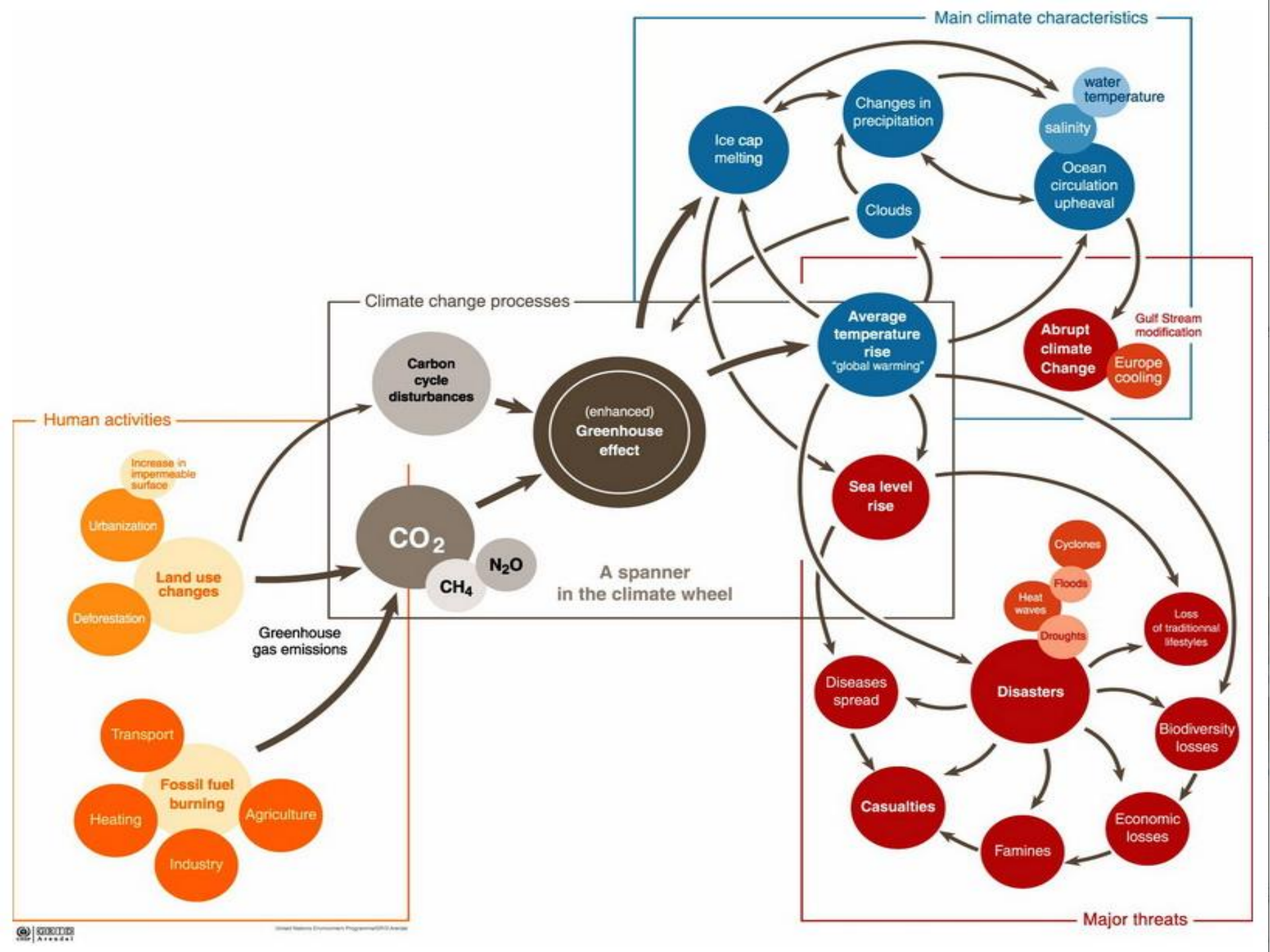
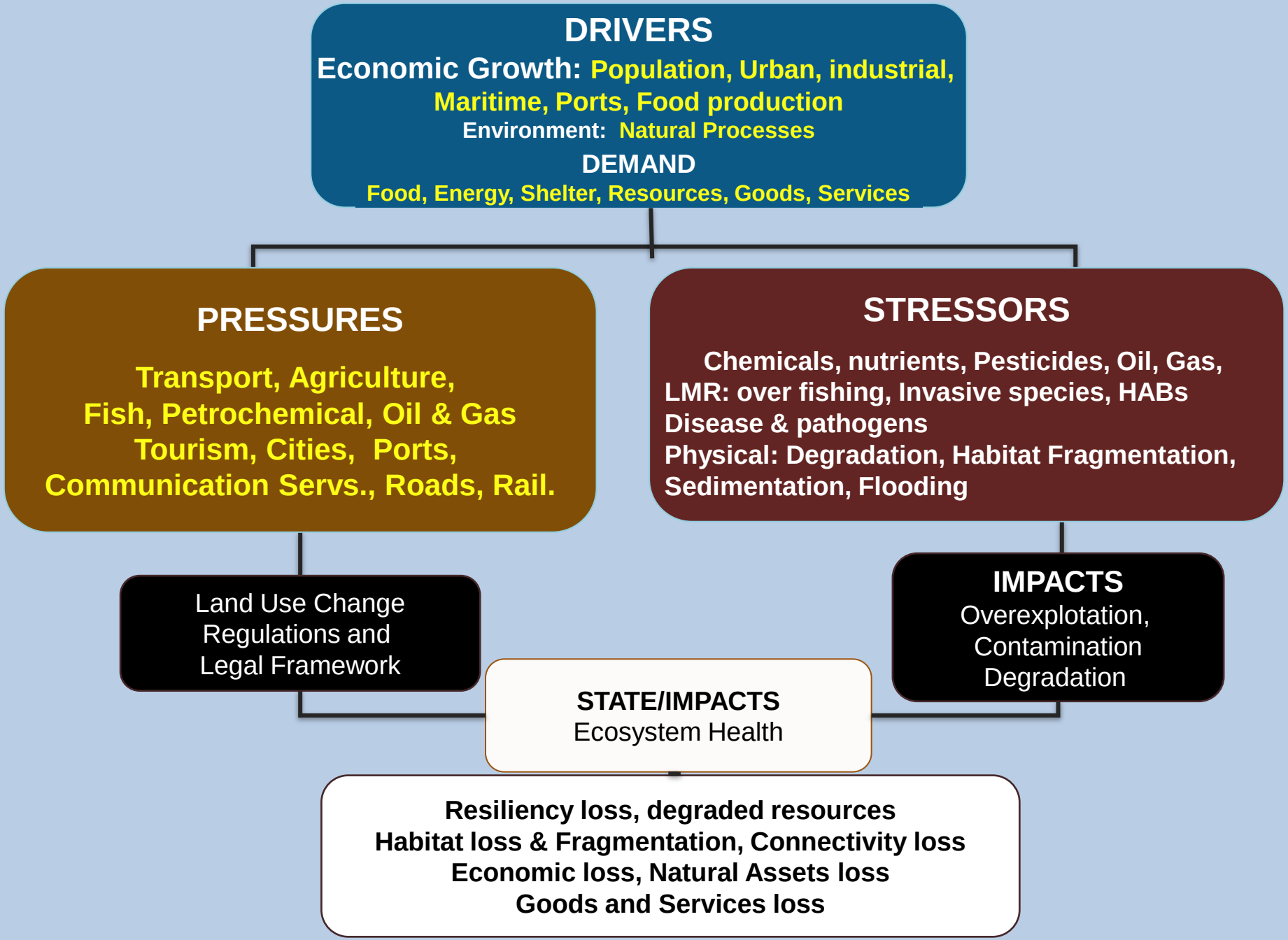
Gulf of Mexico LME Goods and Services at Risk from Energy Production and Climate Change

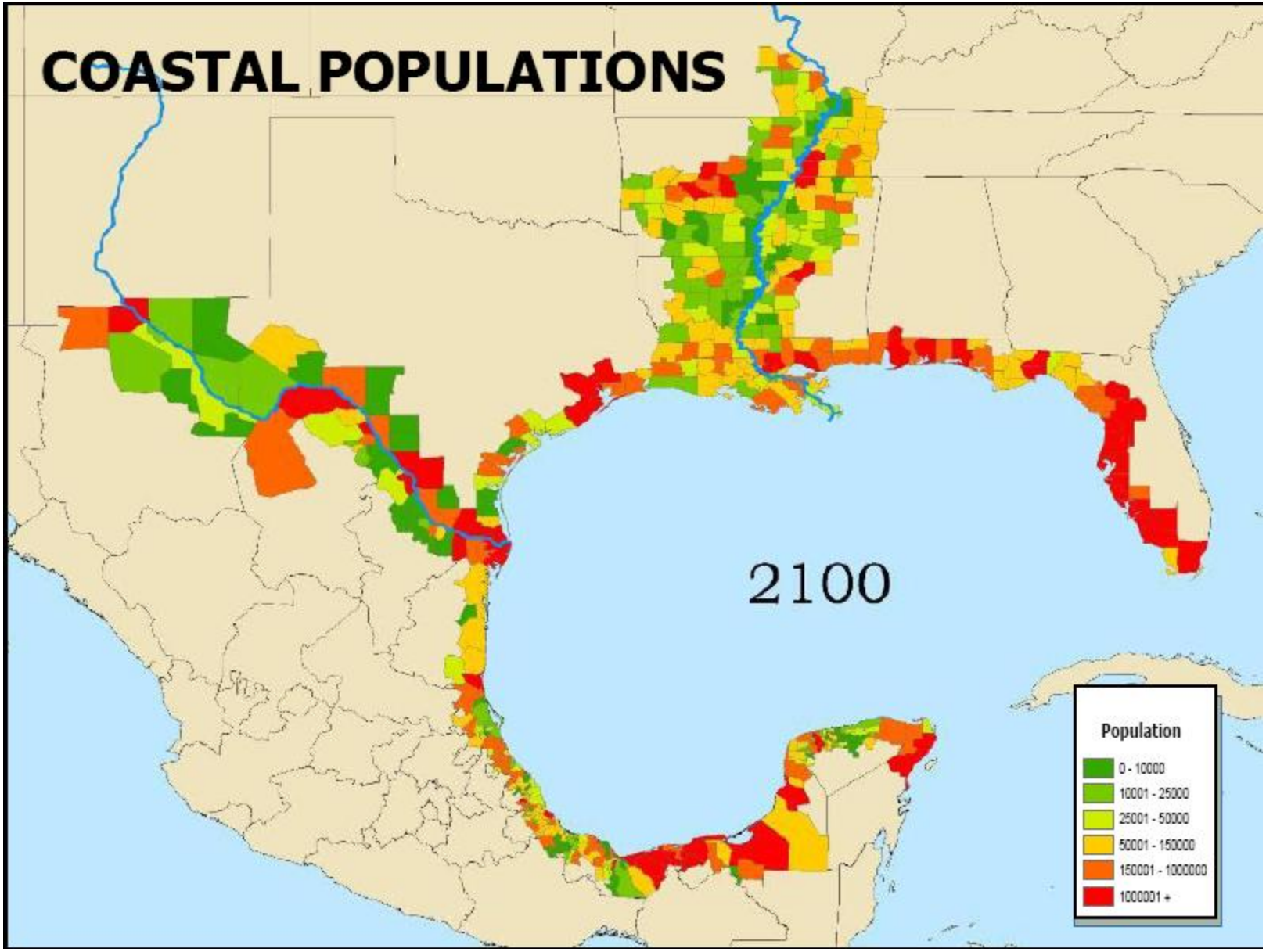
IWC6

6TH BIENNIAL INTERNATIONAL WATERS CONFERENCE

17-20 OCTOBER 2011, DUBROVNIK, CROATIA


Main climate characteristics
Ice cap melting
Changes in precipitation
water temperature
salinity
Ocean circulation upheaval
Clouds
Climate change processes
Carbon cycle disturbances
(enhanced) Greenhouse effect
Average temperature rise "global warming"
Abrupt climate Change
Gulf Stream modification
Europe cooling
Human activities
Increase in impermeable surface
Urbanization
Land use changes
Deforestation
CO2
N2O
CH4
A spanner in the climate wheel
Greenhouse gas emissions
Sea level rise
Transport
Fossil fuel burning
Heating
Agriculture
Industry
Cyclones
Floods
Heat waves
Droughts
Loss of traditionnal lifestyles
Diseases spread
Disasters
Biodiversity losses
Casualties
Famines
Economic losses
Major threats


DRIVERS
Economic Growth: Population, Urban, industrial, Maritime, Ports, Food production
Environment: Natural Processes
DEMAND
Food, Energy, Shelter, Resources, Goods, Services
PRESSURES
Transport, Agriculture,
Fish, Petrochemical, Oil & Gas
Tourism, Cities, Ports,
Communication Servs., Roads, Rail.
STRESSORS
Chemicals, nutrients, Pesticides, Oil, Gas,
LMR: over fishing, Invasive species, HABs
Disease & pathogens
Physical: Degradation, Habitat Fragmentation,
Sedimentation, Flooding
Land Use Change
Regulations and
Legal Framework
IMPACTS
Overexplotation,
Contamination
Degradation
STATE/IMPACTS
Ecosystem Health
Resiliency loss, degraded resources
Habitat loss & Fragmentation, Connectivity loss
Economic loss, Natural Assets loss
Goods and Services loss


