

Keeping fossil fuels underground: Innovative options for mitigation



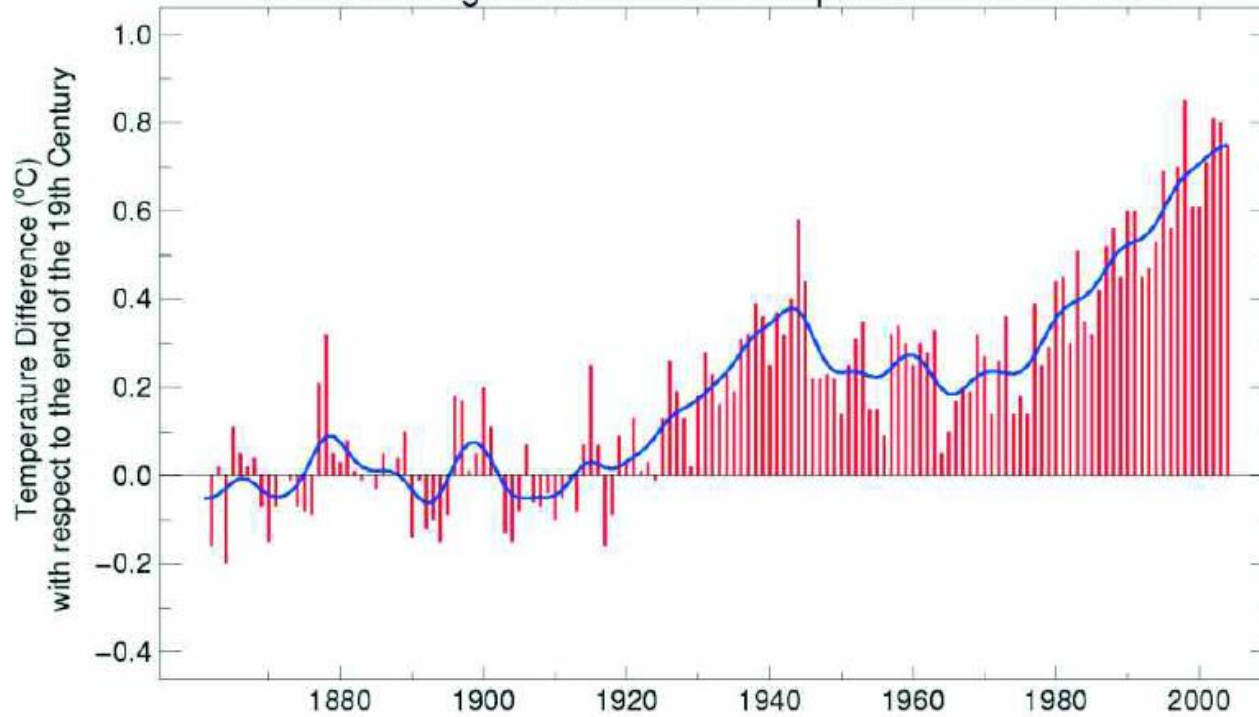
Carlos Larrea
Universidad Andina Simón Bolívar

Global Warming: 1861-2004

Strong global warming observed since 1975



Global Average Near-Surface Temperatures 1861–2004



Temperature, methane and CO₂: geologic evidence

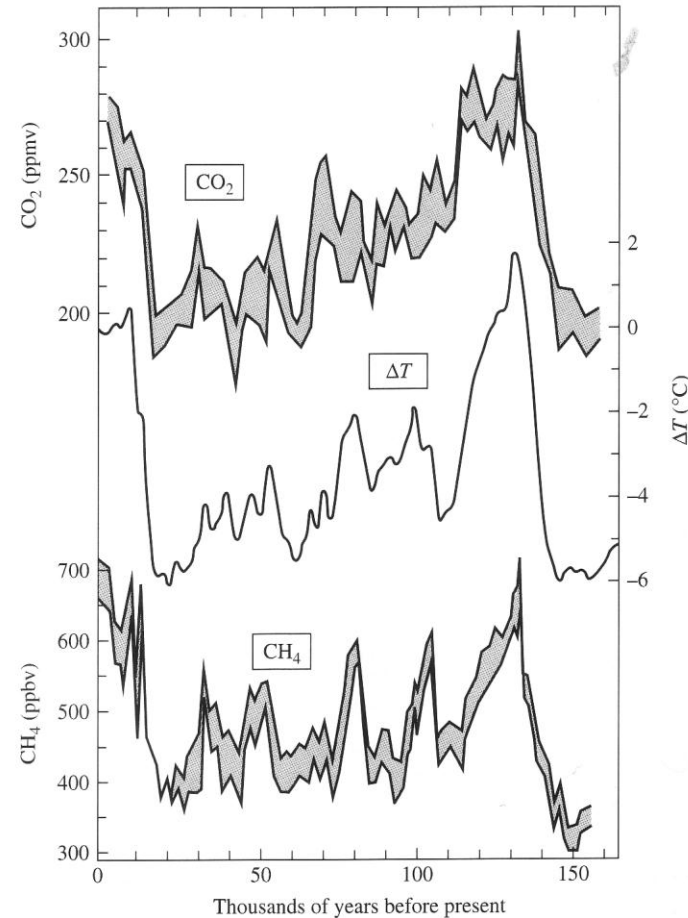


Figure 6.21 Antarctic ice-core records of local atmospheric temperature, and corresponding air concentrations of carbon dioxide and methane for the past 160,000 years. Source: J. T. Houghton et al., eds. (1990). *Climate Change: The IPCC Scientific Assessment* (Cambridge, U.K.: Cambridge University Press).

Temperature, methane and GHG: recent evidence

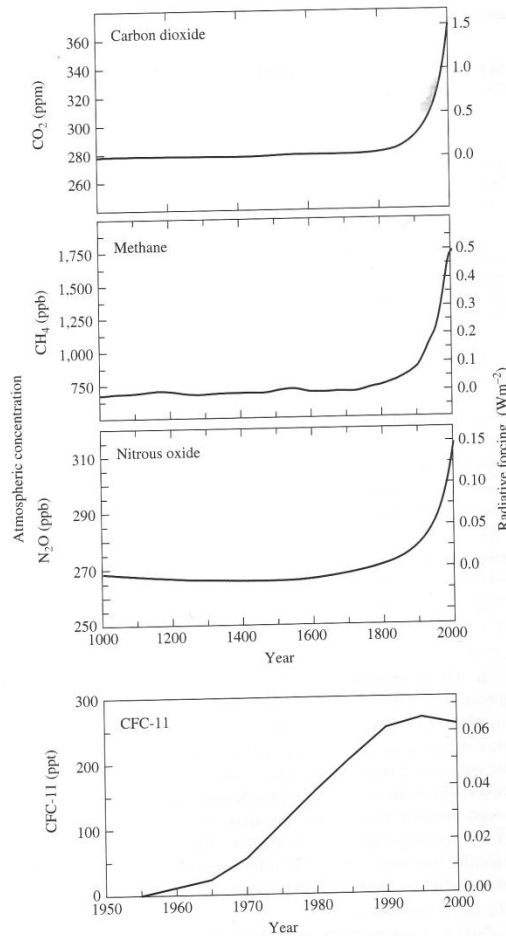
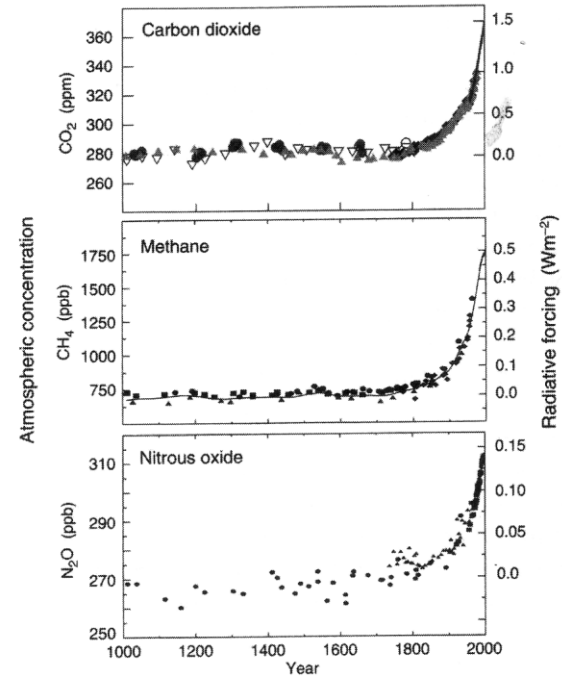
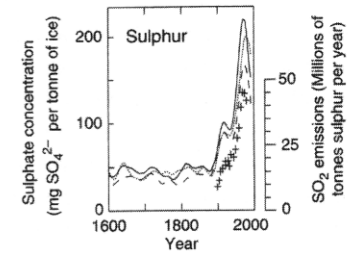


Figure 6.16 Estimated historical concentrations of major greenhouse gases. Carbon dioxide, methane, and nitrous oxide are natural components of the atmosphere, and their concentrations began to rise above background in the nineteenth century at the dawn of the Industrial Revolution. The chlorofluorocarbons (CFCs) are synthetic compounds without a natural component. Their atmospheric emissions began in the 1950s when they entered the world market in a variety of products. Source: A Report of Working Group I of the Intergovernmental Panel on Climate Change (IPCC) (2000). *Summary for Policymakers* (Geneva, Switzerland: World Meteorological Organization/United Nations Environment Programme). (<http://www.unep.ch/ipcc/pub/spm22-01.pdf>)

