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5th High Level Forum on United Nations
Global Geospatial Information Management
Implementing the Sustainable Development Goals:
The Role of Geospatial Technology and Innovation

Sheraton Maria Isabel Hotel, Mexico City, Mexico, 28-30 November 2017

Geospatial Data for Advancing Health-related SDGs

Ramesh S. Krishnamurthy, PhD, MPH, PHIF
Senor Advisor, Health Systems and Innovations Cluster
World Health Organization

World Health Organization

Key Messages

- Integration of geospatial data to health systems strengthening efforts shall be more widely practiced in the context One Health, SDG 2030 and UHC.
- At national-level, legal mandate is essential for closer collaboration between Ministry of Health and other relevant ministries and space agencies to leverage the benefits of geospatial data for health gains.

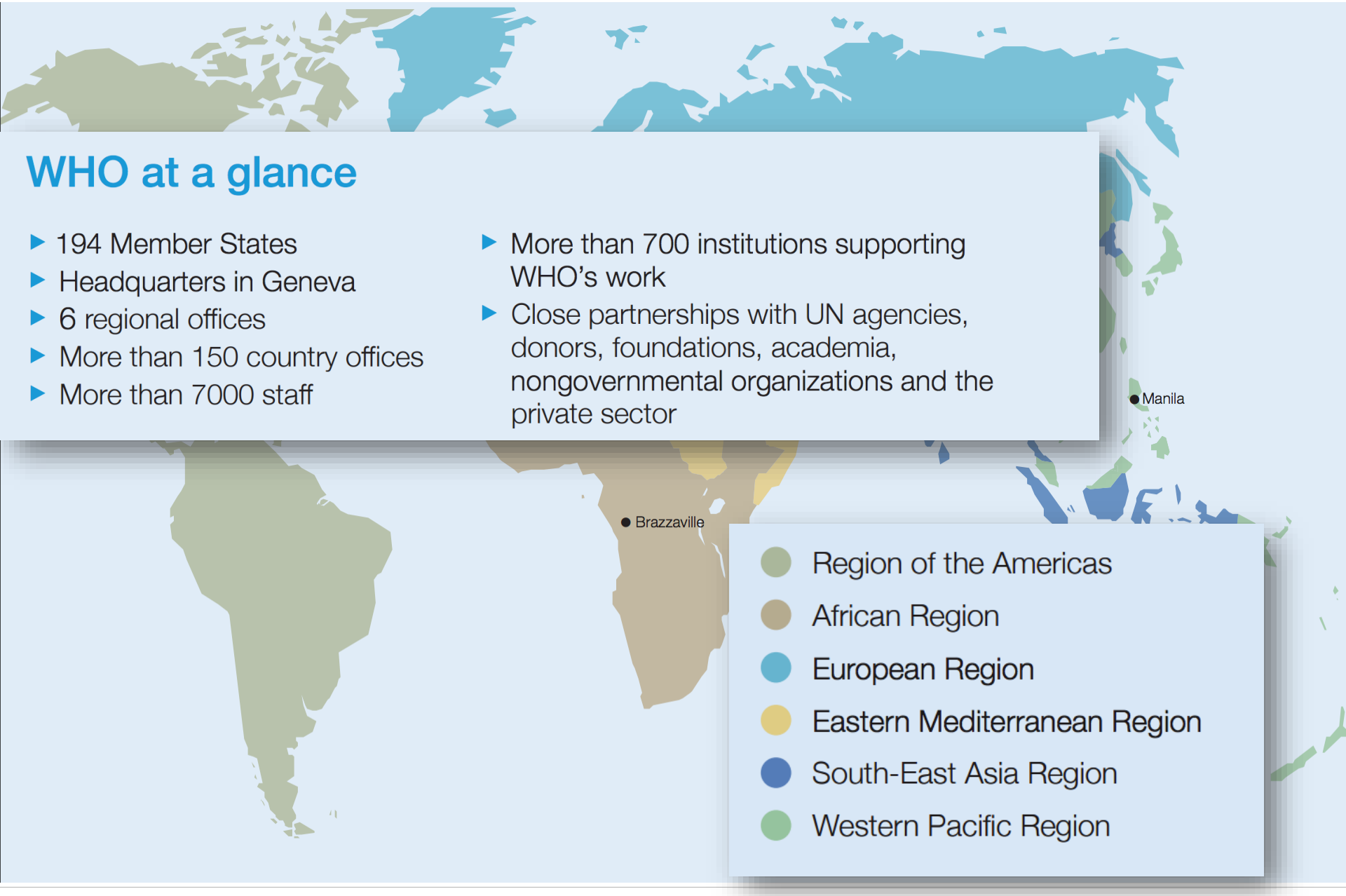
World Health Organization

United Nations specialized agency
for building a better, healthier future for people all over the world

World Health Organization

WHO at a glance

- 194 Member States
- Headquarters in Geneva
- 6 regional offices
- More than 150 country offices
- More than 7000 staff
- More than 700 institutions supporting WHO's work
- Close partnerships with UN agencies, donors, foundations, academia, nongovernmental organizations and the private sector



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World Health Assembly
the decision-making body of WHO

5th High Level Forum on United Nations
29 November 2017 | Mexico City, Mexico

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Human health in the context of One Health

the interconnectedness of human health, animal health and the ecosystem

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One Health

Source: OIE, 2016; http://www.oie.int/for-the-media/onehealth/

One Health

60% of existing human infectious diseases are zoonotic

At least 75% of emerging infectious diseases of humans (including Ebola, HIV, and influenza) have an animal origin

5 new human diseases appear every year. Three are of animal origin

80% of agents with potential bioterrorist use are zoonotic pathogens

Source: OIE, 2016; http://www.oie.int/for-the-media/onehealth/

Relevance of Geospatial data to health-related SDGs

Leveraging benefits of space science, geospatial data for advancing health agenda

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HEALTH IN THE SDG ERA

TARGETS		INDICATORS	
3.1	By 2030, reduce the global maternal mortality ratio to less than 70 per	3.1.1	Maternal mortality ratio
3.4	By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote	3.4.1	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease
3.8	Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe,	3.8.1	Coverage of essential health services (defined as th coverage of essential services based on tracer inter
3.B	Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all	3.B.1	Proportion of the population with access medicines and vaccines on a sustainable
		3.B.2	Total net official development assistance and basic health sectors
3.C	Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States	3.C.1	Health worker density and distribution
3.D	Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks	3.D.1	International Health Regulations (IHR) ca emergency preparedness

3.2 3.5 3.3 3.9 3.6 3.7 3.A

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WWW.WHO.INT/SDGS

Matrix of Relevance

SDG	GEOSPATIAL DATA AND HEALTH RELEVANCE
1: No Poverty	Prioritizing the health needs of the poor
2: Zero Hunger	Addressing the causes and consequences of all forms of malnutrition
6: Clean water and sanitation	Preventing diseases through safe water and sanitation for all
10: Reduced inequalities	Ensuring equitable access to health services through Universal Health Coverage Based on stronger primary care
13 Climate Action	Protecting health from climate risks, and promoting health through low-carbon development
14: Life below water	Supporting the restoration of fish stocks to improve safe and diversified healthy diets
15: Life on land	Promoting health and preventing diseases through healthy natural environments

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Use of space science and technology in environmental health and health systems research

