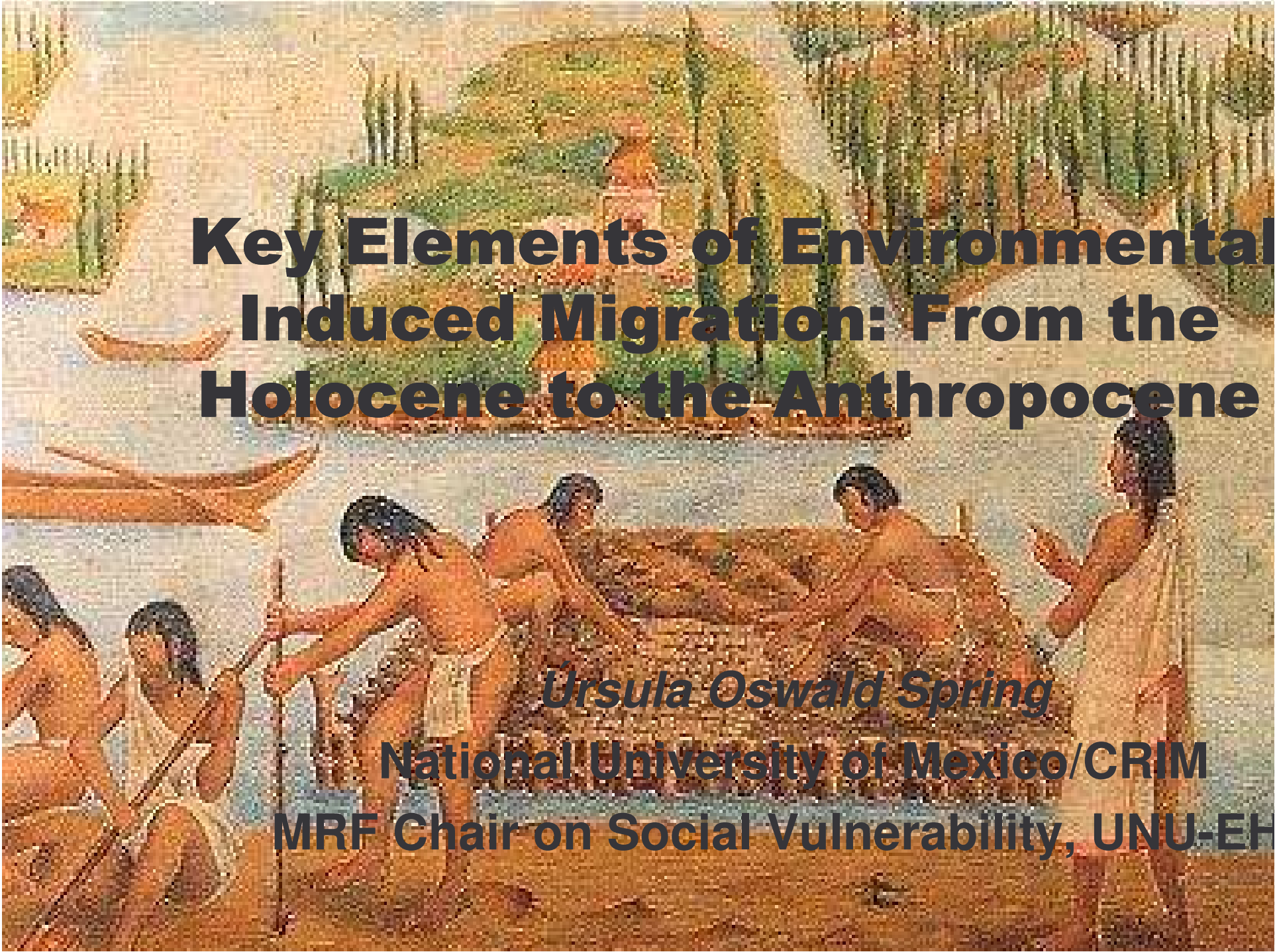

Key Elements of Environmental Induced Migration: From the Holocene to the Anthropocene

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1. Hypothesis of Environmental Induced Migration: EIM

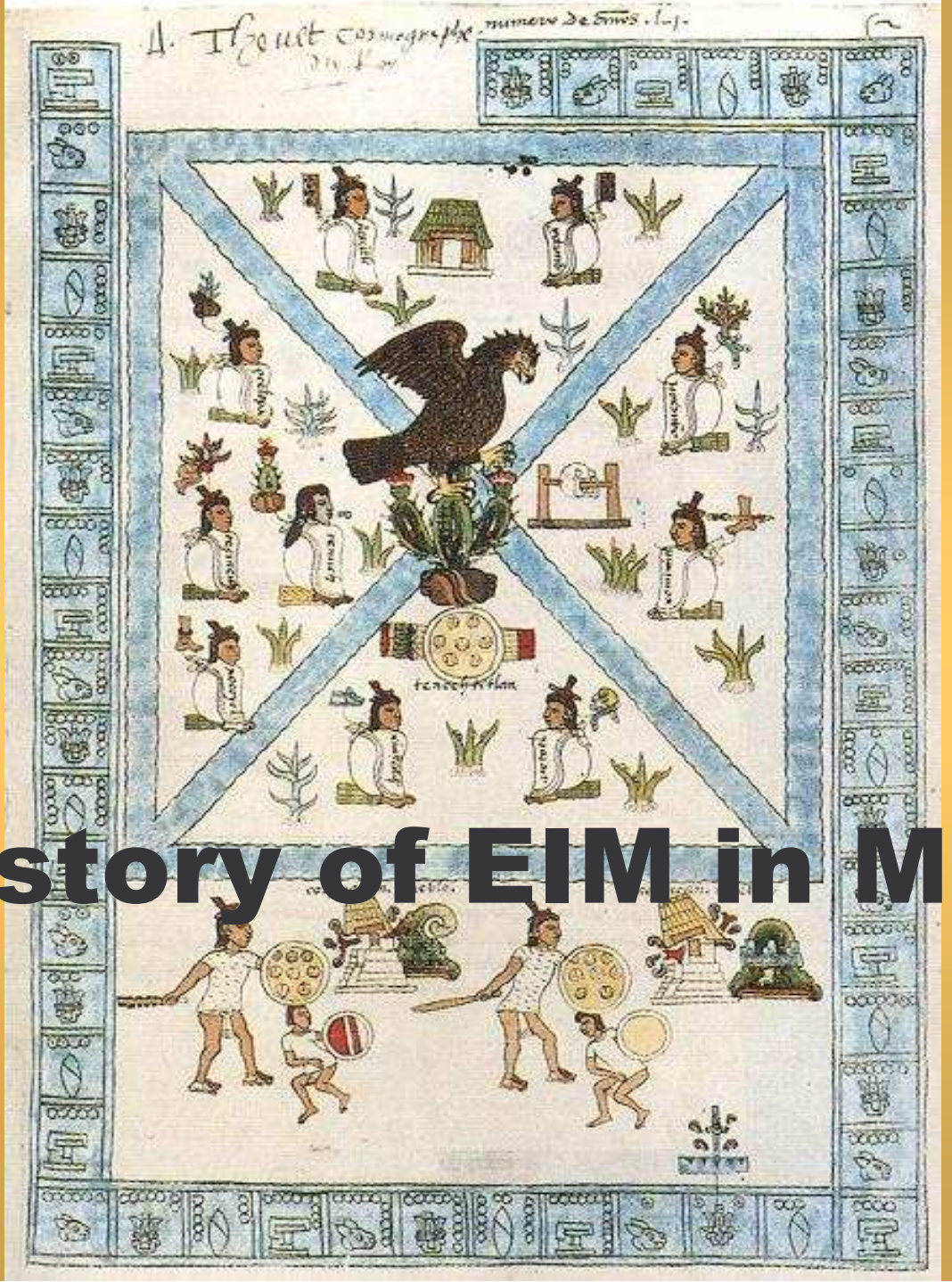
- Migration is a permanent phenomenon in human history.
- Humankind dispersed all over the globe and with it food crops, diseases and culture, due to migration.
- Key elements distinguish the EIM during the Holocene (since 12,000 BA) from the EIM in the emerging Anthropocene (since 1750 AD) period of Earth history.

2. Definition of EIM

"Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad" (IOM, MC/INF/288 2007: 2).

3. Holocene

- The Holocene is a period of transition in Earth history that experienced dramatic environmental change, where the huge ice sheets that covered the northern and western parts of North America (Laurentide) melted and disappeared from the Great Lakes, while the ice sheets survived in the northern latitudes for another 3000 years.
- Enormous volumes of water, stored as glacier ice for thousands of years, returned to the oceans.
- Holocene covers the period of the past 10,000 years.
- The end of the last glaciation permitted the development of agriculture and the earliest pollen remains are dated some 10,000 years ago.
- In Mesoamerica, squash was the first plant domesticated while corn experienced an artificial transgenosis, where wild varieties of *Tripsacum* with teocintle (*Zea mexicana*) generated a complete genome.
- This complex process started about 7,000 years ago and produced maize, one of the five basic food crops of the world (corn, rice, wheat, potatoes and beans).