COASTAL POPULATIONS
2100
Population
0 - 10000
10001 - 25000
25001 - 50000
50001 - 150000
150001 - 1000000
1000001 +


LOUISIANA
25 square miles of coastal wetlands lost per year
Lower Mississippi River Basin
Heavy Industry
Nursery Habitat
Coastal Communities
Hypoxia Zone
Harmful Algal Blooms
Gulf Estuaries
Loop Current Eddy
Sustainable Fisheries
Coral Reefs
Oil & Gas Platforms
Oil & LNG Tankers
LOOP CURRENT
Ocean Observations
HURRICANES
GULF OF MEXICO
Sea Turtles
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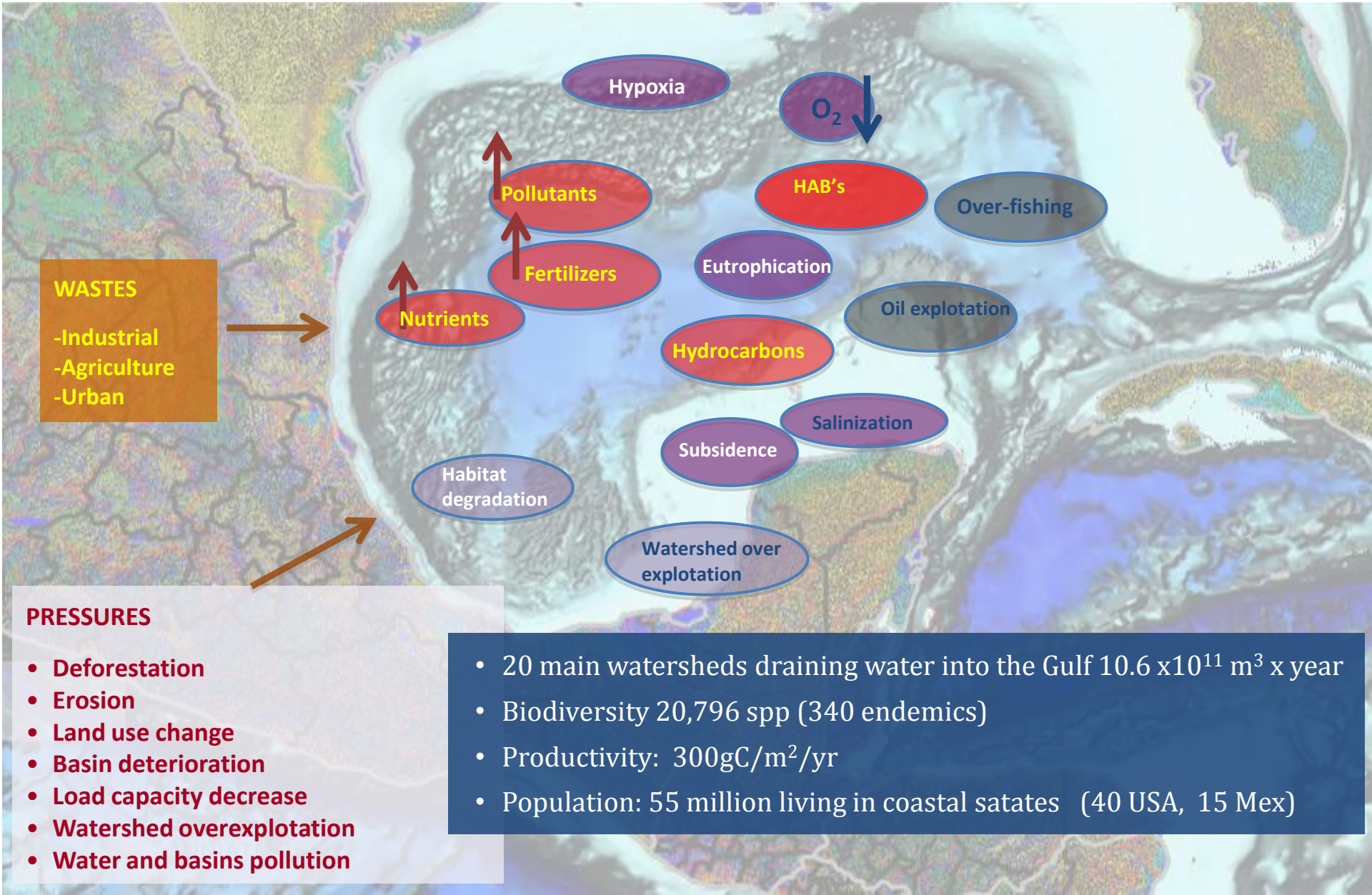
Gulf of Mexico Key Stressors

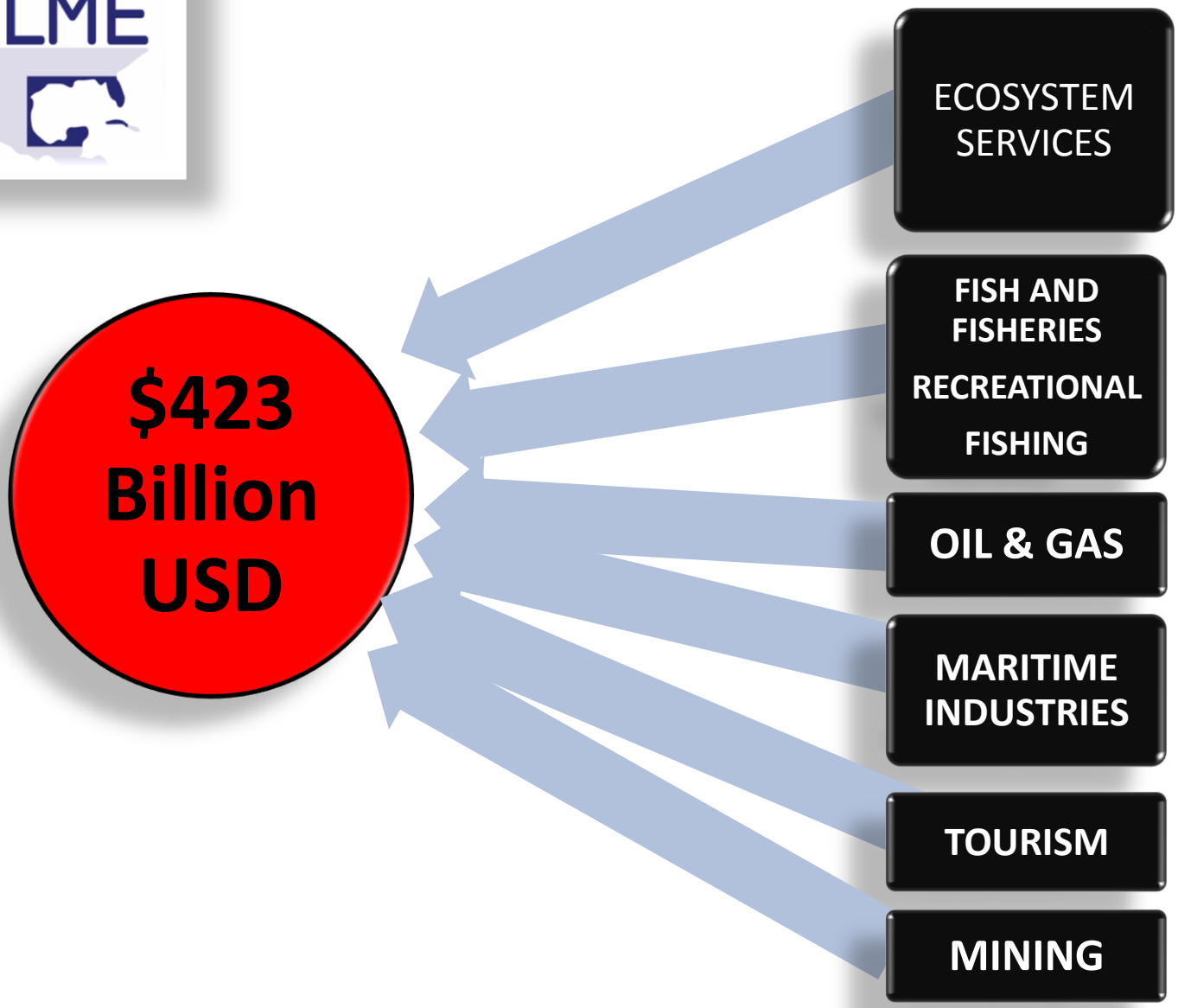


PRESSURES

- **Deforestation**
- **Erosion**
- **Land use change**
- **Basin deterioration**
- **Load capacity decrease**
- **Watershed overexplotation**
- **Water and basins pollution**

- 20 main watersheds draining water into the Gulf 10.6 x10^{11} m^3 x year
- Biodiversity 20,796 spp (340 endemics)
- Productivity: 300gC/m^2/yr
- Population: 55 million living in coastal satates (40 USA, 15 Mex)

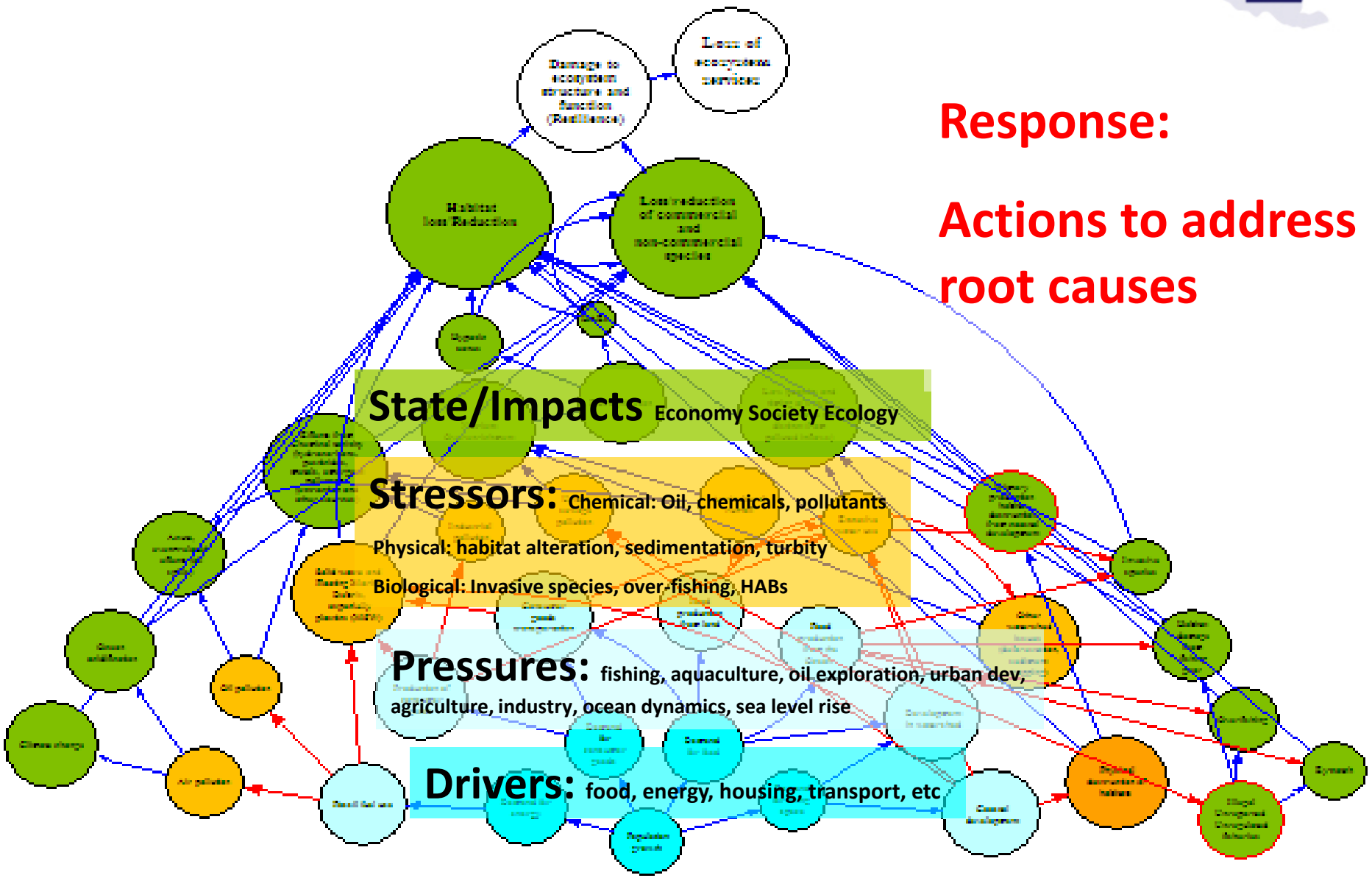
Current calculated value of sectors in the GoM LME