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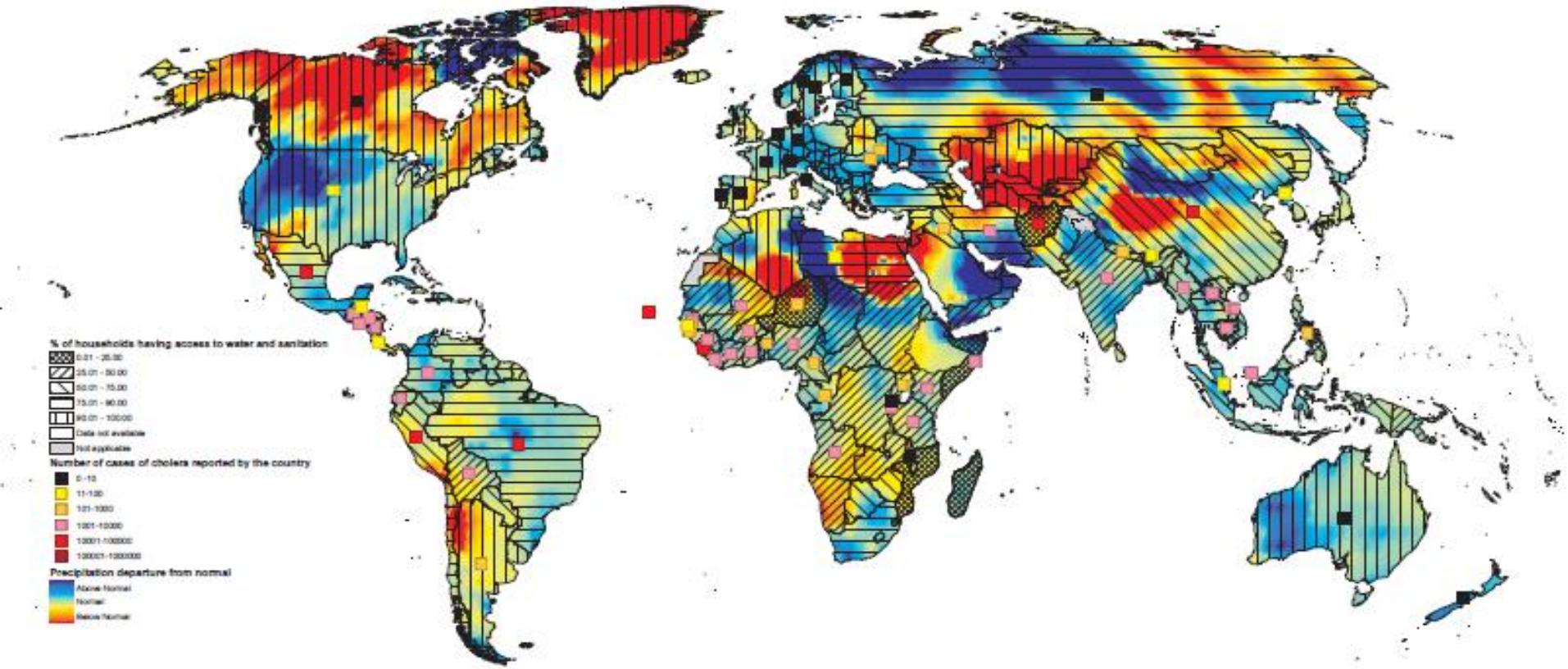
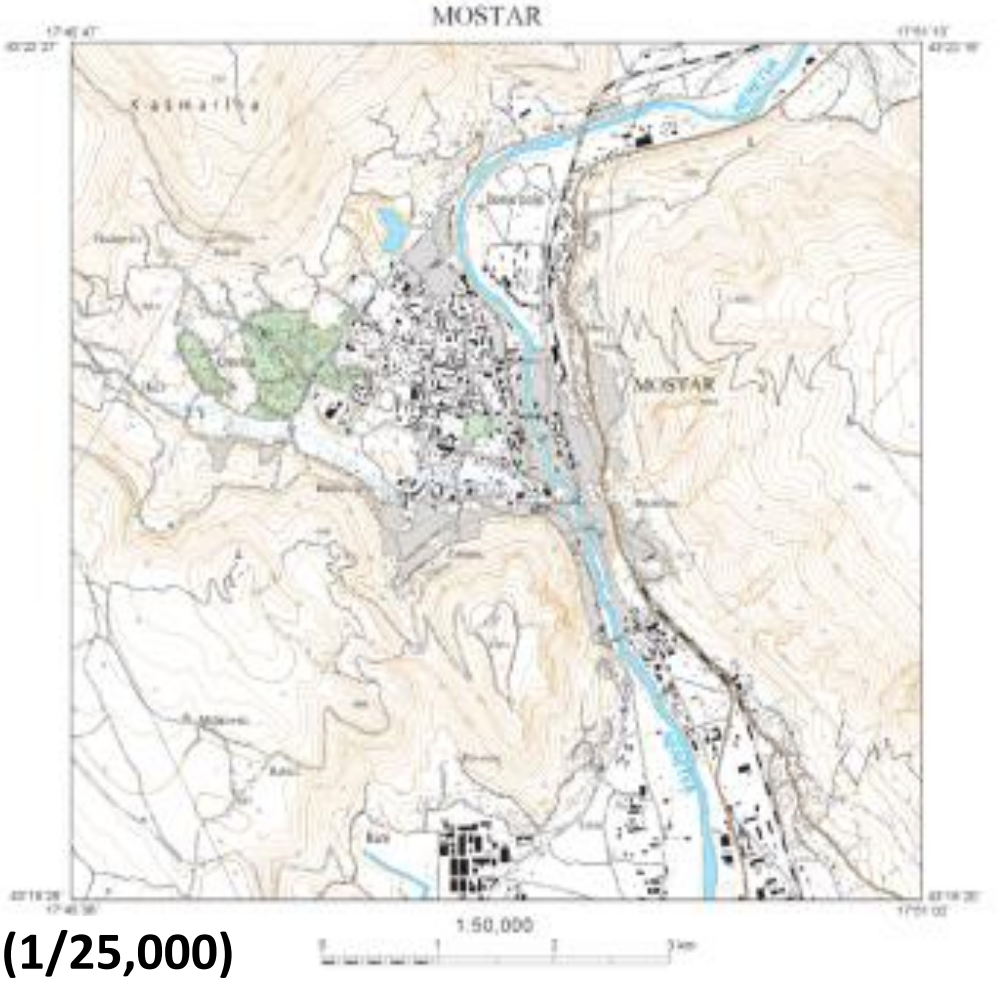
Mapping WASH and NTDs…hotspot analyses



Source: Rifat Hossain, WHO, 2015

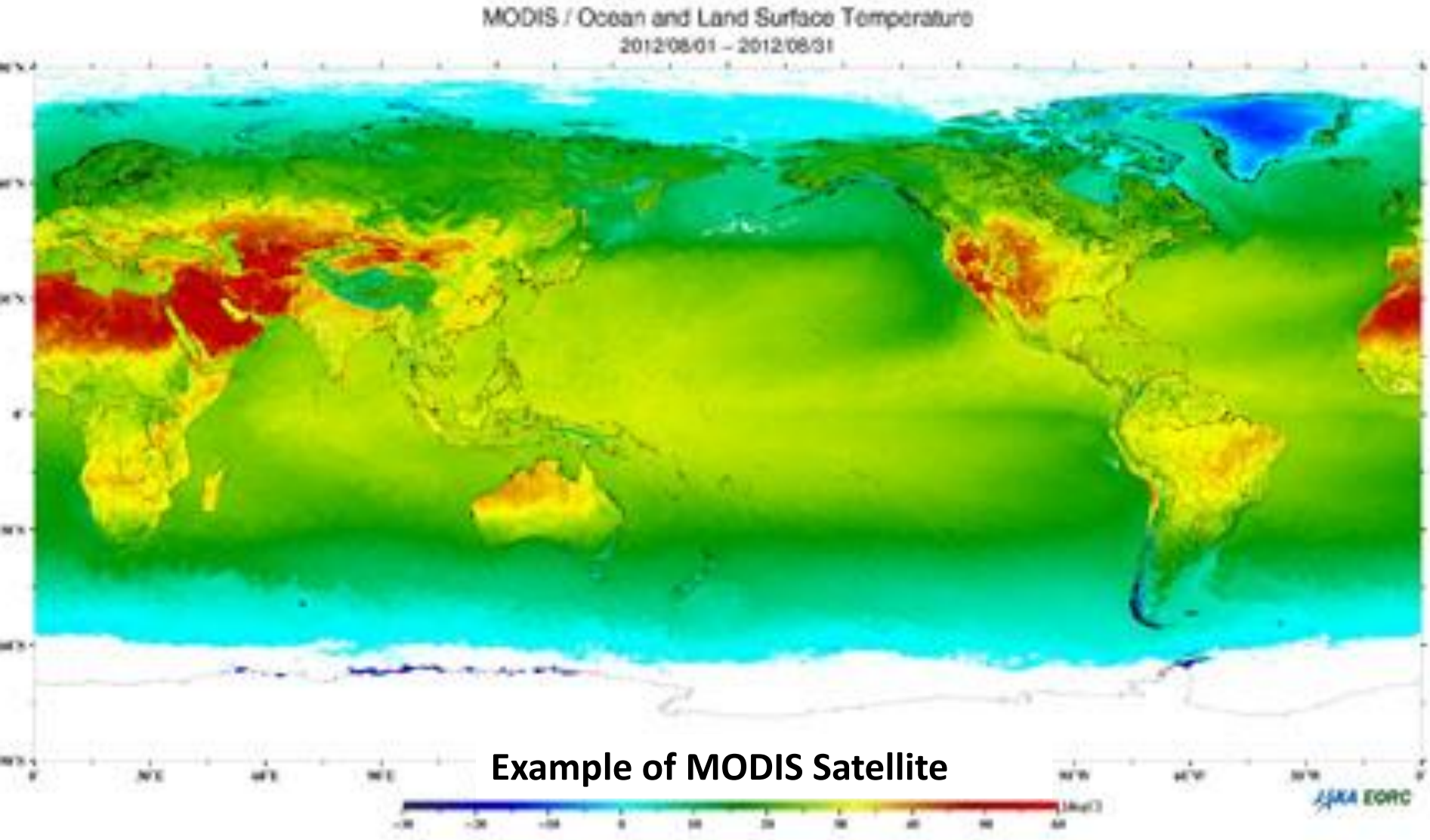
Source: Jaxa 2013



Bosnia (1/25,000)

Topographic map from ALOS is useful in developing countries. Road network is essential to deliver vaccines and to visit medical facilities.