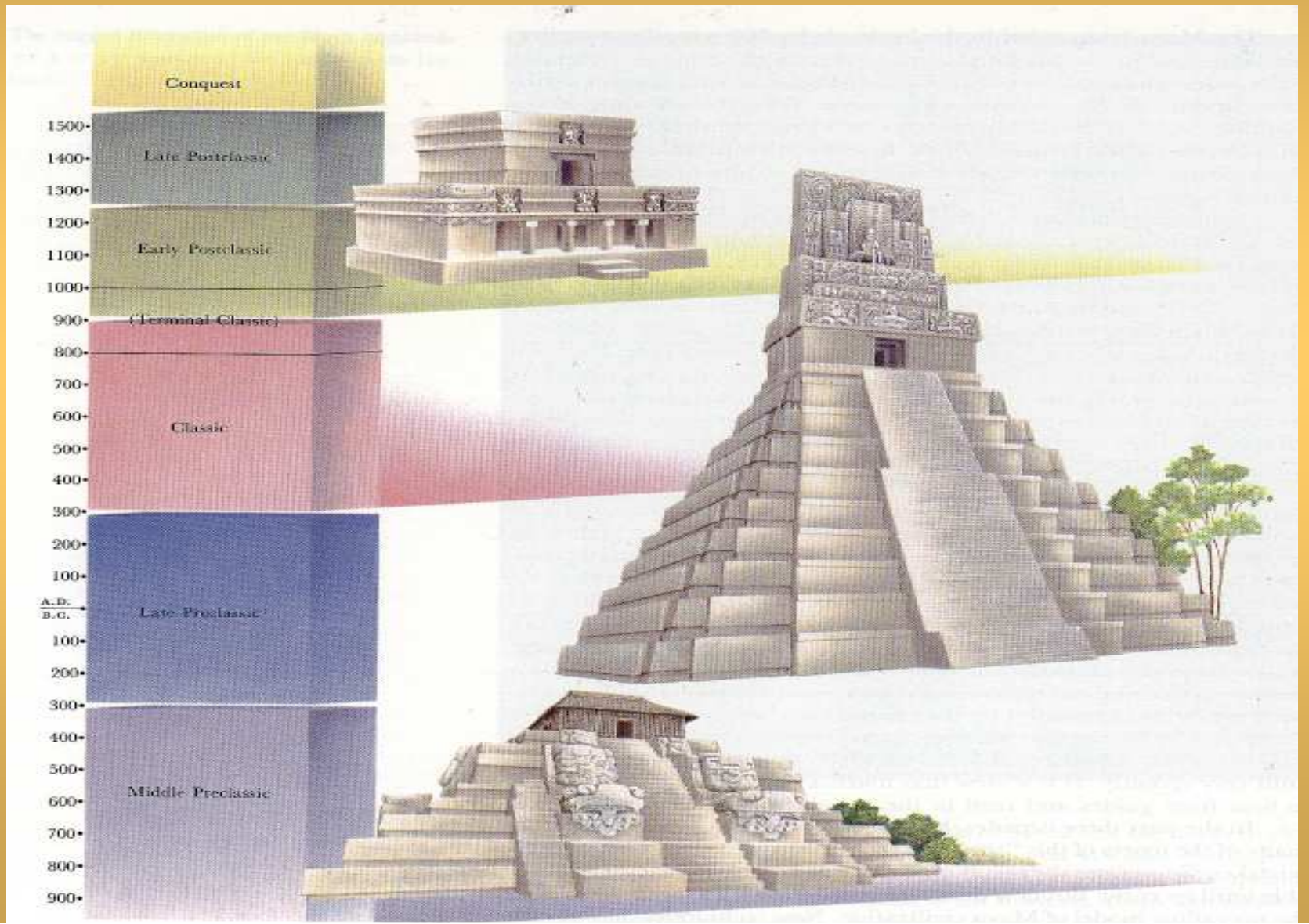


4. History of EIM in Mexico

Main Cultures

- Through migrations from the North Mesoamerican cultures turned into **civilizations** with powerful religious cults, large ceremonial centers and a complex art.
- The most influential early culture was that of the **Olmec** along the Gulf Coast of Mexico (1200-400 BC), later the **Mayan,** the **Mixtecs** and the large city of **Teotihuacan**.
- Chiefdoms and later **empires** (Triple Alliance of the Aztecs) controlled the trade of food, luxury goods and medical plants from the north to Mesoamerica and in the south to Colombia and beyond.

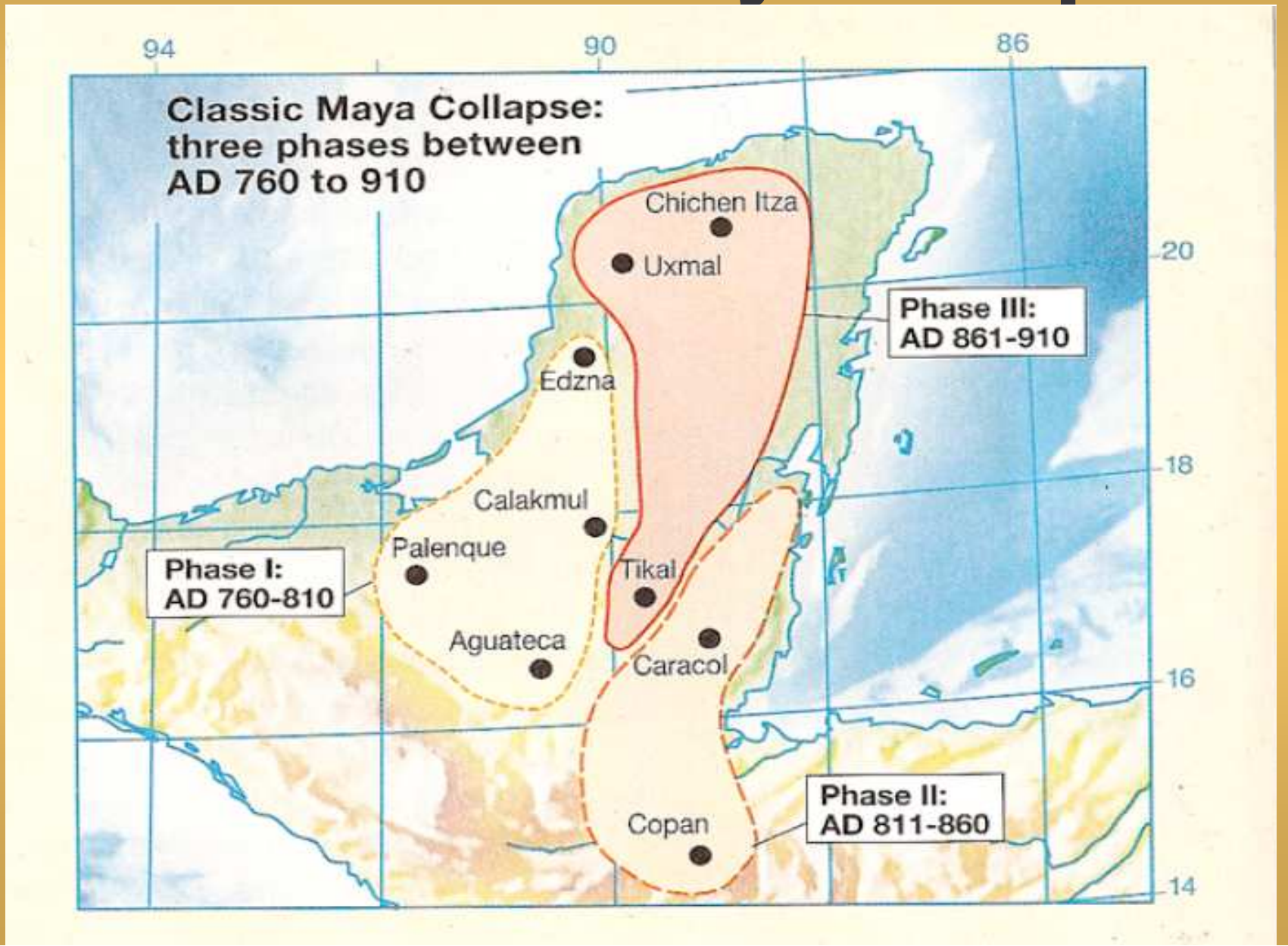
5. Rise and Fall of the Mayan Culture



Three Phases of Mayan Collapse

- During the Holocene the **Mayan culture** was seriously affected by natural climate variations, population growth, deforestation, bad harvests, water scarcity, local and regional conflicts and migration.
- **First phase**: Palenque, Edzna and Calakmul (the Puuc culture) basically relied on rainfall and river water with few ground water. Reduced water availability (760-810), massive deforestation of the tropical forest, big demand of food and ceremonial goods, construction with high buildings and large ceremonial centres and palaces demanded an intensive use of natural resources and affected this civilization.
- **Second drought phase (861-910):** distressing the lowland freshwater from lagoons and some other surface water. These environmental threats were able to destroy great ceremonial centres such as Copan and Caracol localized in the dry tropical forest ecosystems.
- **Third drought (811-860):** was severe enough to reduce the availability of water in the lagoons and aquifers (cenotes) located in limestone that provided water for human use and irrigation in Chichen Itza, Uxmal and Tikal for increasing population.
- **Climate impacts**, severe periods of drought, soil depletion with deforestation, land use changes, hierarchical and exploitive labour system, loss of food security, hunger riots, illnesses & power struggles: massive migrations in the Yucatan peninsula to remote forest areas destroyed post-classic phase of the Mayan civilization (Gil 2000).