An individual choice…

"It started when I bought the Hummer"

Correspondence with the Drivers- Pressures- Stressors- State/impact- Response framework

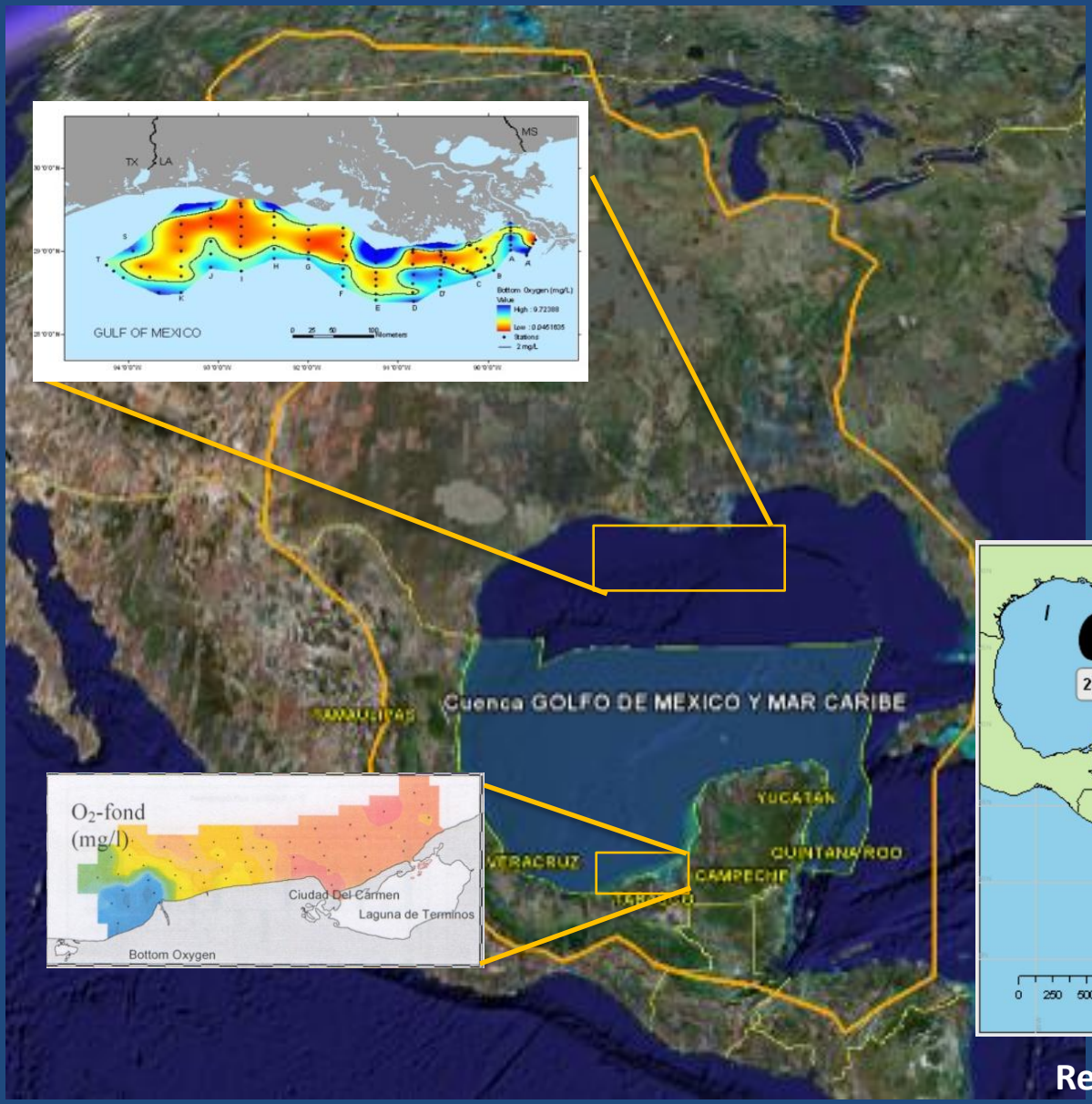


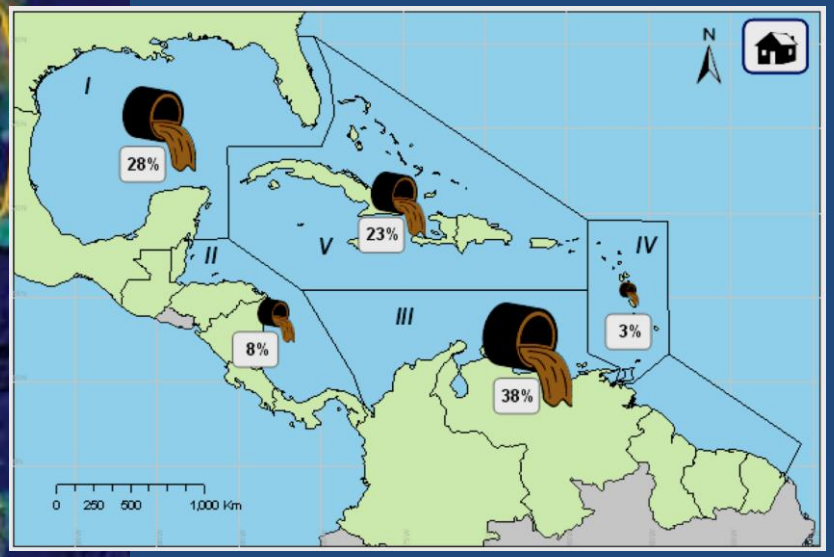
Response:

Actions to address root causes

Hypoxia, dead zones, nutrient overloading

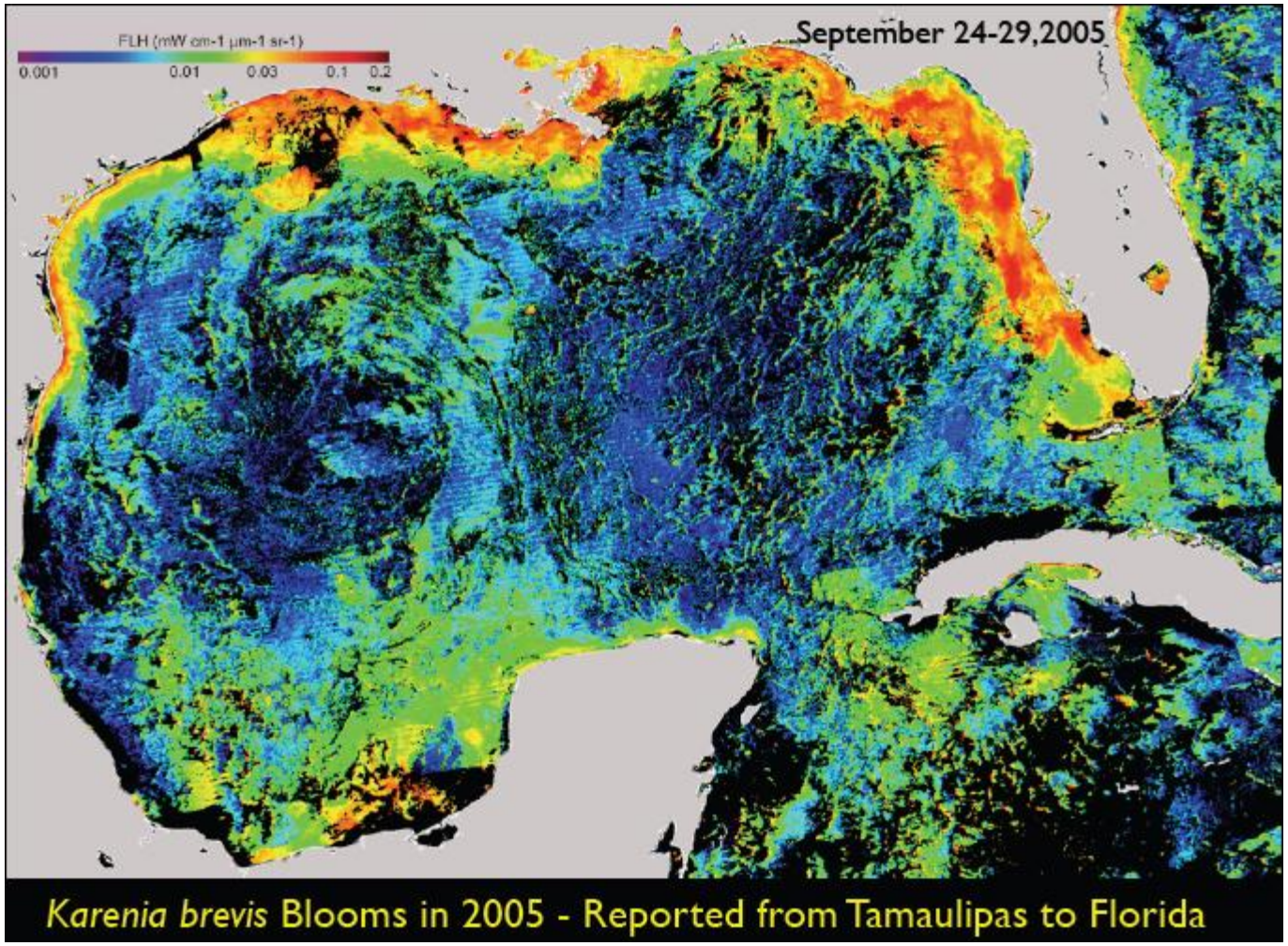
- Coastal Pathogens
- Population Growth & Development
- Wetland/Habitat Loss
- Nutrients & Hypoxia
- Toxics/Contaminants
- Harmful algal blooms
- Oil Spills





