



Asia-Pacific  
Economic Cooperation

# Resilience Redefined: The Synergistic Co-Creation of Academia, Local Government, and Communities

María del Pilar Cornejo-Rodriguez

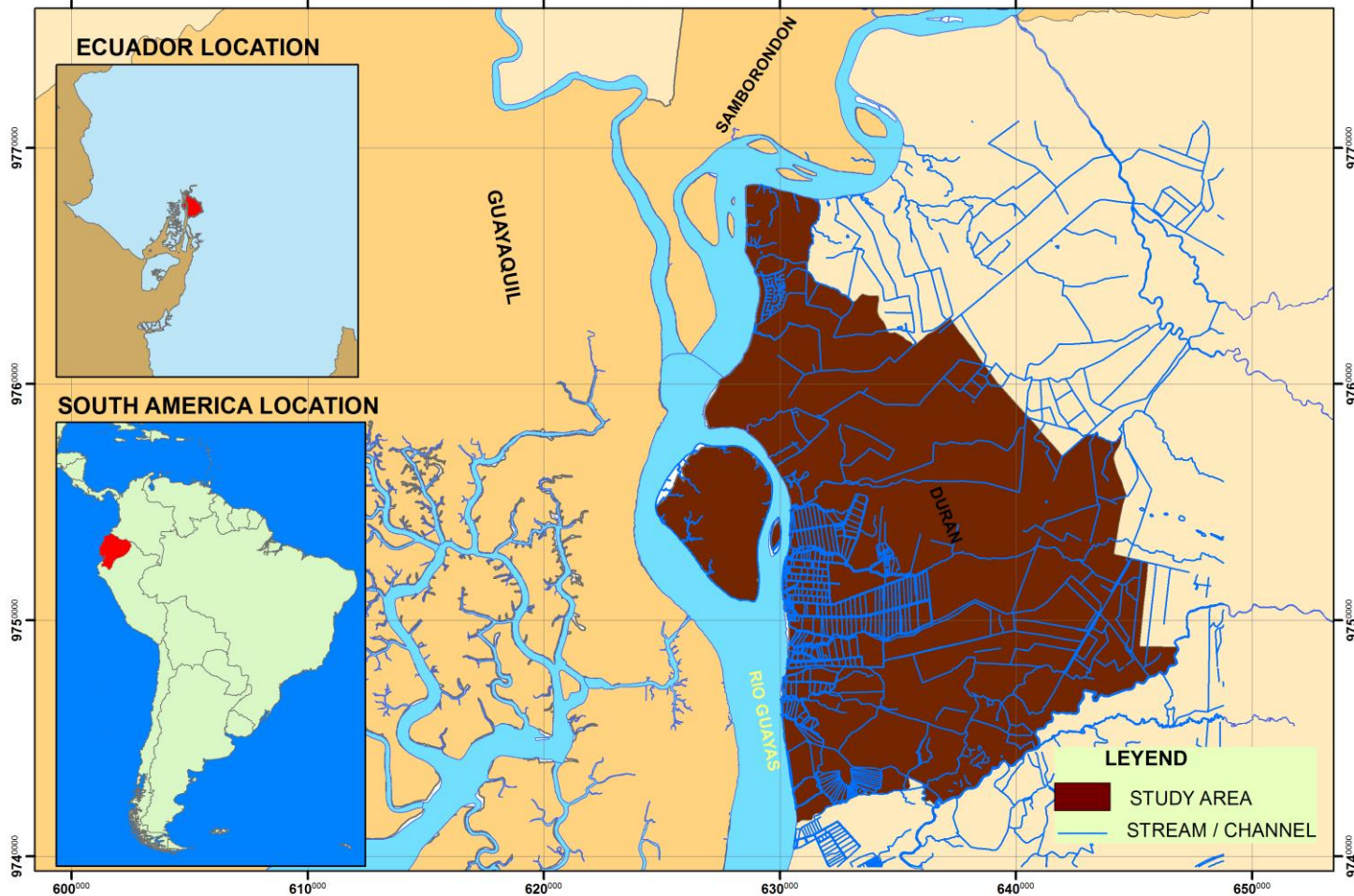
ESPOL, POLYTECHNIC UNIVERSITY

GUAYAQUIL, ECUADOR

August 13, 2024

# Introduction

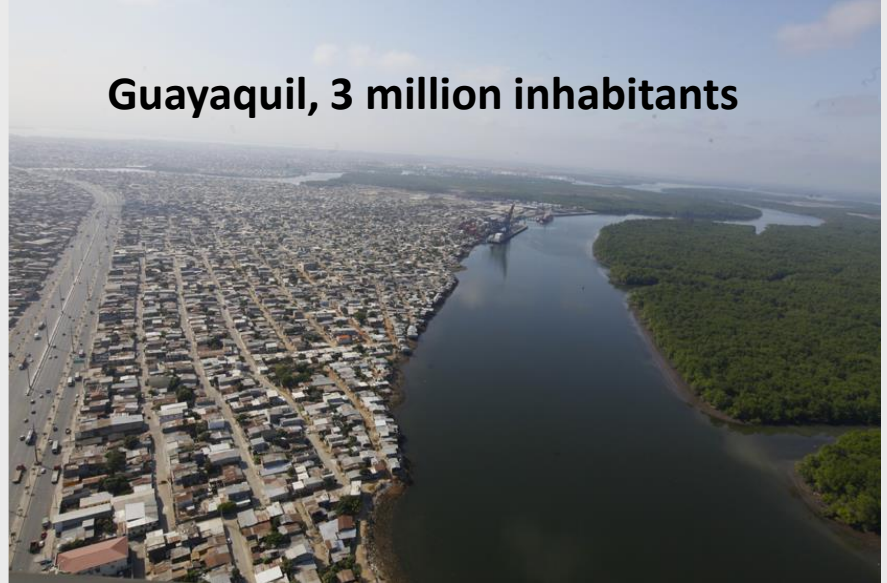
CANTON DURÁN LOCATION MAP



Duran, 300 k inhabitants

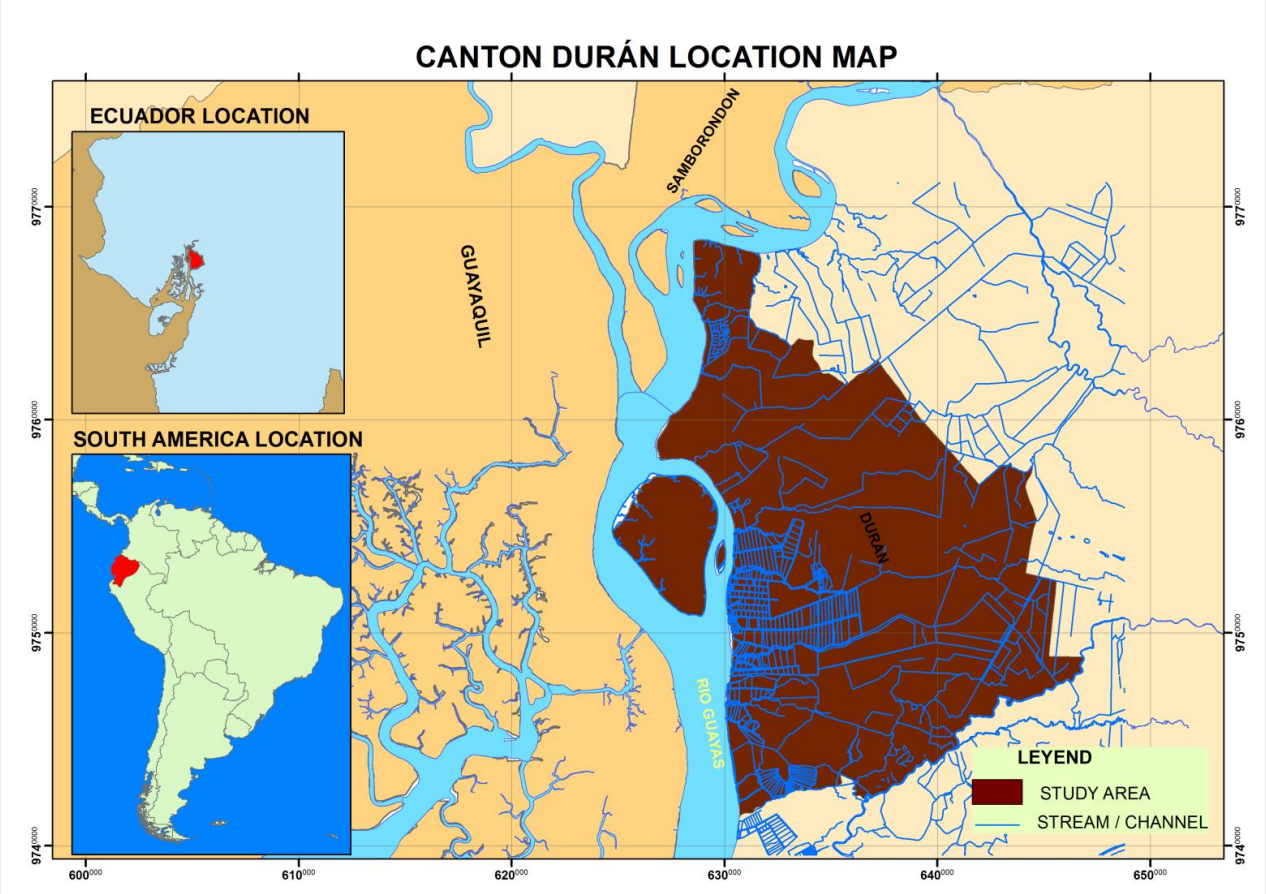


Guayaquil, 3 million inhabitants



Linking Guayas Basin to the Guayas Estuary is a systemic way to manage hydroclimatic risks (flooding, sedimentation, erosion, landslide, etc.)

# Introduction



2017-on going



# Background

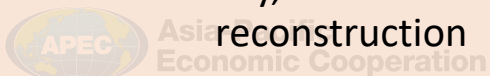
## Sendai DRR

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction



## Paris CCH

to strengthen the global response to the threat of climate change

Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production

Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development

## World Meteorological Organization

Early Warning systems must protect everyone within five years (March 23, 2022)