Climate and Maya Collapse

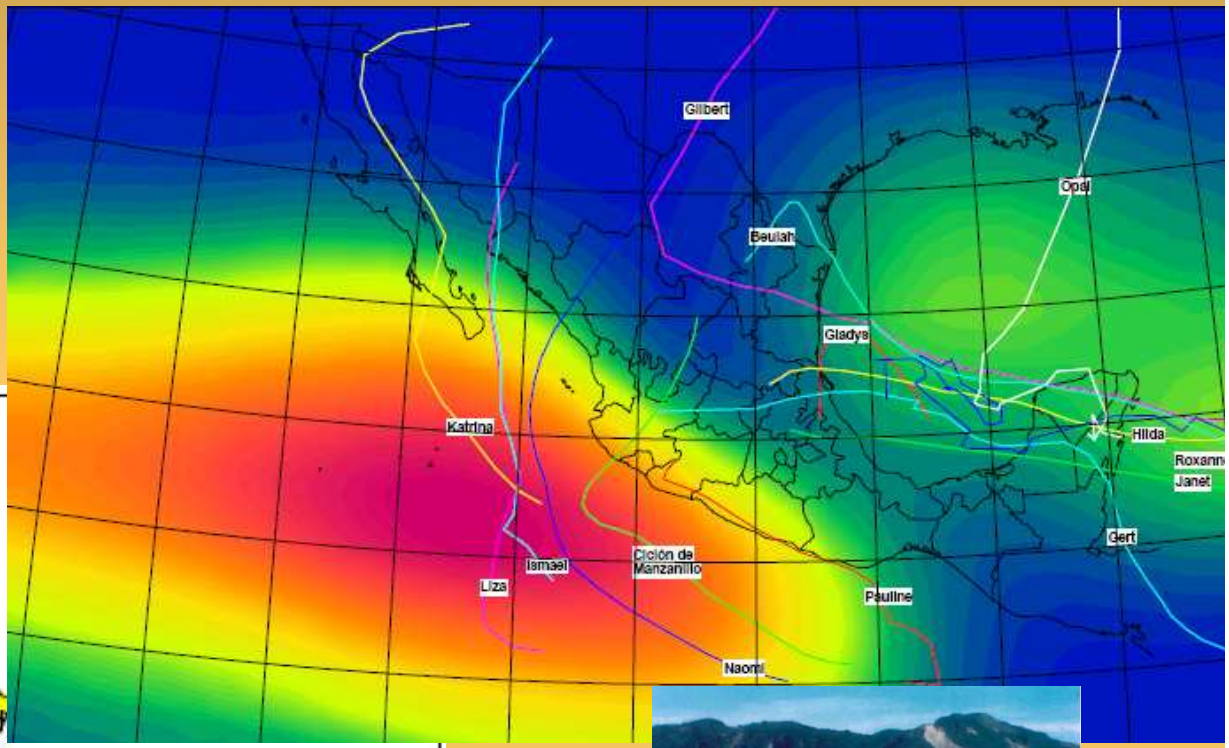


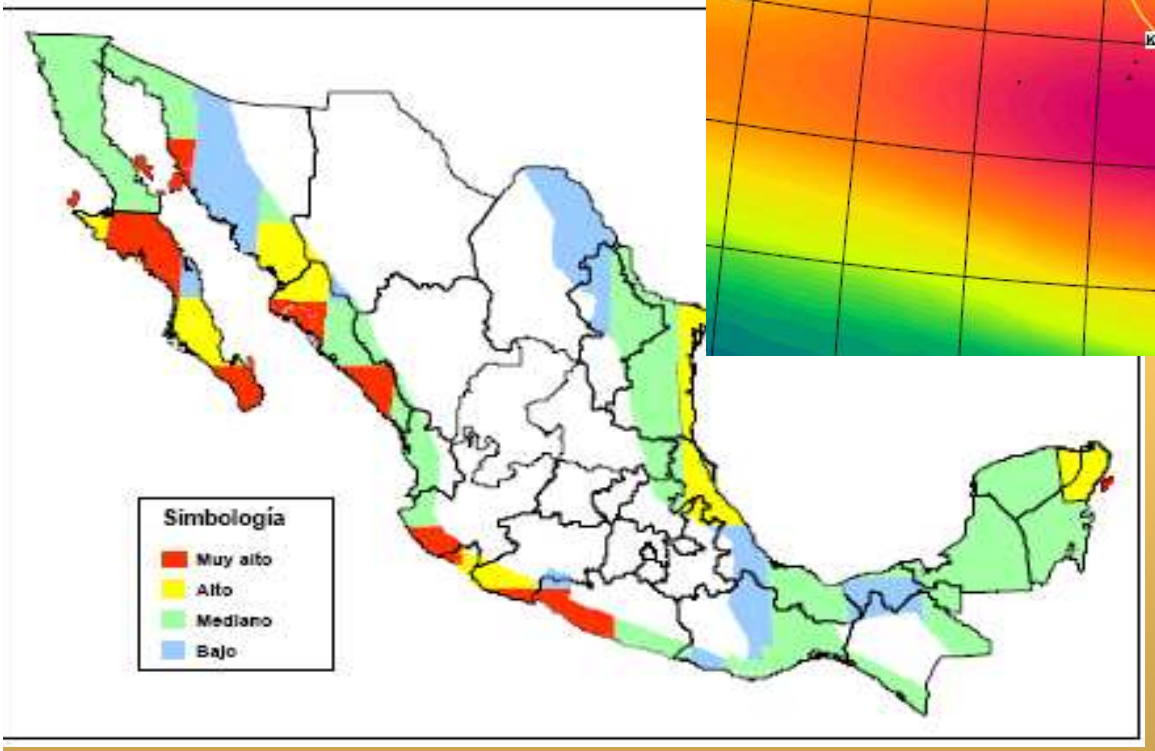
6. Anthropocene

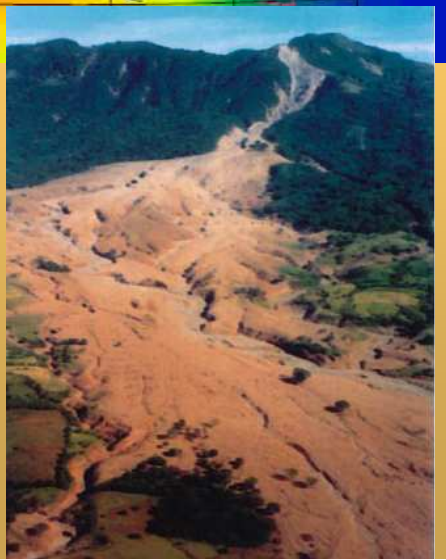
- Paul Crutzen, a Nobel laureate in chemistry: new era to acknowledge the increasing role of human activities in the functioning of the Earth system. Applies to the drastic changes in Earth history since the Industrial Revolution: started with the steam engine and the intensive use of fossil fuels (coal, oil, gas).
- Major changes during the past 260 years: sediment erosion and deposition patterns; acidification of the oceans, changes in biology and biodiversity, and major disturbances in the carbon cycle and in the global average temperatures.
- Interaction between natural and social processes threatened the tiny marine life that forms the bottom of the food chain, but affected also soils, air quality and biodiversity along with socioeconomic and cultural processes.
- Global environmental changes (GEC) were accompanied by a regressive globalization with increasing inequity and inequality between South and North and within countries and across gender lines.
- Non-lineal outcome does not permit any prospecting for complex future interactions.

