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23–27 May  
2022

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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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## Development and **Validation** of Earth Observation-Based Indicators for the Monitoring of the Sendai Framework Using the Example of Flooding in **Ecuador**

- 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:



on the basis of a decision by the German Bundestag

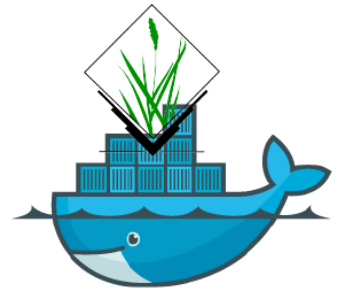


Servicio Nacional de Gestión de Riesgos y Emergencias



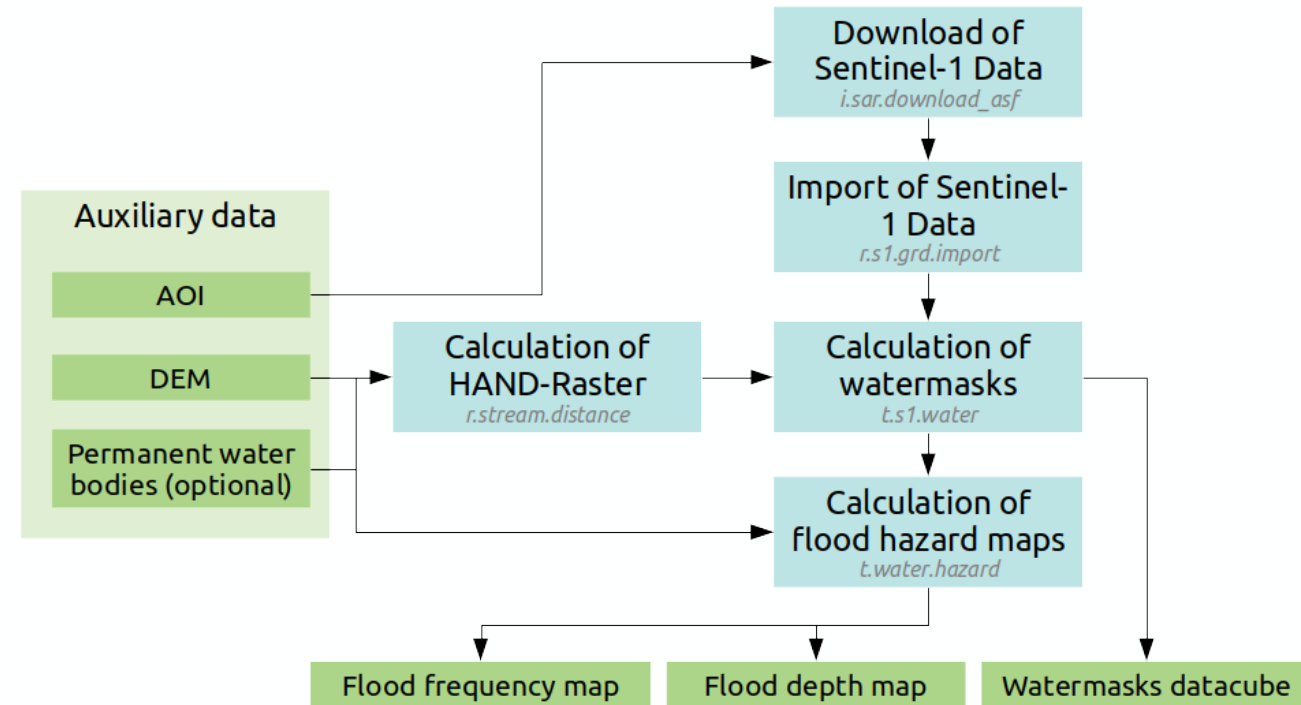
The relevant components are the open source software stack and the open access data pool with the scope of accessibility and reproducibility.

