

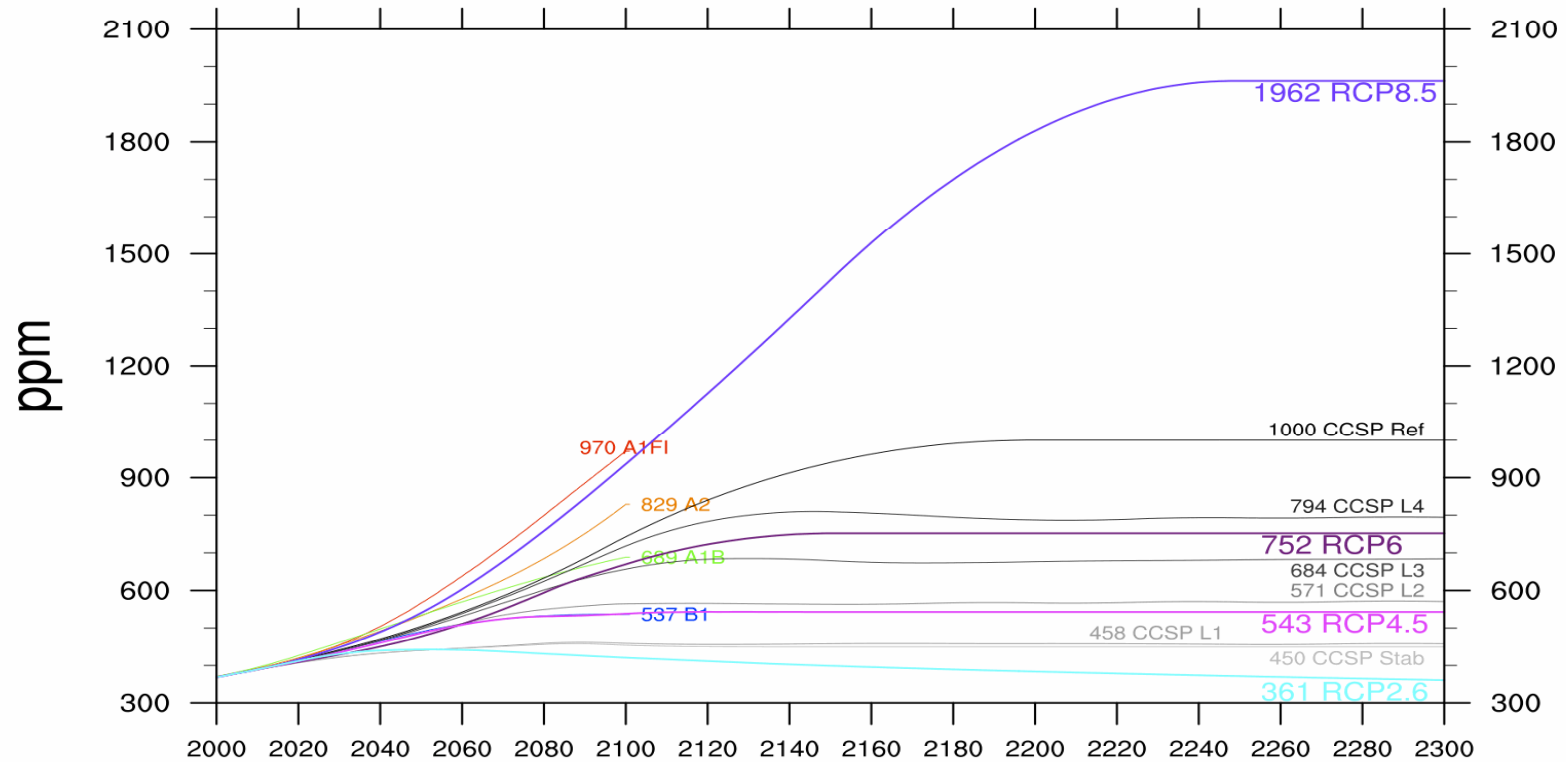
Adaptacion a los impactos del cambio climatico en humedales. Portafolio en ejecucion