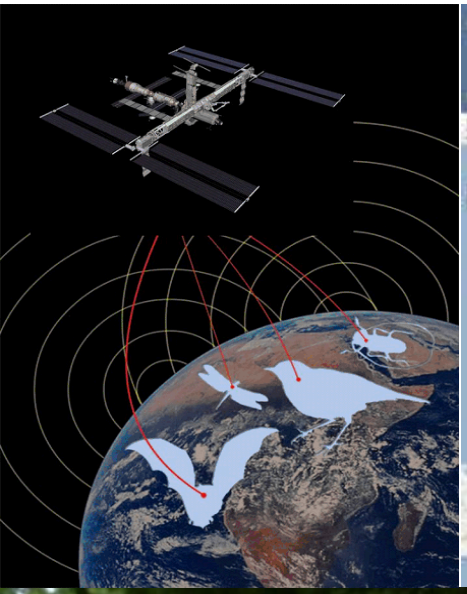
Source: JAXA, 2014

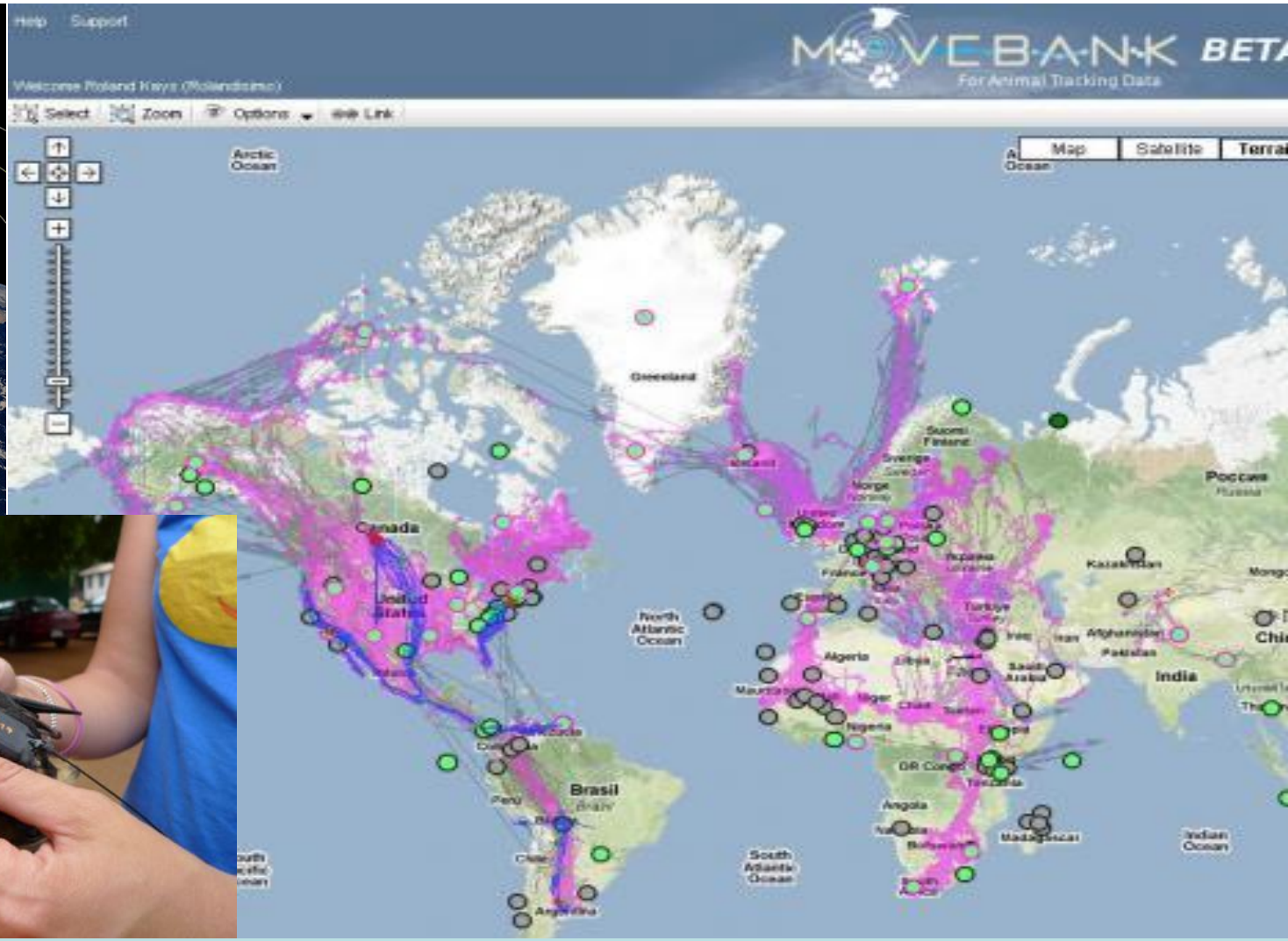


Example of MODIS Satellite

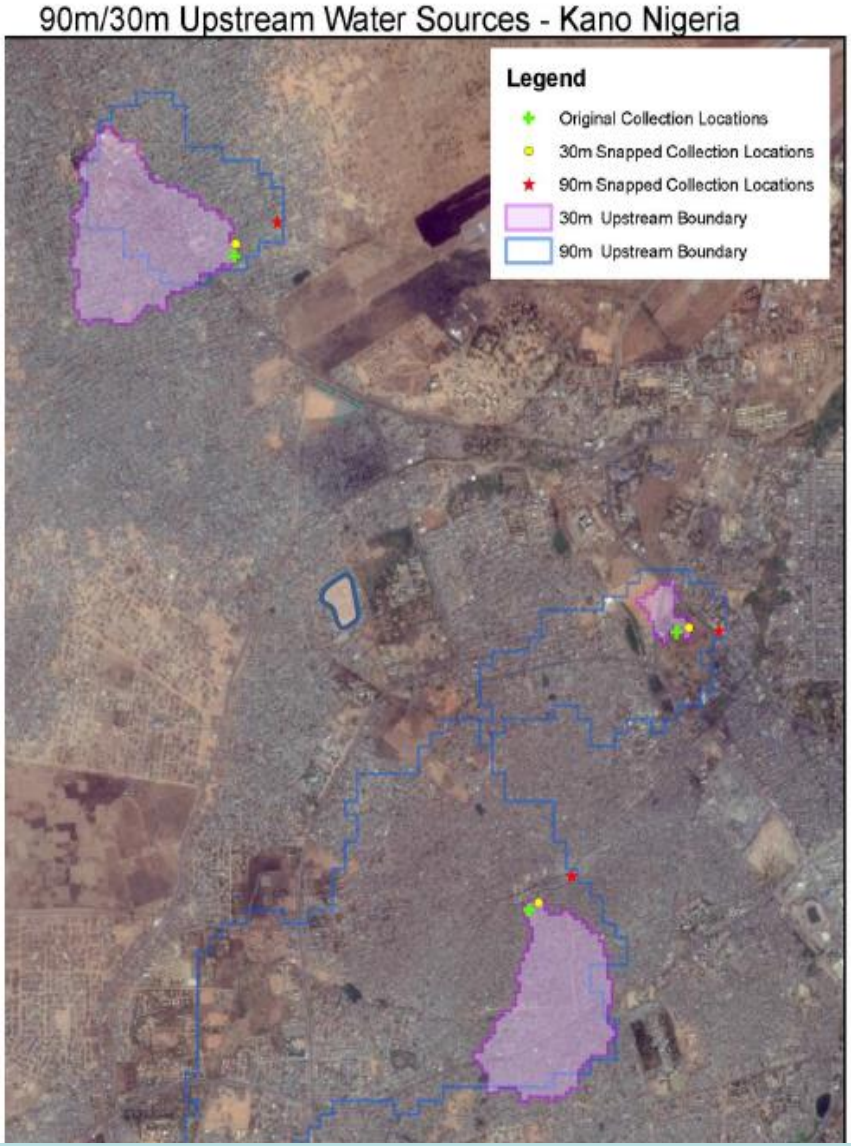
JAXA's GCOM-C will continue to observes surface temperature, which can be used for countermeasures of heat stroke.