Threats: Mexico in the Anthropocene

Source: CENAPRED, 2001



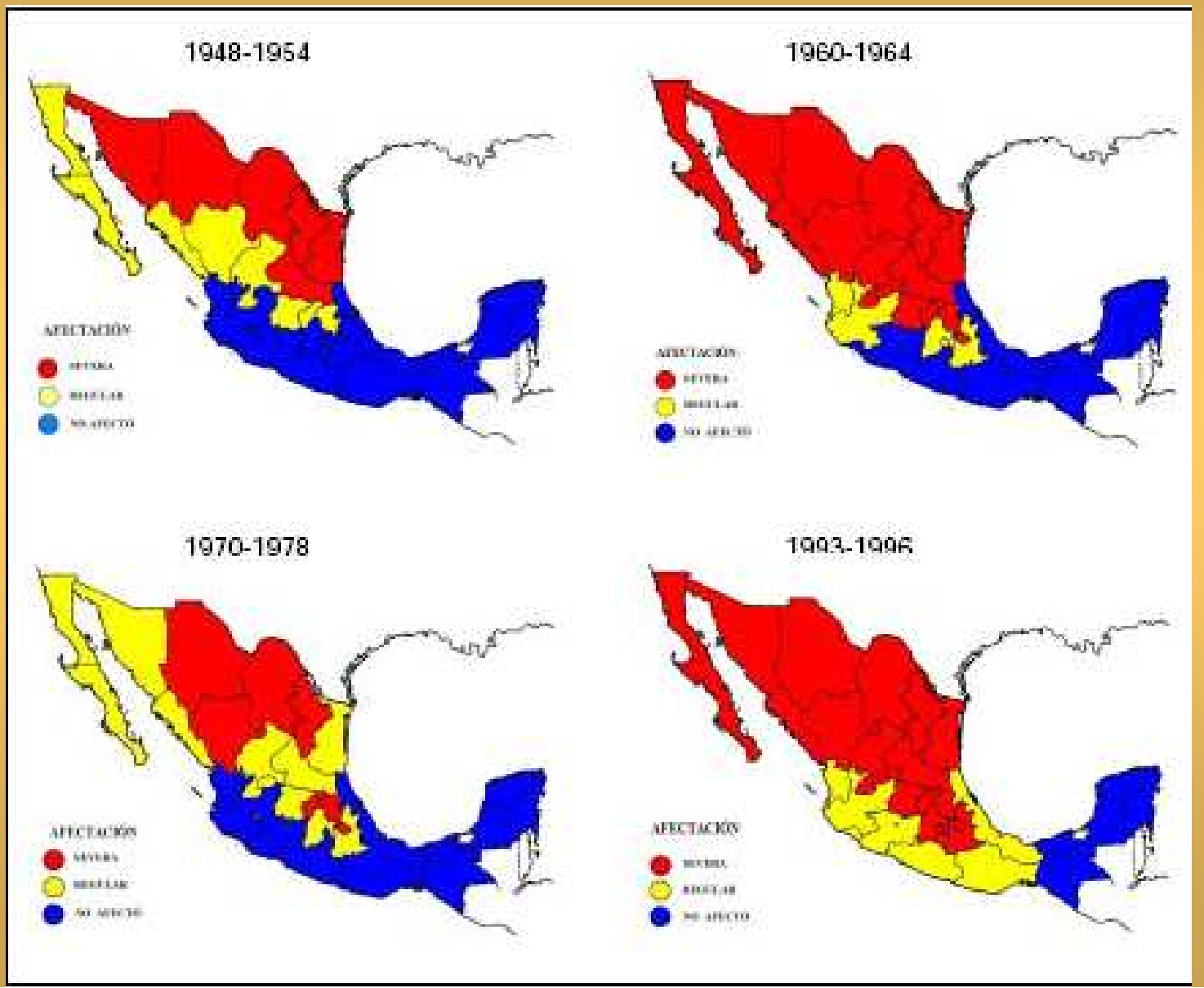




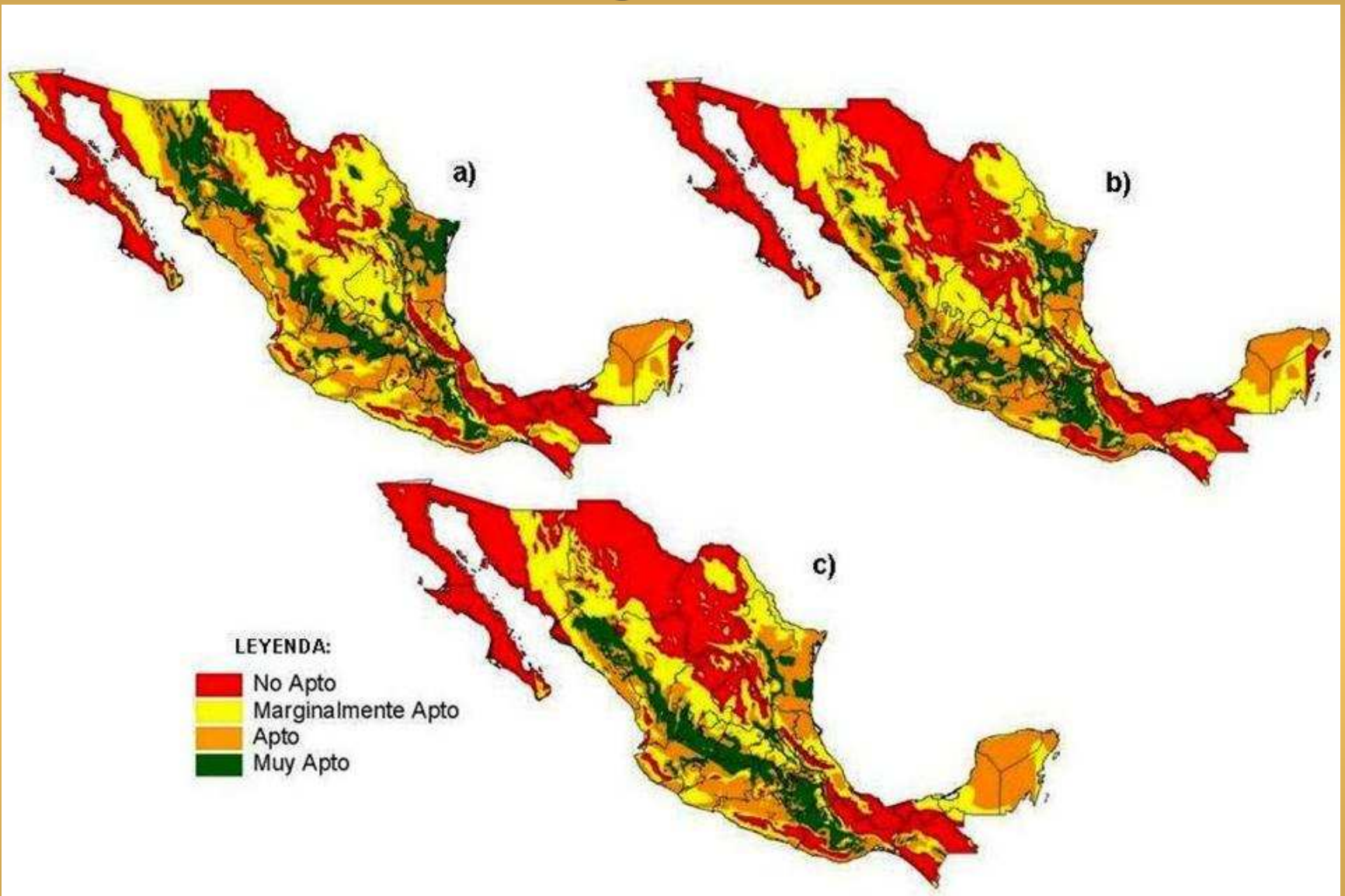
Modern Mexico

- During the **Anthropocene**, the fourth biodiverse country is threatened by almost all anthropogenic processes
- Repercussions for nature and society: rural-urban migration, poverty, chaotic urbanization, illegal international migration, unequal integration into the world market through free trade agreements (FTA), desertification, hurricanes, floods, droughts, landslides, loss of biodiversity, sea level rise and human induced disasters.

Desertification and EIM



Climate Change, Corn and EIM

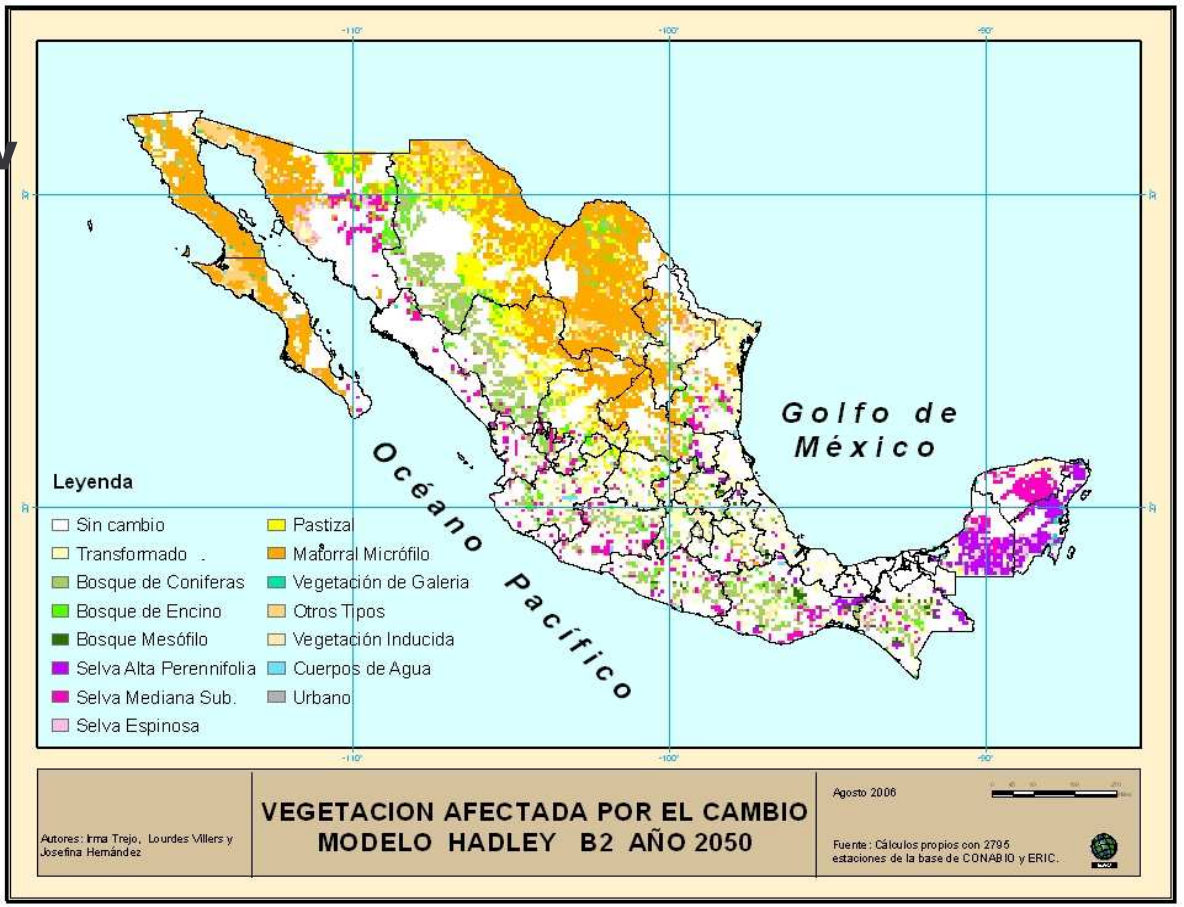


Monterroso, A. G, Rosales, 2006.

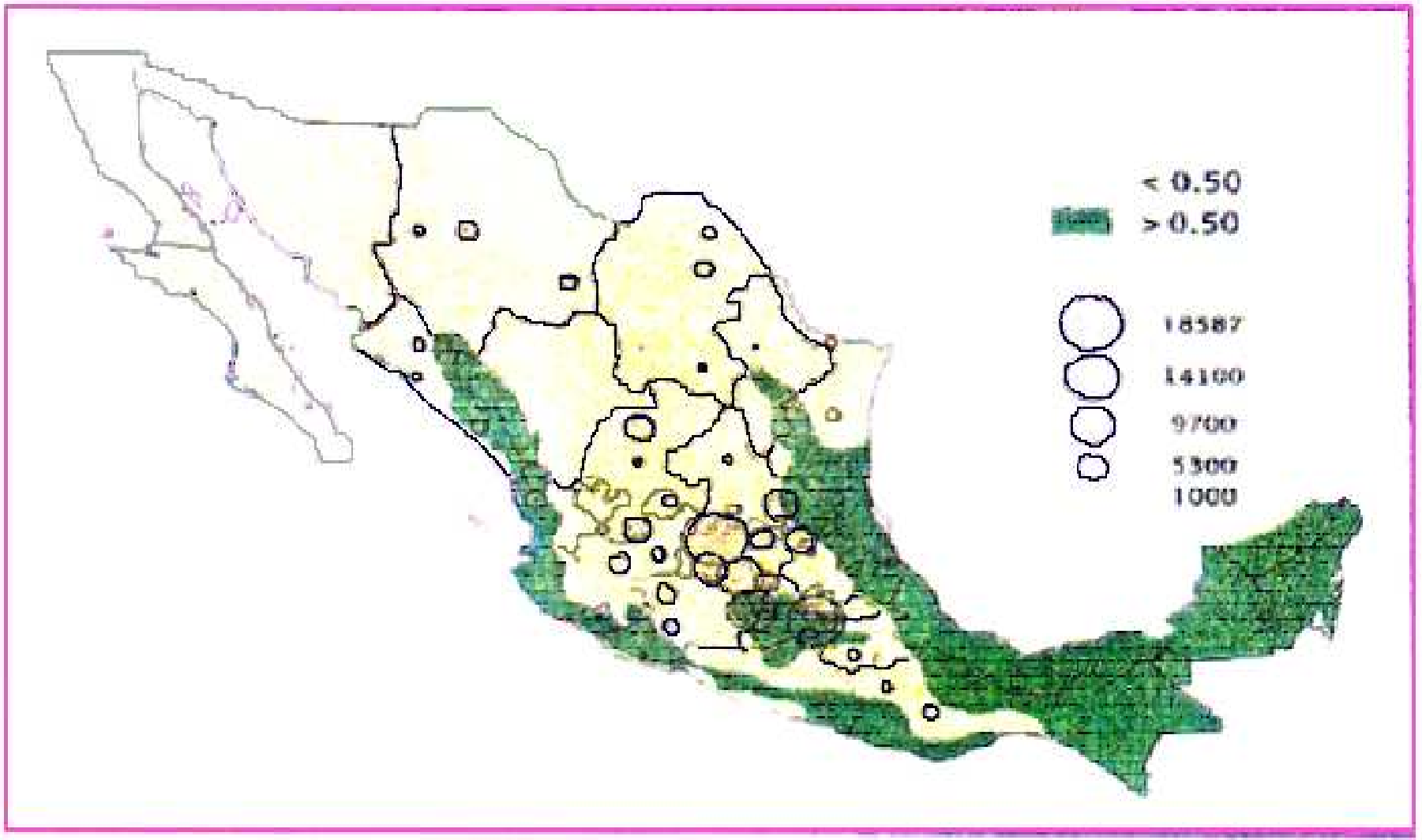
Environmental Impacts of CC (2050)

