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Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: The Mexican Case

Úrsula Oswald Spring

National University of Mexico/ CRIM

MRF Chair on Social Vulnerability, UNU-EHS

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Vulnerability and Adaptation

Adaptation: “Adjustment in natural or *human systems* in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” or “the ability of a system to adjust to *climate change* (including *climate variability* and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences” (IPCC WG2 2007:869).

- **Vulnerability** is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC WG2 2007:883).
- Cutter (1996) identifies three elements for vulnerability: (1) as risk of exposure to hazards (e.g. hurricane, drought); (2) as a capability for social response (e.g. insurance, social networks, irrigation); (3) as a vulnerability of places (e.g. river bed, coastal, mountain zone).

- Vulnerability refers to the propensity of social and ecological system to **suffer harm** from exposure to external stresses and shocks. Research on vulnerability can, for example, assess how large the risk is that people and ecosystems will be affected by climate changes and how sensitive they will be to such changes (Stockholm Resilience Centre 2007a).
- For poor people, vulnerability is both a condition and a determinant of poverty, and refers to the (in)ability of people to avoid, cope with or recover from the harmful impacts of factors that disrupt their lives and that are beyond their immediate control...In relation to climate change, vulnerability relates to direct effects such as more storms, lower rainfall or sea level rises that lead to displacement, and to indirect effects such as lower productivity from changing ecosystems or disruption to economic systems (International Institute for Sustainable Development, 2003).

Obstacles: Social Vulnerability

- Social vulnerability is an historical and accumulative result of poverty and unequal access to material and cultural consumption and power.
- Increase susceptibility of a community or person confronted with hazard impacts.
- Poor women, heads of single household are at greater risks: **poverty has women's face.**
- Hazard impacts **can empower** affected people and prepare them to cope with disasters and new risks.

Resilience

- Resilience means in Latin *resilio*, referring to “return from a leap, jump, rebound”, and in common acceptance “elasticity”. In physics it represents the capacity of a material to recover the same form after having been exposed to extreme pressures.
- The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change (IPCC WG2 2007: 880).
- Resilience refers to the capacity of a social-ecological system both to withstand perturbations from, for instance, climate or economic shocks and to rebuild and renew itself afterwards (Stockholm Resilience Centre 2007b).
- In the social field it refers to the “human capacity which permits persons after having passed through adverse situations to be not only safe but also **transformed through this experience**”. Gloria Laengle (2004) “the capacity of human being to **overcome difficulties** and at the same time **learning** from the errors”. Ángela Quintero (2005) refers to “the **capacity** of a family to **adapt** and reconstruct from the adverse situation”. Helena Combariza (2005) defines “human resilience is the capacity of an individual or social system to **live well and develop** positively, irrespective of the difficult conditions and even being reinforced and **transformed**”.
- Brooks and Adger (2005:168) “In practical terms, adaptive capacity is the ability to design and implement effective adaptation strategies, or to react to evolving hazards and stresses so as to reduce the likelihood of the occurrence and/or the magnitude of harmful outcomes resulting from climate-related hazards. The adaptation process requires the **capacity to learn from previous experiences to cope with current climate**, and to apply these lessons to cope with future climate, including surprises.

Social Representations

- “*Systems of values, ideas and practices*” create a **system of order that is** able to offer a person the possibility to get familiar with the social and material world.
- Communication within a community offers a **code of common social interchange**, where several aspects of life, personal and collective history are **classified without ambiguity** (Moscovici, 1976: xiii).
- Social representations originate in **daily life**, where society is the **thinking and acting system**.
- The theory of social identity establishes a continuum between personal and social identity with a **processual**, relational, multidimensional, contextual and essentialist character.

Three Pillars of Human Security

- **“Freedom from fear”** by reducing the probability that hazards may pose a survival dilemma for most affected people of extreme weather events (UNESCO, HSN), **Canadian approach: Humanitarian agenda**
- **“Freedom from want”** by reducing societal vulnerability through poverty eradication programs (UNDP 1994; CHS 2003: Ogata/Sen: Human Security Now), **Japanese approach; Development and human rights agendas**
- **“Freedom from hazard impact”** by reducing vulnerability & enhancing coping capabilities of societies confronted with natural & human-induced hazards (Bogardi/Brauch 2005). **Hazard/disaster agenda**

Widening, Deepening and Sectorialization of Security Threats, Challenges, Vulnerabilities & Risks



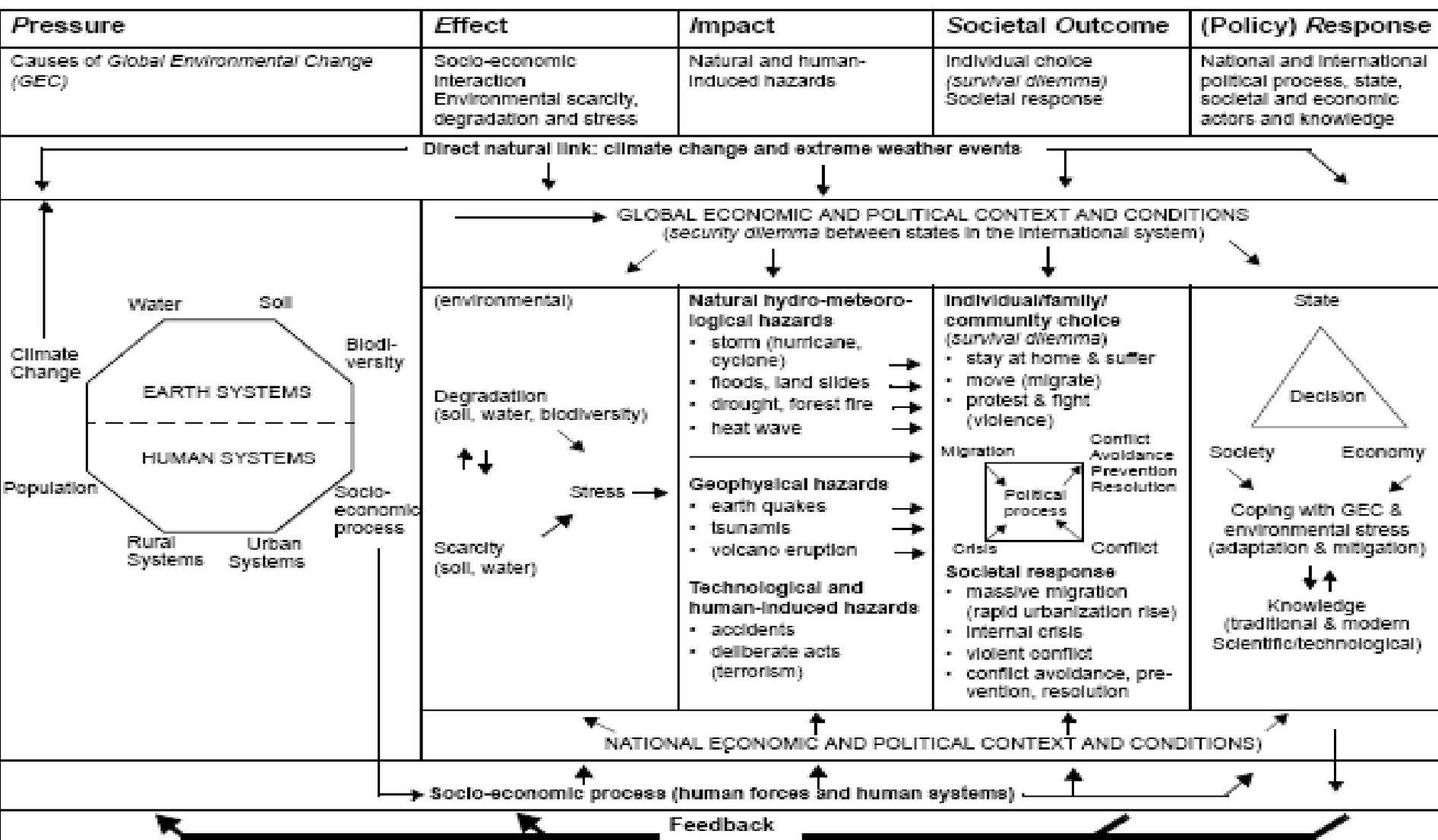
Security dimension ⇒ ↓ Level of interaction	Military	Political	Economic	Environmental ↓	Societal
Human individual Human security ⇒	Land mines	Failed state	Food & Health security	Cause & victim	Food & Health security
Societal, community security	Border control	Public security	Water, Food & Health sec.		↓↑
National security	During Cold War shrinking (in USA since 2001 ↑ & since 2009 ↓)		Energy security	↓↑	Energy Food, Water & Health security
International and Regional security			Water security	↓↑	Water security
Global and planetary security ⇒	Terrorism	Intern. migration	Financial crisis	CC; GEC; biodiversity loss	Health security

Síntesis de Seguridad Humana

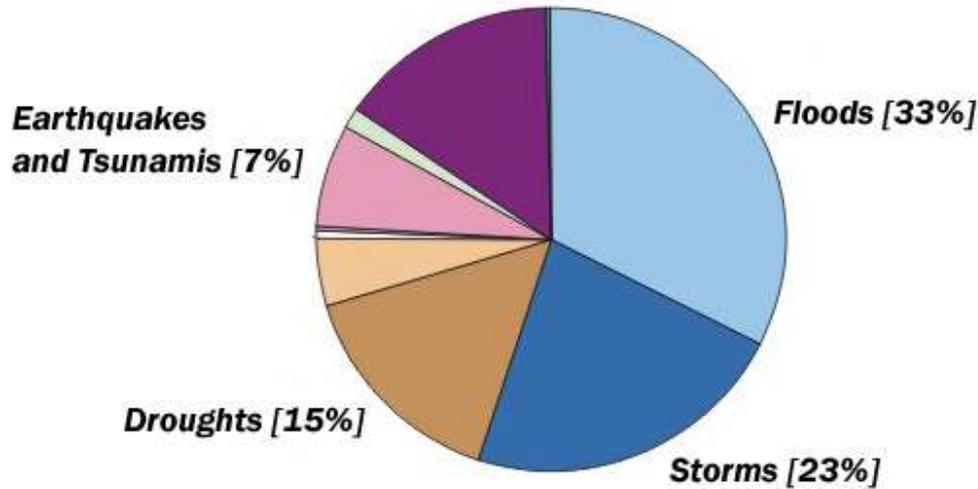
Amenaza, Desafío, Vulnerabilidad, Riesgo

Peligros a la SH	Seguridad Humana: SH			
	Amenazas	Desafíos	Vulnerabilidad	Riesgos
Subdesarrollo ('ausencia de miedos') Paz estructural	- bienestar - salud -alimentos -expectativas de vida	- redes sociales -desarrollo humano - alimentos sanos -patrimonio - equidad	- crisis económicas -epidemias - pobreza - hambre - desigualdad - discriminación	los más vulnerables (sociales, económicos), expuestos a falta de desarrollo, violencia, discriminación, negligencia y desastres: - campesinos - pobres - mujeres - niños - ancianos - indígenas - minorías - minusválidos - desempleados
Conflictos y violación a derechos sociales y humanos ('ausencia de amenazas') Paz física	-vida y seguridad personal (guerras) - identidad, valores, representación social	- sentimiento de seguridad comunitaria -derechos sociales y humanos - democracia	- caciques de guerra - régimen y dirigentes corruptos, -abusos a derechos sociales y humanos -violencia género	
Peligros naturales y desastres ('ausencia de riesgos naturales') Paz y desarrollo sustentables	- supervivencia - hogar -comunidades - ciudades perdidas	- desarrollo sustentable -soberanía alimentaria -seguridad territorial, agua	- Población expuesta -Supervivencia - hábitat - enfermedades (cólera, dengue, malaria, VIH-SIDA)	

