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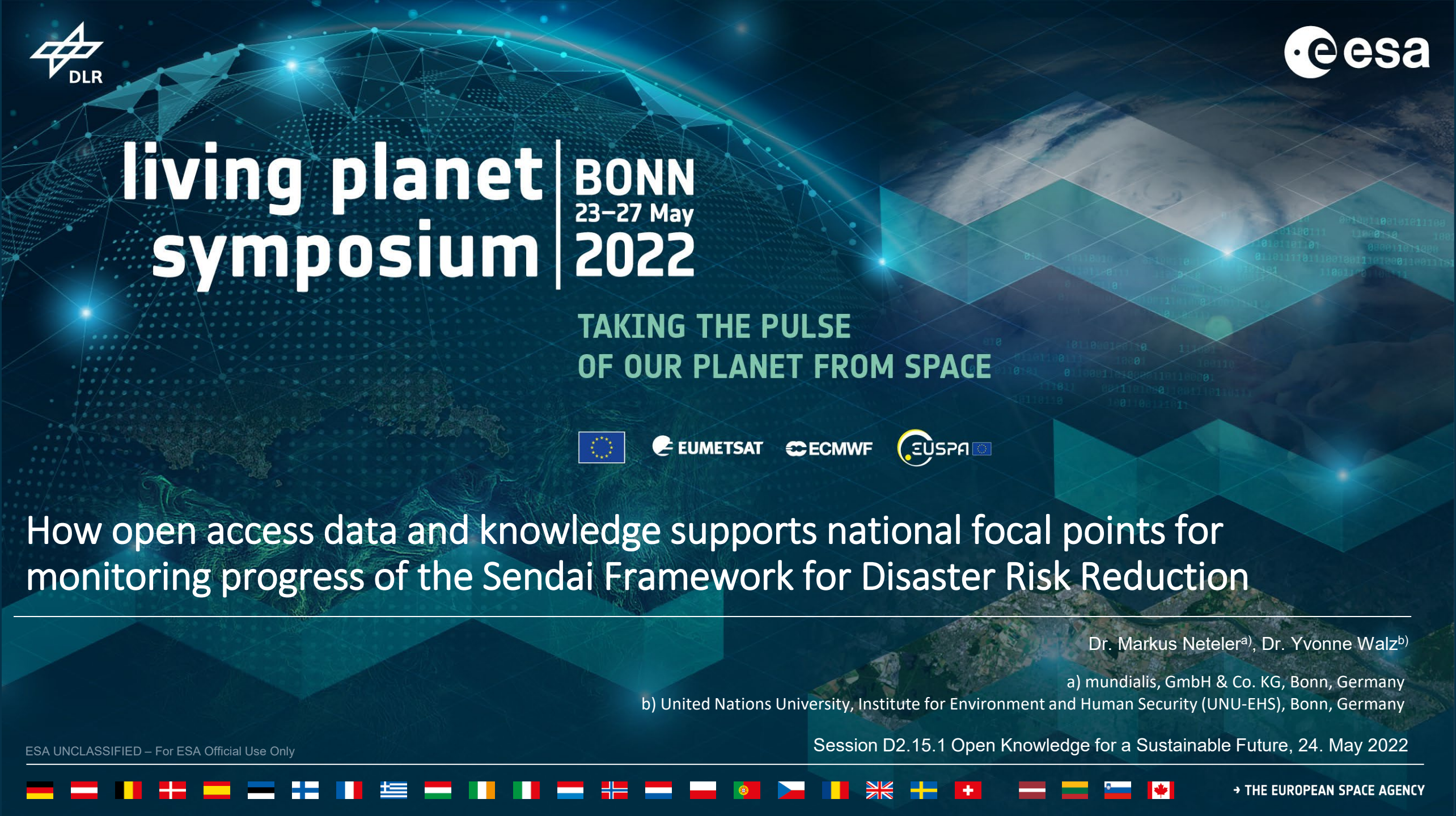
living planet symposium | BONN 23–27 May 2022

TAKING THE PULSE OF OUR PLANET FROM SPACE

EUMETSAT ECMWF EUSPA



How open access data and knowledge supports national focal points for monitoring progress of the Sendai Framework for Disaster Risk Reduction

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Session D2.15.1 Open Knowledge for a Sustainable Future, 24. May 2022

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Context: VALE project

Development and **Val**idation of Earth Observation-Based Indicators for the Monitoring of the Sendai Framework Using the Example of Flooding in **E**cuador

- Research project with execution time from 01/2020 to 03/2022. Funded by the German Federal Ministry of Economics and Energy.

- Main Objective:
  To reduce flood-related impacts in Ecuador and other countries through the development and validation of an innovative method for obtaining Earth-based information products to monitor the Sendai Framework for Disaster Risk Reduction indicators.

- Project consortium:

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

DLR Space Administration

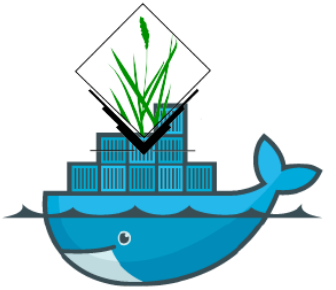
Servicio Nacional de Gestión de Riesgos y Emergencias

Gobierno del Encuentro | Juntos lo logramos

UNDRR UN Office for Disaster Risk Reduction

Open source and open data

The relevant components are the open source software stack and the open access data pool with the scope of accessibility and reproducibility.