Natural coverage will be affected by 50% due to climate change.

Template forests, low dry tropical forest, xerophytes bushes and template savannas will be highly affected.

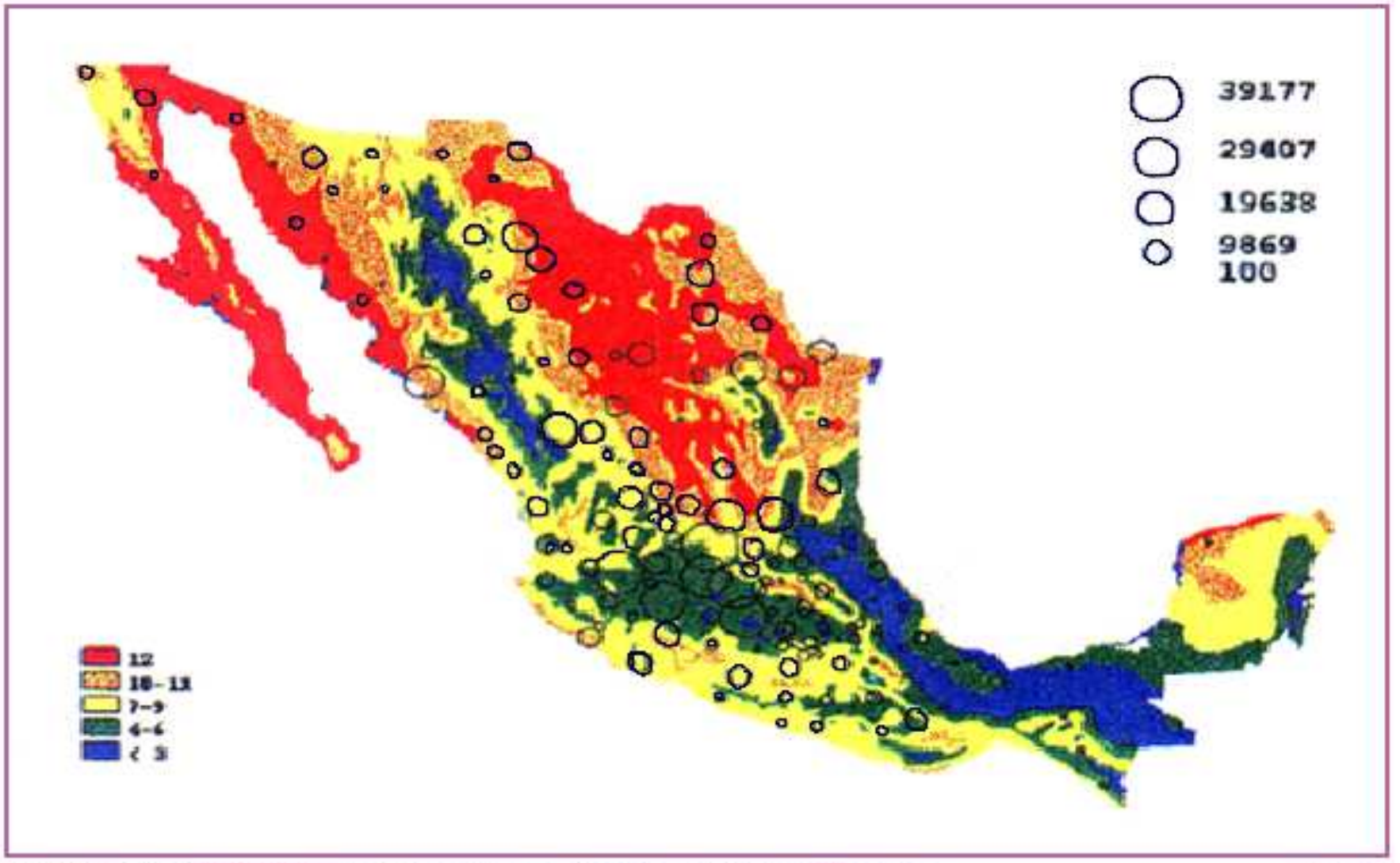


Rural Migration and Aridity



- Arid and dry areas (< 0.50)
- Humid area (> 0.50)
- Flow of Mexican migrants in 1995, living and working in the US, surveyed on the border on their return to Mexico (spatial distribution according to the region of last residence in rural localities of Mexico.

Number of Dry Months and Migration



Number of dry months and flow (estimation for 1993) of Mexican migrants living and working in the US, surveyed on the border on their return to Mexico (spatial distribution according to their region of birth in Mexico, rural and urban localities).

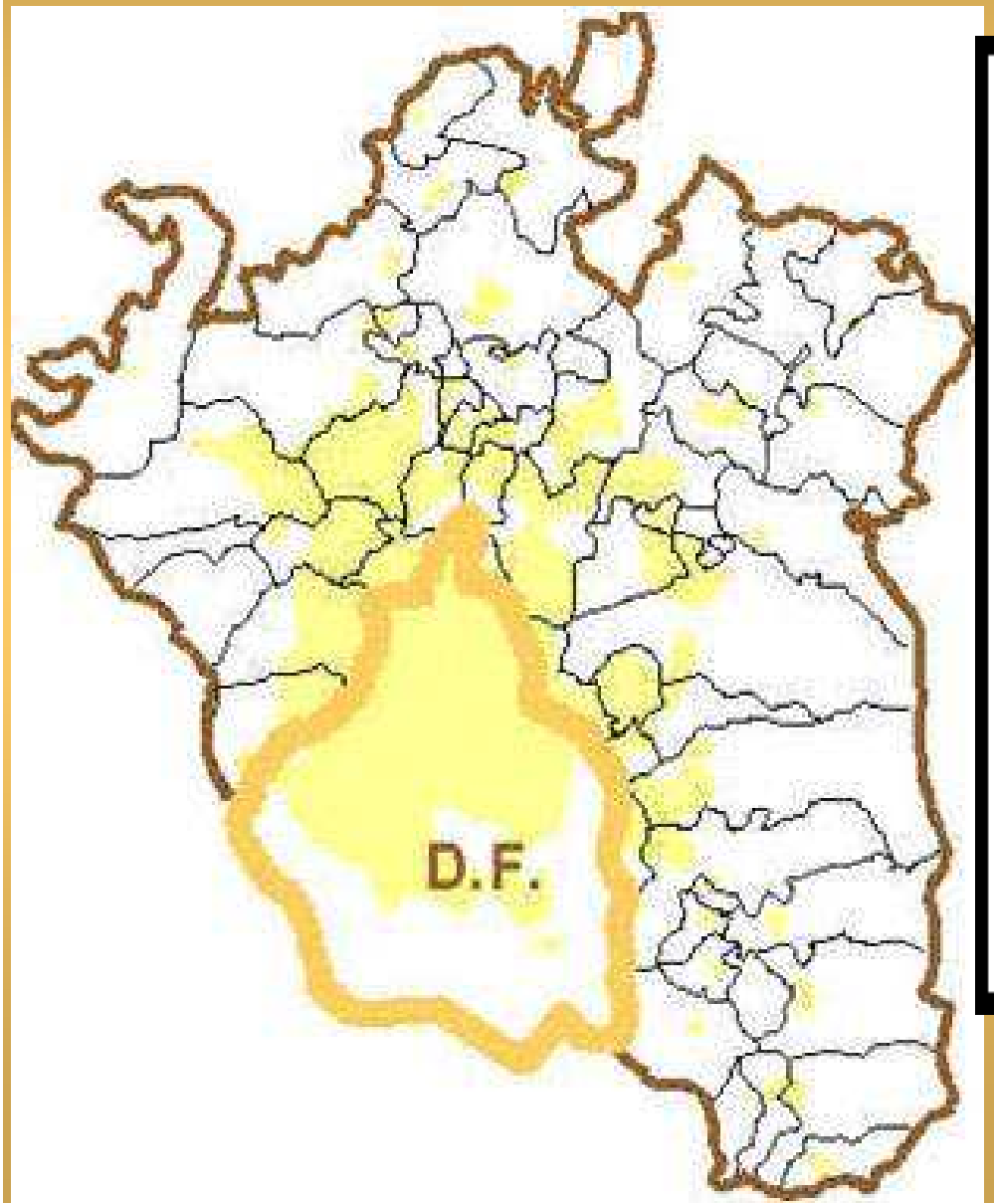
Sources:

