# Advancing Health Related Sustainable Development Goals through Space Science, Technology and Applications

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*United Nations / Germany High Level Forum: The way forward after UNISPACE+50 and on Space2030.
Bonn, Germany 13 - 16 November 2018*

# Space and Global Health: Capabilities and Challenges

- Space Capabilities (Science, Technology and Operational Systems) make significant contributions to many areas relevant to Global Health

  - **Space and Global Health a thematic priority of UNISPACE+50**

    - In stakeholder consultations during preparation of UNISPACE+50 end user needs and space capabilities were clearly identified.
    - A number of challenges and barriers exist which limit broader use of capabilities
    - Top level recommendation in UNISPACE+50 for closer and effective coordination between space and health stakeholders to improve public health

- **How do we practically achieve the UNISPACE+50 Space and Global Health recommendations?**

# Mapping Global Health Needs & Space Capabilities

# WHO 13ᵗʰ Programme of Work (2019-2023)
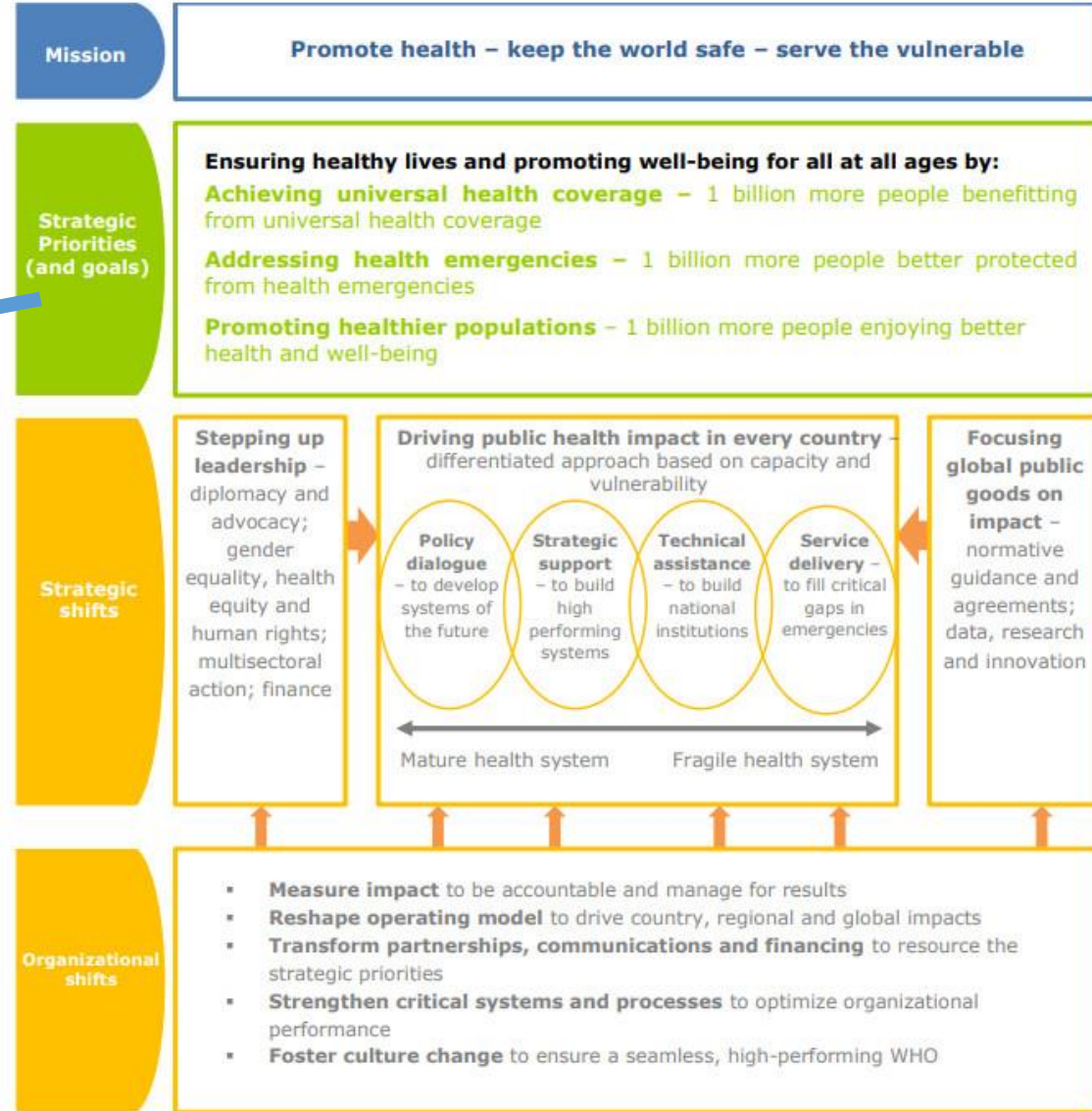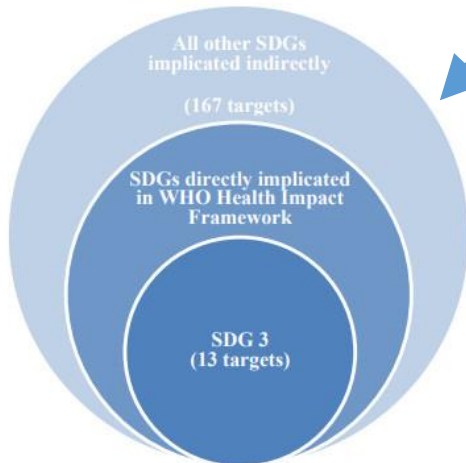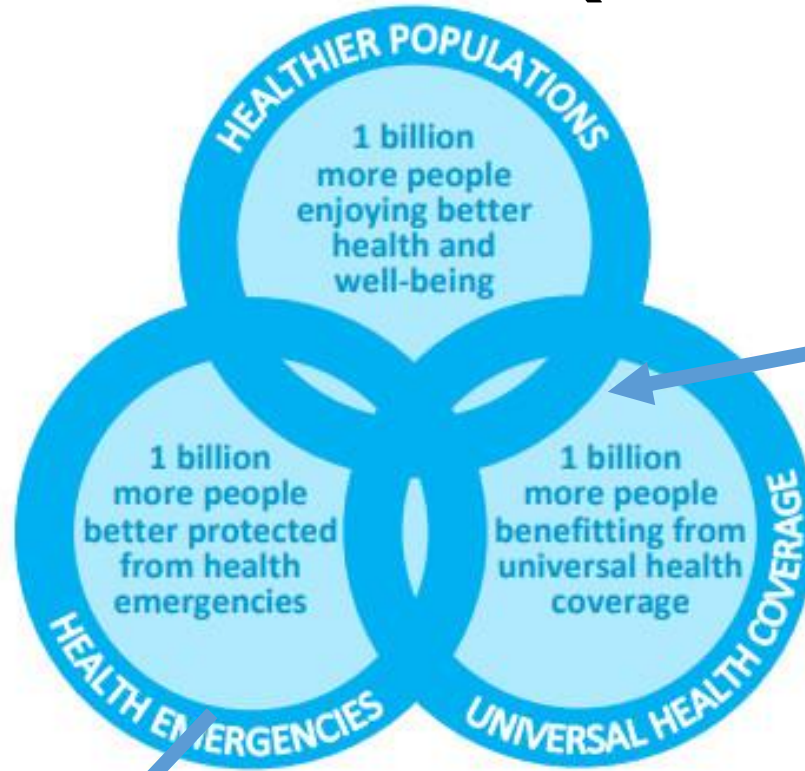
## HEALTH IN THE SDG ERA

### TARGETS

**3.B** Support the research and development communicable and non-communicable developing countries, provide access to and vaccines, in accordance with the D Agreement and Public Health, which af countries to use to the full the provisio Related Aspects of Intellectual Property protect public health, and, in particular all

**3.C** Substantially increase health financing development, training and retention of developing countries, especially in leas island developing States

**3.D** Strengthen the capacity of all countries countries, for early warning, risk reduc and global health risks

Framework Convention on Tobacco Co appropriate

World Health Organization WWW.WH

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**PEOPLE  PROSPERITY  PLANET  PEACE  PARTNERSHIPS**

Home » People

### SDG3 Good Health and Well-being

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More information about target, please visit this link.