(a) Global atmospheric concentrations of three well mixed greenhouse gases

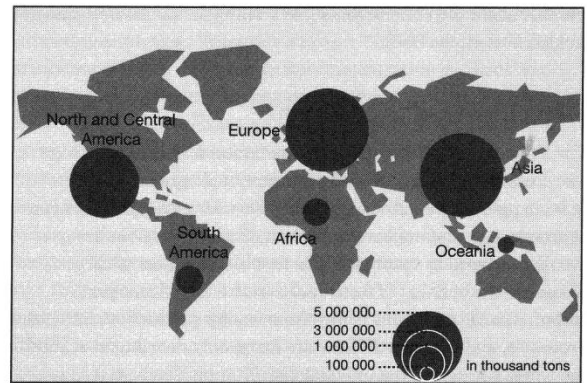


(b) Sulphate aerosols deposited in Greenland ice

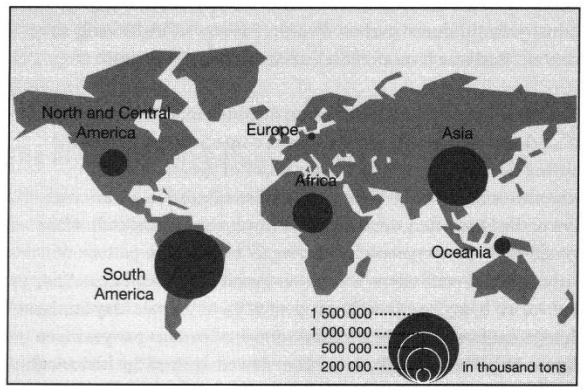


3. Indicators of the human influence on the atmosphere composition during the industrial era

Deforestation, fossil fuel combustion and CO₂ emissions

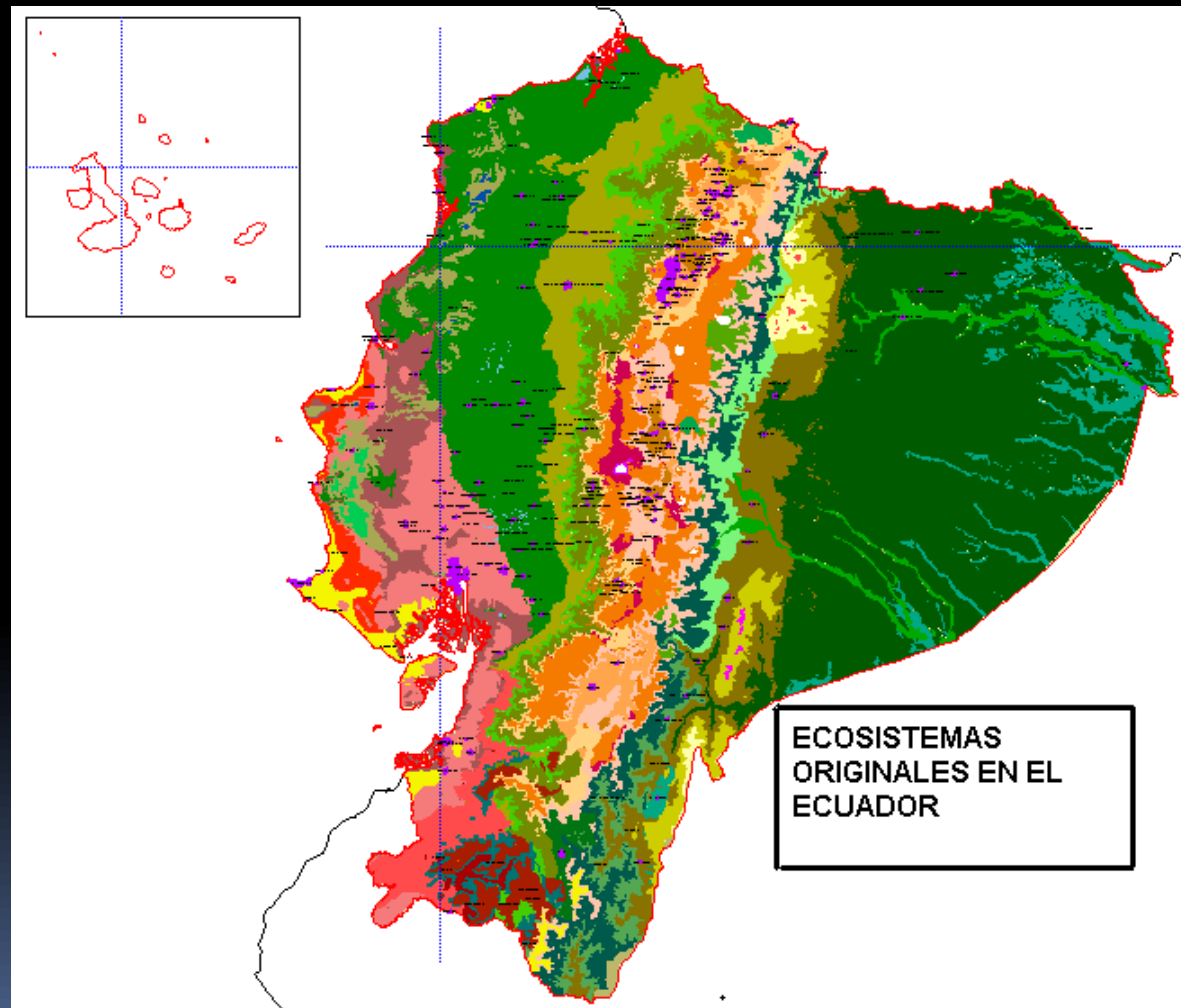


4a. CO₂ emissions from industrial processes

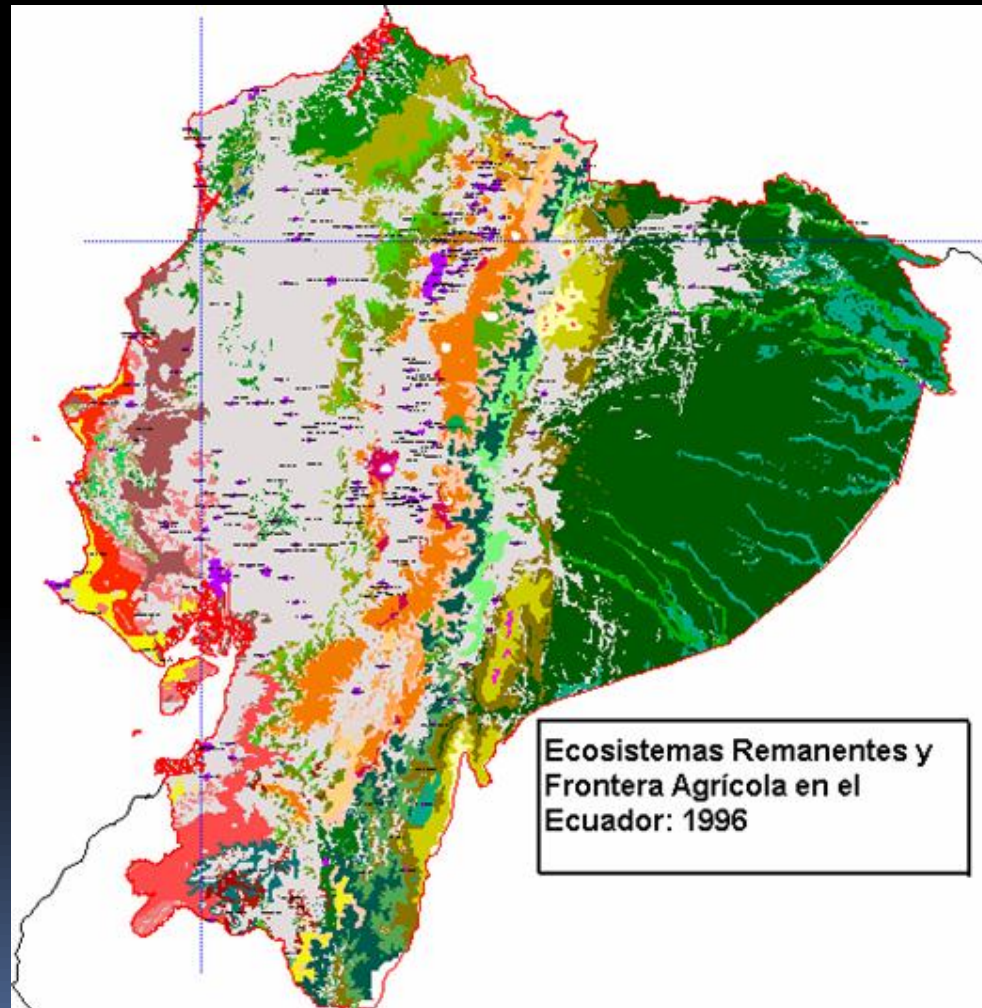


4b. CO₂ emissions from land-use change

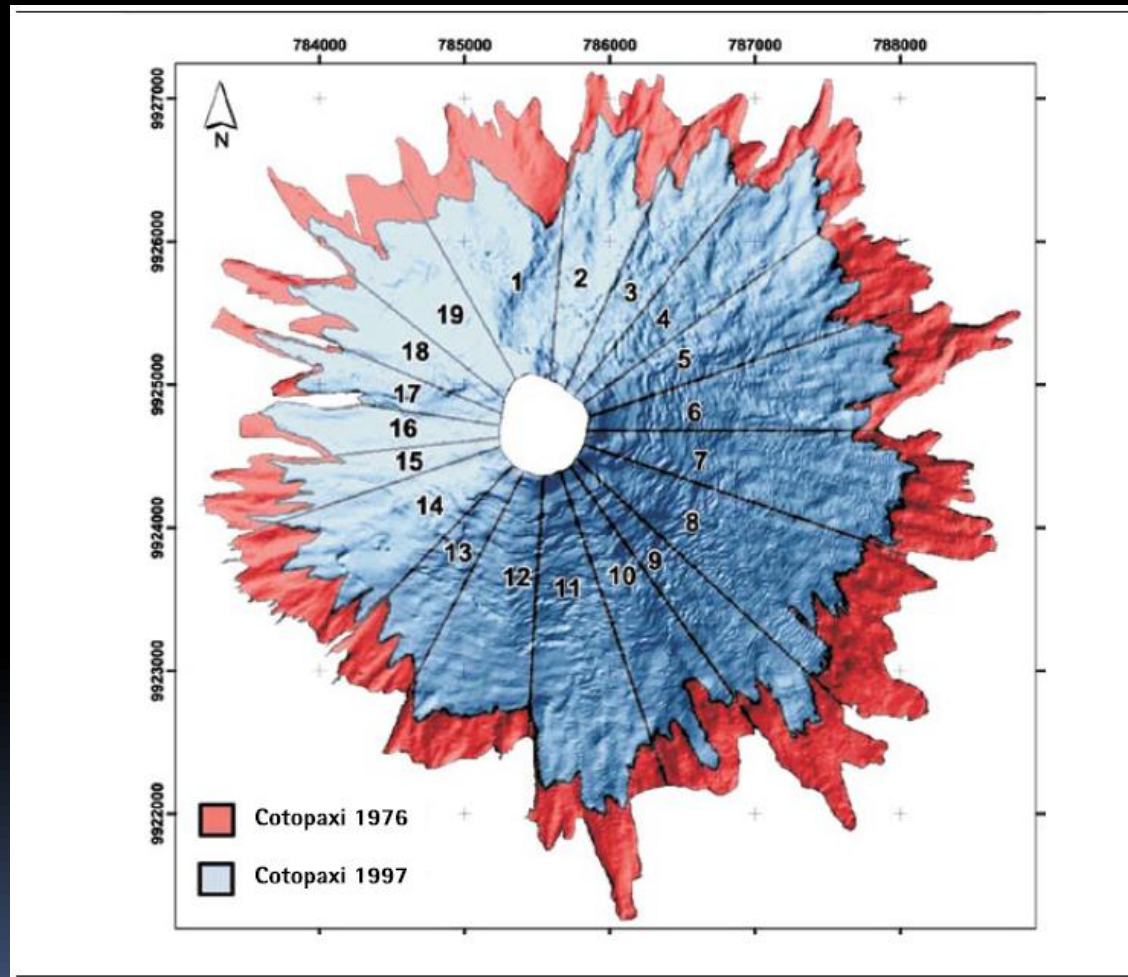
Original Ecosystems in Ecuador



Remaining Natural Formations: Ecological Footprint

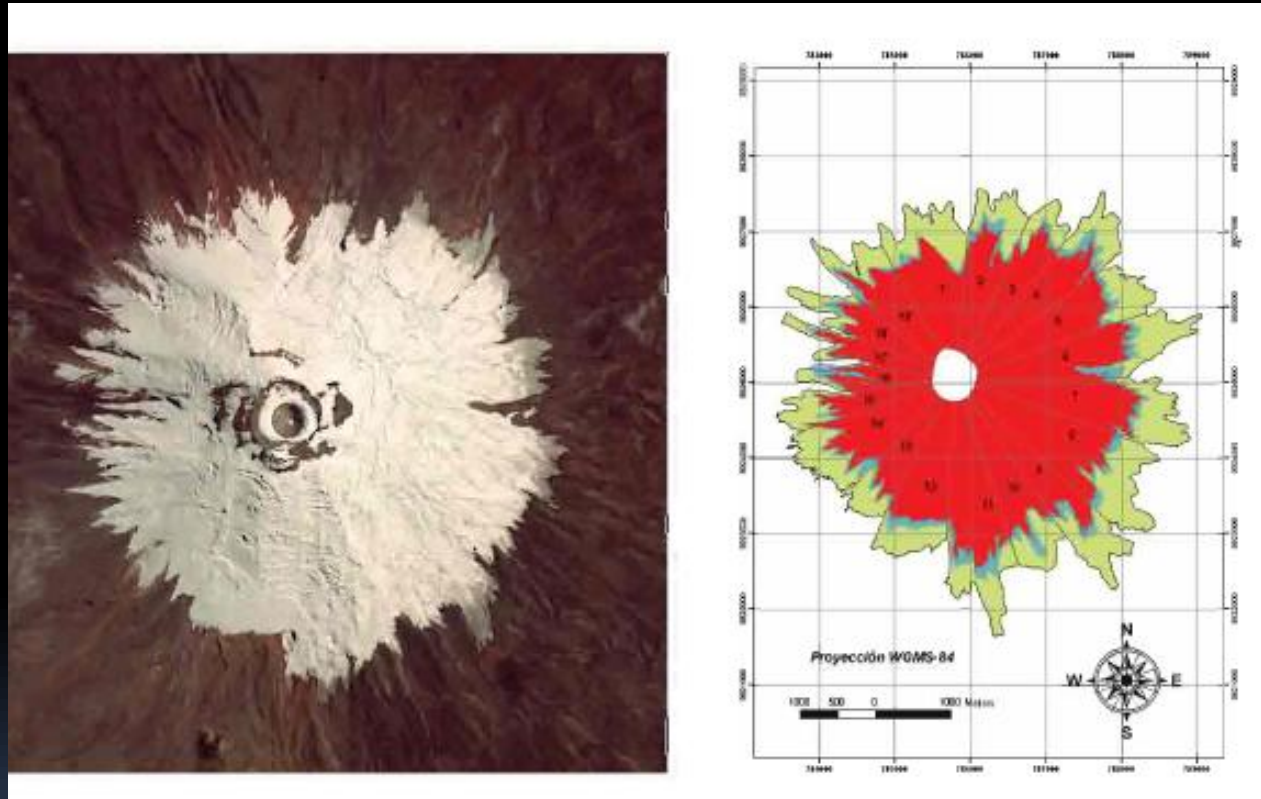


Andean Glaciers: Cotopaxi



