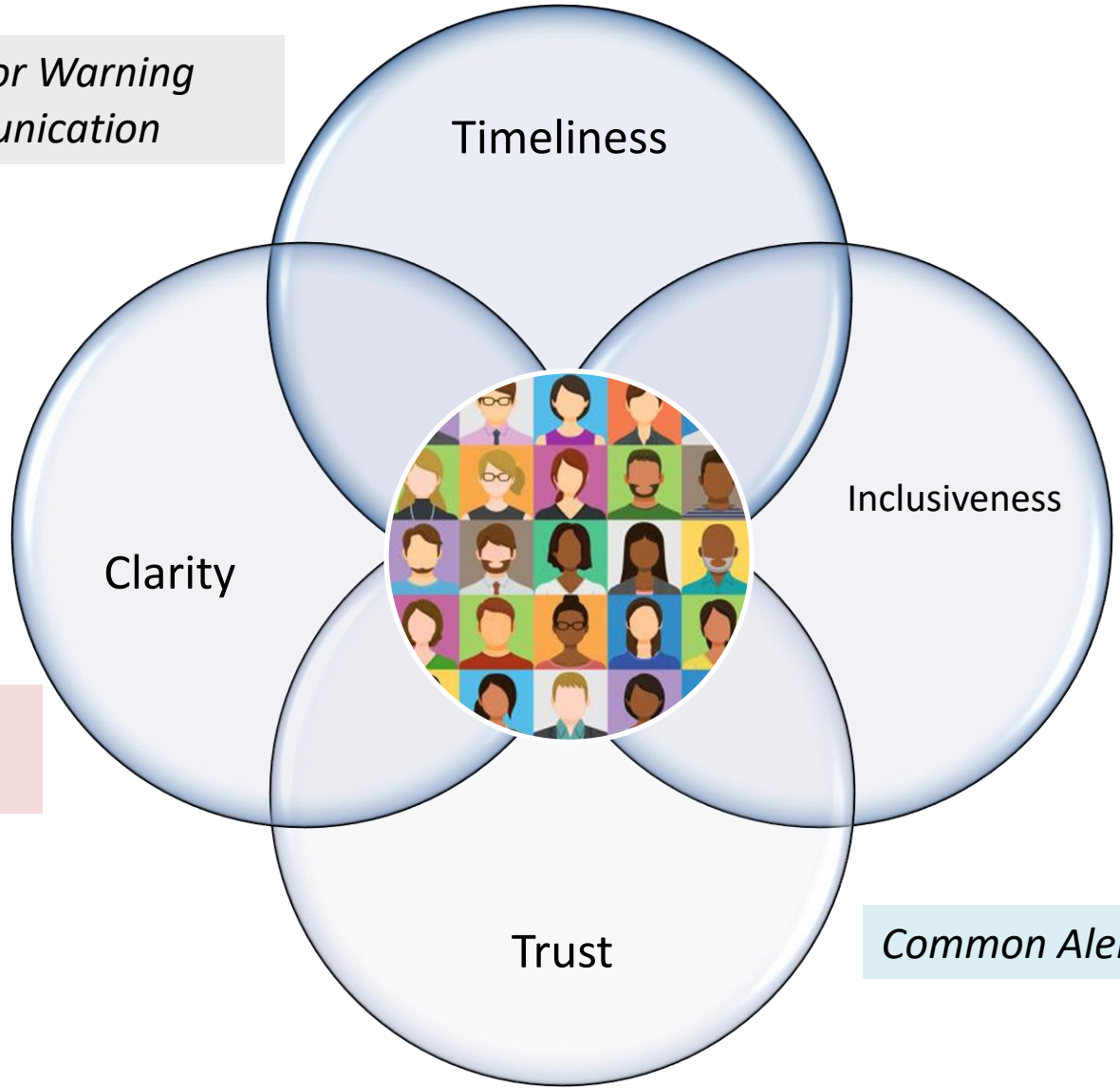
✓ Message is actionable

Trust

✓ Information sent from trusted source

People Centric Approach - Solutions

Multi-channel Approach for Warning Dissemination and Communication



- *Last mile connectivity*
- *Cell Broadcast*

Using AI

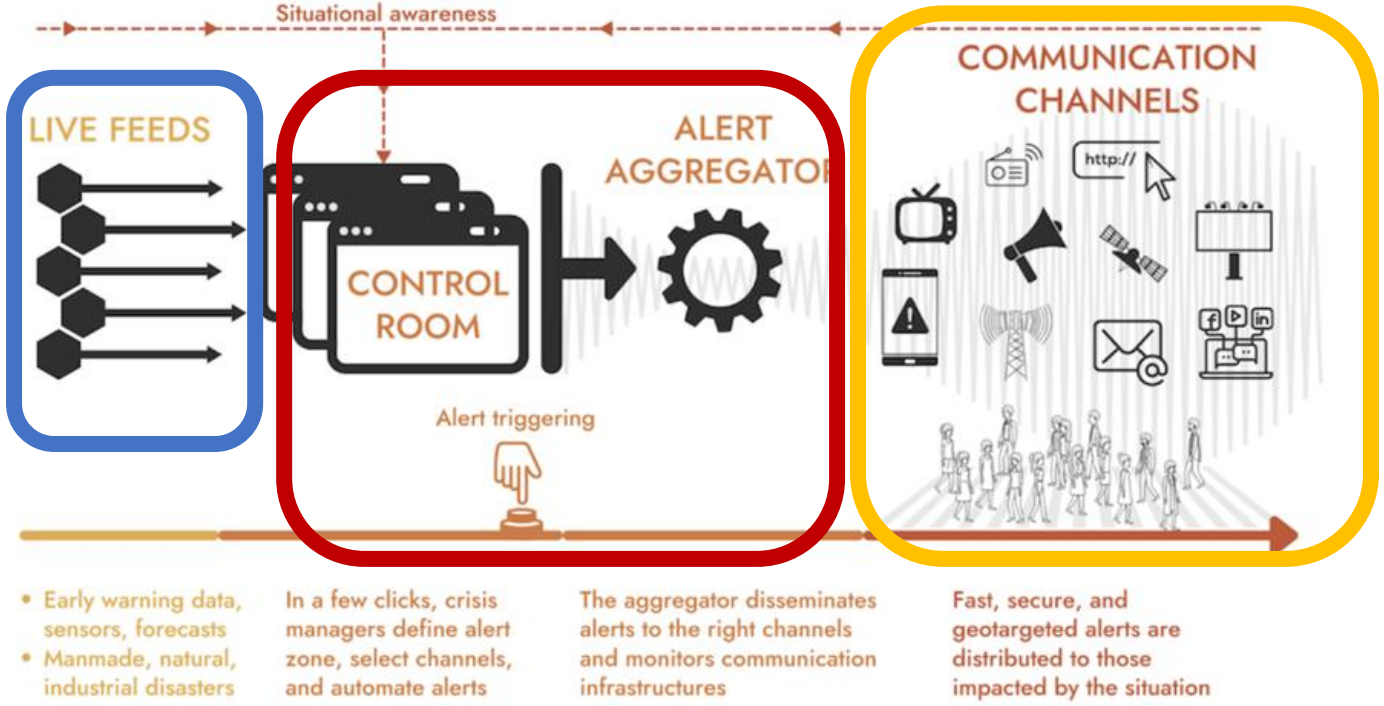
National Emergency Telecommunication Plan

Common Alerting Protocol (CAP)

EWS Basic Architecture

The basic architecture of an EWS requires three components

1. Monitoring of inputs to provide the situation awareness of an event
   - Alert type
   - Maps of locations
   - Description of event
2. An Alert Aggregator to package the alert into a format (i.e. CAP) to be sent to appropriate channels/parties
3. Dissemination Channels <u>including but not limited to</u>
   - Mobile
   - Broadcast media
   - Social Media



Source INTERSEC

Integrating Common Alerting Protocol (ITU-T X. 1303)

International standard format for emergency alerting to ensure the interoperability and consistency of alerts via different communication networks.

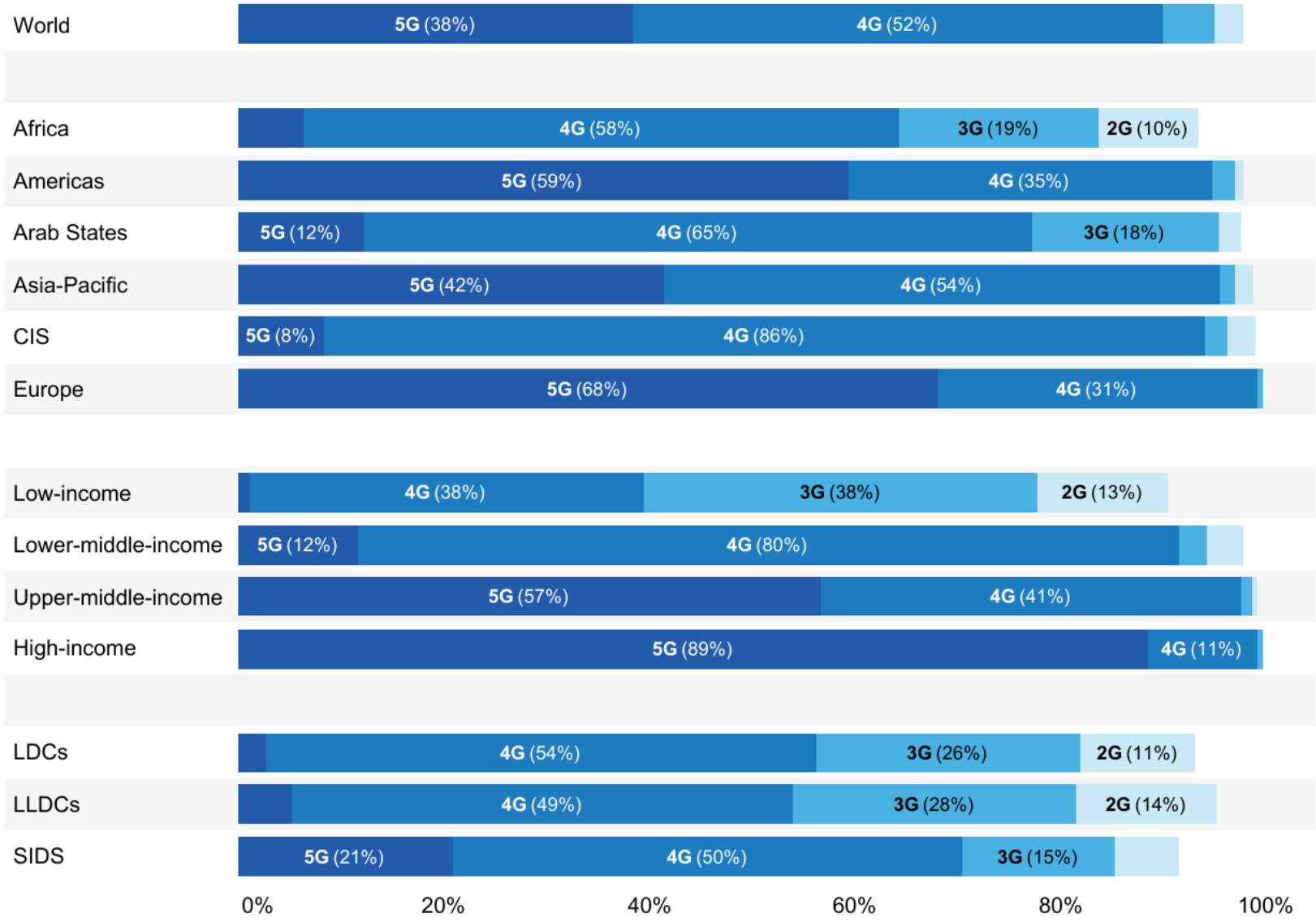
- **Requires an alerting agency**
- **Requires tools to be effective**
  - *Input information such as meteorological forecasts and monitoring systems*
  - *Tools and systems for implementation such as maps, CAP tools, integration with operators and other actors*

- ✓ **OVER ANY AND ALL MEDIA**
- ✓ **ABOUT ANY AND ALL KINDS OF HAZARD**
- ✓ **TO ANYONE**

98% of the world population is covered by some version of mobile network

…a great opportunity to use mobile networks for early warning systems!

