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# Economic Impact Assessments (EIA) of Application of GEOGLOWS in Ecuador

## Under the principles of the Aguascalientes Declaration


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# Introduction of EIA at **SERVIR**

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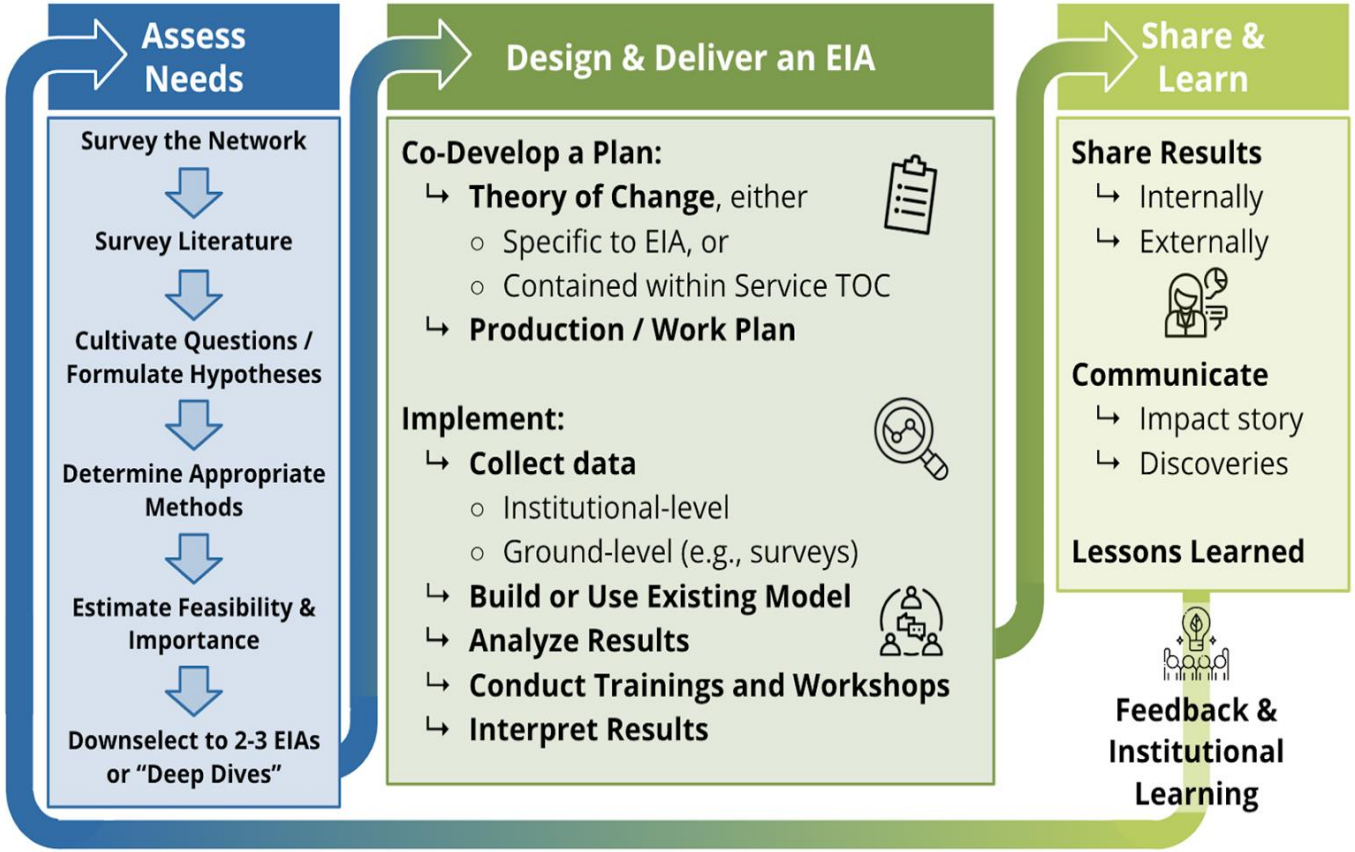
# What is EIA at **SERVIR**?

