

# Network of potential terrestrial connectors for the conservation of biodiversity facing climate change scenarios



# INECC

INSTITUTO NACIONAL  
DE ECOLOGÍA  
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**National Institute of Ecology and Climate Change**

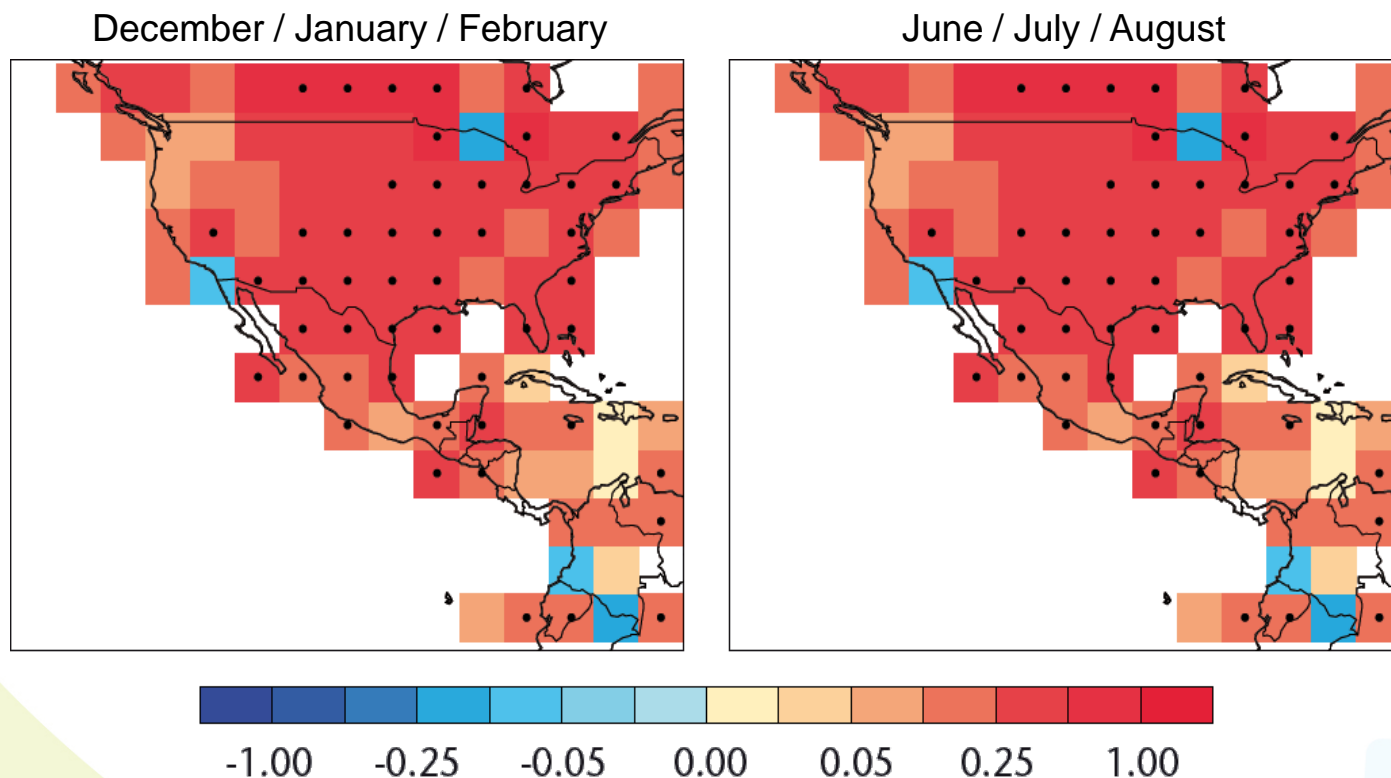
**XIX Meeting of the Canada/Mexico/U.S. Trilateral Committee for  
Wildlife and Ecosystem Conservation and Management  
Querétaro, México  
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# Presentation outline