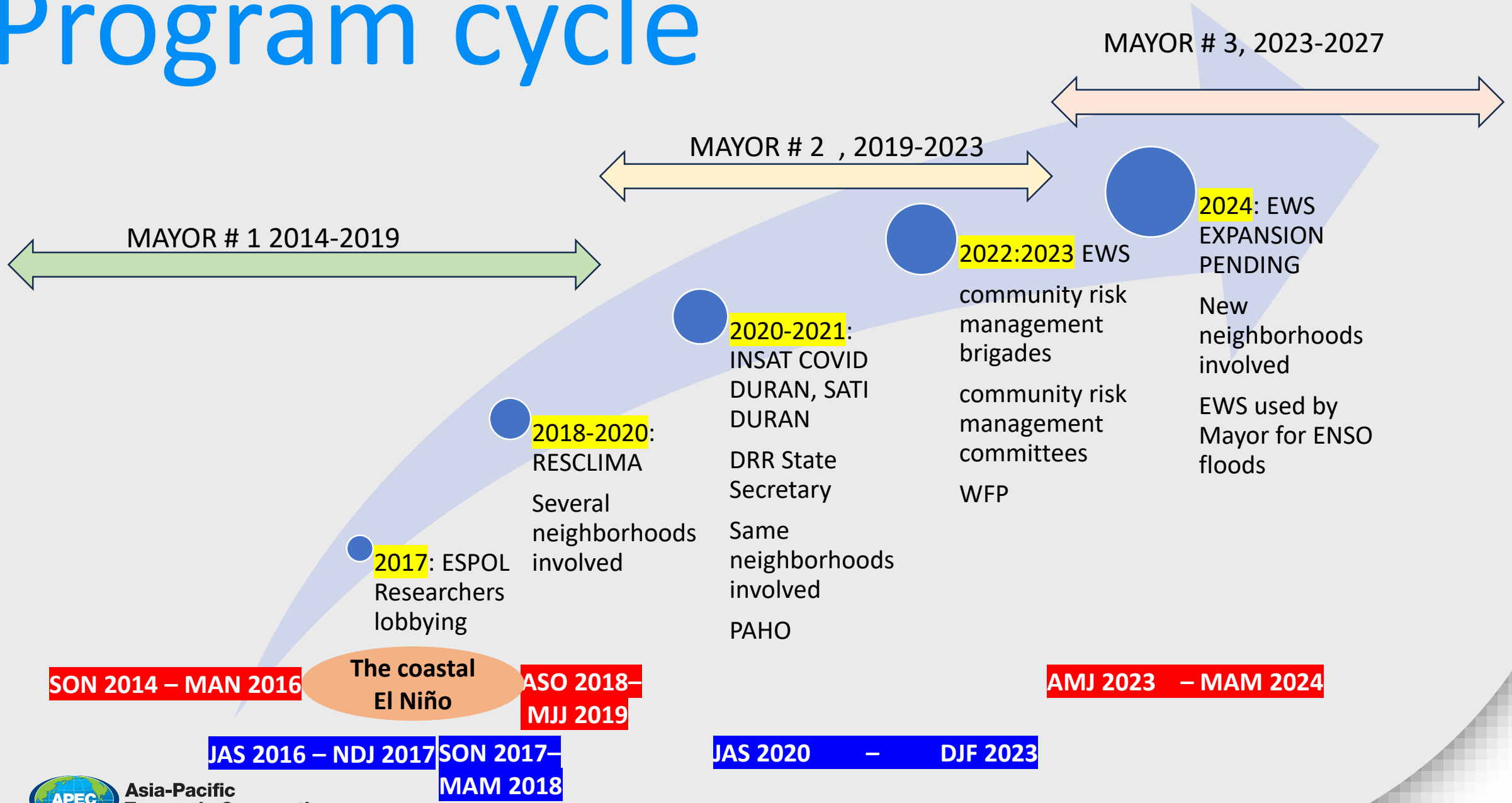
**António Guterres**

Secretary-General of the United Nations

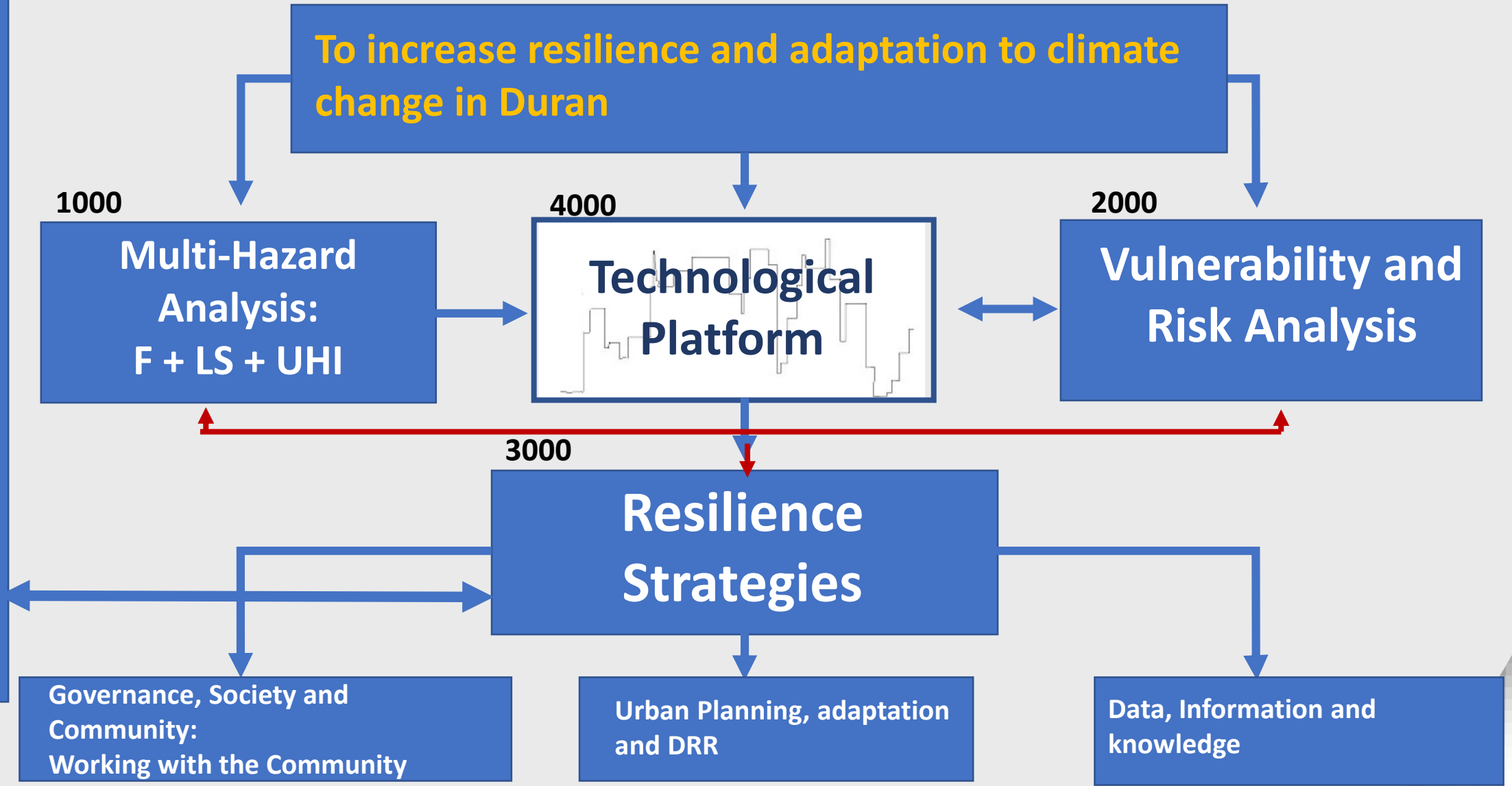
“ We must boost the power of prediction for everyone and build their capacity to act. On this World Meteorological Day, let us recognize the **value of early warnings and early action** as critical tools to reduce disaster risk and support climate adaptation. ”