- 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

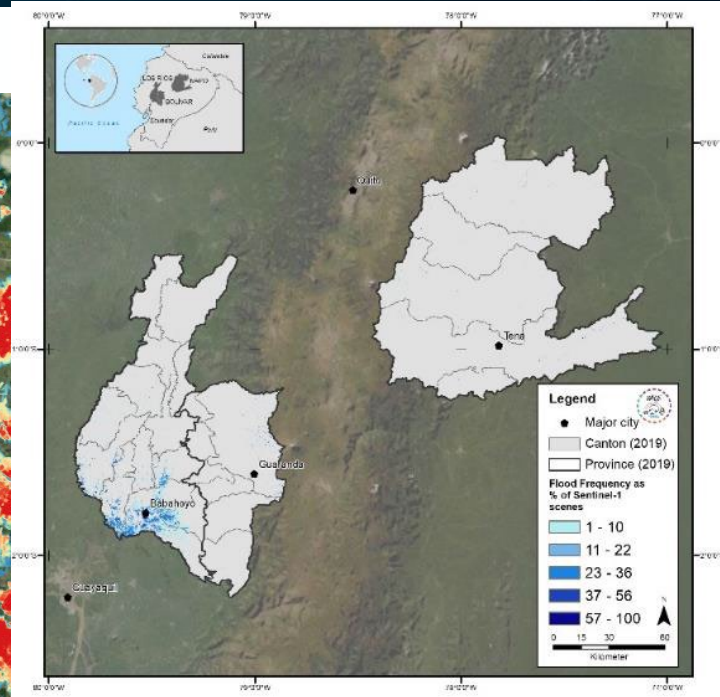
