

**Wetlands: Climate adaptation,
mitigation and biodiversity
protection**
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Climate Hot-Spots in Latin America

<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 for thermal tolerance, corals will be gone.	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, leading to major uni-directional changes in mountain ecology.	Disappearance of glaciers, drying-up of mountain wetlands, extinction of cold-climate endemic species.	Impacts on water and power supply, displacement of current agriculture and changes in planting patterns (with varying degrees of impacts depending on location, seasonality, and ability to adapt).
Coastal Wetlands & Mangroves	Subsidence and salination; increased exposure to extreme weather	This century	Irreversible sea level rises will submerge coastal wetlands, affecting their ecology.	Disappearance of coastal wetlands, displacement and extinction of local and migratory species.	Impacts on coastal infrastructure, fisheries and agriculture.
Amazon Basin	Forest dieback	This century	If rainfall decreases in the basin, biomass densities would also decrease.	Drastic change to the ecosystem, leading to potential savannah.	Impacts on global water circulation patterns, agriculture, water and power supply on a continental scale

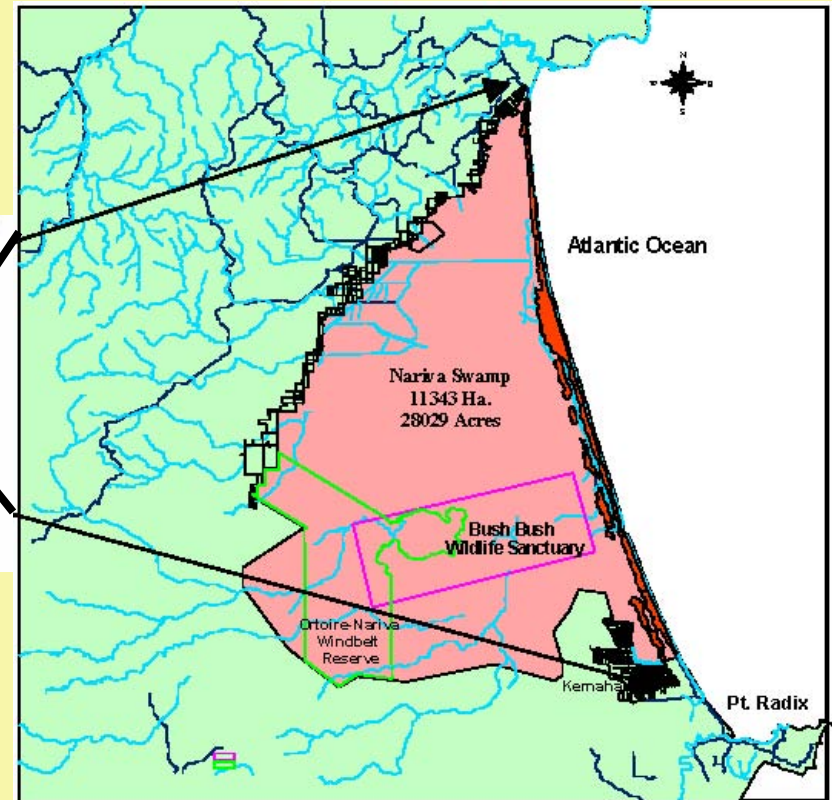
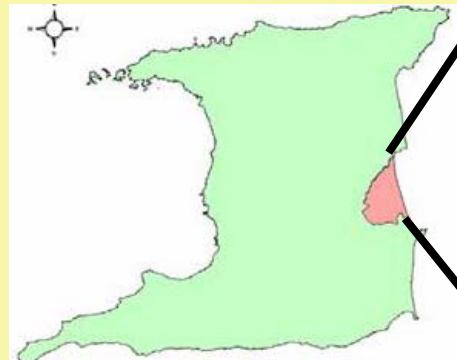
Wetlands and climate change

- **Wetlands are amongst the most biologically diverse and yet most threatened ecosystems.**
- **Wetlands and associated forest ecosystems are important carbon sinks.**
- **Coastal wetlands, in particular mangroves, provide a valuable coastal protection function. Mountain wetlands provide water regulation for agriculture and power generation.**
- **Worldwide, around 50 percent of wetlands are estimated to have disappeared since 1900 !**