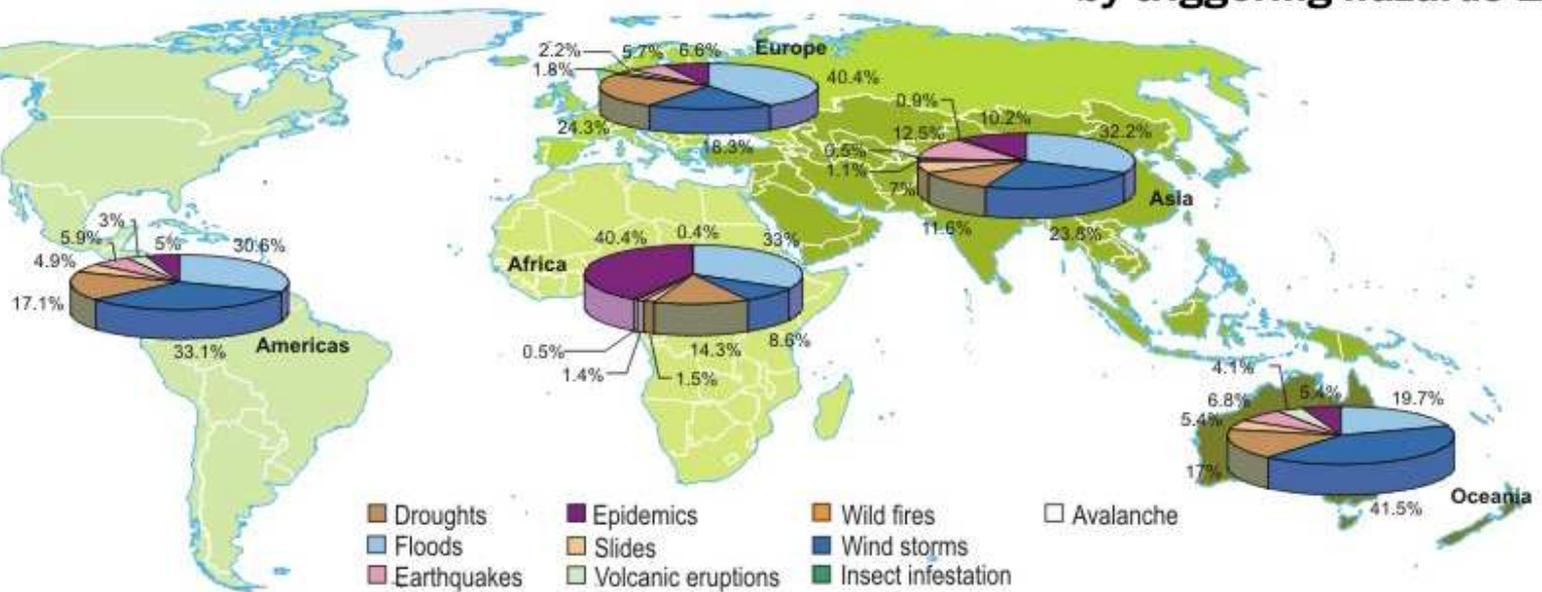
Climate Change & Impacts: PEISOR Model



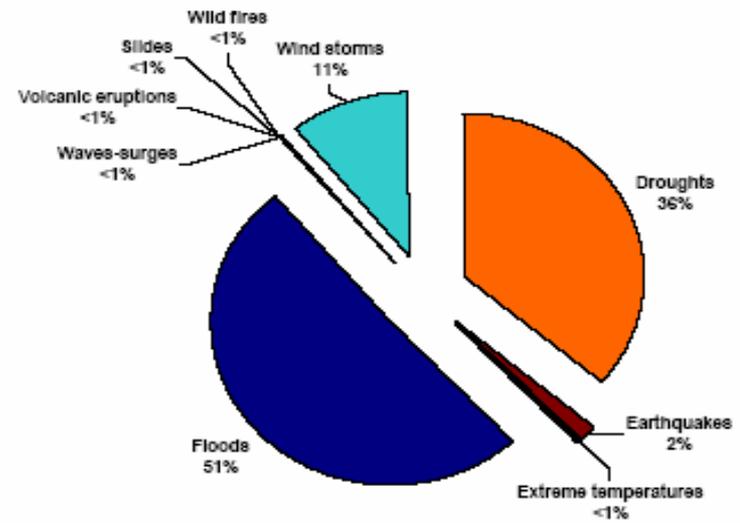
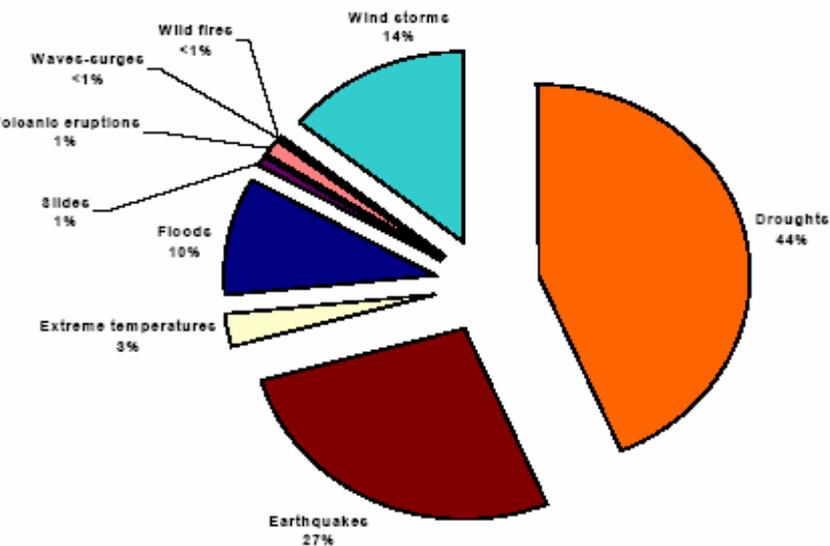
Distribution of disasters 1994-2003



Regional distribution of disasters: by triggering hazards 1994-2003



Disaster's Dead and Affected People (1974-2003)



(1) injured + homeless + affected

Total: 2'066,273 dead; 5 076 494 541: more than 5 billion affected

Source: Hoyois and Guha-Sapir (2004)

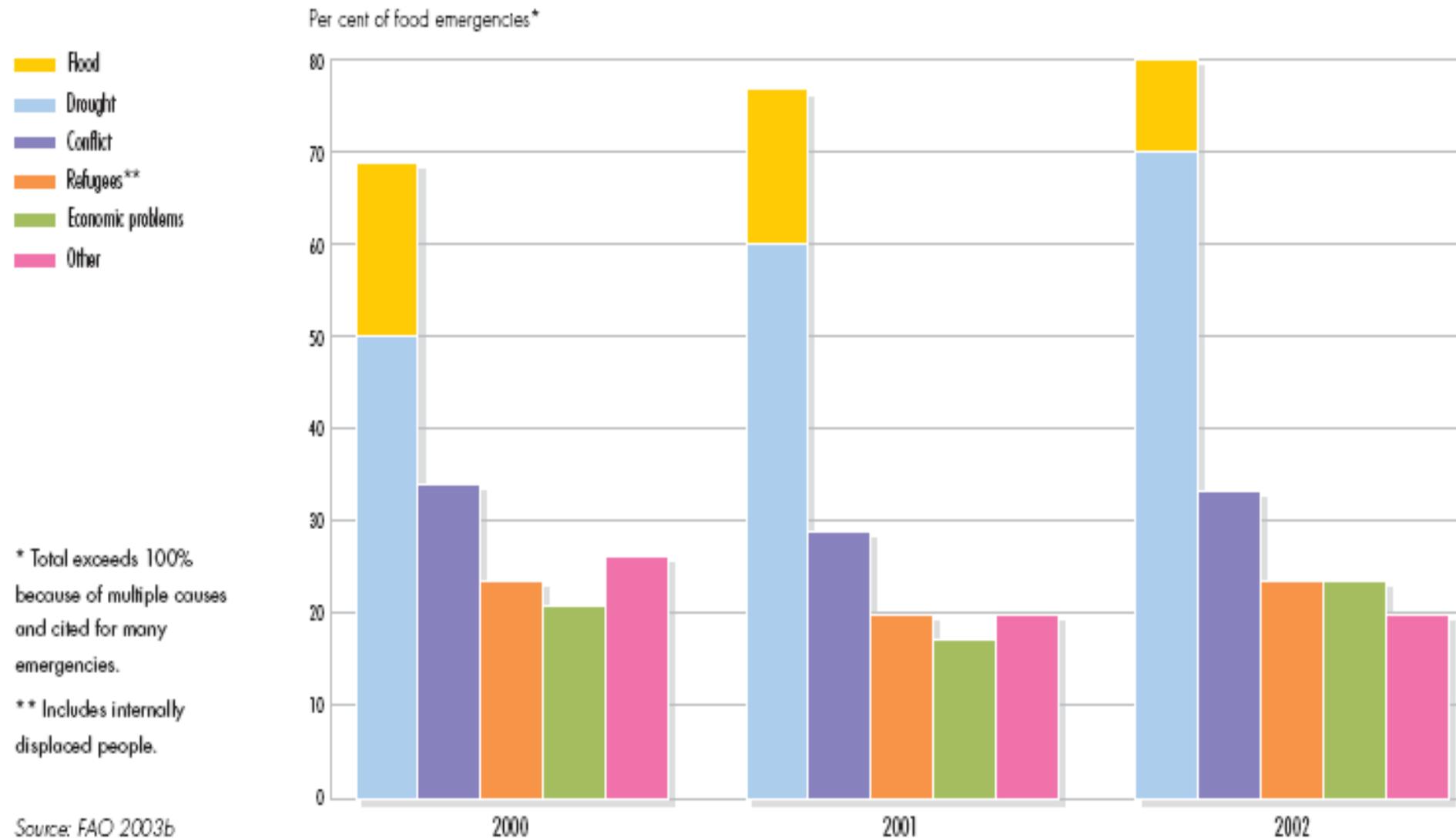
People affected by Disasters in 2008

Concept	All Disasters	CC related Disasters
Number Disasters	221	211
Affected (million)	207.2	160.4
Homeless reported (million)	2.9	2.85
Displaced	7.4	7.3
Evacuated & Displaced	36.1	20.3
% Displaced/Evacuated	17	13

Source: UNCHR, 2009

Causes of food emergency

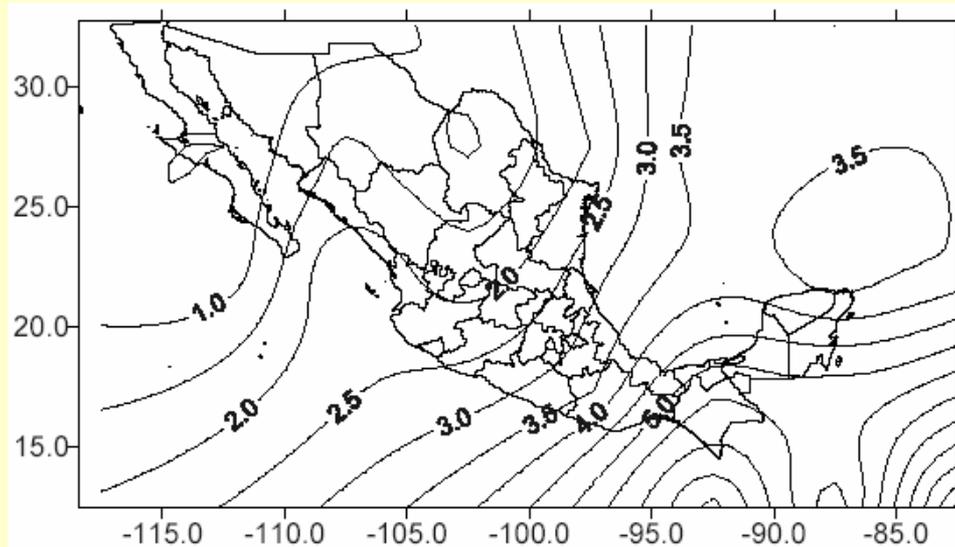
Figure 7.10 Causes of food emergencies in developing countries



