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Integrating Hydraulic Simulation and Geospatial Technologies to Support Flood Early Warning Capabilities in Paraguay

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AGENCIA ESPACIAL DEL PARAGUAY

GEO Lab

Floods are becoming more frequent and severe due to climate change, population growth, and land cover changes.

In Paraguay, floods are the most common weather-related hazard and disproportionately impact poor and vulnerable populations (World Bank 2025).

Flooding 2019	70,000 households (≈ 273,000 individuals)

Source: National Emergency Secretariat of Paraguay (SEN 2019)

Background - AEP's role in risk management

INTERNATIONAL CHARTER ON SPACE AND MAJOR DISASTERS

A global collaboration through which satellite data are made available for the benefit of disaster management.

+750 ACTIVACIONES IN +130 PAISES

17 MIEMBROS

+270 SATELITES IN +35 CONSTELACIONES

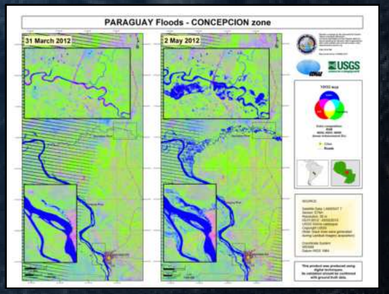
24/7 OPERANDO 24HRS AL DIA 7 DIAS A LA SEMANA

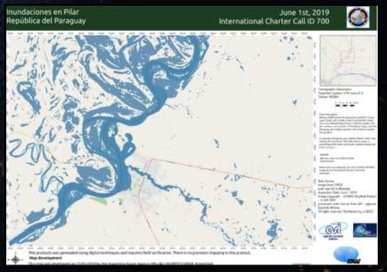
20 OCT 2000 FUNDADO POR ESA, CNES Y CSA EL 20 OCTUBRE 2000

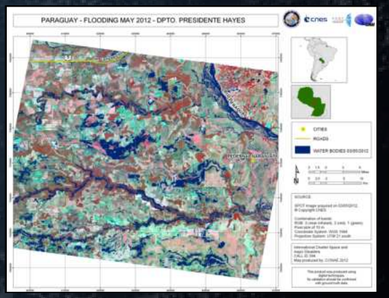
+20 APOYADO POR MÁS DE 20 ORGANIZACIONES INTERNACIONALES

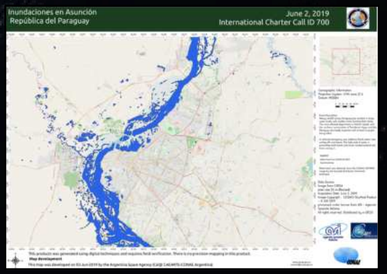
Background

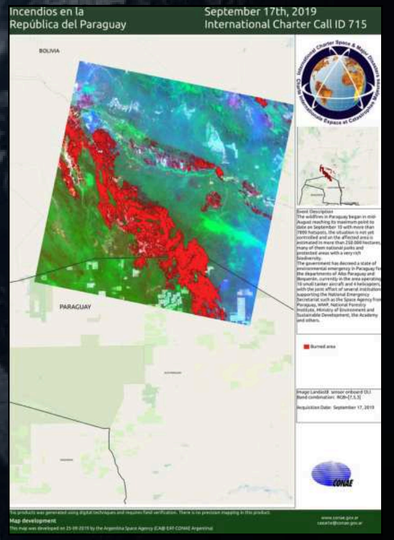
YEAR	EVENT	ACTIVATION	PROJECT MANAGEMENT	PRODUCT
2007	*January* Floods in Bolivia-Paraguay-Argentina	SIFEM	CONAE	CONAE
	August Fires in Paraguay	SIFEM	CONAE	CONAE
2012	*May* Floods in Paraguay	SIFEM	CONAE	CONAE
2019	*May* Floods in Paraguay	SEN	AEP	CONAE
	September Fires in Paraguay	SEN	AEP	CONAE

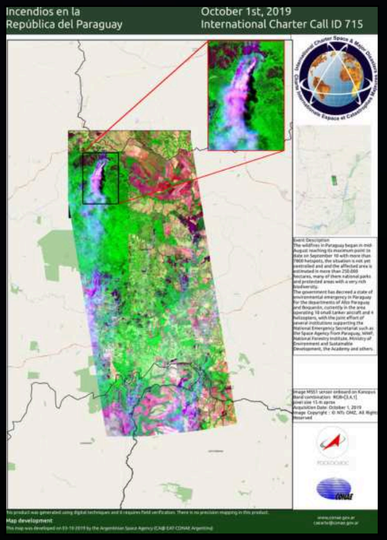












The Earth Observation and GIS Laboratory (GEOLab) generates geospatial data-based information and solutions useful to decision-makers in a variety of fields.