Population coverage by type of mobile network, 2023

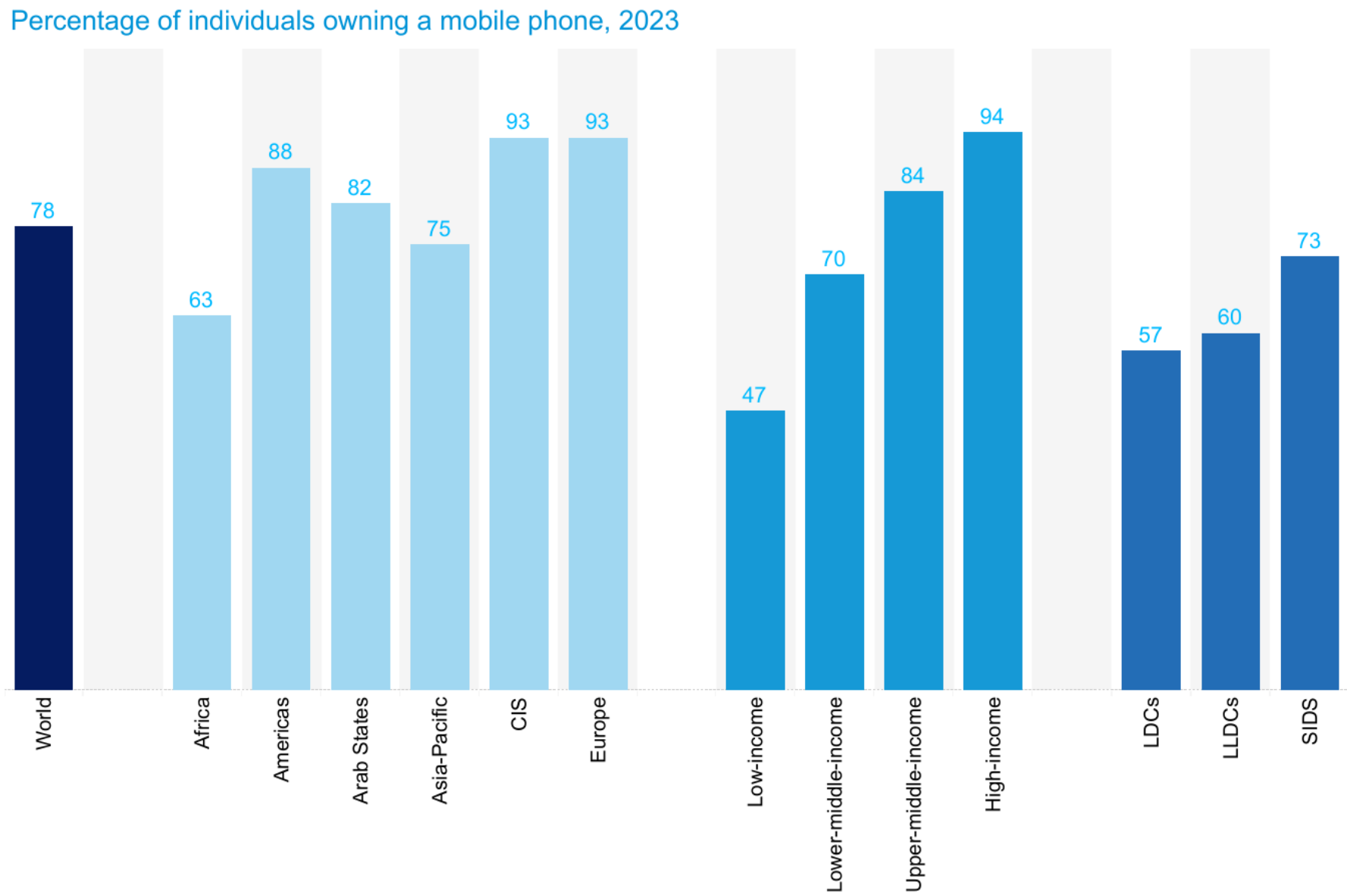


Note: The values for 2G, 3G and 4G networks show the incremental percentage of the population that is not covered by a more advanced technology network (e.g. in 2023, 95 per cent of the world population is covered by a 3G or above network, that is 5 per cent + 52 per cent + 38 per cent).

Source: ITU

Percentage of individuals owning a mobile phone, 2023

…a great opportunity to use mobile networks for early warning systems!



Note: Mobile phone ownership refers to individuals aged 10 or older.

Source: ITU

How and why alerting via mobile-cellular networks works?

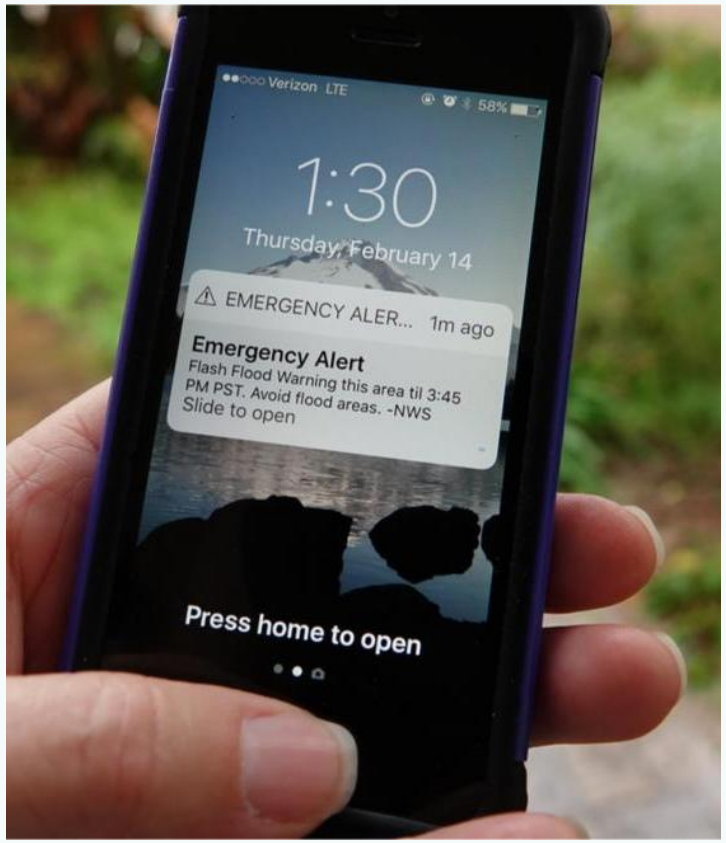
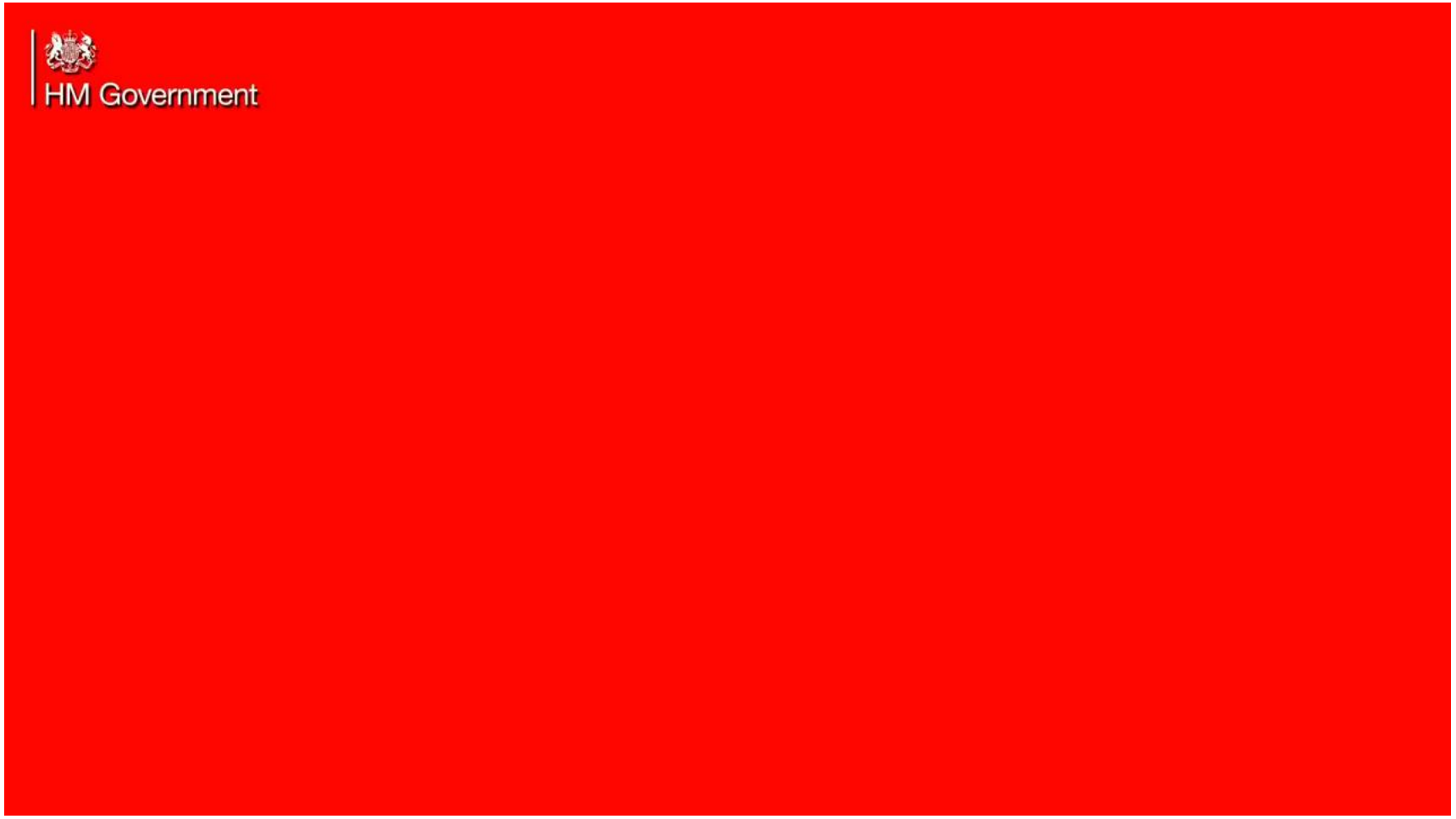