Fuente: CAN-PNUMA-IRD-AECI. *¿El fin de las cumbres nevadas? Glaciares y cambio climático en la Comunidad Andina.* Lima, CAN, 2007.

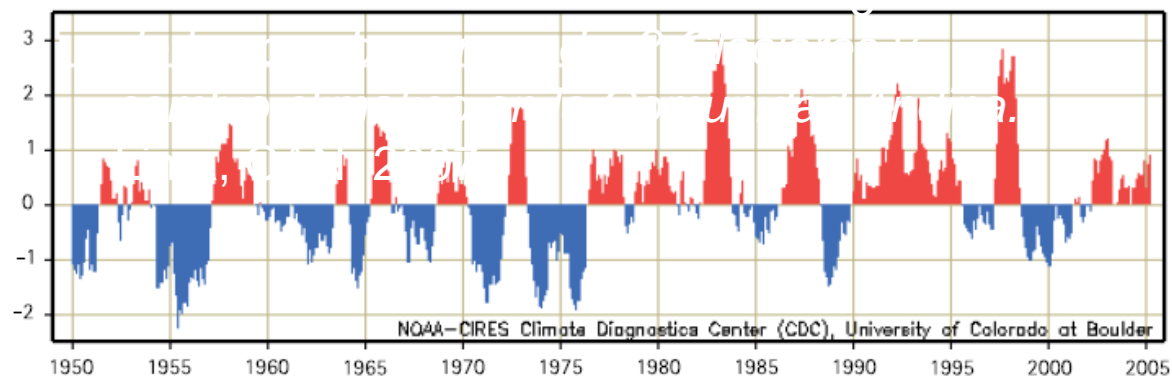
Cotopaxi Glaciers : IRD



* Mapa del retroceso de los glaciares del Cotopaxi. En amarillo, azul y rojo, las extensiones de esos glaciares en 1976, 1997 y 2006 respectivamente. La superficie de glaciares alcanzaba 21,8 km² en 1976, 15,4 km² en 1997 (-30%), y 11,8 km² en 2006 (-45%). [Jordan et al., 2005, actualizado por Cáceres, 2010]

ENSO: El Niño Index from 1950 to 2006

- Índice Multivariado del ENSO entre 1950 y 2005



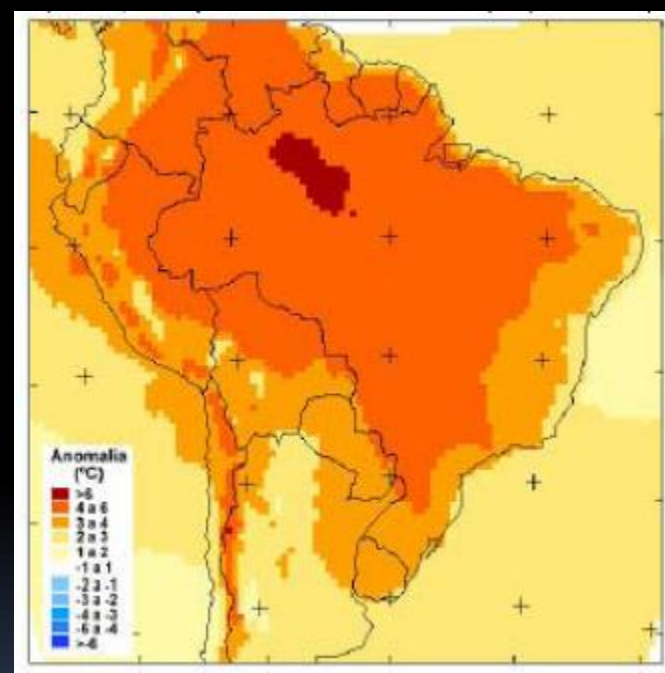
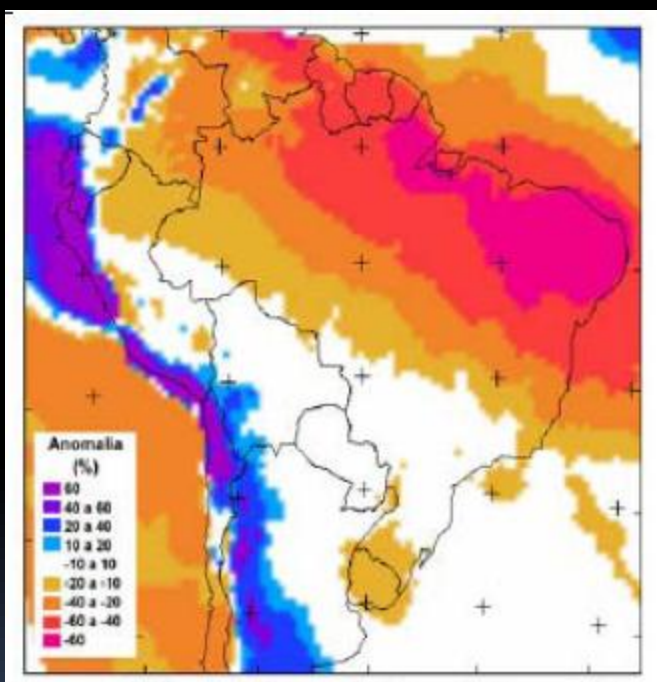
Fuente: Klaus Wolter; NOAA-CIRES

Fuente: CAN-PNUMA-IRD-AECI. *¿El fin de las cumbres nevadas? Glaciares y cambio climático en la Comunidad Andina.* Lima, CAN, 2007.