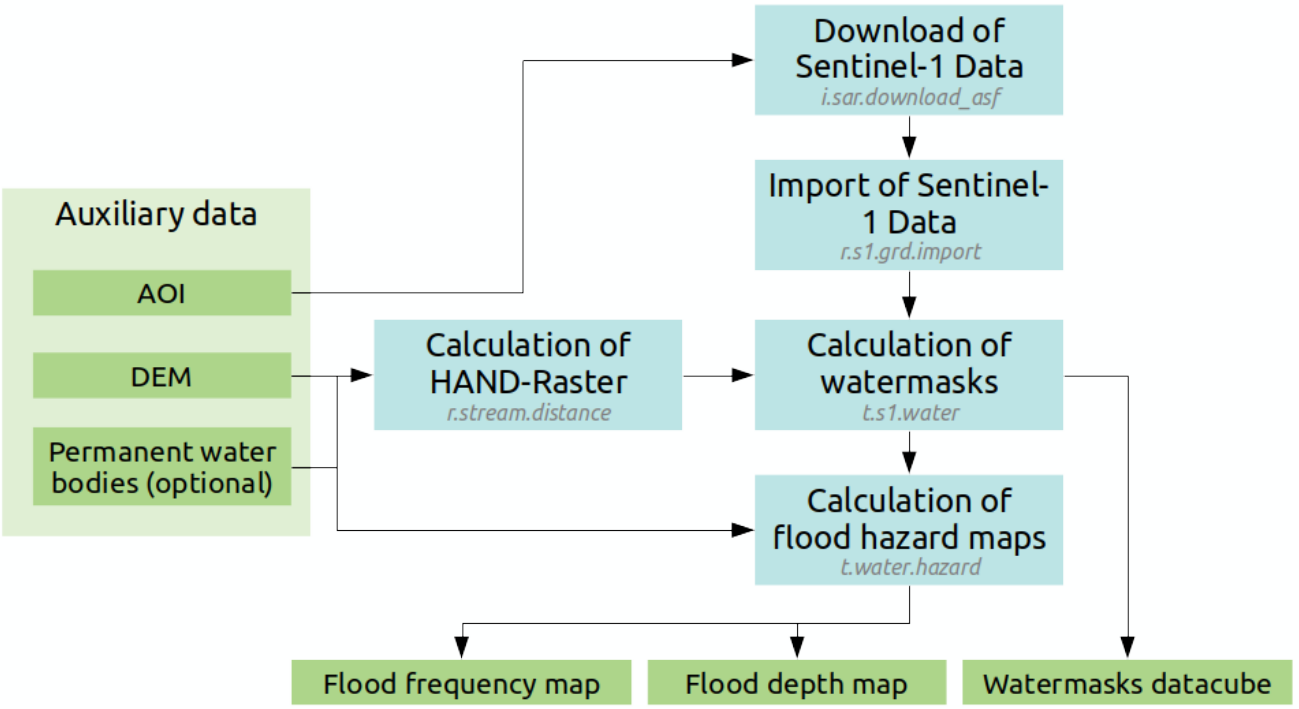
- Software stack:
  - Cloud based infrastructure with Docker/podman images, allowing a containerized scalable deployment.
  - GRASS GIS + GDAL + ESA SNAP

- Open access data pool:
  - Area of interest: Ecuador training and test sites
  - Elevation model: NASADEM (might be replaced by COP-DEM in future)
  - Dataset of permanent water bodies (provided by MAG)
  - Sentinel-1 data

EO approach

Flood mapping

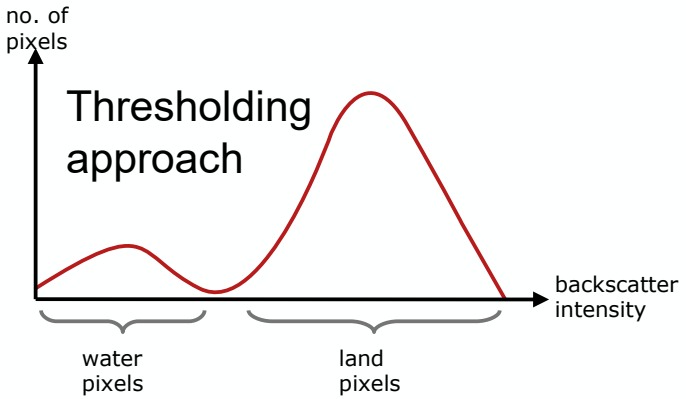
- Calculation of **HAND** (height-above-nearest-drainage) raster map:
  - used to minimize false alarms during the flood mapping from elevation map,
  - It holds the height difference between each pixel and the nearest pixel on a drainage network.