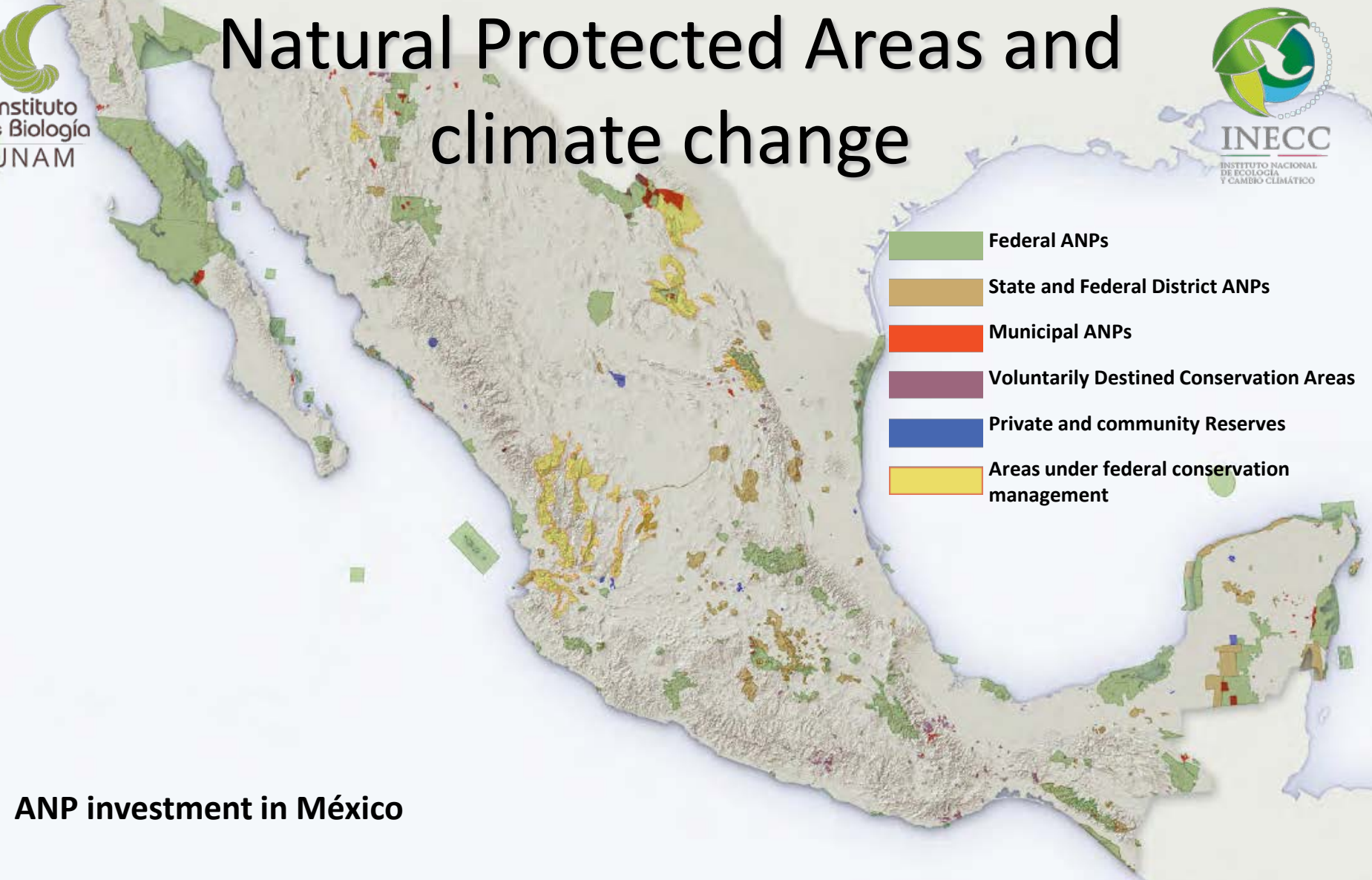
- Introduction
  - Mexico and climate change
  - Natural Protected Areas and climate change
  - Climate change scenarios
- Background
- Objectives
- Methodology
- Outlooks

# Mexico and climate change

Mexico has become warmer since 1960.



