Space Science and Technology for Advancing Health-related SDGs

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

Committee on the Peaceful Uses of Outer Space
Scientific and Technical Subcommittee Fifty-fourth session
Vienna, 30 January-10 February 2017
Item 5 of the provisional agenda on Space technology for socioeconomic development

|Expert Focus Group on Space and Global Health |February 2-3, 2017 | UN Vienna International Center C0713/15 |

World Health Organization

Key Messages

- Space Science and One Health in the context of UN-COUPOS +50; SDG 2030; and UHC
- Integration of Space science and technology to health systems strengthening efforts to be more widely practiced
- Closer collaboration between Ministries of Health and Ministries of Science/Technology is essential

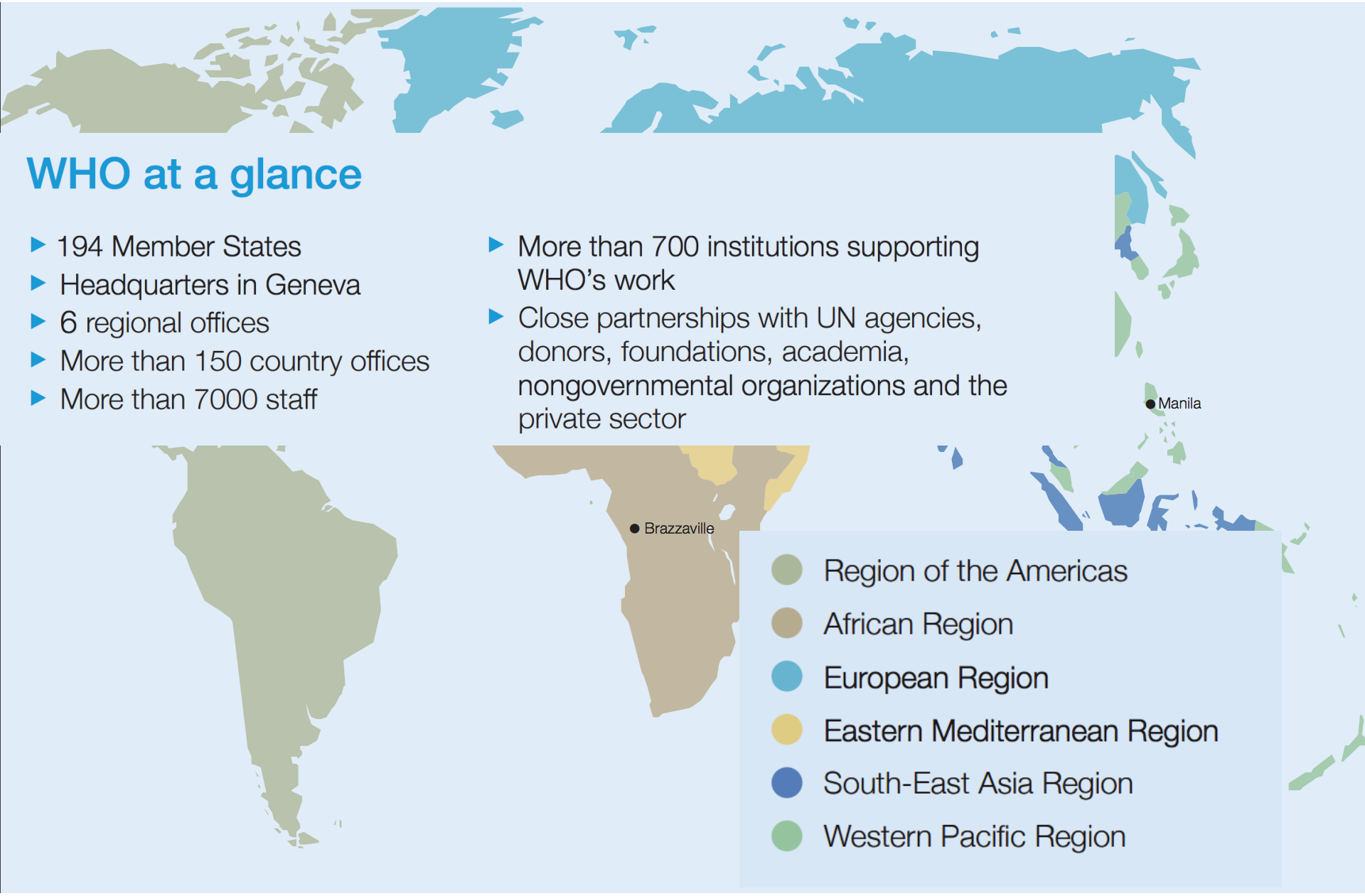
World Health Organization

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



World Health Organization

World Health Assembly
the decision-making body of WHO

UN COPOUS Expert Focus Group on Space and Global Health
February 2-3, 2017 | UN Vienna International Center, Austria

World Health Organization

UN COPOUS Expert Focus Group on Space and Global Health
February 2-3, 2017 | UN Vienna International Center, Austria

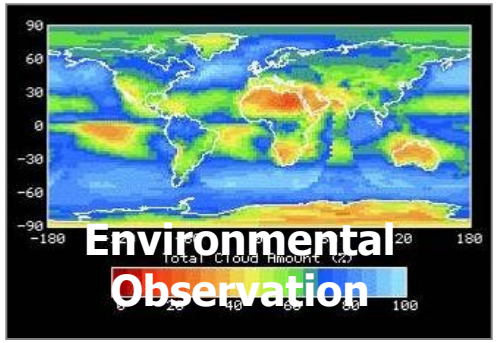
World Health Organization

Relevance of Space Science to SDG for Health

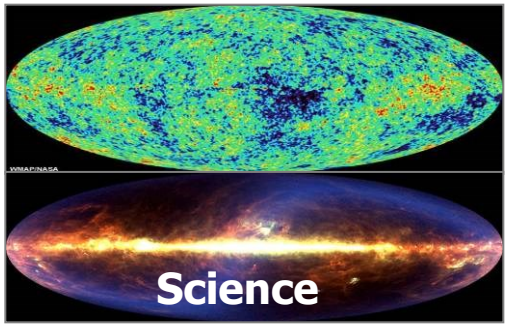
Leveraging benefits of space science, geospatial data for advancing health agenda

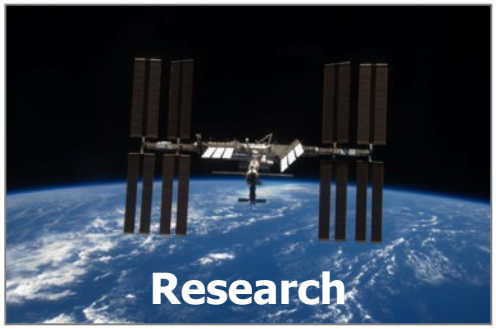
World Health Organization

Benefits from Space Activities



Source: UNOOSA June 2015

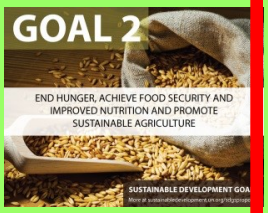





1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

SDGs and Benefits from Space Science

Poverty



Food Security

Health

Education

Gender Equality

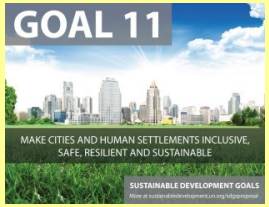
Water

Energy

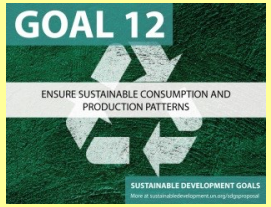
Employment

Resilient Infrastructure

Reduce Inequality



Cities



Sustainable Consumption

Climate Change

Marine Resources

Ecosystems and Biodiversity

Justice and Good Governance

Partnerships for Implementation

World Health Organization

Source: UNOOSA June 2015

HEALTH IN THE SDG ERA

World Health Organization

WWW.WHO.INT/SDGS

SUSTAINABLE DEVELOPMENT GOALS

Relevant Documents for Discussion

World Health Organization

World Health Organization

INTERACTIVE DOCUMENT

EXECUTIVE BOARD
140th session
Geneva, 23 January–1 February 2017

EB140/1 Rev.1
24 January 2017

Agenda

1. **Opening of the session**

2. **Adoption of the agenda**

   Documents EB140/1 and EB140/1 (annotated)

3. **Report by the Director-General**

   Document EB140/2

4. **Post of Director-General**

   4.1 Nomination of candidates

   Document EB140/INF./1

   4.2 Draft contract

   Document EB140/3

   4.3 Procedures for the conduct of the election

   Document EB140/4

5. **Report of the Programme, Budget and Administration Committee of the Executive Board**

   Document EB140/5

6. **Report of the regional committees to the Executive Board**

   Document EB140/6

7. **Preparedness, surveillance and response**

   7.1 Health emergencies

   - WHO response in severe, large-scale emergencies

   Document EB140/7

   - The Independent Oversight and Advisory Committee for the WHO Health Emergencies Programme

   Document EB140/8

   - Research and development for potentially epidemic diseases

   Document EB140/9

   - Health workforce coordination in emergencies with health consequences

   Document EB140/10

   7.2 Antimicrobial resistance

   Documents EB140/11 and EB140/12

   7.3 Poliomyelitis

   Document EB140/13

   7.4 Implementation of the International Health Regulations (2005)

   - Draft global implementation plan

   Document EB140/14

   - Public health implications of the implementation of the Nagoya Protocol

   Document EB140/15

   7.5 Review of the Pandemic Influenza Preparedness Framework

   Documents EB140/16 and EB140/16 Add.1

8. **Health systems**

   8.1 Human resources for health and implementation of the outcomes of the United Nations' High-Level Commission on Health Employment and Economic Growth

   Document EB140/17

   8.2 Principles for global consensus on the donation and management of blood, blood components and medical products of human origin

   Document EB140/18

   8.3 Addressing the global shortage of medicines and vaccines

   Document EB140/19

8.4 Evaluation and review of the global strategy and plan of action on public health, innovation and intellectual property