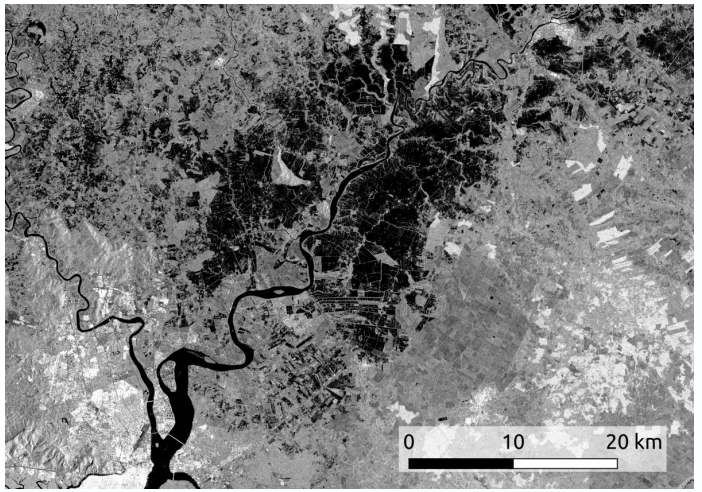


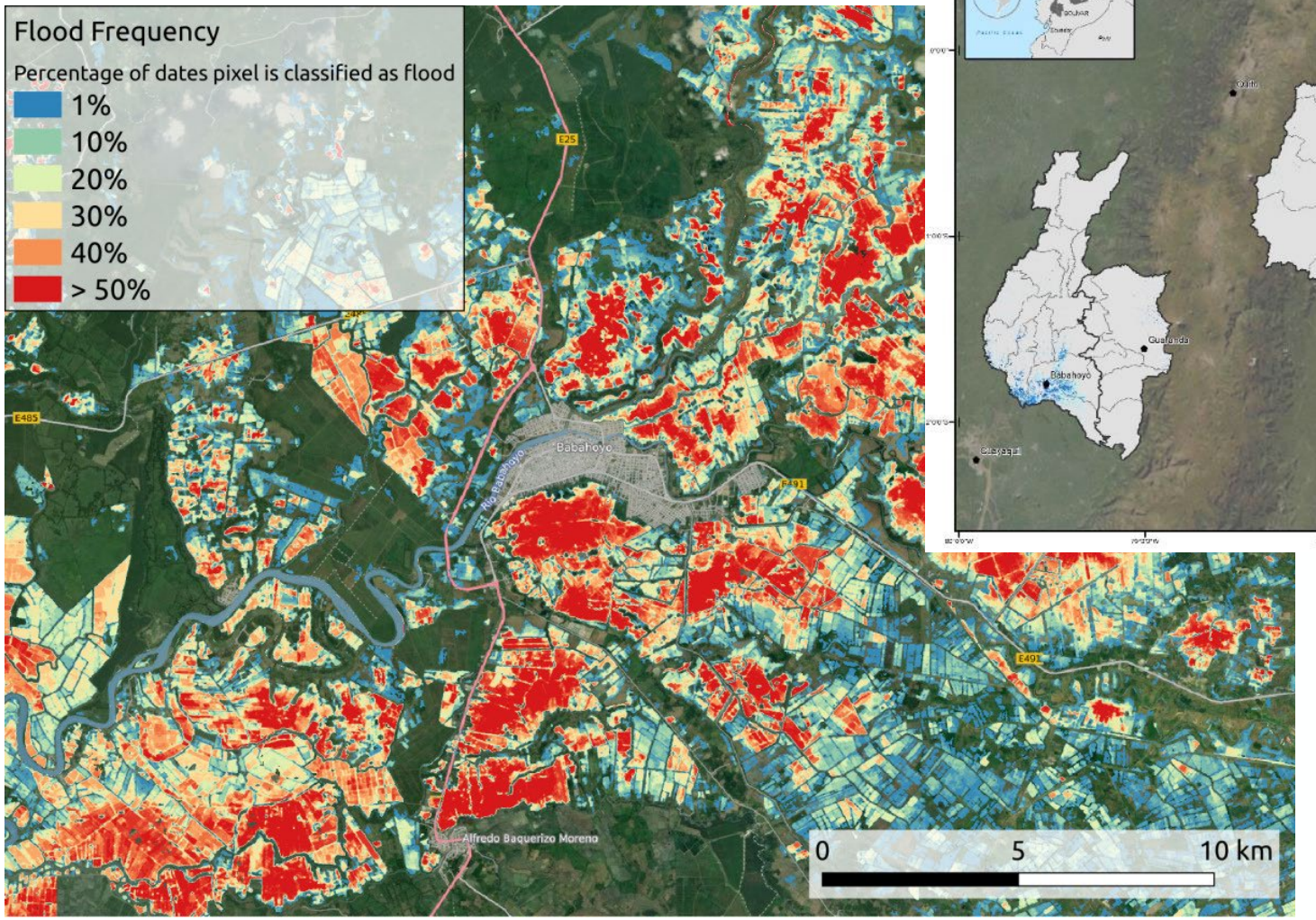
- Calculation of **water masks** for each Sentinel-1 input scene (terrain-corrected, speckle-filtered, and calibrated, both VV and VH) using an adaptive thresholding algorithm

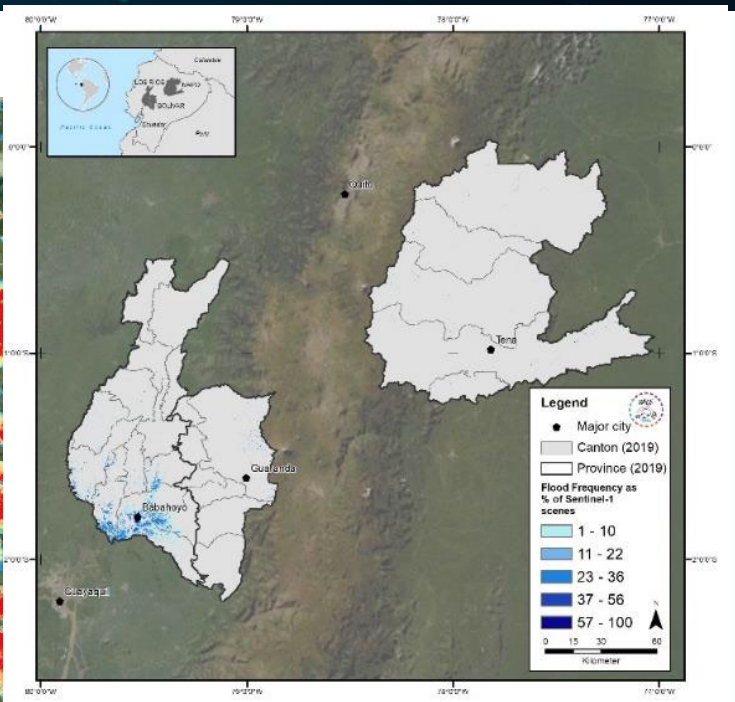
- Calculation of **flood hazard maps**: From the timeseries of water masks and the DEM, statistics such as flood frequency and median flood depth are derived.