Our Approach

Project on the Application of Space Programs for Socioeconomic Development.

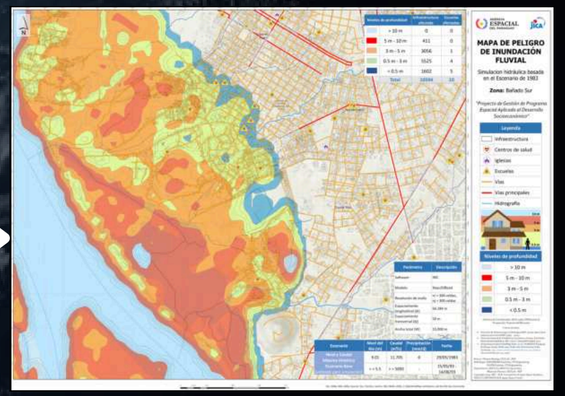
AGENCIA ESPACIAL DEL PARAGUAY

JICA

Satellite data

+60 years of hydrological records

Hydraulical modeling

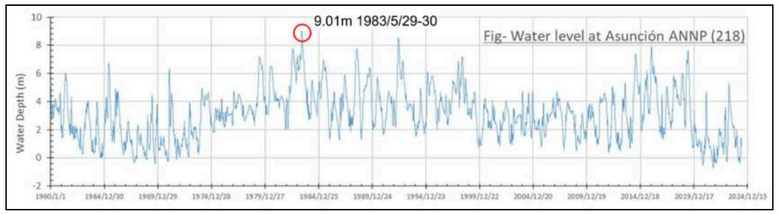


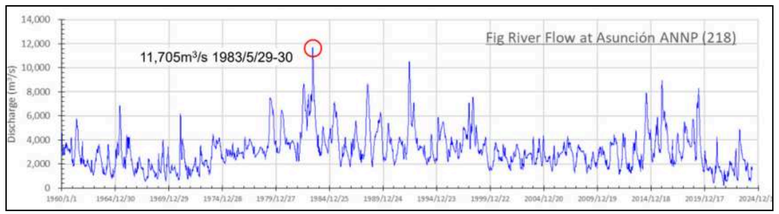
Flood hazard identification

Our Approach

The level of 5.5 m is considered critical for the port of Asunción.