Documents EB140/20 and EB140/20 Add.1

8.5 Follow-up of the report of the Consultative Expert Working Group on Research and Development: Financing and Coordination

Documents EB140/21 and EB140/22

8.6 Member State mechanism on substandard/spurious/falsely-labelled/falsified/counterfeit medical products

Documents EB140/23 and EB140/23 Add.1

8.7 Promoting the health of migrants

Document EB140/24

9. Communicable diseases

9.1 Global vaccine action plan

Document EB140/25

9.2 Global vector control response

Document EB140/26

10. Noncommunicable diseases

10.1 Preparation for the third High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases, to be held in 2018

Documents EB140/27 and EB140/27 Add.1

10.2 Draft global action plan on the public health response to dementia

Documents EB140/28 and EB140/28 Add.1

10.3 Public health dimension of the world drug problem

Document EB140/29

10.4 Report of the Commission on Ending Childhood Obesity: implementation plan

Document EB140/30

10.5 Cancer prevention and control in the context of an integrated approach

Documents EB140/31 and EB140/31 Add.1

10.6 Revitalizing physical activity for health

11. Promoting health through the life course

11.1 Progress in the implementation of the 2030 Agenda for Sustainable Development

Document EB140/32

11.2 The role of the health sector in the Strategic Approach to International Chemicals Management towards the 2020 goal and beyond

Document EB140/33

11.3 Global Strategy for Women's, Children's and Adolescents' Health (2016–2030): adolescents' health

Document EB140/34

12. Programme and budget matters

12.1 Overview of financial situation: Programme budget 2016–2017

Document EB140/35

12.2 Proposed programme budget 2018–2019

Documents EB140/36 and EB140/INF./5

13. Financial matters

13.1 Scale of assessments for 2018–2019

Document EB140/37

13.2 [deleted]

14. Management and governance matters

14.1 Overview of WHO reform implementation

Document EB140/38

14.2 Governance reform: follow-up to decision WHA69(8) (2016)

Documents EB140/39, EB140/40, EB140/40 Add.1, EB140/INF./2 and EB140/INF./3

Space Science and Public Health

United Nations A/AC.105/1091

General Assembly

Distr.: General
30 April 2015

Original: English

Committee on the Peaceful Uses of Outer Space

Space for global health

Special report of the Inter-Agency Meeting on Outer Space Activities on the use of space science and technology within the United Nations system for global health

I. Introduction

1. The General Assembly, in its resolution 69/85, on international cooperation in the peaceful uses of outer space, urged the Inter-Agency Meeting on Outer Space Activities (UN-Space), under the leadership of the Office for Outer Space Affairs of the Secretariat, to continue to examine how space science and technology and their applications could contribute to implementing the Millennium Declaration and to the post-2015 development agenda process, and encouraged entities of the United Nations system to participate, as appropriate, in UN-Space coordination efforts to that effect.

2. UN-Space serves as the focal point for inter-agency coordination and cooperation in space-related activities within the United Nations system. At its thirty-fourth session, held in New York on 13 and 14 May 2014, UN-Space recalled that its previous special reports had addressed the following themes (A/AC.105/1064, para. 17): new and emerging technologies, applications and initiatives for space-related inter-agency cooperation (see A/AC.105/843); space benefits for Africa: contribution of the United Nations system (see A/AC.105/941); use of space technology within the United Nations system to address climate change issues (see A/AC.105/991); and space for agriculture development and food security (see A/AC.105/1042).

3. At its thirty-fourth session, UN-Space agreed that the next special report should address the theme of space for global health (A/AC.105/1064, para. 18).

4. The present report was prepared by the Office for Outer Space Affairs in cooperation with the World Health Organization (WHO), the Cartographic Section of the Department of Field Support of the Secretariat and the secretariat of the United Nations Framework Convention on Climate Change.

V.15-02978 (E) 140515 150515

Please recycle

Special report of the Inter-Agency Meeting on Outer Space Activities on the use of space science and technology within the United Nations system for global health

UN Document: A/AC.105/1091
30 April 2015

World Health Organization

Space Science and Public Health

United Nations A/AC.105/1099

General Assembly

Distr.: General
29 October 2015

Original: English

Committee on the Peaceful Uses of Outer Space

Report on the meeting on the applications of space science and technology for public health organized by the World Health Organization and the Office for Outer Space Affairs

(Geneva, 15 and 16 June 2015)

I. Introduction

1. The World Health Organization (WHO) is the directing and coordinating authority for health within the United Nations. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries to strengthen their health systems, assisting countries in reaching the health-related targets of the Sustainable Development Goals and monitoring and assessing health trends.

2. The Office for Outer Space Affairs of the Secretariat is the implementing organization for the United Nations Programme on Space Applications, which is mandated to provide technical advisory services on the use of space science, technology and applications as requested by Member States or any of the specialized agencies.

3. There exists a wide range of space science and technology applications that address public health issues. Earth observation satellites enable us to collect valuable local, regional and global data and information in support of public health decision-making, for example, with regard to epidemic control, disease management, planning related to well-being, and studying and monitoring vector-borne diseases.

4. Telecommunications satellites are used in tele-health and telemedicine applications for transmitting medical advice and information, in particular in rural and isolated locations that have limited access to adequate medical support. Telecommunications satellites can also assist in tracking the delivery of essential medical supplies and health commodities. Tele-health solutions aid countries in

V.15-07463 (E) 101115 111115

Please recycle

Report on the meeting on the applications of space science and technology for public health organized by the World Health Organization and the Office for Outer Space Affairs

UN Document:
A/AC.105/1099
29 October 2015

World Health Organization

Space Science and Public Health

United Nations A/AC.105/1069

General Assembly

Distr.: General
10 September 2014

Original: English

Committee on the Peaceful Uses of Outer Space

Report on the United Nations Expert Meeting on the International Space Station Benefits for Health

(Vienna, 19-20 February 2014)

I. Introduction

1. The United Nations Expert Meeting on the International Space Station Benefits for Health was held in Vienna on 19 and 20 February 2014. The Meeting was part of the Human Space Technology Initiative, an initiative carried out within the framework of the United Nations Programme on Space Applications (see www.oosa.unvienna.org/oosa/en/SAP/hsti/index.html).

2. The Meeting focused on facilitating dialogue to extend the benefits of the International Space Station (ISS) for health. The Meeting was designed to compile existing or new information related to the six leadership priorities of the World Health Organization (WHO), as defined by the sixty-sixth World Health Assembly in its twelfth general programme of work for the six-year period 2014-2019, and to facilitate a dialogue between ISS partner agencies and WHO aimed at identifying potential areas of collaboration where the needs and requirements of the health sector intersected with the benefits derived from space applications and technologies.

3. The Meeting was organized by the Office for Outer Space Affairs of the Secretariat. WHO and the partner agencies of the ISS programme, namely, the Canadian Space Agency (CSA), the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA), the National Aeronautics and Space Administration (NASA) of the United States of America and the Russian Federal Space Agency (Roscosmos) participated in the Meeting.

4. The present report has been prepared pursuant to General Assembly resolution 68/75. It describes the background, objectives and programme of the Meeting. It also provides a summary of the current leadership priorities of WHO and the health-related activities of the participating ISS partner agencies, describes the identified shared problems related to providing health care for astronauts on ISS

V.14-05773 (E) 220914 230914

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Report on the United Nations Expert Meeting on the International Space Station Benefits for Health