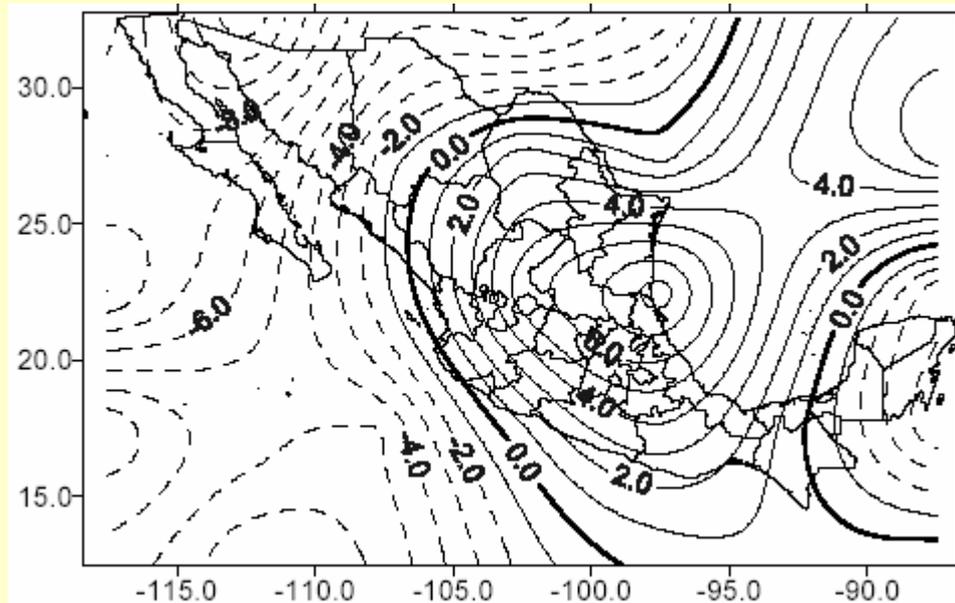
Changes in yield productivity

Years	Total Grains	Rice	Wheat	Corn	Other Grains
1950-60	2.0	1.4	1.7	2.6	---
1960-70	2.5	2.1	2.9	2.4	2.3
1970-80	1.9	1.7	2.1	2.7	0.4
1980-90	2.2	2.4	2.9	1.3	1.7
1990-95	0.7	1.0	0.1	1.7	-0.8

Potential changes in precipitation due to CC in 2050 in Mexico



Medium scenario (1961 – 1990) of annual precipitation (day)

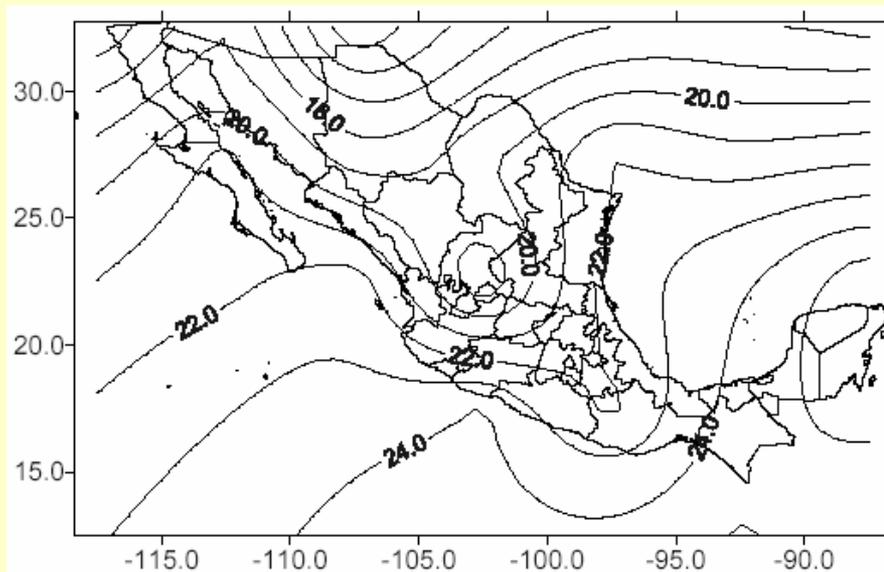


Changes in yearly average of precipitation (%) with medium affectation (ECHAM4 Model)

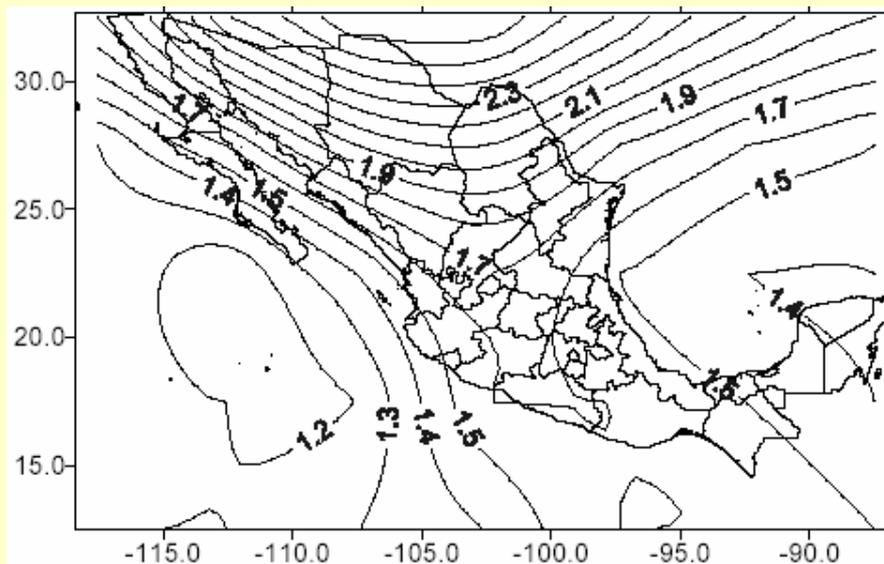
--- less precipitation

2050: Change in Average Temperature

Scenario based on data
1961 – 1990 of average
temperature/ year

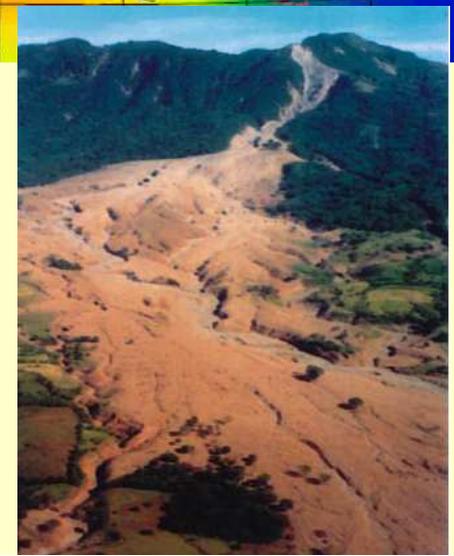
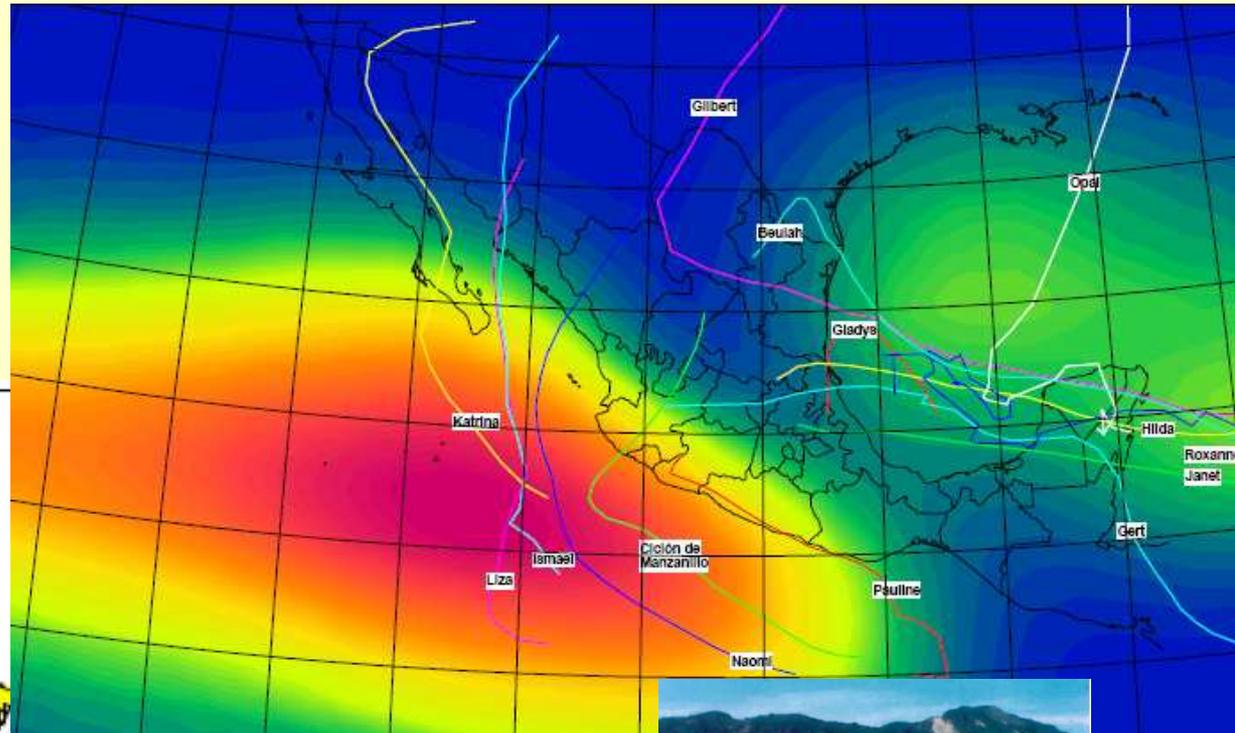
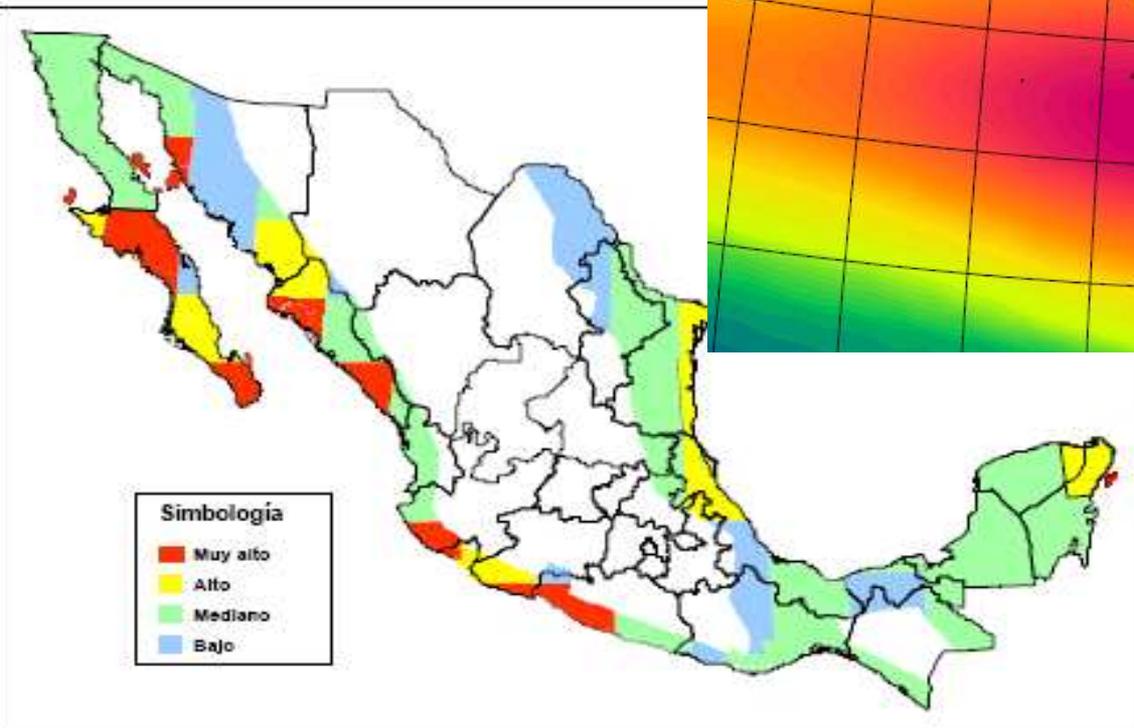