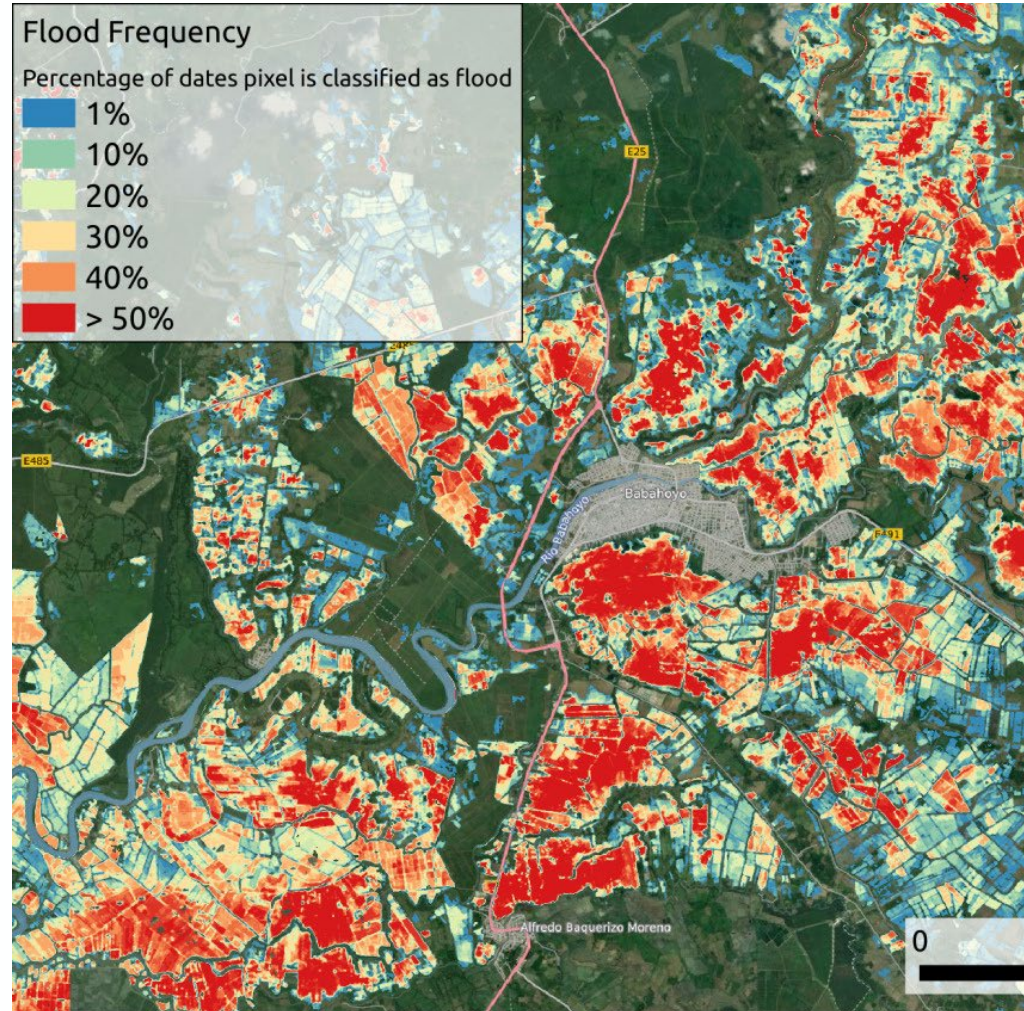
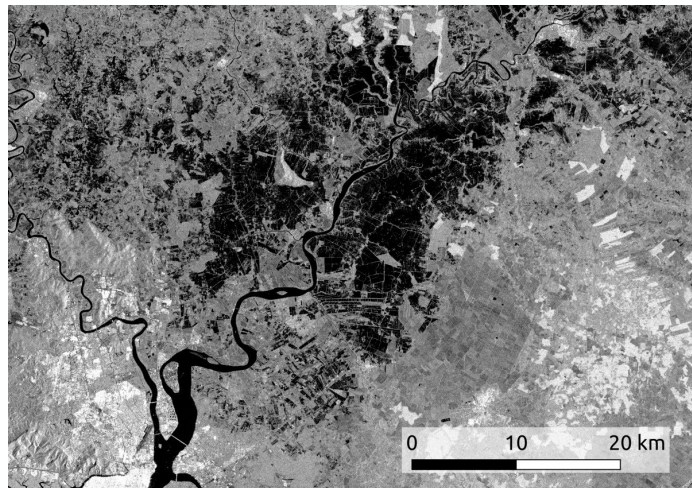
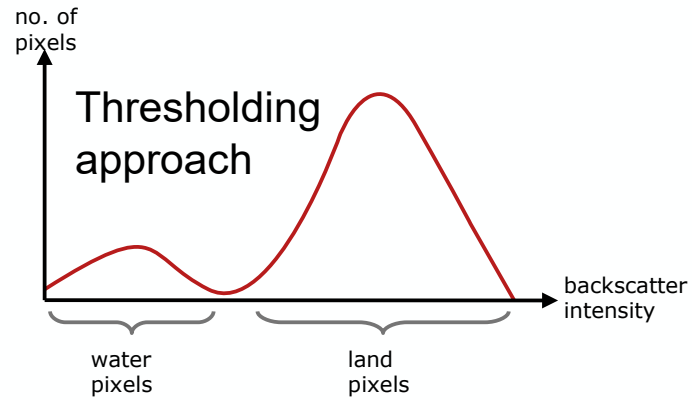