# Program cycle



**Key Stakeholder Dialogue**



# Extreme climatic events or chronic perturbations?



2012



2015



2017

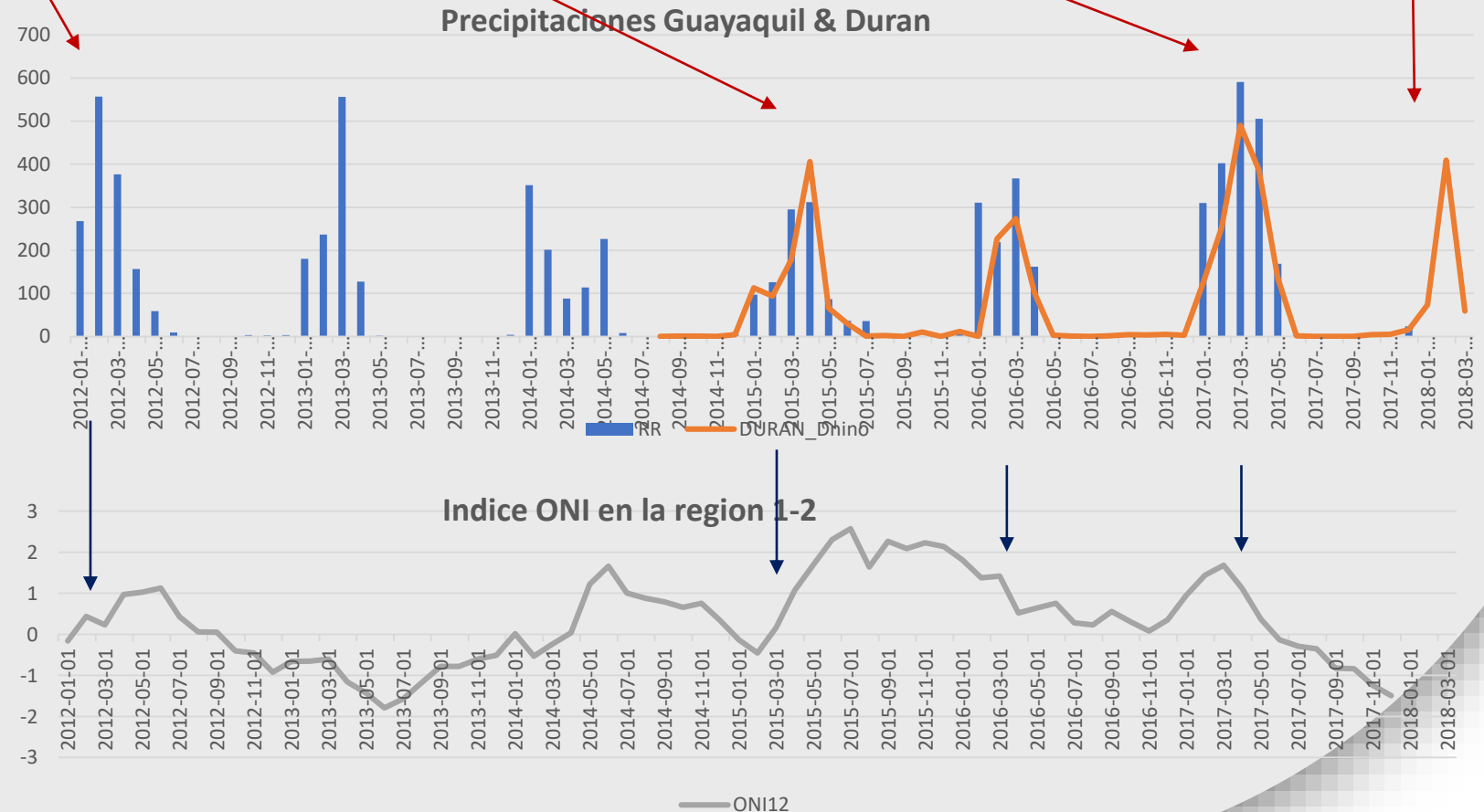


2018

## Climate and extreme events indicators

- precipitation
- Return periods
- ONI 1.2
- Urban Hydrology
- Institutional
- Social

There are chronic perturbation derived from underestimated infrastructure, and unplanned urbanization social processes





# 2000. Vulnerability and Climate Risk in the urban context: Vulnerability Index= 0.5 exposure+ 0.25 sensitivity – 0.25 adaptive capacity