Wetlands and Climate Work sponsored by the World Bank in Latin America

- T&T: NARIVA Wetland Restoration Project
- Mexico: Adaptation to Climate Impacts in the Gulf of Mexico Wetlands
- Paramo (mountain wetland) ecosystem conservation in Northern Andes
- Amoya: Environmental Services Project

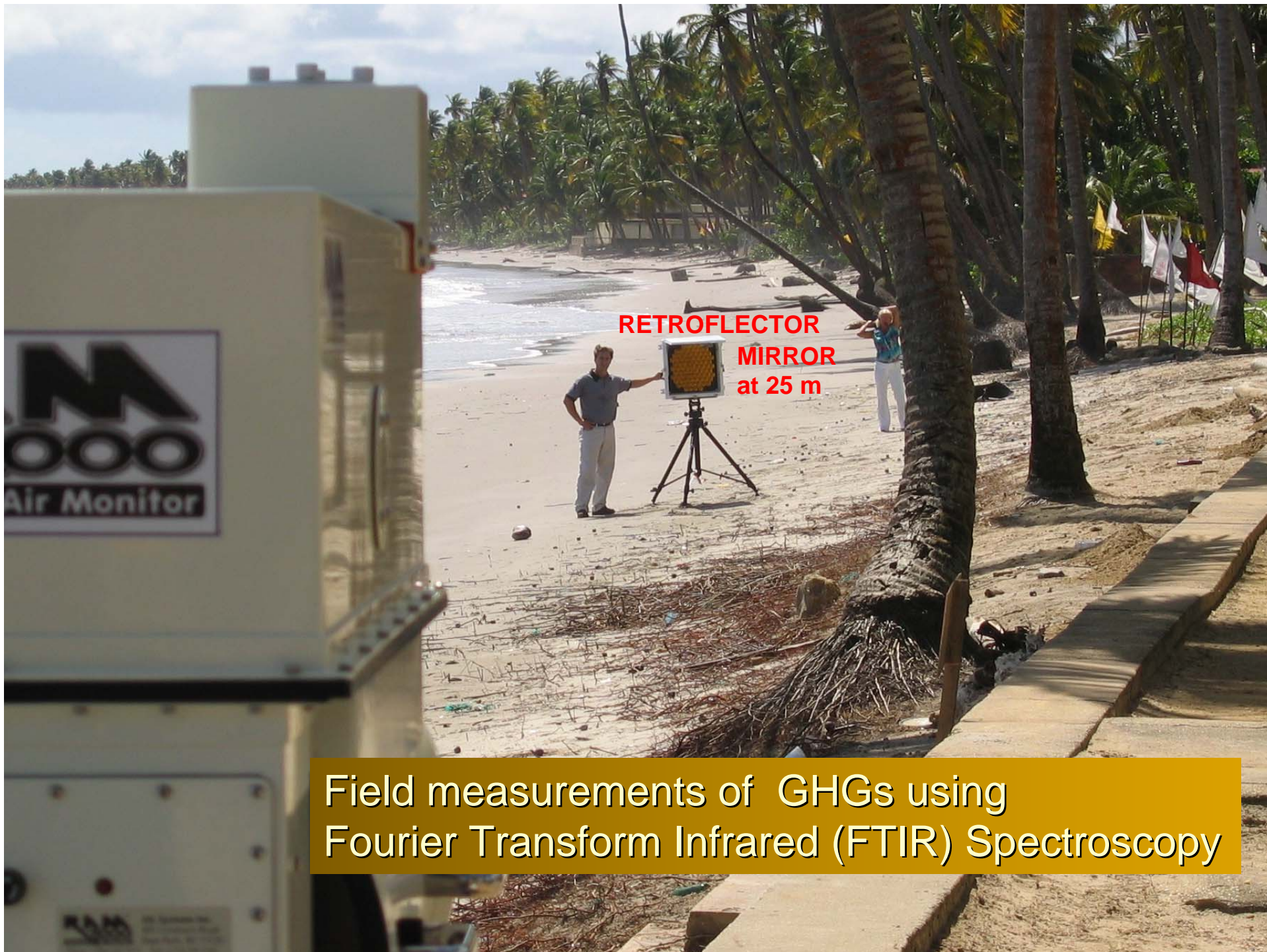
Trinidad & Tobago: Nariva wetland carbon sink/emission reduction project