IPCC 2070-2100 Scenarios : A2

Precipitation

Temperature



Climate Change and the Amazon

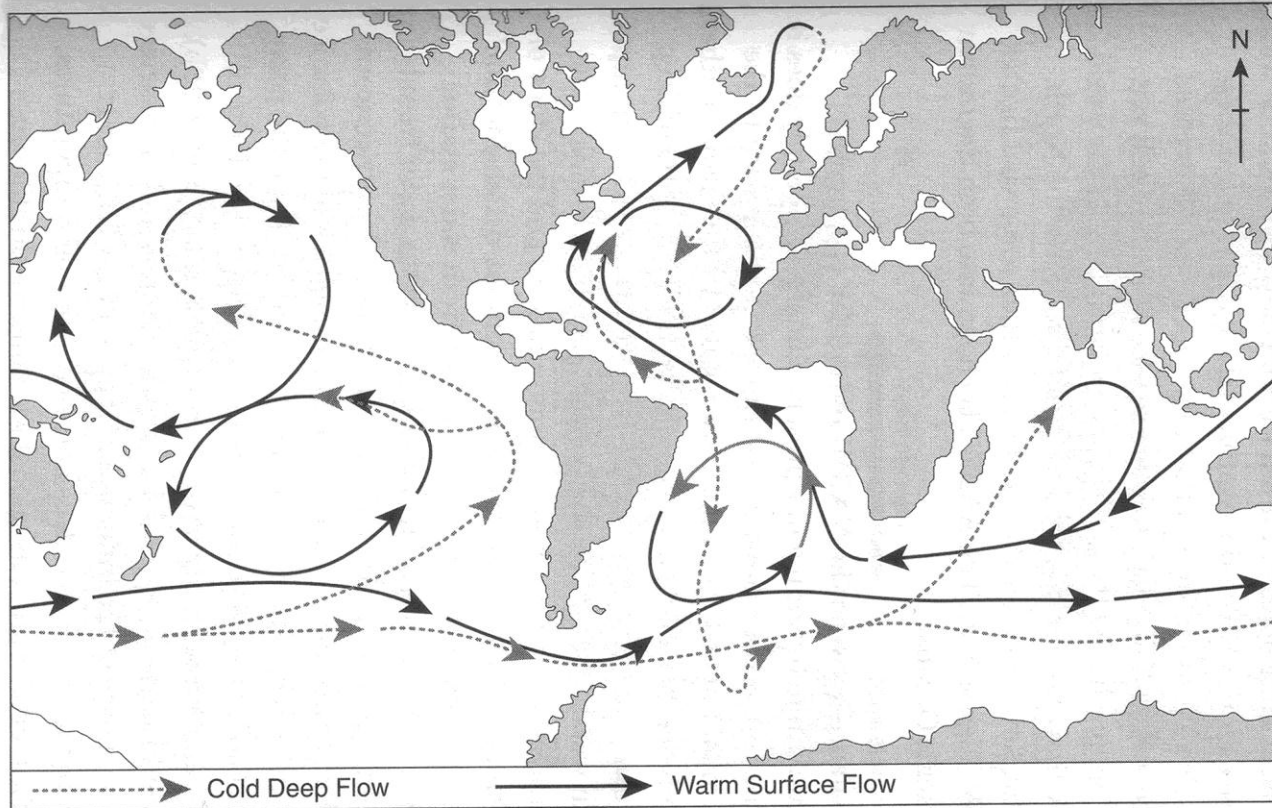
- As a result of climate change, the Amazon basin will turn hotter, drier and more instable.
- Rainforest cover may be turned to grassland in about 30% to 60% of Amazon basin (WWF, *Climate Change Impacts in the Amazon: Review of Scientific Literature*, 2006).
- Taking into account deforestation, the effect can be higher.
- As a consequence, about one million species, equivalent to up to 25% of global biodiversity, may disappear (Pounds & Puschendorf, "Clouded Forests", *Nature*, V. 427, January 8, 2004).

Flooding risk: Guayas basin, Ecuador's coast.



Fuente: CIIFEN (www.ciifen-int.org)

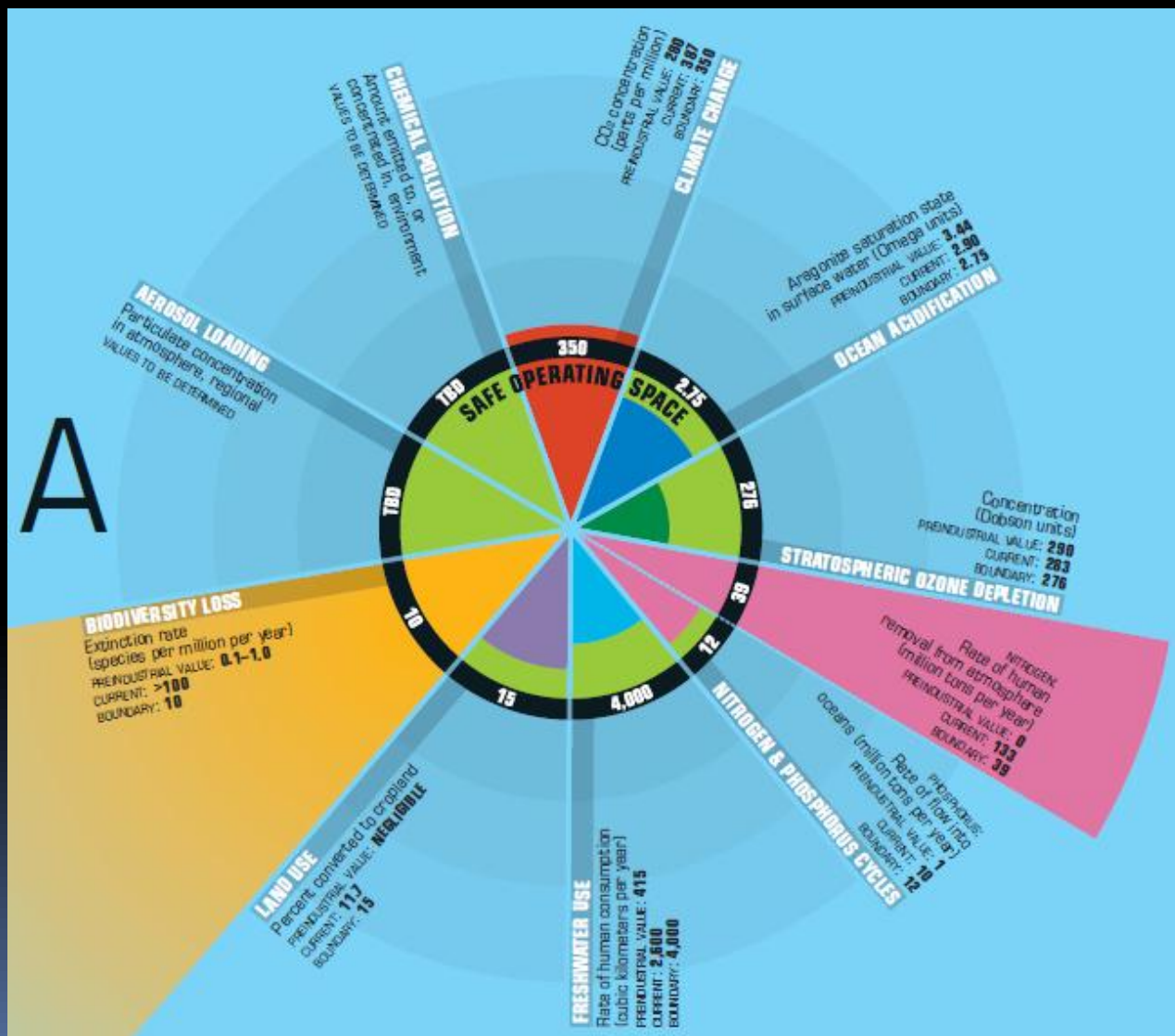
Sea currents and global distribution of heat