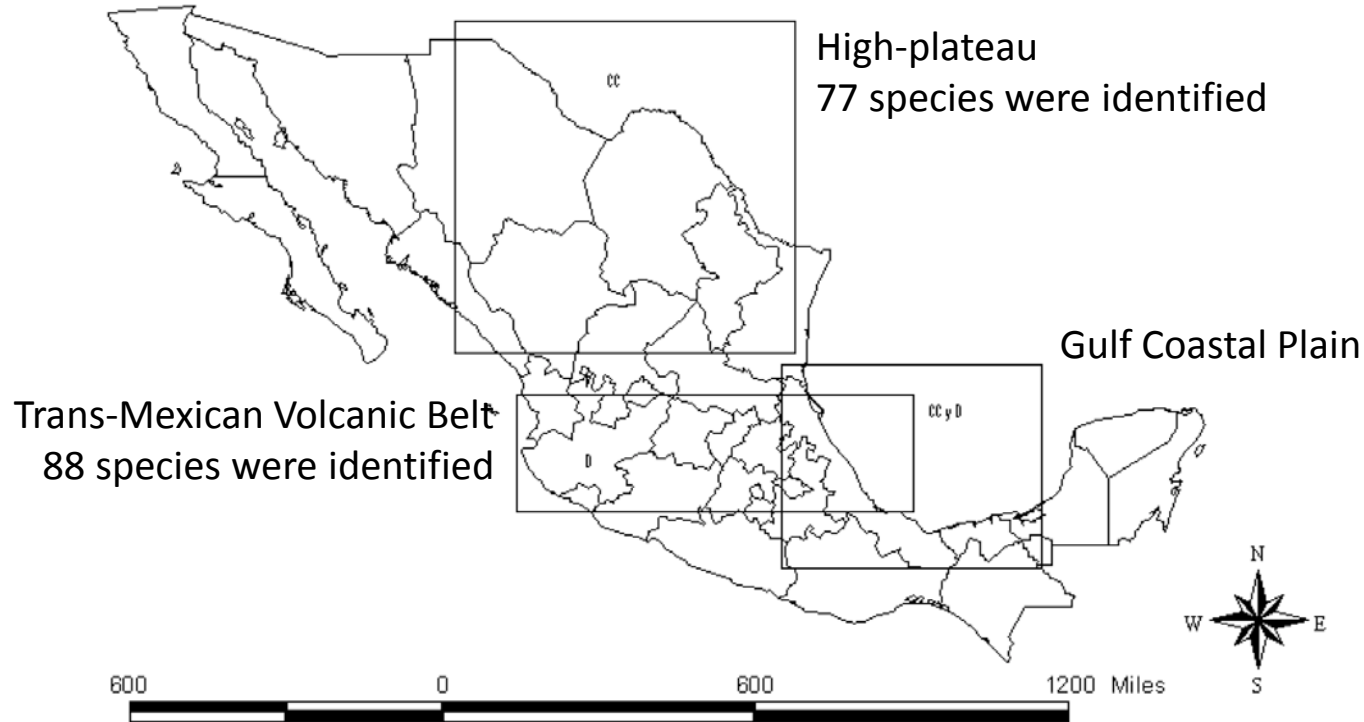
# Natural Protected Areas and climate change



## ANP investment in México

# Background

Previous studies have identified three climate change and deforestation risk regions:



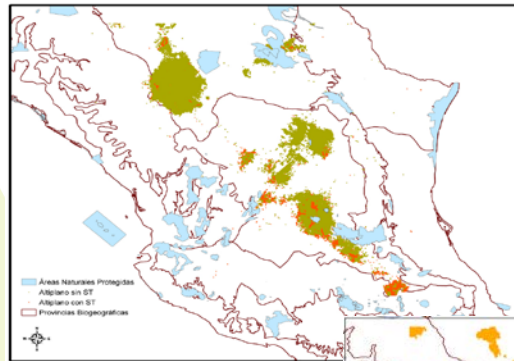
The identified vertebrate species were mammals, birds, reptiles and amphibians