Physical

## Exposure



Physical and climatic factors

population

## Sensitivity



Demographics and susceptibility

Resources

## Adaptive capacity



City and community resources



# Operational Geographic Information System

Census data

- Downloading with REDATAM
- Management
- Table Atributes
- Shape files

Remote Sensing variables

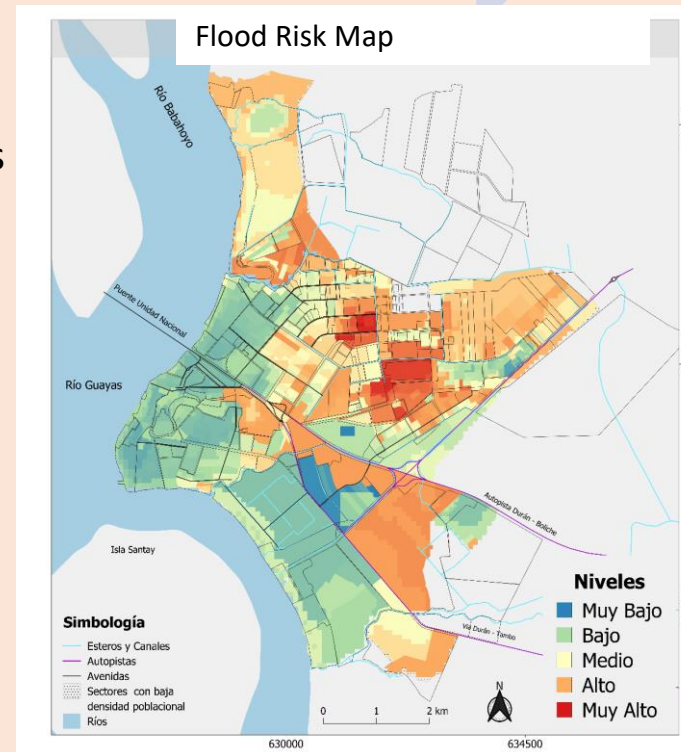
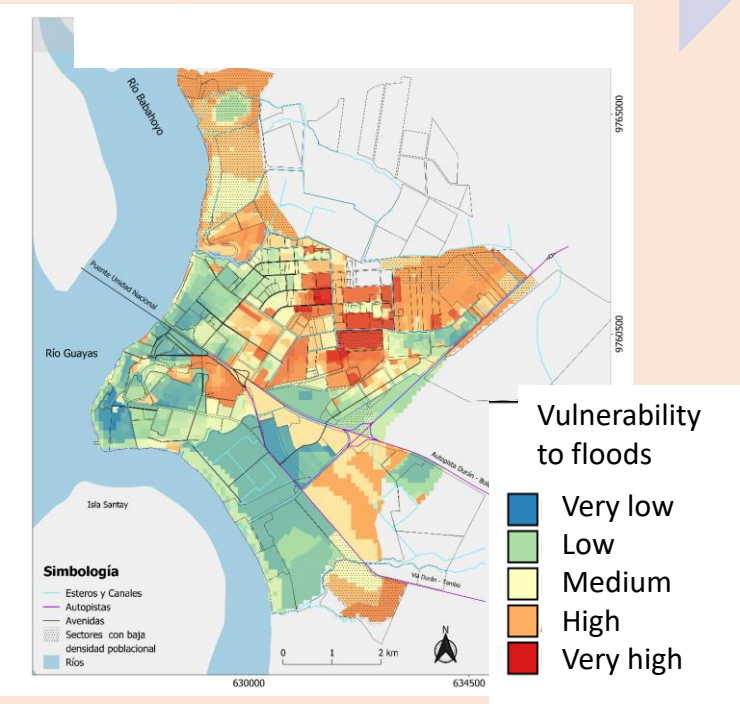
- Downloading Landsat 8 info with QGIS
- Computing Surface Temperature

Vulnerability and Risk Indices

- Indices calculation
- Map properties and styles
- Printing design

## Main Results

- Municipality personnel trained
- Exposure and access to new tools
- Usage of open-source software
- Other:
  - Improved communication among different municipal departments
  - Increased self esteem
  - New co-funding for EWS
  - Future
  - MOOC
  - Training trainers
  - New partners (municipalities)



INAMHI Durán ESPOL

SISTEMA DE INFORMACIÓN GEOGRÁFICO OPERACIONAL

EQUIPOS GIS: Mercy J. Barber, Anabel Constantine, Genoveva J. Gar, Rommel Caza Quiroga

EQUIPO PLATAFORMA TECNOLÓGICA: Daniel Ochoa, Ph.D, Federico Domínguez, Ph.D, Carmen Vaca, Ph.D, Ing. Osvaldo Bayona, Ing. Eduardo Cruz, Ing. Georgette Salazar

CEFA PICDRR

# 4000 Technological Platform

GHENT UNIVERSITY | Gobierno Autónomo Descentralizado Municipal del Cantón Durán | ESPOL

Las ciudades están siendo afectadas por el cambio climático

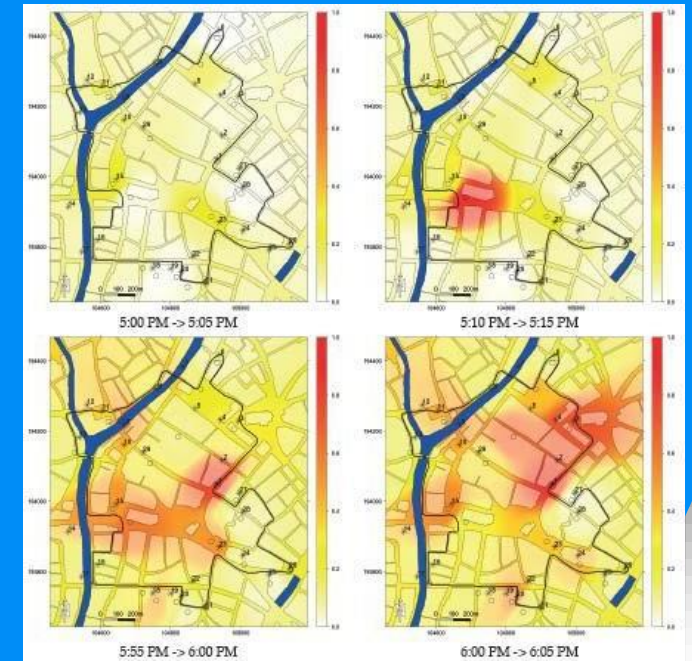
Participa en la campaña de movilidad DURAN RESILIENTE

- 1 Descarga el app Connect Duran
- 2 Registra tu recorrido  
Cómo y hacia dónde vas?
- 3 Envía tu recorrido  
Por dos semanas la app registrará tu recorrido automáticamente
- 4 Optimiza tu recorrido  
El app te dirá como y porqué viajas y cuanto te demoras