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**Additional information**

- ESA: Space for Sustainable Development
- UNOOSA
- SDGs: Sustainable Development Knowledge Platform

**Social networks activity**

Tweets by @spaceforearth

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Find out the latest scientific findings from @ESA_EO's SwarmMission - live stream of the press conference at the @EuroGeosciences #EGU18 in Vienna starts at 09:30 GMT (11:30 CEST).
Watch here: client.cntv.at/egu2018/pc2

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ACTIVITY
**AIR-Portal - Air quality dashboard for European cities**
Thu, 03/08/2018 - 19:40
The feasibility study was performed by a consortium of Arcadis, S[&]T and KNMI [Royal Netherlands Meteorological Institute] in collaboration with three major European cities: Amsterdam, Athens and Lyon....
People  SDG3 Good Health and Well-being  Prosperity  SDG9 Industry, Innovation and Infrastructure  SDG11 Sustainable cities and communities  Planet  SDG13 Climate action

ACTIVITY
**aircheckr**
Thu, 03/08/2018 - 19:40
Poor outside air quality is a silent killer. It is responsible for more than 450.000 premature deaths in Europe each year. But what can we do about it? Available air quality data are too complex for personal use....
People  SDG3 Good Health and Well-being  Prosperity  SDG9 Industry, Innovation and Infrastructure  SDG11 Sustainable cities and communities  Planet  SDG13 Climate action

ACTIVITY
**Airway monitoring**
Thu, 03/08/2018 - 19:40
The "Airway Monitoring" experiment investigates and develops the use of a biomarker for monitoring airway inflammation in space. The experiment also has clinical applications for people on Earth....
People  SDG3 Good Health and Well-being

ACTIVITY
**AMAZON**
Thu, 03/08/2018 - 19:40
AMAZON is based on a previous ESA-backed project that resulted in the successful development of a telemedicine system for commercial aviation applications [TEMPUS]....
People  SDG3 Good Health and Well-being

ACTIVITY
**Automatic sample testing thanks to space**
Thu, 03/08/2018 - 19:40
A miniaturised biotech unit developed for the International Space Station is improving medical diagnoses on Earth with affordable automation of small-scale diagnostics....
People  SDG3 Good Health and Well-being

ACTIVITY
**B-LiFE - Biological Light Fieldable Laboratory for Emergencies**
Thu, 03/08/2018 - 19:40
The objective of the ESA IAP-ARTES 20 Biological Light Fieldable laboratory for Emergencies [B-LiFE] project was to bring a diagnostic capability as close as possible to the crisis area, thus providing an essential element of fast emergency response while preserving the safety of deployed staff a...
People  SDG1 No poverty  SDG3 Good Health and Well-being  Partnerships  SDG17 Partnerships for the goals

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# Examples of potential focus areas identified in ESA-WHO Cooperation discussions

# Earth Observation Data and Products



## ESA Space Capability

Earth observation data from a wide range of ESA Developed Earth Observation Satellite Missions

- Scientific (Earth Explorers),
- Sentinels (EU Copernicus)
- MetOp (Eumetsat)



## EO for SDG

Use of EO data in implementation of Official Development Assistance (ODA) projects, source of environmental information for environmental safeguard, monitoring and evaluation

Integration of EO data in measuring and monitoring of SDG targets with UN Statistical Offices and National Statistical Offices

## Health SDG Relevant Focus areas;

- **Water mapping** => Accessibility, quality, disease vectors
- **Climate change and determinants of health**
- **Disaster / epidemic response** (link with IDC)