## Flood mapping

- 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.

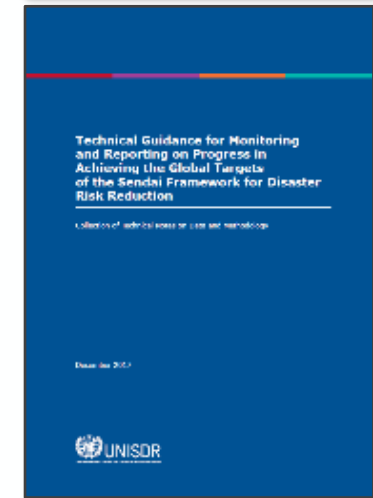
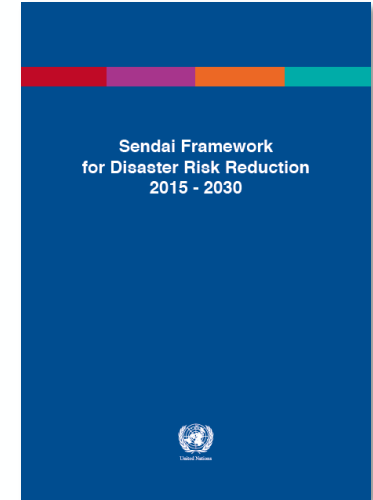
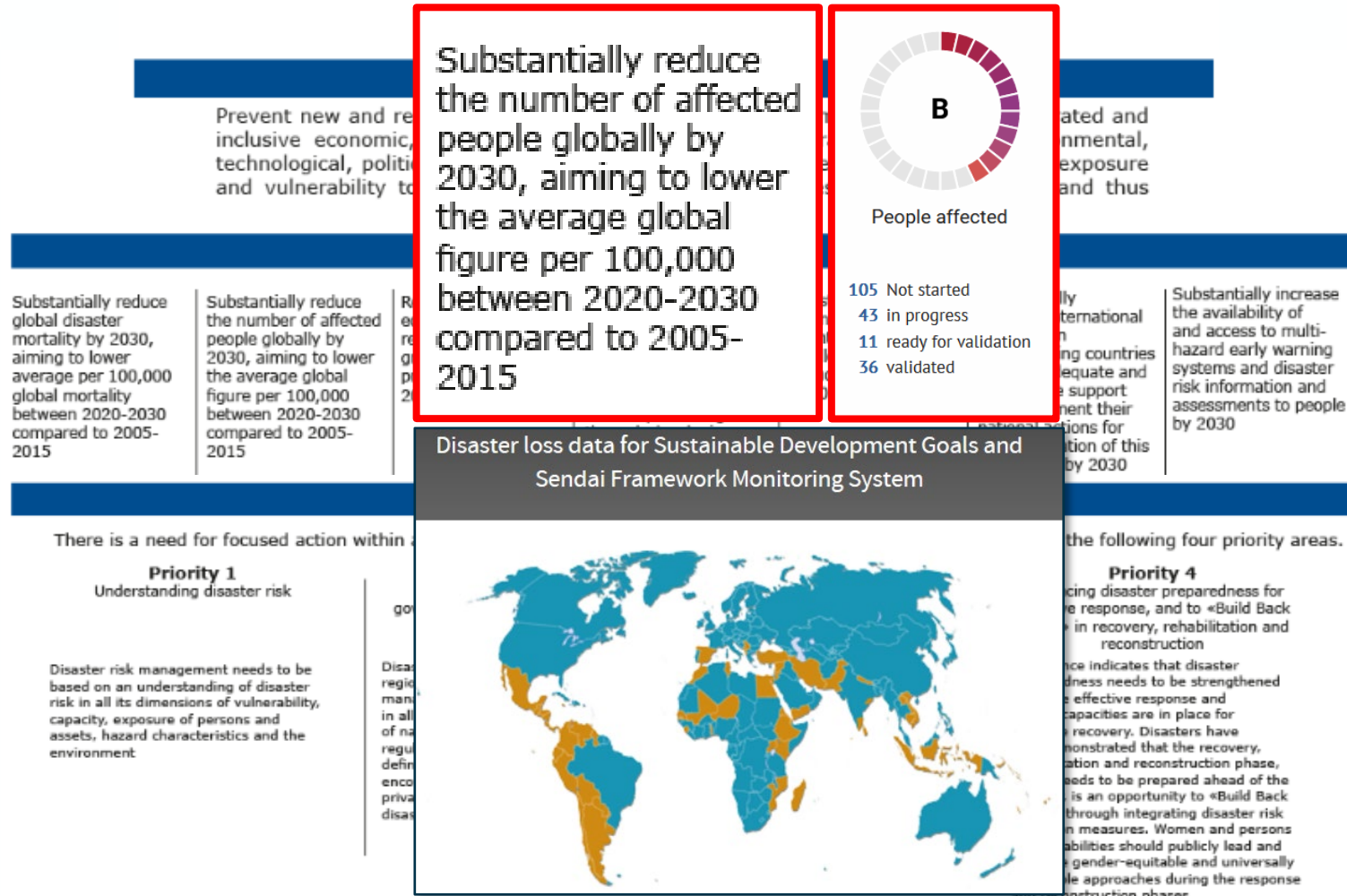