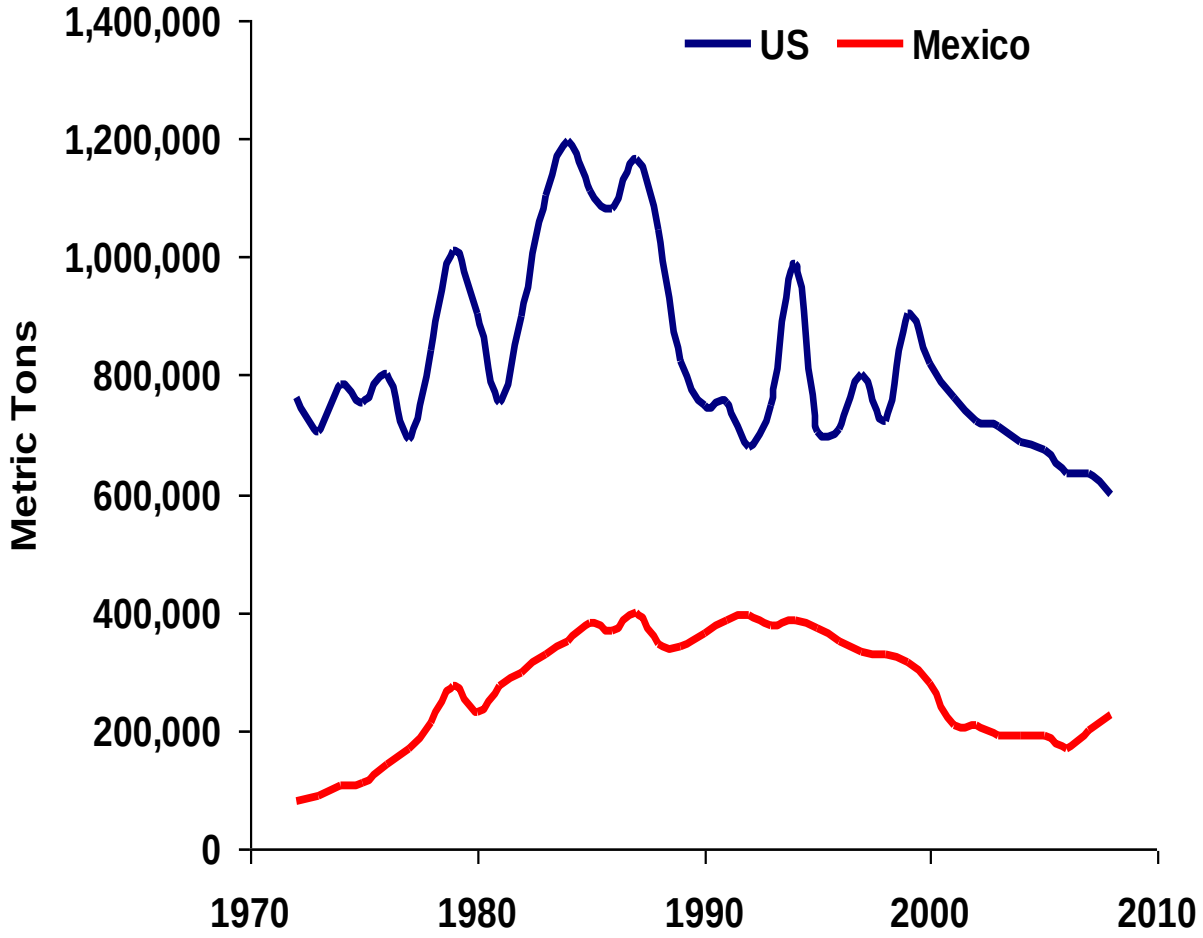
Reporte 33, Wider Caribbean UNEP 2009

Harmful Algal Blooms in the Gulf of Mexico



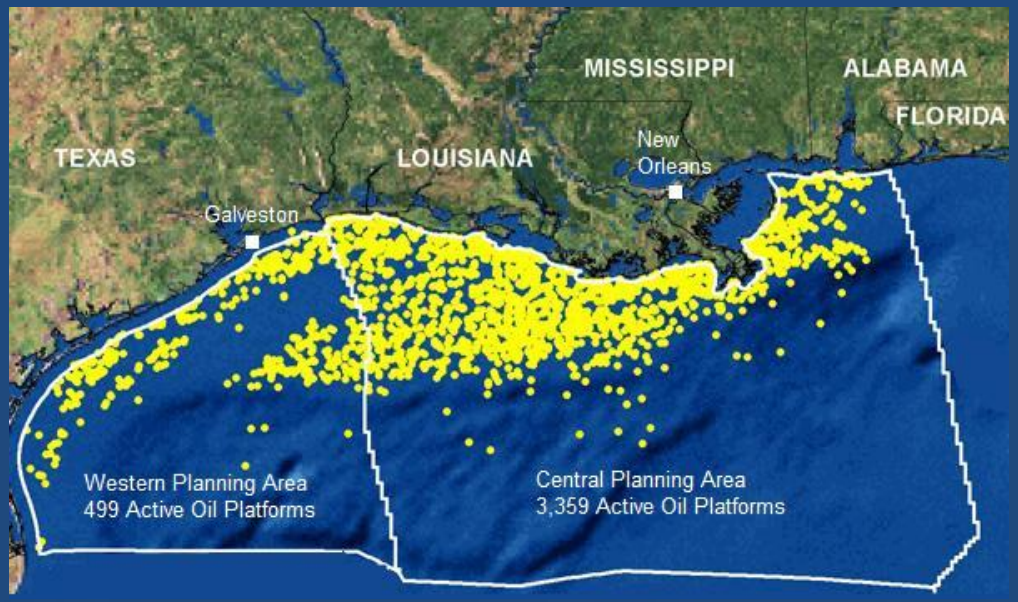
Mexico and US catches in the Gulf of Mexico LME

The same average trend (slope) in both series since 1987. ($p<0.05$)



11,000-14,000 tons less every year in both countries

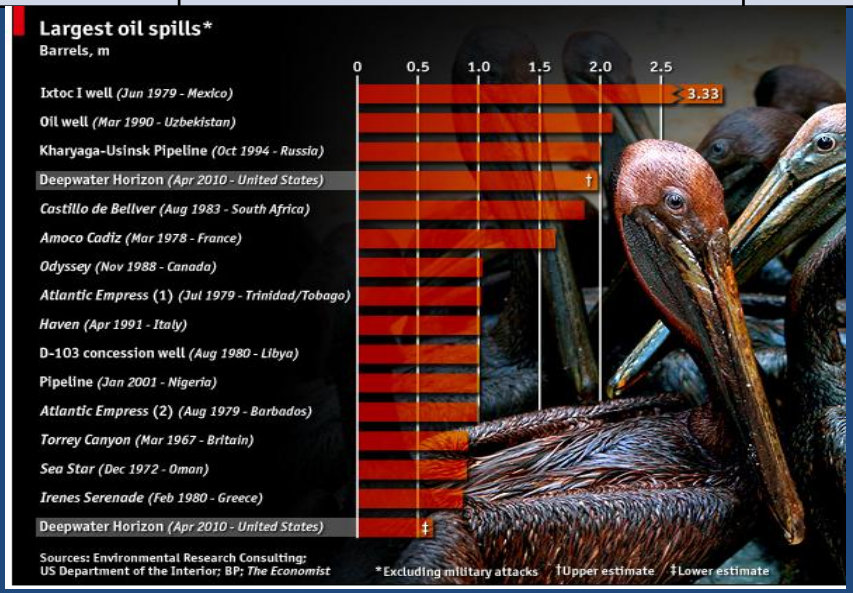
Oil & gas industries



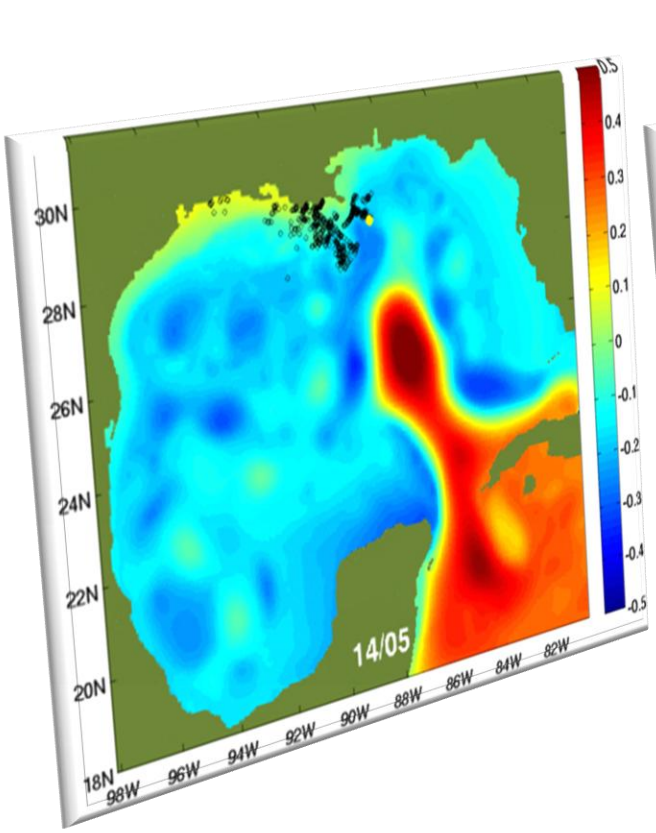
- Oil industry infrastructure (Refineries, platforms)
- Hurricane Ivan (2004) destroyed 7 platforms, damaged 24 more and 102 pipelines
- Katrina and Rita (2005) destroyed 100 platforms and 558 pipelines (575 spills)

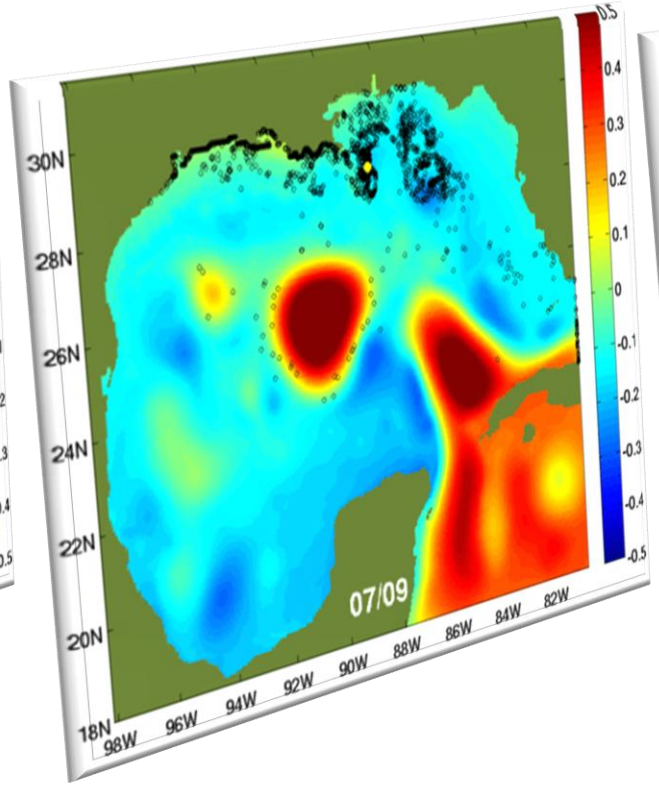
Major Oil Spills

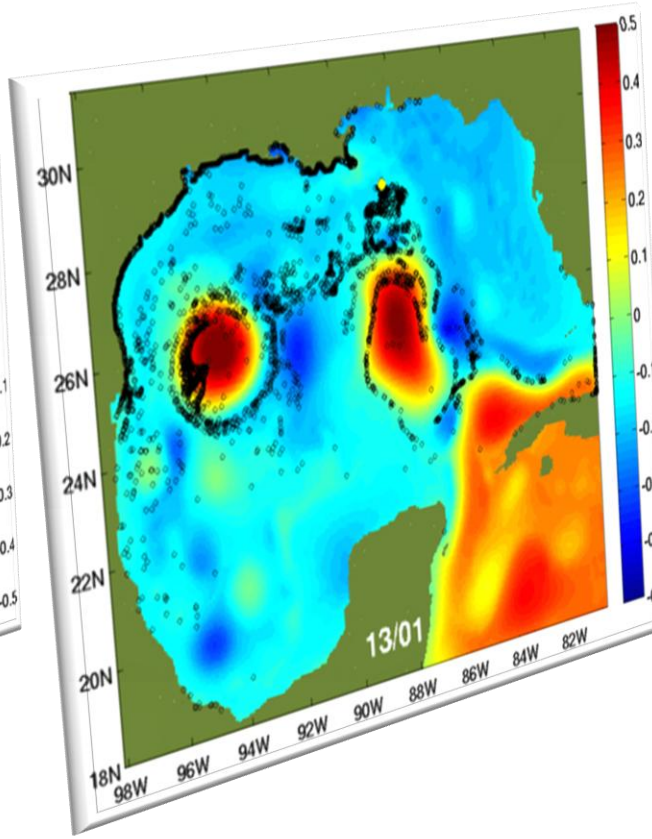
	IXTOC I 1979	EXXON VALDEZ 1989	BP managed DWH MC 252 well 2010
Site	Sonda de Campeche. Gulf of Mexico	Prince William Sound, Alaska, USA	Gulf of México. USA
Spill	3.3 million barrels	262 mil barrels	4.9 million barrels
Damages	Coastal areas TX	Impacts in 1,609 kms of coasts	Assessment ongoing
Duration	3 June 1979 – 24 March 1980	24 March 1989 – 31 July 1989	20 April Sept 19, 2010



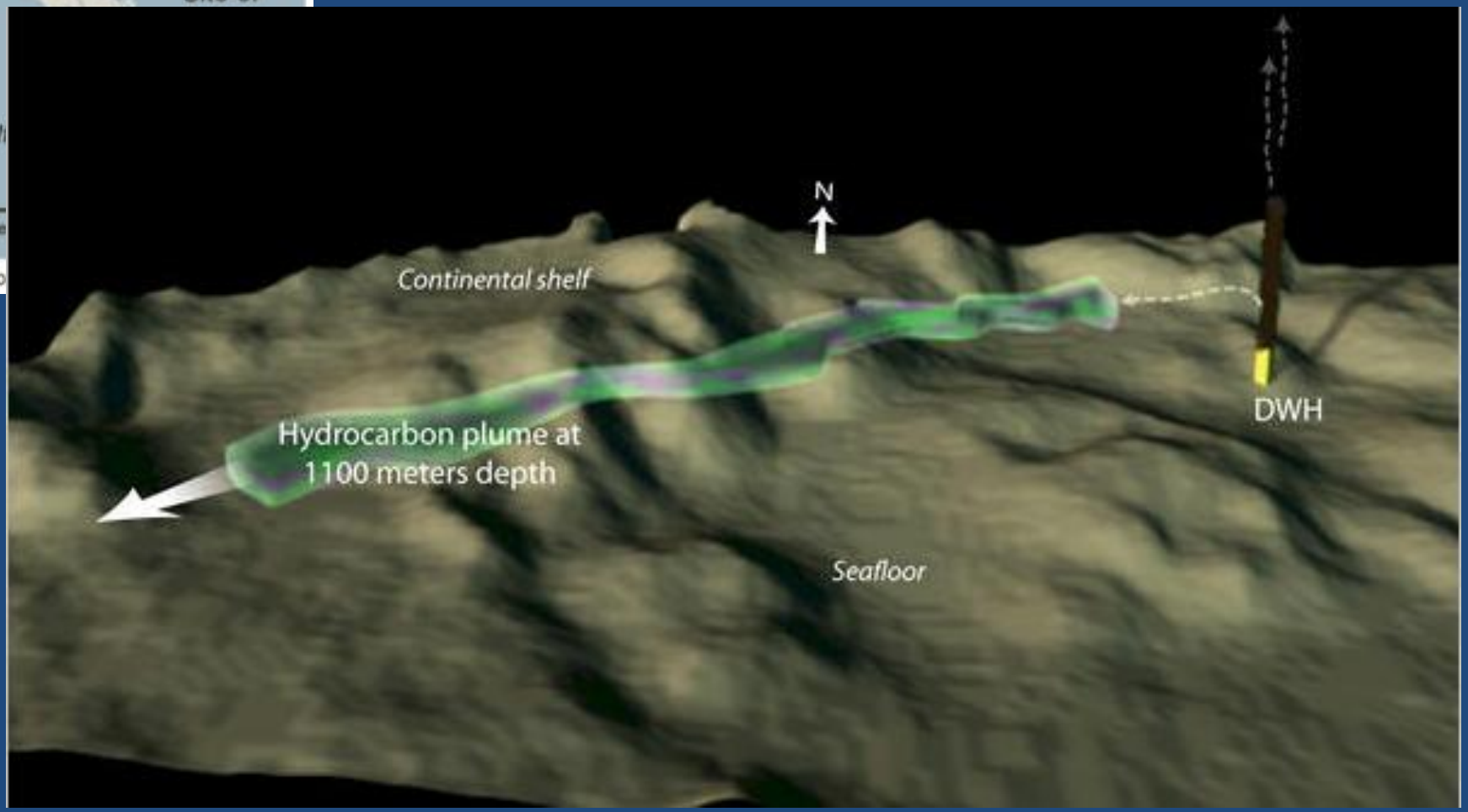
Baseline studies Oil Spill in the Gulf of Mexico