22. The deep circulation of the ocean, termed the oceanic conveyor belt

Planetary Boundaries

Stockholm Environment Institute



Kyoto mechanisms did not reduce emissions: Alternative options are necessary

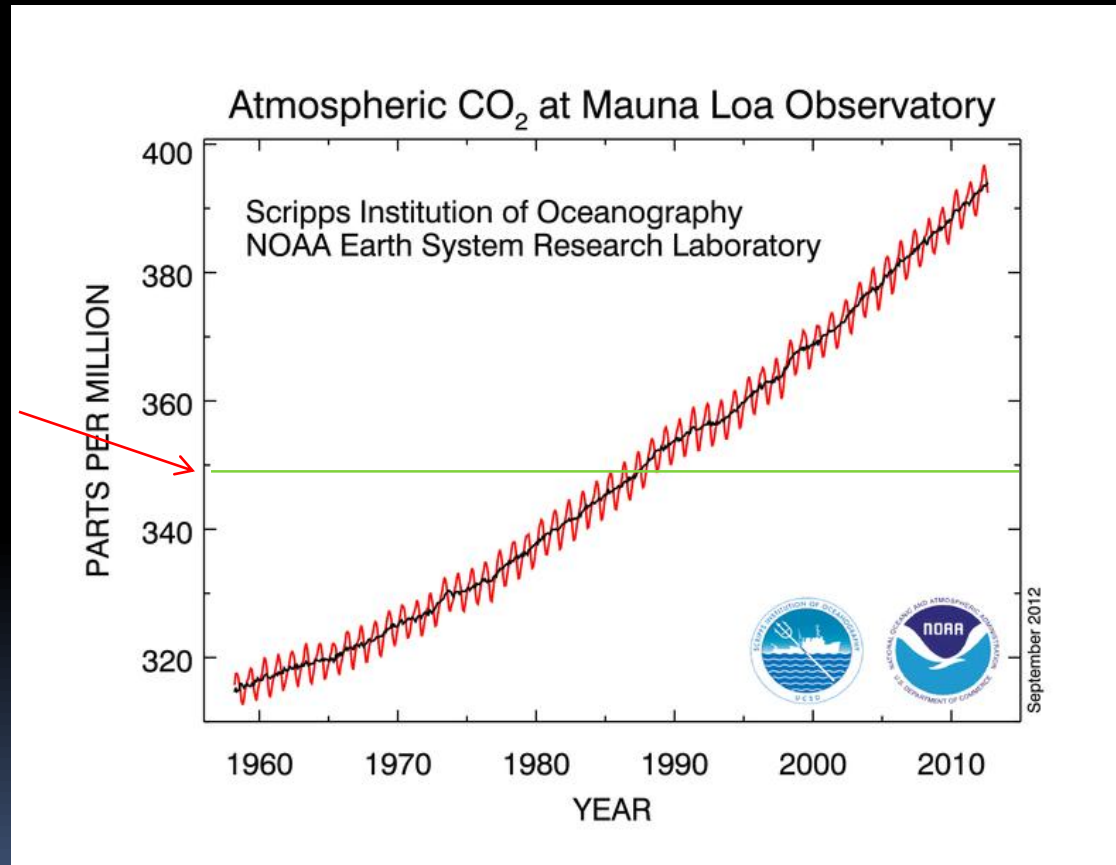
Global CO₂ Emissions: 1900 - 2008

Source: EPA



CO₂ Concentrations Exceed Safe Limits

Maximum safe
limit: 350 ppm



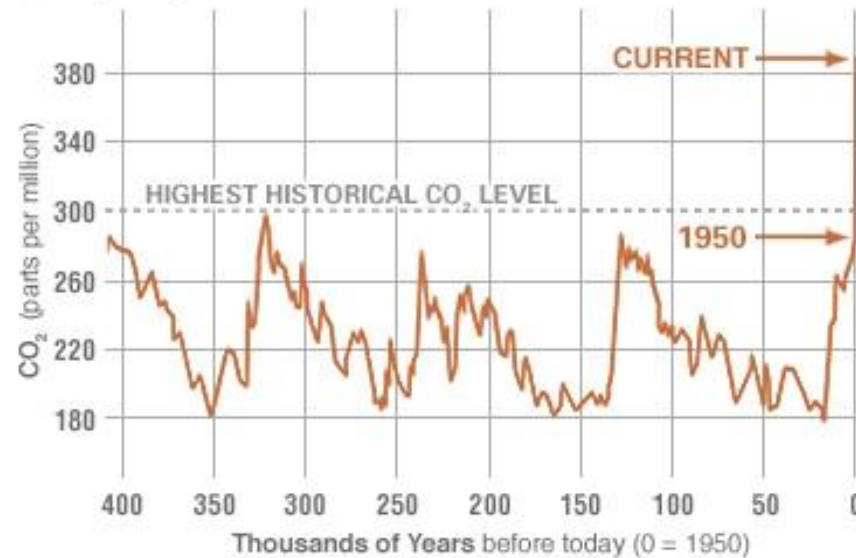
Current CO₂ Concentrations: The Highest in 350,000 years

CO₂ Concentrations, the Highest in 350,000 years

Source: NASA

Data source: Reconstruction from ice cores.

Credit: NOAA



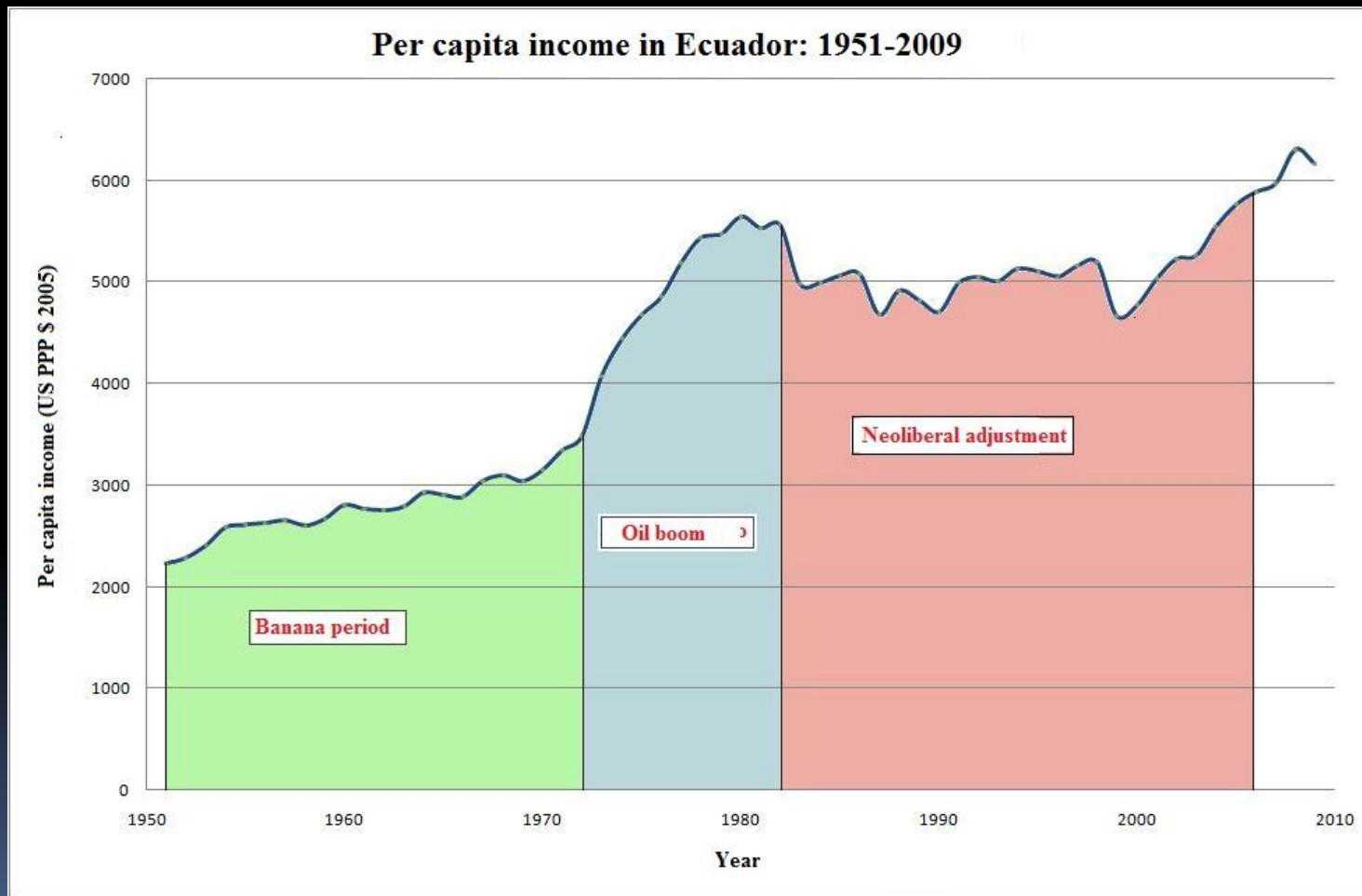
The Yasuni - ITT Initiative

- Large reserves of heavy oil have recently been confirmed in the Yasuni National Park, the most biodiverse hot spot in the western hemisphere, and home of two still isolated indigenous cultures.
- The Ecuadorian government decided, as a first option, to keep the oil underground, asking for an international contribution, equivalent to at least 50 % of the potential revenues of oil extraction.
- The proposal was presented to the United Nations by President Correa on September 2007.

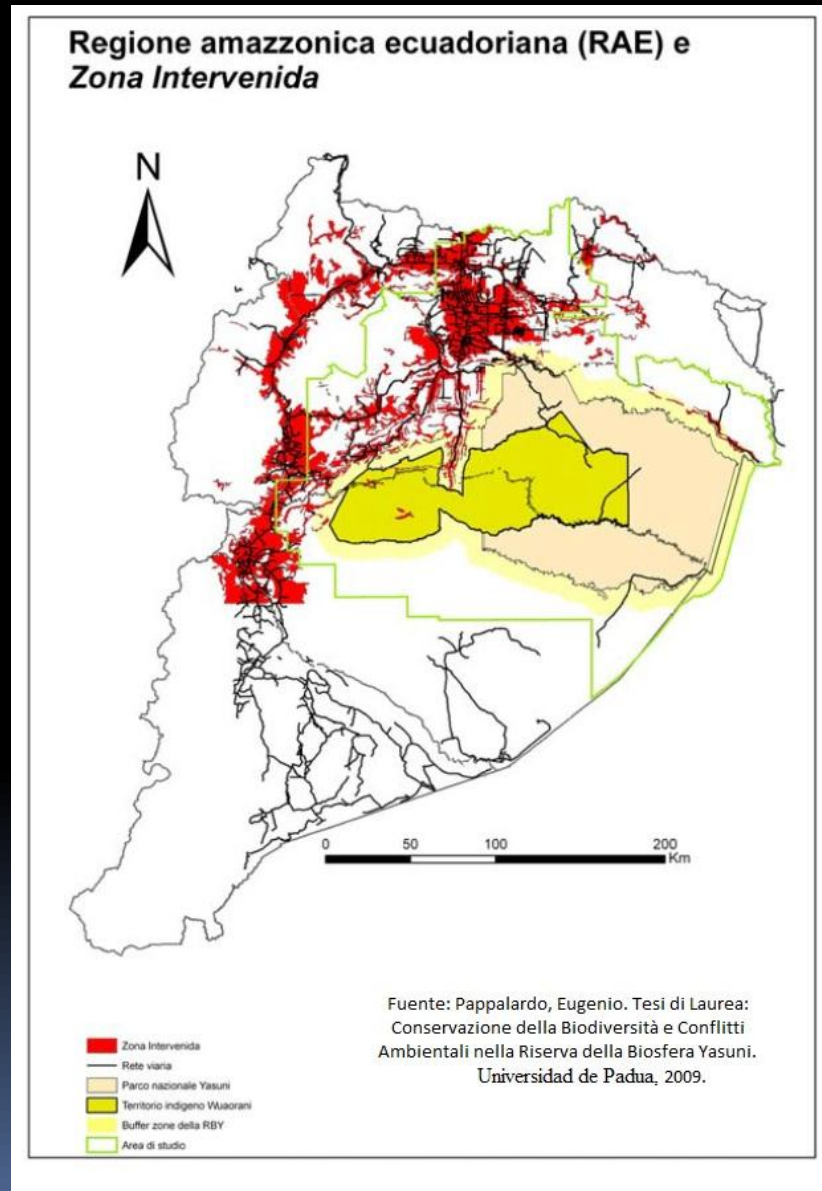
Oil, economy and society

- Current situation:
 - Record oil production: 529.000 b/d in 2006.
 - High oil prices: \$ 90/barrel (WTI)
 - Poverty: 38%, Urban underemployment: 47%. Difficulties to reach MDGs.
 - At least a million Ecuadorians have emigrated abroad since 1998.
 - ¿Did we sow oil?
 - Most comparative studies (Sachs, Thorp, Berry) point out serious development constraints in oil exporting economies.

