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

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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?
Examples of application of space capabilities to health
WHO Polio eradication project:
Locating sample sites on the satellite images and tracking over time using JAXA’s 5-m resolution DEM data.
B-Life (Light Fieldable laboratory for Emergencies)
Developed through ESA’s Integrated Applications Programme

Integrates Satellite Telecoms, Earth Observation and GNSS Capabilities with field laboratory
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.
Mapping Global Health Needs & Space Capabilities
WHO 13th Programme of Work (2019-2023)

Mission

Promote health – keep the world safe – serve the vulnerable

Strategic Priorities (and goals)

Ensuring healthy lives and promoting well-being for all at all ages by:

- Achieving universal health coverage – 1 billion more people benefiting from universal health coverage
- Addressing health emergencies – 1 billion more people better protected from health emergencies
- Promoting healthier populations – 1 billion more people enjoying better health and well-being

Strategic shifts

Driving public health impact in every country
differentiated approach based on capacity and vulnerability

- Policy dialogue – to develop systems of the future
- Strategic support – to build high performing systems
- Technical assistance – to build national institutions
- Service delivery – to fill critical gaps in emergencies

- Mature health system
- Fragile health system

Organizational shifts

- Measure impact: to be accountable and manage for results
- Reshape operating model: to drive country, regional and global impacts
- Transform partnerships, communications and financing to resource the strategic priorities
- Strengthen critical systems and processes: to optimize organizational performance
- Foster culture change: to ensure a seamless, high-performing WHO

All other SDGs implicated indirectly (167 targets)

SDGs directly implicated in the WHO Health Impact Framework

SDG 1 (13 targets)
3.B Support the research and development of communicable and non-communicable diseases, provide access to medicines and vaccines, in accordance with the Agreement and Public Health, which all countries to use to the full the provisions related aspects of intellectual property to protect public health, and, in particular all.

3.C Substantially increase health financing, development, training, and retention of the developing countries, especially in the least developed States.

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

Framework Convention on Tobacco Control is appropriate.
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)
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
Space Technology and Services

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

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

WHO 13th GPW
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

WHO 13th GPW
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
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