# Semi-automated flood hazard mapping with Sentinel-1 data in GRASS GIS



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

## Chart of the Sendai Framework for Disaster Risk Reduction



Source: <https://sendaimonitor.unisdr.org/>, accessed 16.11.2021  
[http://www.unisdr.org/files/54970\\_techguidancefdigitalhr.pdf](http://www.unisdr.org/files/54970_techguidancefdigitalhr.pdf) (14.10.2020).

<https://sendaimonitor.unisdr.org/>



# 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)

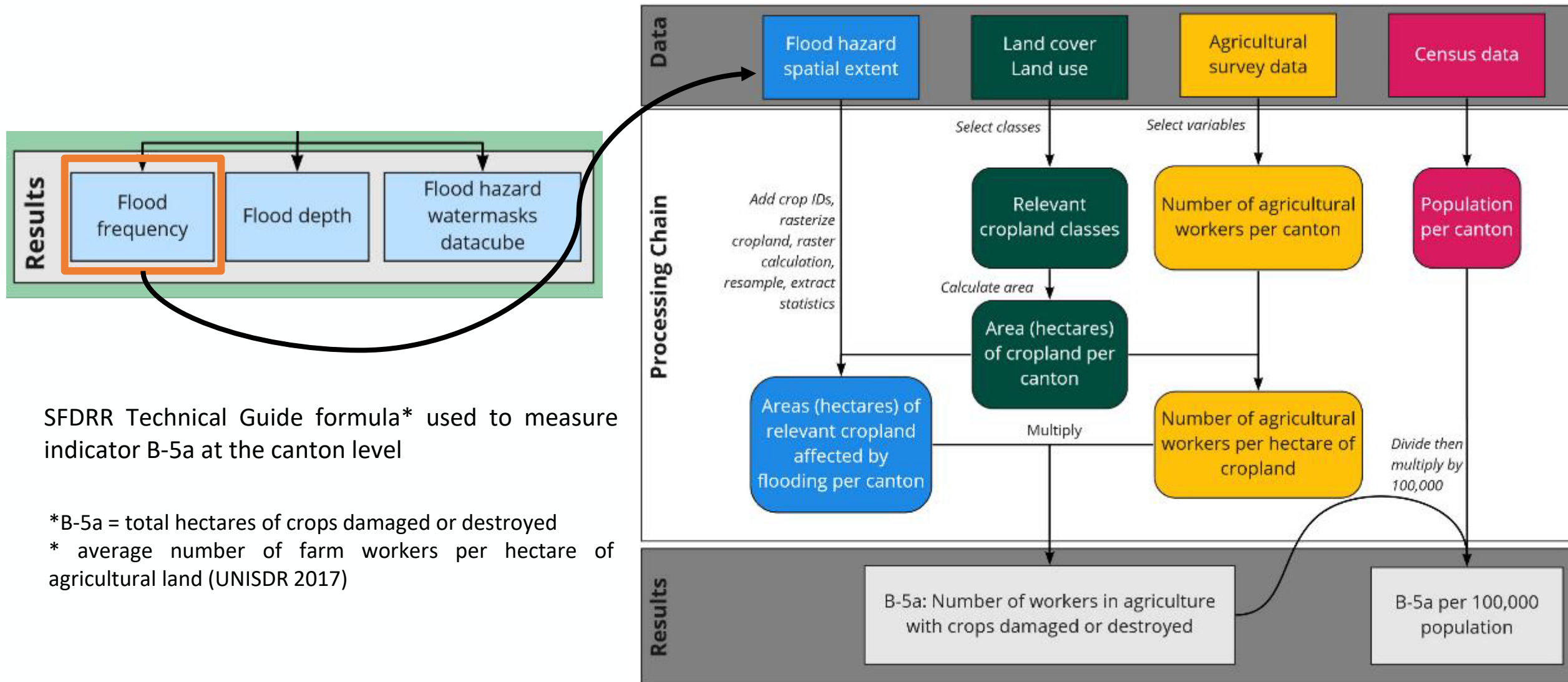
October 2020: Participatory local expert workshop on flood risk indicators