Semi-automated flood hazard mapping with Sentinel-1 data in GRASS GIS

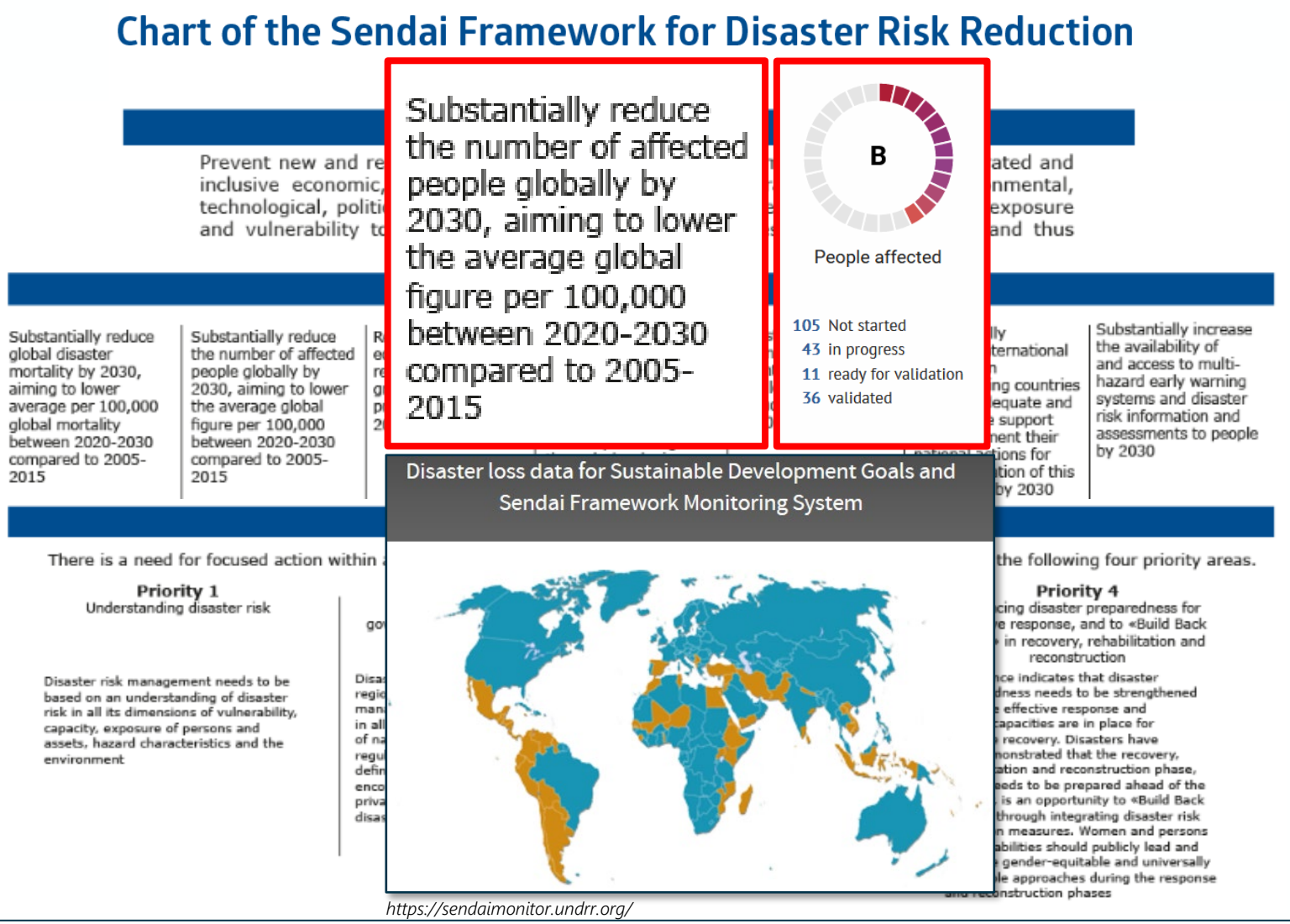




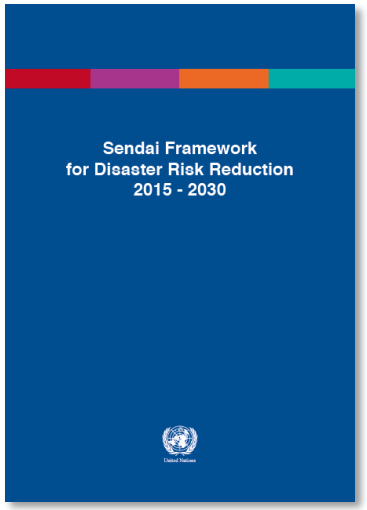


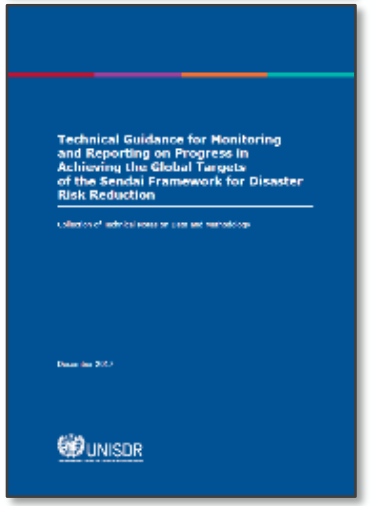


Supporting national focal points in the Sendai monitoring process: 1.) Understanding the demand the context