Changes of average
temperature/year (°C)
with Model ECHAM4
medium impact



Mexico highly vulnerable to CC

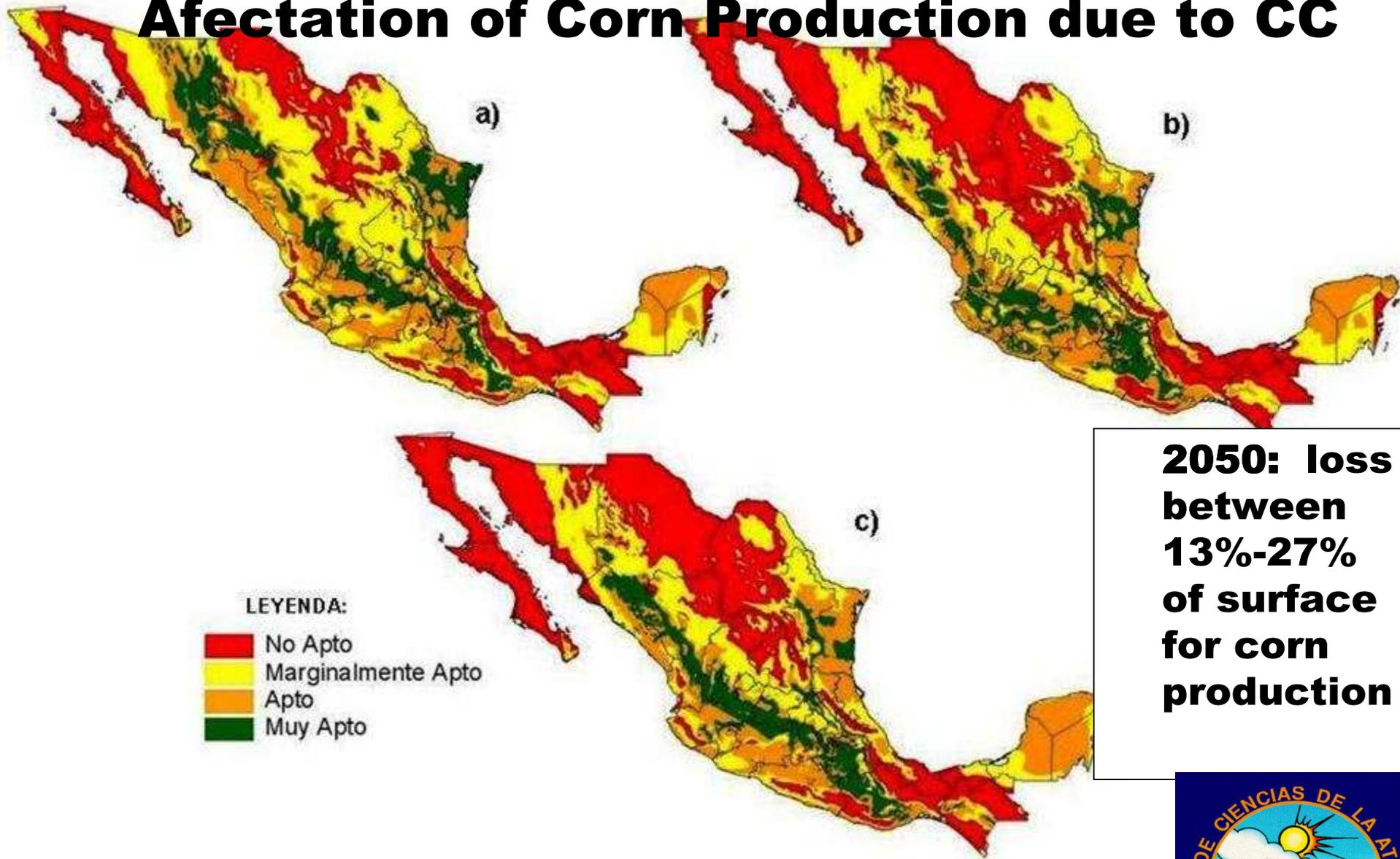
Source: CENAPRED, 2001



Natural Risks in Mexico: Volcanoes, Floods, Hurricanes, Earthquakes & Landslides

Level of Risk	Personas (million)	% of affected people
Very high	28.6	26
High	11.0	10
Regular	24.2	22
Low	14.3	13
Very low	31.9	29

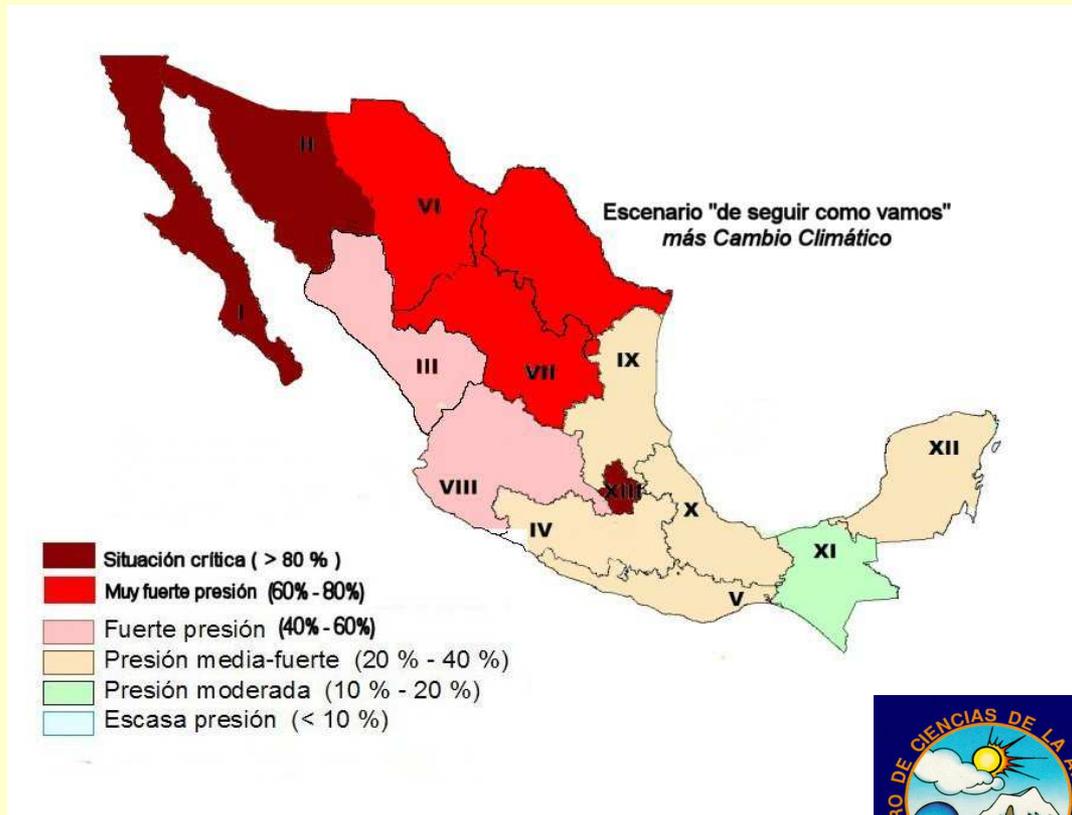
Afectation of Corn Production due to CC



Monterroso, A. G, Rosales, 2006.



Regional Impact of CC in 2030 in Mexico related to Water



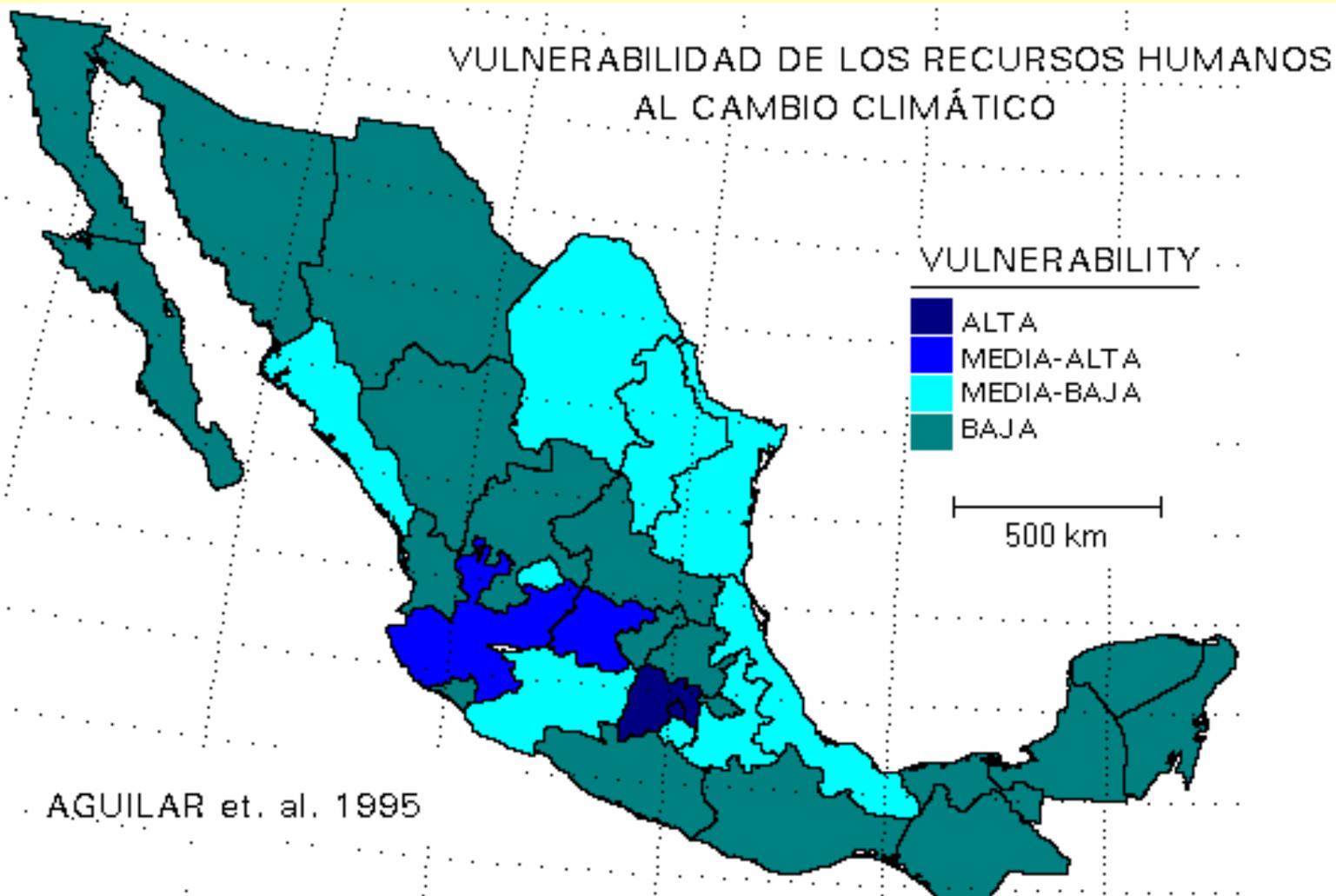
Baja California,
Sonora & Center
critical situation

Sinaloa & Lerma
Basin high pressure
on the resources.

Yucatán Península,
Veracruz, Oaxaca,
Guerrero medium
pressure.