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PRIMERA REUNION INTERNACIONAL SOBRE HUMEDALES

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CO₂ concentrations



SRES: A1FI A2 A1B B1
CCSP: CCSP Ref CCSP L4 CCSP L3 CCSP L2 CCSP L1 CCSP Stab
RCP: RCP8.5 RCP6 RCP4.5 RCP2.6

La trayectoria actual de emisiones sigue el peor escenario posible

Climate strategy in Latin America

- Adaptation is priority one, given the large and irreversible impacts of climate change in the region;
- Support low carbon development maintaining and or reducing carbon footprint from key economic sectors;
- Facilitate linkage between knowledge and policy making.

| <i>Climate Hotspot</i> | <i>Direct effect</i> | <i>Immediacy</i> | <i>Irreversibility</i> | <i>Magnitude of physical impacts</i> | <i>Economic consequence</i> |
|---|--|------------------|---|---|--|
| Coral Biome in the Caribbean | Bleaching and mass mortality of corals | Now | Once temperatures pass the threshold corals will collapse. | Total collapse of ecosystem and wide-ranging extinction of associated species. | Impacts on fisheries, tourism, increased vulnerability of coastal areas. |
| Mountain ecosystems in the Andes | Warming | Now | The thermal momentum in mountain habitats will result in significant increases in temperature | Disappearance of glaciers, drying-up of mountain wetlands, extinction of species. | Impacts on water and power supply, displacement of current agriculture |
| Coastal areas in the Caribbean and the Gulf of Mexico | Subsidence and salinization; increased exposure to extreme weather | This century | Irreversible sea level rises will submerge coastal areas affecting their ecology. | Disappearance of coastal wetlands, displacement and extinction of species. | Impacts on coastal infrastructure, fisheries and agriculture. |
| Amazon Basin | Forest dieback | This century | Biomass densities would decrease. | Drastic change to the ecosystem, leading to potential savannah. | Impacts on global water circulation patterns, |

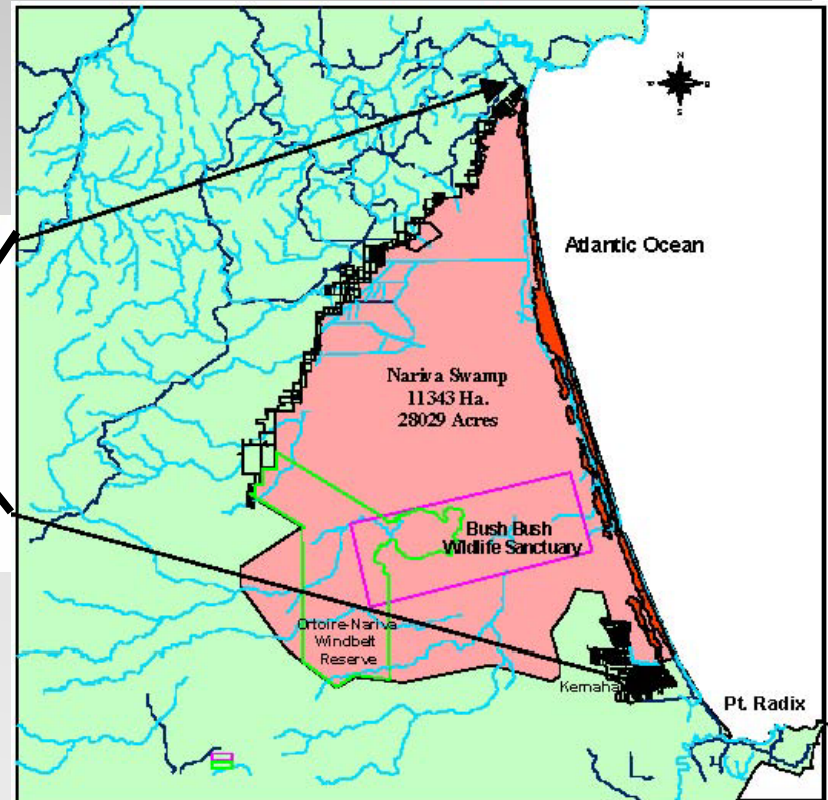
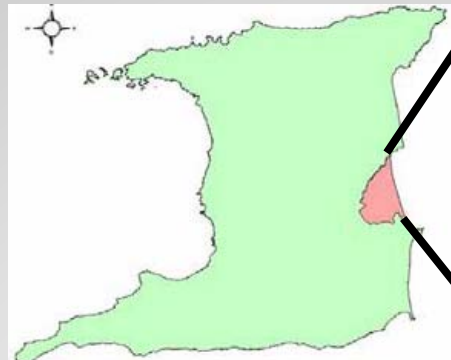
Wetlands and climate change