- Illoldi-Rangel, P., Ciarleglio, M., Sheinvar, L., Linaje, M., Sánchez-Cordero, V., & Sarkar, S. 2012. *Opuntia* in México: Identifying Priority Areas for Conserving Biodiversity in a Multi-Use Landscape. (B. Fenton, Ed.) *PLoS ONE*, 7(5)
- Figueroa, F., & Illoldi-rangel, P. 2011. Evaluación de la efectividad de las áreas protegidas para contener procesos de cambio en el uso del suelo y la vegetación. ¿Un índice es suficiente?. *Revista mexicana de biodiversidad*, (82) 951–963.

# Background

- High-plateau region showed the greatest suitability reduction for vertebrate species, in both A2 and B2 scenarios.
- Trans-Mexican Volcanic Belt showed less effect under climate change scenarios, however, deforestation will have greater impact.

## High-plateau

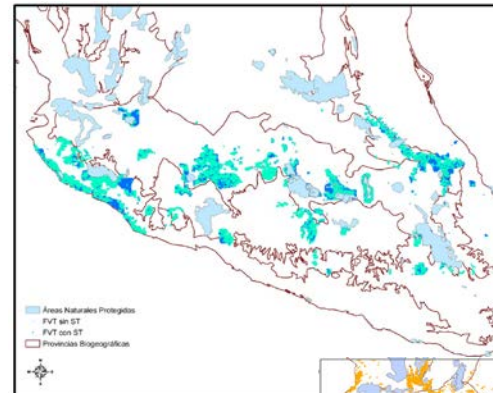


Current priority conservation areas

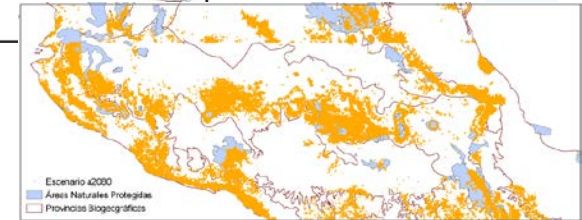


Priority conservation areas projected to 2080 using scenario A2 (the worst scenario)

## Trans-Mexican Volcanic Belt



Current priority conservation areas



Priority conservation areas projected to 2080 using scenario A2 (the worst scenario)

## Main objective

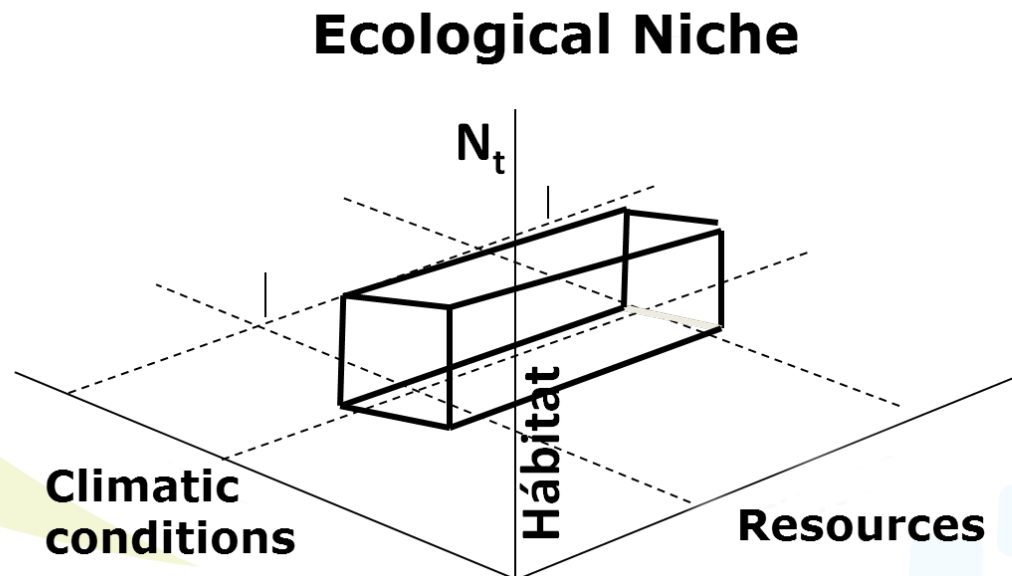
To use new climate change scenarios for Mexico (ECHAM and GFDL, IPCC 2013) in order to identify priority areas for conservation and connectivity in the three regions of Mexico: High-plateau, Trans-Mexican Volcanic Belt and Gulf Coastal Plain.