Source: Dr Hatton, ESA 2015





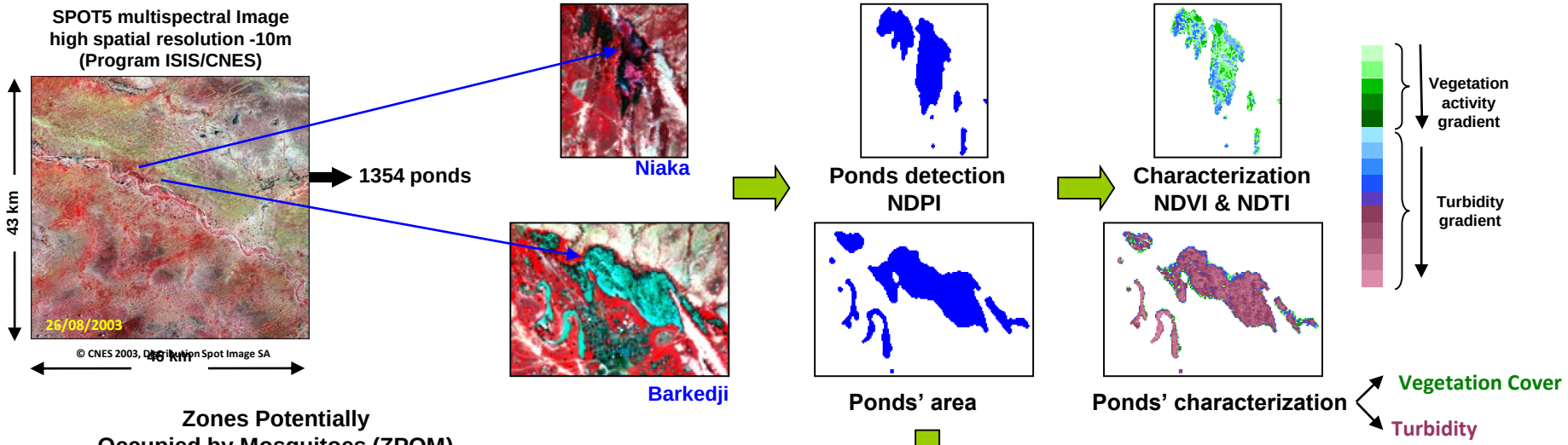
Tracking of spread of animal born diseases: Small Animal Tracking from ISS: DLR ICARUS Project



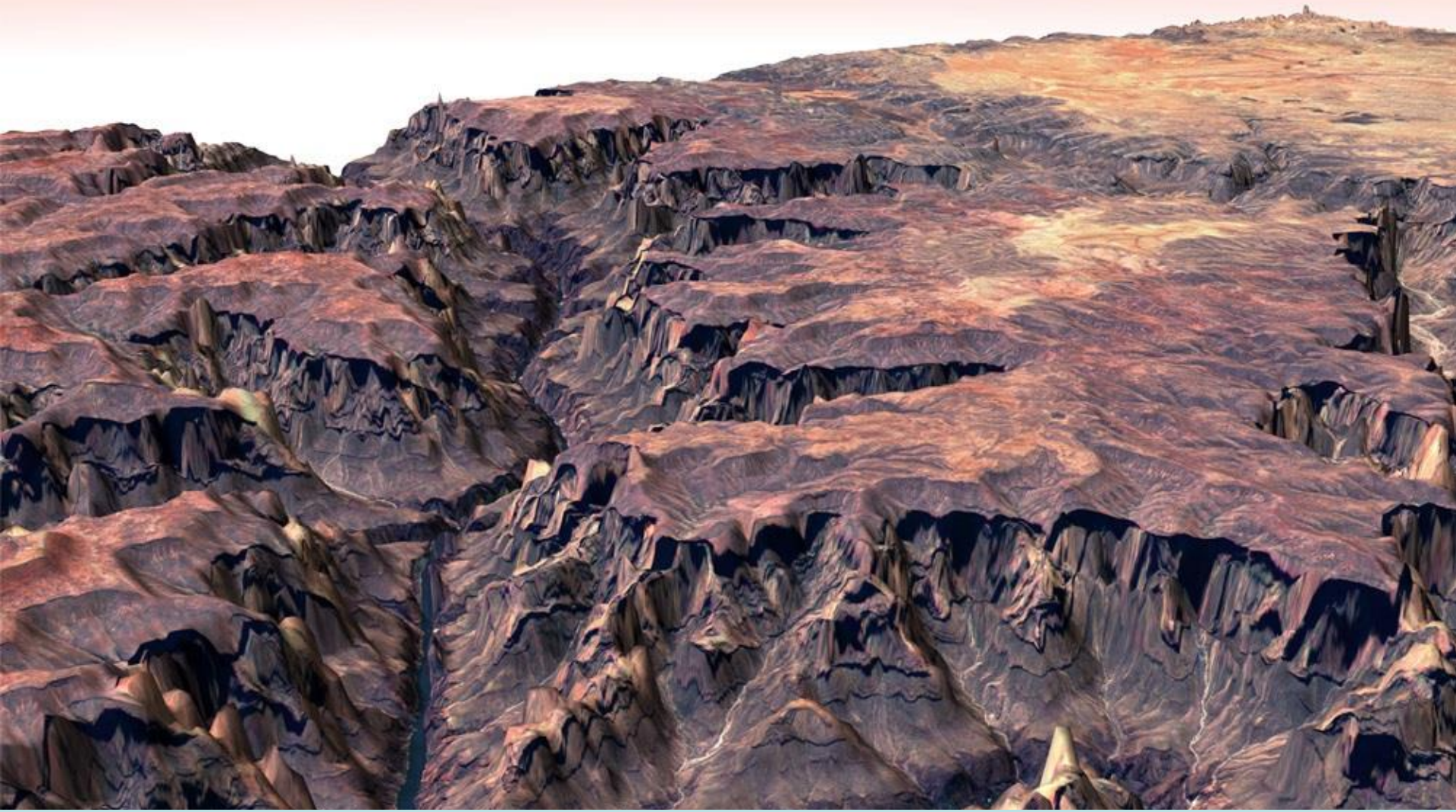
Polio eradication project: Locating sample sites on the satellite images and tracking over time using JAXA's 5-m resolution DEM data

A Remote-sensing tool applied to Rift Valley Fever (RVF) Monitoring

Identify environmental factors of A. vexans & C. poicilipes presence by remote sensing to obtain risk map



Source: JAXA, 2014
Grand canyon , USA.



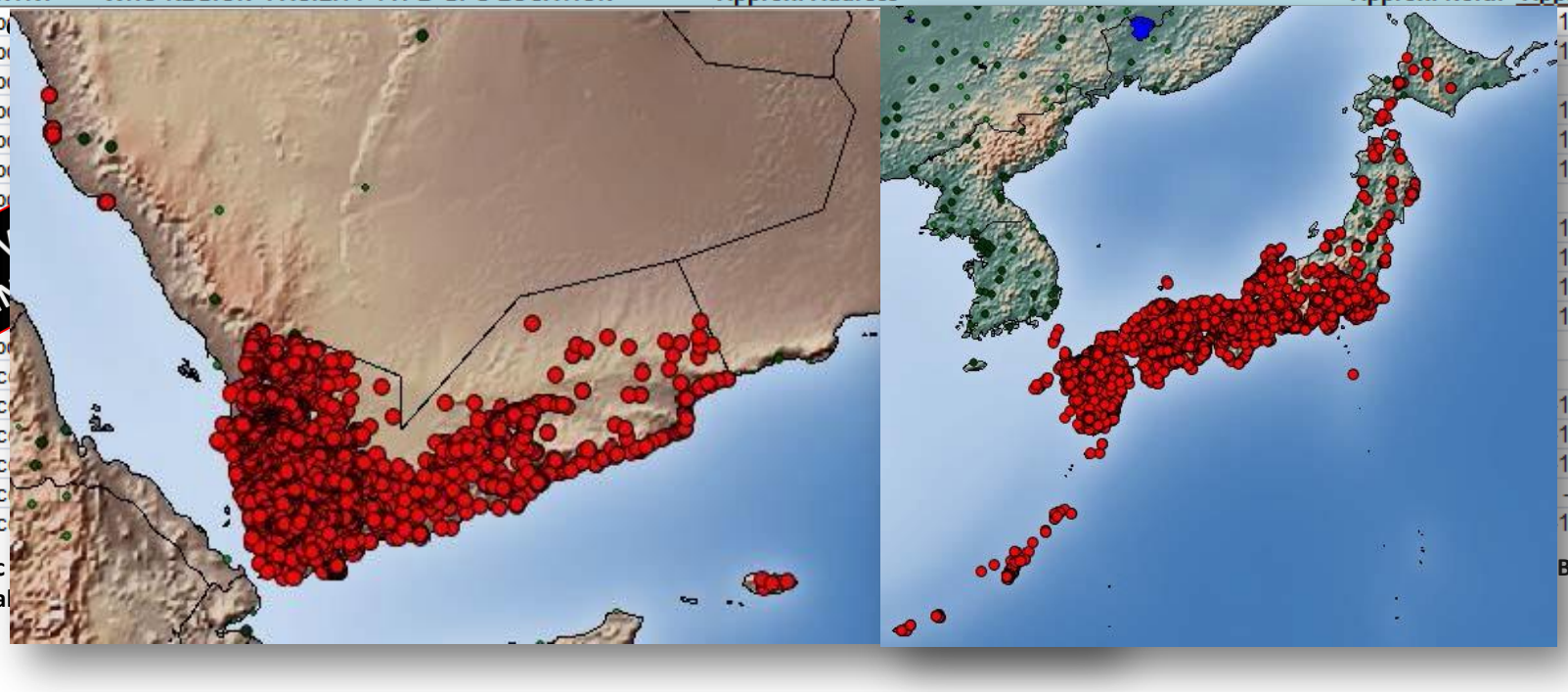
This shows ALOS 3-D mapping capacity. It is the world's most accurate vertical resolution, 5m, among satellites.