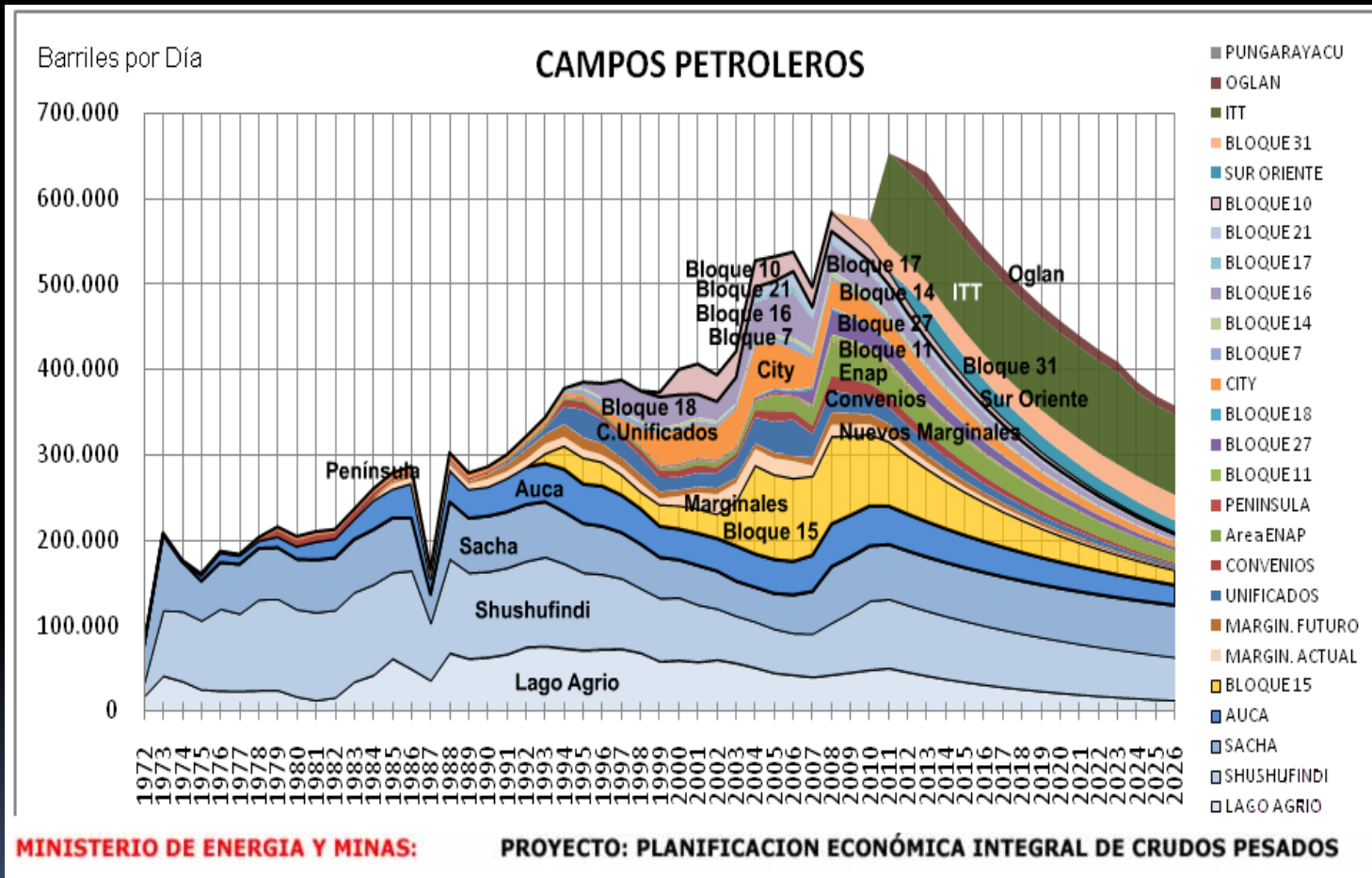
Per Capita Income in Ecuador: 1950-2009



Amazon Deforestation and the Yasuni Park



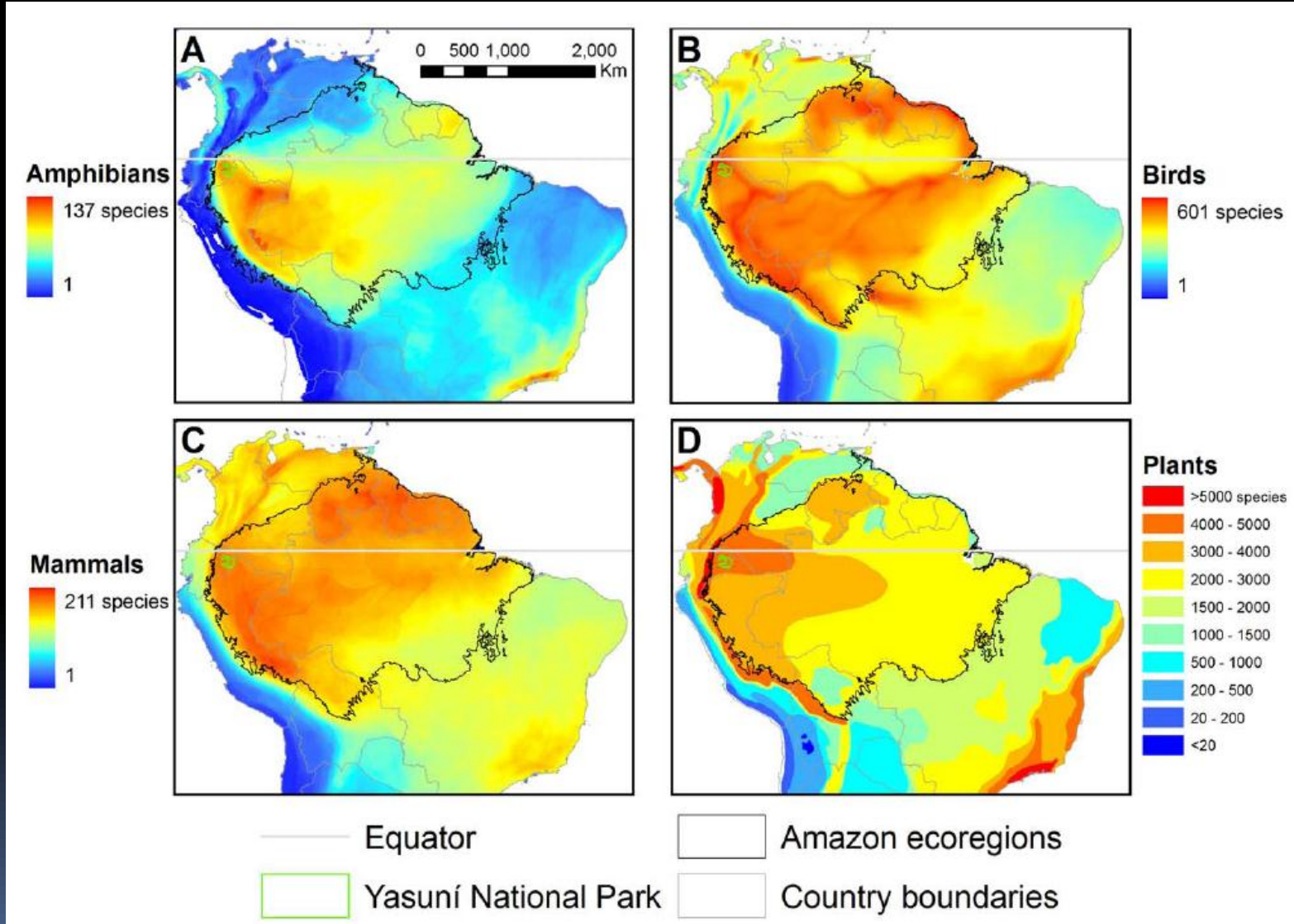
Oil Extraction Prospects in Ecuador



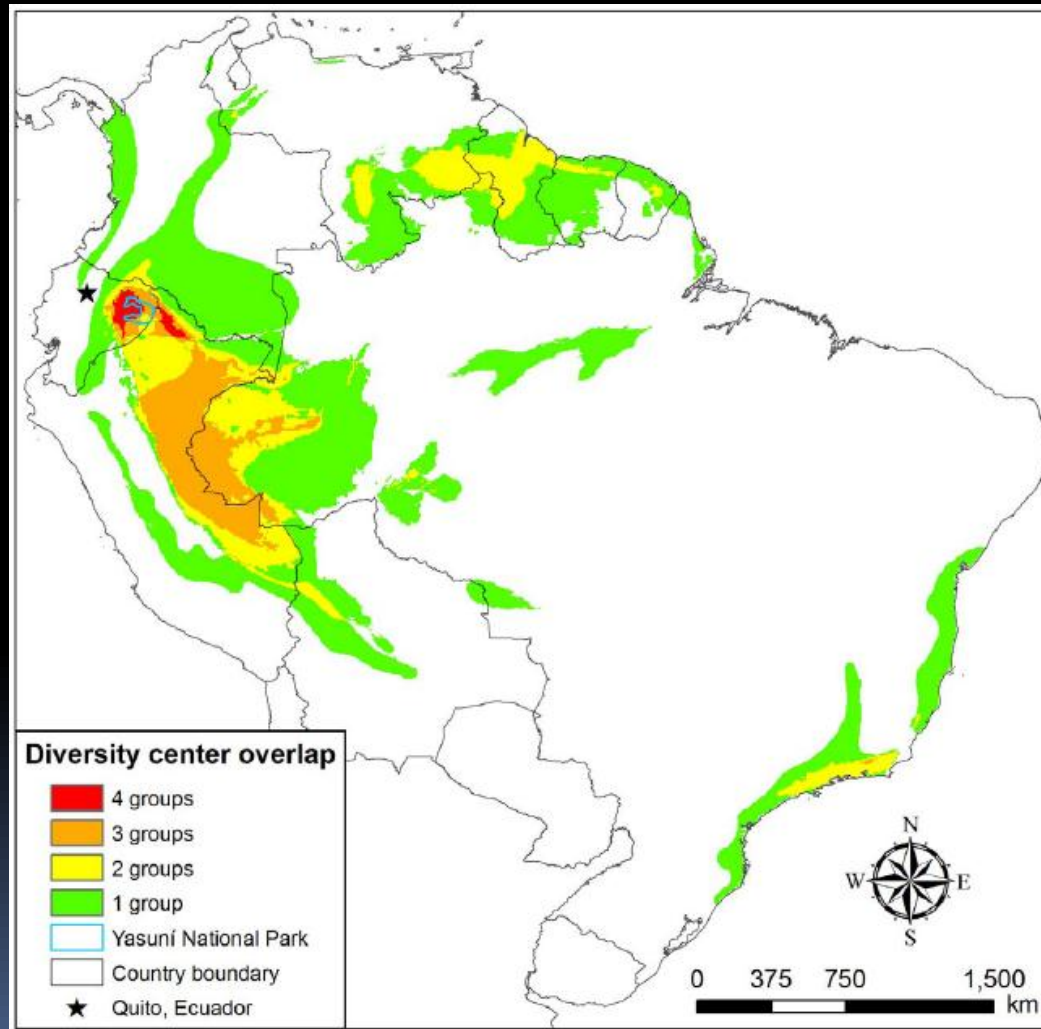
The Yasuní National Park Endowment

- **The most diverse area in the world.**
- **One hectare in the park contains as many tree species as the United States and Canada together.**
- **150 species of amphibians, 121 of reptiles, 596 of birds, about 200 of mammals, 500 of fish and 4.000 plants have been identified in the Yasuni Park.**
- **It was a biodiversity refuge during the Pleistocene period, when most of the Amazon rainforest became grasslands due to glaciations.**
- **Home of two voluntarily isolated and not contacted indigenous cultures: the Tagaeri and the Taromenane.**

Biodiversity of Yasuni Park



Yasuni biodiversity overlap map