UN Document: A/AC.105/1069
10 September 2014

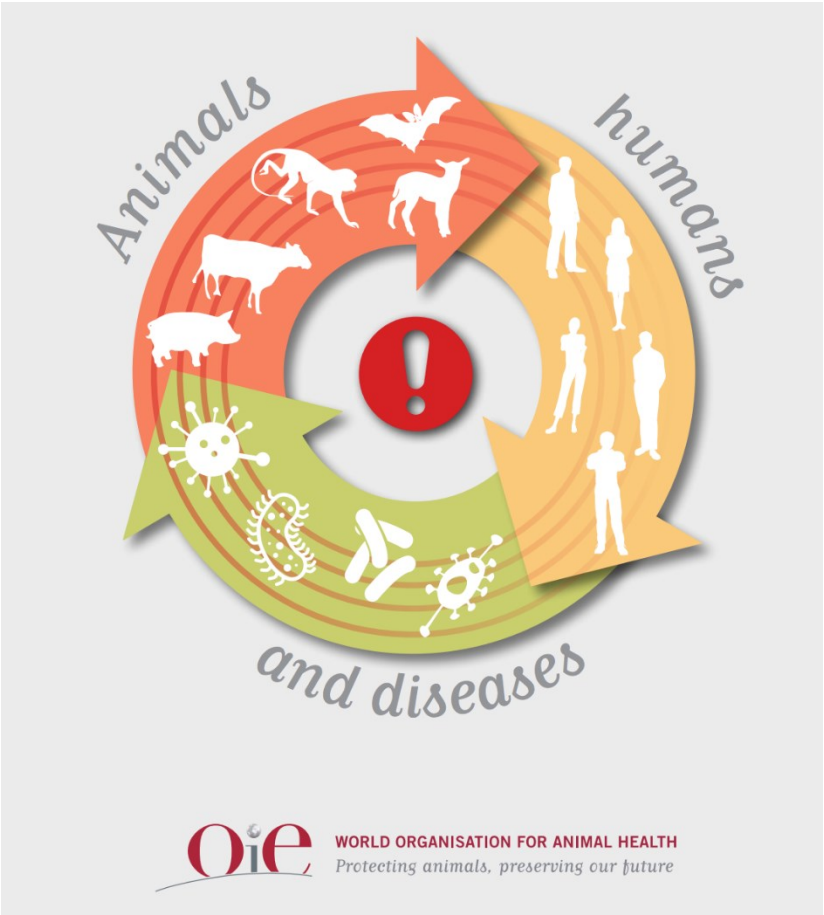
World Health Organization

One Health

the interconnectedness of human health, animal health and the ecosystem

World Health Organization

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/

Space Science and Big Data Analytics

World Health Organization

analysis and use of rapidly collected

extremely large volumes of

both structured and unstructured electronic data

through multiple data sources

to answer complex questions

that are ordinarily cannot be answered using single datasets

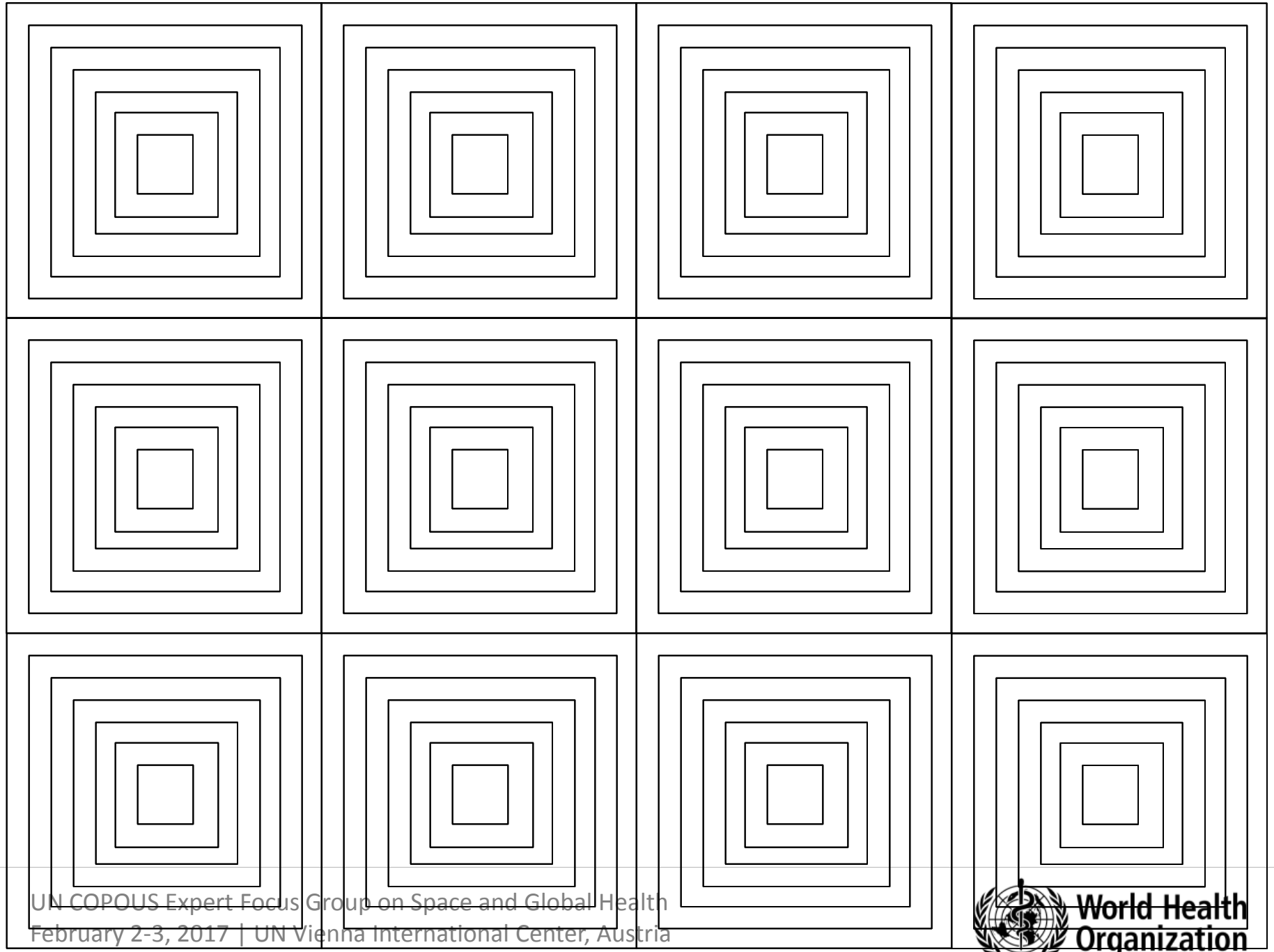
Big Data

- Mega datasets and longitudinal data
  - Details and location of telephone call logs
  - Daily global airline passengers manifest
  - Hourly mean temperature of all cities of the world
  - Hospital admissions and discharges around the world
  - Hourly weather data
  - Monthly projection of populations worldwide

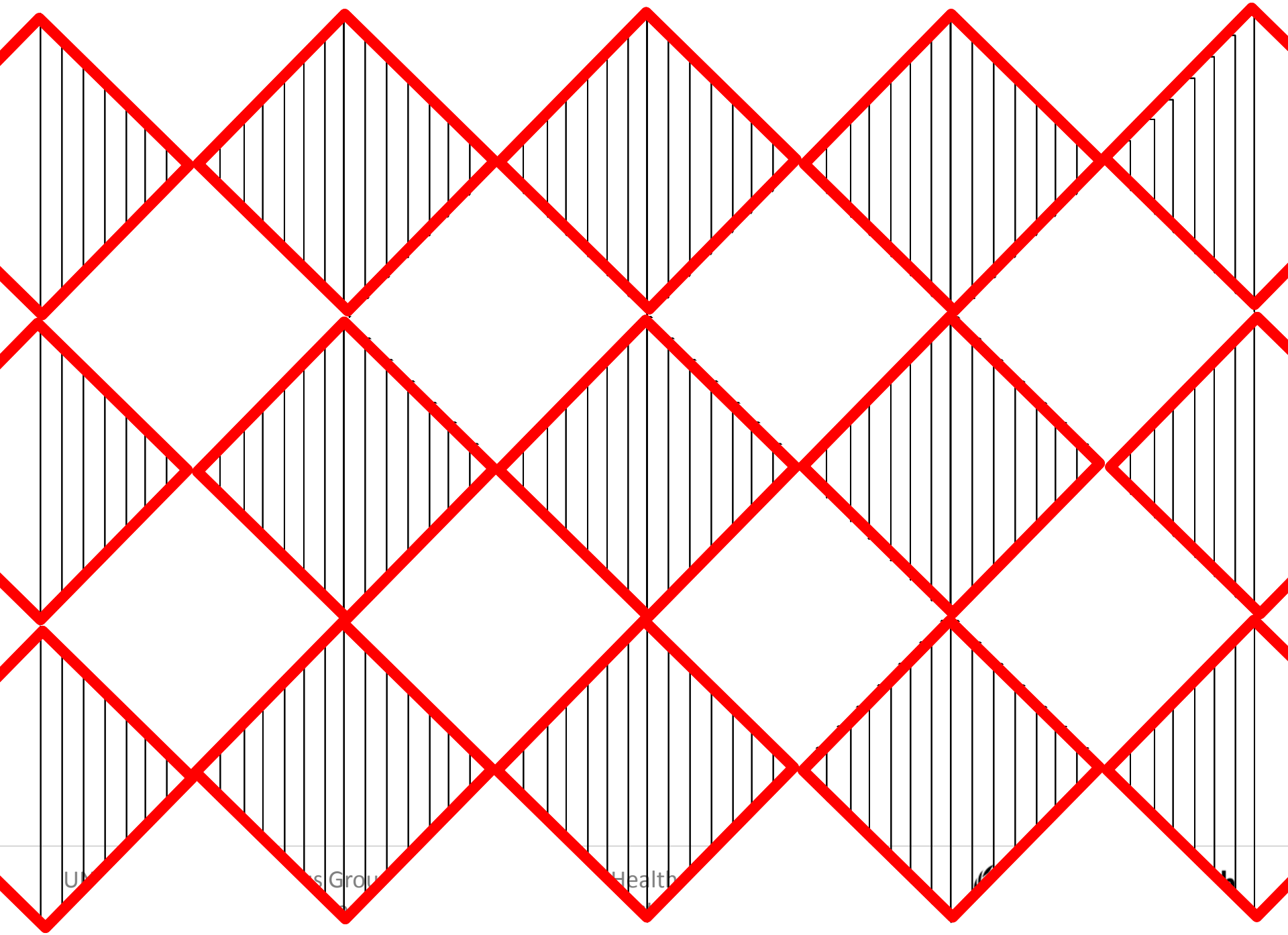
Data driven decision-making

…large scale pattern recognition,

unseen unless combined by various data types…



World Health Organization



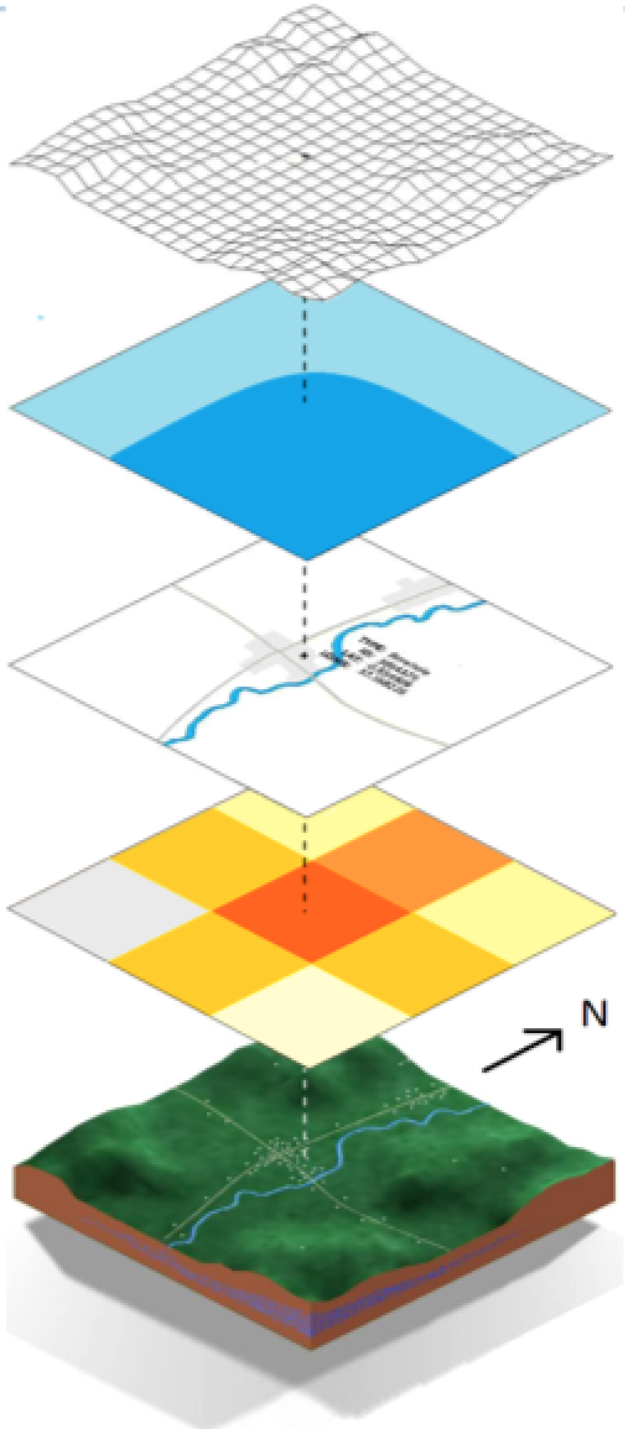
World Heal
Organization

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 .