https://sendaimonitor.undrr.org/





Source: https://sendaimonitor.unisdr.org/, *accessed 16.11.2021*

http://www.unisdr.org/files/54970_techguidancefdigitalhr.pdf *(14.10.2020).*

Supporting national focal points in the Sendai monitoring process: 2.) Collaboration with policy makers and policy implementers

February 2020: Project kick-off meeting

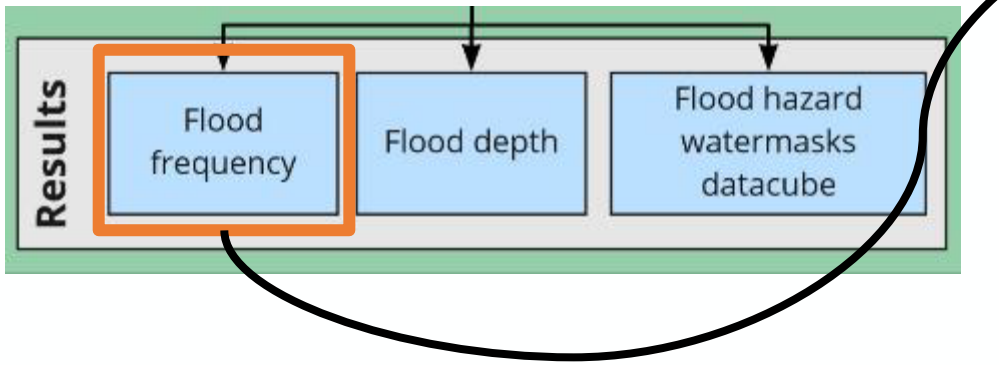
March 2020: Workshop and user-dialogue in Ecuador
- Quito (workshop and meetings)
- Los Ríos and Bolívar (field trip)
- Samborondón and Durán (field trip and meetings)

October 2020: Participatory local expert workshop on flood risk indicators

November 2021: Training of Trainers Workshop

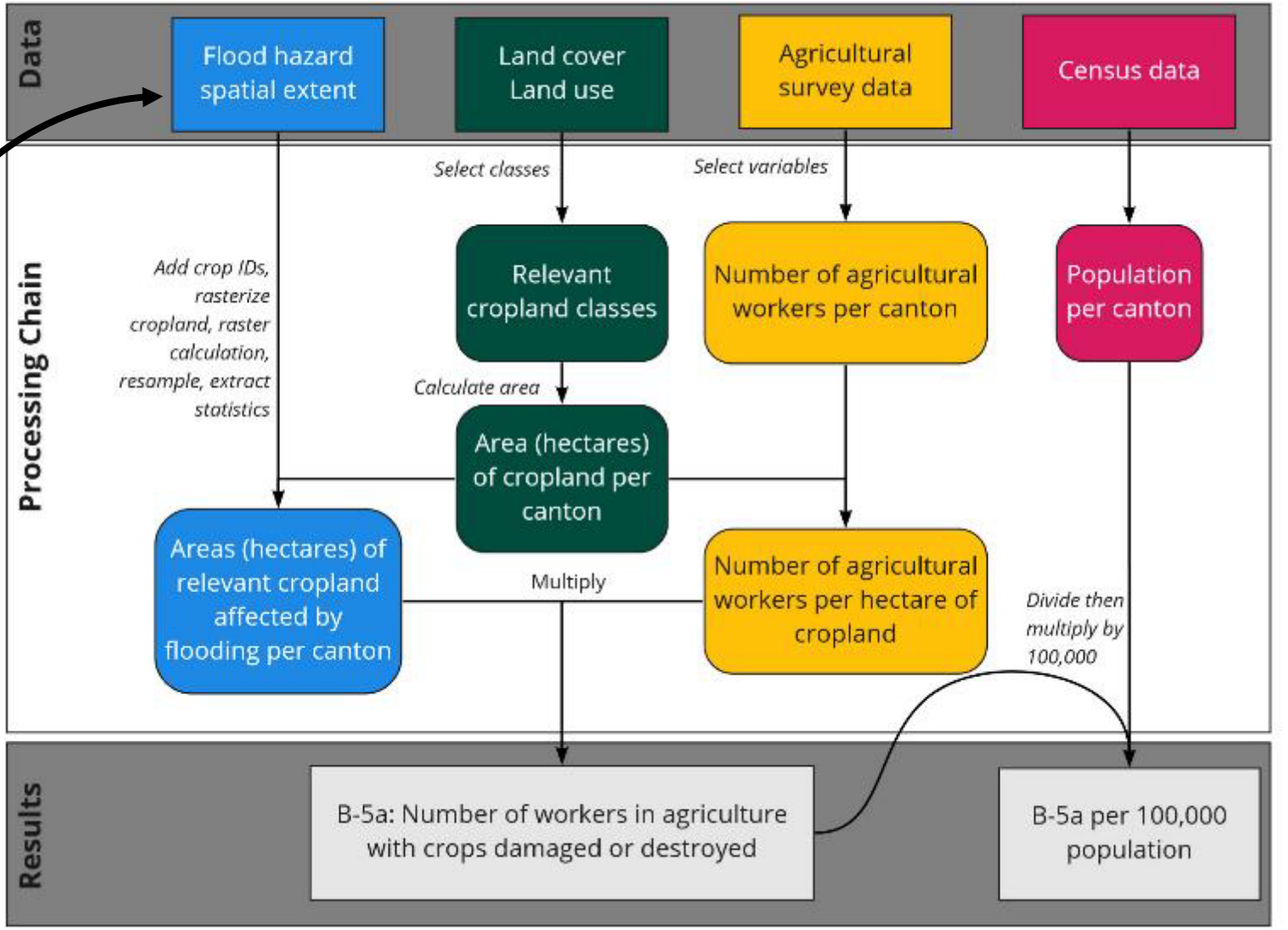
Presentation at the Sendai Technical Forum (UNDRR)

