SATELLITES FOR GEOHEALTH: IMPROVING HEALTH RESEARCHERS' ACCESS TO SATELLITE DATA

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Space for health

Various Planetary Health issues can be addressed using **Earth Observation (EO)** satellite or model data, among others:

- Diseases: interactions between humans and environment
- Pollution: causes, processes, and effects
- Hunger: towards sustainable agriculture for healthy food for all
- Climate change: monitoring of and response to extremes

Many data sets are openly accessible, yet health researchers are often unaware of them or data handling is perceived to be difficult.
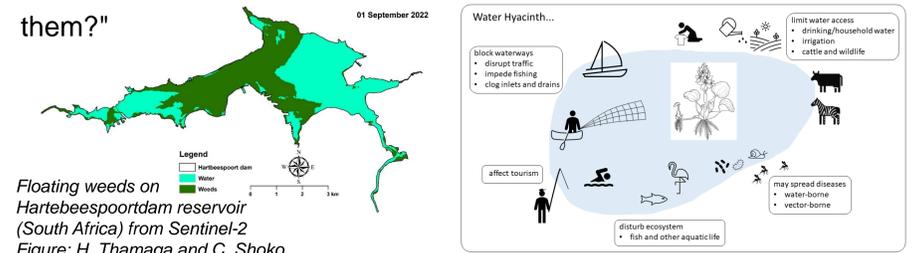
At ITC, Planetary Health topics are being addressed in research projects and education. Examples are presented on the right.

Our approach to improving EO data accessibility is shown below.

Advantages & characteristics of EO data
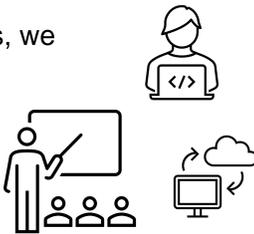## (N. Tjaden & M. Penning de Vries)

EO data:

- Are global, frequent & consistent
- Are often freely accessible
- Can fill gaps in sparse air quality measurement networks
- But come with some challenges

We aim to **strengthen collaboration between health researchers and the EO community.** In a series of different projects, we

- Take inventory of available EO air pollution data
- Identify barriers and requirements for end users
- Co-develop ready-to-use data sets & tools
- Educate on proper use of EO data

Satellites for GeoHealth MSc course at ITC/UTwente
(M. Penning de Vries, C. Kioko, J. Blanford)

Educating students to become EO experts with knowledge of health issues or health experts with EO skills

Outline - **health topics connected to EO topics and skills**:

1. Air pollution, health & satellite data of the atmosphere
2. Water-related diseases and satellite data of the water cycle
3. Temperature extremes and data from weather models and reanalysis
4. Climate change and general circulation models
5. Vector-borne diseases, vegetation indices & machine learning

1. Invasive species (M. Penning de Vries)

- Aquatic weeds like water hyacinth adversely affect livelihoods, access to water, and may be linked to increased disease occurrence
- International interdisciplinary project "Water hyacinths: use them or lose them?"

*Floating weeds on Hartebeespoortdam reservoir (South Africa) from Sentinel-2
Figure: H. Thamaga and C. Shoko*

- **Approach**: systematic study of water hyacinth using satellite data
- **Impact** on health of lake ecosystem and wellbeing and living conditions of people relying on lakes

2. Vector-borne diseases: Malaria (C. Kioko & J. Blanford)

Disease occurrences cannot be determined from EO data directly, but areas suitable as malaria vector habitats can be identified, enabling development of **early warning systems**.
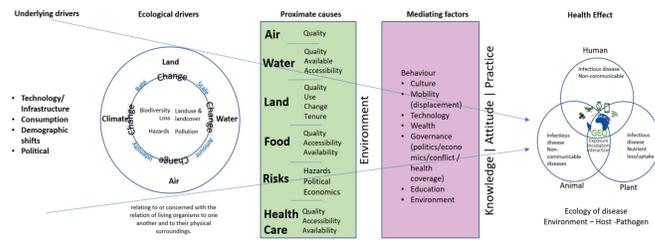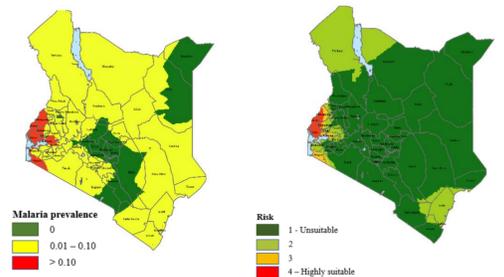
Top figures: Fraction of population in Kenyan regions infected with malaria (left) and habitat suitability of malaria vectors derived from environmental factors (Kioko & Blanford, 2023)

Left: Schematic of ecology of disease environment (Blanford 2023, adapted from Myers, 2017).

3. Tackling hidden hunger from space (M. Belgiu)

- Hidden hunger: the presence of multiple micronutrient deficiencies, without a deficit in energy intake as a result of consuming an energy-dense, but nutrient-poor diet. (Lowe, 2021)
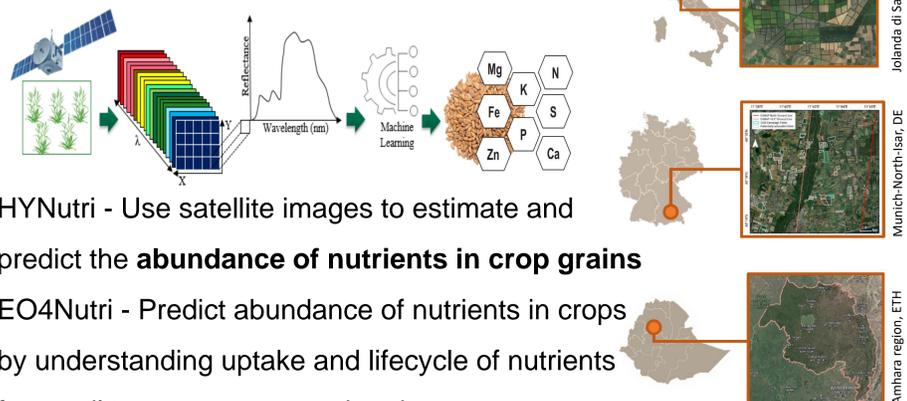
- HYNutri - Use satellite images to estimate and predict the **abundance of nutrients in crop grains**
- EO4Nutri - Predict abundance of nutrients in crops by understanding uptake and lifecycle of nutrients from soil to crop canopy and grain
- See: www.hynutri.nl and www.eo4nutri.nl

Blanford (2023). Geo+Health: Healthy living in a changing planet.
Kioko and Blanford (2023) Malaria in Kenya during 2020: malaria indicator survey and suitability mapping for understanding spatial variations in prevalence, intervention and risk. *AGILE Conference Short Paper*
Lowe et al., (2021): doi https://pubmed.ncbi.nlm.nih.gov/33896431/
Myers (2017): doi https://doi.org/10.1016/S0140-6736(17)32846-5
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