Vulnerability of Human Settlement

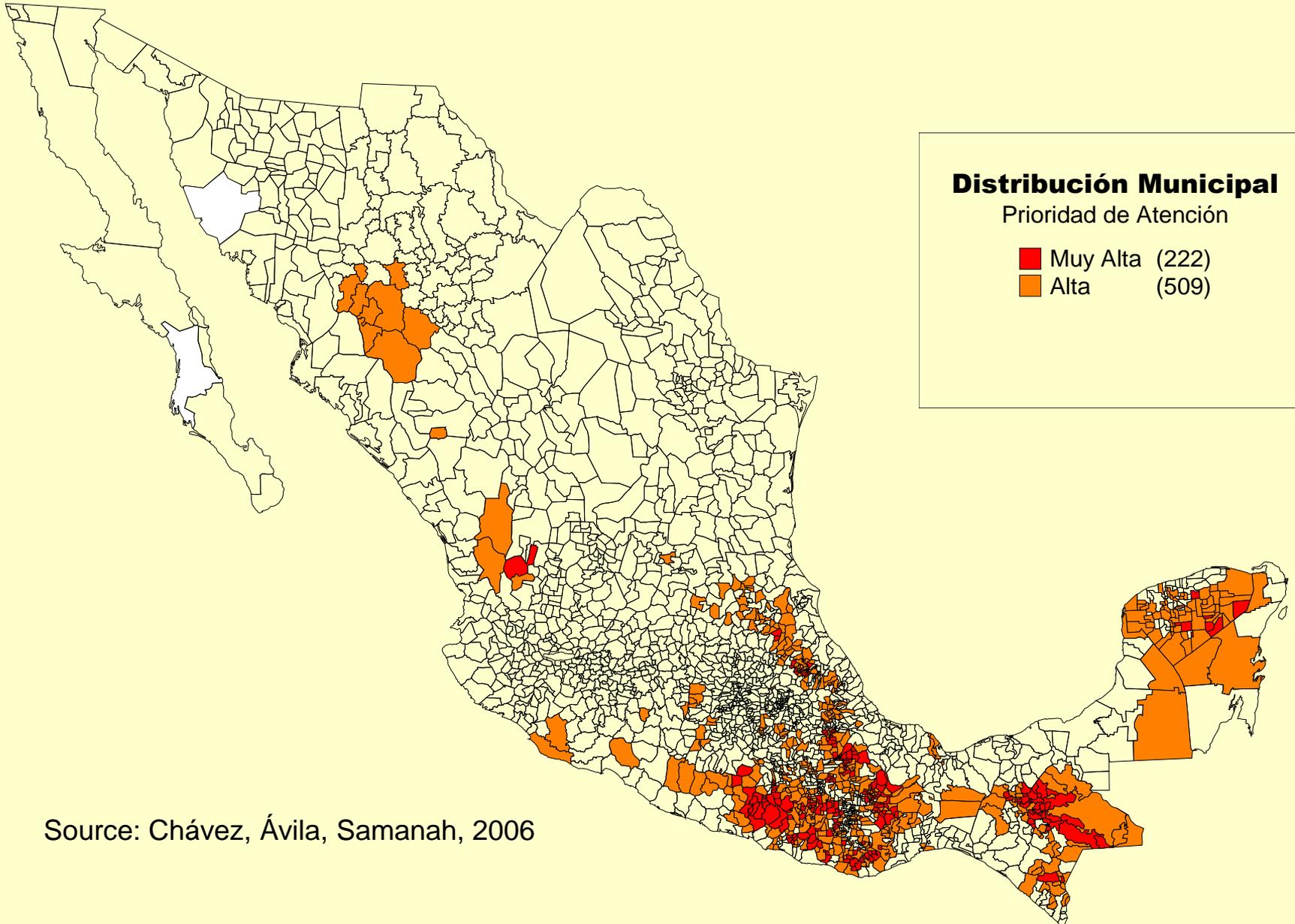


Vulnerability related to population density, growth, morbidity, water consumption/ scarcity / pollution and the impact of CC

Poverty in Mexico

- 28% of Mexican children are poor (UNICEF, 2005)
- Infant poverty: place 80 (After South Africa: 76; WB 2005)
- Income *per capita*: place 80 (WB, 2005)
- National income: 637.2 billion US\$; place 10, WB, 2005)
- Inequality: 20% of rich people concentrate 43% of consumption and generate artificial scarcity
- PEA: 43 million: only 12.5 million in the formal sector
- Occupied population: 26 million: 7% less than 1 MS; 20.7%: 1-2 MS; 46.2%: 2-5 MS; 26.1%: more than 5 MS (INEGI, 2005)
- Food crisis 2009: 5 million new poor people; 3 million more with hunger
- 11.9 million migrants registered in the USA

Poverty and High Marginality

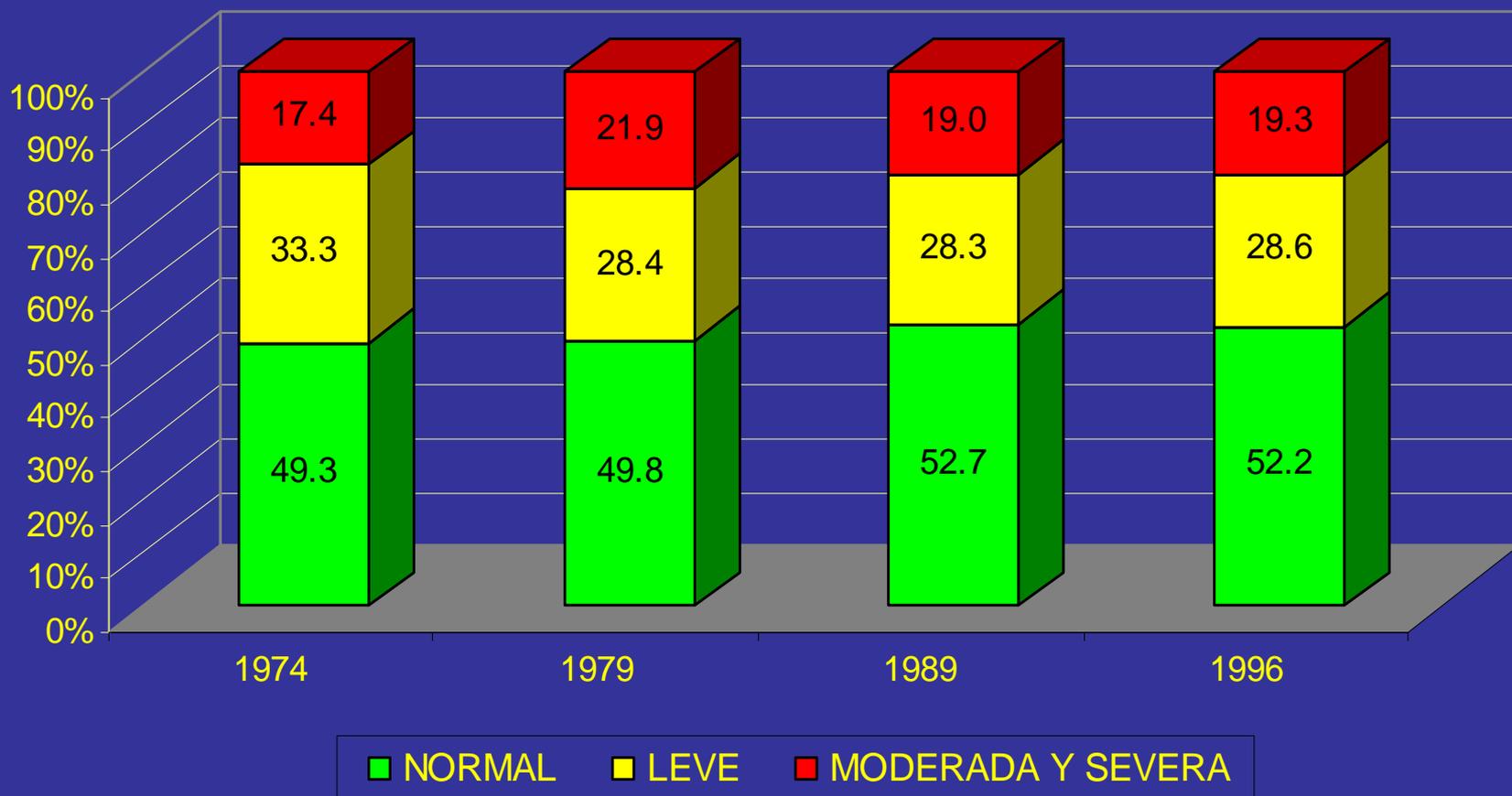


Source: Chávez, Ávila, Samanah, 2006

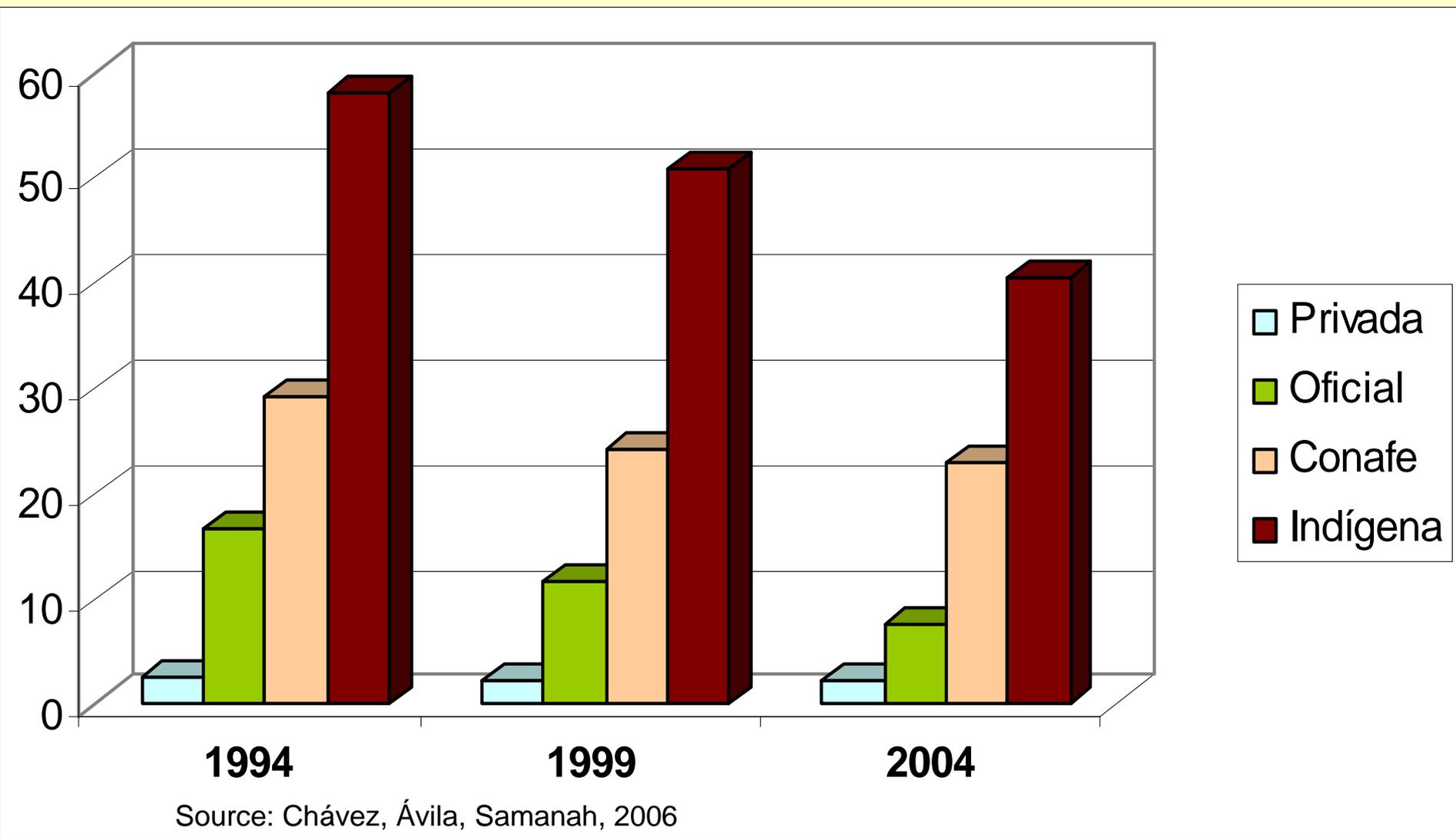
Evolution of Nutrition of Children by the National Inquiring from 1974,1979, 1989 and 1996