Disponibles en Google Play



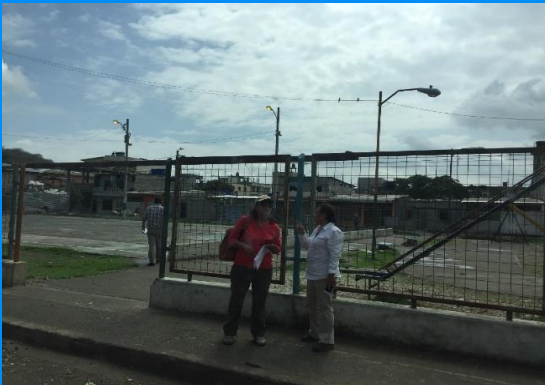
- Deployment of an urban network for monitoring environmental variables through different sensors
- Development of a crowdsourcing network for monitoring environmental variables based on smart phones
- Geospatial platform for displaying hazards and the monitored information





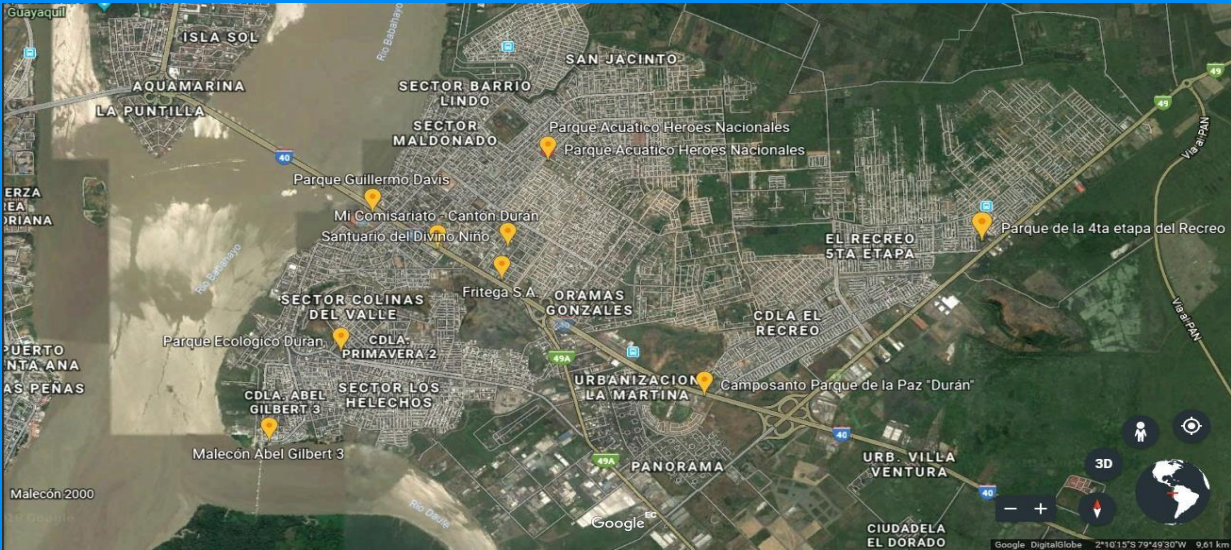
# 4000 Technological Platform

Sensors Network



Sites for Meteorological Monitoring with Wifi

“Human” Sensors





# Cross-sectoral collaboration

Capacity building for Climate Resilience:  
Stakeholder involvement  
New policies

Co-funding

Co-production



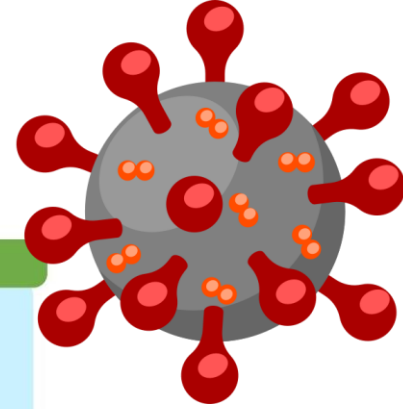
# Cross-sectoral collaboration

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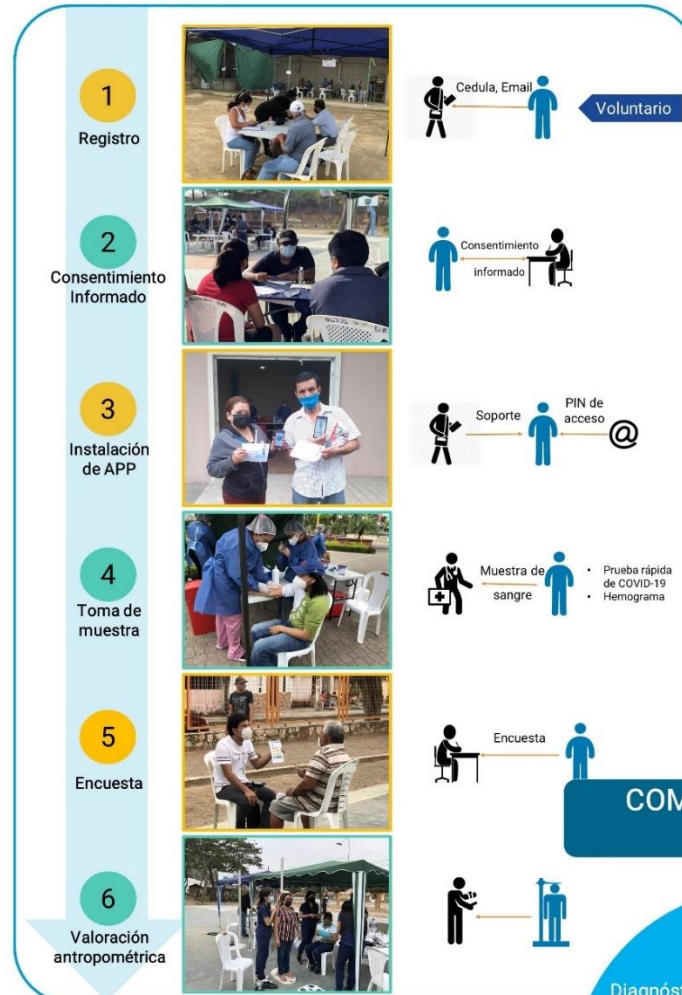
Co-funding