EIA is critical for assessing socio-economic impacts of SERVIR Services

EIA at SERVIR seeks to understand the full spectrum of impacts across all hub regions

Aim to pinpoint one or two specific services for in-depth assessment each year

# General Approach to Conduct Need Assessment and Disseminate EIA in SERVIR Context.



# Deep Dive: EIA of Application of GEOGLOWS in **Ecuador**

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# Deep Dive: EIA of Application of GEOGLOWS in **Ecuador**

- NASA+USAID+NOAA Collaboration
- Several GEOGLOWs related success stories from Nepal, Malawi, Ecuador
- SERVIR's interest to design and evaluate services for positive impacts
- NOAA's interest to assess the economic benefit of GEOGLOWs and share results at GEO Plenary Mar.'25
- Strong interest to use Ecuador for the pilot
  - Highly communicative partners
  - Expectation to continue in Malawi or other African Country using GEOGLOWS

**Overarching Objectives:**

**1. Identify and Confirm** Economic Benefits of Early Streamflow Predictions

**2. Identify the gaps** in data and infrastructure for a robust EIA

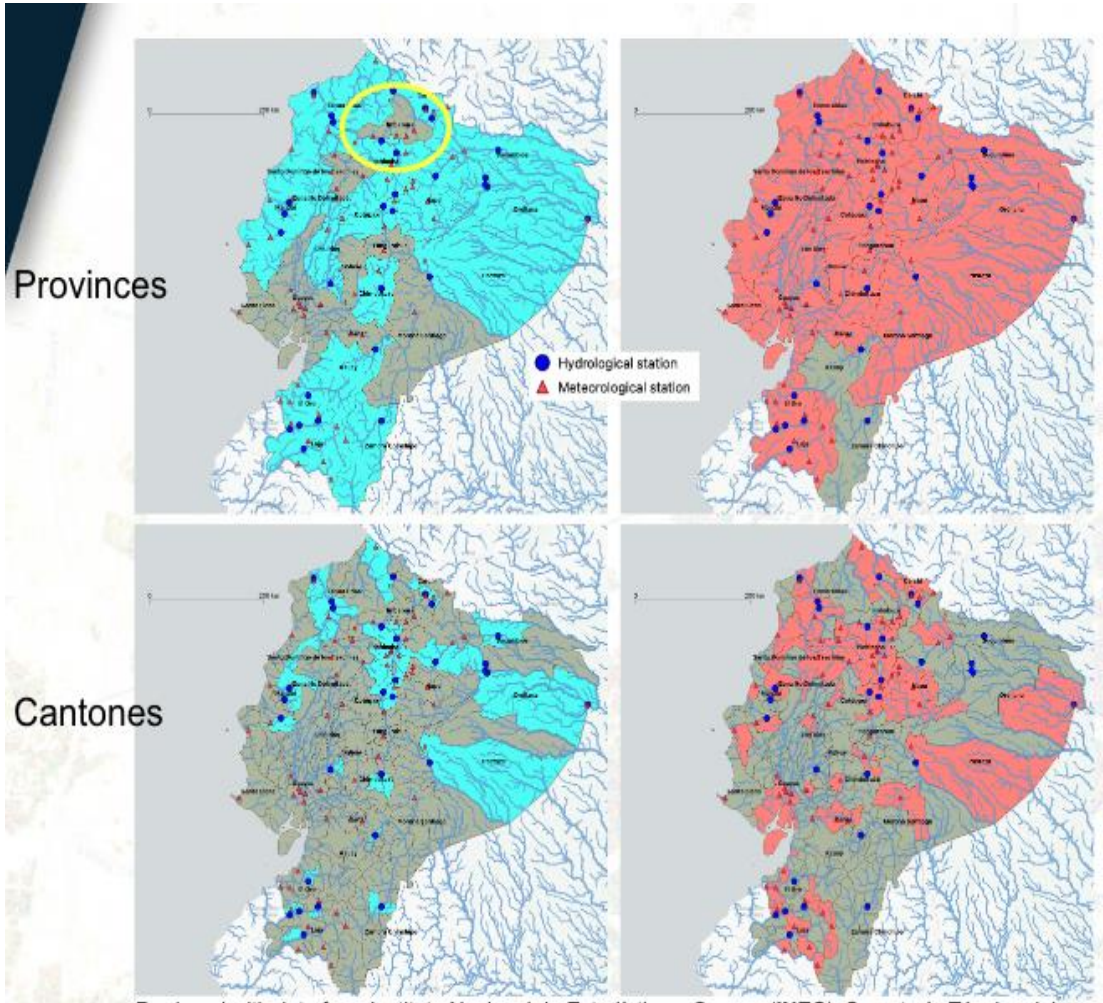
# Streamflow Data Prep from **GEOGLOWS**:

- Data Source: Queried daily streamflow data for all GEOGLOWS v2 streams in Ecuador from the 1940s to 2024

  Percentile Calculation: Established 90th, 95th, and 99th percentiles for each stream using data from 1940 to 2010
- Threshold Flagging: Flagged occurrences where streamflow exceeded these percentiles
- Monthly Aggregation: Aggregated flagged exceedances monthly from 2017 to 2024
- Provincial Association: Linked each stream to its corresponding province
- Provincial Calculations:
  - Counted the number of days in a month when any stream in a province exceeded the 90th, 95th, and 99th percentile streamflow.
  - Counted the number of rivers in a province exceeding these percentiles each month.