B-LiFE at Ebola treatment centre
Last Accessed: 13/09/2016 16:14
http://www.esa.int/spaceinimages/Images/2015/04/B-LiFE_at_Ebola_treatment_centre
ESA: Telecommunications and Integrated Applications

Health Facilities Locator

1	COUNTRY	WHO REGION	FACILITY TYPE	GPS LOCATION	Approx. Address	Approx. North	Approx. Eas
11109	Camb						105.2845
11110	Camb						104.9358
11111	Camb						104.935
11112	Camb						104.9306
11113	Camb						104.7791
11114	Camb						104.9251
11115	Camb						104.935
11116	Ca						104.9363
111							104.9349
							104.9356
							104.9354
	amb						103.880
121	Mexic						-98.208
11122	Mexic						105.2215
11123	Mexic						105.2317
11124	Mexic						105.2447
11125	Mexic						-100.349
11126	Mexic						100.3497

SAMPLE V IN



Sourc BY-SA);
Special

Locating health facilities using space-based technologies:
Mapping of health facilities

Metrics and Measurements

Data for evidence-informed decision-making

Integrating geospatial data as part of national health information architecture

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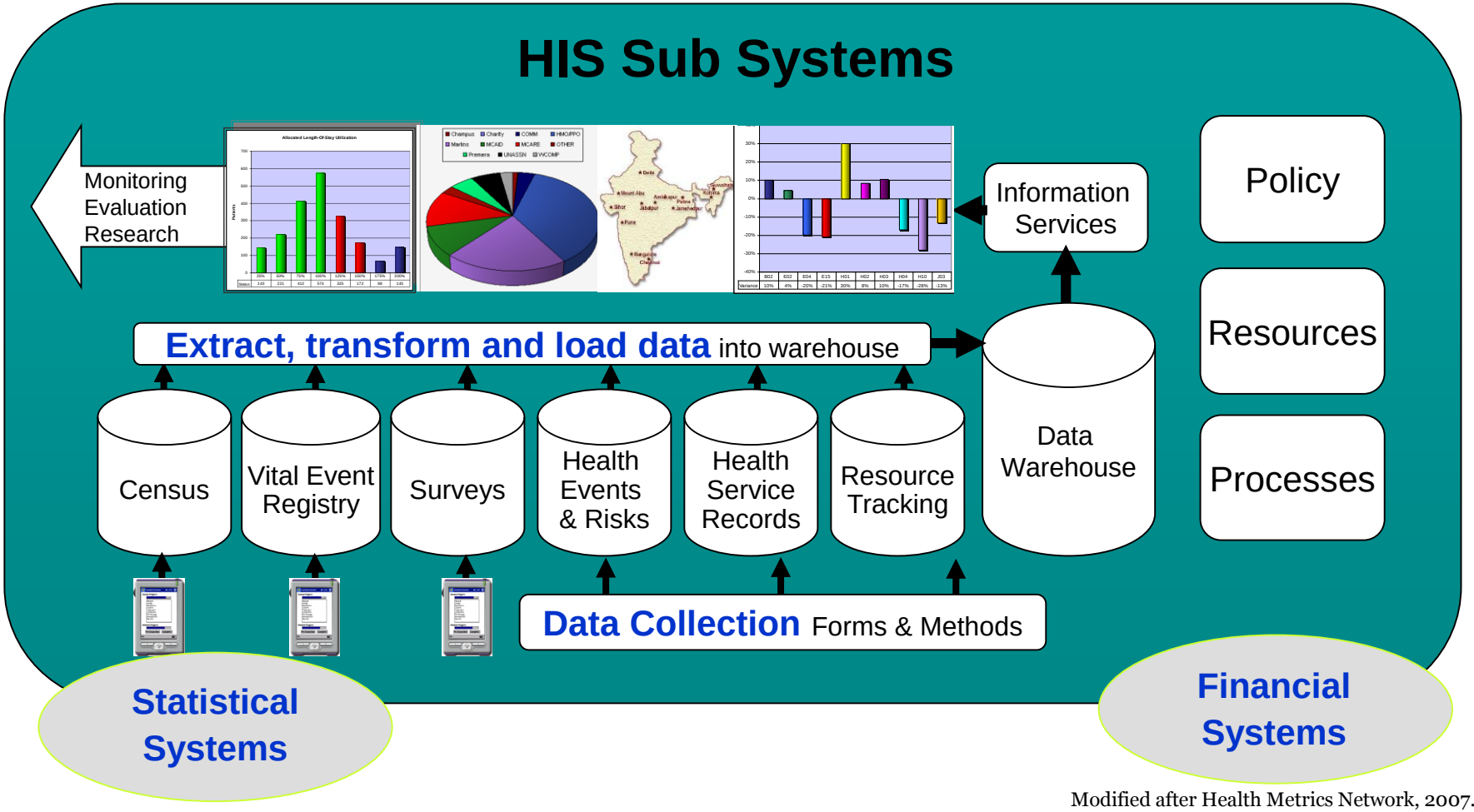
Health Information System Landscape

A Set of Complex Sub Systems



Modified after Health Metrics Network, 2007.

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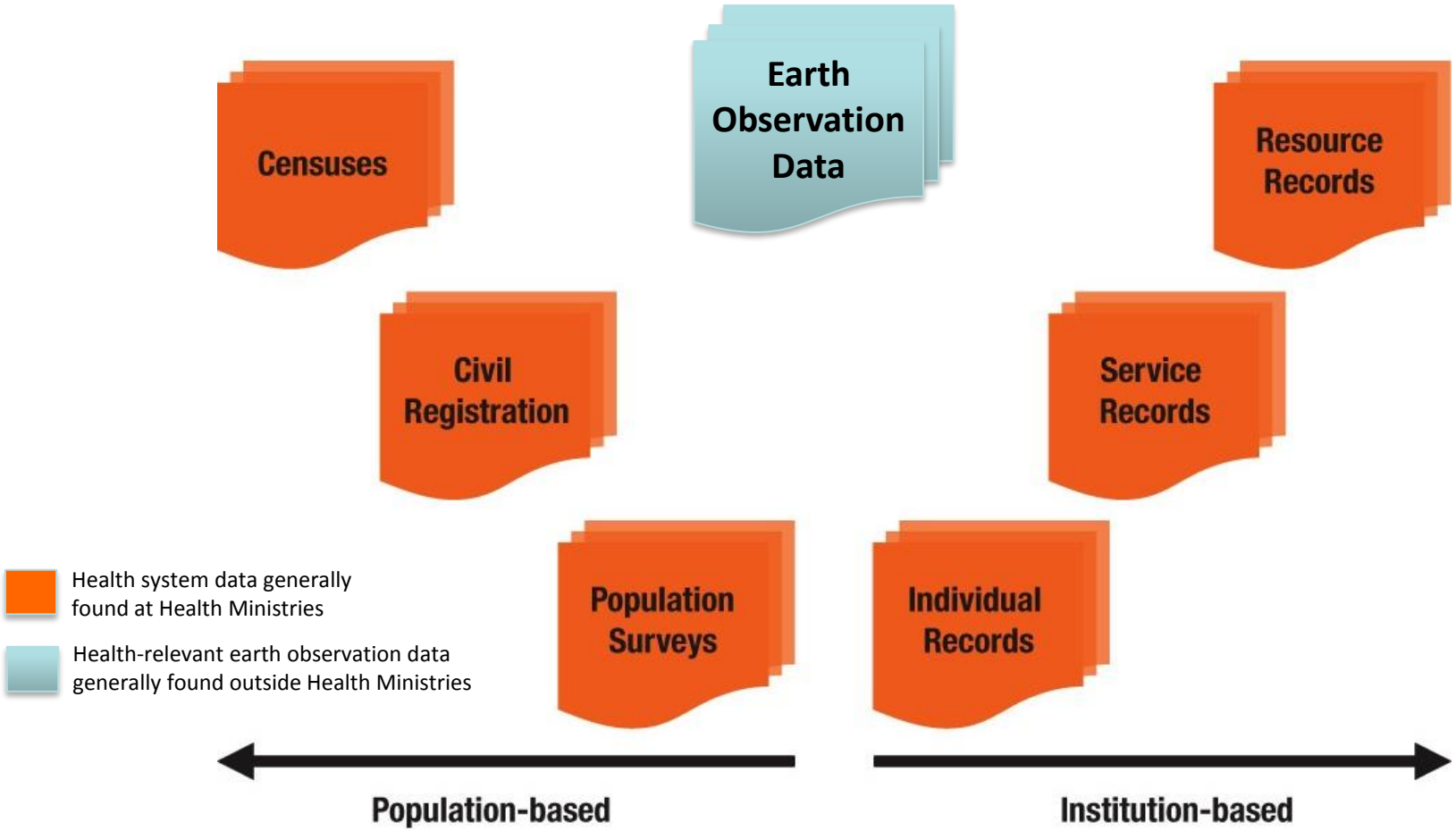
Common health-relevant data sources



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Examples of earth observation data