**WHO 13th GPW**
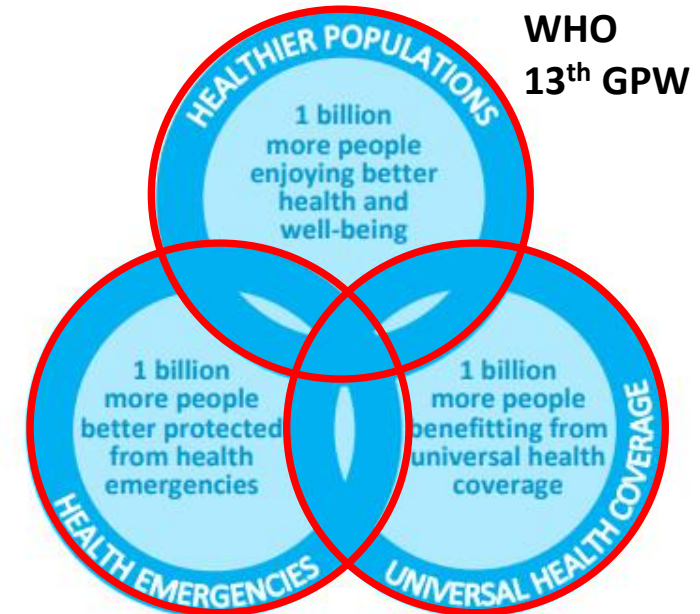
# Operations Planning and Big Data Analytics



## ESA Space Capability

- Spacecraft Operations: Tracking & Control of Spacecraft, planning of operations

- Innovative Technology solutions for decision making

## Potential Applications to Health

- **Predictive Analytics, data driven modelling and forecasting**
  - Early detection of disease outbreaks, models of evolution of epidemics, what if analysis of different scenarios & preventative measures

- **Artificial Intelligence Planning & Scheduling of Health services delivery**
  - Optimal allocation of resources & sequences for service delivery
  - Simulated feasibility analysis of (what-if) scenarios of new services
  - Health Emergency process management & decision support

**WHO
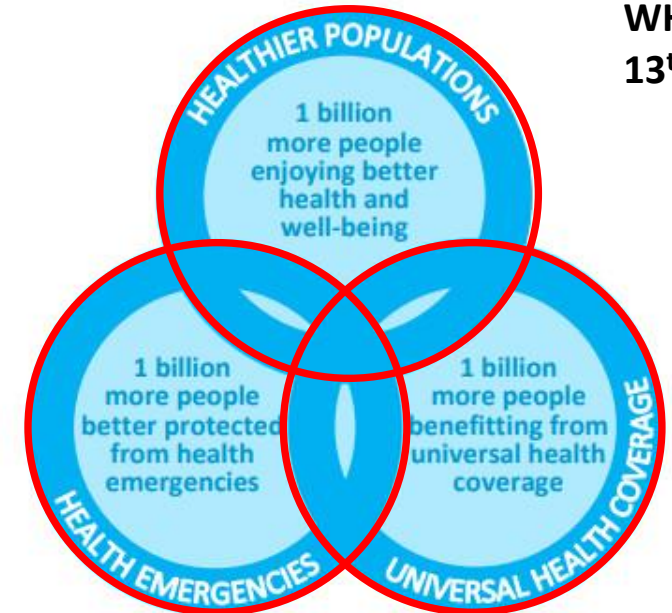13th GPW**

# Space Technology and Services
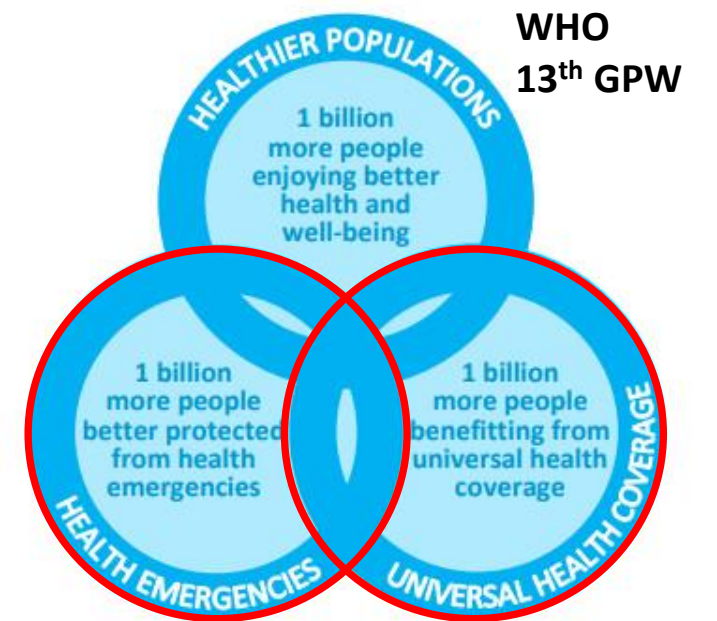


## ESA Space Capability

- Supporting development of projects which utilise space technologies and capabilities for terrestrial applications