16 km SSE the town of Sangre Grange on East Coast of Trinidad
(Map Sources: CIA World Factbook & Ducks Unlimited)

Nariva wetland carbon sink/emission reduction project

1. **Carbon sequestration through afforestation and reforestation of selected areas of the Nariva wetland ecosystem**
 - Increase the carbon stocks of the wetland
 - Activity will be monitored and certified through AR-AMS0003
 - Total asset 200,000 tons CO₂ until 2017 (sink) purchased by the BCF
2. **Emission reduction through restoration of surface hydrology**
 - Restoration of the wetland's natural drainage regime leading to increased dissolved oxygen and reduction of CH₄
 - The ERs documented through the use of FTRIS, using EPA protocol, for the measurement of CH₄ N₂O emissions from surface waters
 - A new CDM methodology is being developed as the basis for certified emission reductions
 - Total asset 80,000 tons CO₂

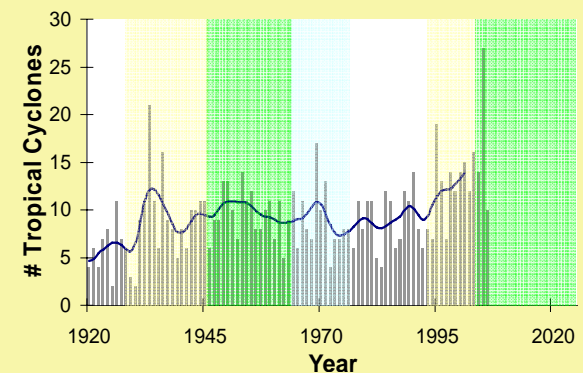


**RETROREFLECTOR
MIRROR
at 25 m**

Field measurements of GHGs using Fourier Transform Infrared (FTIR) Spectroscopy

Mexico: Adaptation to climate impacts in the coastal wetlands of the Gulf of Mexico

- Address impacts from subsidence and salination on the Gulf Coast of Mexico:
 - Restoration of natural surface drainage
 - Rationalization of water use
 - Regeneration of soil cover
 - Repopulation of associated reefs
 - New set asides
- Use wetlands as a carbon sink
 - Promote reforestation of mangroves



Mexico: Adaptation to climate impacts in the coastal wetlands of the Gulf of Mexico

Funding:
Special Climate
Change Fund
(SCCF),
NAWCA
Climate Change
Implementation
Grant