Co-production

## CAMPAÑAS DE TOMA DE EXÁMENES DE SANGRE Y ENCUESTA DE SALUD EN DURÁN



PROCESO REALIZADO



**2 campañas**  
10, 11, 12, 17 y 18 de septiembre  
y  
15, 16, 22, 23 y 24 de octubre  
2021

**5 locaciones**

**Participación diversa**  
Mujeres, hombres, adultos mayores, niños, personas con discapacidad, etc.

### COMPONENTES DEL PROYECTO

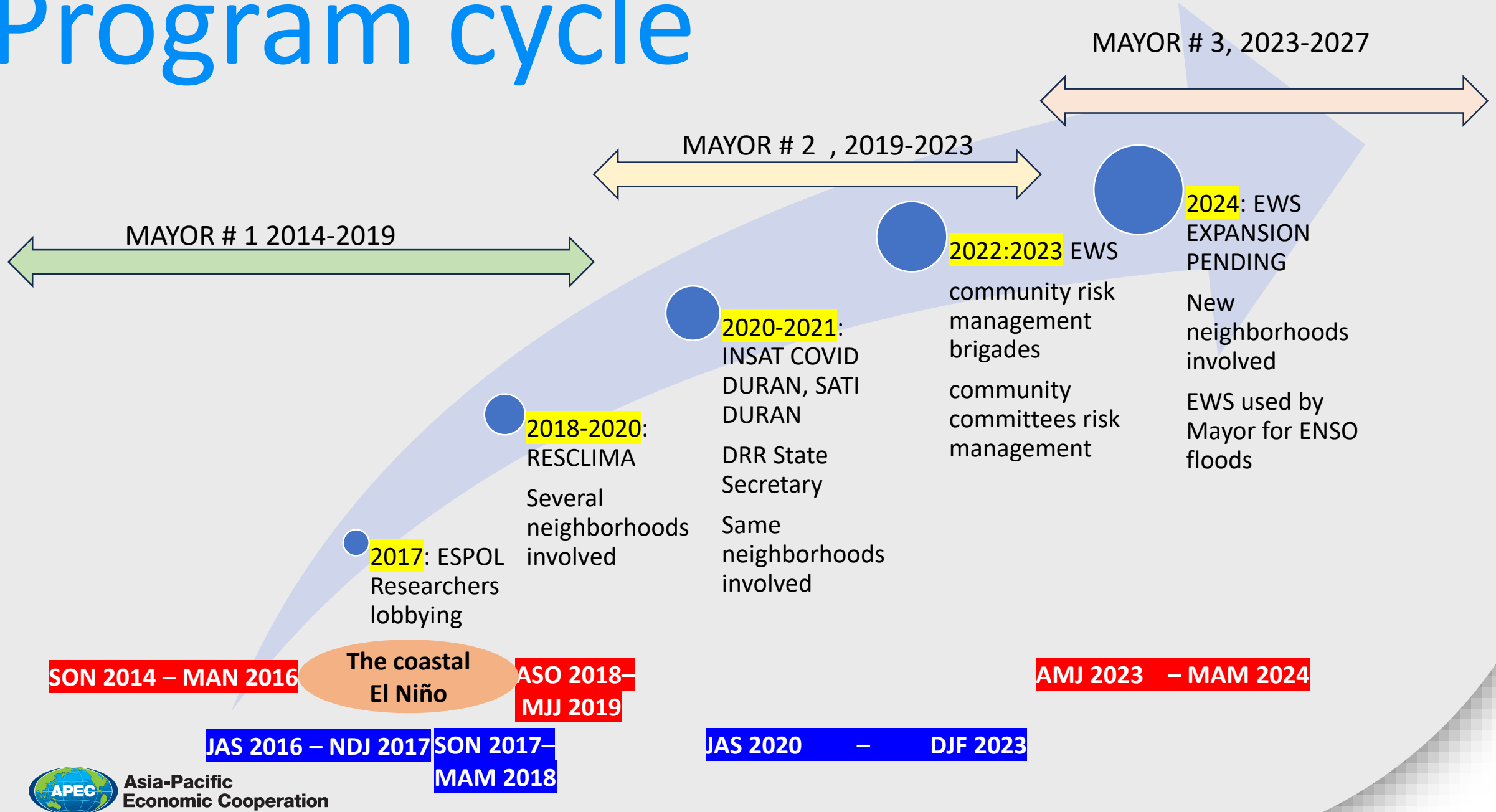


Análisis de pruebas y entrega de resultados

**597**   **653**

Monitoreo y entrega de resultados por la app

# Program cycle





# Policy Recommendations: Early Warning System

- Flood levels and impact
- Flood Vulnerability and Risk Assessment



- Coordination with local Risk Management Office
- Design and improvement of monitoring network

- Designing and application of response protocols
- Emergency response to floods by the local authority and the community

- Engagement with local Risk Management Committees and Neighborhood alliances
- Establishment of communication channels between local authority and the community

# Early Warning System

Alert level	Description
White or not alert	Normal conditions: Null probability of occurrence, or very low for a dangerous event
Yellow	Hazard Thread: Parameters monitoring indicates activation of a significant hazard
Orange	Imminent event: Conditions and parameters show that hazard is imminent.
Red	Current event: The event is developing, and its evolution is monitored, management and impacts.

With community leaders from several neighborhoods Recinto Rosa Elvira, La Unión, 288 hectáreas, El Recreo 2da Etapa y 5 de Junio





# Monitoring and alert



The Duran Early Warning System (SAT) was ready in April 2023





# Duran EWS

EL TELEGRAFO NEWS FEB 28, 2024

"We are monitoring the situation together with the Risk Directorate of the Municipality of Durán, according to the first report we have reached a very high level of precipitation, having exceeded 62mm in the first 60 minutes of rain."