Source: Chávez, Ávila, Samanah, 2006

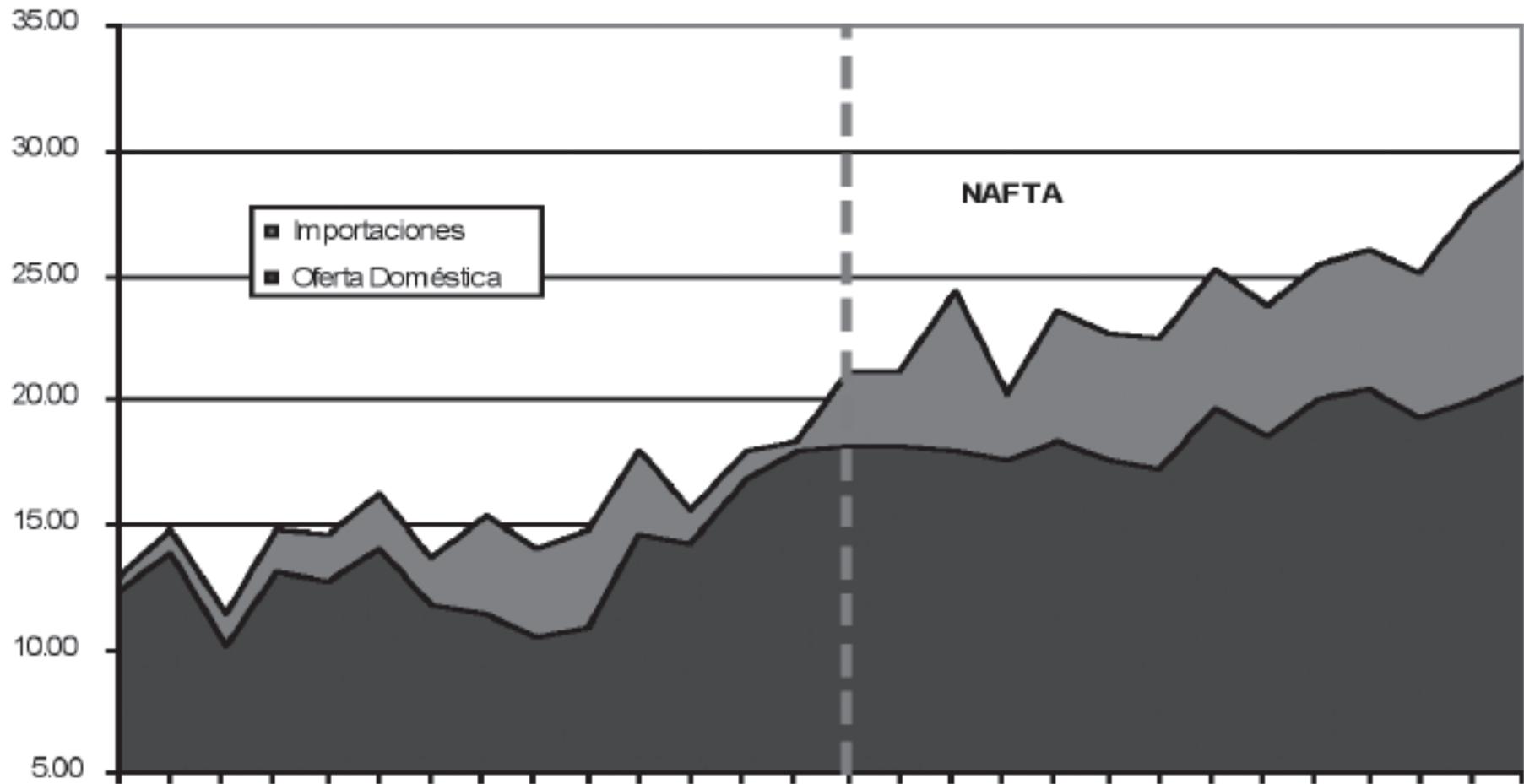
ESTADO DE NUTRICION DE LOS NIÑOS MENORES DE CINCO AÑOS, DE ACUERDO CON EL INDICADOR PESO PARA LA EDAD



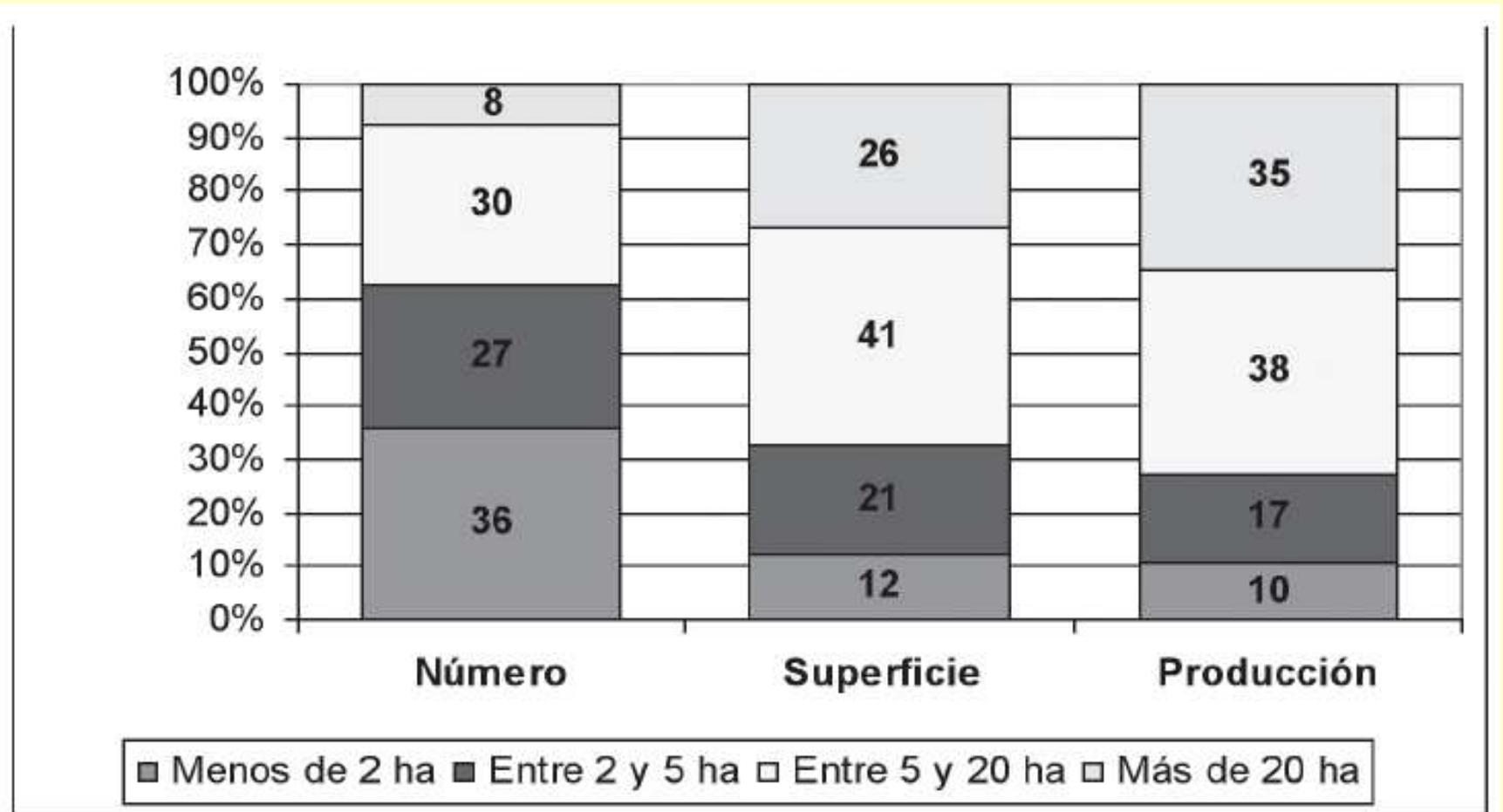
Undernourishment and type of schools



Mexico: Total Offer & Demand of Corn



Land and productive structure of Corn in Mexico



10 Years of NAFTA and Peasantry

- 1,780,000 peasants emigrated
- 2/3 of rural people live in poverty
- Profit of big agribusiness exented of tax payments:
 - Bimbo: 3.3 billion US\$/year
 - Pulse y Savia 1.2 billion US\$/year
 - Maseca 1.221 billion US\$/year (14 million tons imported)
 - Bachoco 1 billion US\$/year
- Loss of food sovereignty and hunger riots:
 - Increase of corn importation from 2.5 a 6.148million tons
 - Increase of basic grain importation from 8.7 a 18.7 mt
 - Importation of 95% of soya beans, 58.6% of rice, 49% of wheat, 25% of corn, 40% of meet
 - Cost of food import: 78 billion US\$/ 10 years

Hunger Riots: Food Price Increase

UNREST OVER FOOD

This map records some of the worst recent violence – where people died or large numbers protested – wholly or partly in response to rising food prices. Other, lesser outbreaks occurred in West Africa. Even Wal-Mart in the United States rationed rice and Italian consumers protested over the price of pasta.

MEXICO
Jan 2007: 75,000 protest against a 400% rise in tortilla prices.

HONDURAS
Apr 2008: Thousands of activists, students and farmers block highways and rally against high food prices and free trade.

PERU
Feb 2008: Farmers strike. May 2008: 1,000 women hang pots outside Congress. Jul 2008: One-day national strike.

HAITI
Apr 2008: Food price riots leave 4 dead. Prime minister sacked. Aug 2008: More violence erupts.

MOROCCO
200 injured in bread protests.

SENEGAL
Apr 2008: 1,000 march; many with empty rice sacks.

GUINEA
Jan 2007: 130 killed in 16-day national strike.

ARGENTINA
Mar-Apr 2008: 3-week farmers' strike over new export taxes on soya and other products.

SOUTH AFRICA
Aug 2008: National day of protest and strikes. 25,000 march through Johannesburg.

MAURITANIA
Nov. 2007: 1 killed in riots. May 2008: More violence; president sacks govt over slow response. Aug 2008: Coup ousts president.

EGYPT
Apr 2008: 2 die in major bread riots; army is ordered to start baking bread.

CAMEROUN
Feb 2008: Riots leave 24 dead.

YEMEN
Sep 2007: Tanks called in, 4 killed, in 5-day riots over wheat prices.

SOMALIA
May 2008: 10s of 1,000s protest at doubling of food prices; 2 killed.

MOZAMBIQUE
Feb 2007: 8 killed in food and fuel protests.

UZBEKISTAN
Sep 2007: Food protests erupt in the capital, Tashkent, and the Fergana region.

INDIA
Sep 2007: At least 6 die in mob attacks on West Bangali rice sellers in rationing protests. Aug 2008: Food riots follow flooding in eastern India.

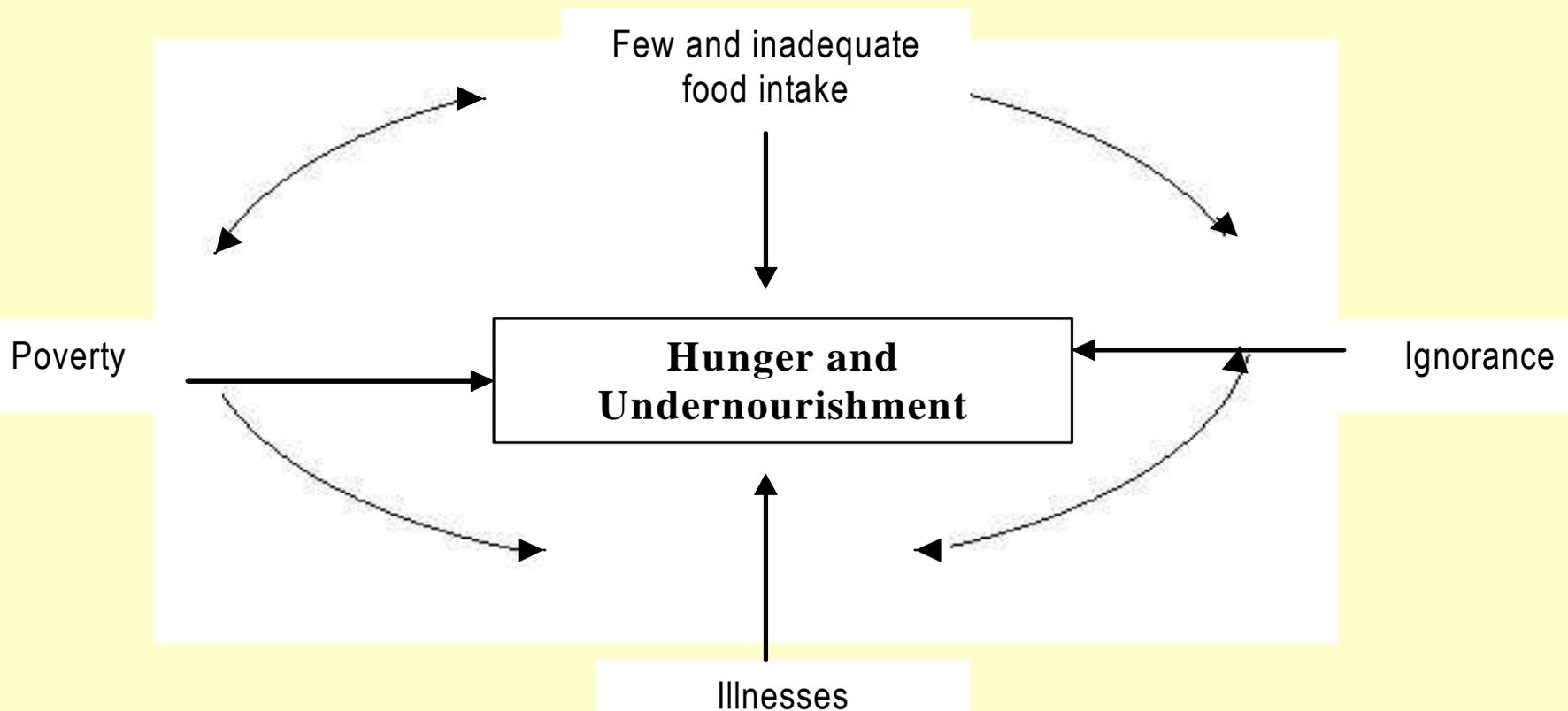
BANGLADESH
Apr 2008: 20,000 textile workers riot over wages and food prices.