Modelling a Sendai indicator: Example of B-5a

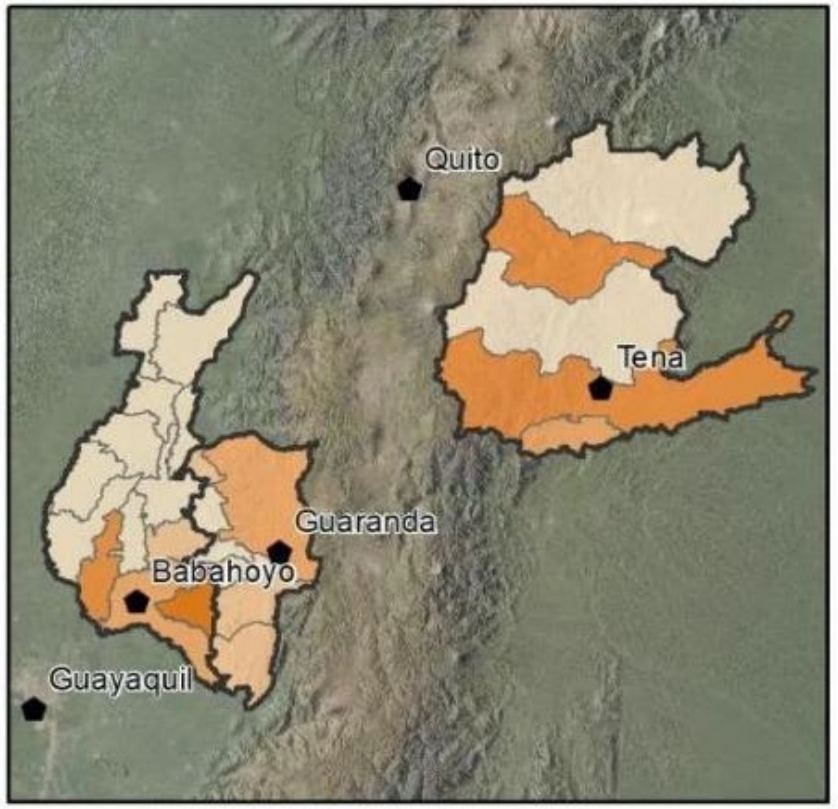


SFDRR Technical Guide formula* used to measure indicator B-5a at the canton level

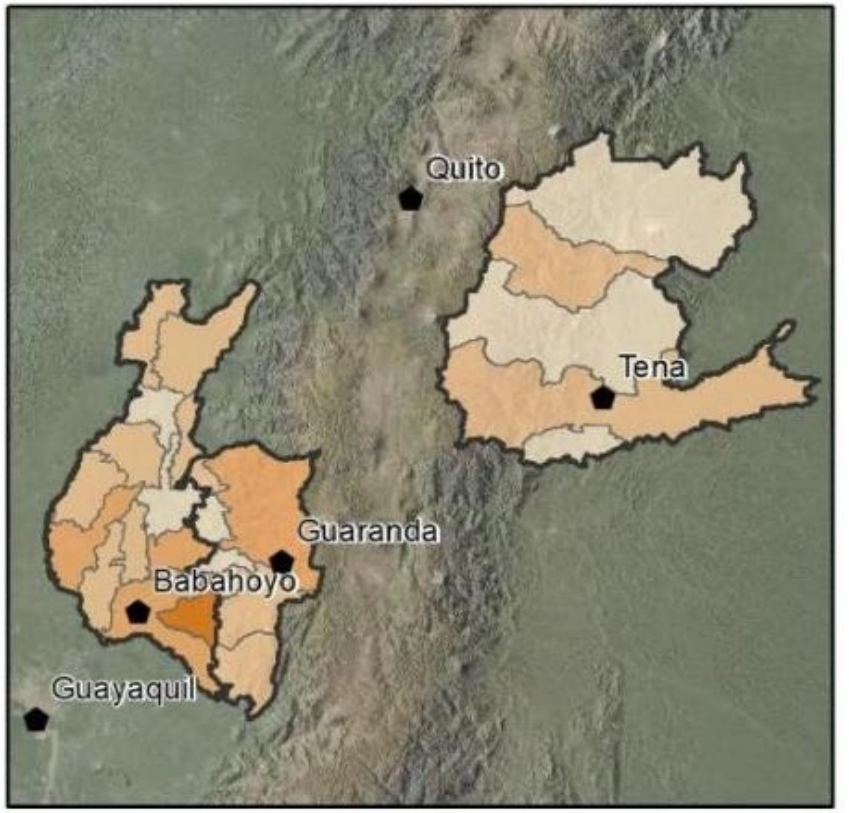
*B-5a = total hectares of crops damaged or destroyed
* average number of farm workers per hectare of agricultural land (UNISDR 2017)