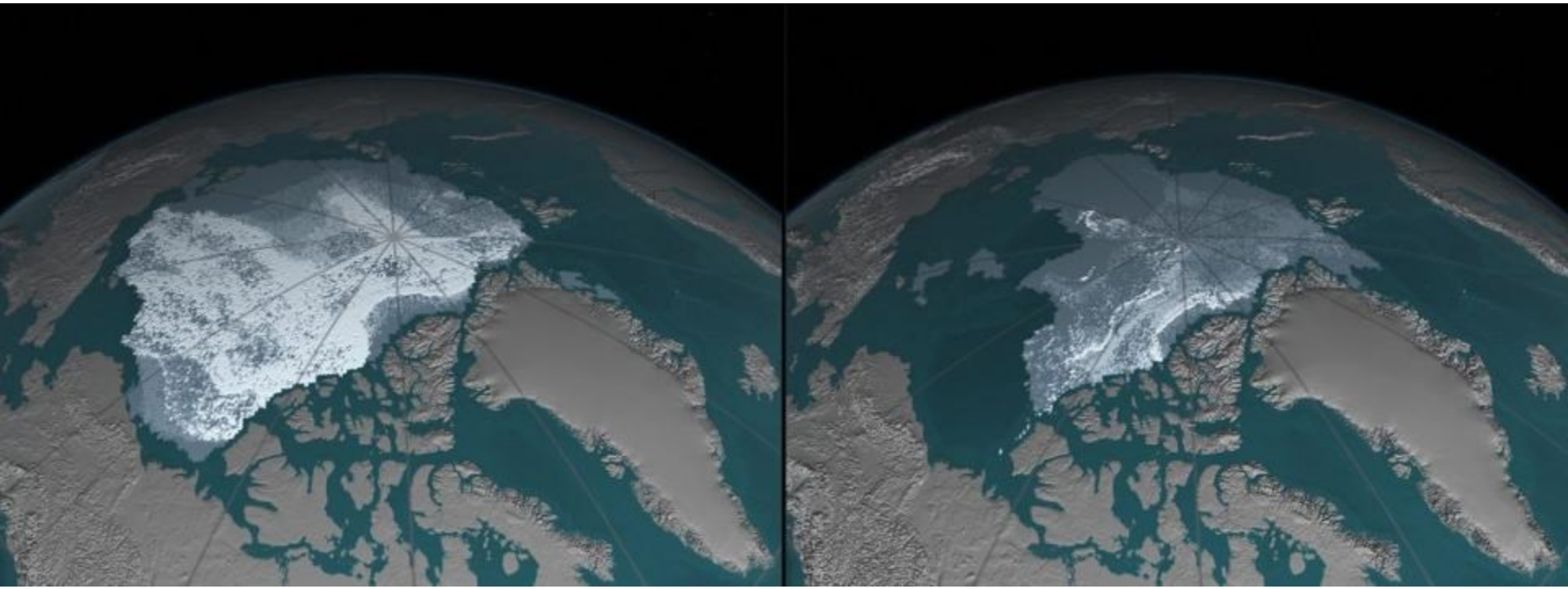
Areas with improved water access: (combination of layers) Displays 1-km LandScan areas that have achieved water access per guidelines, i.e. at least one access point per 1-sq.km

Earth Observation and Geospatial Data

Source: Rifat Hossain, WHO, 2015

World Health Organization

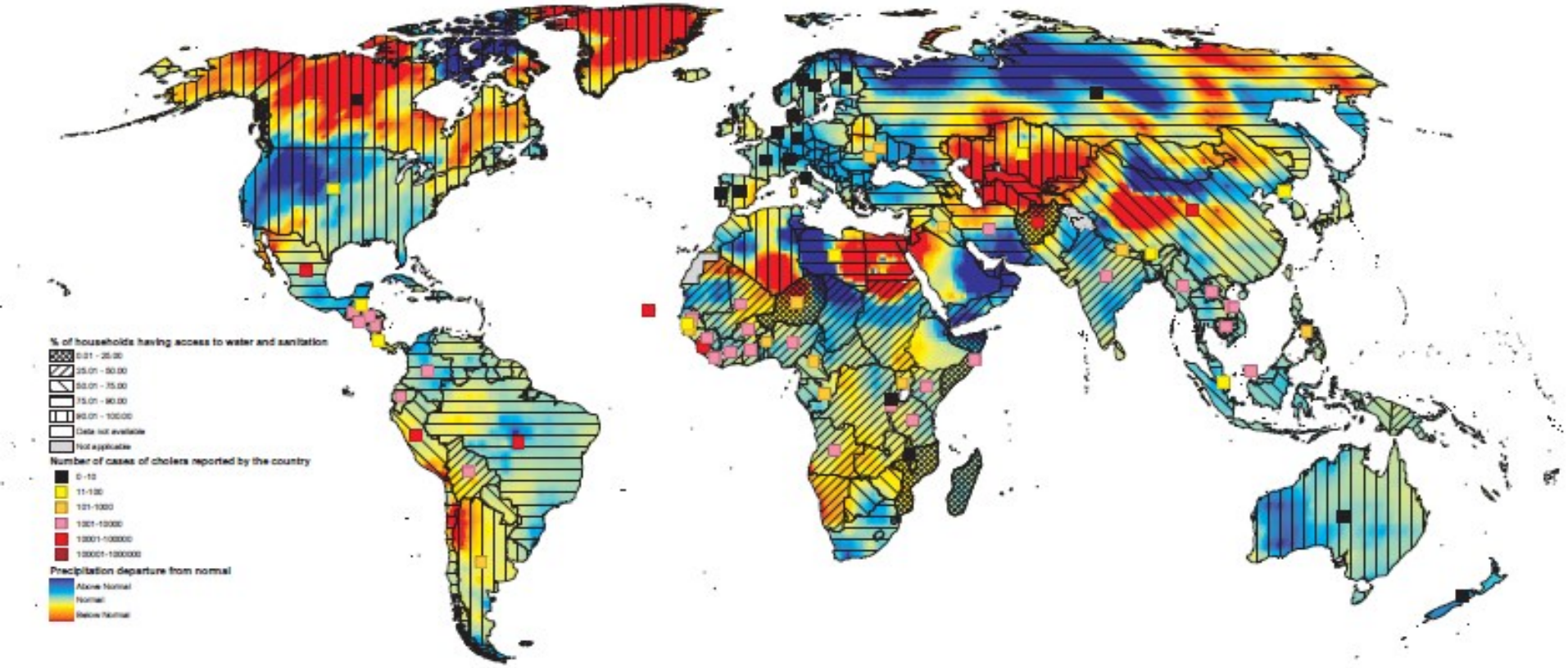
Land use Change



Arctic sea ice decline - comparing September 1984 to September 2016

NASA's Images Of Change show contrasting environments through the past 3 decades (Credit: NASA)