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

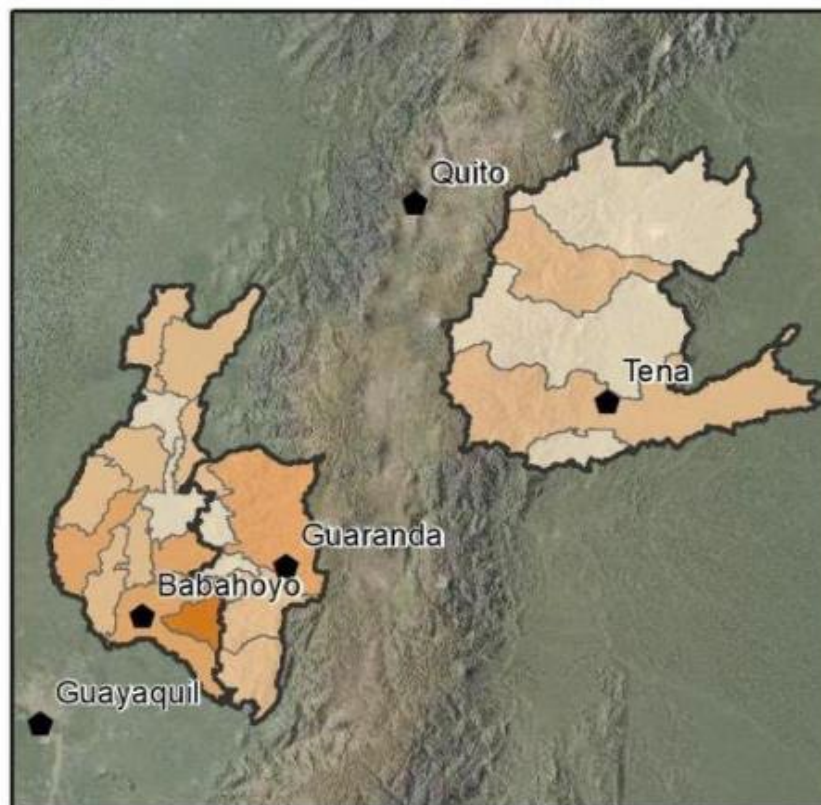
\* average number of farm workers per hectare of agricultural land (UNISDR 2017)



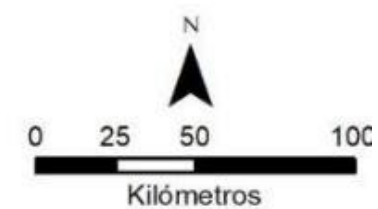
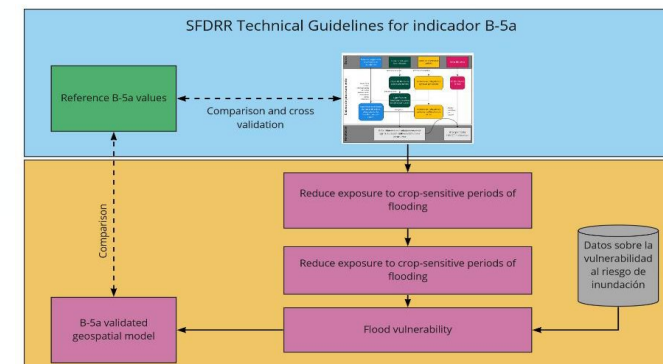
# Validating a Sendai indicator: Example of B-5a



B-5a Referential



B-5a Validated model



# 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



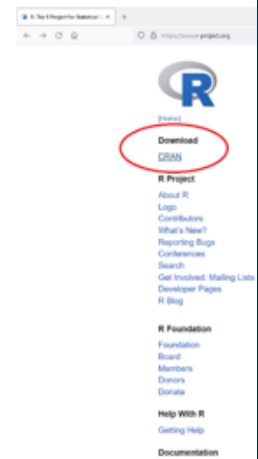
### 2.3. Preparación y mantenimiento de R