- **Wetlands are amongst the most threatened ecosystems by climate consequences.**
- **Wetlands are also efficient carbon sinks.**
 - **Sea level rise threatens the stability of coastal wetlands.**
 - **Coastal mangroves face changes in hydrology potentially affecting their long-term viability.**
 - **Increases in sea surface temperature is destabilizing the coral biome in the Caribbean and affecting long-term viability of marine species.**
 - **Extreme events are projected to rise in intensity affecting coastal wetlands.**
 - **Mountain wetlands are being destabilized by changes in hydrology and temperatures.**

Examples of wetlands and climate work sponsored by the World Bank in Latin America

- Nariva Wetland Carbon Sink Project
- Mexico: Adaptation in the Wetlands of the Gulf of Mexico Project
- Colombia: Adaptation in Mountain Wetlands

Trinidad & Tobago: Nariva wetland carbon sink/emission reduction project



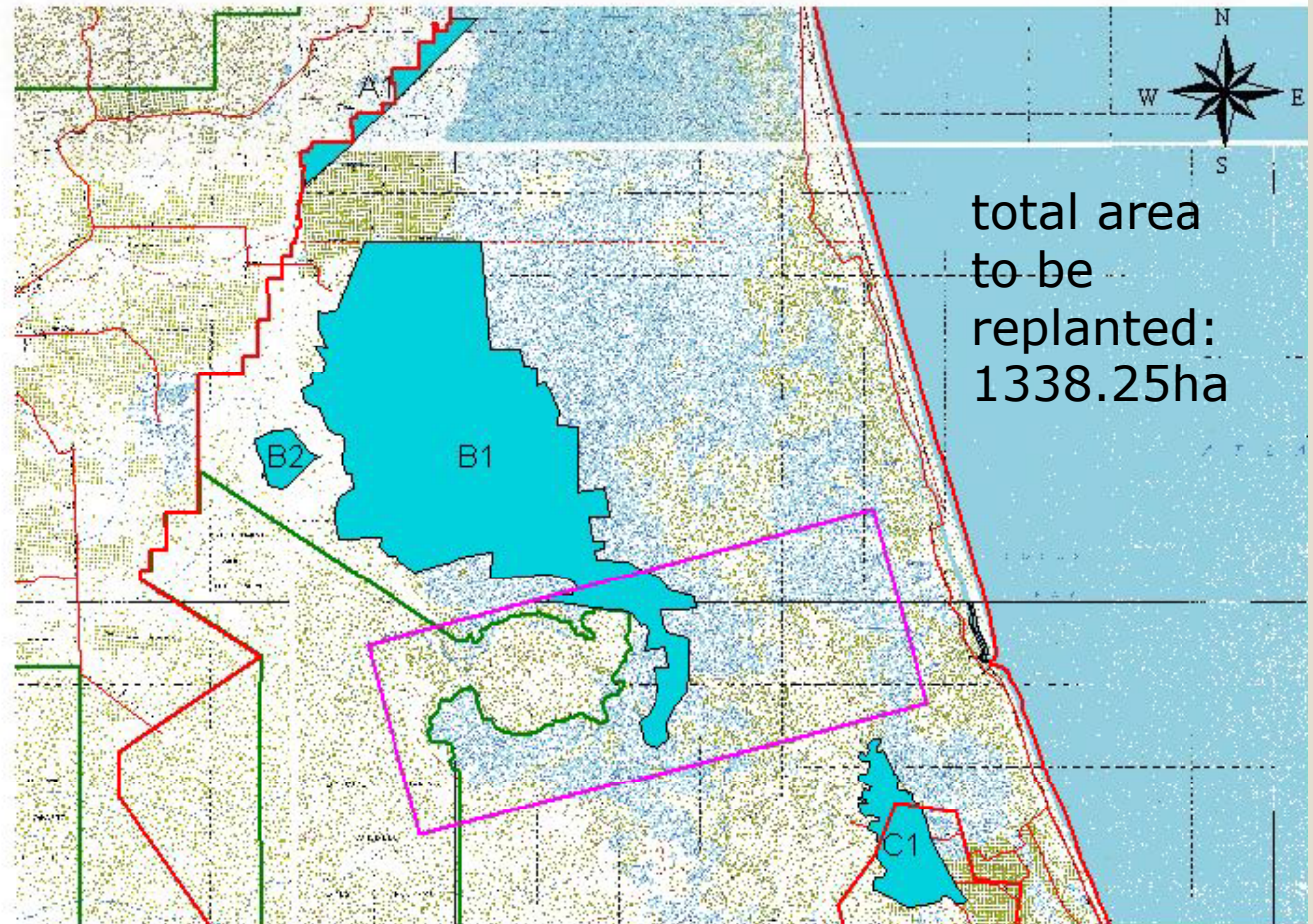
16 km SSE the town of Sangre Grange on East Coast of Trinidad