## Specific objectives

- To use vertebrate species with specific characteristics:
  - The listed in NOM- 059- SEMARNAT- 2010
  - Endemic to the region of concern
  - Present in at least 10 collection localities
- To project the potential distribution on two horizons for both scenarios: distant future and near future.
- To identify in the selected regions the interest areas for conservation.
- To identify suitable areas for biological connectivity between regions.
- To compare interest areas for conservation identified in this project with previously identified A2 and B2 scenarios.

# Methodology

- ❖ Data on species distribution generally are available in two ways, “locations” made from record of presences and “distribution models” calculated from locations. The last allows quantification of the species-environment relationship and habitat structure. This feature permits use of distribution models for conservation planning at the ecosystem scale.
- ❖ On the other hand, biodiversity loss studies have been inferred by quantifying the deforestation of the main types of vegetation, that is associating loss biodiversity with the reduction of natural habitat.





## General Plan analysis

Vertebrate georeferenced location data

Environmental layers

MaxEnt model

Ecological niche modelling as current potential distribution

Land use and vegetation information Series V (INEGI)

Priority Conservation Areas in current conditions and climate change scenarios

ConsNet model

Ecological niche model projected as current distribution in remaining natural habitat

# Environmental layers

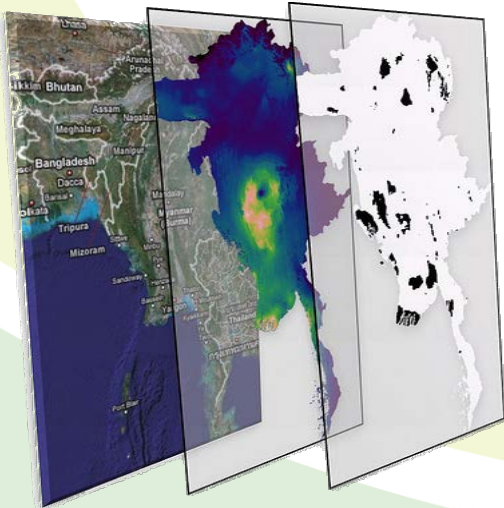
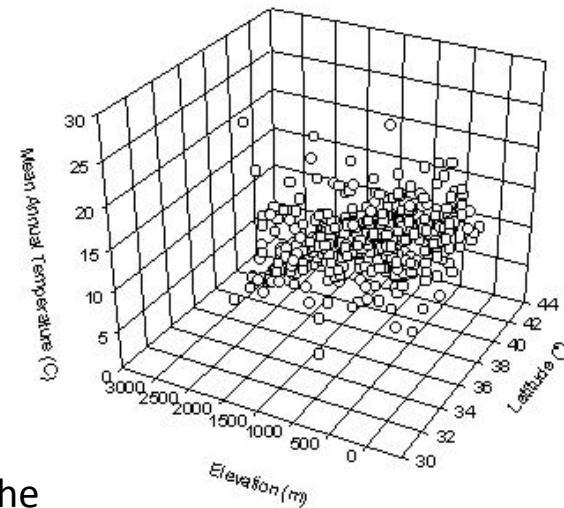
- Current potential distribution will be determined by using:
  - **Series V ??** of land-use and vegetation information, created by INEGI (<http://www.inegi.gob.mx/>)
  - 19 bioclimatic layers (<http://www.worldclim.org/>)
- Future potential distribution will be modelled using the new climate change scenarios for México based on ECHAM and HadGEM GCMs (IPCC, 2013; <http://uniatmos.atmosfera.unam.mx/>)
- Vertebrate distribution models will be analyzed and integrated in priority conservation areas and connectors

## MaxEnt

Maximum entropy modelling is a framework for integrating information from many heterogeneous information sources for classification.