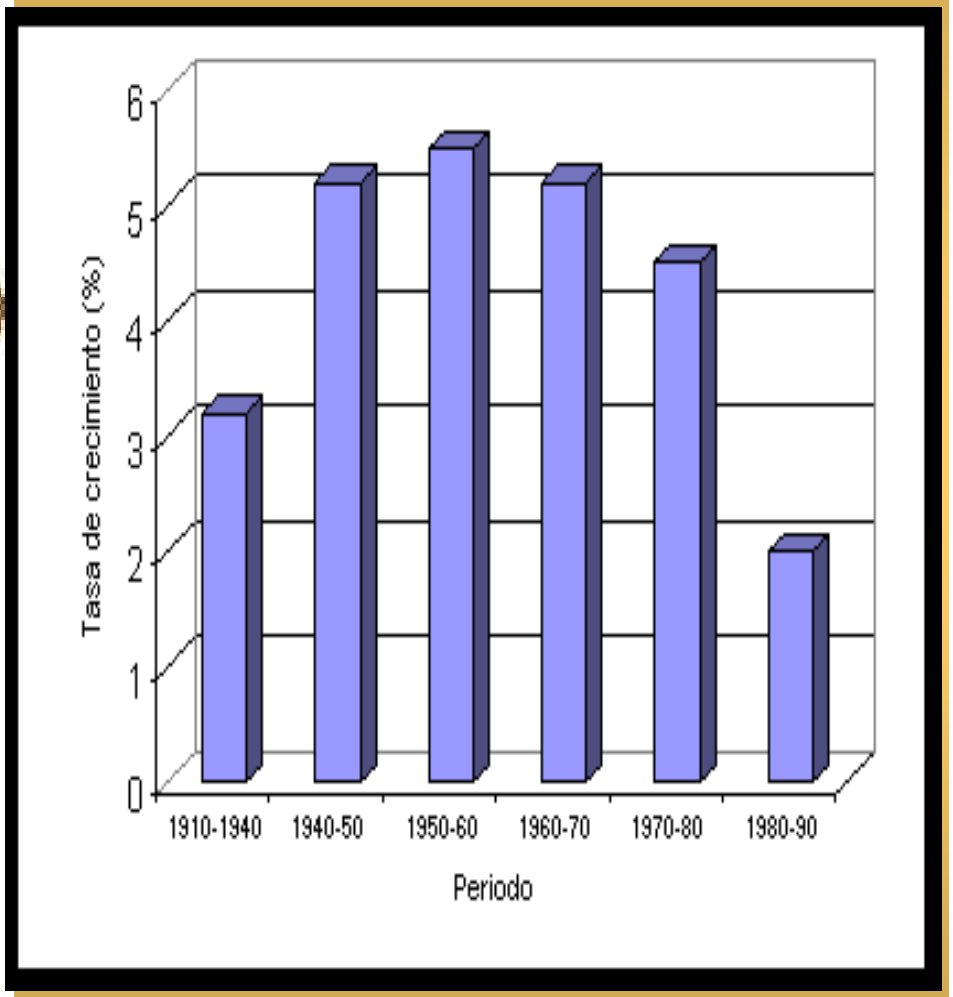
7. Four Phases of EIM in Mexico City: Internal and External Migration

EIM in Mexico after 1950

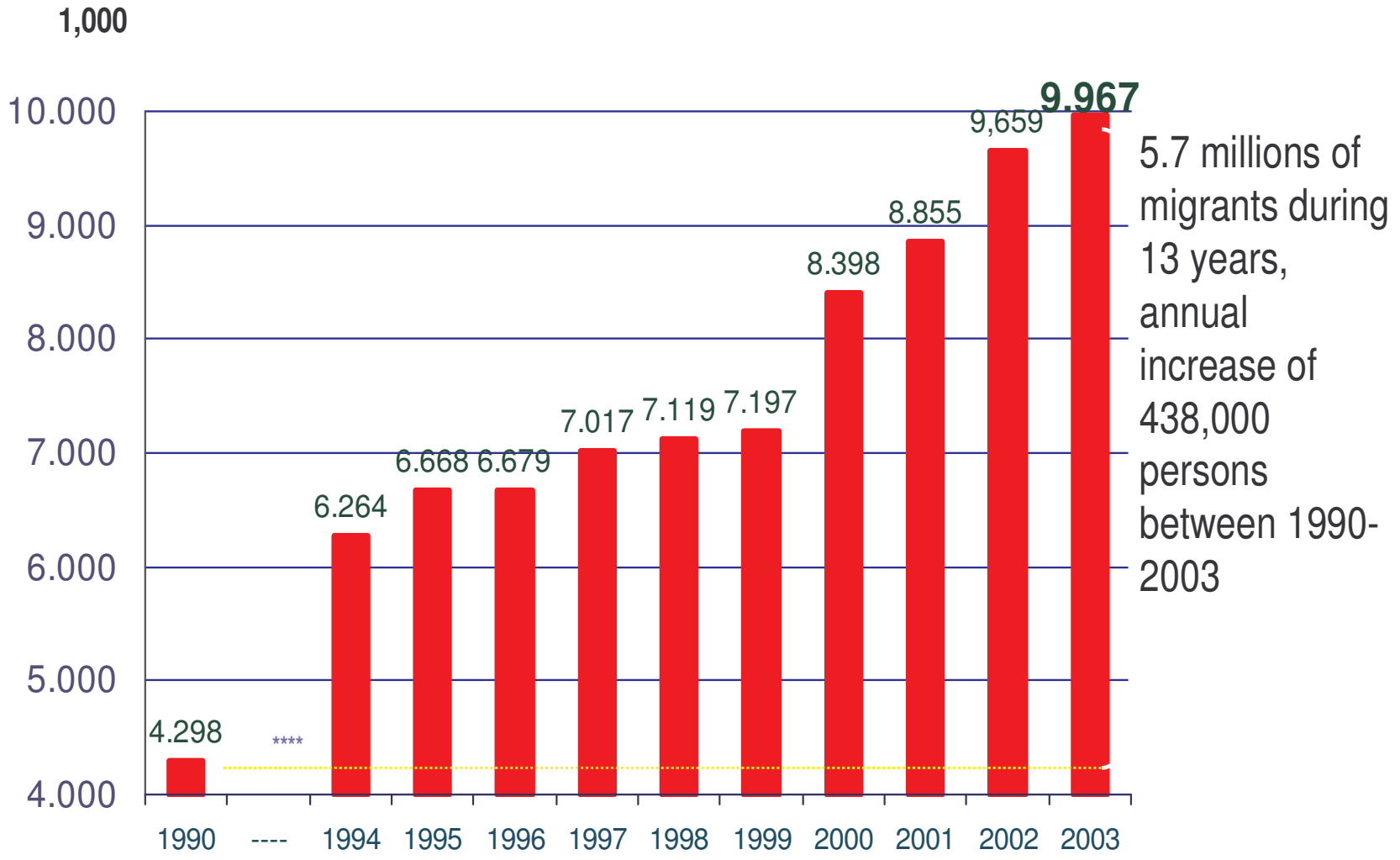
1. **1950-1970:** neglect of rural areas and transference of **accumulation to urban area** and **industrialization** induced massive rural-urban migrations led to a rapid growth of slums in Mexico City and other urban centers;
2. **1970-1990:** import substitution policy, cheap oil and food prices due to the **green revolution**, economic crises, resulted in further rural-urban migration that triggered high air pollution in urban centers;
3. **1990-2005:** economic **globalization** with **free trade agreements** (NAFTA) and 1994/95 huge **economic crisis**. Importation of basic food at low prices led to an abandonment of rural policy what resulted in a new wave of massive (primarily illegal) emigration to the **USA** that was further aggravated by the effects of climate change, desertification and water scarcity;
4. **since 2005:** more frequent and intense **disasters**, desertification, floods, **regressive globalization**, loss of food security and massive population movements from the rural and hazard prone areas to small towns reinforced also the illegal migration to the USA, partly organized by **transnational crime** rings.