Photo credit: Dimone Hogan/Shutterstock

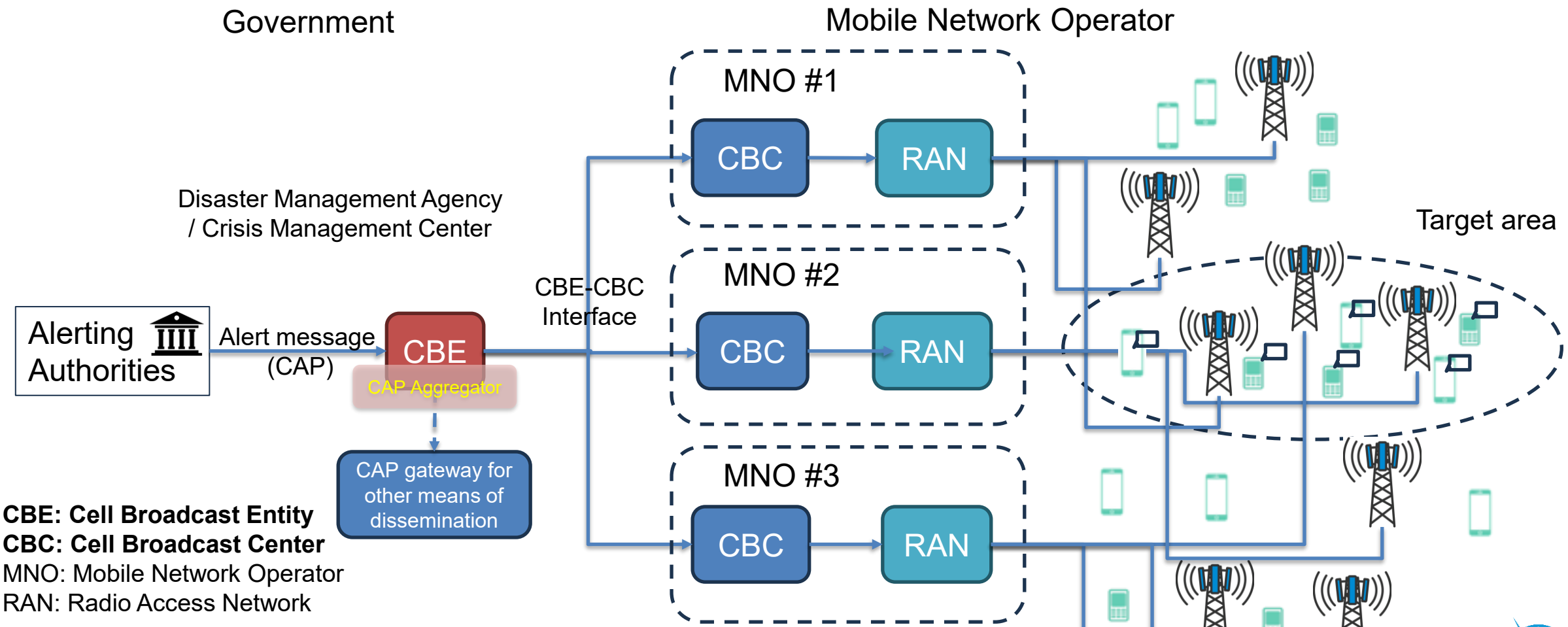
Cell-Broadcast (CB) & Location-based SMS (LB-SMS)

- **Wide reach:**
  - Send geo-located messages to users within risk areas, including roamers
  - Opt-in challenges limited(as opposed to mobile-apps)
  - Compatible on most (CB) /all devices (LB-SMS)
- No risk of congestion (CB)
- No subscription needed (CB)
- Supports multi-language alerts (CB & LB-SMS)
- A “blind technology” that does not allow 2-way communication (CB)
- 2-way communication to provide information such as the number of users in risk areas (LB-SMS)

Emergency Alerts via Cell Broadcast



Key elements of Cell Broadcast technology

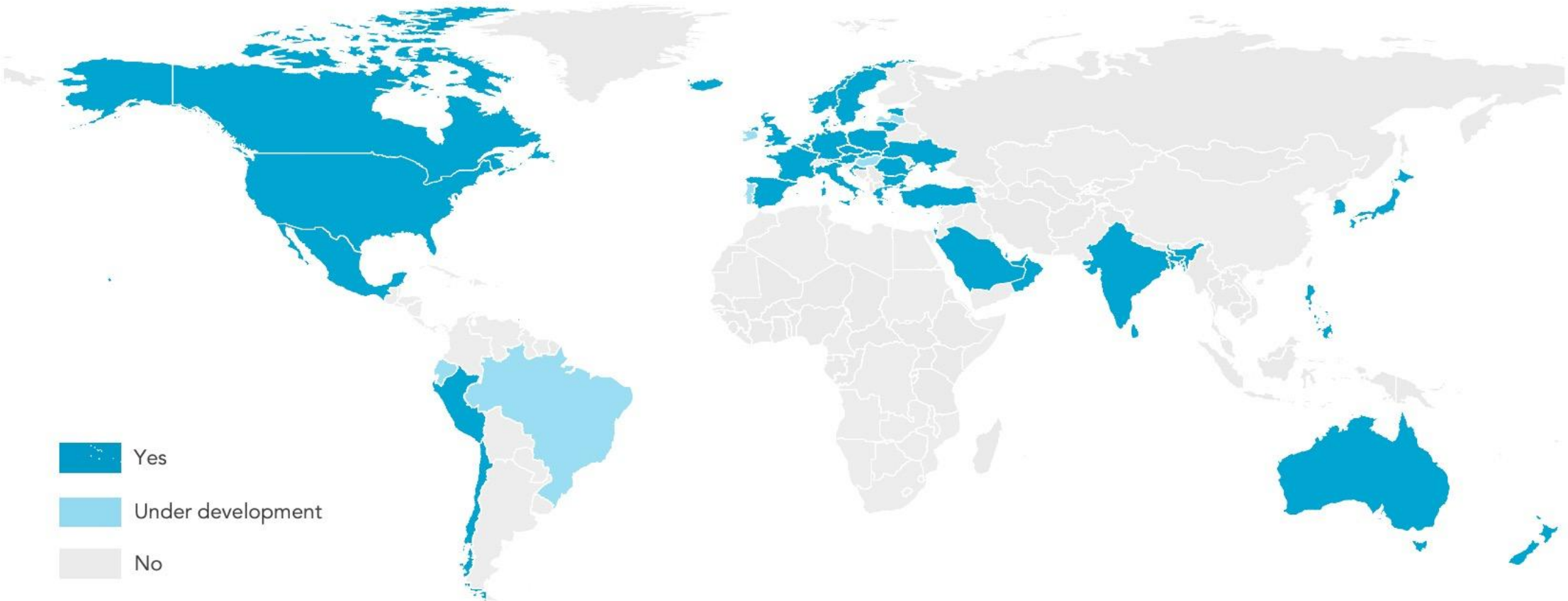


CBE: Cell Broadcast Entity
CBC: Cell Broadcast Center
MNO: Mobile Network Operator
RAN: Radio Access Network

Source: Cellular Tower Vector Images (VectorStock.com) / Getty Images/iStockphoto

Countries with mobile EWS in place

using cell broadcast and location-based SMS*



** work in progress, based on ITU research*

Cell Broadcast Standards

EU-ALERT
ETSI TS 102 900
V1.3.1 (2019-02)

3GPP Main standards:

CBS	3GPP TS 23.041 V18.1.0 (2022-12)
BSC GSM/2G	3GPP TS 48.049 V17.0.0 (2022-03)
RNC UMTS/3G	3GPP TS 25.419 V17.0.0 (2022-04)
MME LTE/4G	3GPP TS 29.168 V17.1.0 (2021-12)
AMF 5G	3GPP TS 29.518 V18.2.0 (2023-06)

Scope

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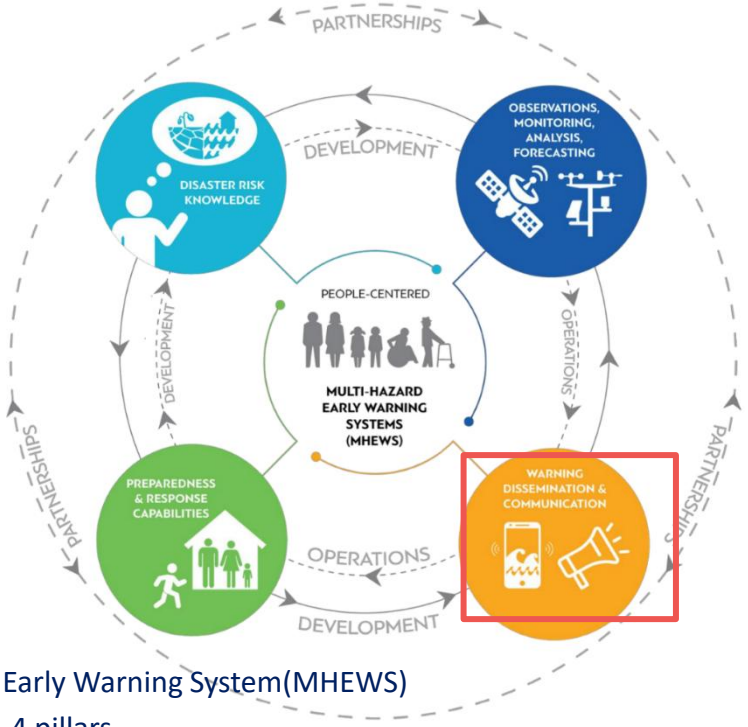
ITU Mandate on Early Warning Systems

ITU's Membership has provided the Union with a clear mandate to support countries in implementing early warning systems, including:

- **PP Resolution 136 (Rev. Bucharest, 2022)** : the use of telecommunications/information and communication technologies for humanitarian assistance and for monitoring and management in emergency and disaster situations, including health-related emergencies, for early warning, prevention, mitigation, and relief."
- **ITU World Telecommunication Development Conference (WTDC) Resolution 34 (Rev. Kigali, 2022)** : on "the role of telecommunications/information and communication technology in disaster preparedness, early warning, rescue, mitigation, relief and response."

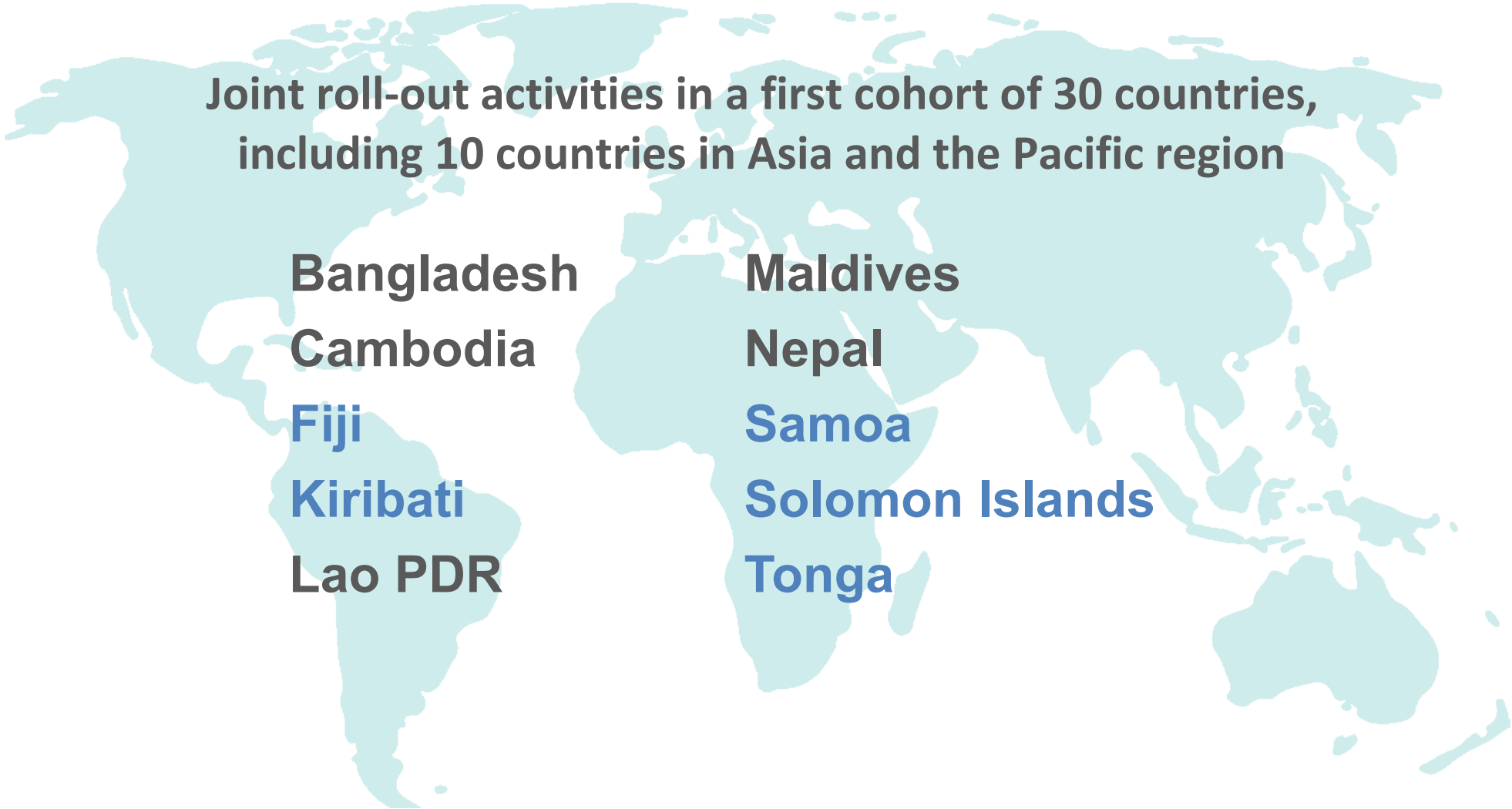
Early Warning for All Initiative Action Plan: launched during COP27