Mapping WASH and NTDs…hotspot analyses



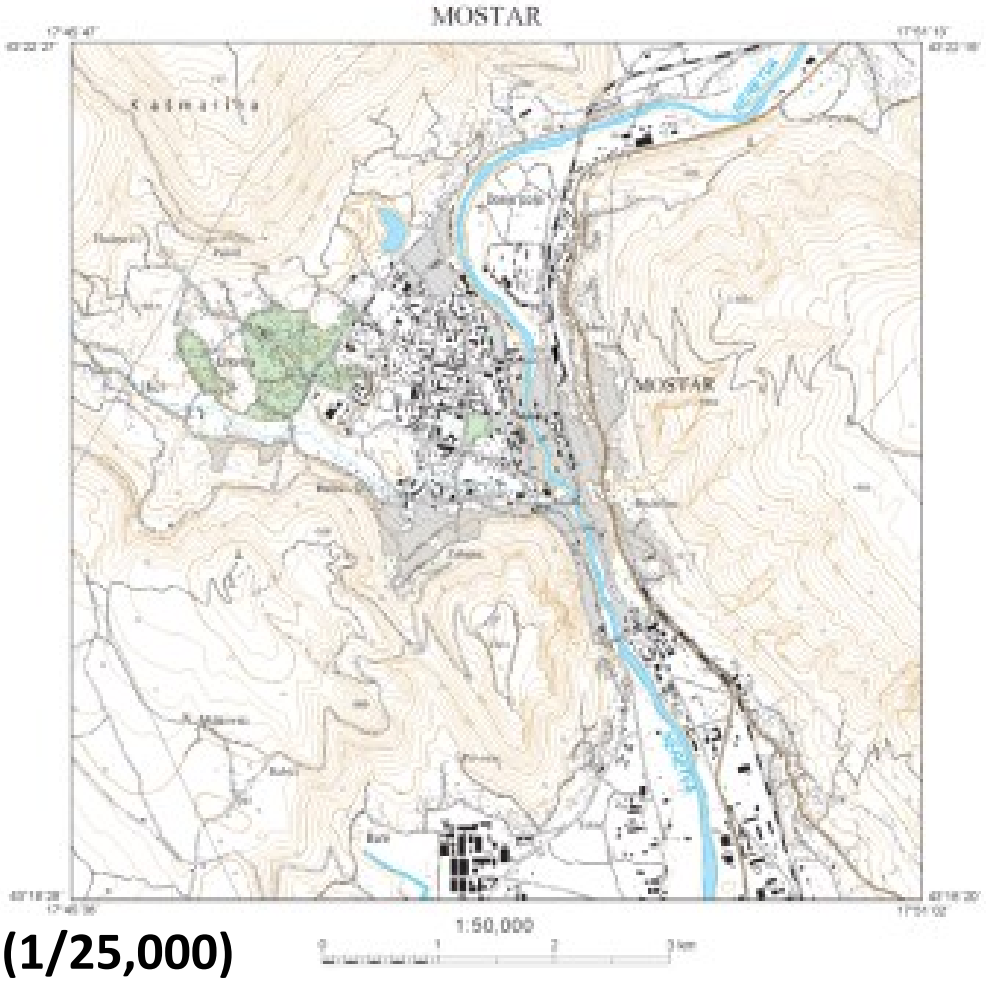
Source: Rifat Hossain, WHO, 2015

World Health Organization

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

World Health Organization

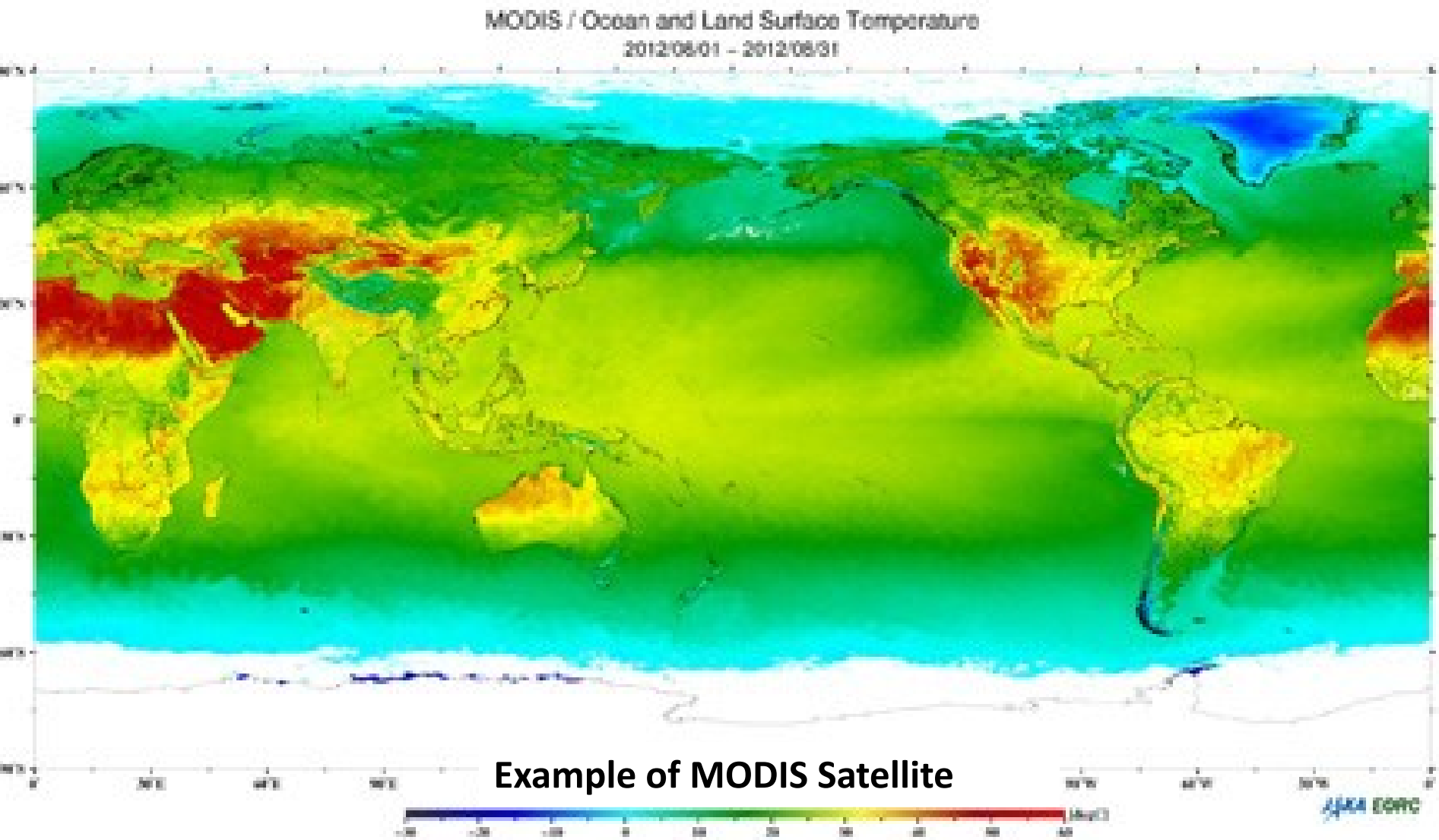
Source: Jaxa 2013



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.