Megacity of Mexico



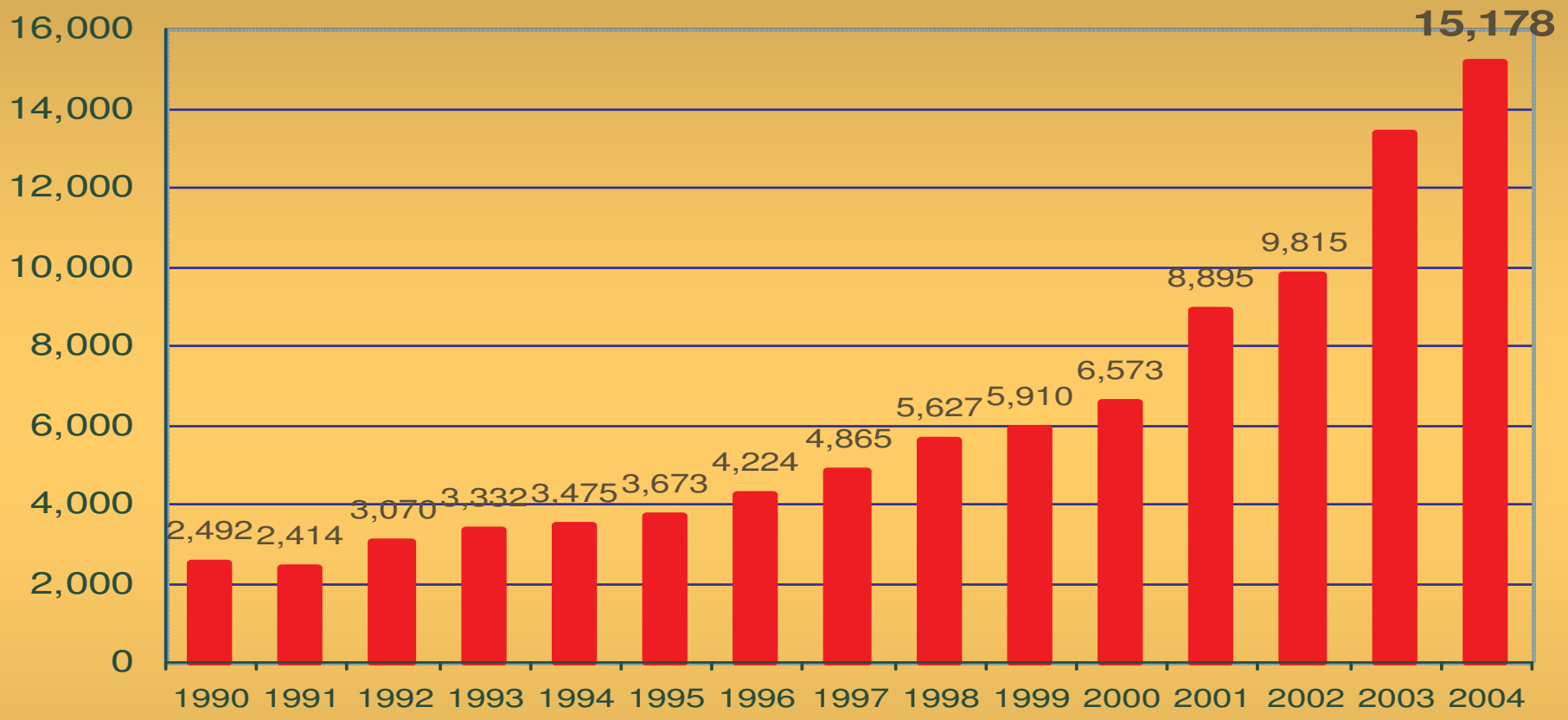


Migration to the USA



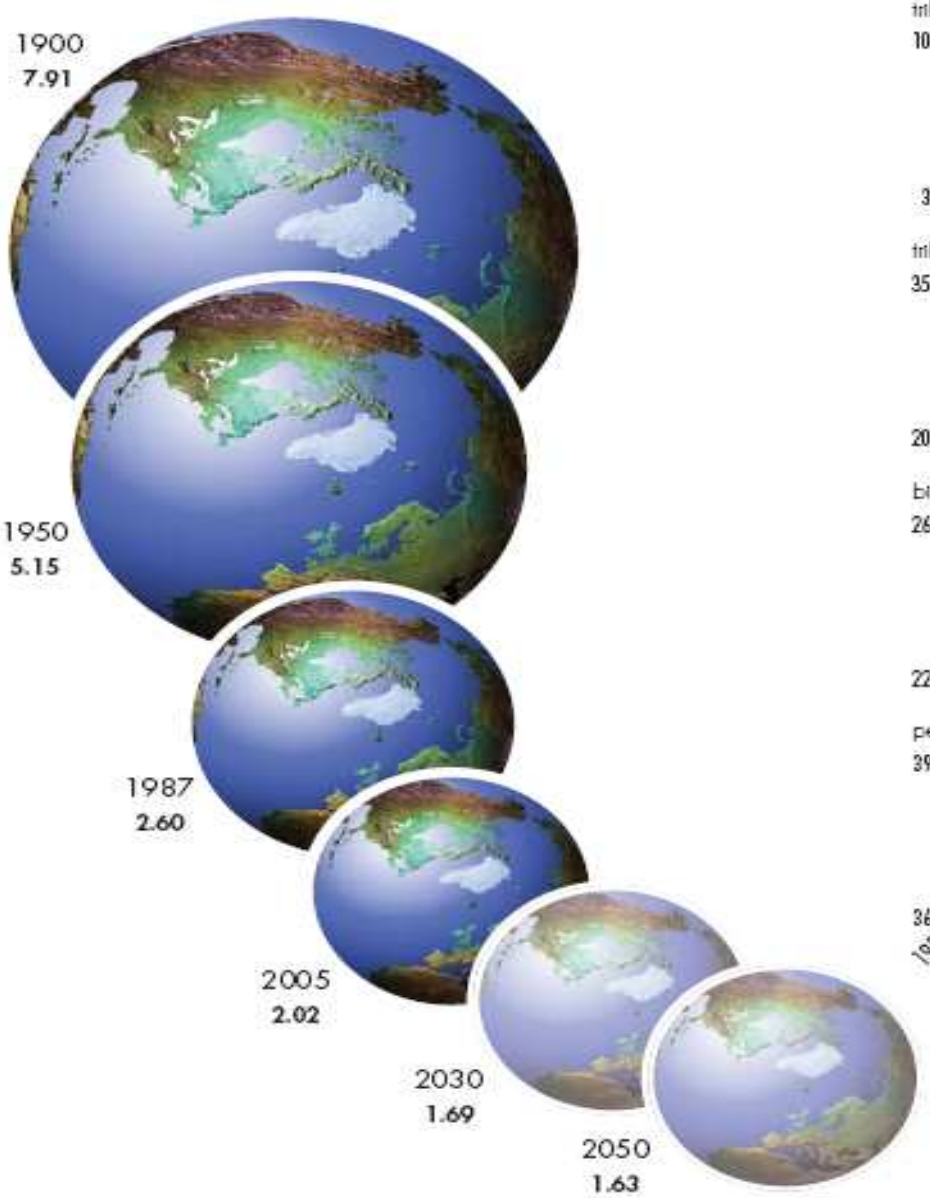
Source: Public registers by the US Census Bureau, Current Population Survey, March Supplement, elaborated by Fernando Lozano, 2005

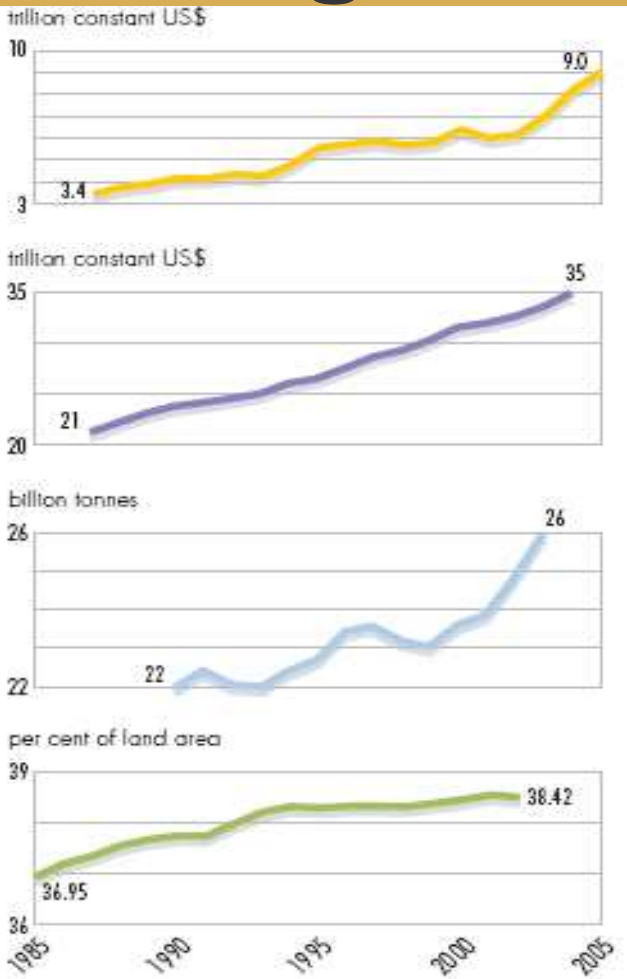
Remittances from USA



Remittance were growing and achieved during 2007, **23.978 billion**, representing **9.2%** of all exportations and **55.9%** of oil revenues. Economic crisis in the USA is seriously affecting the amount of remittances to Mexico, and during August 2008 they reduced in 12.2%, compared with August 2007 (Bank of Mexico, 2008).