INDONESIA
Jan 2008: 3,000 rally in Jakarta to demand action on soybean price, which doubled in a year.

Source: Al Jazeera, Antara News, AP, BBC, Bloomberg, Institute for War and Peace Reporting, International Business Times Online, New York Times, Reuters, The Times (South Africa)

Survival strategies, micro-business and local food sovereignty

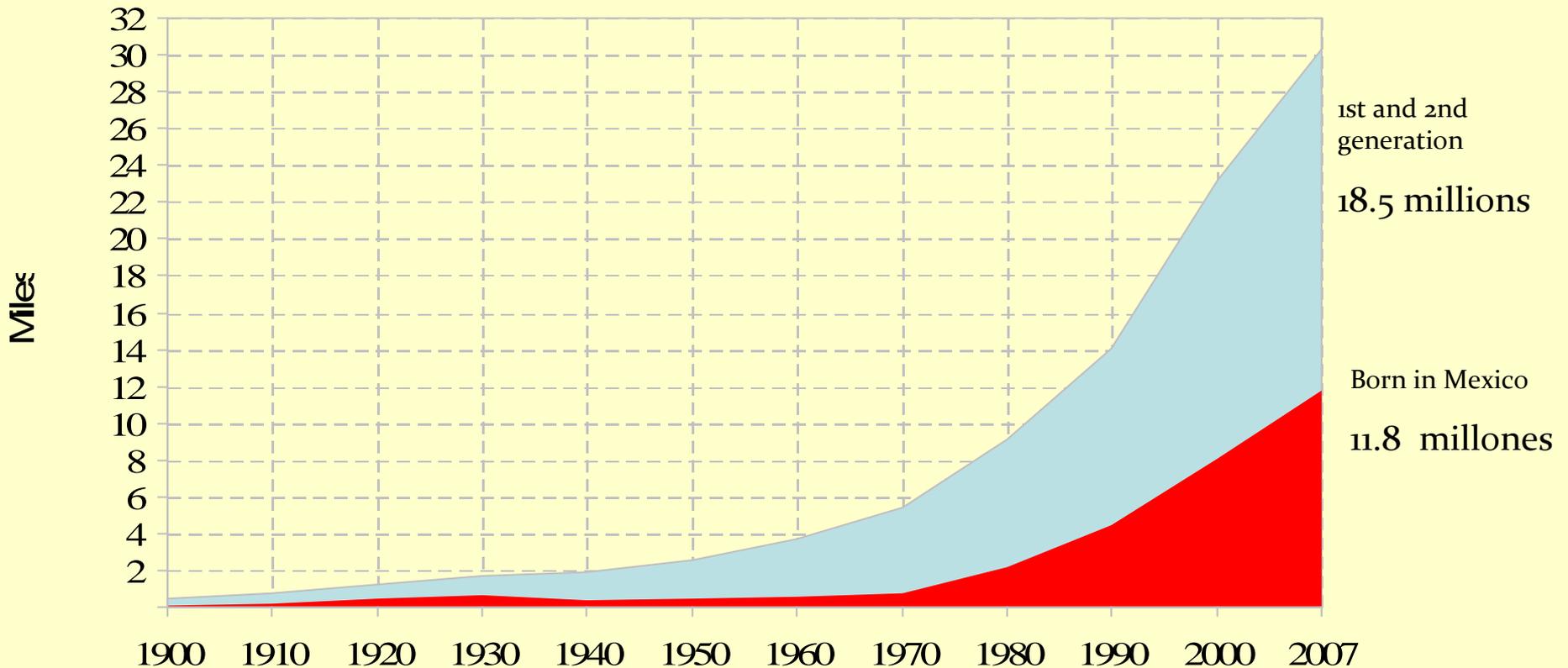
Vicious circle of hunger, undernourishment, poverty, and ignorance. Source: Chávez/Ávila/Shamah (2007: 208).



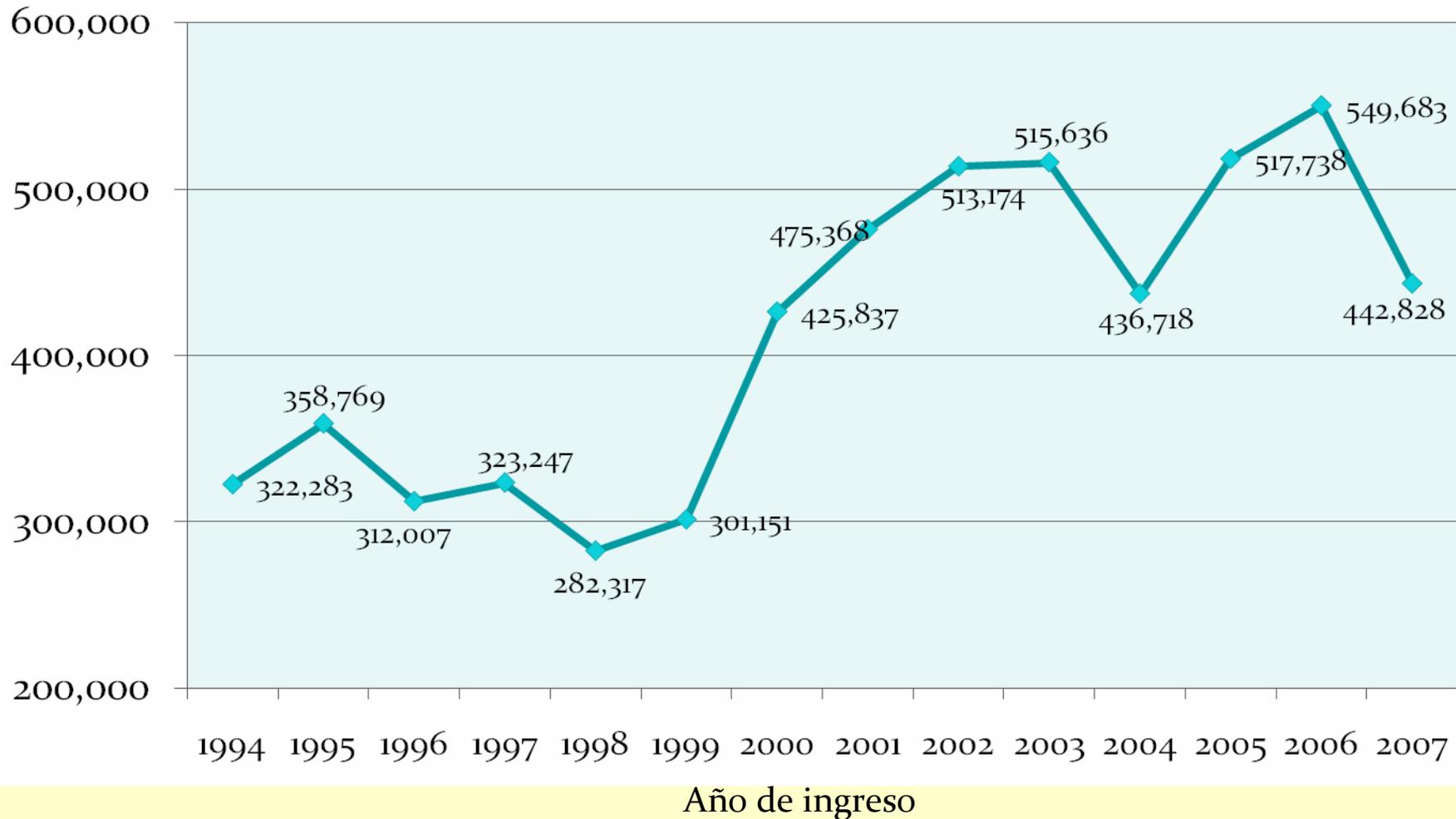
CC and Migration

- The impacts of climatic change already affect Mexico, where **82% of the land is subhumid, semiarid, arid and hyperarid**. Drought, changes in precipitation, **floods in coastal areas, plagues and crop illnesses**, together with **salinization** of soil and aquifers resulted in declining crop yields what led to unsustainable livelihoods.
- This process affected primarily peasants depending on **rain-fed subsistence crops** representing almost 78% of all rural producers. Their productive activities cannot guarantee the reproduction of their very poor livelihoods.

Results: Mexican's Residents in the USA



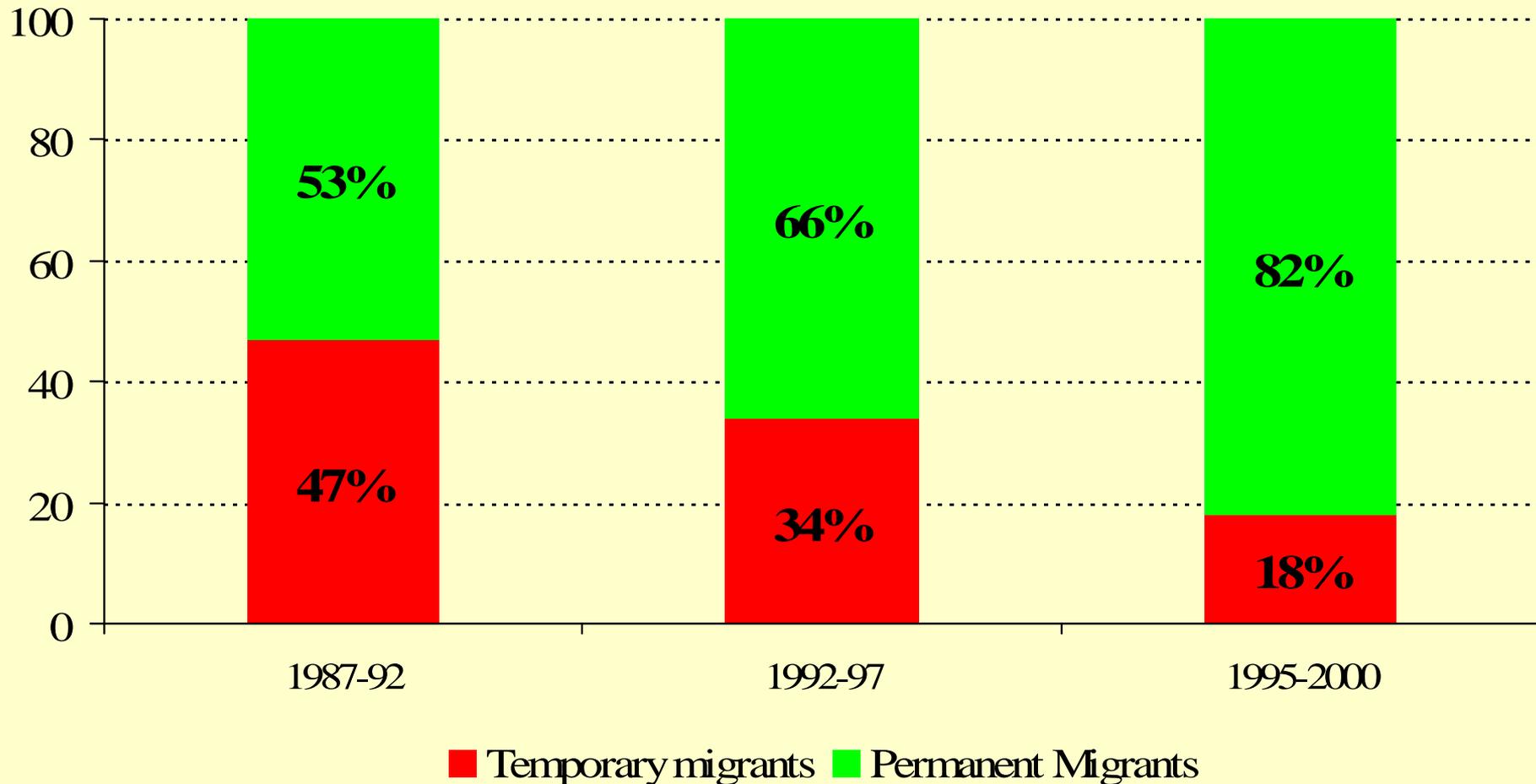
Native Mexican Population resident in the USA: Migration 1994-2007