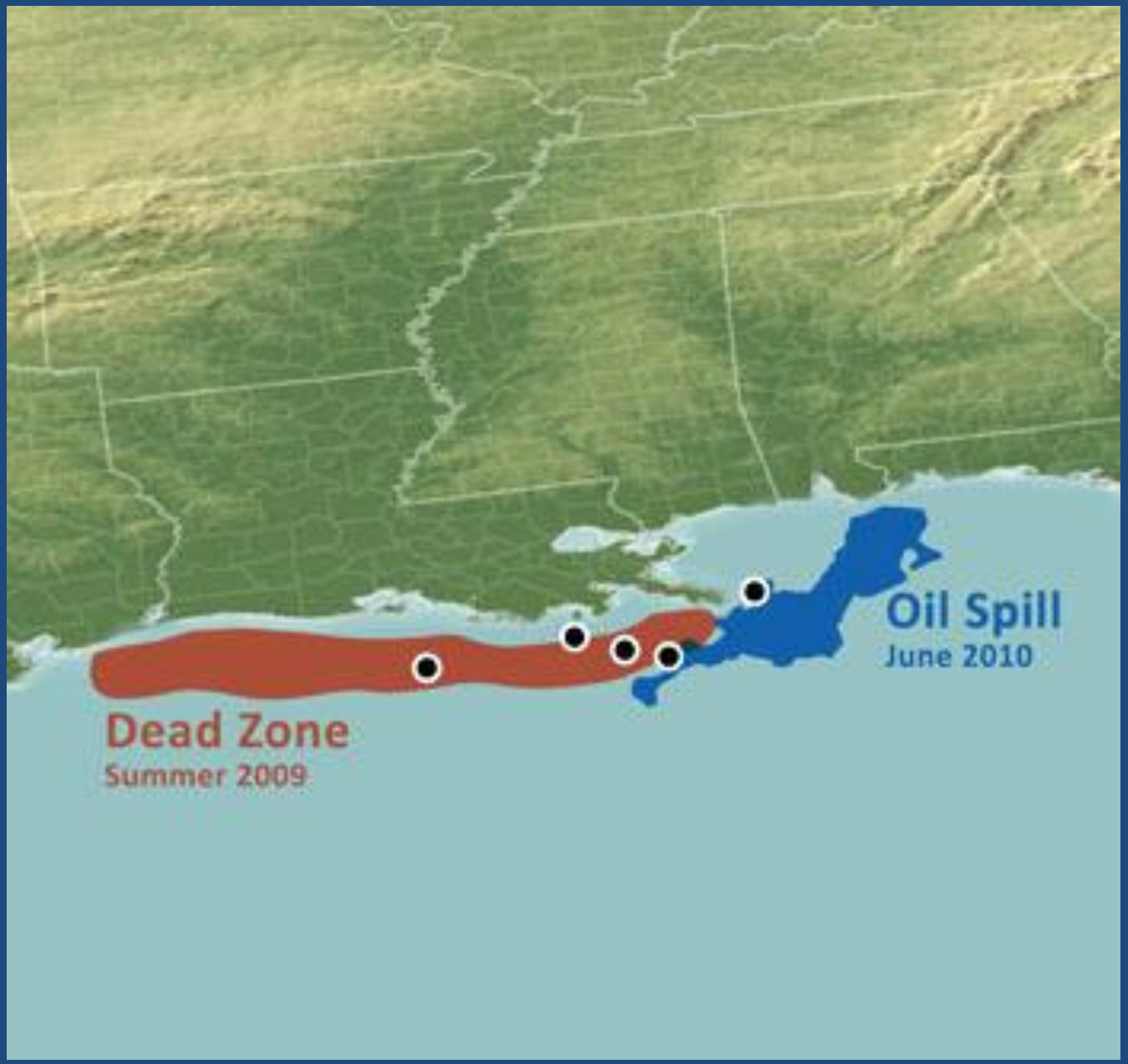


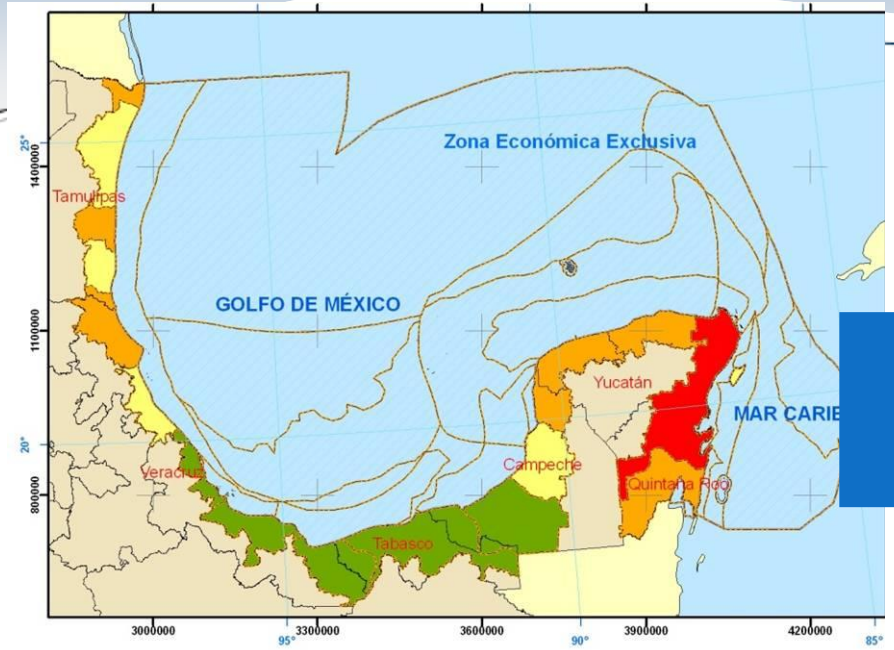


Oil plume in deep areas



Double challenge

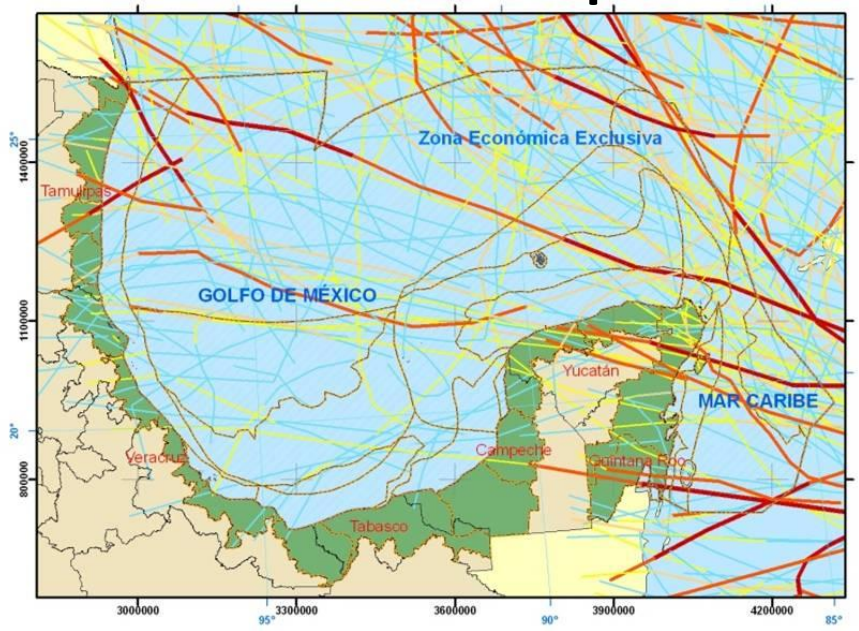


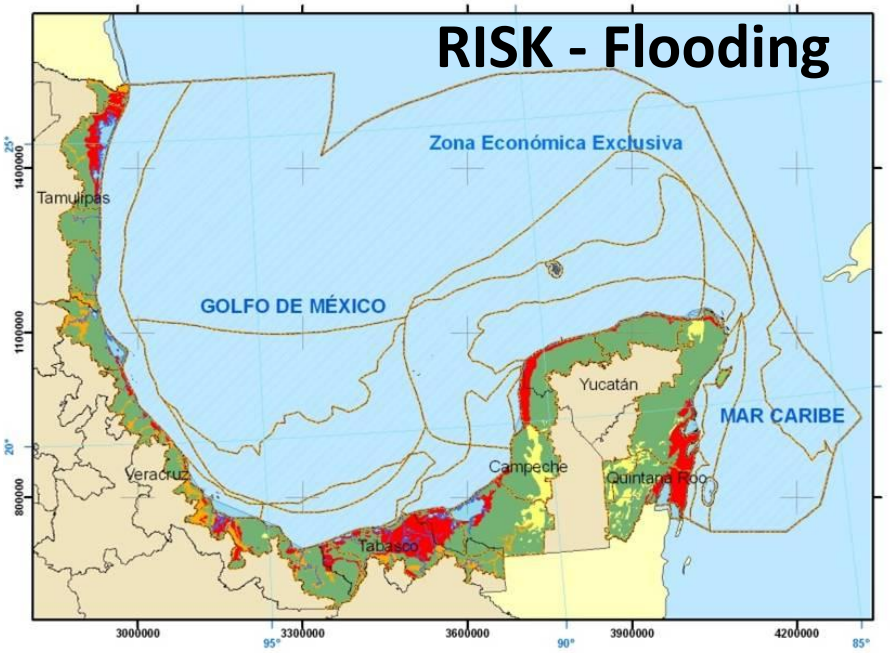


Most threatened regions (sea level rise)

- ✓ Northern areas of Tamaulipas
- ✓ Southern tip of Veracruz
- ✓ Deltaic plain Grijalva-Usumacinta system in Tabasco, and
- ✓ Coastal areas of Campeche, Yucatan and Quintana Roo