Pillar 3: Warning dissemination and communication



Multi-Hazard Early Warning System(MHEWS) Value Cycle – 4 pillars

EW4ALL Country Roll Out



Joint roll-out activities in a first cohort of 30 countries, including 10 countries in Asia and the Pacific region

- Bangladesh
- Cambodia
- Fiji
- Kiribati
- Lao PDR
- Maldives
- Nepal
- Samoa
- Solomon Islands
- Tonga

EW4A Pillar 3 technical assistance

1. Assessment and technical advice:

- Assess current use of different warning dissemination channels (e.g., mobile, TV, broadcast, siren, etc)
- Analyze necessary steps to be taken to implement most appropriate dissemination channels
- Support countries develop bidding document
- Advice on Common Alerting Protocol
- National Gap Analysis on Digital Infrastructure Resilience, Preparedness and ICT service affordability
- Last Mile Connectivity planning
- Disaster Connectivity Maps (DCM)

2. Economic scope

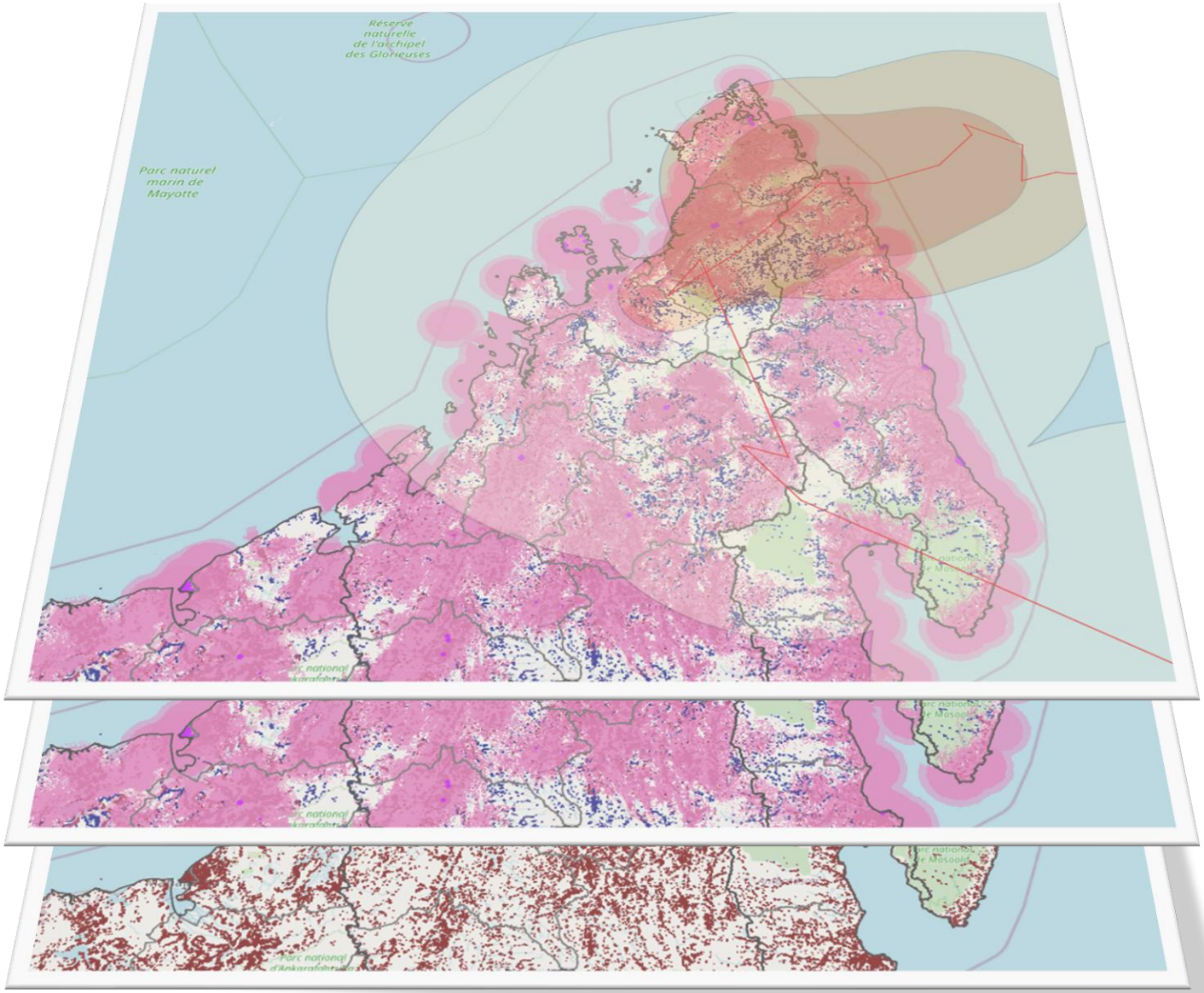
- Cost estimation of the roll-out of mobile EWS, and community-level last mile warnings targeting specific vulnerable groups
- Identify possible funding opportunities

3. Regulatory scope

- NETP preparation
- Review and assess the current legislation and SOPs, if appropriate and necessary, propose modifications to the regulatory framework

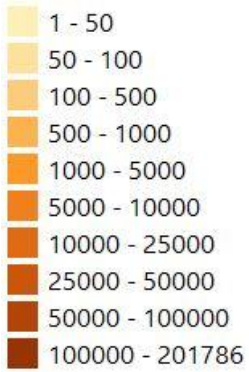
Early Warning Connectivity Map
EWCM

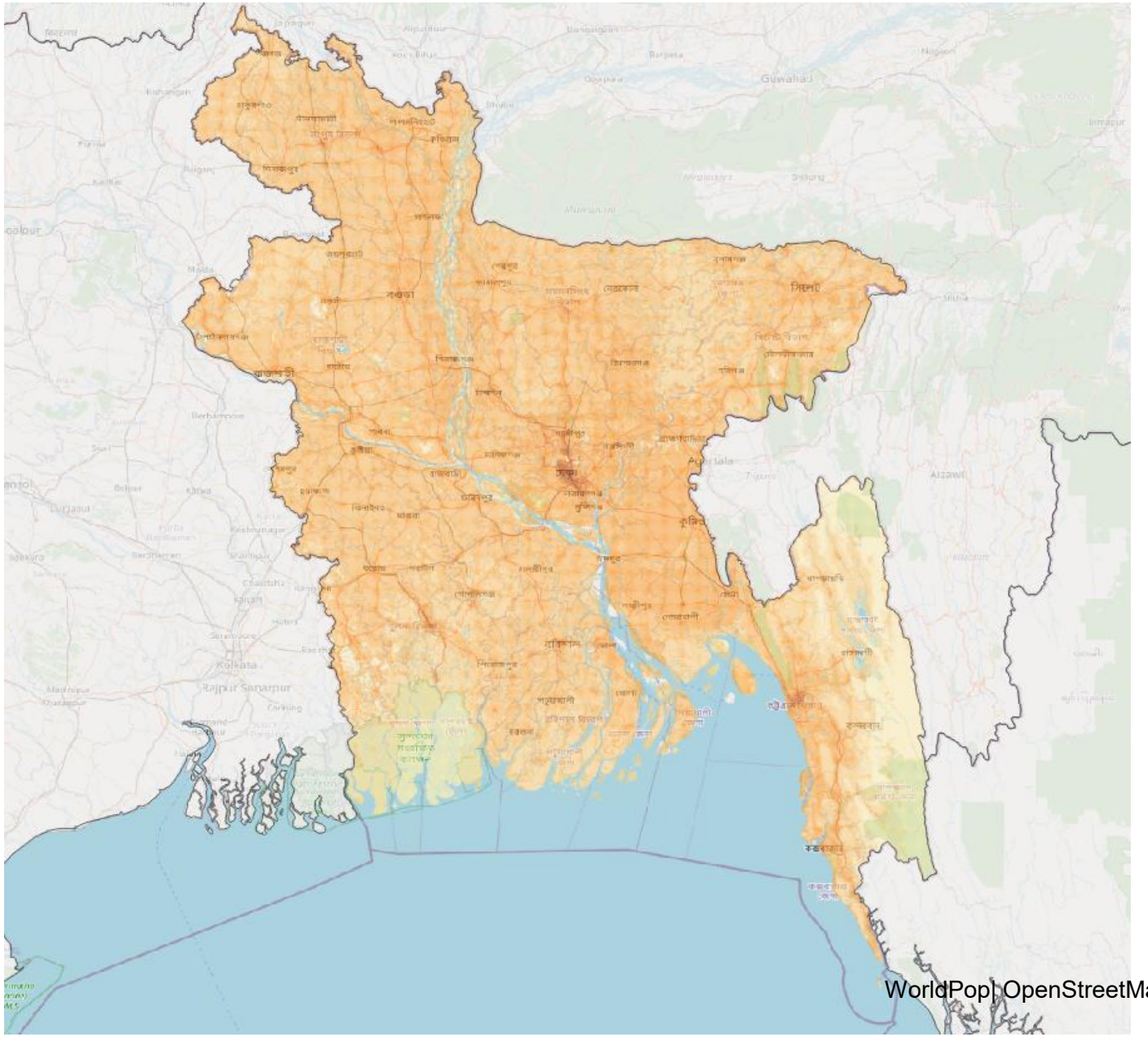
- ITU collaborates with Microsoft AI for Good Lab, Planet, and the Institute for Health Metrics and Evaluation (IHME) at the University of Washington.
- Integrates AI with satellite imagery to create high-resolution population density maps and visualize connectivity data, to **highlight areas where people are vulnerable to natural hazards due to limited access to emergency notifications.**
- These results will guide **data-driven decisions on warning dissemination strategies** and guide mobile infrastructure investment to ensure no one is left behind.



