# Scheme of mangrove restoration in Mexico

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# Context setting

- Mexico ranks **fourth** in the world in total Mangrove area.
- The most important zone is the Yucatan Peninsula, a karstic platform with **55%** of the total national mangrove forest areas.
- The second largest area in the pacific coast includes the sates of Nayarit and Sinaloa with 18% of the national total.
- Mangrove species present in Mexico:

  Red mangrove (*Rhizophora mangle* L.), Black mangrove (*Avicenia germinans* (l.) L.), White mangrove (*Laguncularia racemosa* (L.) Gaertn. f.), Button mangrove (*Conocarpus erectus* L.), Mangrove (*Rhizophora x harrisonii* Leechm.) and *Avicennia bicolor*.

# Distribution of mangrove forest in Mexico

# Priority areas for mangrove forest restoration

# Legal framework in Mexico for mangroves

- General Law for Ecological Equilibrium and Environment protection.
- General Law for Wildlife
- Official Norm (NOM 022 SEMARNAT 2003) for conservation and sustainable harvest of mangrove.
- Official Norm (NOM 059 SEMARNAT 2010) for protection of endangered species (all mangrove species considered **endangered** species).

## Legal control problem:

- The legal framework is highly restricted, the owners need to go throught a number processes to collect seeds, produce plants and restore mangroves.
- Harvest is forbidden, since ilegal harvesting and land changes is the biggest threat to mangroves.
- It's possible to use the resources brought forth by the mangrove (wood, fish, etc.) as long as the mangrove as a whole is not affected.

## Main problems associated with mangrove degradation

- Modifying hydric flows changes the water chemistry, it increases the amount of salts, alters the temperature, pH, and decreases the of amount disolved oxygen, causing a disturbance in the natural habitat of the Mangrove.

- Soil changes result depletion of carbon in the soil and subsidence that decrease of the topographical level, causing seeds not to take root.

# Mangrove degradtion but don´t lost of topographic level yet

# Lost of topographic level

# Soil mangrove profile


# Organic soil

# Threats to Mangroves

- The tides move the propagules and the loss of topographic level, doesn't permit the establishment of new mangrove plants.

- The loss of organic carbon fixation in the soil, caused by the oxidation process is a big issue, some other threats are changes in soil properties, mainly porosity, permeability as well as the interruption of capillary flow.

# Mongrove restoration projects and hectars in Mexico

| Period | Projects | hectars | USD($) |
|---|---|---|---|
| 2013-2015 | 11 | 1,606 | 2,306,402 |
| 2016 | 13 | 3,808 | 7,751,501 |
| 2017 | 13 | 1,501 | 3,770,023 |
| **Total** | **37** | **6,915** | 13,827,926 |

# Restoration lessons in Mexico

- First, we need identity the reference site, flow direction and the soil parameters.
  - Topographic level
  - Level of capillar water
  - Salinity
  - Temperature
  - Disolved oxygen
- Restoration the hydric flows by channels.
- Revegetation or reforestation, revegetation is easily and cheaper.

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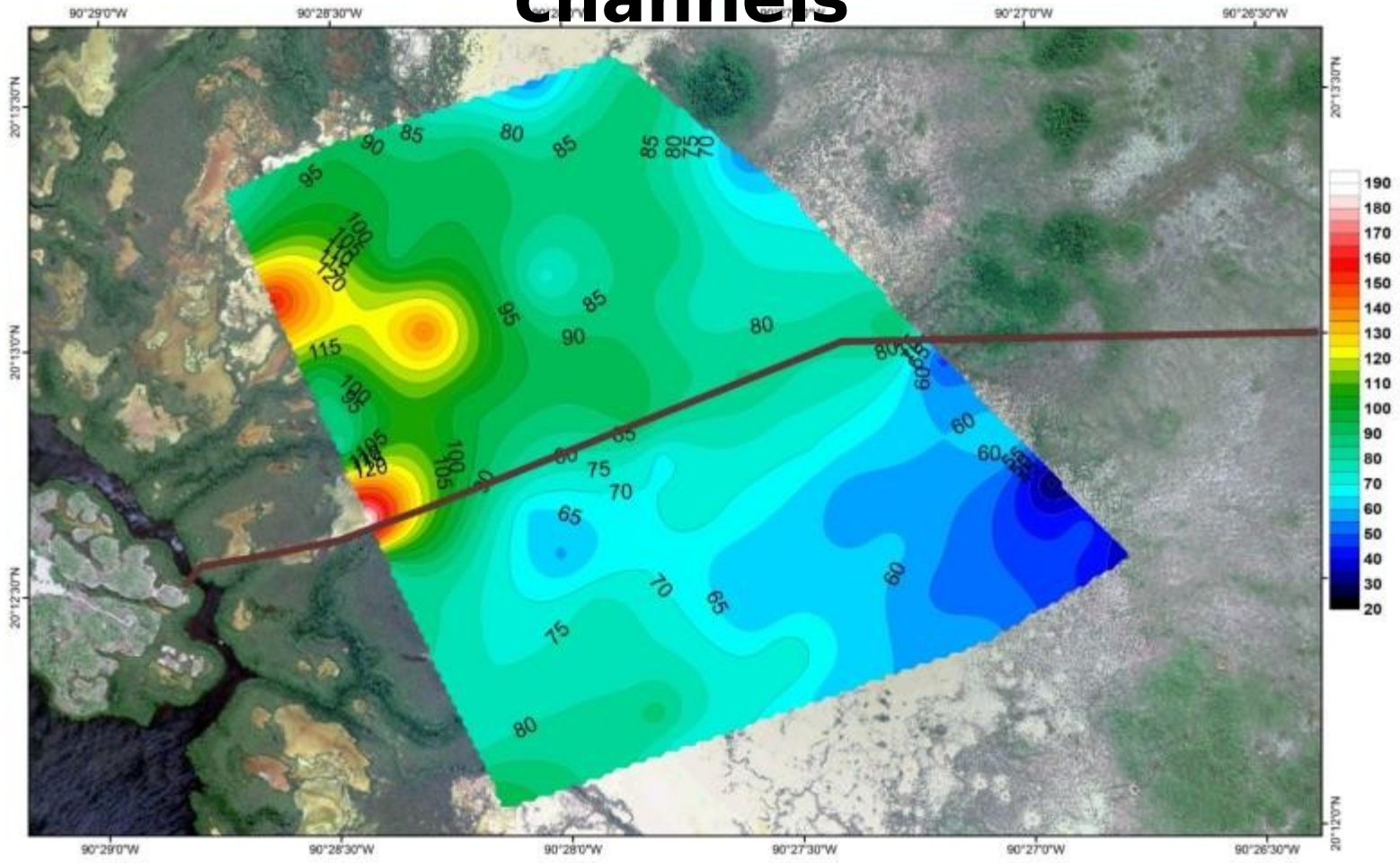
# Salinity before construction of flow channels