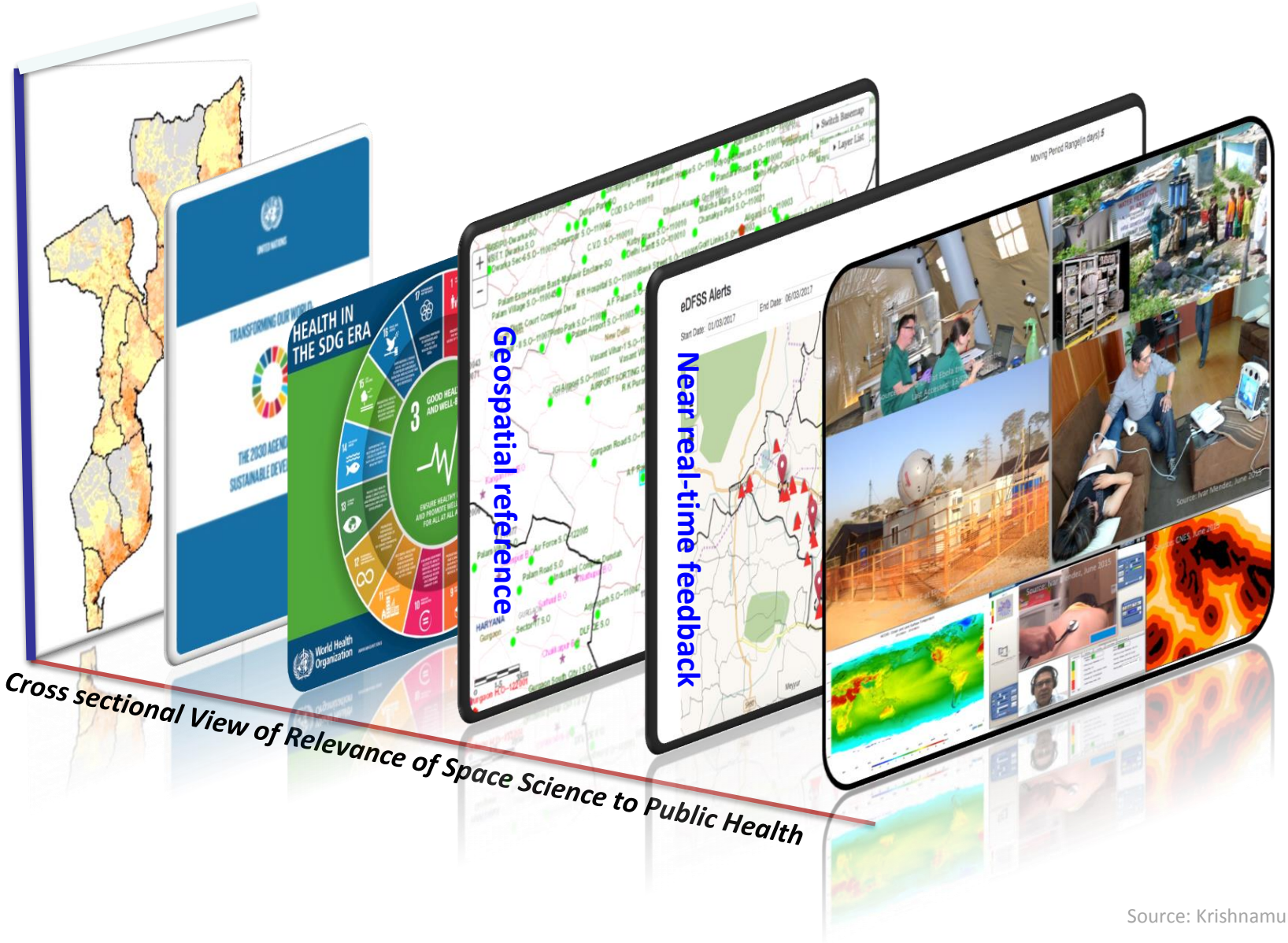
Near-real-time health-relevant earth observation data obtained from satellites

375 m Active Fire
Aerosols
Brightness Temperature
Carbon Monoxide
Cloud motion vectors (Winds)
Cloud Top Pressure
Clouds and Trace Gases
Clouds/Aerosols
Columnar Cloud Liquid Water over ocean
Columnar Water Vapor over ocean
Corrected Reflectance Imagery
Dust
Fire
Global Rainfall
Global Total Precipitation
Land Surface Reflectance
Land Surface Temperature
Moisture Profiles
Nitric Acid
Nitrous Oxide
Ocean Wind Speed
Ozone Profile
Ozone
Precipitation
Radiances
Retrieved Carbon Monoxide
(Thermal Infrared Radiances)
Sea Ice Concentration
Sea Ice
Snow Cover
Snow Water Equivalent
Soil Moisture
Sulfur Dioxide
Temperature
Total Column Ozone and Aerosol Index
Total Precipitable Water
Water Vapor

Source: NASA, 2017. https://earthdata.nasa.gov/earth-observation-data/near-real-time/download-nrt-data

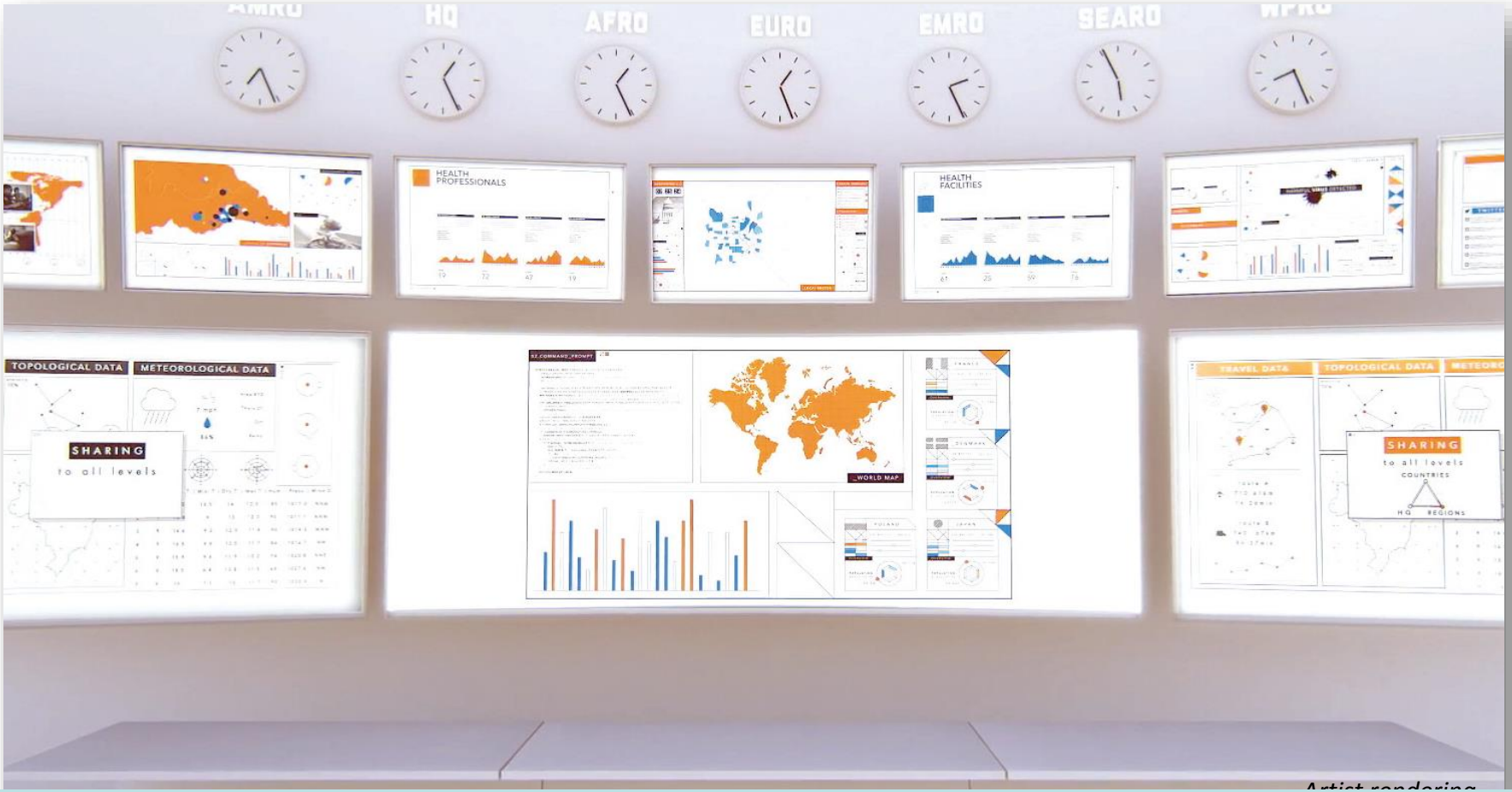
Example of dataset required for national unified health information system

Data set required for	Prevention	Preparedness	Response	Recovery
Data from Routine Health Information Systems (Health Management Information Systems, Routine disease-specific information systems; other health information sub-systems; national emergency operations systems situation reports; NCD and environmental health data)				
Complete list of diseases, health conditions		**List of donor and partner agencies**		**Subject-specific financial Data**
Health facilities list (all types and levels)		**Health workforce data** (all cadre)		**Outbreak-related health data**
Essential medicines list		**Supply-chain information**		**Essential medical devices list**
Satellite Imagery (various types and resolutions)		**Other context-specific data**		**Other remotely sensed data** (temperature, precipitation, terrain and topology)
GIS with shape files, base maps and commonly used layers				
National pubic assets data (Airport locations, transportation hubs, Road network maps)				**Country-specific population data** (national/sub-national level; projections, census, actual)