(Map Sources: CIA World Factbook & Ducks Unlimited)

The afforestation project

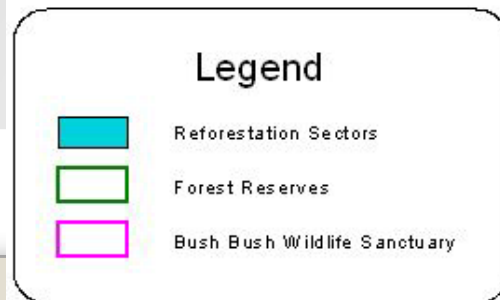
- Carbon sequestration through afforestation / reforestation using a small-scale CDM methodology
 - Nariva (total 11,350 ha) is the most important protected area in Trinidad & Tobago
 - Contains endangered species & species not found anywhere else in the country and is a RAMSAR site
- Reforestation: 1338 ha (conservative scenario 1160 ha) in 5 years with native species. Activities already started
- **Emission Reduction (ER) Potential by 2012:** 84K tCO₂e (73K tCO₂e conservative scenario)
- **ER Potential by 2017:** 224K tCO₂e (194K tCO₂e)

Location of planting sites for activity 1 in NARIVA



total area to be replanted: 1338.25ha

1 0 1 2 3 4 5 Kilometers



| |
|---------------|
| A1- 48 Ha |
| B1- 1131.6 Ha |
| B2- 32 Ha |
| C1- 126.65 Ha |

Methane mitigation through restoration of surface hydrology

- Rough estimate using model called “Wetland-DNDC Model” (open source)
- The model has two parts –
 - the first part models soil environmental factors such as temperature, moisture, redox potential and substrate concentration profiles
 - the second part predicts flux of trace gases such as nitrogen oxide, methane and ammonia
- The model estimates the flow of GHGs and the impact of changes in hydrology in this flow.