Population density at 1km resolution

Total population (UNPD, Jan 2024) 172,507,468





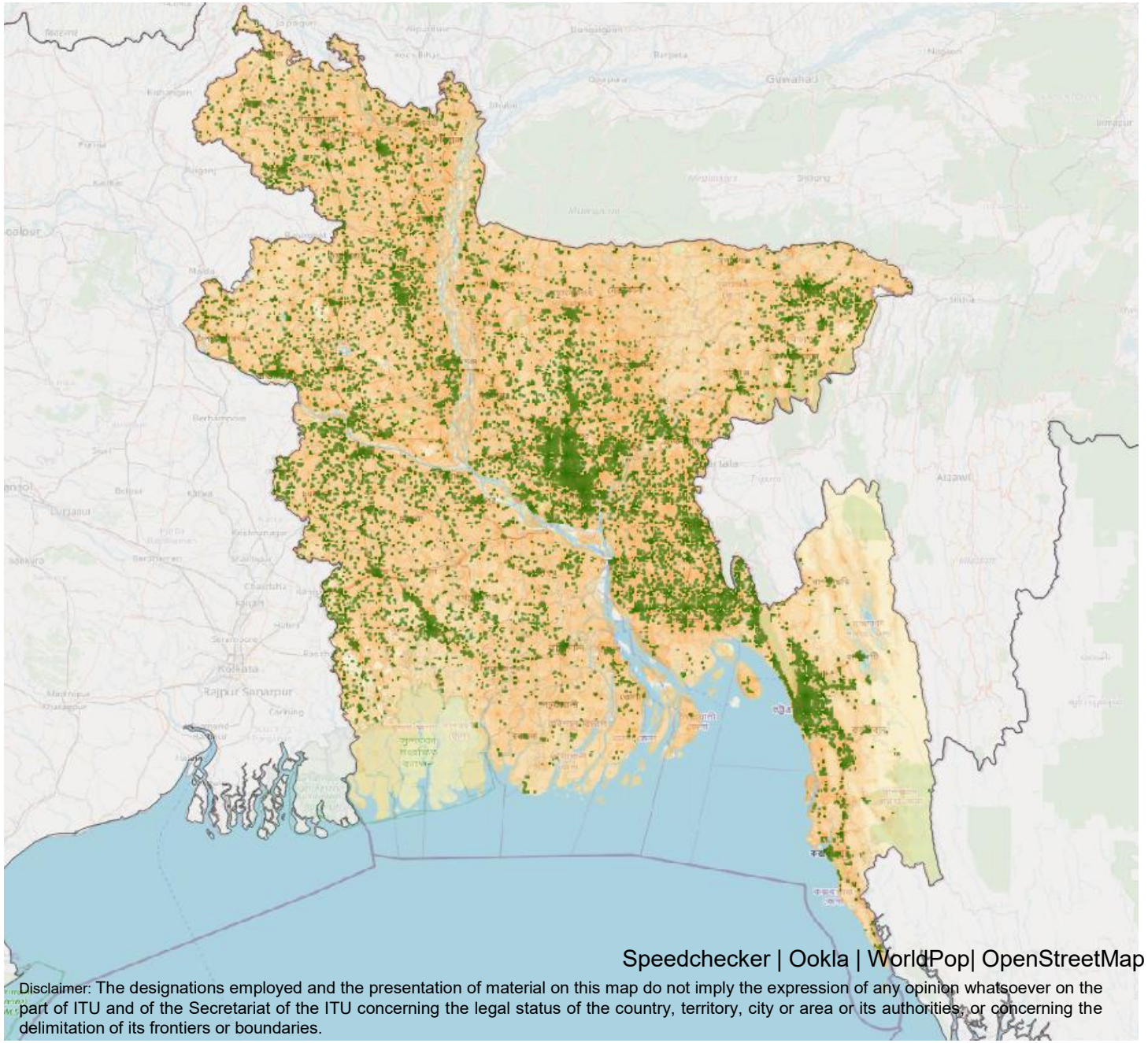
Coldspot map of offline population.

- What is the extent of fixed and mobile telecom coverage, and therefore, which channels can be used to send early warning notifications?
- How many people, and where, are vulnerable to natural hazards as they cannot receive emergency notifications, because they live in places beyond the reach of fixed broadband, 2G, and 3G+ networks.

Fixed broadband datapoints

Total population (UNPD, Jan 2024) 172,507,468

- 1 - 50
- 50 - 100
- 100 - 500
- 500 - 1000
- 1000 - 5000
- 5000 - 10000
- 10000 - 25000
- 25000 - 50000
- 50000 - 100000
- 100000 - 201786



Speedchecker | Ookla | WorldPop| OpenStreetMap

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- According to the Bangladesh Telecommunication Regulatory Commission, there were 12.9m fixed broadband subscriptions in 2023 (7.5% of the population), 191m (111%) cellular subscriptions, and 99.6% of the population is covered by 2G, and 98.8% by 3G+.

2G cellular coverage

Total population (UNPD, Jan 2024) 172,507,468

- 1 - 50
- 50 - 100
- 100 - 500
- 500 - 1000
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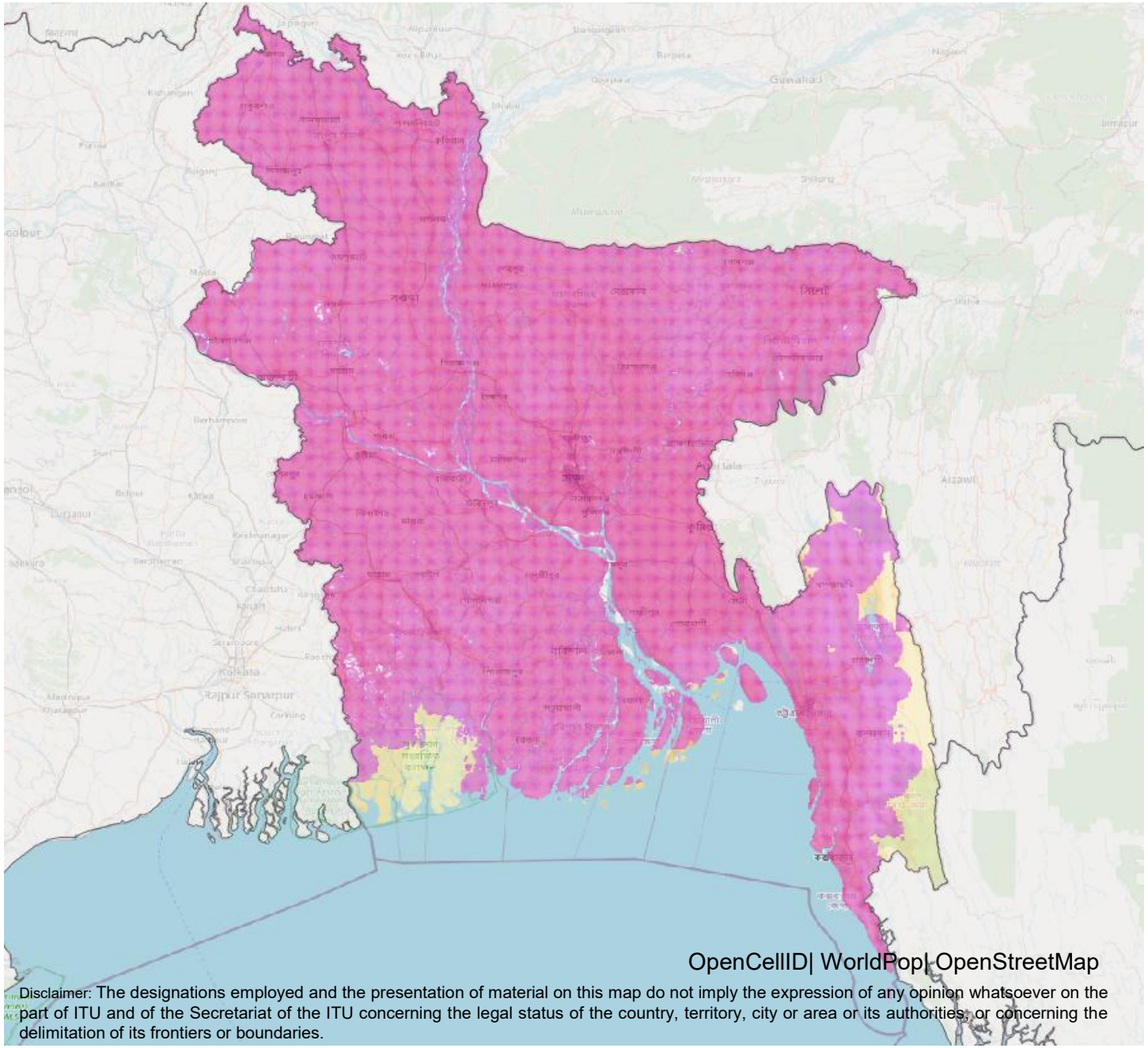
- 50000 - 100000
- 100000 - 201786



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3G+ cellular coverage

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- 100 - 500
- 500 - 1000
- 1000 - 5000
- 5000 - 10000
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- 50000 - 100000
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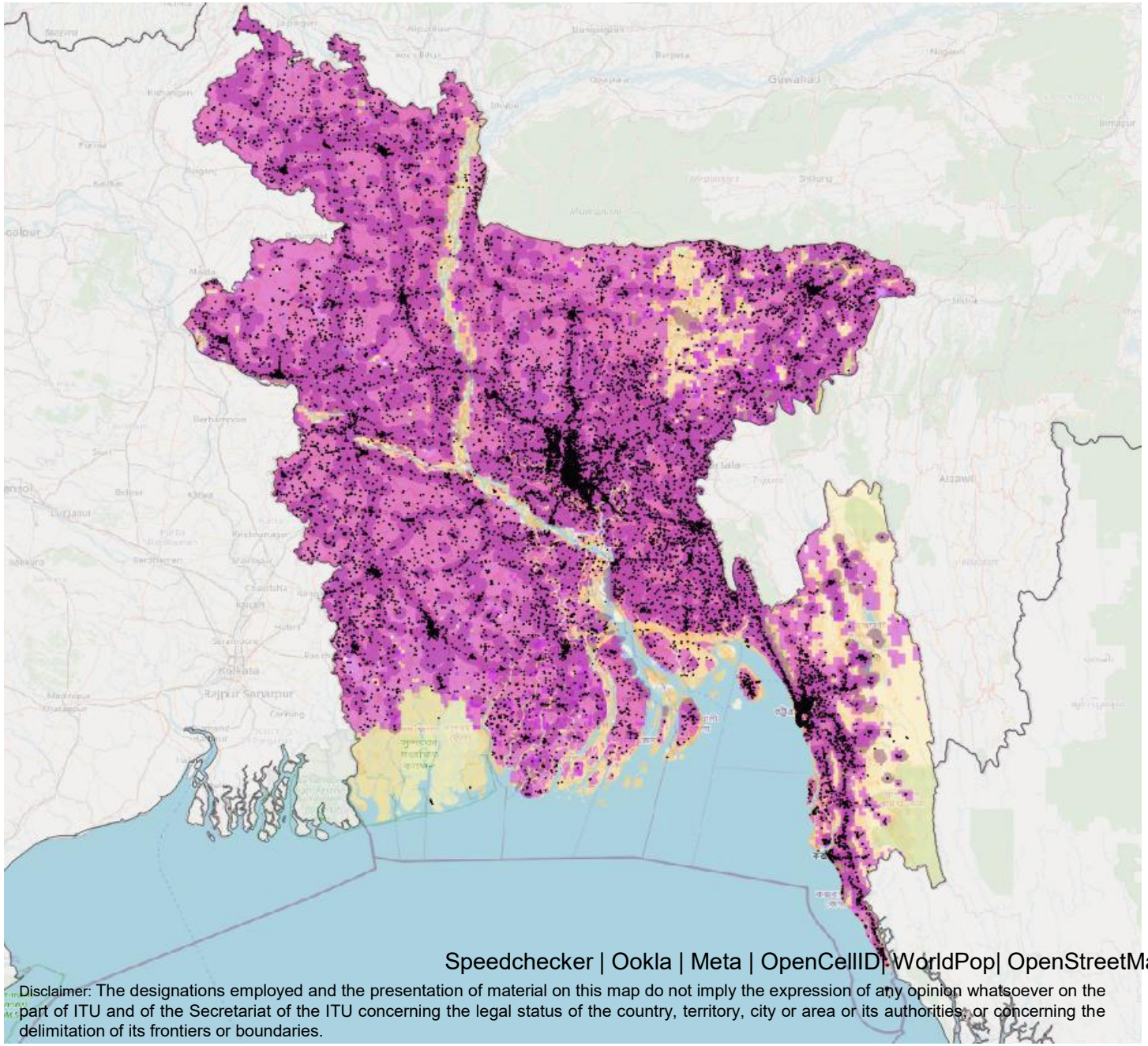