## ConsNet

It is a comprehensive software package for the design and analysis of conservation area networks to represent biodiversity.

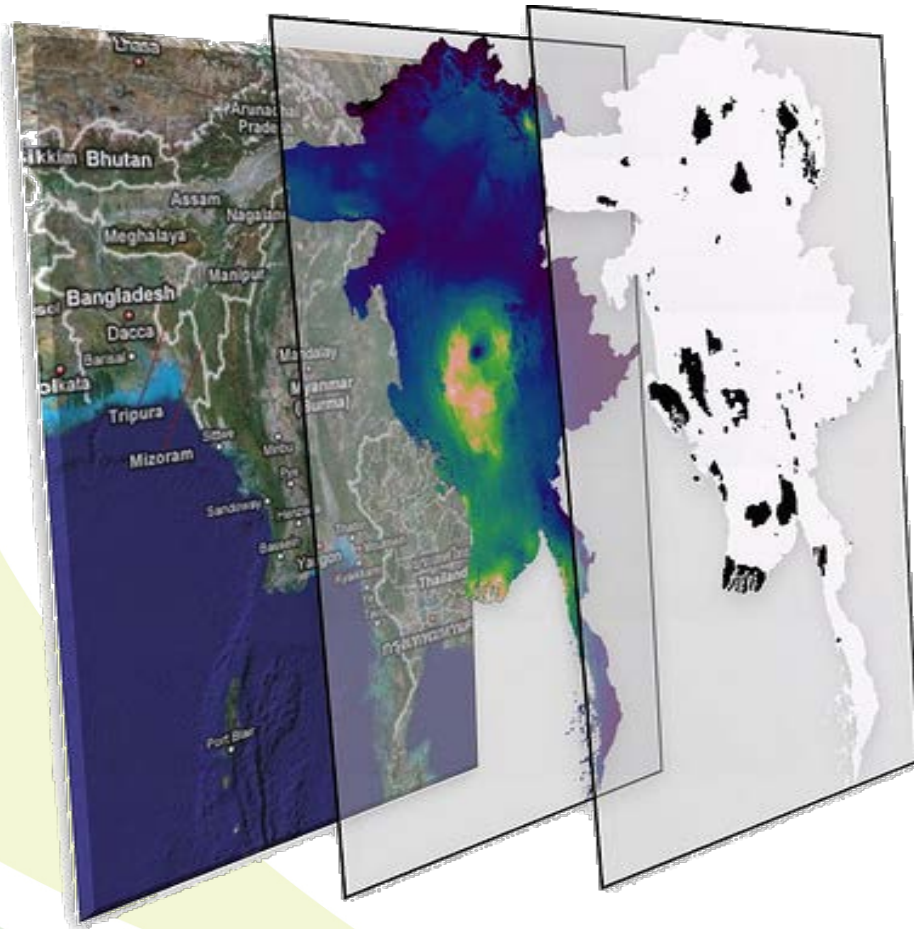


# Outcomes

.....the fact that the new climate change scenarios for Mexico are developed in coordination between scenarios generators and scenarios users, opens the expectation that the priority conservation areas and the potential species distribution determined in this study could be more accurate and reflect the experts observations of climate trends in different regions of the country.

- To evaluate the performance of the new scenarios of climate change from the previous scenarios A2 and B2.
- To determine the priority conservation areas in the northern border of Mexico, in order to identify mechanisms for bi-national collaboration for the development of research, strengthening capacities, and vulnerability and adaptation to climate change assessment.

# Thanks



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