← Post



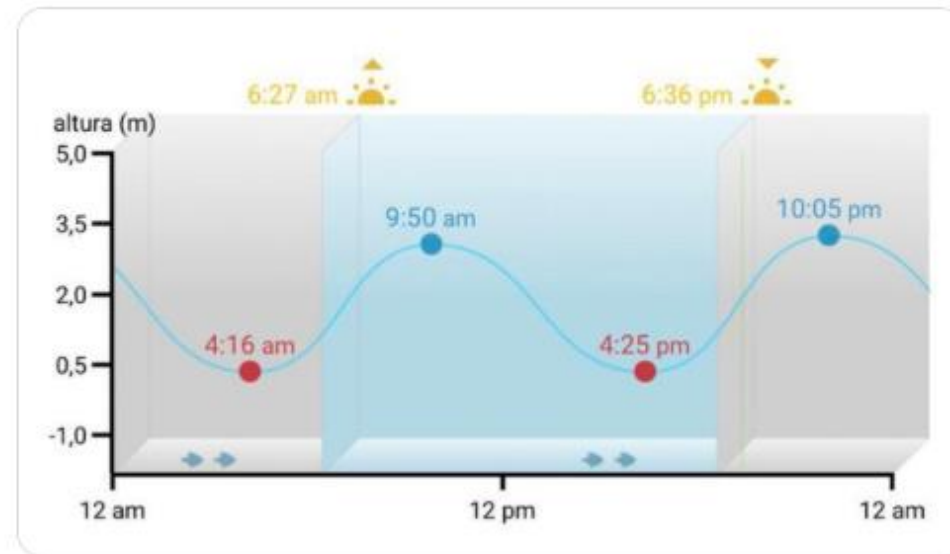
Luis Chonillo  
@CHONILLOec

Estamos monitoreando permanentemente la situación de [#LluviasDeAltaIntensidad](#); al momento llevamos 103mm de precipitación con una disminución en la última hora a 41mm.

Esperamos que la lluvia pare o siga disminuyendo su intensidad para que las estaciones de bombeo puedan evacuar con mayor eficiencia las aguas.

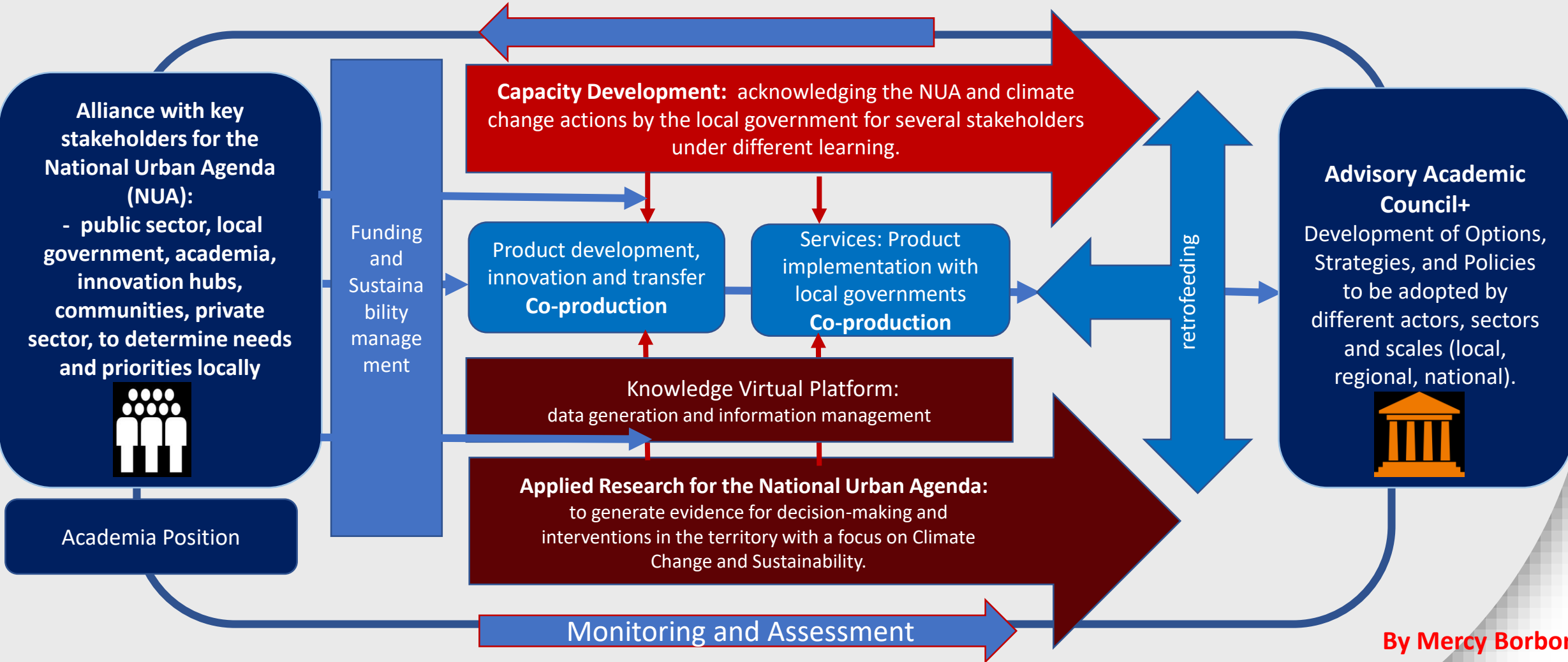
En estos momentos nos encontramos con la marea alta y se pronostica que la marea empiece a bajar desde las 21h40 aproximadamente.

[Translate post](#)

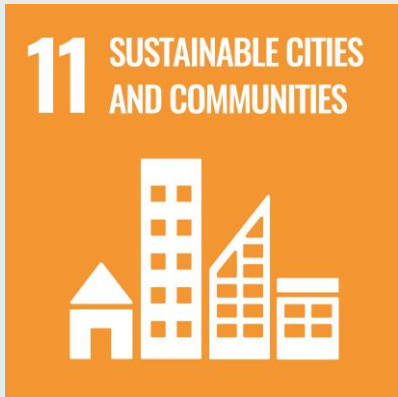


7:36 PM · Feb 28, 2024 · 3,476 Views

# Conclusions



By Mercy Borbor



**We support and  
contribute to SDG!**



# Thank you

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[pcornejo@espol.edu.ec](mailto:pcornejo@espol.edu.ec)



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