8. Conclusions: The World Is Getting Smaller



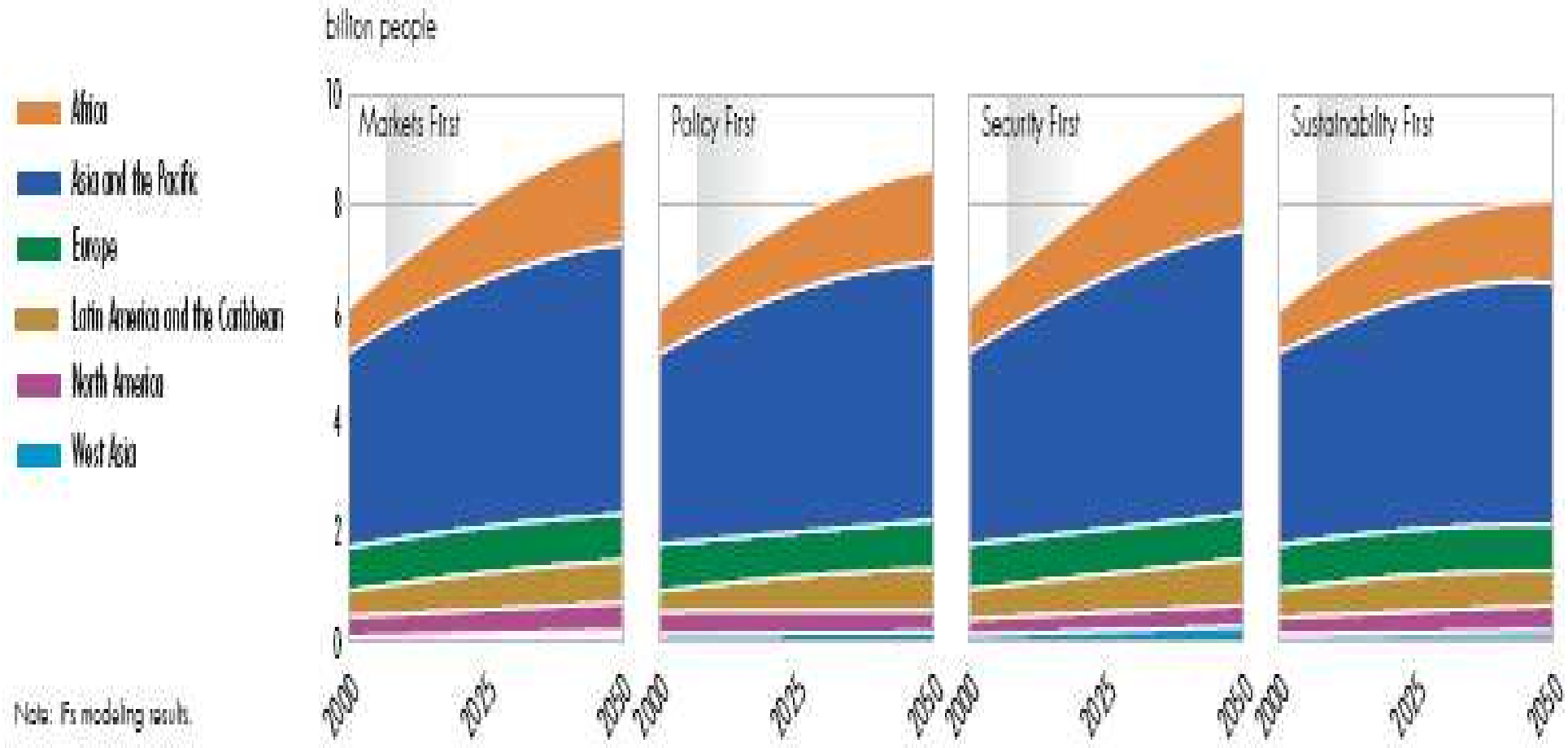


Notes: Numbers next to images of Earth reflect hectares of land per capita.

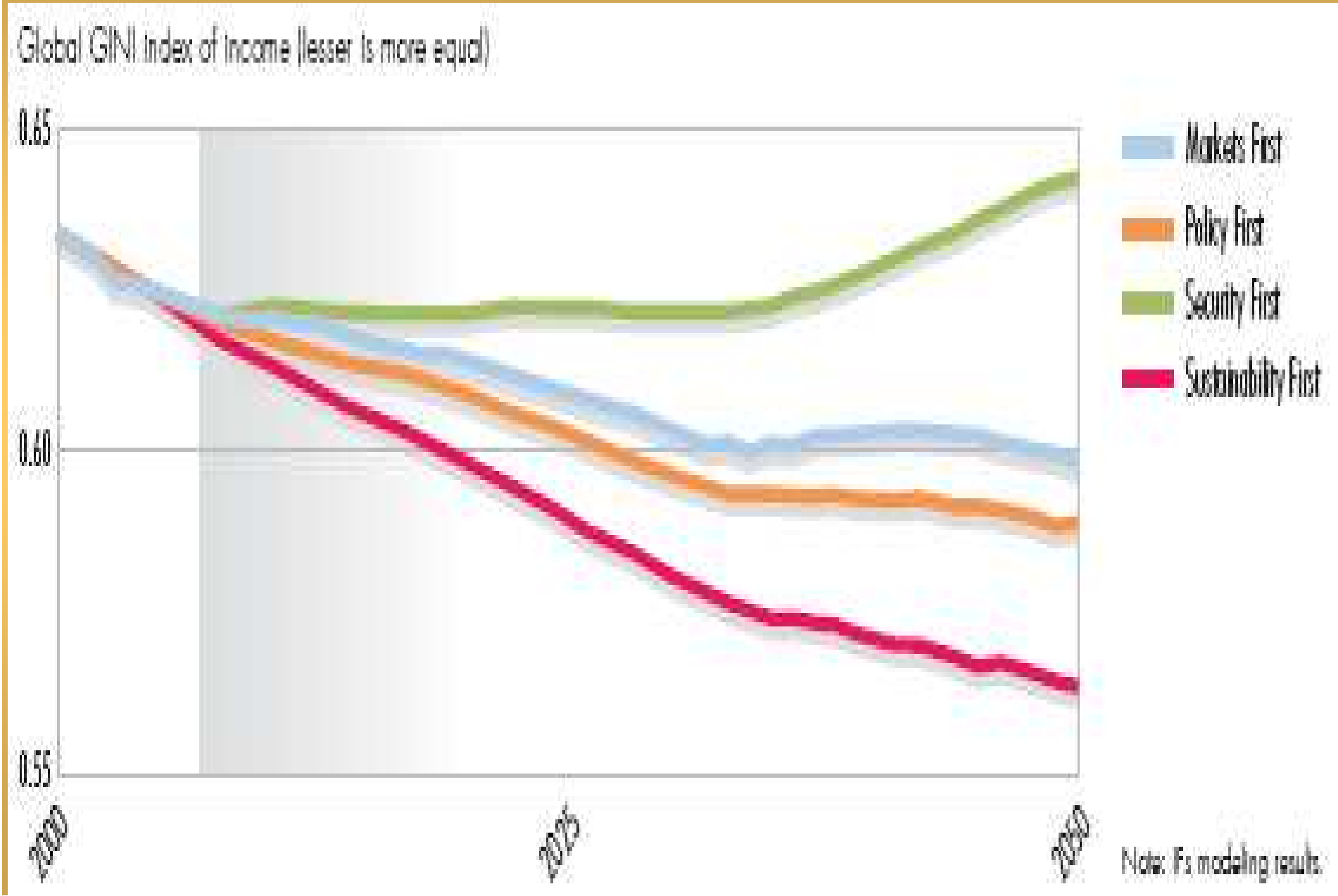
Graphs show changes in trade volume (1987–2005), GDP (1987–2004), CO_2 emissions (1990–2003) and agricultural land area (1987–2002).

Sources: FAOSTAT 2006, Chapter 9 population projection, WTO 2007, GEO Data Portal compiled from UNPD 2007low estimate, World Bank 2006a, UNFCCC-CDIAC 2006 and FAOSTAT 2004

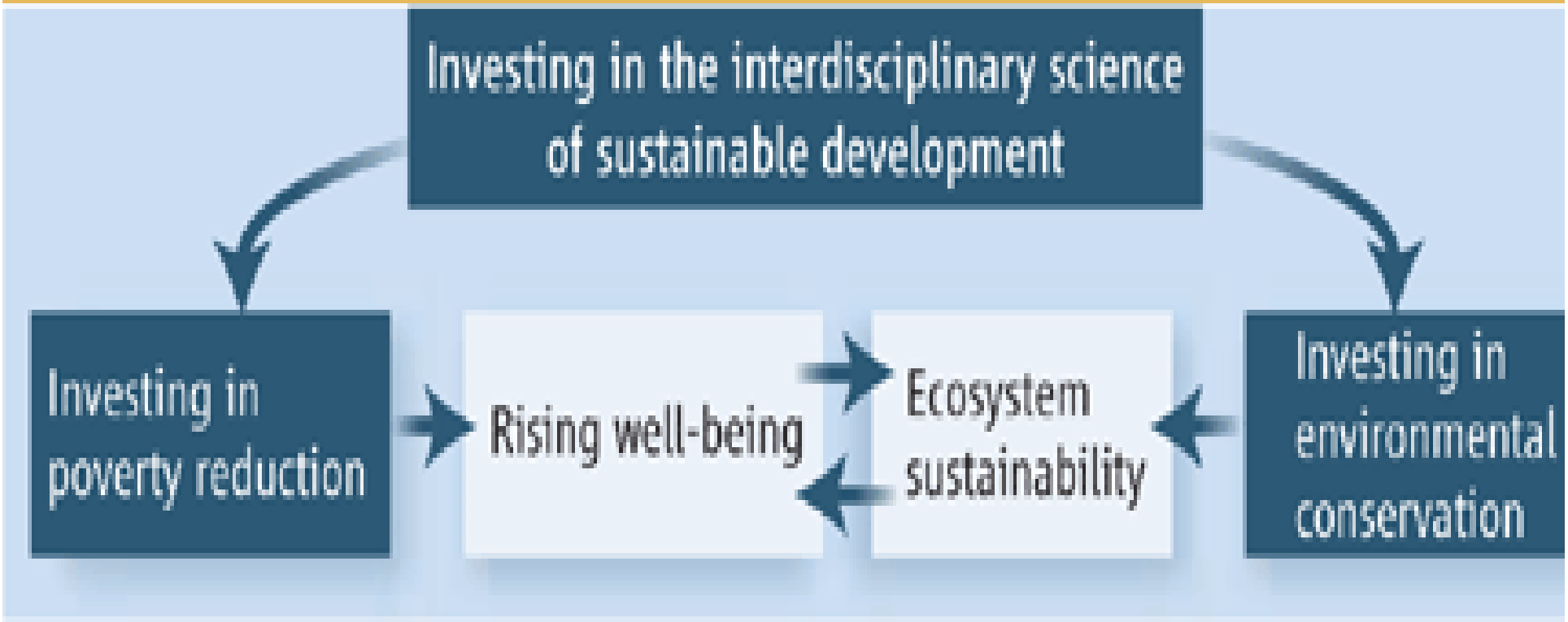
Possible Future: Neo-Malthusian Approach



Social Inequality: Gini coefficient



Integral proposal of poverty alleviation and environmental recovery to reduce EIM



7. Conclusions

- Migration and EIM can only be stopped by a world, national and local effort:
  - poverty alleviation eases environmental stress
  - offer food and livelihood to the poorest
  - enable the whole society to invest in preventive environmental protection and services
  - alternative sustainable energy sources
  - crucial improvement of energy efficiency
  - job creation and wellbeing in threshold countries with numerous youth population asking for energy and sustainable livelihood (limit terrorism)
  - exposed to multiple hazards: migration continues viable alternative for livelihood and EIM forms part of a complex survival strategy.

Thanks for your attention

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http://www.afes-press.de/html/download_oswald.htm