River Flood - 1983 Scenario

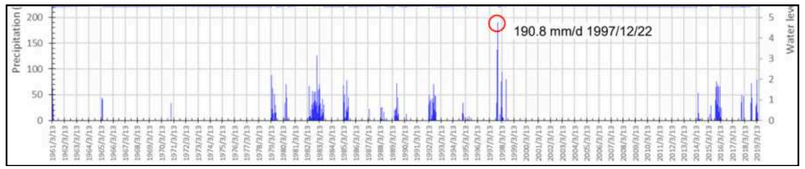




May 29, 1983

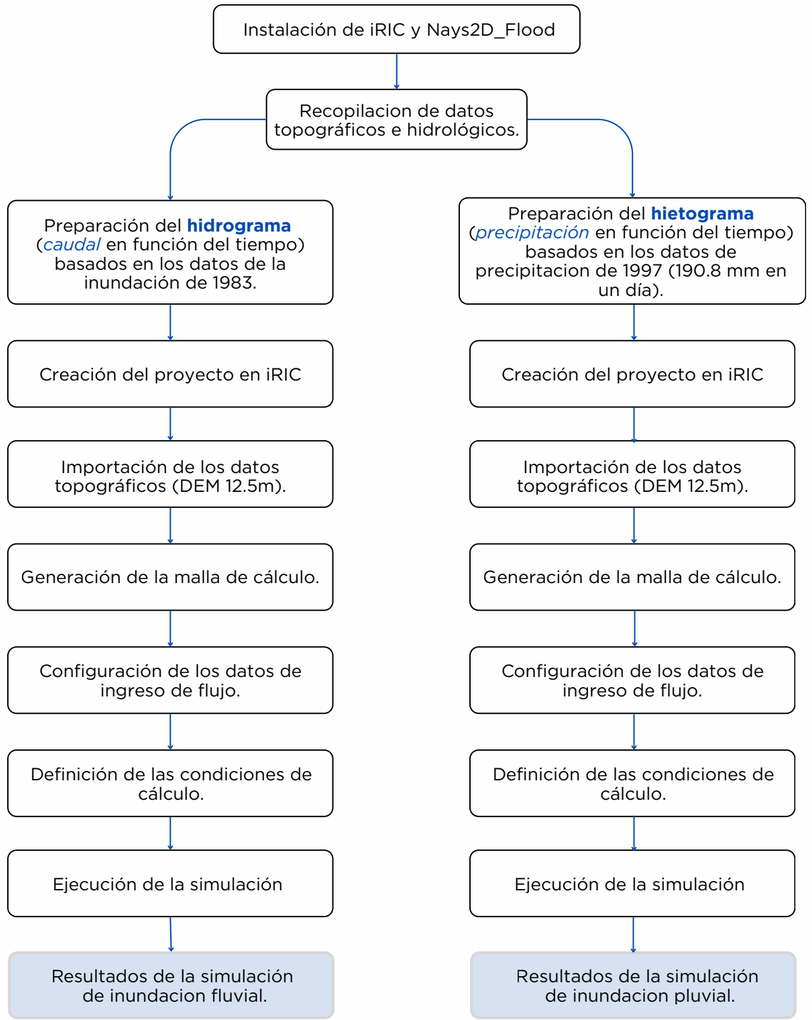
- Historical maximum level: 9,01 m
- Historical maximum flow: 11.704 m^3/s