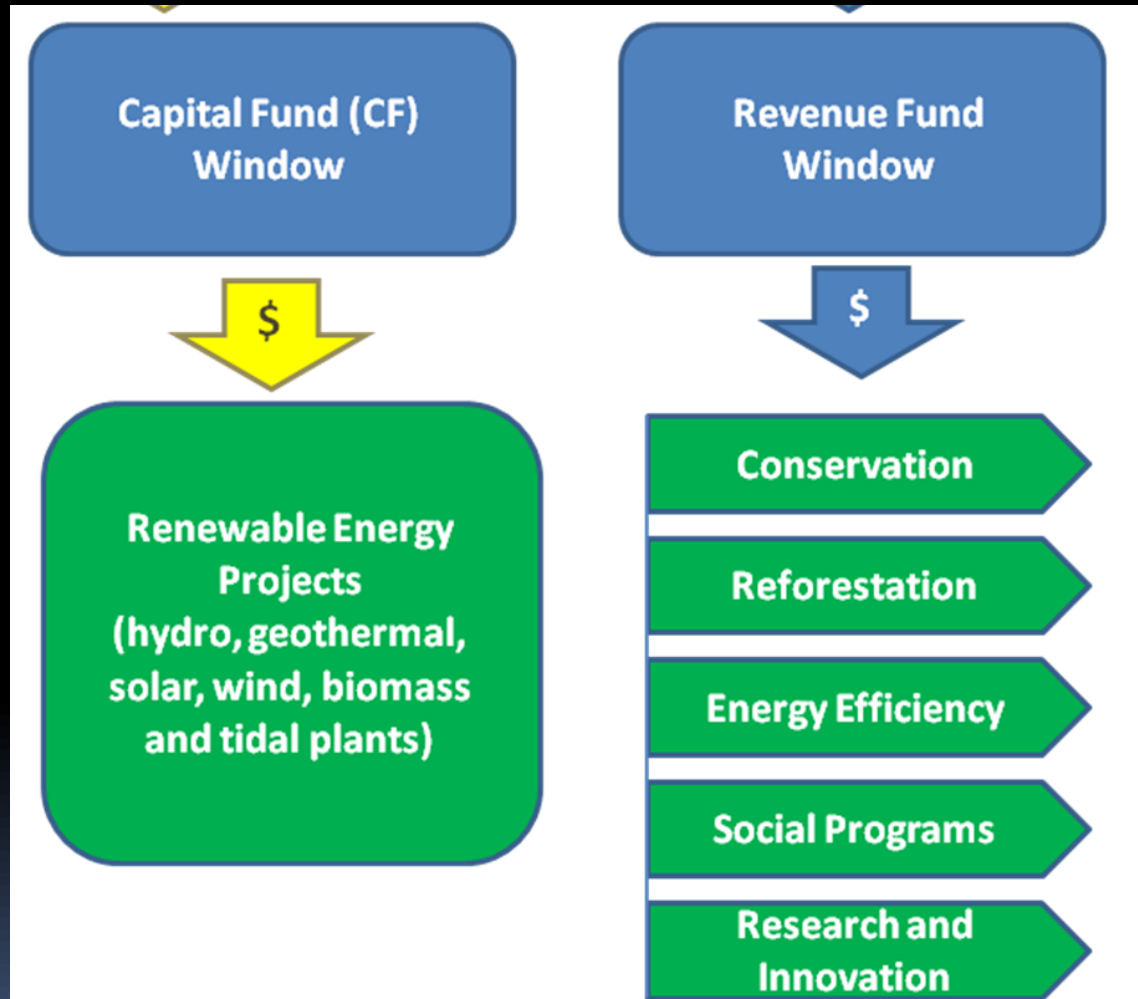


Opisthocomus Hoazin

Basic traits of Yasuni-ITT Initiative

- Ecuador's Binding commitment : keeping indefinitely ITT reserves underground.
- An holistic proposal:
 - Climate change,
 - biodiversity,
 - Social development,
 - Indigenous cultures.
- It is not compatible with current Kyoto mechanisms (CDMs), It poses new ways of mitigating CO₂ emissions, by avoiding exploitation of fossil fuels in sensitive areas of developing countries.

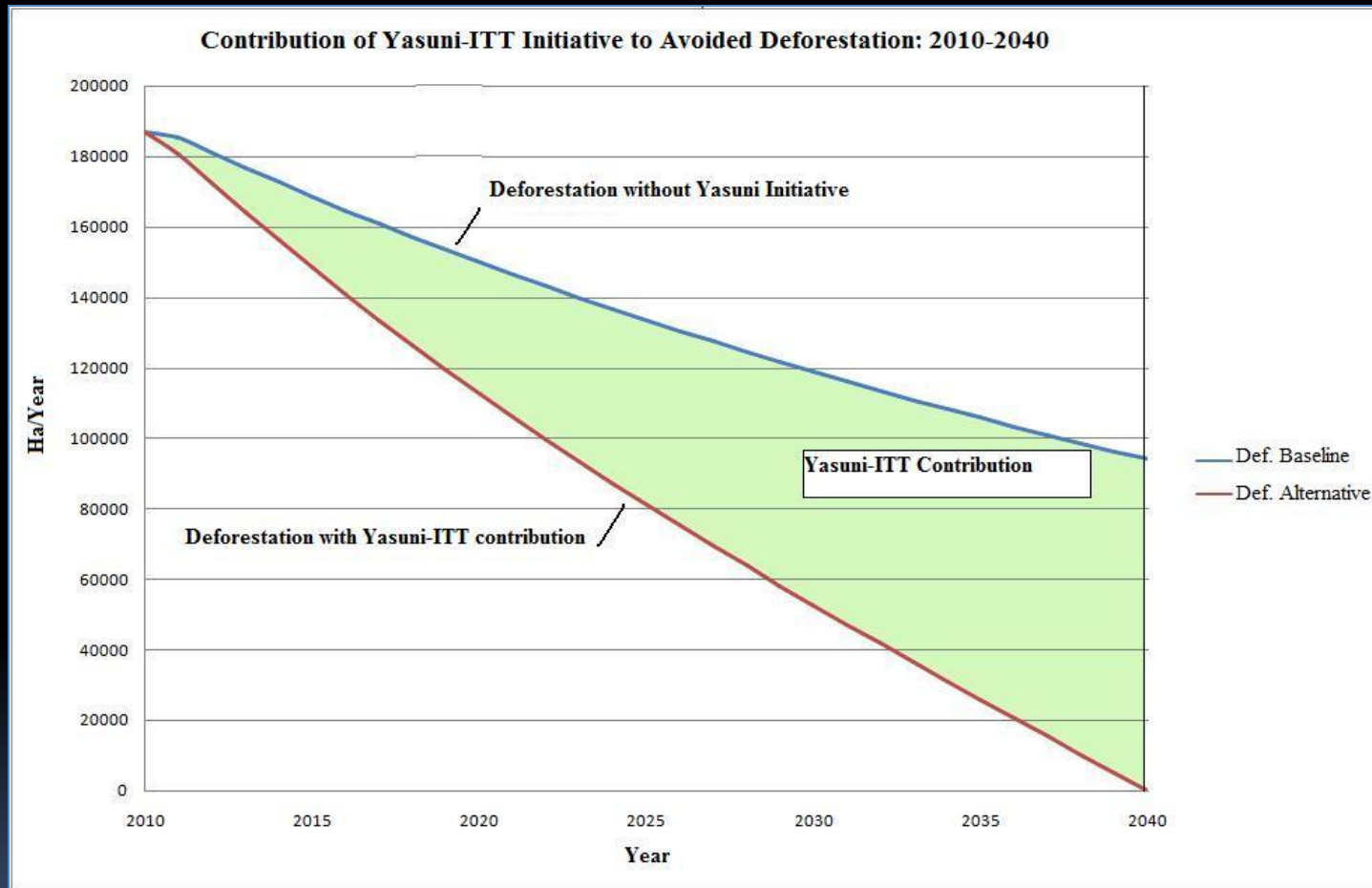
Structure of Yasuní Fund



CO₂ avoided emissions

- The ITT field contains **846** million barrels of **heavy crude** reserves (14.7° API), that can reach 1,500 million, including probable reserves.
- Keeping the reserve underground will prevent the emission of **407** million tonnes of CO₂.
- Additional mitigation from avoided deforestation can reach **800** million tonnes of CO₂ in 30 years.