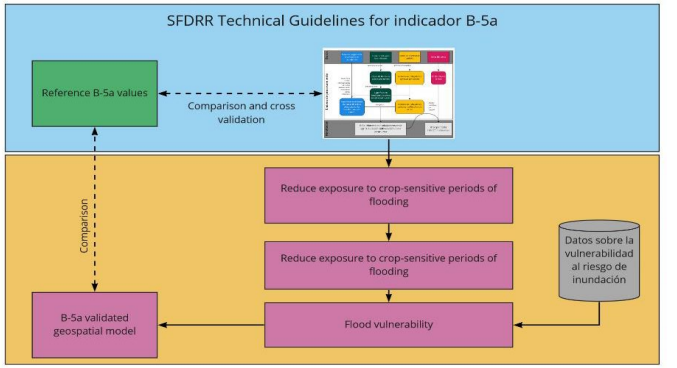
Validating a Sendai indicator: Example of B-5a

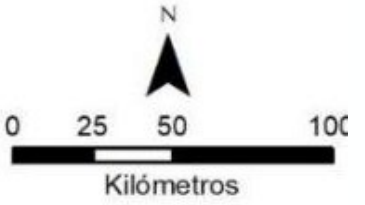


B-5a Referential



B-5a Validated model





Source: Urrutia II, JM., Scheffczyk, K., Riembauer, G., Mendoza, J., Yanez, D., Jímenez, S., Ramírez, A., Acosta, M., Arguello, J., Huerta, B., Neteler, M., Walz, Y. (2022) A validated geospatial model approach for monitoring progress of the Sendai Framework: The example of people affected in agriculture due to flooding in Ecuador. Progress in Disaster Science, accepted 12 May 2022, publication in progress.

Capacity building in the target region: Training of trainers

VALE Practical Exercise on Geospatial Modeling and Validation for the Sendai Framework for Disaster Risk Reduction Indicator B-5a

Self-taught learning on the example of flooding in the Ecuadorian cantons of Babahoyo and Urdaneta in the province of Los Rios for the year 2017

November 2021

UNITED NATIONS UNIVERSITY
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Institute for Environment and Human Security

VALE

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2.3. Preparación y m
2.3.1. Instalación del sof

R

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project.org/

Para descargar R, hacemos c
(Fig. 6). Haga clic en cualqui
clic en "welcome.html" (Fig.

- Datos de la cubierta del suelo del MAG para derivar las tierras agrícolas
- Límites administrativos a nivel de cantón proporcionados por el SNGRE

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individuales e inspeccionarlos

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# Cantones, año y hect
view(Val_DB)

# Se han identificado
afectados) y 52 (culti
# Seleccione las colum
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# para nuestros canton
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  filter(CANTON == "BA
  # Suma de las hectár
  # el número total de
  mutate(Ha_Crops_Tota
HECTARES_LOST_CROPS27)
  # eliminar las colum
  dplyr::select(-c(3,4

# Lee la base de datos
# y filtrar los canton
```

```
# Traza las cosechas de los cantones
gplot(cant_cropland_raster) + geom_tile(aes(fill = value)) +
  facet_wrap(~ variable) +
  scale_fill_continuous(low = 'white', high = 'brown',
                        name = "Crops") +
  coord_equal()
```

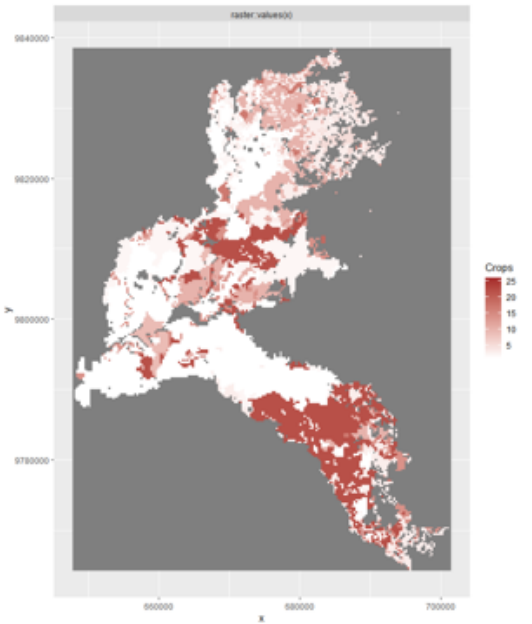


Fig. X: Diagrama de las tierras de cultivo en los cantones focales, donde los valores son las identificaciones de los cultivos, que indican los diferentes tipos de cultivos.