Pluvial Flood - Scenario 1997



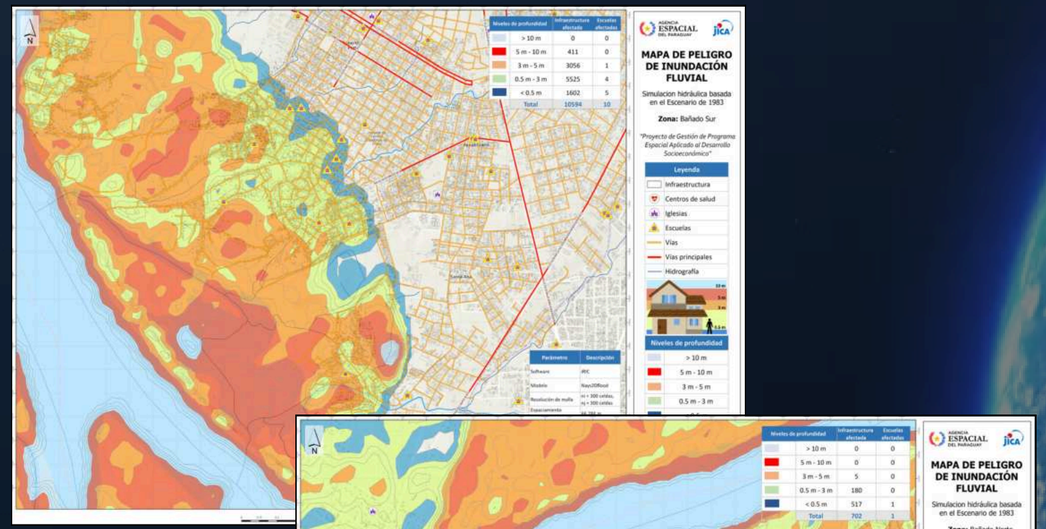
December 22, 1997

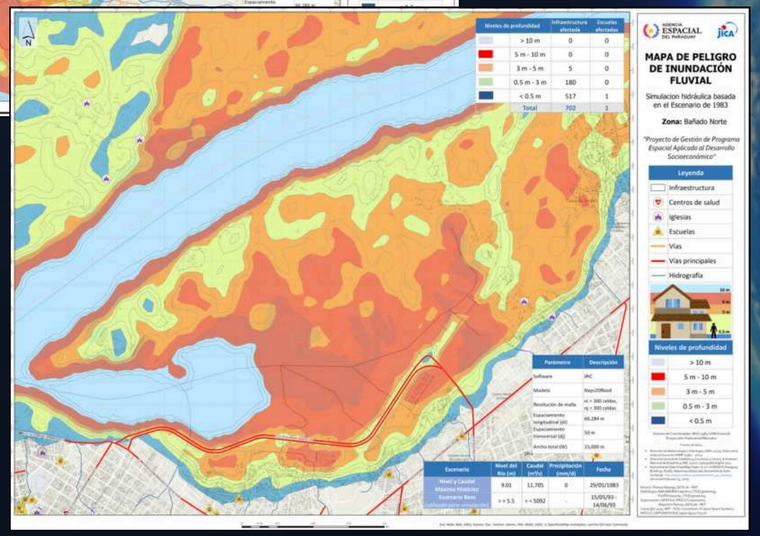
- Historic maximum rainfall: 190.8 mm



Key Outcomes

Identification of flood hazard zones

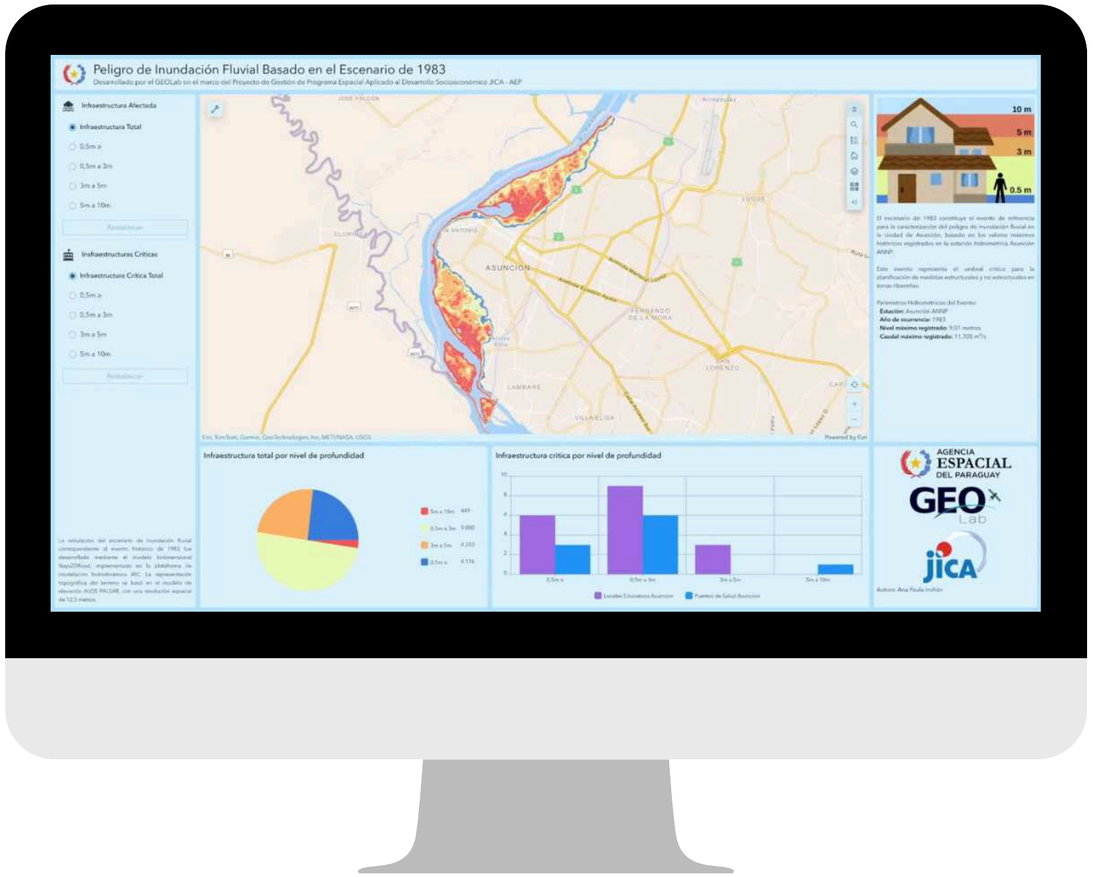




Establishment a Disaster Management Working Group

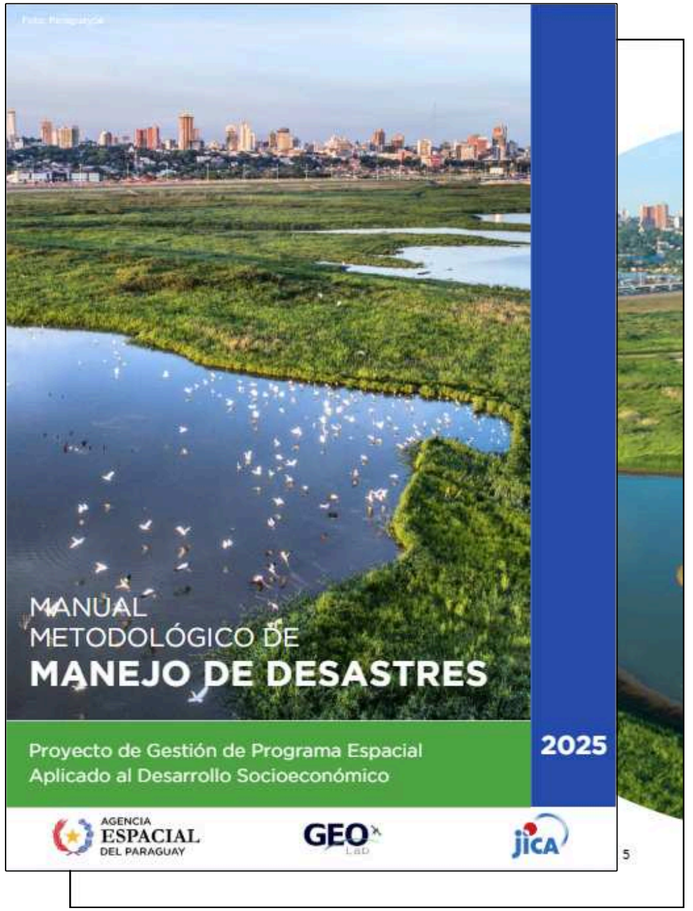
Key Outcomes

Development of interactive web dashboard



QR del Dashboard:

Methodological manual for replication

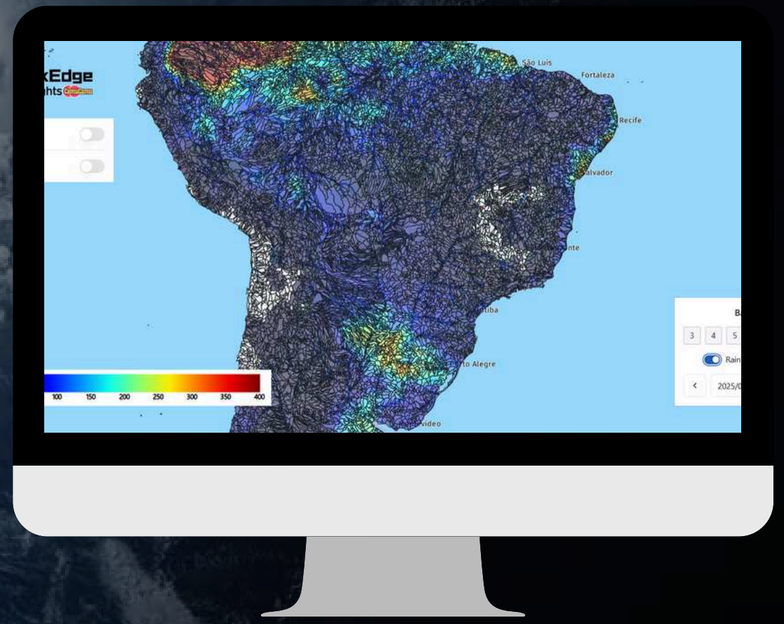


QR del manual:

Key Outcomes

International cooperation projects

- ArkEdge Space → co-development early warning app with real-time hydrological + satellite data



Results

- Better urban planning & disaster preparedness.
- Strengthened institutional coordination.
- Example of how global partnerships accelerate local resilience.
- Methodology scalable to other inland and coastal regions.

Space technology

+

Interinstitutionl collaboration

+

International cooperation

=

Resilience for all communities.

“Flood hazards do not respect borders, whether coastal or inland, resilient communities require timely data, strong institutions, and global cooperation. Our experience in Paraguay shows how integrating these elements builds a foundation for early warning and resilience.”

Thank you very much!

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