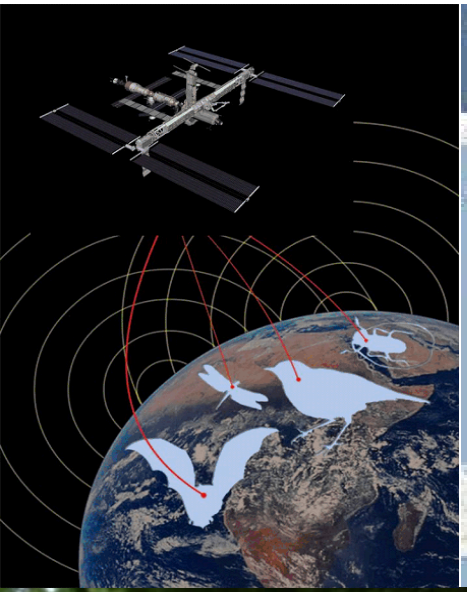
Source: JAXA, 2014

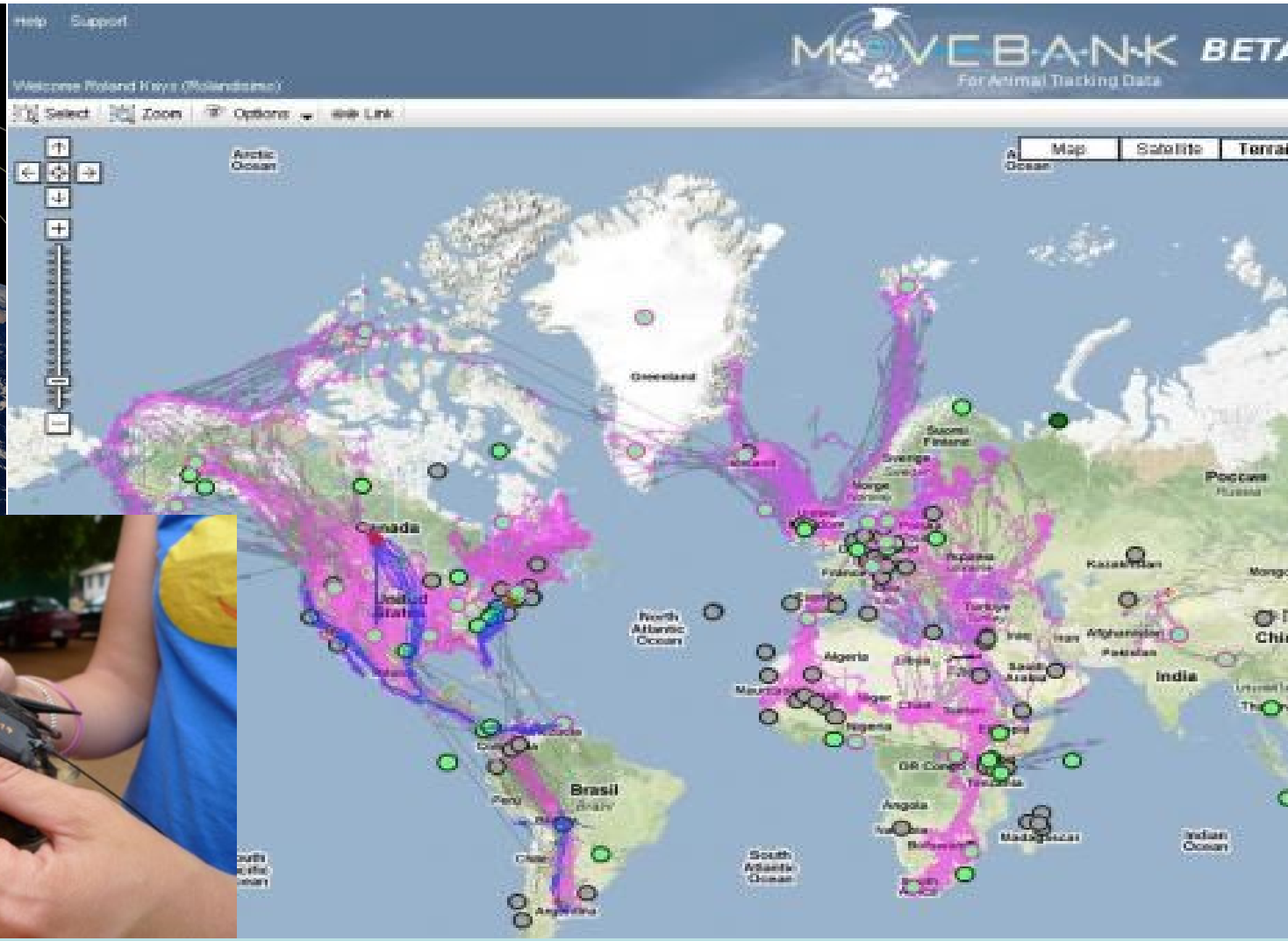


Example of MODIS Satellite

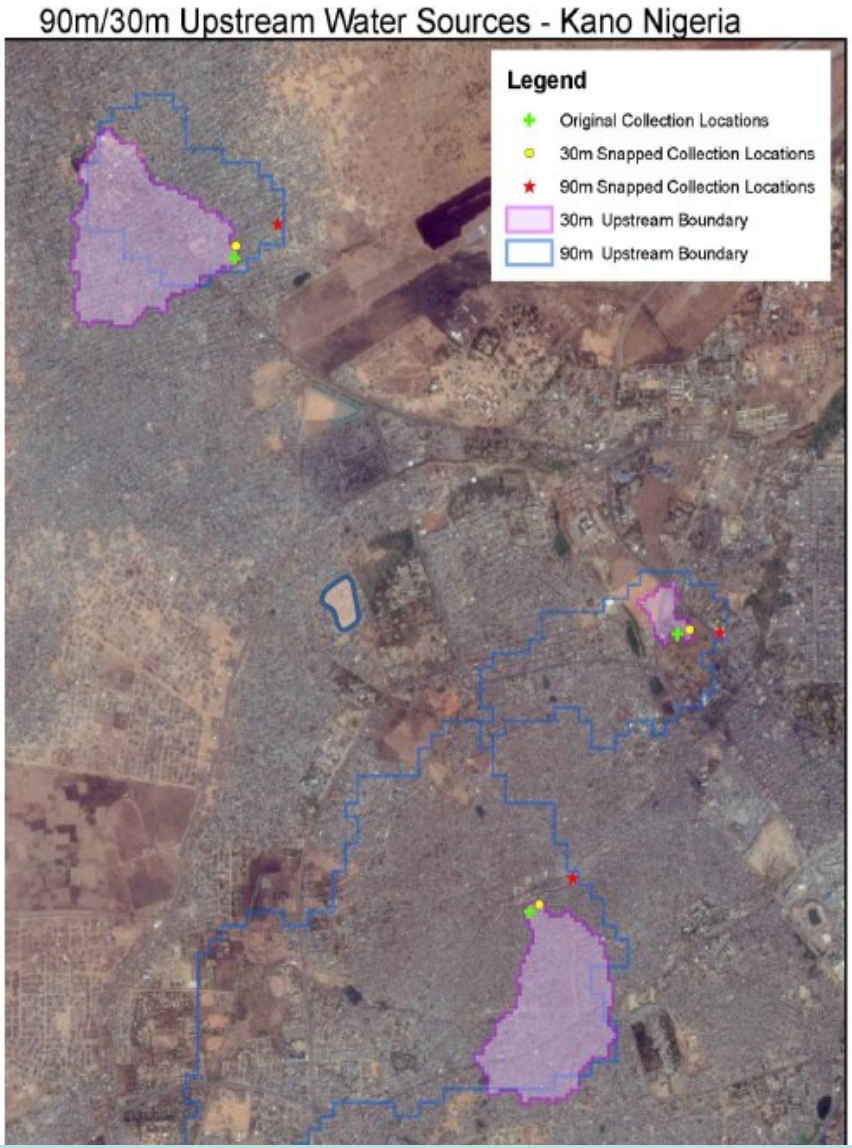
JAXA's GCOM-C will continue to observes surface temperature, which can be used for countermeasures of heat stroke.

Source: Dr Hatton, ESA 2015





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

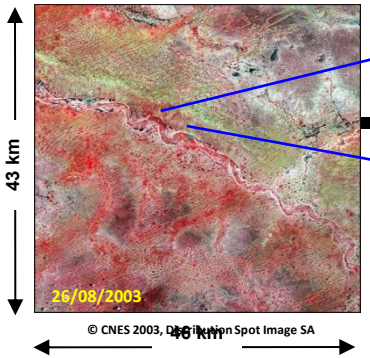


Polio eradication project: Locating sample sites on the satellite images and tracking over time using JAXA's 5-m resolution DEM data

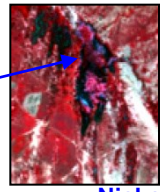
A Remote-sensing tool applied to Rift Valley Fever (RVF) Monitoring

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

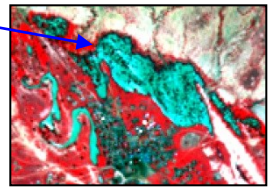
SPOT5 multispectral Image
high spatial resolution -10m
(Program ISIS/CNES)



1354 ponds

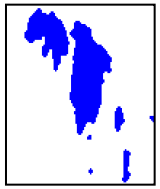


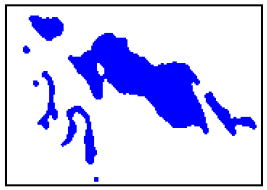
Niaka



Barkedji

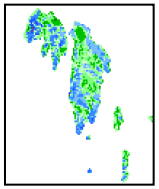
Ponds detection
NDPI

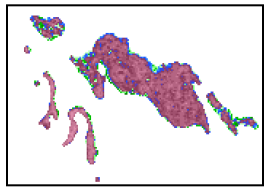




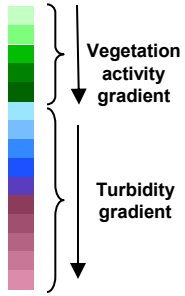
Ponds' area

Characterization
NDVI & NDTI





Ponds' characterization

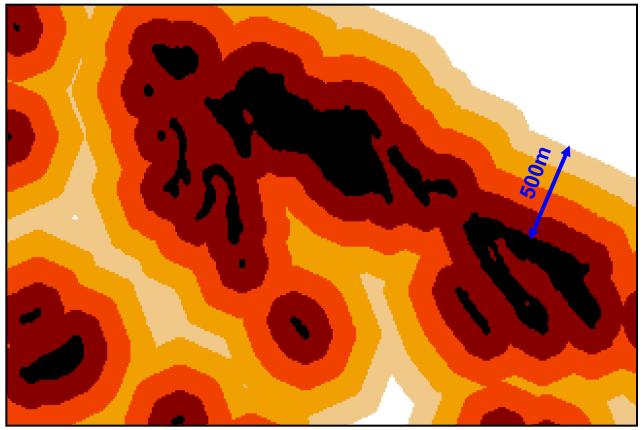


Vegetation Cover

Turbidity

Mosquitoes flying range
~500m (Bâ et al., 2005)

Mapping the ZPOM

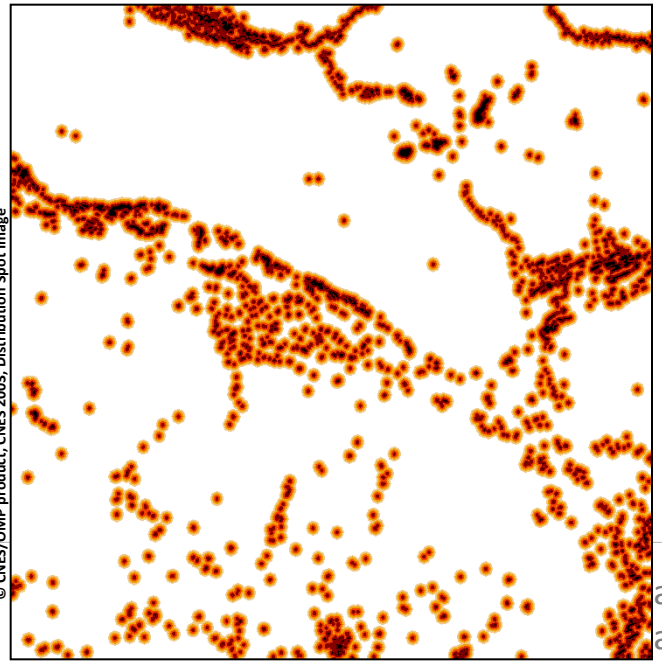


26/08/2003

Ponds ~ 1%

ZPOM = 25%

Zones Potentially
Occupied by Mosquitoes (ZPOM)