Speedchecker | Ookla | Meta | OpenCellID| WorldPop| OpenStreetMap

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Fixed broadband, 2G, and 3G+ cellular coverage

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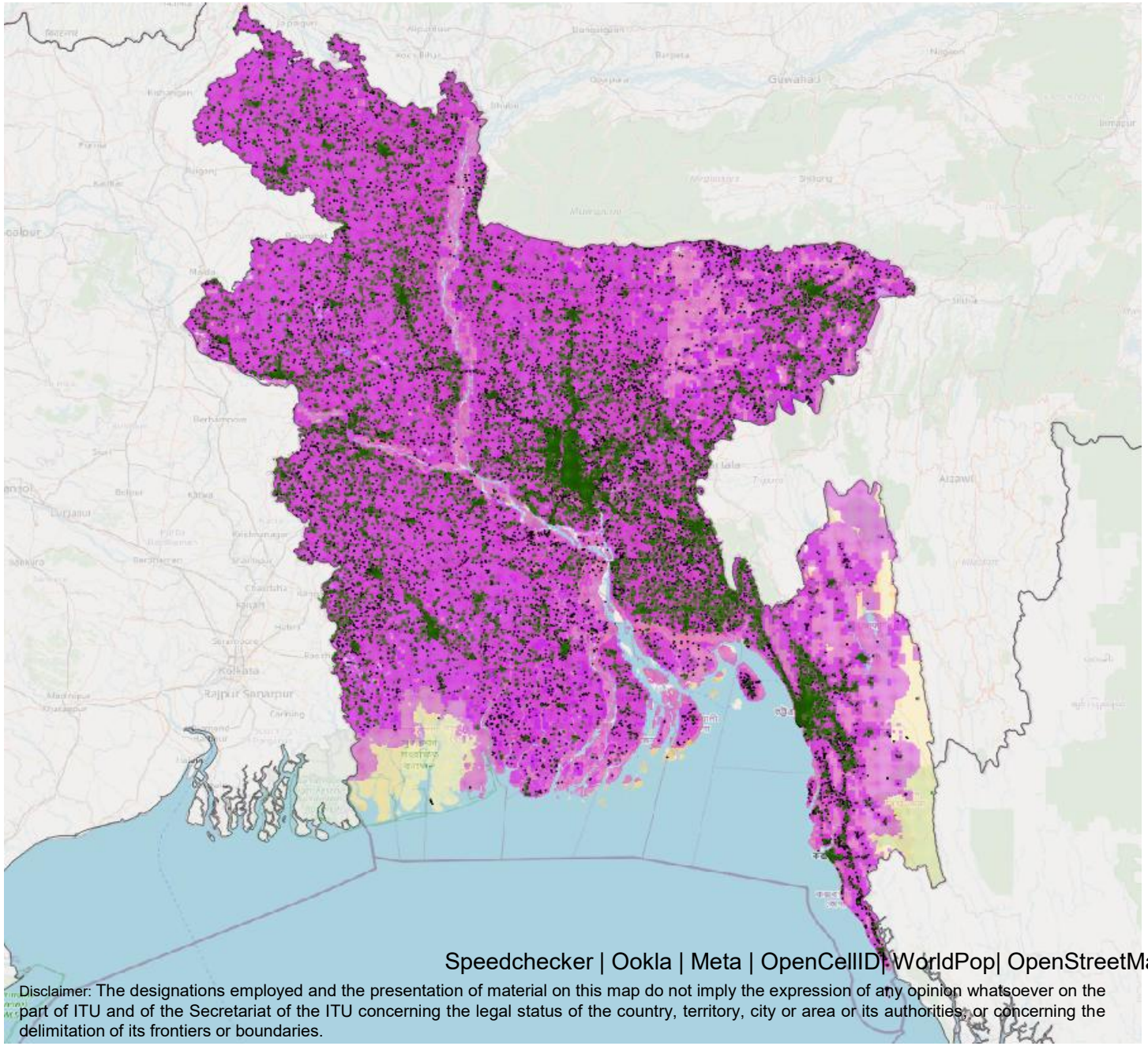

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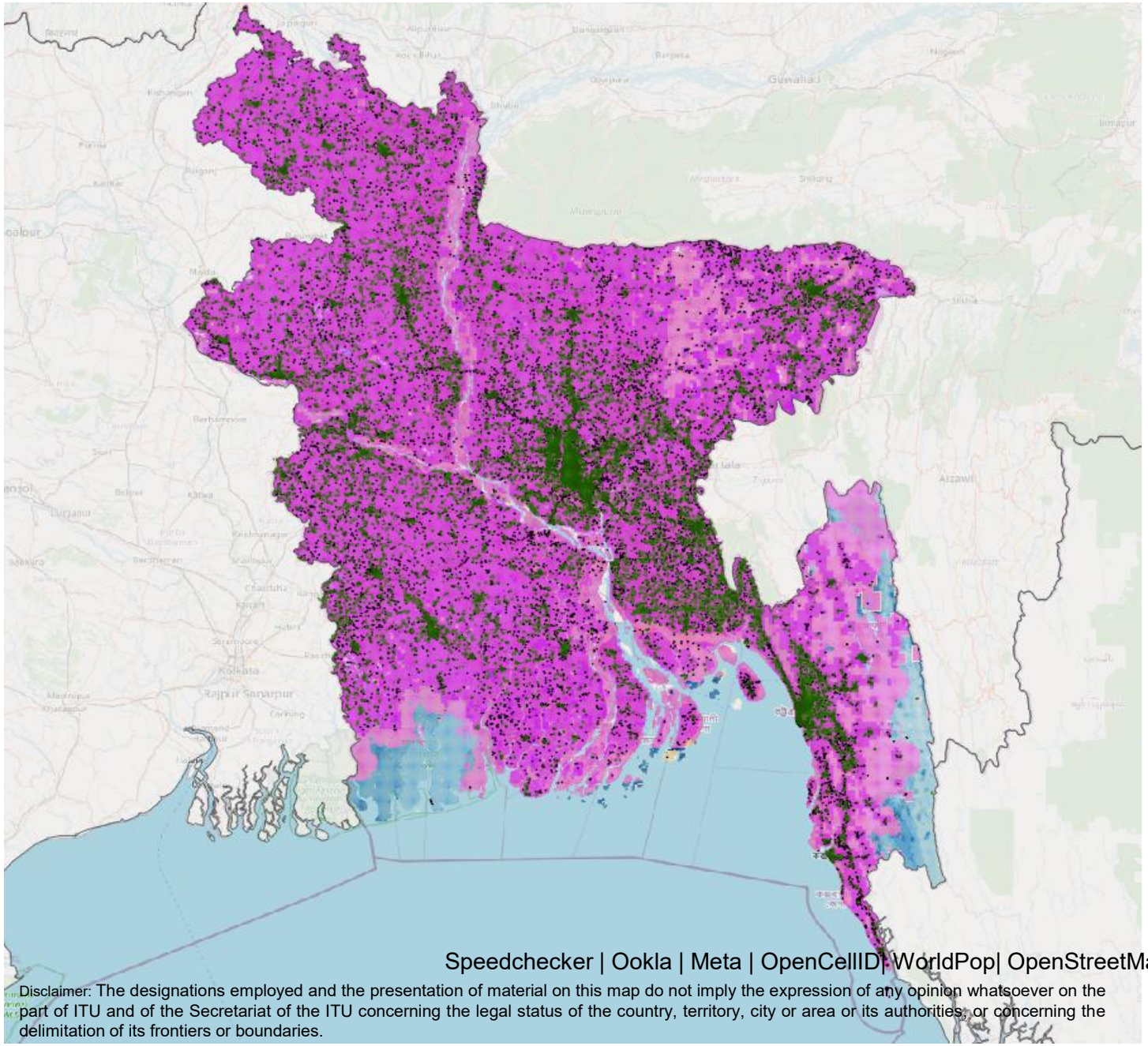
Population beyond network reach 418,458 (0.2%)

- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 250
- 250 - 500
- 500 - 1180.6



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- Geographical areas beyond the network reach

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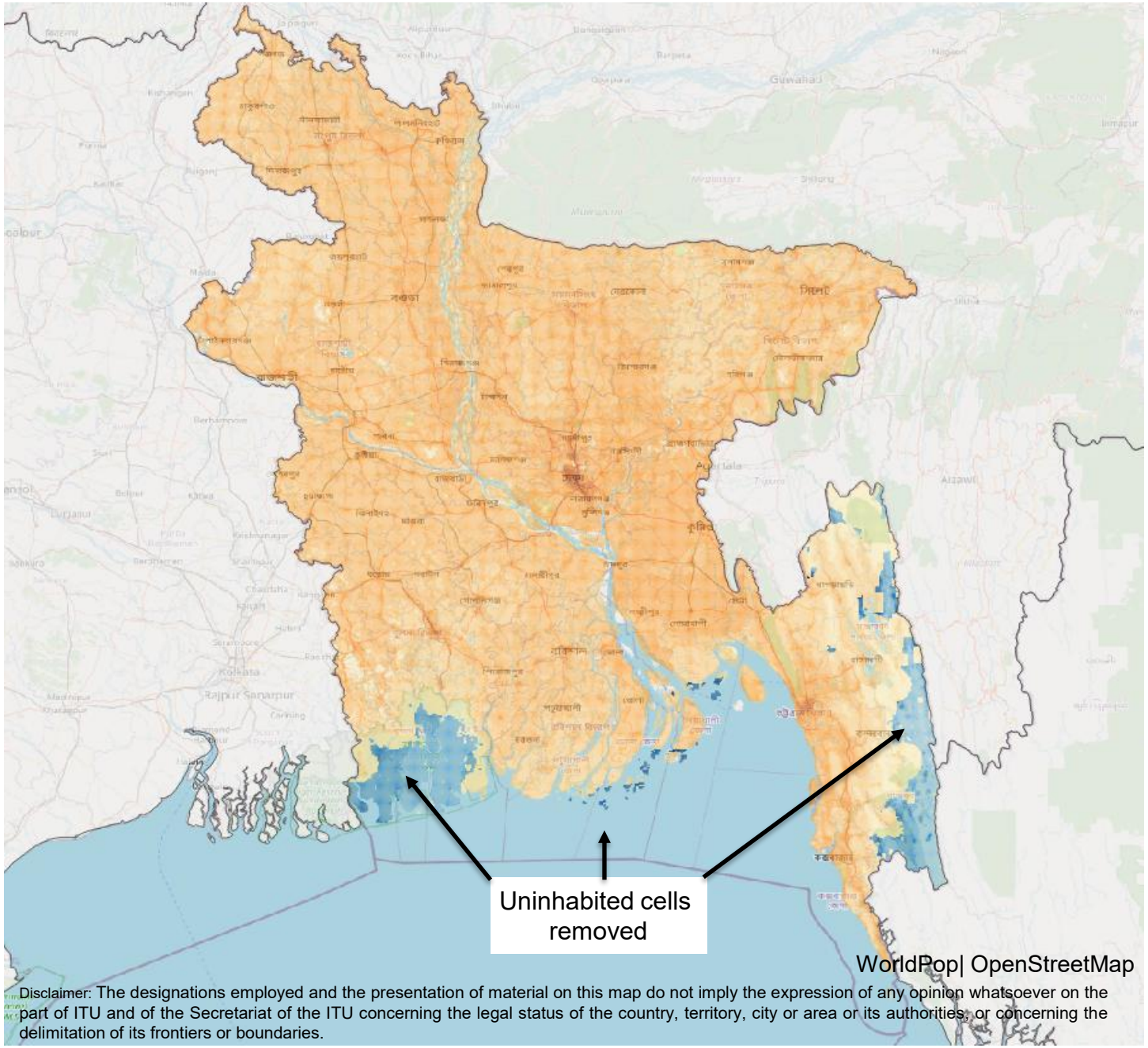