Source: Krishnamurthy, R. 2017

Future Health Information Platforms



Artist rendering

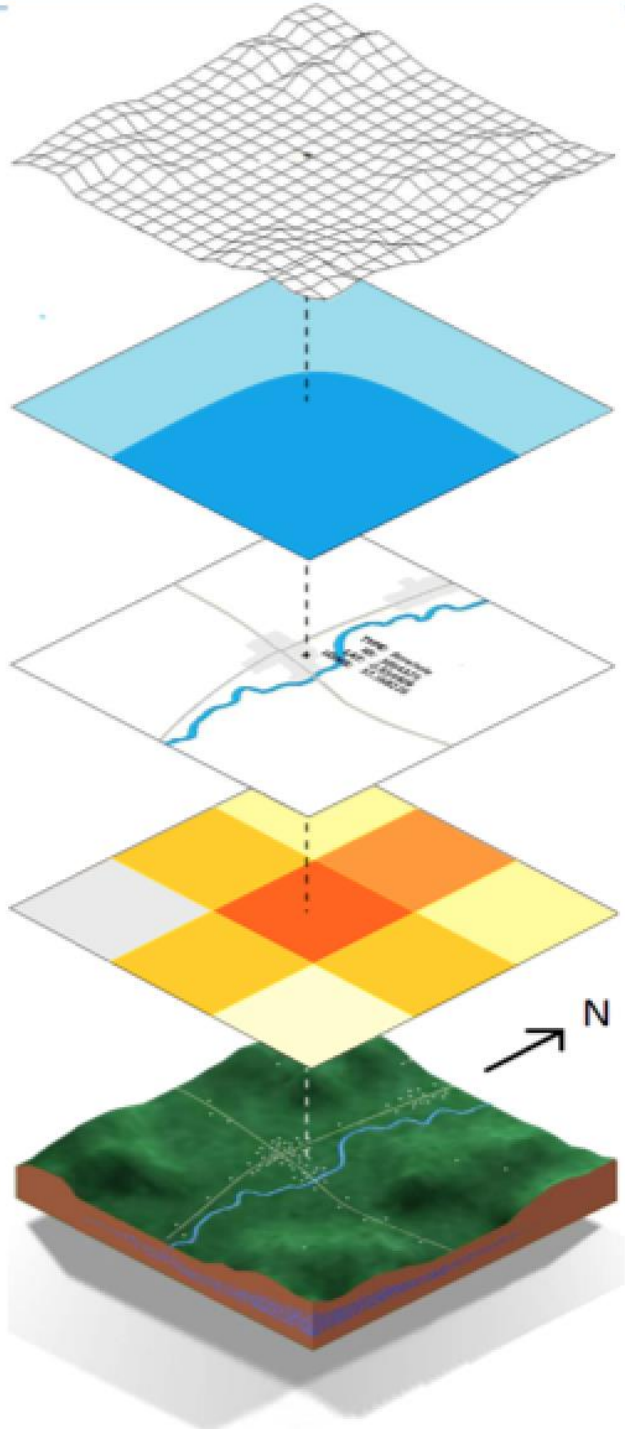
Health information platform for monitoring public health combined with context specific geospatial data.

Digital Elevation Model (DEM): Worldwide coverage from NASA's ASTER mission with 30-meter resolution.

Water Resource Map: Aquifer yield data from multiple sources.

Improved water source location: Location of wells continually updated with new water projects via interactive Web 2.0 application.

LandScan Population Database: commercially available 1-kilometer population database updated yearly (http://www.ornl.gov/sci/landscan/landscan_data_avail.shtml).



Water accessibility: (combination of layers) Access measured in amount of energy per capita (calories) needed to collect water, highlighting access limitations due to terrain. Also shows populations living on marginal land without water access.

Water resources per person: Determines whether underlying water resources (aquifer yield) can meet demand of overlying population based on 50 liters per person per day .

Areas with improved water access: (combination of layers) Displays 1-km LandScan areas that have achieved water access per guidelines, i.e. at least one access point per 1-sq.km

Earth Observation and Geospatial Data

Source: Rifat Hossain, WHO, 2015

Strengthening national capacities for utilizing earth observation data to advance national health-related SDG 3 targets

Need for a Conceptual Framework

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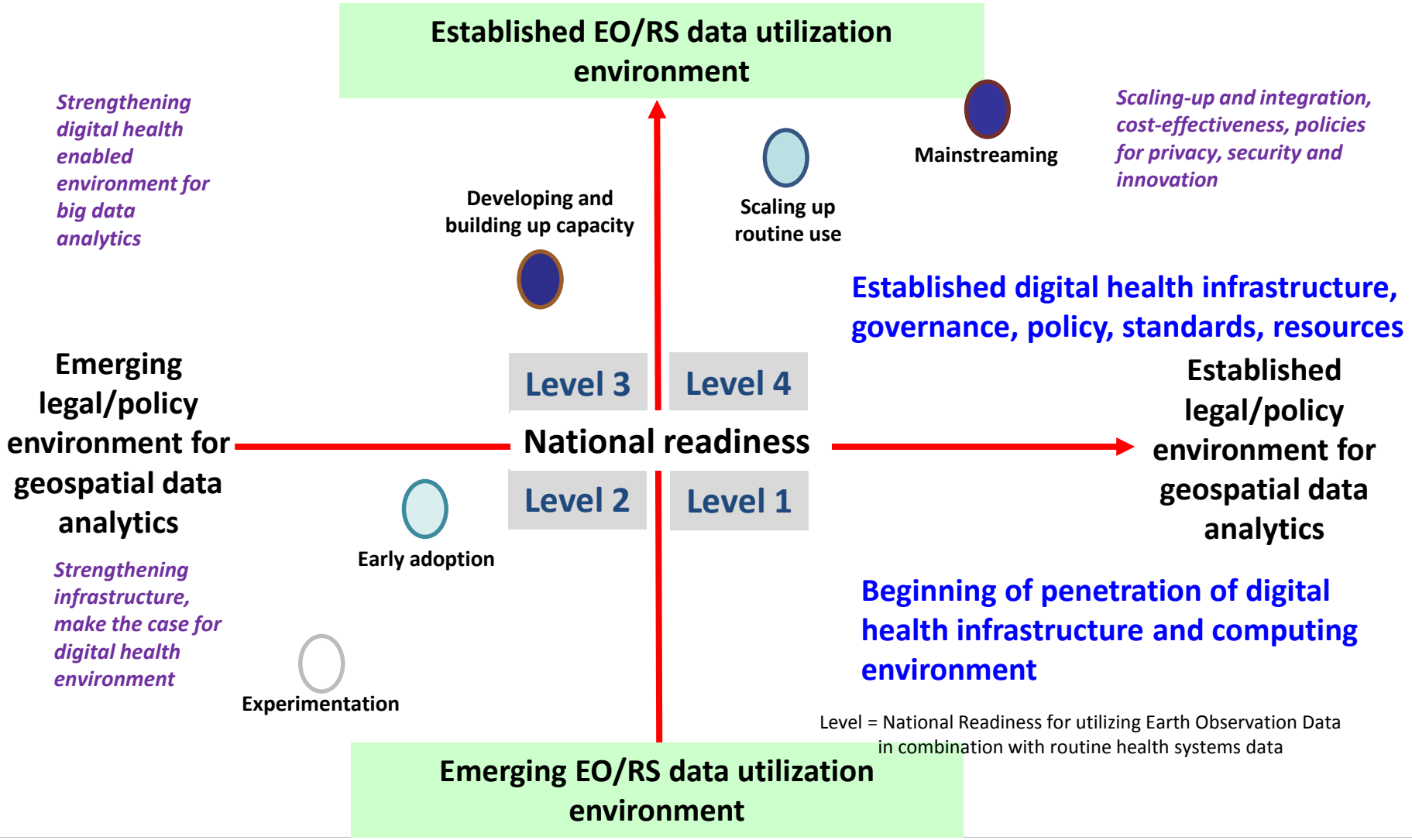
Components of the Framework

1. **National readiness** for using earth observation data in conjunction with routine health systems data
2. **Multi-sectoral engagement** for establishing earth observation data utilization environment in the national context
3. **Alignment** of stakeholders, strategies, and efforts

Conceptual Framework for Country Capacity Development

For utilizing Satellite-based Earth Observation Data in advancing health-related SDG targets