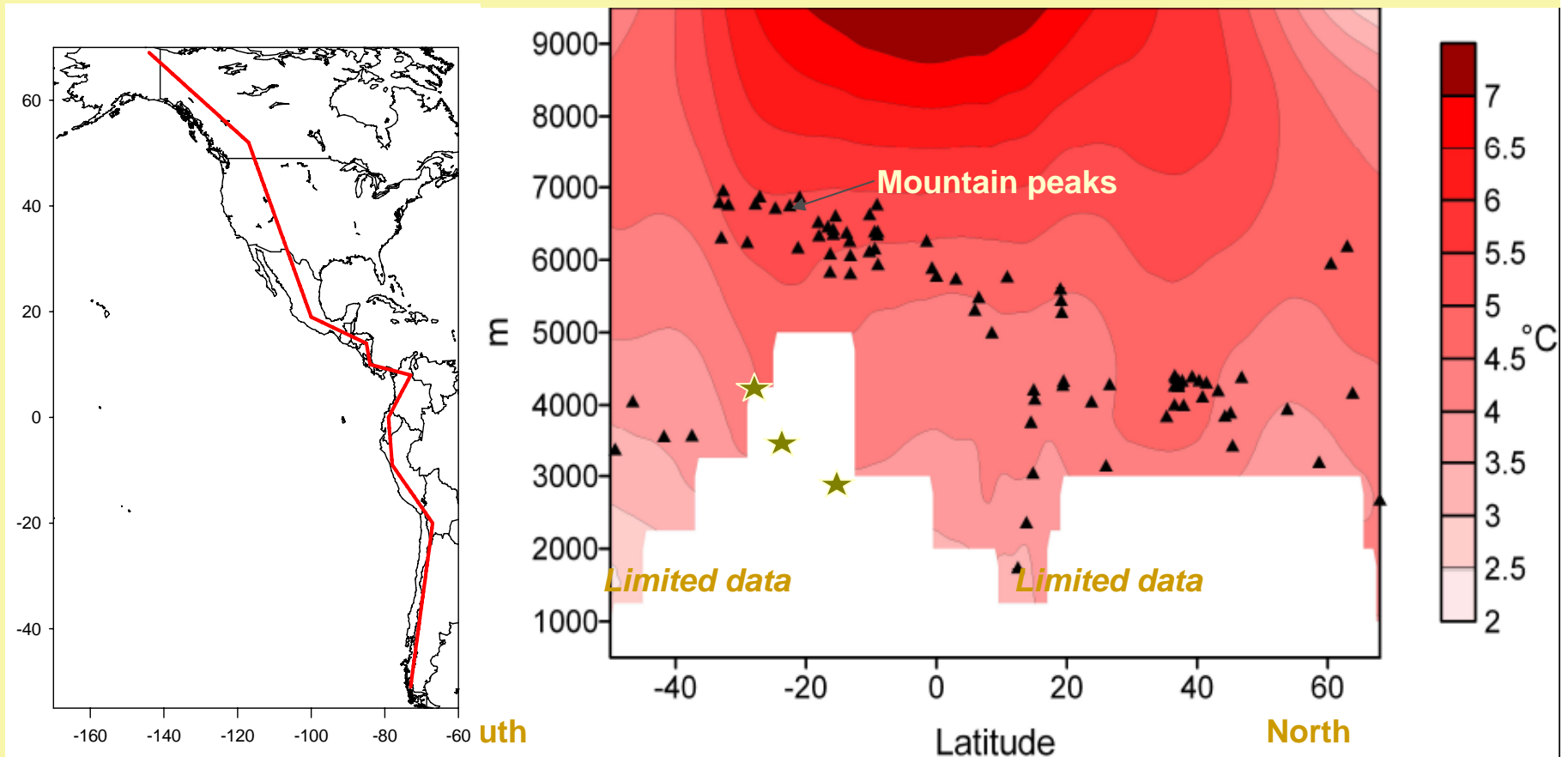


Mountain wetlands (Paramo) are affected by climate change

- Paramo is a mountain wetland with a unique assemblage of flora and fauna endemic to the Northern Andes;
- Paramo is an important reservoir of carbon;
- Paramo is a key source of water regulation for populations, agriculture, ecosystem integrity,



Mountain wetlands. GCMs project continuing and very fast warming of mountain ranges



8 member ensemble under A2 scenario

Source: *Bradley , et al 2006*

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



Activities

- (i) Restore and conserve natural ground cover in upper watersheds in Paramo ecosystems (Chingaza Paramo).
- (ii) Strengthen land management. Involve local community in management and conservation activities.
- (iii) Strengthen capacity to prevent and respond to mountain fires.
- (iv) Eliminate mining activities.