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Offline population, filtering out uninhabited grid cells

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Population beyond network reach 113,047 (0.1%)

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- 50 - 75
- 75 - 100
- 100 - 250
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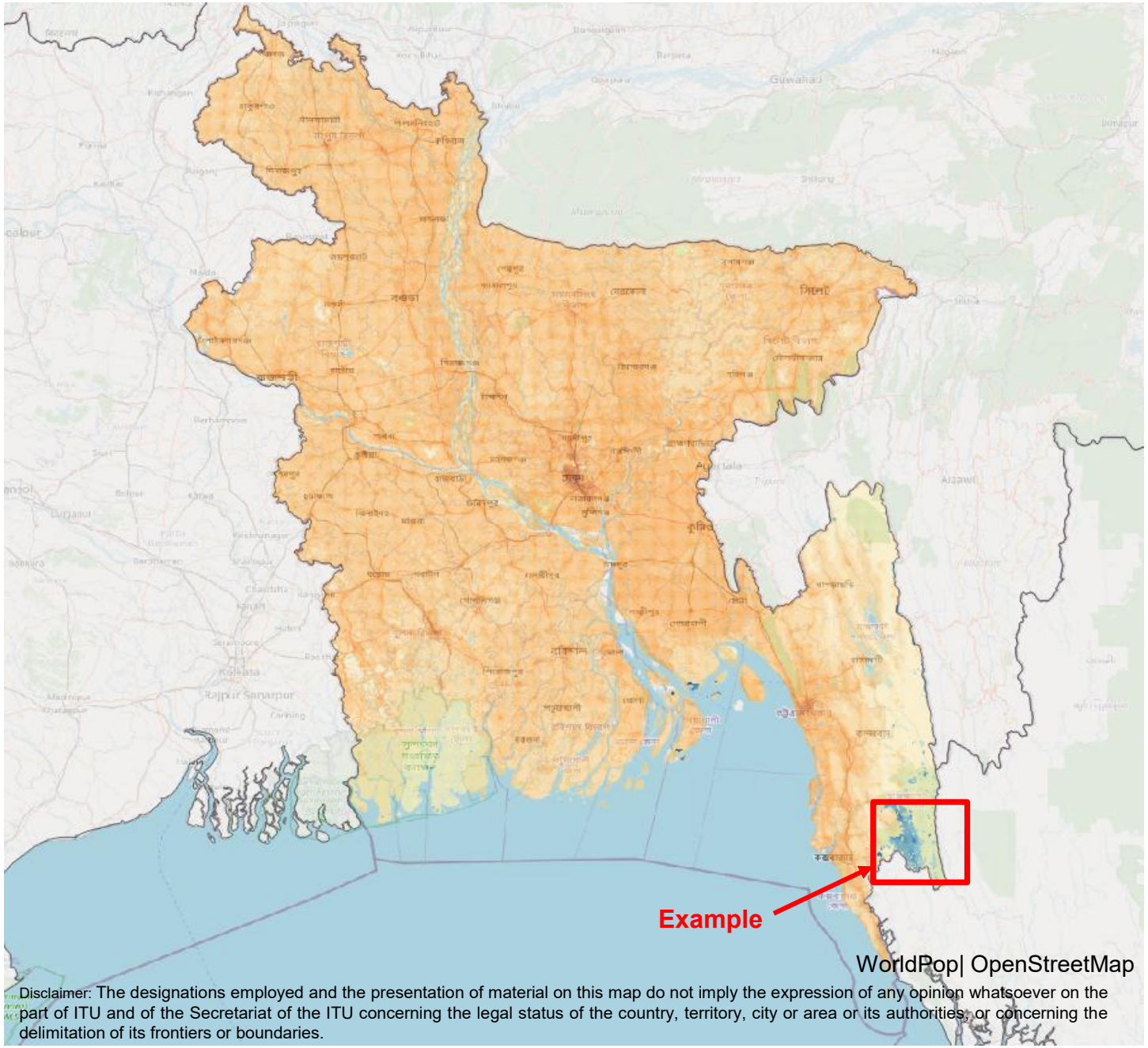

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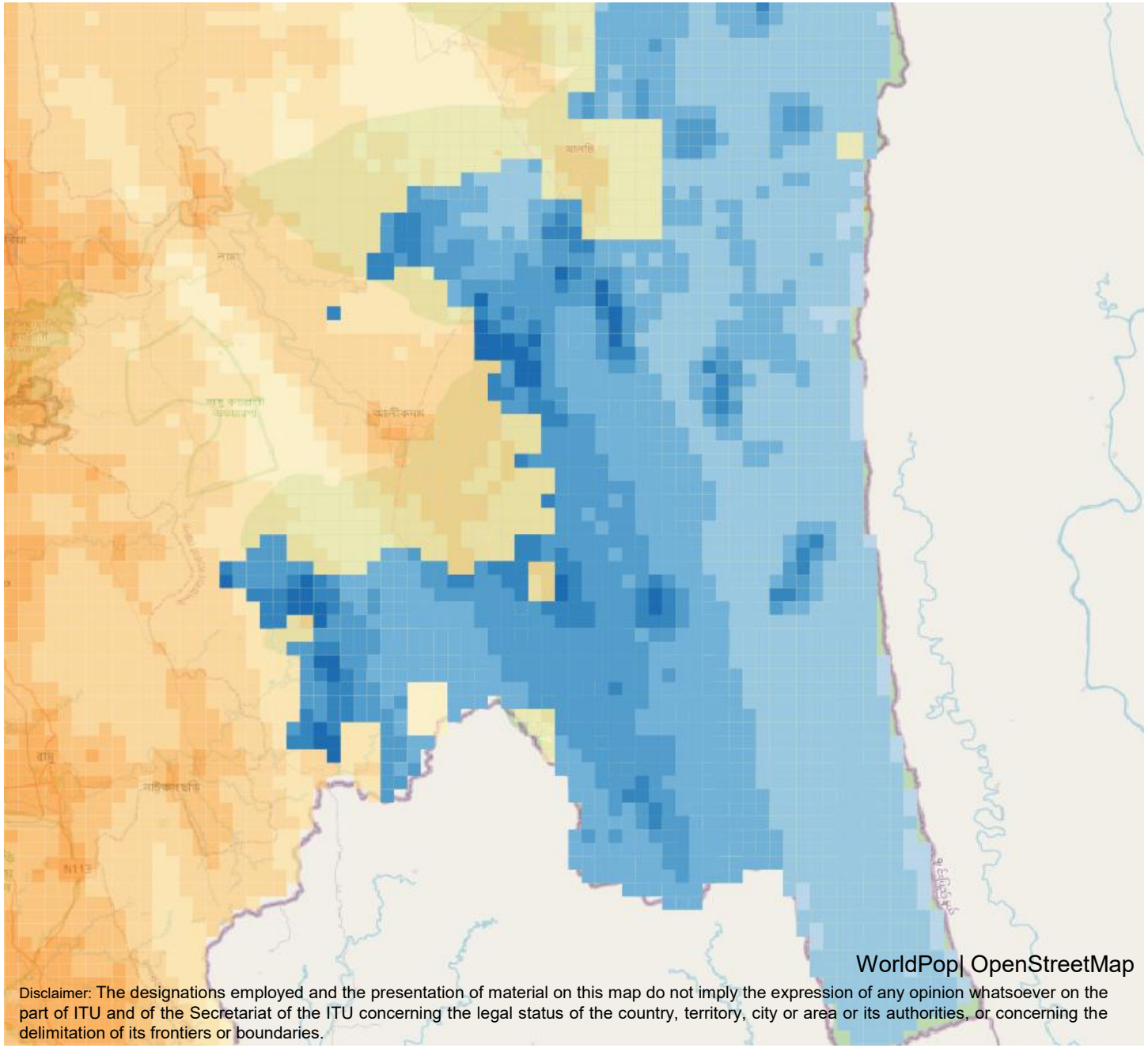

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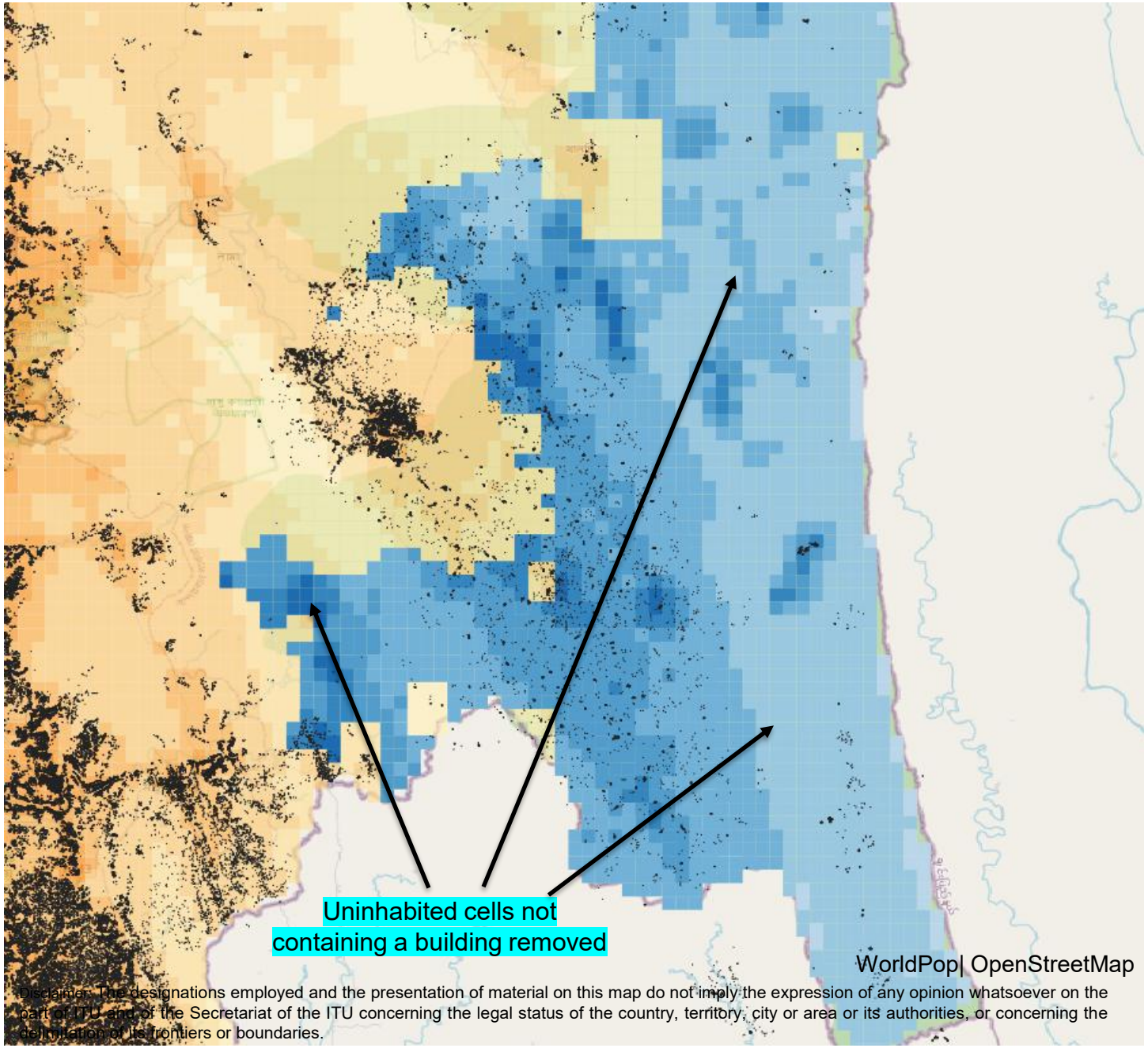