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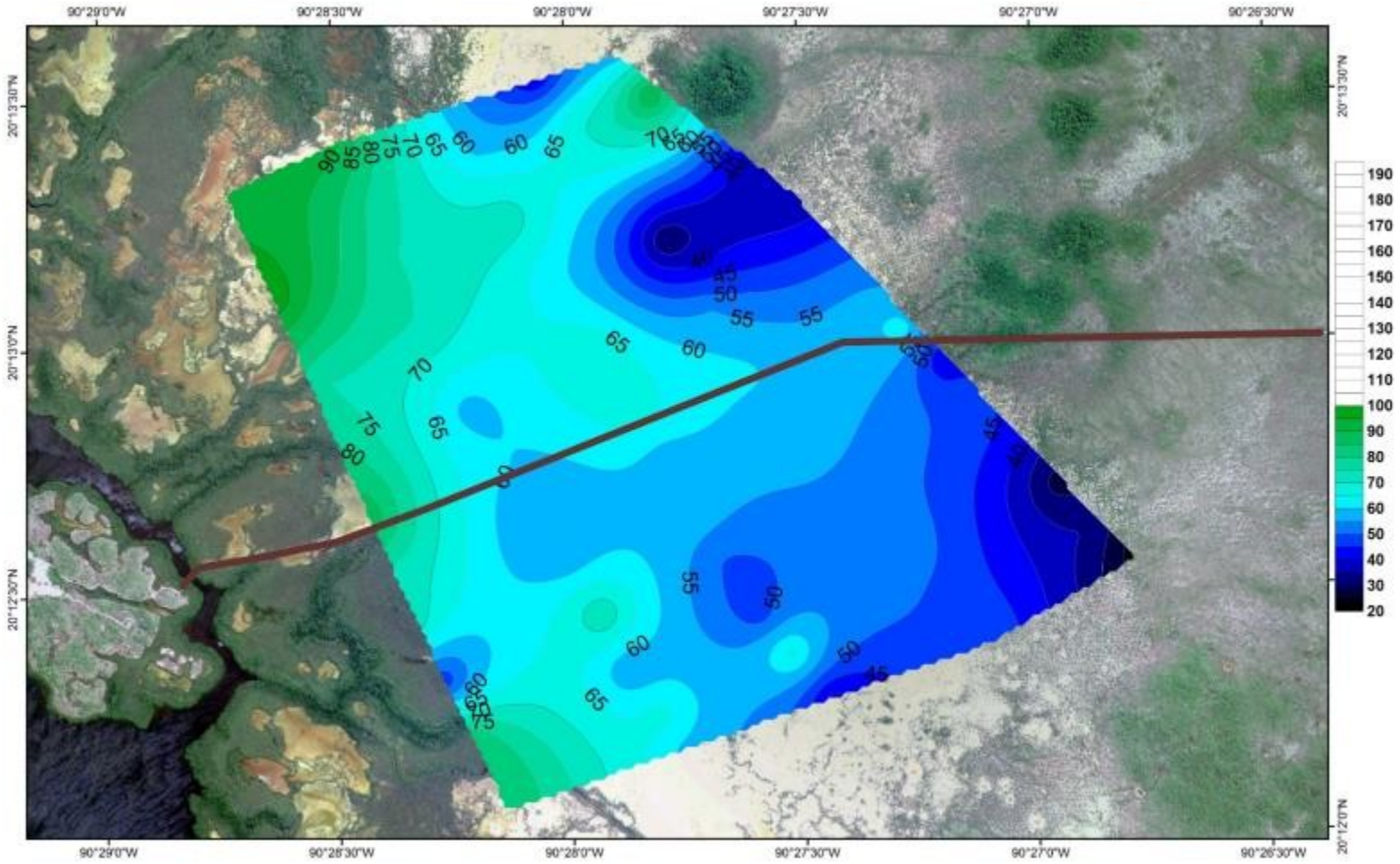