- Transfer of technology developed for space applications for terrestrial use

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**Example Health Applications**

- **eHealth & Telemedicine (50% of ESA's Health Projects)**
- **Deployable lab / midi lab on table technology**
- **Environment – water & air monitoring**
- **Water treatment technologies**

# Human Spaceflight Research, Applications and Technology



## Space Capability

- Health relevant research in space and analogue platforms

- Living & working in hostile environments and development of countermeasures

- Diagnostic technology and emergency / autonomous medical care for space crew

## Terrestrial Health Application of Human Spaceflight research findings & technology

- Medical and biology research – applicants to terrestrial health

- Water treatment, food production in compact environment / limited resources

## Technology & Knowledge Spin in / Spin out for Human Space Exploration

- Emergency medical care, Monitoring of personalised in isolated environments, with remote or autonomous decision making for medical care

- Medical diagnostics technologies and processes

## Healthy Living / Optimising use of Physical Exercise

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# Education & Capacity Building
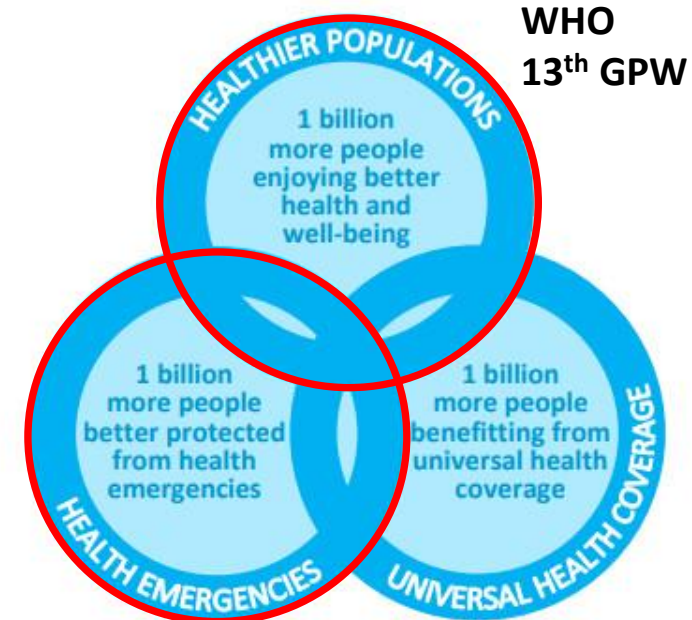


## Space Capability

- Full portfolio of ESA space activities

- Broad range of education activities at many different levels associated with projects and programme

- Inspiration and fostering cooperation

**Education Activities linked to Health relevant SDG's**

**SDG 3 - Ensure healthy lives and promote well-being for all at all ages** Mission X – train like an astronaut

**SDG 4 - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all** --> ESA Education runs a continuous teacher training programme at school level and student training programme at university level

**SDG 5 - Achieve gender equity and empower all women and girls;** Gender equity/breaking of stereotypes is a cultural aspect we promote through all ESA Education initiatives

**SDG 6 - Ensure availability and sustainable management of water and sanitation for all;** new European school initiative about Exploration, including water recycling

**SDG 13 - Take urgent action to combat climate change and its impacts** new European school initiative about Climate Change