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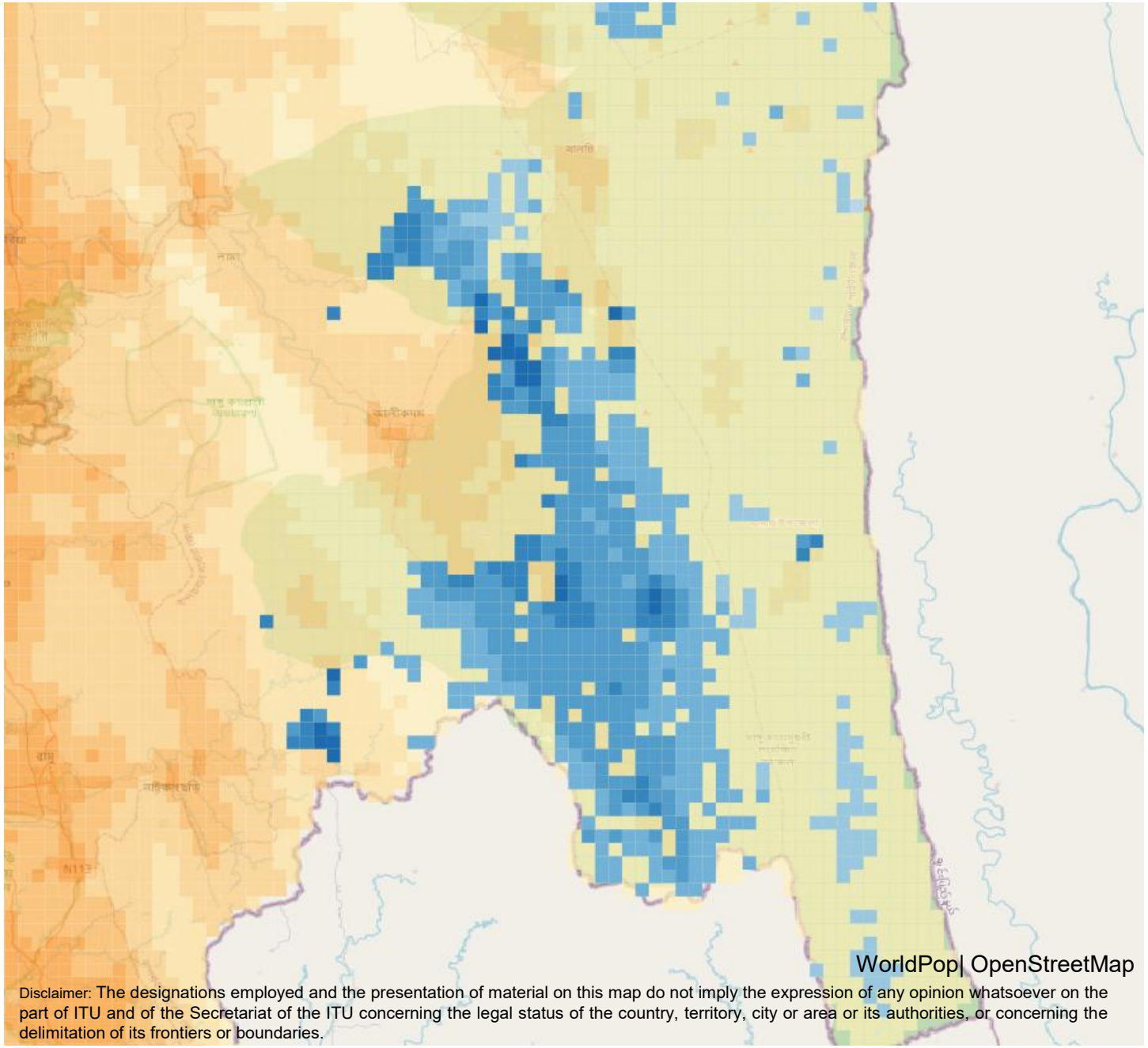

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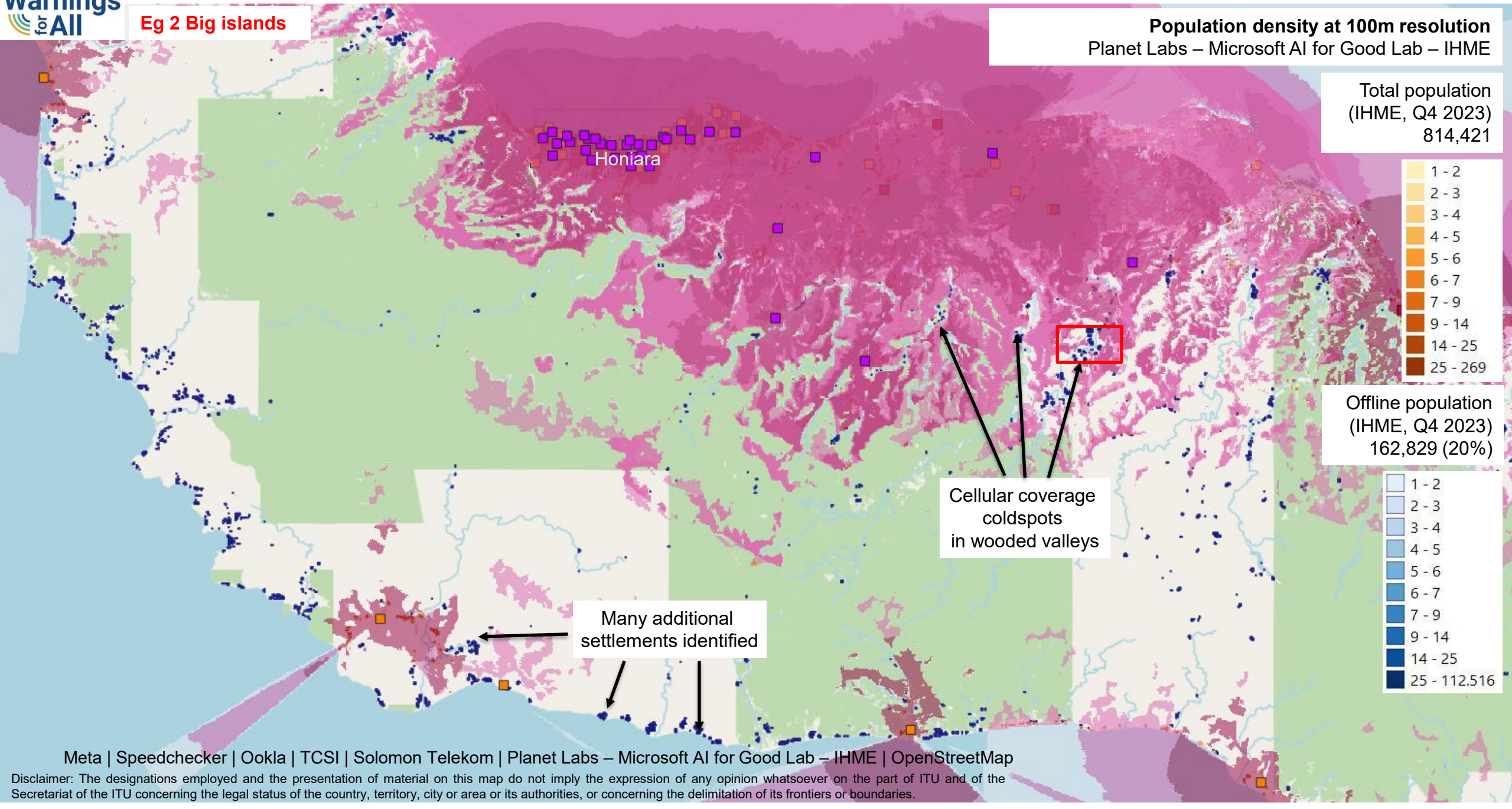
Early Warnings for All: Population beyond the reach of fixed broadband, 2G and 3G networks, Solomon Isla

Eg 2 Big islands



Meta | Speedchecker | Ookla | TCSI | Solomon Telekom | Planet Labs – Microsoft AI for Good Lab – IHME | OpenStreetMap

Leveraging AI in Pillar 3

- The EW4All Action Plan recognizes the need for accelerating innovation and technology - references private sector and AI.
- AI transforms disaster management practices e.g. enhances monitoring, analysis, and forecasting of hazards.
- Optimises information delivery to communities at risk, ensuring timely response to warnings.
- Establishment of the AI Sub-Group for EW4All to cultivate partnerships to further leverage AI – Microsoft is a key partner.

Early Warnings for All Initiative

Opportunities to get involved

1 Provide a **financial contribution** to support the implementation of the initiative:

- ✓ Fund the development and deployment of EWS, ensuring alerts reach at-risk communities.
- ✓ Provide flexible funding to enable ITU to respond to member states, adapt to changes, and plan strategically.
- ✓ Support multi-year agreements for predictable funding.

2 Provide **(in-kind) expertise as a knowledge partner** in specific country implementation:

- ✓ Offer expertise, technology, and a tender for CB infrastructure to enhance EWS, especially in vulnerable regions.
- ✓ Support the development of mobile EWS, leveraging widespread mobile phone usage.
- ✓ Share experiences and best practices from countries with mobile EWS to raise awareness.
- ✓ Provide technical expertise in cell-broadcast and the common alerting protocol (CAP) for resilient warning systems.

3 **Pledge commitments** to cooperate and support the initiative from mobile and satellite industry:

- ✓ Pledge support from the mobile and satellite industries to disseminate warnings quickly and widely.
- ✓ Engage mobile network operators and the satellite industry through COP pledges.

Early Warnings for All Initiative

Who can work with us?

1 **Governments:** We urge national leadership from countries needing better EWS. Governments must show political support and engage stakeholders to build resilient systems. Endorse the EW4All initiative and seek donor support.

2 **Private Sector:** The private sector should provide data and infrastructure support to identify digital network coverage in risk areas. We need partners to contribute anonymized data to improve global connectivity maps for better disaster management.

3 **ITU Membership:** Members working on AI and EW4All should join our AI for EW4All group to explore AI use cases and address gaps in EWS.

Conclusion

- **Broadcast and ICT media both have some salient features that are needed in DRR**
- **Full CAP and EWS adoption is required through a policy intervention at national level**
- **Harness technologies together for benefit of ALL.**

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