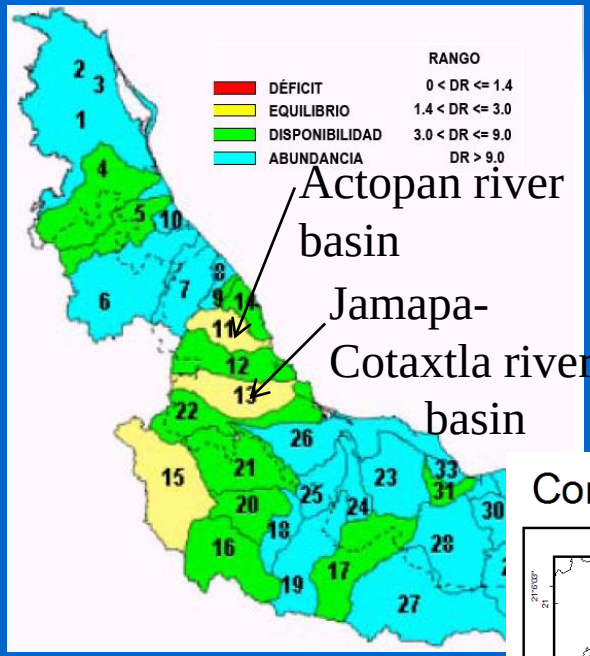
Historical hurricane paths





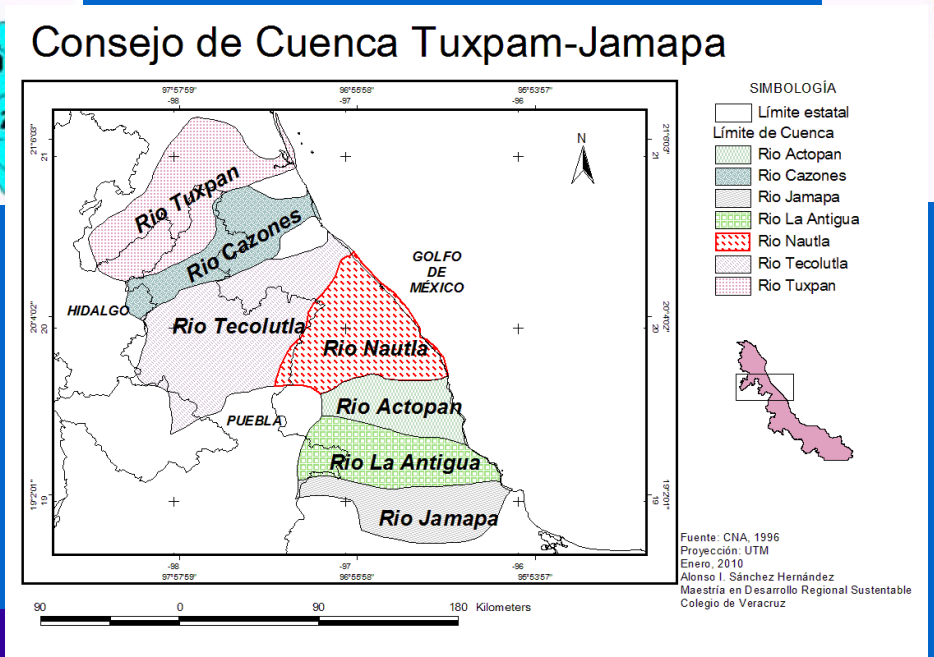
Tuxpan-Jamapa Basin Council ISSUES

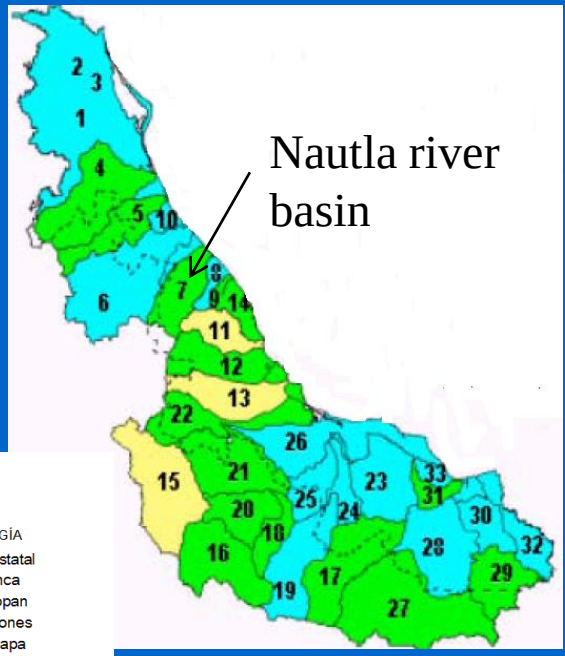
Scarcity



Water availabilty, 2004

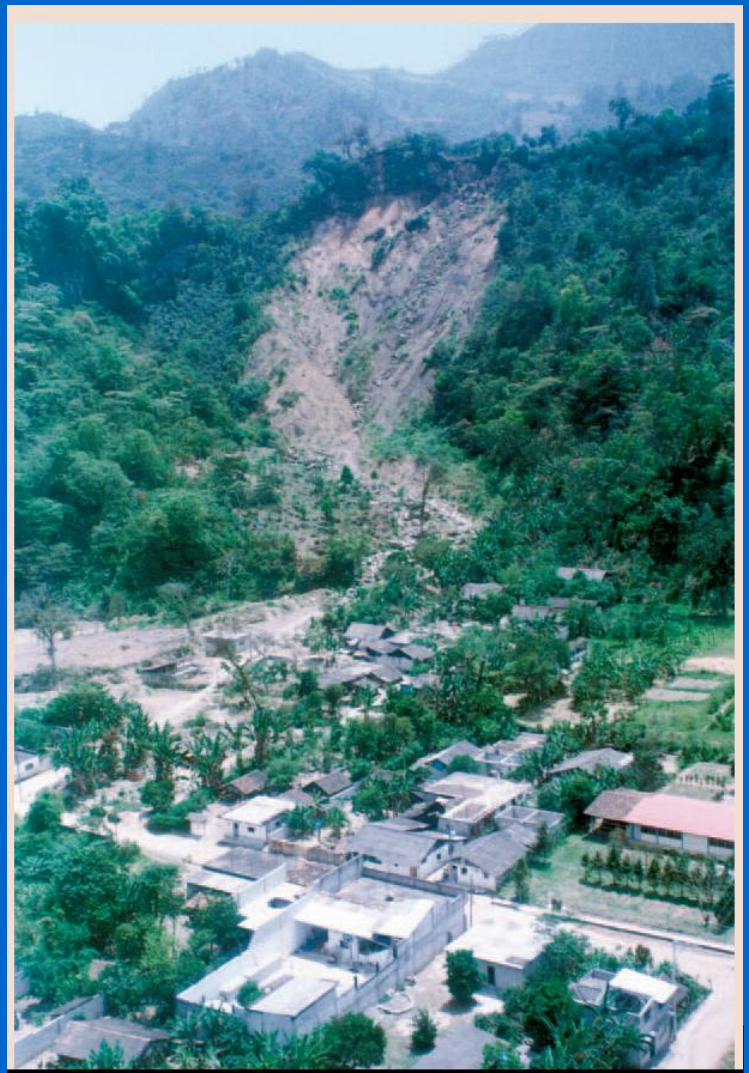
Deficit of 60.42% in domestic water supply





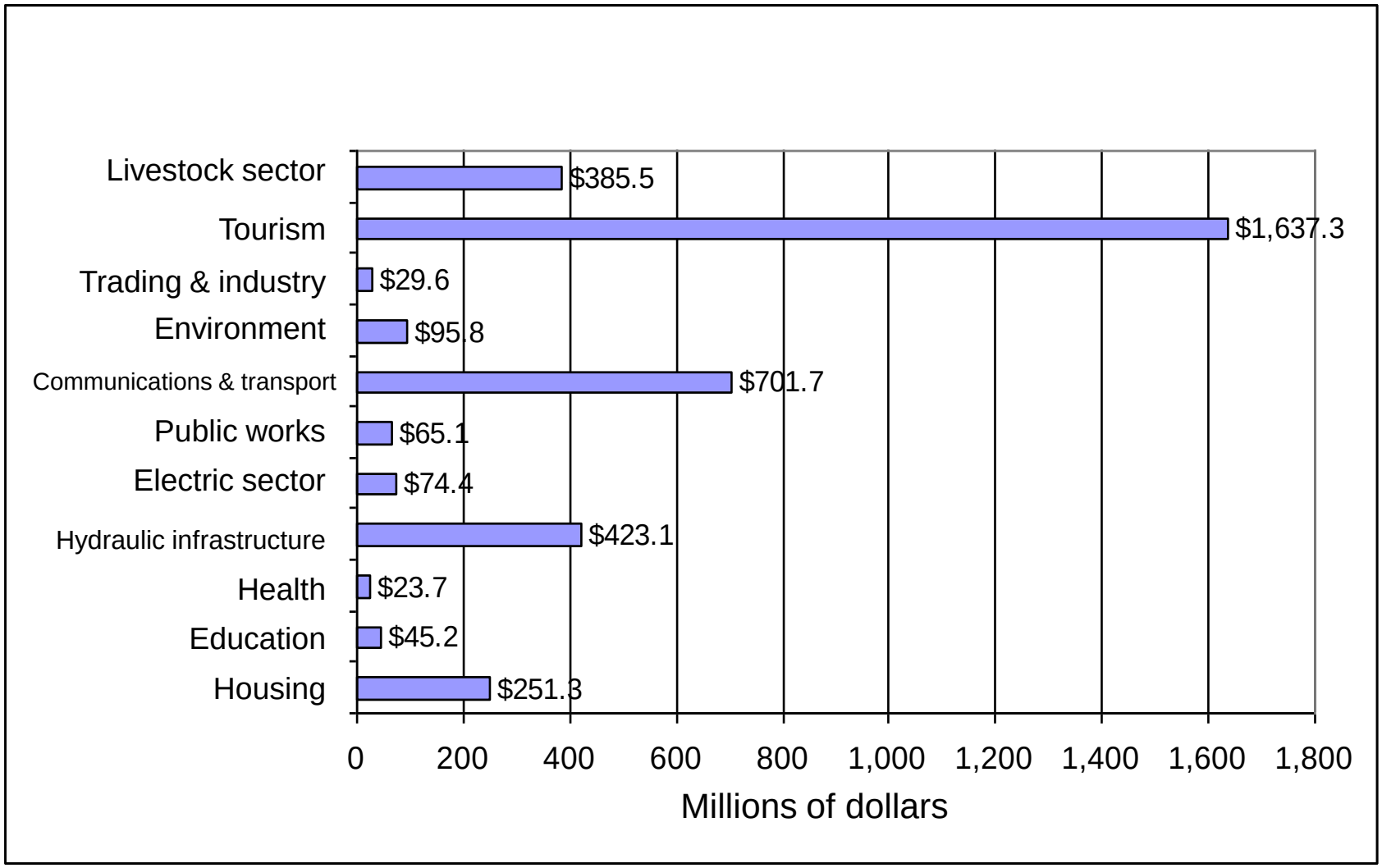
Forecast 2025

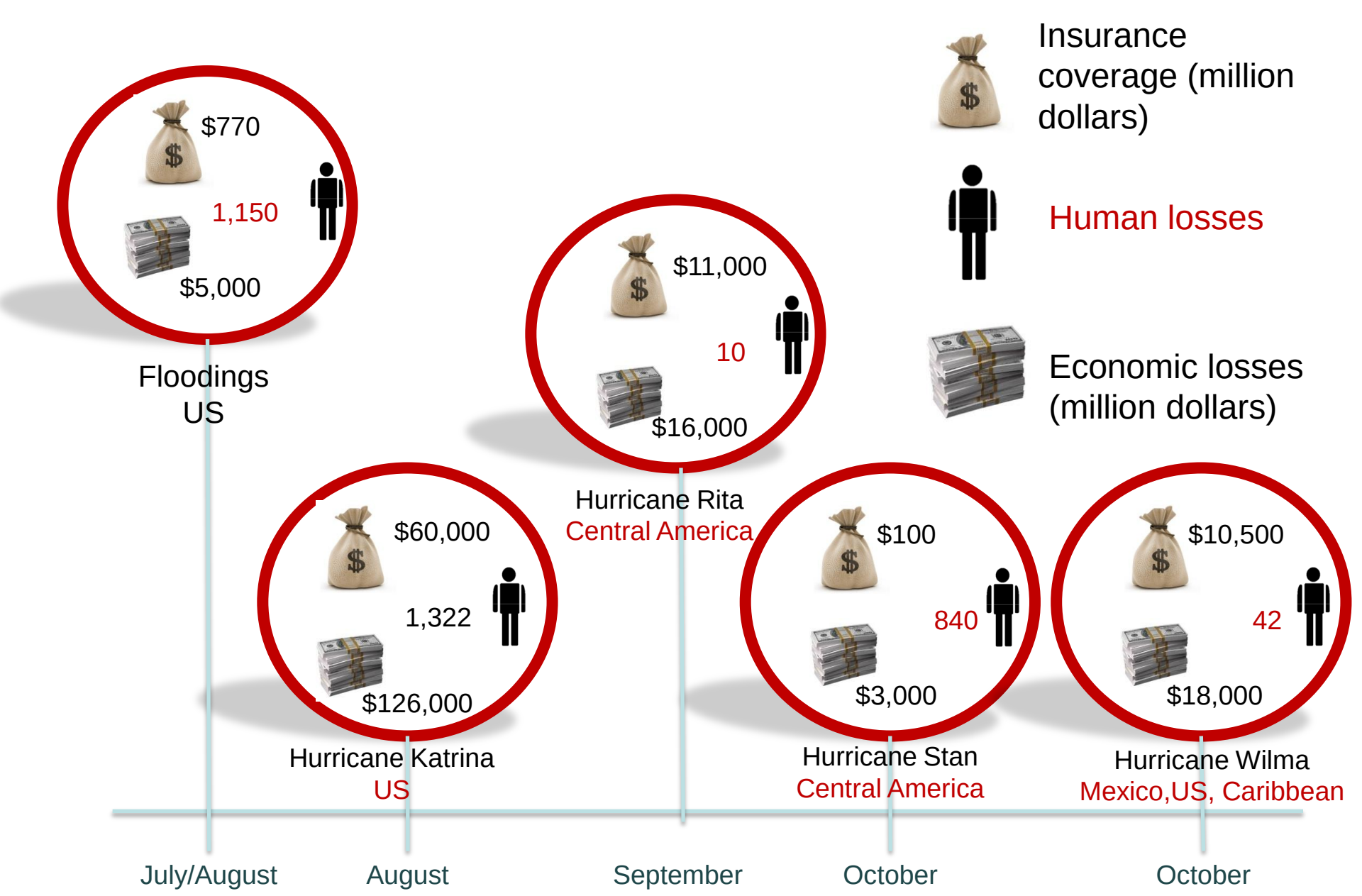
Floodings: Heavy rain + headwater deforestation



In 2005 (Puebla-Veracruz), precipitation of 743-844 mm in 4 days. Land use change + deforestation caused 40% of total failure. 263 casualties

Stan and Wilma. Damages by sector, 2005





Global losses due to the five major hydro-meteorological events in 2005.
Source: Cepal, 2009

Ecological Connectivity (Sea Turtles)

- 5 species of sea turtles

Kemp's ridley, hawksbill, loggerhead, green and occasionally leatherback

- Main Threats:
  - bycatch
  - habitat destruction (erosion, infrastructure)
  - feral predators
  - pollution (oil, debris, etc)
  - hurricanes incidence (low temperatures, flooding, erosion, etc.)