```
# Guarda tu progreso actual de esta unidad para saltar y continuar más
tarde, si es necesario.
save.image(file= paste0(outputs, 'Unit2_Step3-1.RData'))
```

Capacity building and wider dissemination

Published April 12, 2022 | Version v1

EO4SENDAI-MONITORING | Knowledge Package | Metadata-only

A quantitative EO-based assessment of the number of workers in agriculture with crops damaged or destroyed (SFDRR indicator B-5a)

Urrutia, II, J. Manuel[1]; Riembauer, Guido[2]; Scheffczyk, Konstantin; Huerta, Brenda; Neteler, Markus[2]; Walz, Yvonne[1]

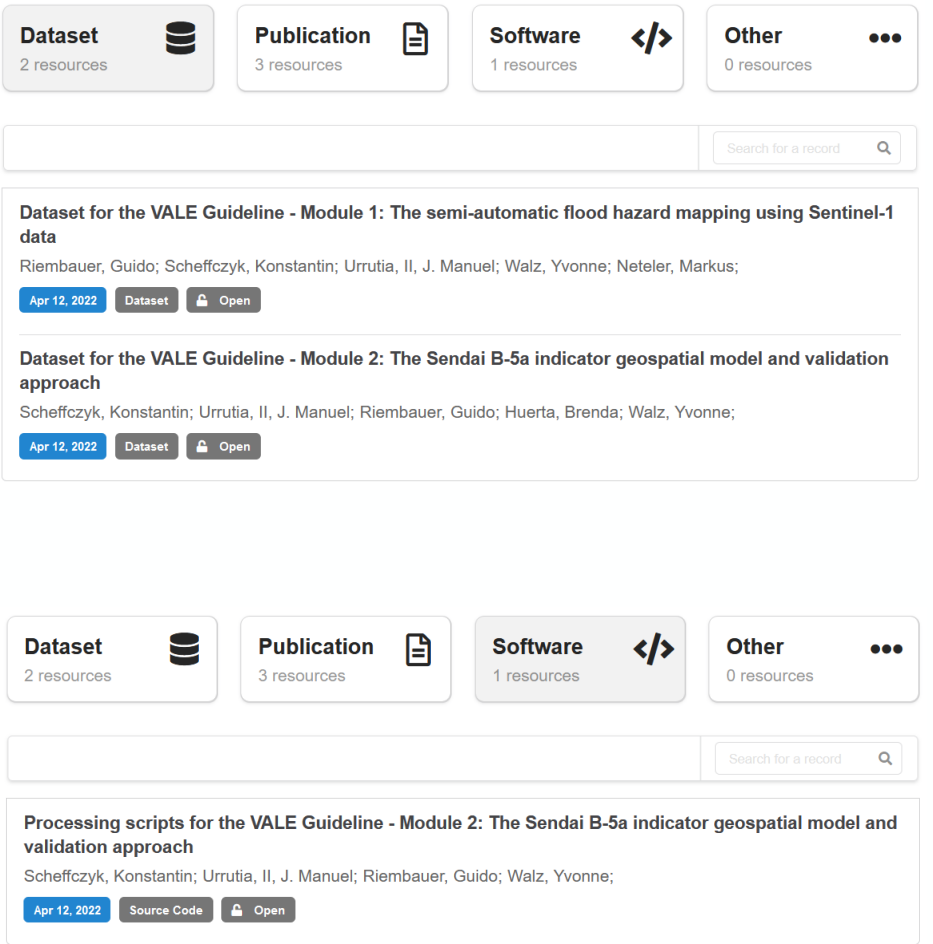
Show affiliations

Hosting institution:
United Nations University, Institute for Environment and Human Security (UNU-EHS)

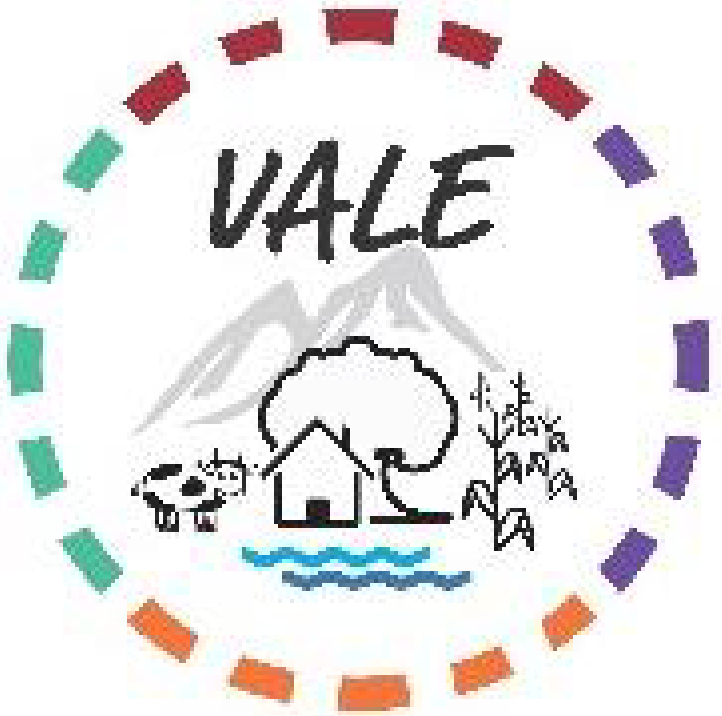
Others: Panchi-Robles, Sofia[1]; Valdiviezo-Ajila, Angel[2]; Mena Benavidas, Melisa; Díaz, Gissela; Mendoza, Jhoyzett[3]; Yanez, Darwin[3]; Ramírez, Antonio[3]; Acosta, Marlon[4]; Argüello, Jenny[5]

Sponsor: The German Federal Ministry for Economic Affairs and Energy (BMWi)

Show affiliations



https://gkhub.earthobservations.org/records/4sj8k-5z391



Thank you for your attention!

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