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# Conclusions
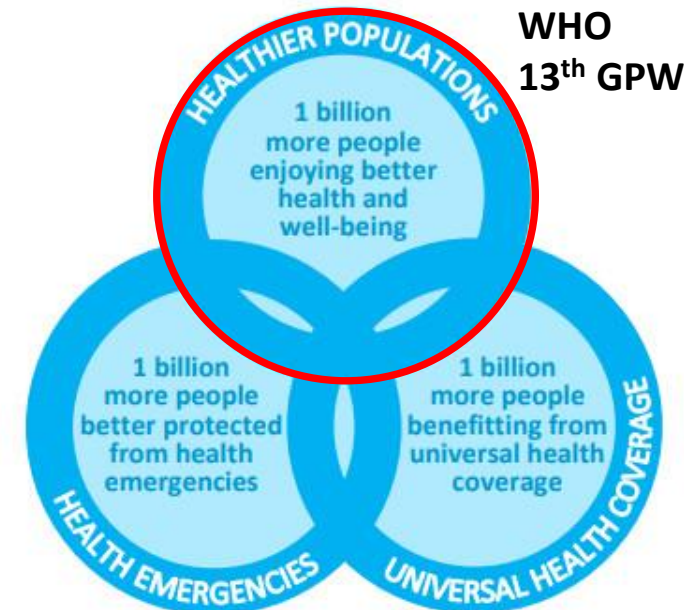
- Space capabilities benefit a broad range of health relevant applications and activities, yet there are a number of barriers to broader use of capabilities

- Implementation of the UNISPACE+50 thematic 5 recommendations can be facilitated by mapping of user needs with space capabilities

- The sustainable development goals & target can act as a common framework for connecting needs with capabilities

- Coordination between stakeholders can occur at many different levels. Space agencies and specialised UN agencies have a key role to play through their broad based programmes which can link space capabilities to end users

- Ultimately space capabilities may be integrated into health care systems, such that the space capability is transparent to the end user

# Examples of application of space capabilities to health

**B-Life (Light Fieldable laboratory for Emergencies)**
Developed through ESA's Integrated Applications Programme

Integrates Satellite Telecoms, Earth Observation and GNSS Capabilities with field labotary
Deployed in Guinea during 2014-2015 Ebola outbreak

# AMAZON Project (TEMPUS)
Developed through ESA's Integrated Applications Programme

Field diagnostic device, enhanced with telemedicine and GNSS locatisation.
Commercially available as Tempus device
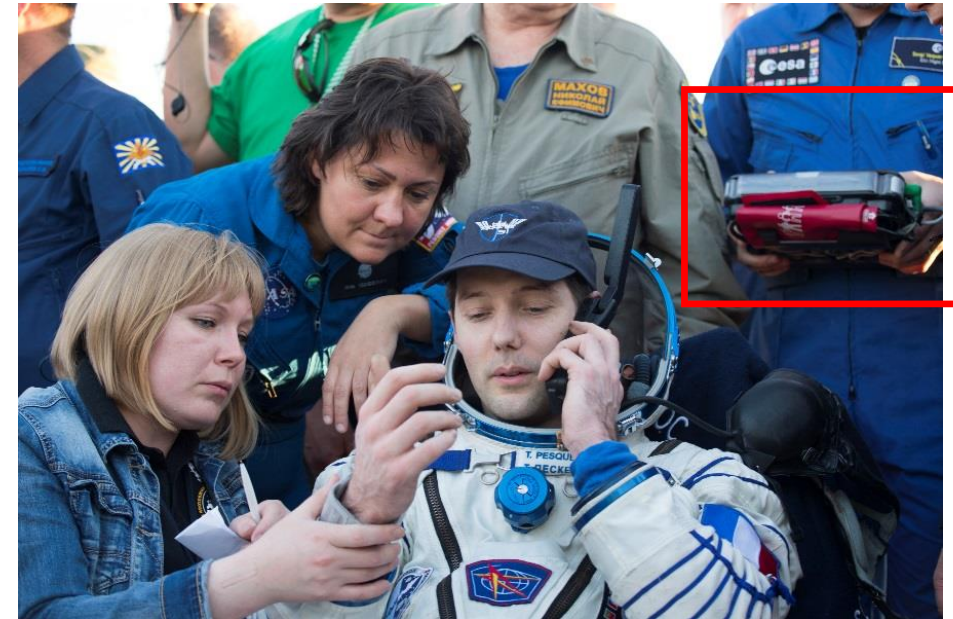
Cross sectional View of Relevance of Space Science to Public Health

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

Kuma Masallachi-Fagge | Gogau Fagge

**Kano Environmental Surveillance Sites**

90m/30m Upstream Water Sources - Kano Nigeria

Legend
+ Original Collection Locations
○ 30m Snapped Collection Locations
★ 90m Snapped Collection Locations
▨ 30m Upstream Boundary
▢ 90m Upstream Boundary