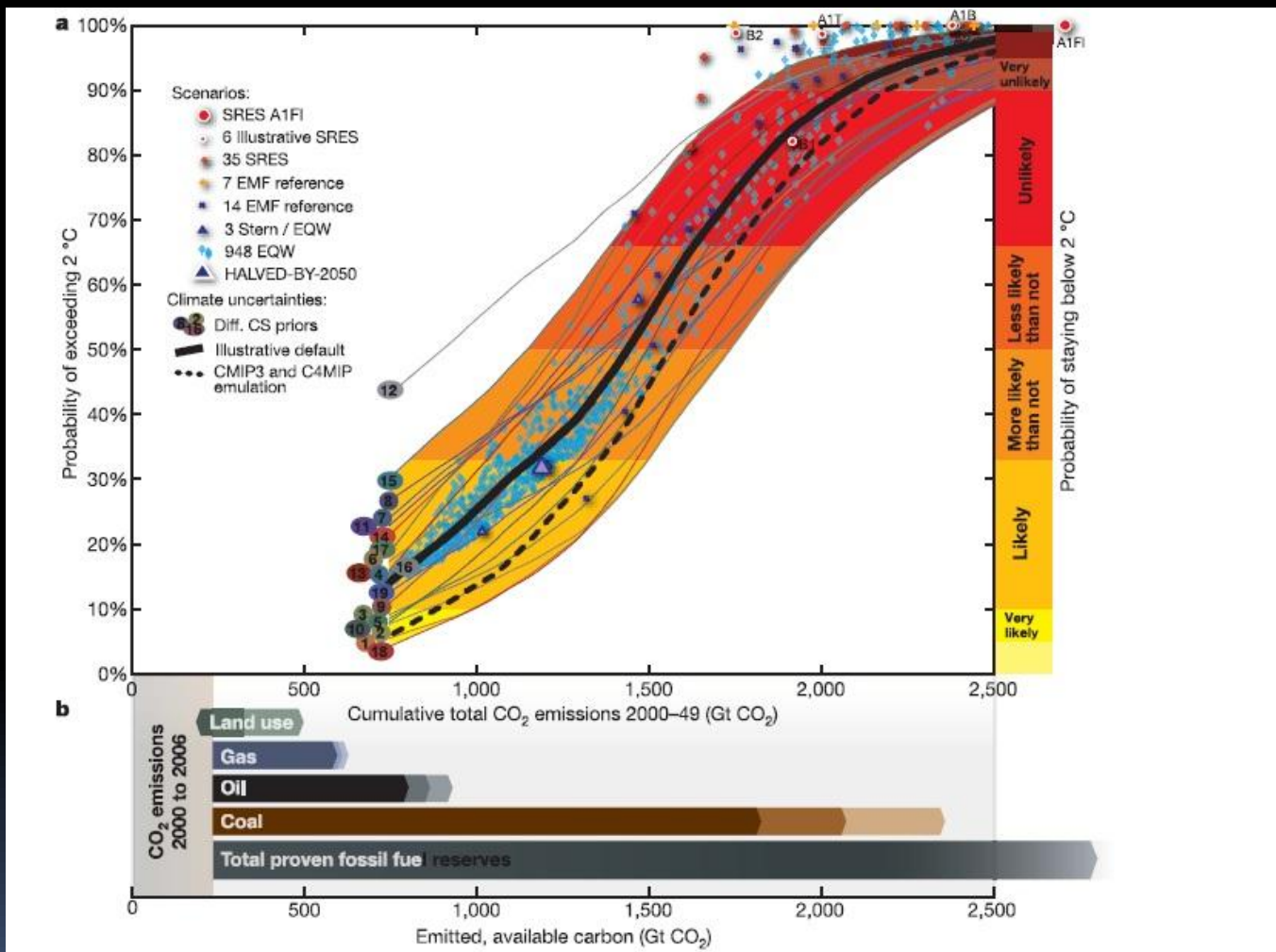
Mitigation from avoided deforestation: 2010-2040



Ecuador's Yasuní project, an innovative proposal to mitigate climate change

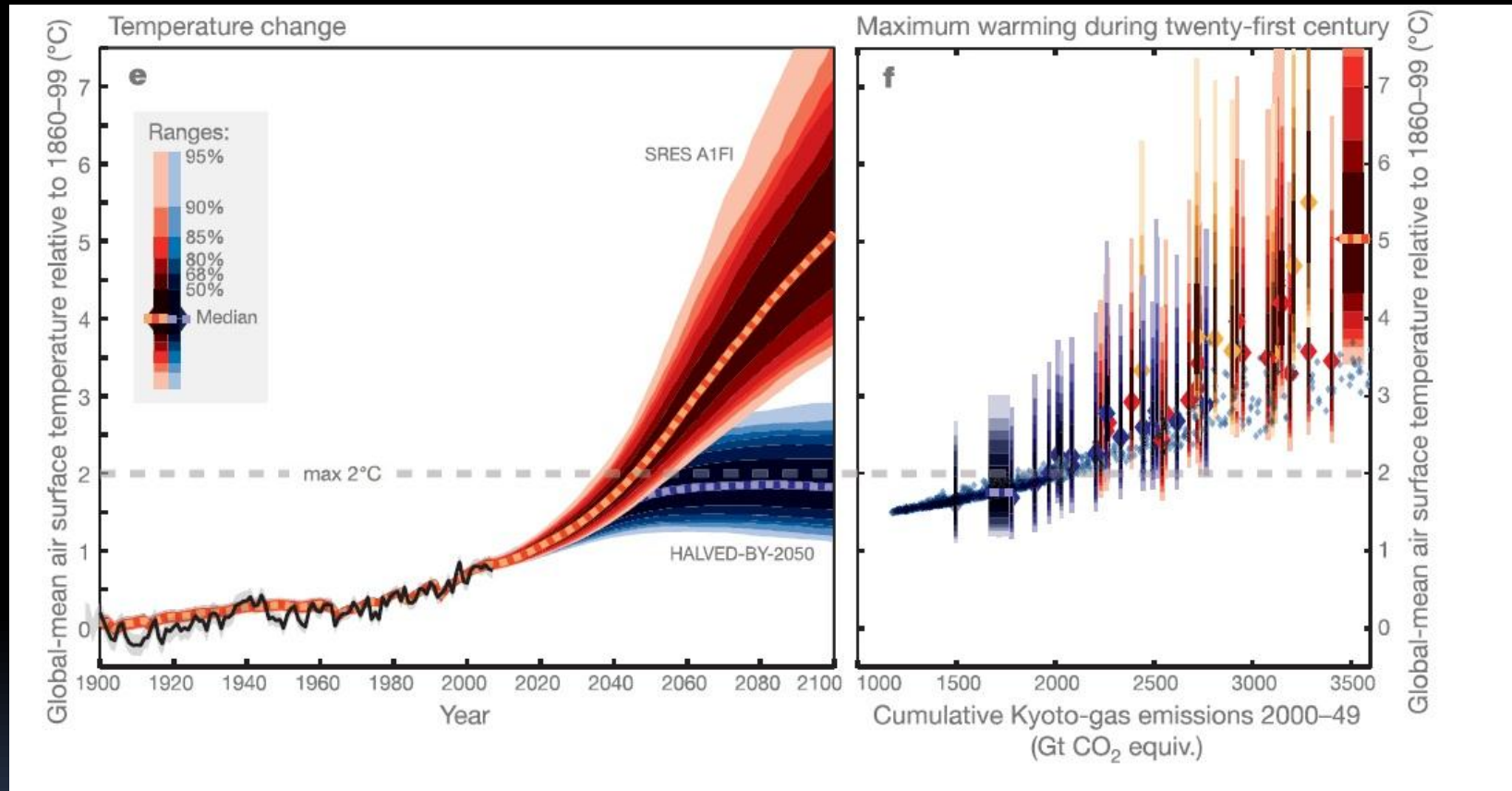
- The project would avoid 407 million tonnes of CO₂ emissions, more than the annual emissions from France or Brazil.
- Current mechanisms of CO₂ mitigation (Kyoto Protocol) are insufficient.
- CO₂ emissions are still growing at 2 % per year, while a 50 % reduction is needed (Stern Report).
- Ecuador proposes an innovative way to cut CO₂ emissions, avoiding fossil fuel extraction in sensitive areas.
- If all fossil fuel reserves are exploited, it is not possible to keep global warming below a safe limit (2° C).

Fossil fuel reserves, CO₂ emissions and global warming



Fuente: Meinshausen et al (2009), *Greenhouse emission targets for limiting global warming to 2°C*, Nature, 458, abril.

Global Warming limit 2°C ↔ 50% emission reduction at 2050



Fuente: Meinshausen et al (2009), *Greenhouse emission targets for limiting global warming to 2°C*, Nature, 458, abril.

The proposal is replicable by other developing countries

- Conditions :
 - Developing countries
 - Being mega-diverse
 - Having fossil fuel reserves in sensitive areas
- Countries like Brazil, Colombia, Costa Rica, Democratic Republic of Congo, Ecuador, India, Indonesia, Madagascar, Malaysia, Papa New Guinea, Peru, Bolivia, the Philippines and Venezuela.

International Support

- Germany and Spain. Economic support.
- Regions of Wallonia and Rhone-Alpes.
- Other European countries.
- EU.
- CAN, CAF, OEA, OPEC.
- 5 nobel price winners, various ex presidents, others.
- National and international civil society.