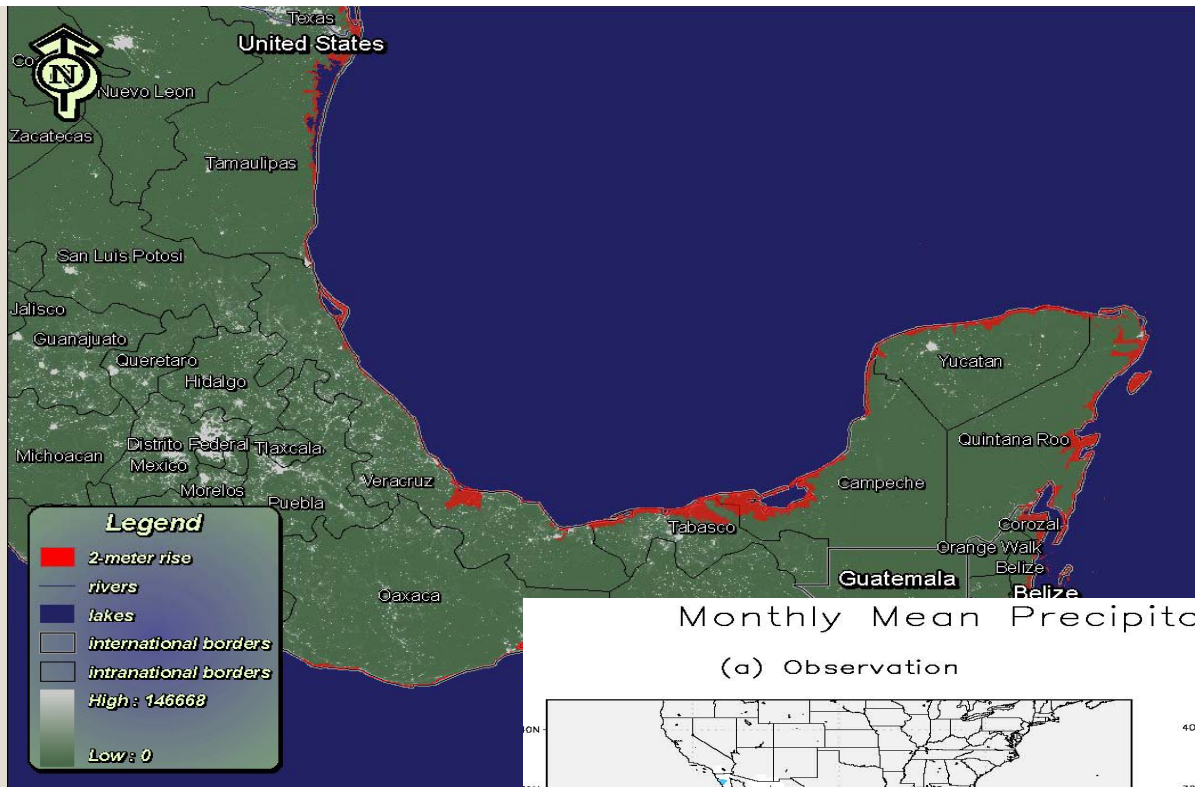
FTIR (Fourier Transform Infrared) Spectroscopy

- FTIR used to identify GHGs (CH₄ N₂O) emissions from the wetland
- Costs are very modest and measurements can be automated and fed via telemetry to an archiving station
- Data is fed to the model and results in an estimate of emission reductions.
- Resulting asset to be sold in the voluntary market
- CH₄ at 20xCO₂; N₂O at 210xCO₂



Implementation of Adaptation Measures in Coastal Wetlands in the Gulf of Mexico

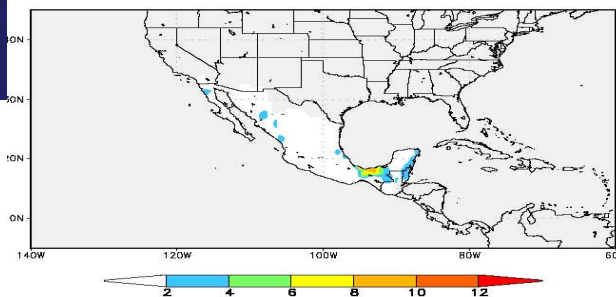
- ❖ Objective: to promote adaptation to the consequences of climate impacts in the coastal wetlands of the Gulf of Mexico, through the implementation of specific, practical pilot measures that will provide information about the costs and benefits of alternative approaches to reduce the vulnerability of said coasts to climate change; and
- ❖ Funding: US\$32 million, including US\$4.5 SCCF; US\$0.5 CCIP, US\$0.7 NAWCA; US\$15 million CONAGUA (baseline investments)