# Preliminary estimates show that 40-75% of the population lives in ungauged admin areas (without hydrologic gauges)




Produced with data from Instituto Nacional de Estadística y Censos (**INEC**), Secretaría Técnica del Comité Nacional de Límites Internos (**CONALI**), accessed from MEGA / **UN-GGIM**; and **GEOGLOWS** v2 streams

| | # admin areas with **hydrologic** station | 2019 demographic counts* within administrative areas ***with*** a hydrologic station (n = 30) | | |
|---|---|---|---|---|
| | | # females | # males | housing |
| Province | 15 of 25 | 5,181,460 (59.48% of total) | 5,088,185 (59.46% of total) | 2,827,547 (60.75% of total) |
| Cantón | 25 of 222 | 2,190,429 (24.28% of total) | 2,115,851 (24.69% of total) | 1,178,699 (25.32% of total) |

| | # admin areas without **hydrologic** station | 2019 demographic counts* within administrative areas ***without*** a hydrologic station (n = 30) | | |
|---|---|---|---|---|
| | | # females | # males | housing |
| Province | 10 of 25 | 3,529,283 (40.52% of total) | 3,469,058 (40.54% of total) | 1,827,081 (39.25% of total) |
| Cantón | 197 of 222 | 6,832,164 (75.72% of total) | 6,453,903 (75.31% of total) | 3,475,929 (74.68% of total) |

# Collaborations

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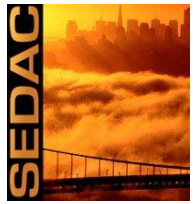
GEOGLOWS
GLOBAL WATER SUSTAINABILITY

Historical Streamflow Data




NASA

Ecuador Population

INAMHI
TIEMPO, CLIMA Y AGUA ECUADOR

Precipitation

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Admin level 1, 2, 3. Demographic data: # males, #females, and household counts for each administrative area. Link: MEGA

EL NUEVO ECUADOR
Secretaría General de Comunicación de la Presidencia

Socio-Economic Data

INSTITUTO GEOGRÁFICO MILITAR

Canton Level yearly GDP, Area and Perimeter, Population and Number of houses

# Gaps in the **Data**

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# Gaps in the **Data**

### 01 In situ Precipitation Data

**CHIRPS Data** was used for recording precipitation from 1981 to present for this study

### 02 Socio-Economic Data

**Inconsistencies** in the categories/types of impacts tracked [years 2020. 2019 and 2018 have very less socio-economic data] - difficulties in identifying impacts with increased or decreased streamflow and precipitation, unable to identify if the impact is lagged

Difficult to make out the difference in impacts caused by floods, landslides, hurricanes etc. as the impacts are all recorded based on number of water related events in the year

### 03 Costs associated with impacts

**Scanty** information on household/canton/provincial level costs associated with floods/landslides/droughts/hurricanes etc**.**

# Next **Steps**

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# Next **Steps**

## 2024

Investigate the potential benefits of using GEOGloWS streamflow forecasts in provinces. The study aims to determine if provinces that utilize GEOGLOWS experience fewer damages compared to similar provinces that do not use GEOGLOWS.

Explore the significance of using GEOGLOWS streamflow forecasts in provinces. The study will investigate if provinces with similar magnitudes/return periods of streamflow, but using GEOGLOWS, experience different damage when normalized for population/size.

Uncover the relevance of using GEOGLOWS streamflow forecasts in provinces. The study will identify contributing factors for reduced overall damage after 2021 and the current costs associated with water-related disasters.

## Upcoming years

- Co-create a coordination and data collection mechanism with national, provincial, and local organizations to collect the relevant data
- Collect information on what are costs incurred in accordance to provide and receive early warnings
- Collection of relevant data may include household level surveys to identify:
    1. If they are receiving early warnings
    2. What decisions get impacted from early warnings
    3. What is their main source of income
    4. What is their monthly income
    5. What are the costs incurred by them due to being affected by floods, droughts etc.
    6. What are the savings made due to early warnings
    7. What do they do with the savings

# THANK YOU!

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