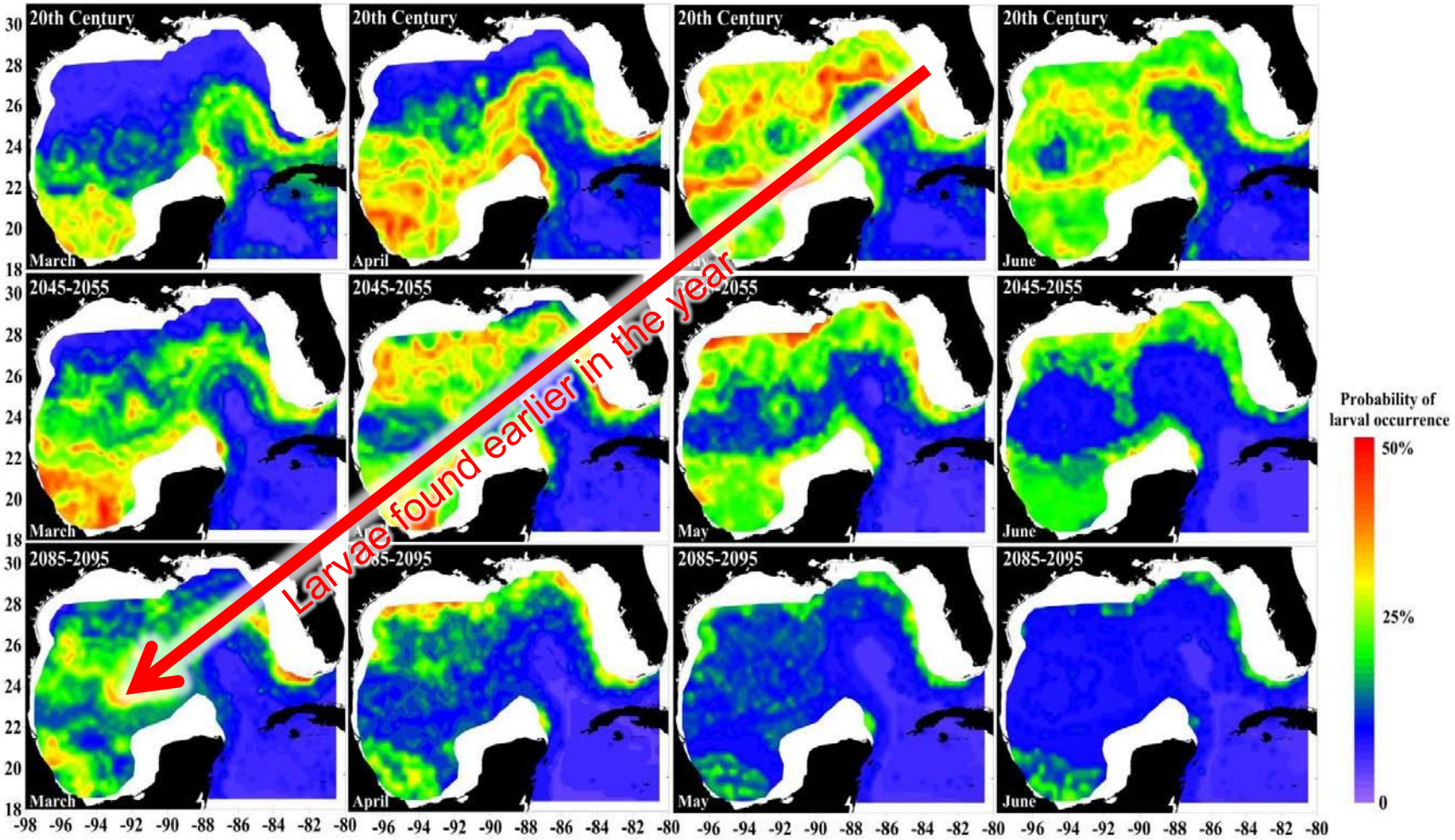
Probability of larval occurrence

March April May June

1980s

2040s

2080s



The probability suitable for the occurrence of larval bluefin tuna.

(Muhling et al 2010)

Climate change and sea turtles in the Gulf of Mexico LME

Kemp's ridley

Lora

Loggerhead

Cabezona

Hawksbill

Carey

Green turtle

Verde (Blanca)

Leatherback

Laúd

From Jeff Seminoff, SWFSC, La Jolla, CA

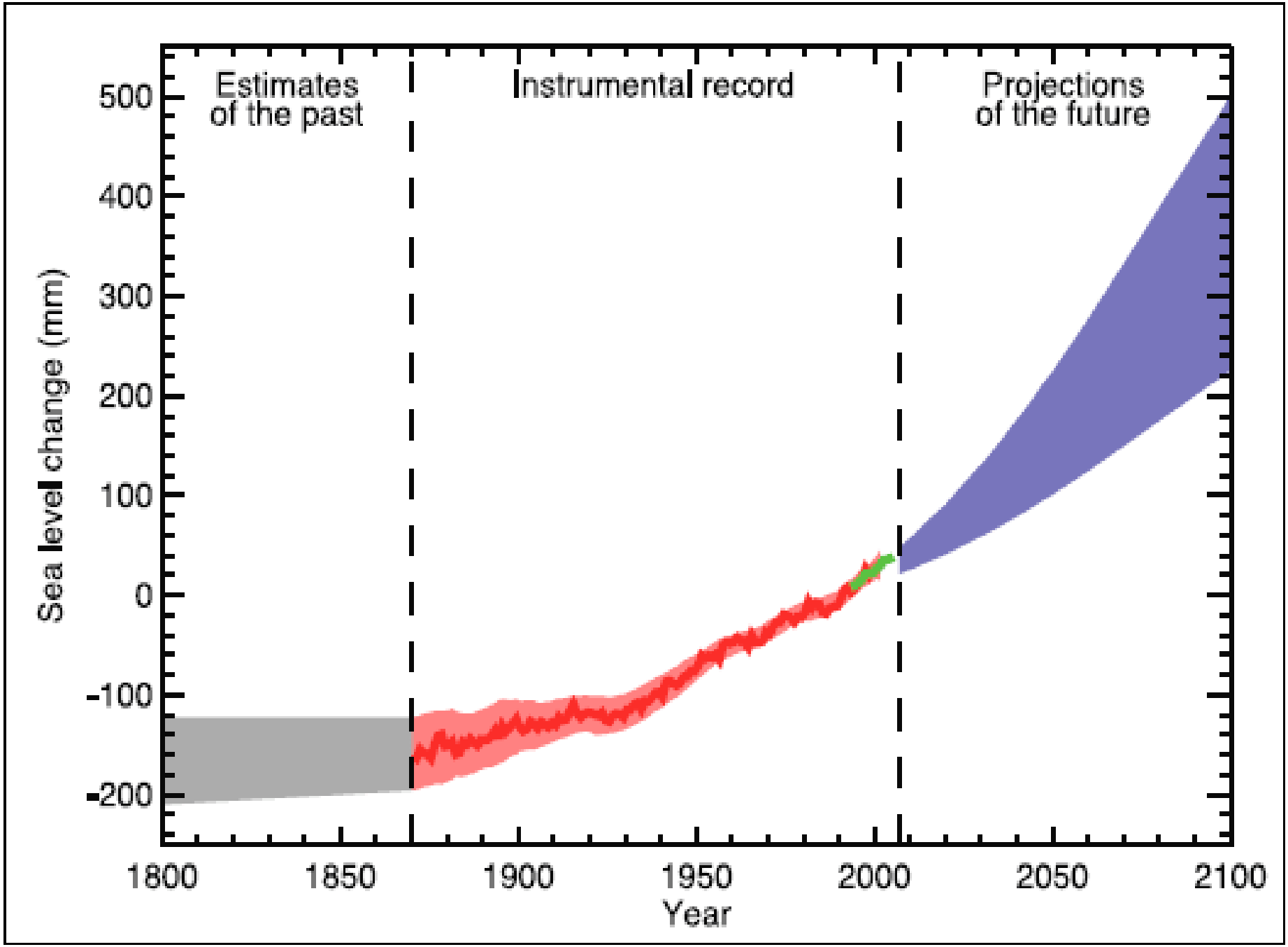
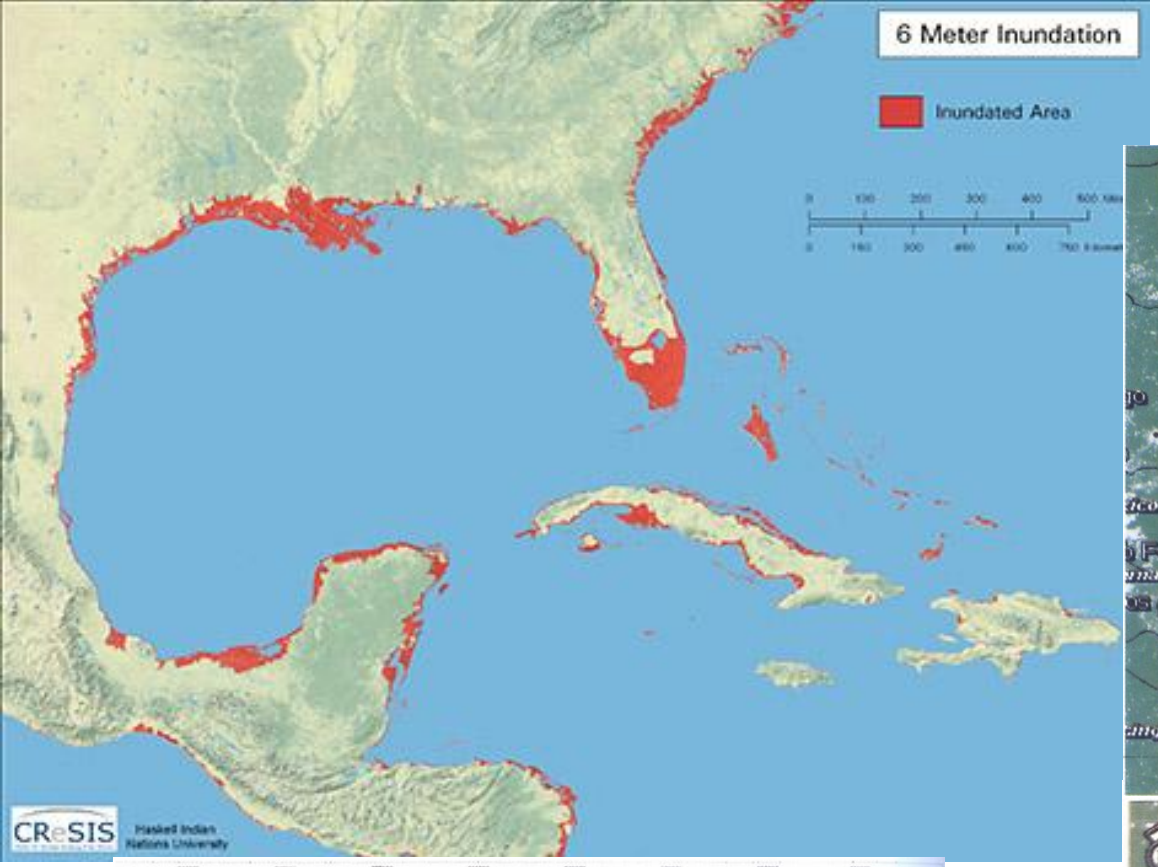
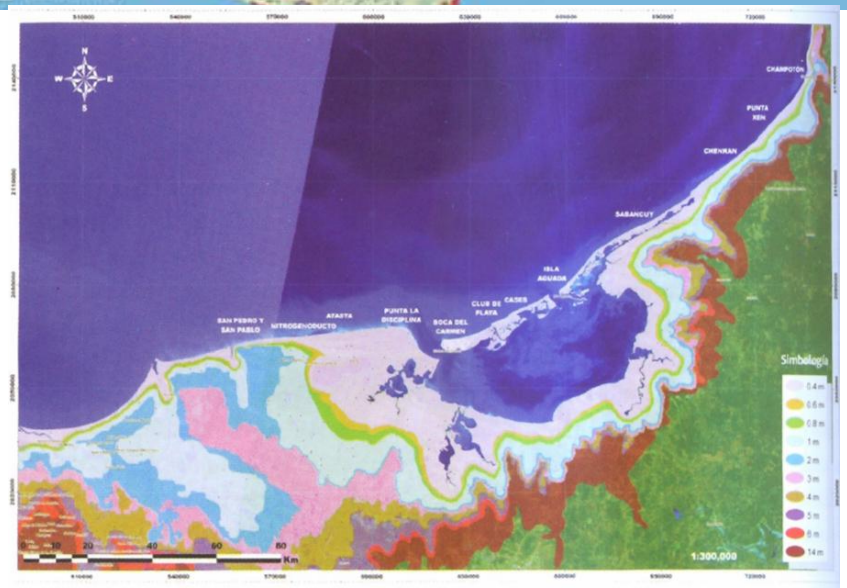