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SEMARNAT

SECRETARÍA DE
MEDIO AMBIENTE
Y RECURSOS NATURALES

# Reference site

# Reference site

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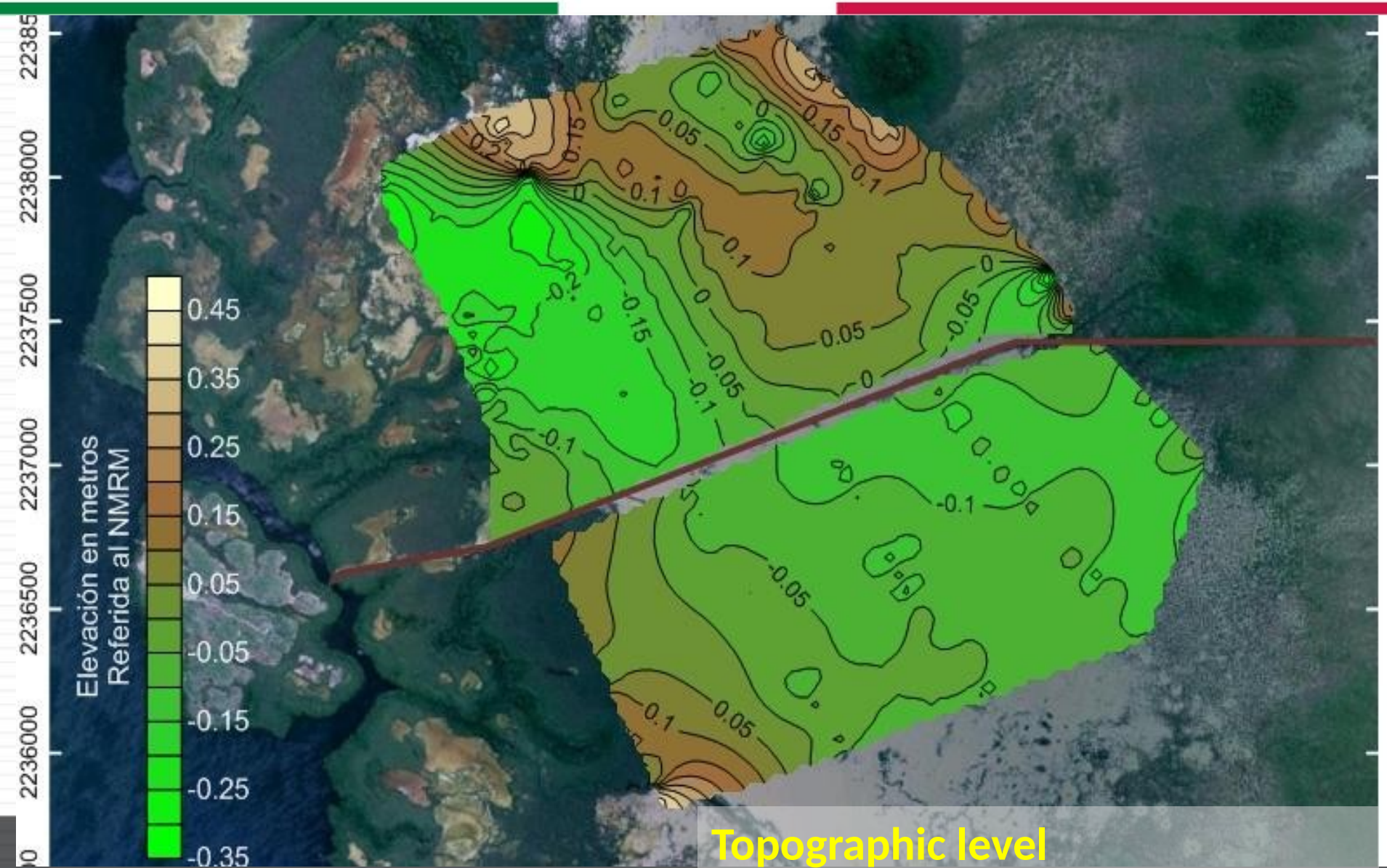
# microtopographic level

# Take parameter measures




Topographic level

When the major hydric flow is identified, we need make channels for flow restitution.

# Recover the topographic level by sedimentation and island restoration

# Sedimentation pools and plantation platform

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# Collection and selection of seeds

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# Forestation channels and restoration islands