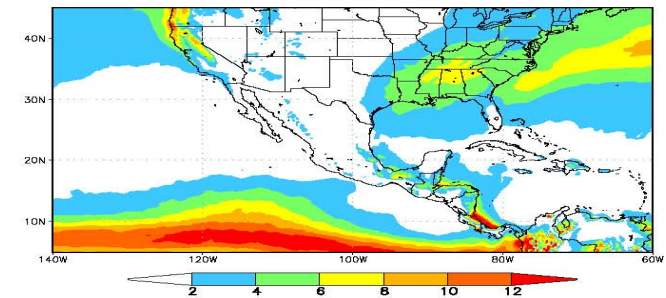
Coastal wetlands in The Gulf of Mexico seen as affected by Changes in runoffs, Sea level rise and Extreme events

Monthly Mean Precipitation (mm d^{-1}) DJF

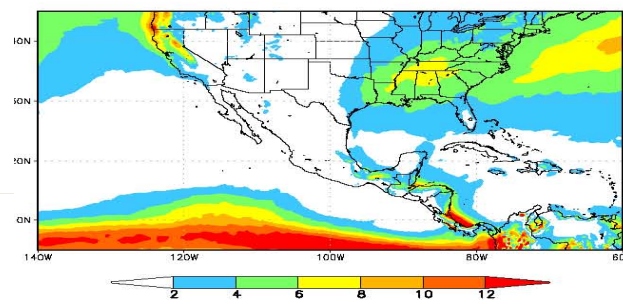
(a) Observation



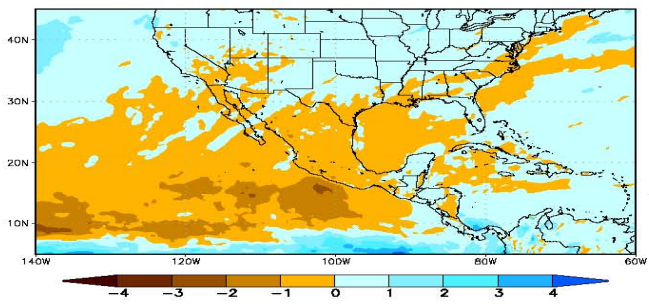
(b) Present



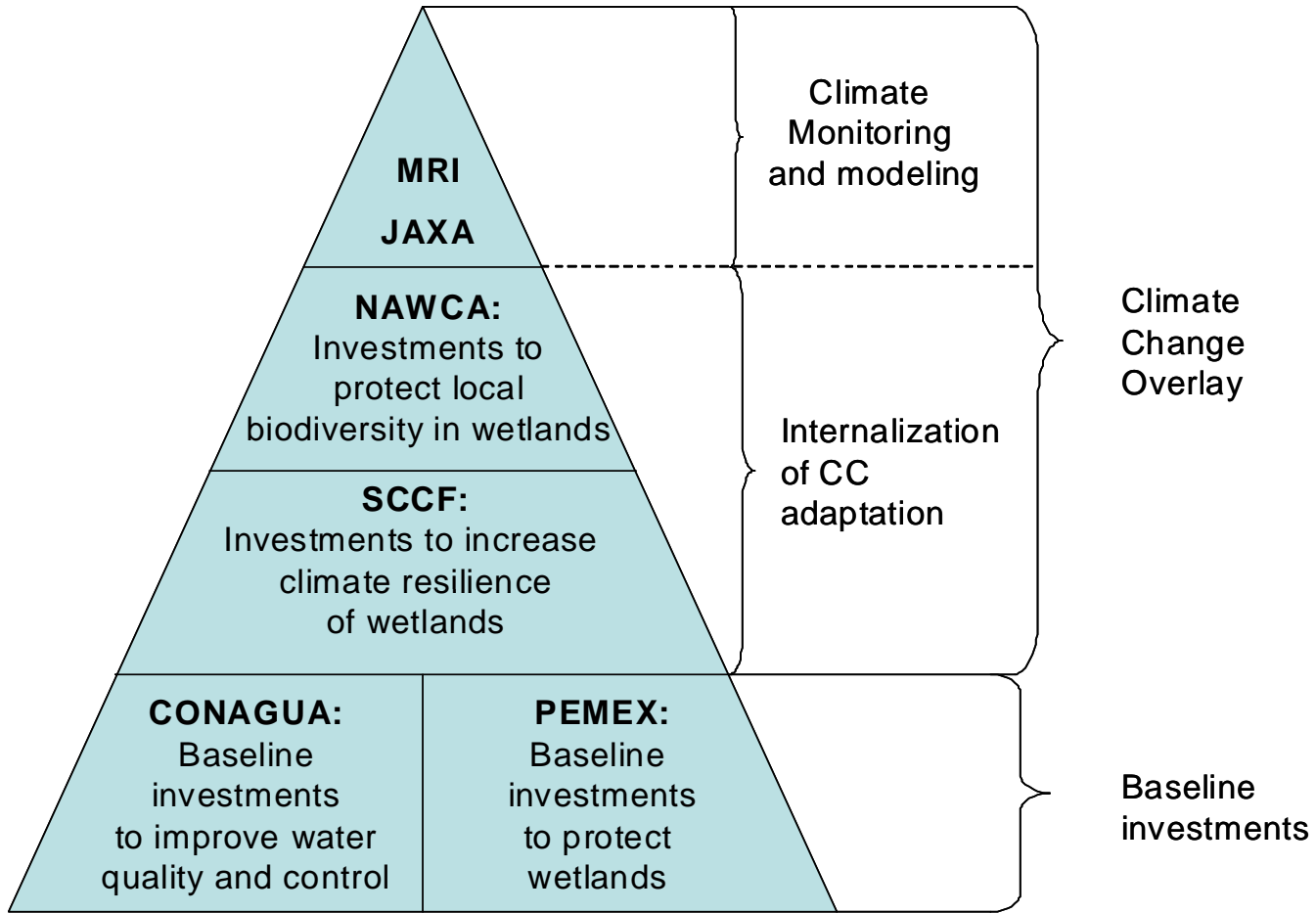
(c) Future



(d) AK - AJ



Financial Structure



Wetlands considered

Panuco River. Corredor
Sistema Lagunar
Tamaulipas state

Papaloapan River-
(Alvarado Lagoon).
Veracruz state

Sistema Lagunar Carmen-
Pajonal-Machona:
Tabasco state

Punta Allen (Sistema
Lagunar Boca Paila):
Quintana Roo state



Pilot adaptation measures to implement

Pánuco wetland

- preparation of a climate resilient coastal zoning plan and associated regulations
- strengthening of land barriers and the carrying out of conservation measures around the Lagoon La Escondida; and
- elaboration of an expansion plan for the conservation area around the Lagoon La Escondida



Pilot adaptation measures to implement

Papaloapan site

- integration of climate concerns in the conservation and management strategy of the Alvarado Lagoon, including the adoption of a plan for the enforcement of a buffer zone around the Alvarado Lagoon; and
- construction of a pilot stabilization barrier to buffer extreme weather events and future rises in sea levels



Alvarado

Pilot adaptation measures to implement

Tabasco site

- development of a wetland conservation and management strategy, including the updating of land zoning regulations;
- carrying out of pilot restoration and reforestation with native species along biological corridors; and
- carrying out of pilot strengthening of the sandbars that separate lagoons from the sea.



Pajonal

Sian Ka' an

Sian Ka'an site

- the strengthening the monitoring system to include climate change impacts; and
- carrying out of pilot repopulation of coastal reefs to maintain their buffering capability and protection of the coastal wetland