Figure 7.20: Projected sea-level rise through AD 2100

Davis, Richard

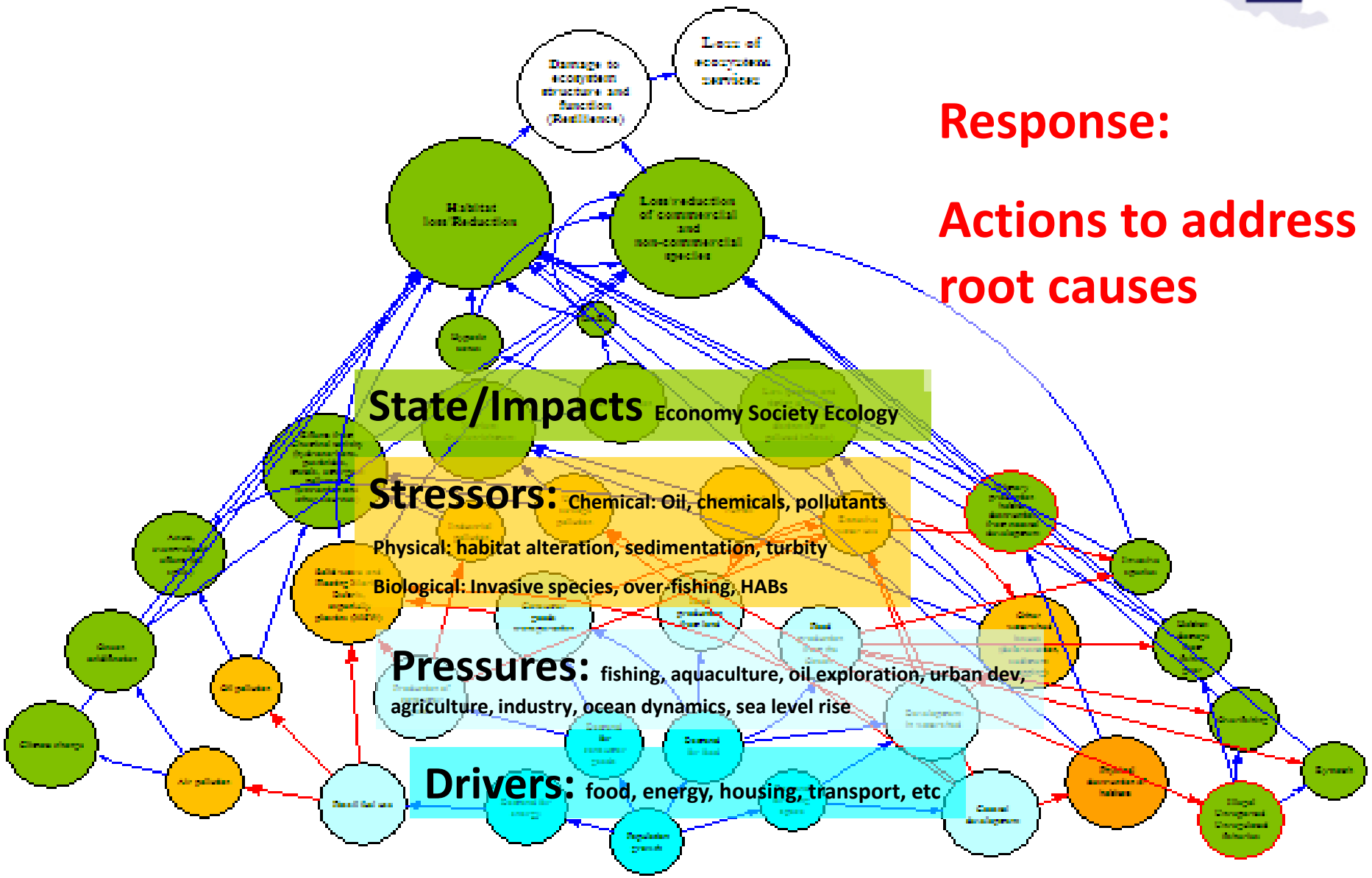

6 Meter Inundation
Inundated Area
CReSIS
Haskell Indian Nations University


Tampico
Pachuca
Jalapa
Tlaxcala
Veracruz
Puebla
Tabasco


CHAMPOTON
PUNTA XEN
CHENKAN
SABANCUY
ISLA AGUADA
CASES
CLUB DE PLAYA
BOCA DEL CARMEN
PUNTA LA DISCIPLINA
ATASTA
SAN PEDRO Y SAN PABLO
Simbología
1:300,000


Leyenda
Susceptibility to Sea Level Rise
Weiss & Overpeck
The University of Arizona
Kilometers

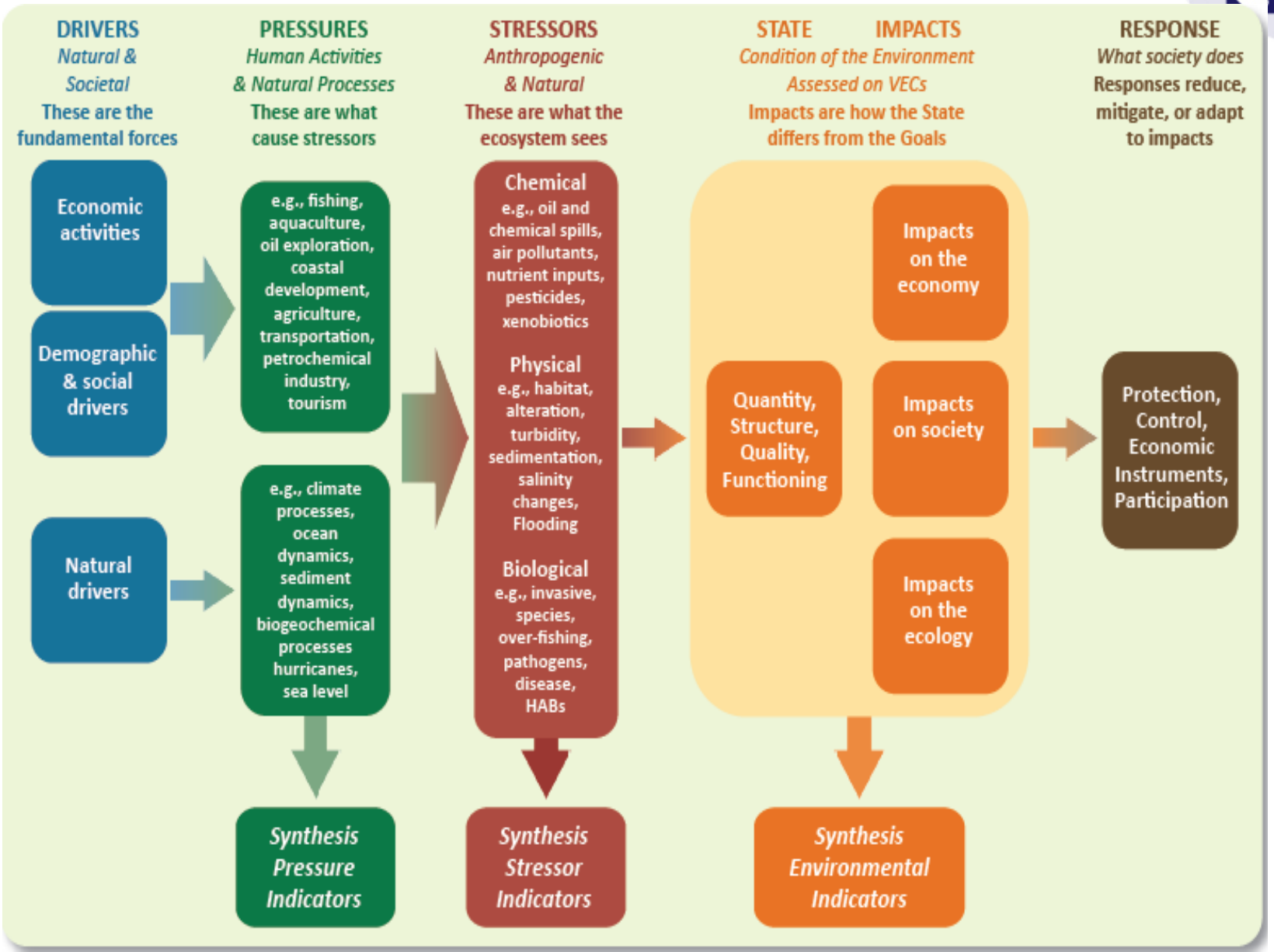
Correspondence with the Drivers- Pressures- Stressors- State/impact- Response framework

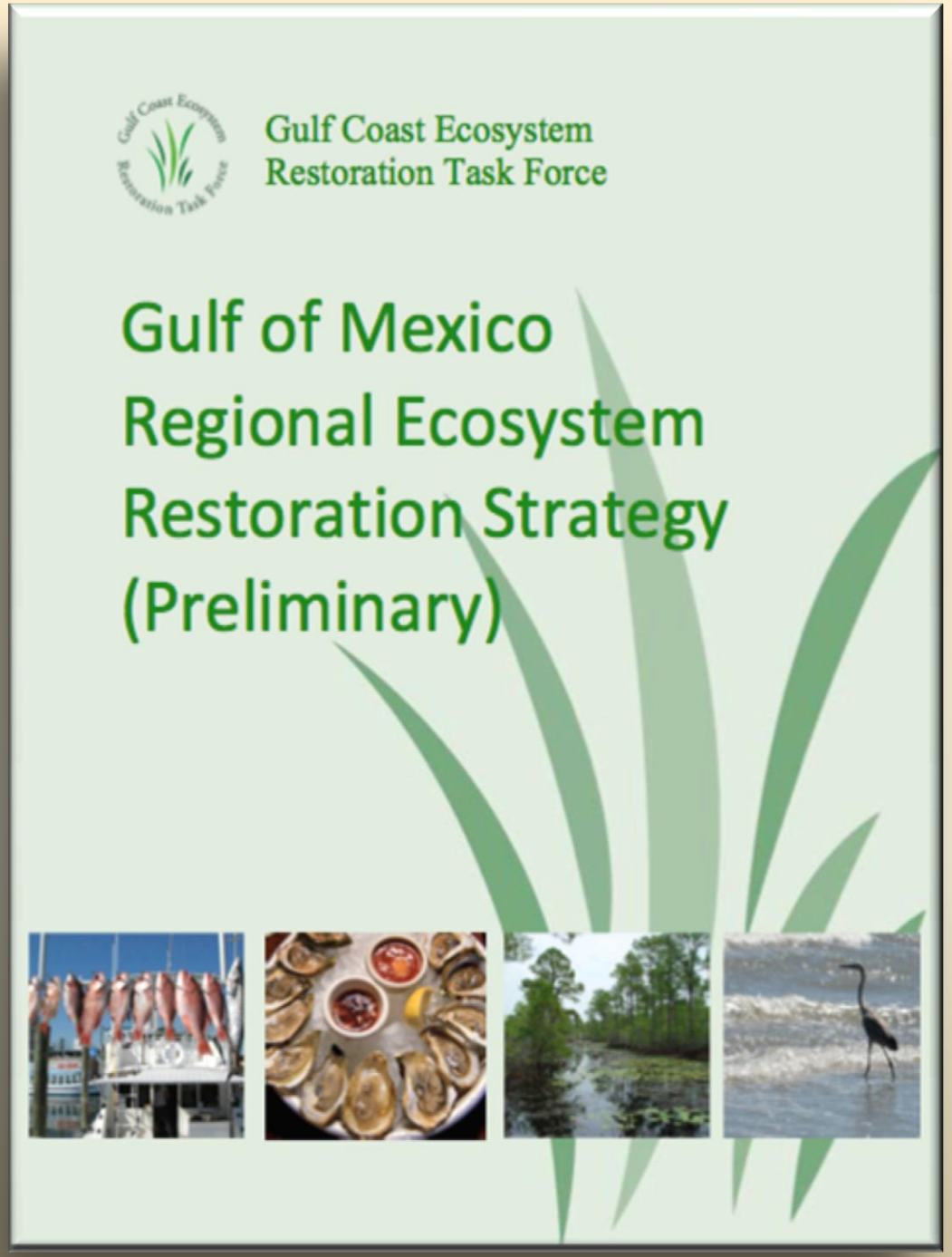


Response:

Actions to address root causes

That is the approach used in the GoM by several initiatives (*i.e.* Ecological Score Card)





Public consultation

5 – 26 October

September, 2011

Integrated Assessment and Management of the Gulf of Mexico Large Marine Ecosystem Project

Transboundary Diagnostic Analysis

GLOBAL ENVIRONMENT FACILITY

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

GULF OF MEXICO LME

Overarching goals

- Developing a unified vision for the future condition of a Gulf of Mexico that is economically and ecologically sustainable
- Adopting a science-based metric, a Report Card, to chart progress towards that vision
- Establishing an ongoing process to assure the best science, most effective policies and most efficient actions to realize that common vision
- Promoting international cooperation in restoration and conservation

INTEGRATED ASESSMENT AND MANAGEMENT OF THE GULF OF MEXICO

www.gulfofmexicoproject.org