Rio Amoya Environmental Services Project



- Run of river unit (no reservoir)
- 75 MW 2 million t CO₂ e 515 Gwh/year; \$80 m investment
- Paramo enables power generation and CO₂ credits

HYDROLOGY

Monthly Average Flows

ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC	TOTAL
12.8	13.2	14.8	19.3	22.5	22.6	21.9	19.0	16.8	20.6	20.2	16.3	18.3



Protection of Paramo Las Hermosas



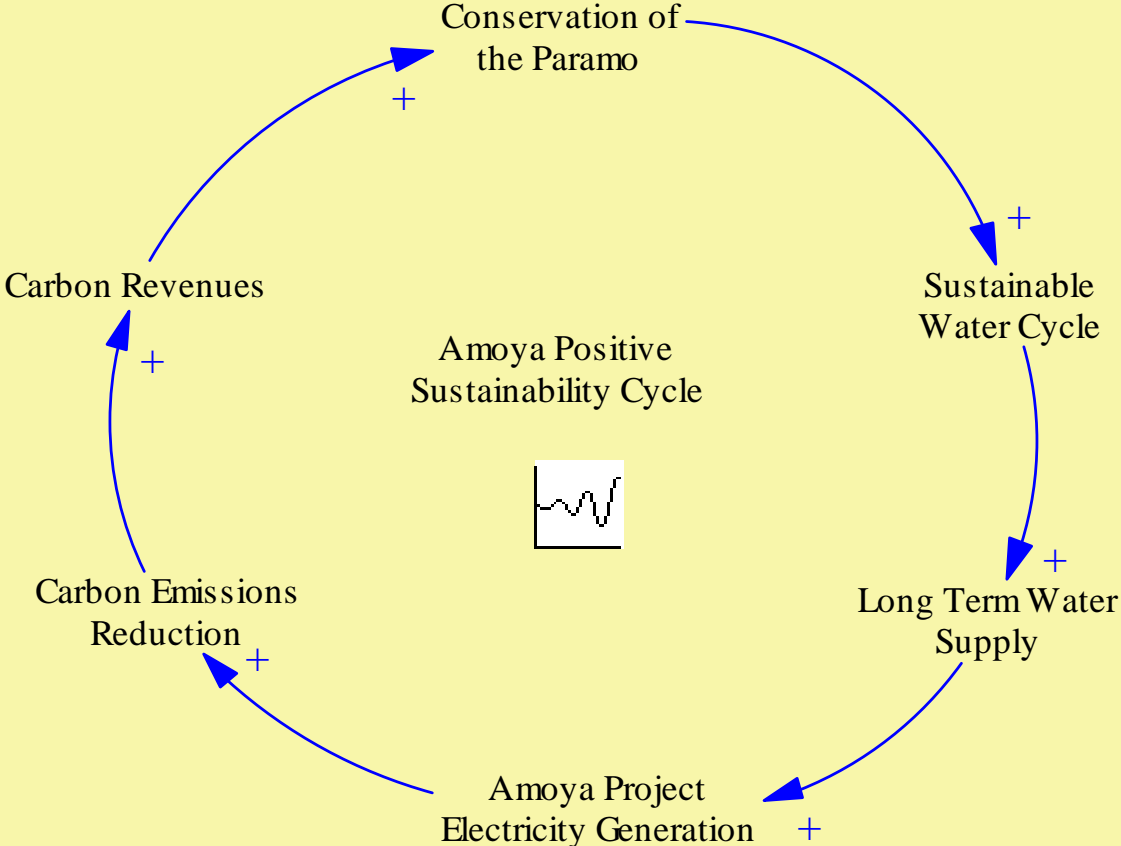
10% of CO2 revenues go to an adaptation Program for the Paramo and its buffer area

- Characterization and conservation of soil cover above 3500 m.
- Water and carbon cycle study and adaptation plan.
- Environmental education and awareness of the threats and services of Paramo in the area
- Conservation program for endangered megafauna
- Monitoring and conservation of small Vertebrates and plants
- Recovery of original ichthyofauna

Colombia: Integrated National Adaptation Project



Sustainability cycle for Amoya Environmental Services Project



Conclusions

- Wetlands are a critical element of carbon (natural carbon sinks) and water cycles at a regional scale
- Wetlands are depositories of biodiversity of global value
- These ecosystems constitute a logical foci to combine the climate and biodiversity agendas
- More resources, technical and financial are required to assess and protect the services provided by wetlands

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