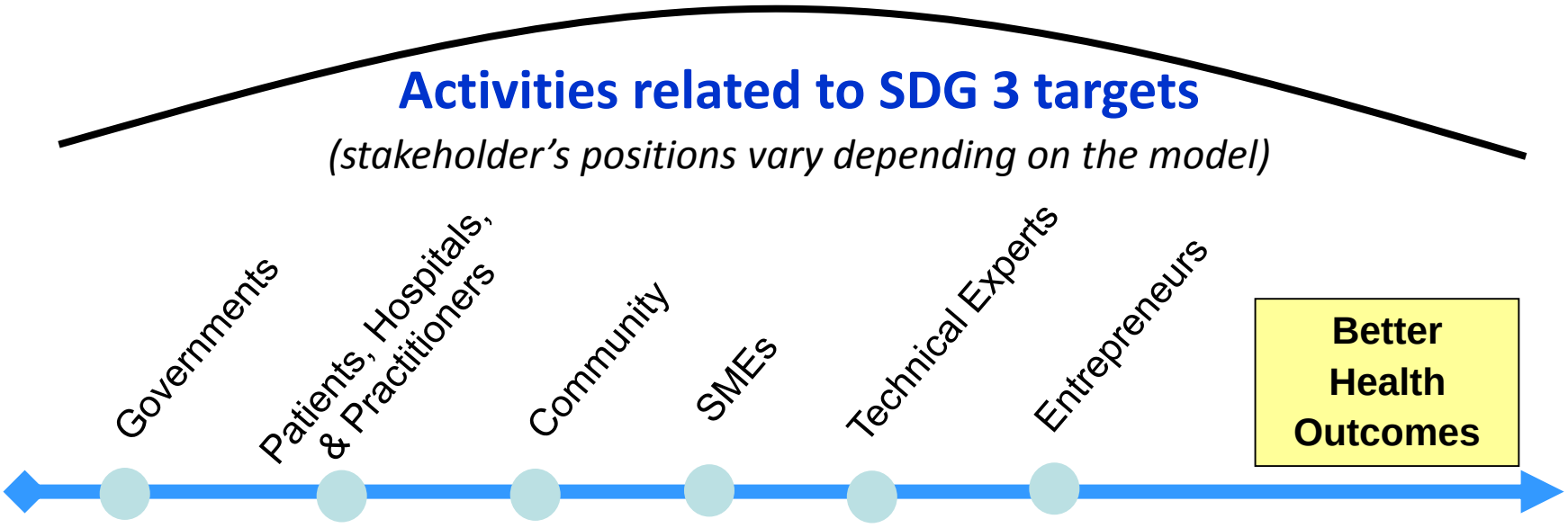
Multi-sectoral engagement

Examples of Partners within Health Information Landscape

- Ministry of Health
- Ministry of Finance
- Ministry of Education
- Ministry of Labour
- Ministry of Telecommunications
- Ministry of Infrastructure
- Ministry of Science and Technology
- Academia and Private Health Sector
- Donors and Implementing Partners

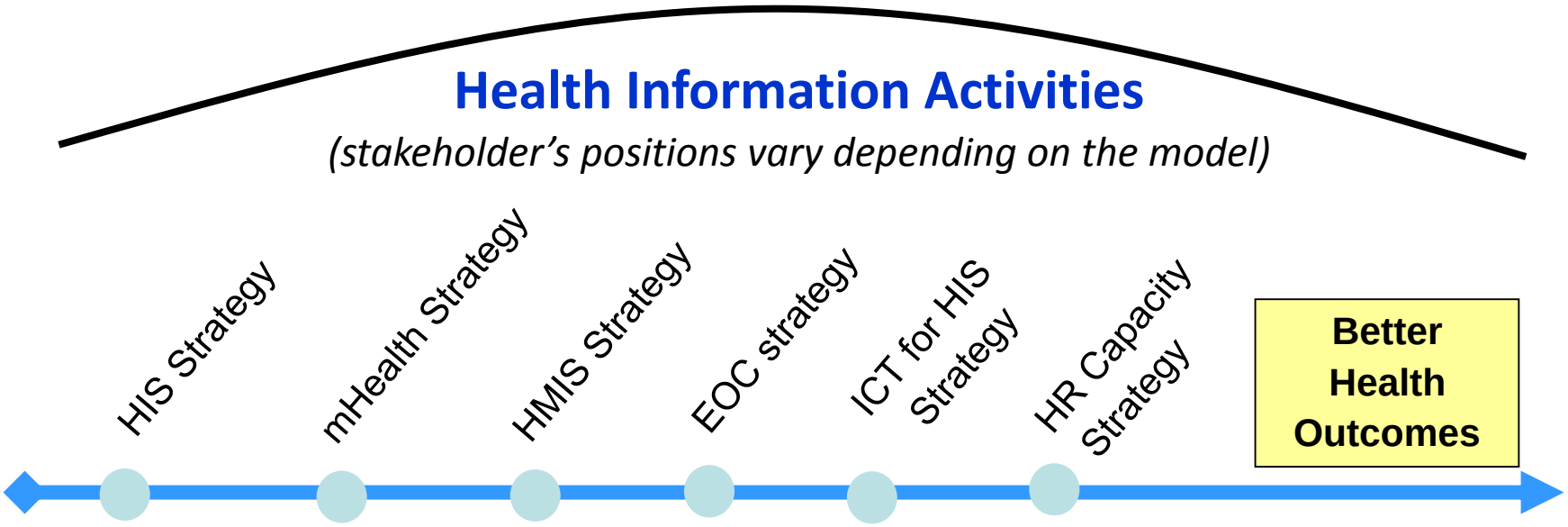
Coordination is essential to owning and sustaining data analytics capacities at National and Sub-national Levels

Align Stakeholders



Value Chain of Solutions
driven by Public Private Partnerships

Align Strategies



Value Chain of Solutions
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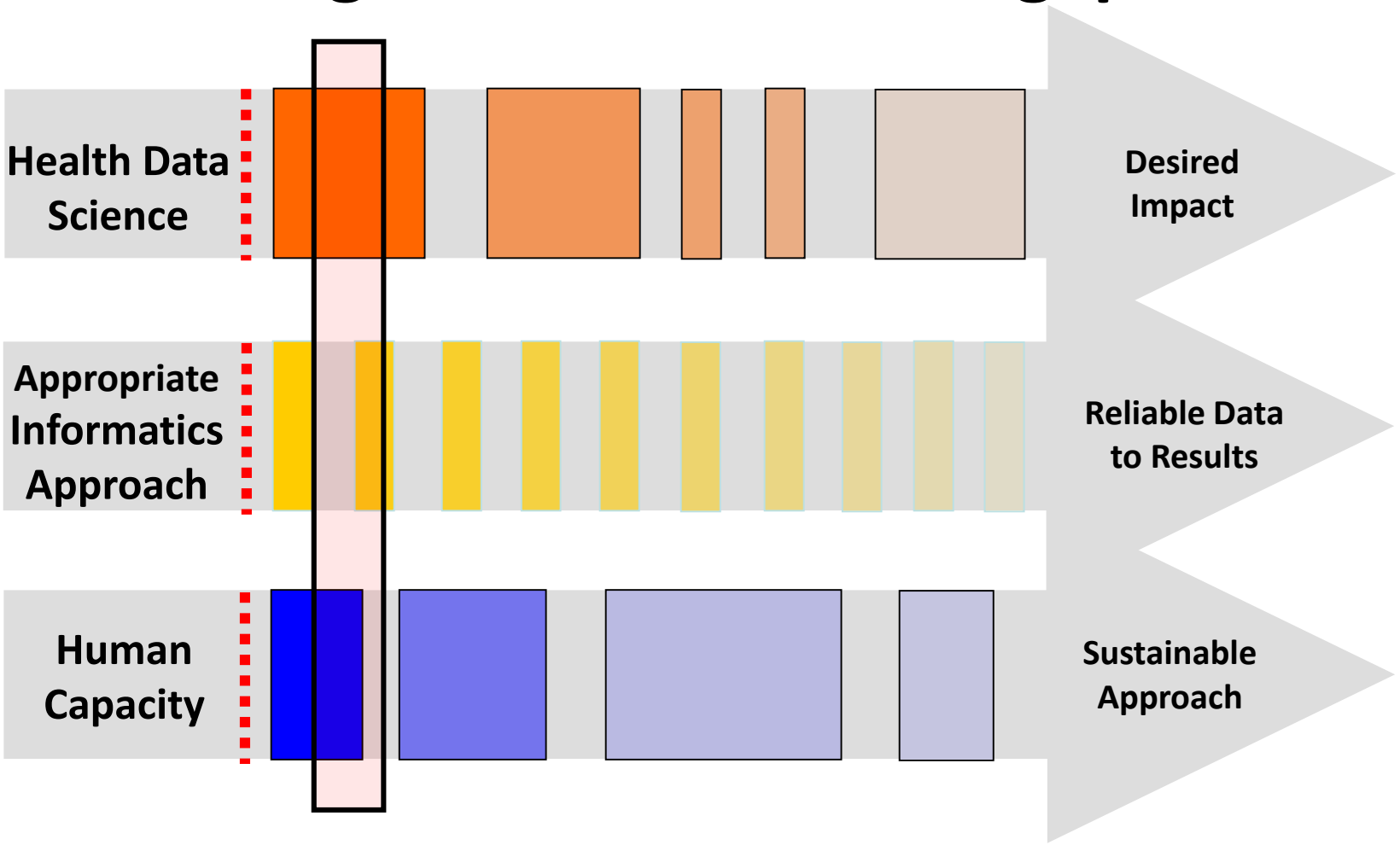
Conceptual Framework for Country Capacity Development

For utilizing Satellite-based Earth Observation Data in advancing health-related SDG targets

Align efforts to reduce gaps



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Thank you

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