#### 2.3.1. Instalación del software

R

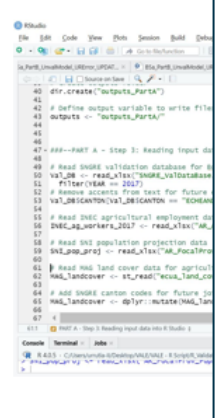
El mantenimiento de R corre a cargo de la comunidad de usuarios de R en la disposición del público de [for project.org/](https://www.r-project.org/)

Para descargar R, hacemos clic en el botón de descarga (Fig. 6). Haga clic en cualquier clic en "welcome.html" (Fig. 7).



- Datos de la cubierta del suelo del MAG para derivar las tierras agrícolas
- Límites administrativos de los cantones proporcionados por el SNICRE

Al leer (es decir, cargar) los datos se realizan algunas ligeras modificaciones en el panel derecho del entorno de desarrollo de R para que sea más fácil para los usuarios individuales e inspeccionarlos.



```

# Leer la base de datos (la notificación de inundación)
Val_DB <- read_xlsx("S:\Data\Val_DB.xlsx")

# Ver el conjunto de datos y seleccionar la información requerida
# Cantones, año y hectáreas afectadas
view(Val_DB)

# Se han identificado los cantones afectados y 52 cultivos
# Seleccione las columnas de los cantones afectados para el año 2017 y
# para nuestros cantones de estudio
canton_events <- dplyr::filter(Val_DB, YEAR == 2017)
canton_events <- dplyr::filter(canton_events, CANTON == "BA")
# Suma de las hectáreas de los cultivos afectados
mutate(Ha Crops Tota = sum(Ha Crops Tota, na.rm=T))
# eliminar las columnas que no se necesitan
dplyr::select(-c(3,4))

# Lee la base de datos de los cultivos y filtra los cantones
    
```

```

# Traza las cosechas de los cantones
plot(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'))
    
```

[About](#)

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, Il, J. Manuel<sup>1</sup> ; Riembaauer, Guido<sup>2</sup>; Scheffczyk, Konstantin ; Huerta, Brenda; Neteler, Markus<sup>2</sup>; Walz, Yvonne<sup>1</sup>

Show affiliations

### Hosting institution:

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**Others:** Panchi-Robles, Sofia<sup>1</sup>; Valdiviezo-Ajila, Angel<sup>2</sup>; Mena Benavidas, Melisa; Díaz, Gissela; Mendoza, Jhozett<sup>3</sup>; Yanez, Darwin<sup>3</sup>; Ramírez, Antonio<sup>3</sup>; Acosta, Marlon<sup>4</sup>; Argüello, Jenny<sup>5</sup>

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

Show affiliations

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

**Dataset** 2 resources  
**Publication** 3 resources  
**Software** 1 resources  
**Other** 0 resources

### Dataset for the VALE Guideline - Module 1: The semi-automatic flood hazard mapping using Sentinel-1 data

Riembaauer, Guido; Scheffczyk, Konstantin; Urrutia, Il, J. Manuel; Walz, Yvonne; Neteler, Markus;

Apr 12, 2022 Dataset Open

### Dataset for the VALE Guideline - Module 2: The Sendai B-5a indicator geospatial model and validation approach

Scheffczyk, Konstantin; Urrutia, Il, J. Manuel; Riembaauer, Guido; Huerta, Brenda; Walz, Yvonne;

Apr 12, 2022 Dataset Open

**Dataset** 2 resources  
**Publication** 3 resources  
**Software** 1 resources  
**Other** 0 resources

### Processing scripts for the VALE Guideline - Module 2: The Sendai B-5a indicator geospatial model and validation approach

Scheffczyk, Konstantin; Urrutia, Il, J. Manuel; Riembaauer, Guido; Walz, Yvonne;

Apr 12, 2022 Source Code Open



Thank you for your attention!