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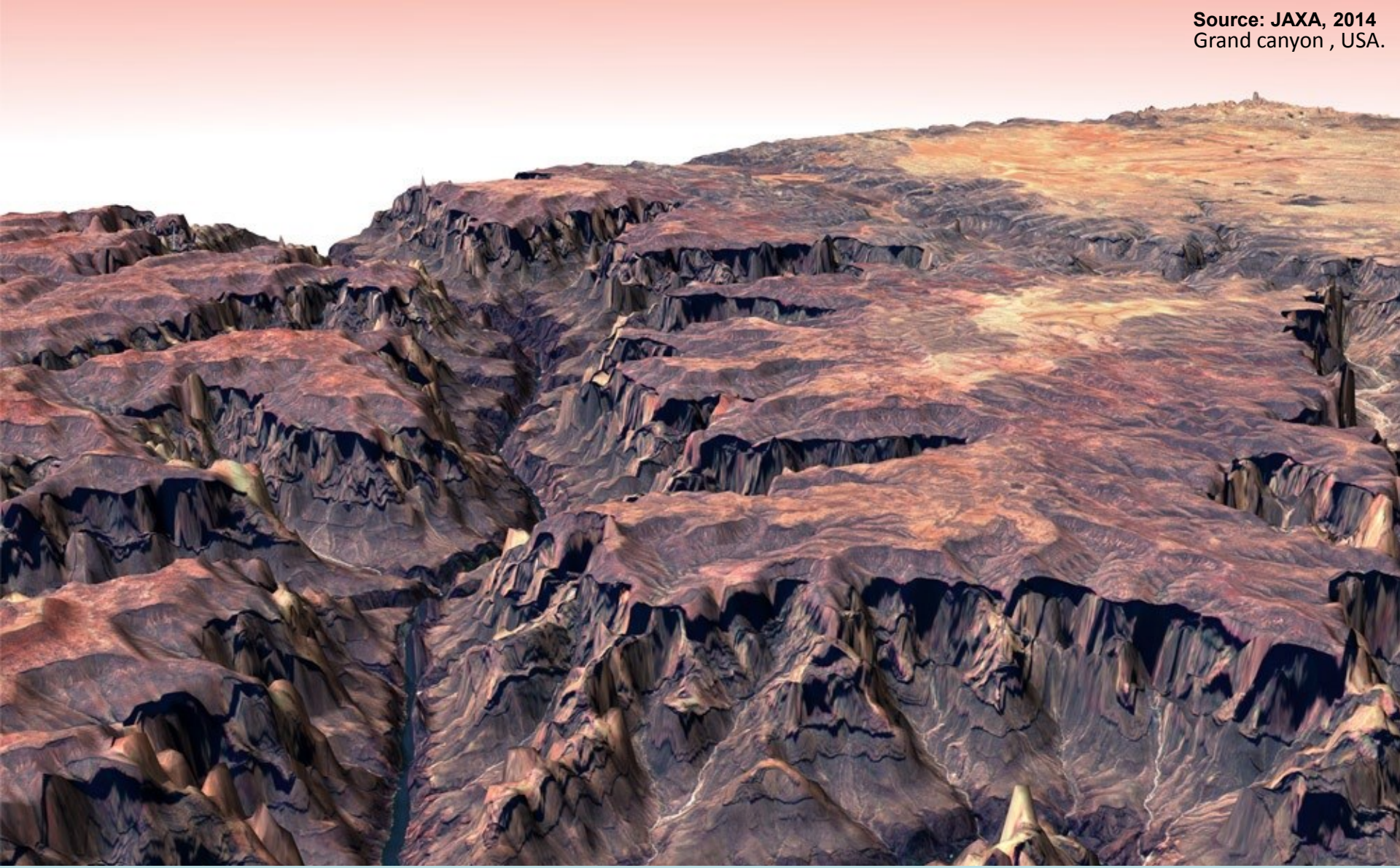
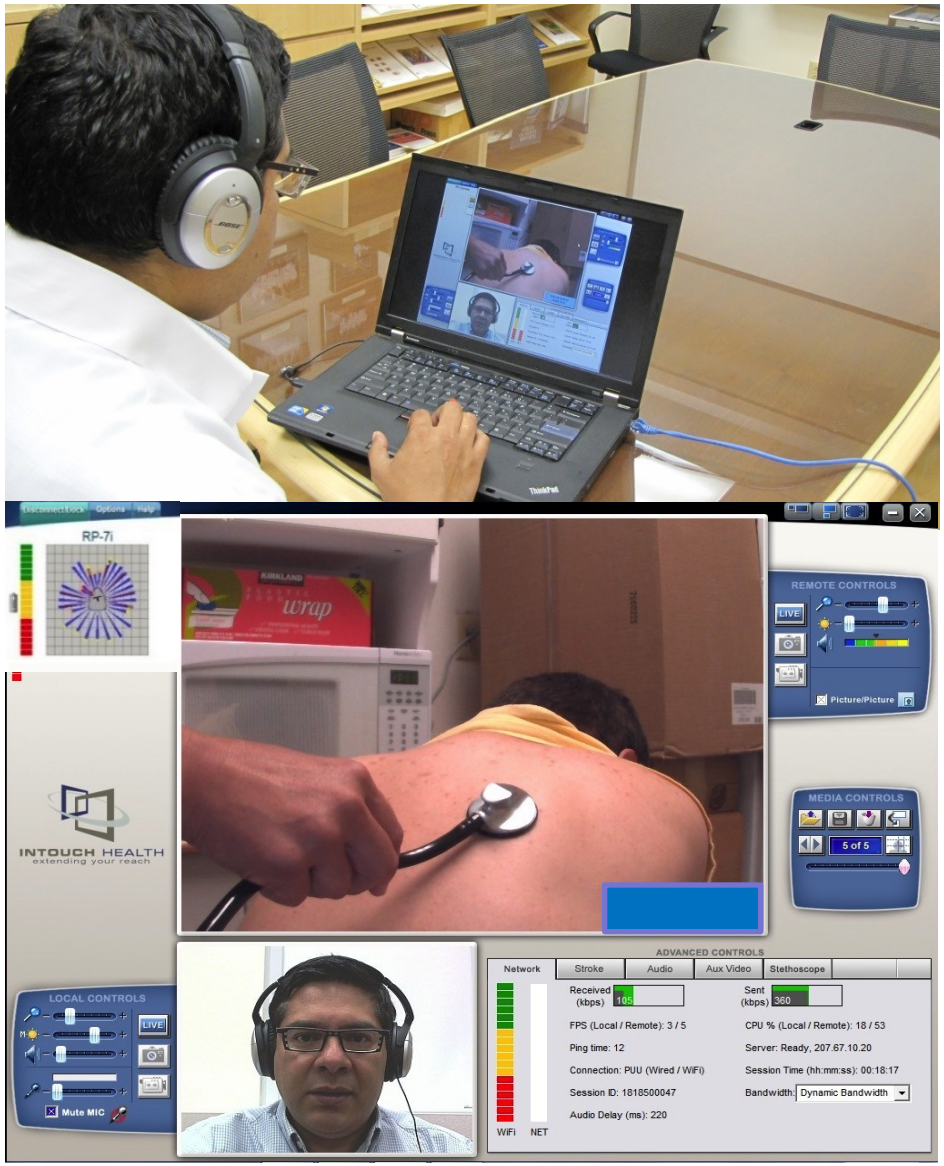


This shows ALOS 3-D mapping capacity. It is the world's most accurate vertical resolution, 5m, among satellites.

Use of space science and technology in clinical care settings

World Health Organization

Source: Ivar Mendez, June 2015



Tele-health applications, connecting patients and caregivers

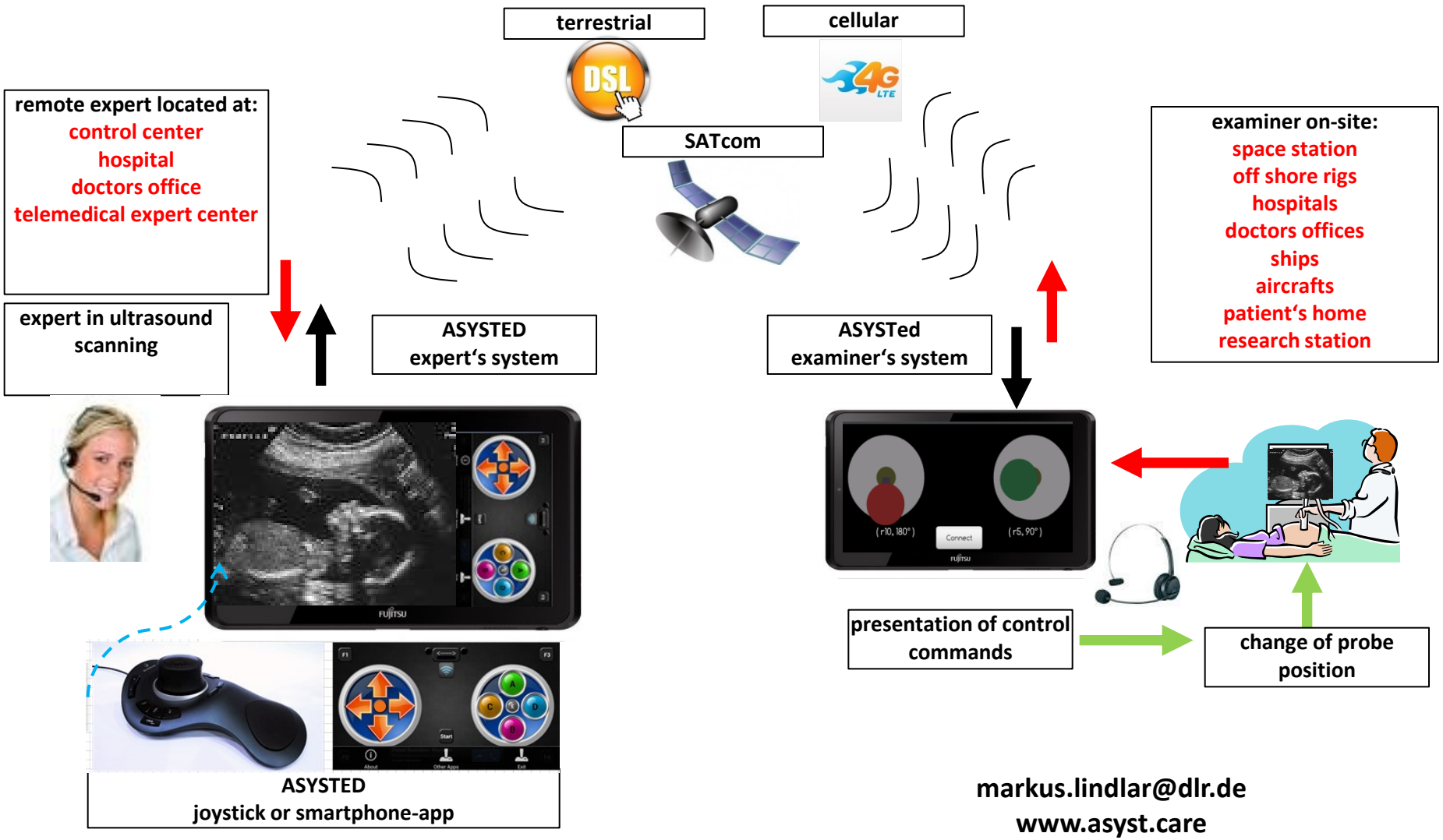
Source: Ivar Mendez, June 2015

Halifax

Bolivia

Tele-health applications, connecting two countries

Source: Dr Gerzer, German Aerospace Center, June 2015



markus.lindlar@dlr.de
www.asyst.care

Advanced System for Tele-guided Ultrasound Diagnosis

CMAJ Medical knowlege that matters

INNOVATIONS

Mobile remote-presence devices for point-of-care health care delivery

Tele-health applications, connecting field sites and physicians

Robotics and health care delivery

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

Source: NASA 2015

Application of Space Technology:
Water filtrations solutions developed and deployed.