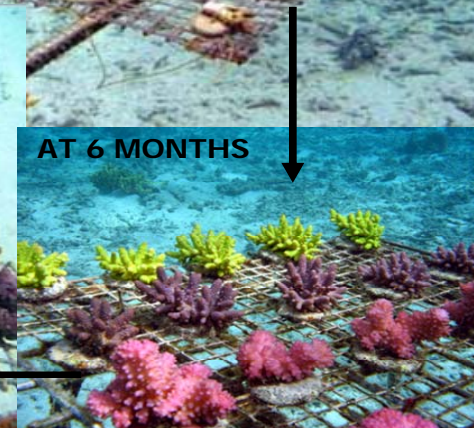


Coral restoration in the Caribbean

AT PLANTING



AT 6 MONTHS



AT 14 MONTHS



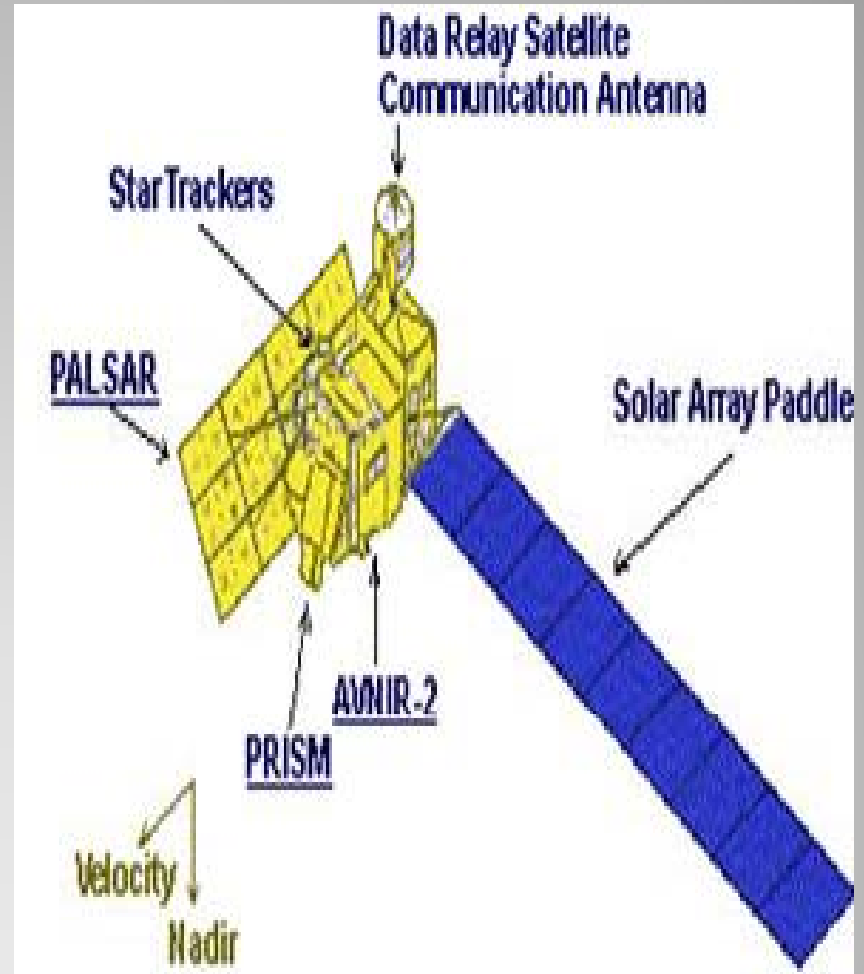
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Adaptation to Climate Impacts in Mountain Wetland Ecosystems in Colombia (as part of INAP project)



- (i) Restore and conserve natural ground cover in upper watersheds in Paramo ecosystems (Chingaza Paramo).
- (ii) Strengthen land management and enforcement plans to reduce anthropogenic impacts that may increase fragility to climate impacts. Involve local community in management and conservation activities.
- (iii) Strengthen capacity to prevent and respond to mountain fires.
- (iv) Eliminate mining activities.

- ALOS (advanced land observation satellite) monitoring dynamics of wetlands along time (subsidence, ground cover)
- Earth Simulator modeling climate dynamics in the Gulf of Mexico
- Ground stations to monitor water quality, conductivity



Monitoring of the wetlands

- ¿Cuáles son los efectos del cambio climático para los humedales en México?
 - En el golfo se prevén cambios en hidrología, salinidad, desestabilización de la línea costera, pérdida de lentes de agua dulce, impactos en especies migratorias
- ¿Qué debe hacer el país ante estos cambios?
 - El proyecto de adaptación en humedales es un gran primer paso, pero es limitado y debe expandirse, usando las lecciones aprendidas, costos incurridos y expandiendo su área de trabajo en toda la costa
- ¿Cómo puede el país pagarlo?
 - Los nuevos mecanismos de fondeo deben ser explorados, incluyendo fondo verde, AF, otros para complementar recursos locales de socios afectados (municipios, PEMEX, otros)