Integrating space science and technology as part of national health information architecture

World Health Organization

Ideal Dataset Requirement Matrix for Unified Systems

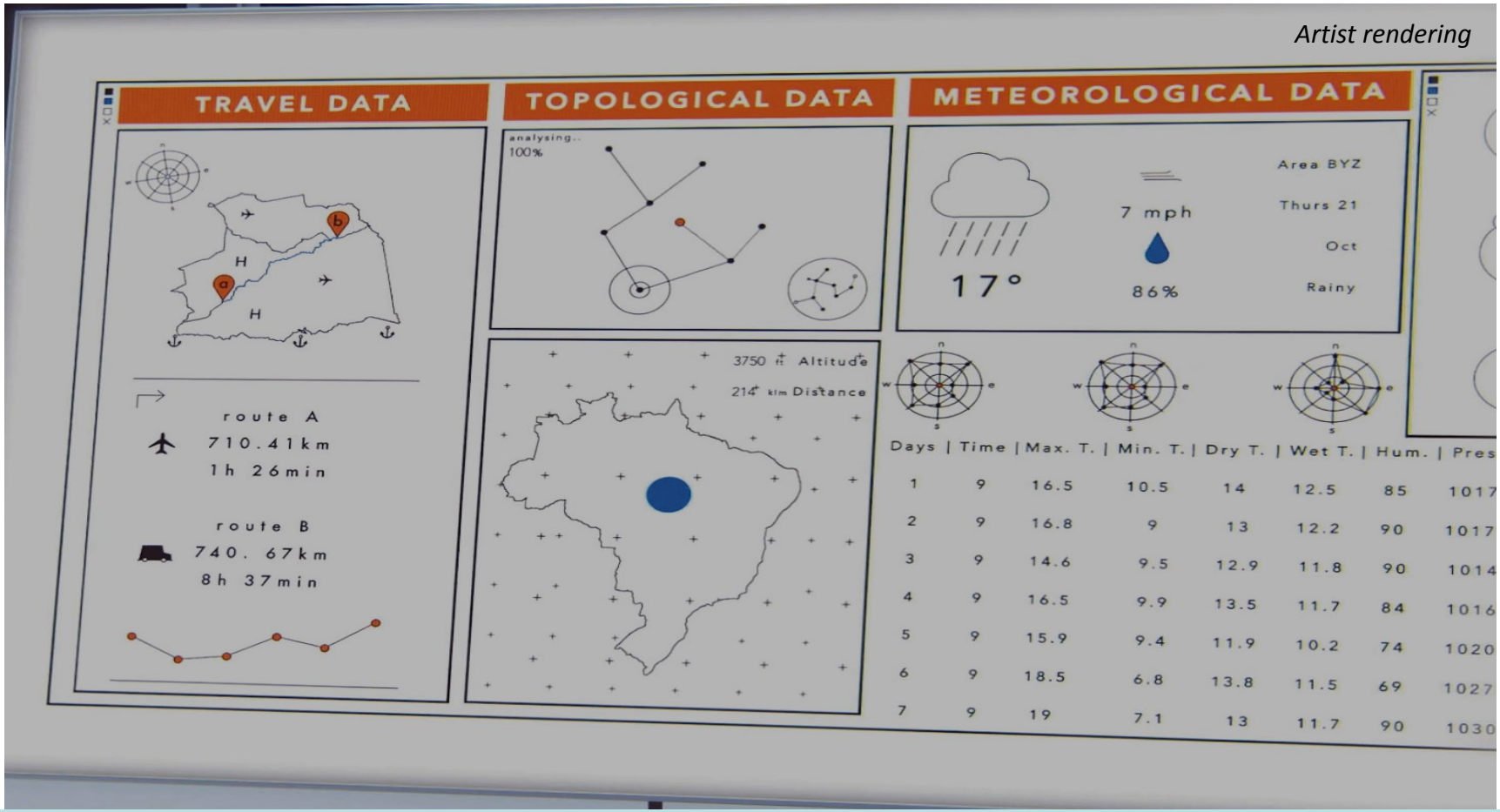
Data set required for	Prevention	Preparedness	Response	Recovery
Data from External sources (National EOC/situation reports, HMIS, routine disease specific active/passive surveillance/ notification systems)				
Exhaustive List of disease/ conditions list *(ICD)*		**List of donor and partner agencies**		
Health facilities (all types and levels)		**Health workforce** (all cadre)		
Essential Medicine		**Logistics**		**Essential Medical devices**
Satellite Imagery (various types and resolutions)				**Other remotely sensed data** (temperature, precipitation, terrain and topology)
Geographic Information System with shape files, base maps				
Transportation assets (Airport locations, transportation hubs, Road network maps)			**Country-specific Population Data** (/sub-national level; projections, census, actual)	

Future Health Information Platforms

Artist rendering

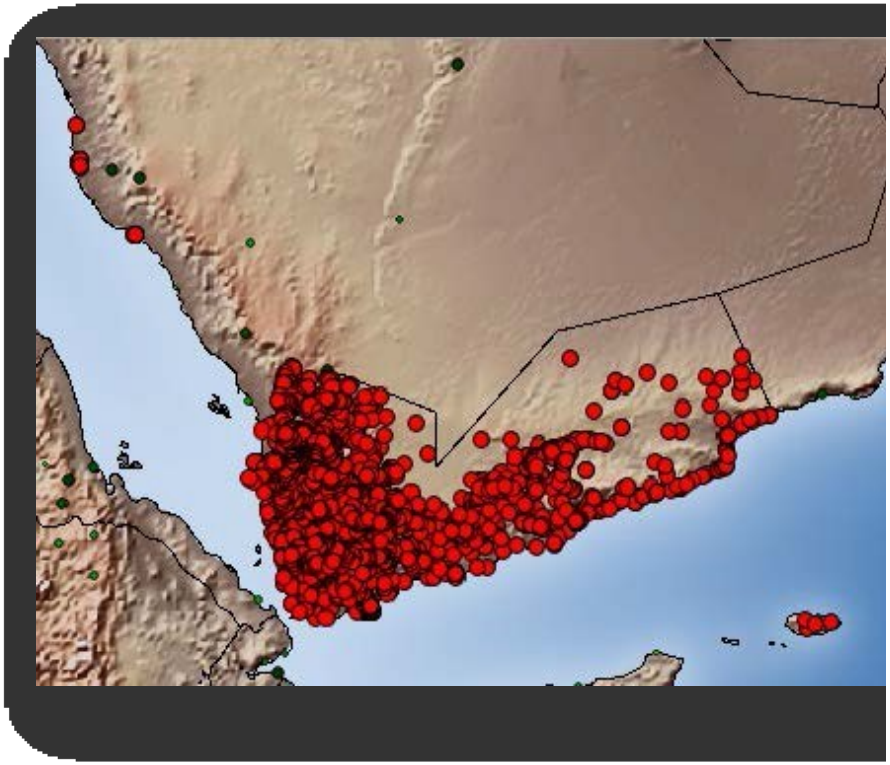
Health information platform for monitoring public health combined with context specific geospatial data.

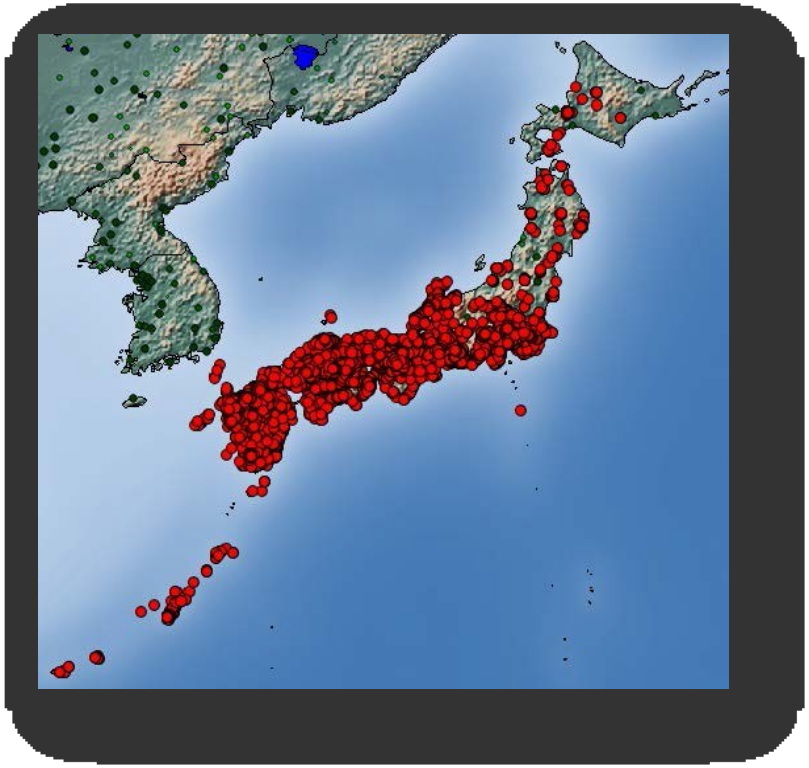
Future Health Information Platforms



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

Health Facilities Locator





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

Pubic Health Priority Areas to utilize Space Science and Technology

World Health Organization

Space Science and Public Health

- Area 1: Space science and technology for epidemic intelligence
- Area 2: Space science and technology Health Emergencies
- Area 3: Shaping the research agenda on Benefits of space science and technology to pubic health

World Health Organization

Key Messages

- Space Science and One Health in the context of UN-COUPOS +50; SDG 2030; and UHC
- Integration of Space science and technology to health systems strengthening efforts to be more widely practiced
- Closer collaboration between Ministries of Health and Ministries of Science/Technology is essential

Thank you

World Health Organization