Source: Estimations CONAPO based on *Current Population Survey 1994-2007*, elaborated by F. Lozano, CRIM, 2009

Permanent and Temporary Migration

Per cent



Source: ENADID92, ENADID97 and Censo 2000, elaborated by F. Lozano, CRIM, 2000

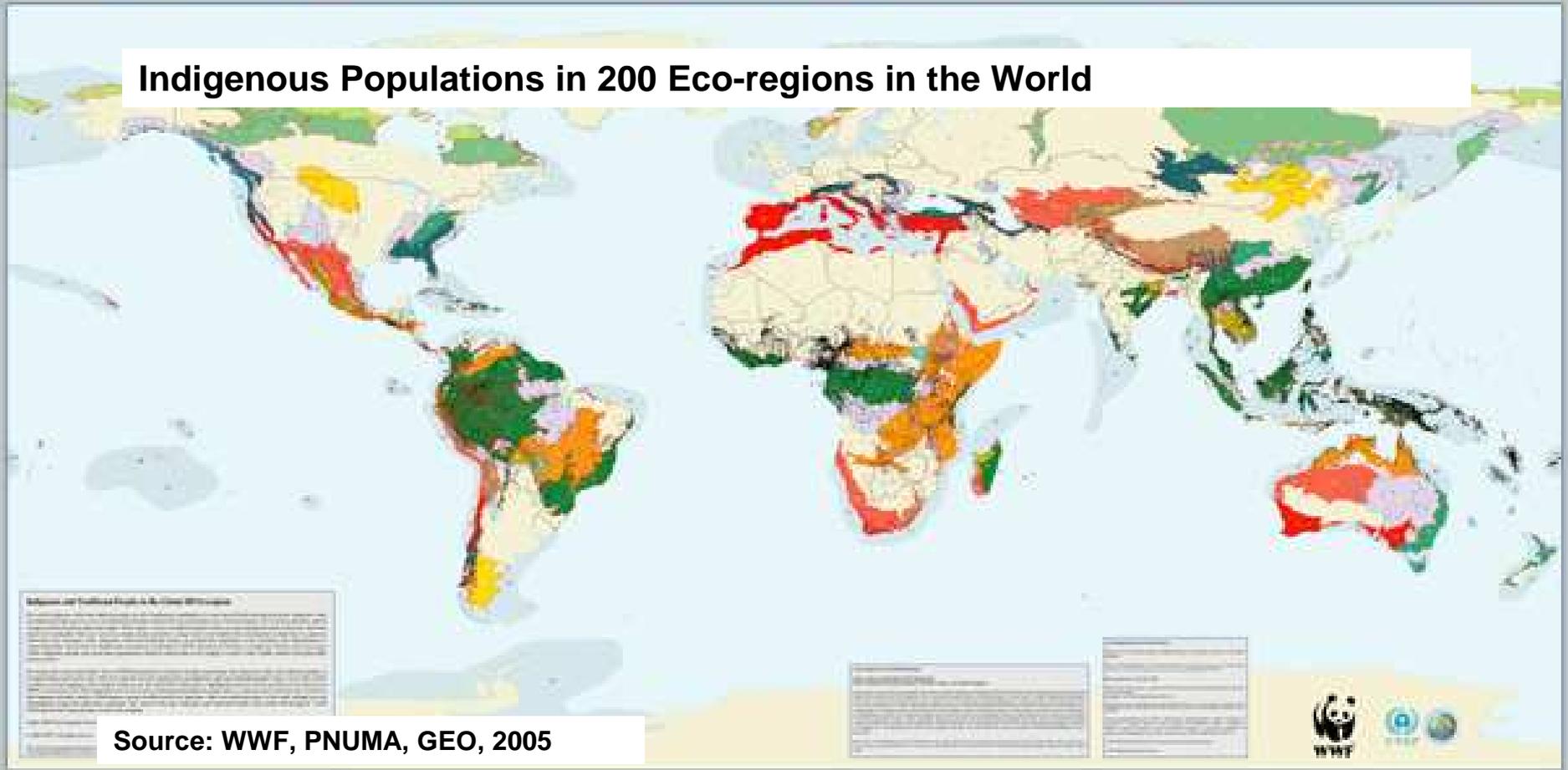
Migration from Mexico to the USA

- The **abysmal socioeconomic differences**, environmental threats and public insecurity between both countries.
- Since 1986, the legal status of Latin migrants in the USA has changed and now **most cross illegally**.
- Since NAFTA (1994), the number of Mexican migrants has increased since Despite the fence, a sophisticated electronic observation system including drones, now **annually 450,000 to 500,000** Mexicans cross the border.
- Legal and physical obstacles have created **new conflicts** and the rejection of an immigration law in 2007 by the US Congress has increased the vulnerability of the Latin migrants.
- Often migration is linked to **organized crime** (drug dealers, human trafficking, pornography, illegal purchase of human organs).
- Migration is a **result of the neoliberal model with low growth rates** (below 2%), a corrupt privatization process with a high concentration of wealth, an inefficient education system and low investments in infrastructure, and a lacking policy to create jobs that pushed trained young people into illegal activities (500,000 are linked to drug gangs; AFI 2008; Mexican Congress 2008). But also the demand for a cheap labor, drugs and pornography in the USA are drivers for illegal migration.

Biodiversity, culture and population

INDIGENOUS AND TRADITIONAL PEOPLES IN THE GLOBAL 200 ECOREGIONS

Indigenous Populations in 200 Eco-regions in the World



Map of Indigenous Peoples & Climate Hotspots
This map shows the distribution of indigenous and traditional peoples across the 200 global ecoregions. The map is color-coded to indicate the presence of indigenous and traditional peoples in each ecoregion. The map is overlaid with a grid of latitude and longitude lines.

Source: WWF, PNUMA, GEO, 2005



Global 200 Ecoregions	Indigenous Peoples	Climate Hotspots
1. Amazonian Forest	Yes	High
2. Andean Forest	Yes	High
3. Andean Shrublands	Yes	High
4. Andean Tundra	Yes	High
5. Antarctic Peninsula	No	Low
6. Antarctic Subantarctic Islands	No	Low
7. Antarctic Subantarctic Islands	No	Low
8. Antarctic Subantarctic Islands	No	Low
9. Antarctic Subantarctic Islands	No	Low
10. Antarctic Subantarctic Islands	No	Low

Environmental Impacts of CC (2050)

50% of natural coverage could be affected by CC.

Temperate forests, low dry tropical forest, xerophyte bushes & temperate savannas will be highly affected



Strategies of Adaptation

❊ Definition of resources:

- **Economic:** financing, infrastructure, poverty alleviation, ethical business, international aid and compensation, participative budget, sustainable job creation, environmental services
- **Social:** peasant organizations, research, science and technology, experts, NGO, Consultation Councils for Government, Public Private Partnership, sustainable livelihood, education and youth attention
- **Environmental:** Strategy of holistic sustainable development, recuperation and protection of ecosystems, environmental protection, urban reorganization, combat to desertification, water integral management, waste recycling, alternative energy, prevention, Political: Transparency, state of law, governance, democratic participation in planning, execution and evaluation, food and health security, early warning, sustainable reconstruction

❊ Integration of National Plan of Development with **Sectoral Plans, State and Municipal Plans**

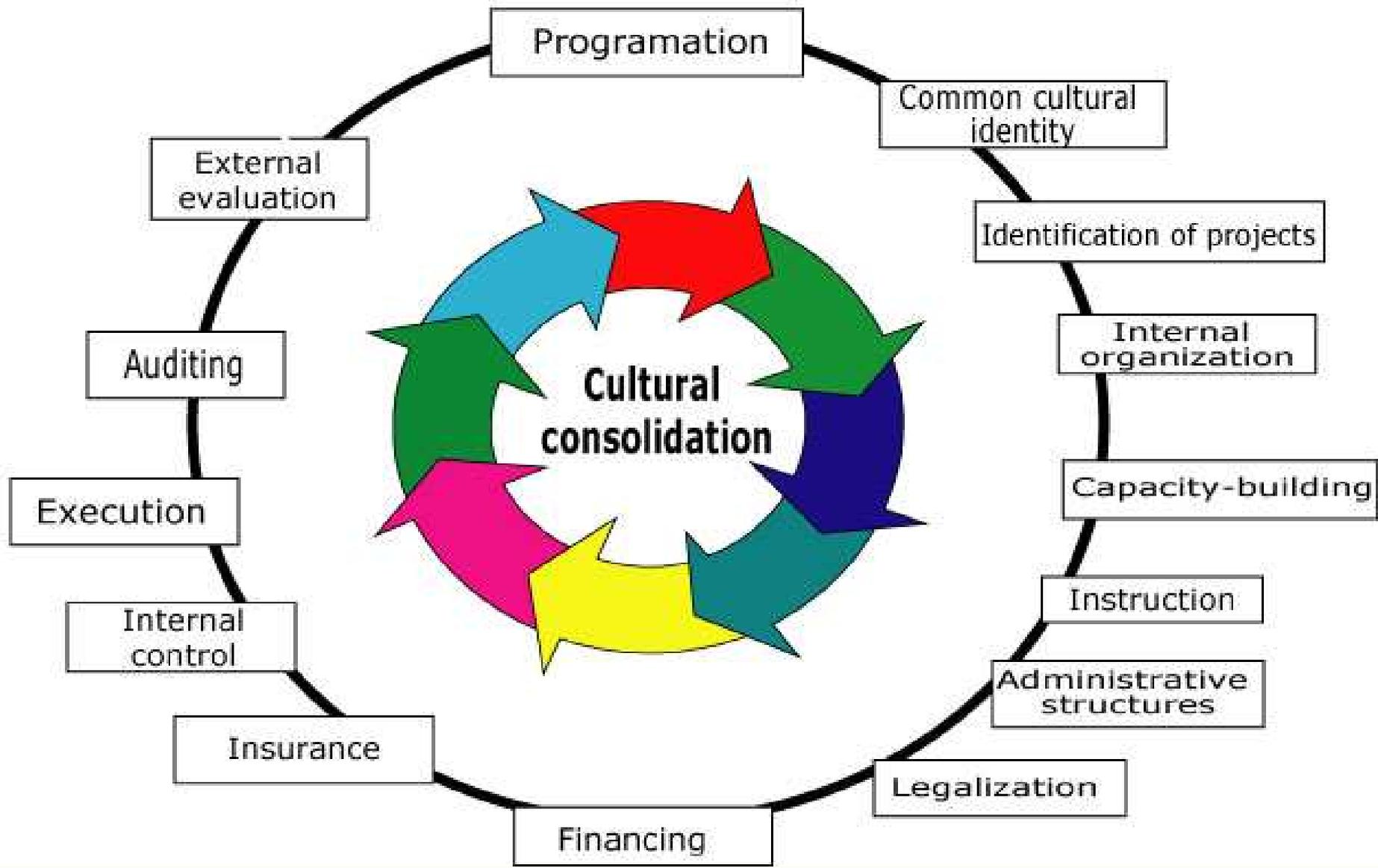
❊ Prevention and permanent monitoring

❊ Rigorous evaluation and modification

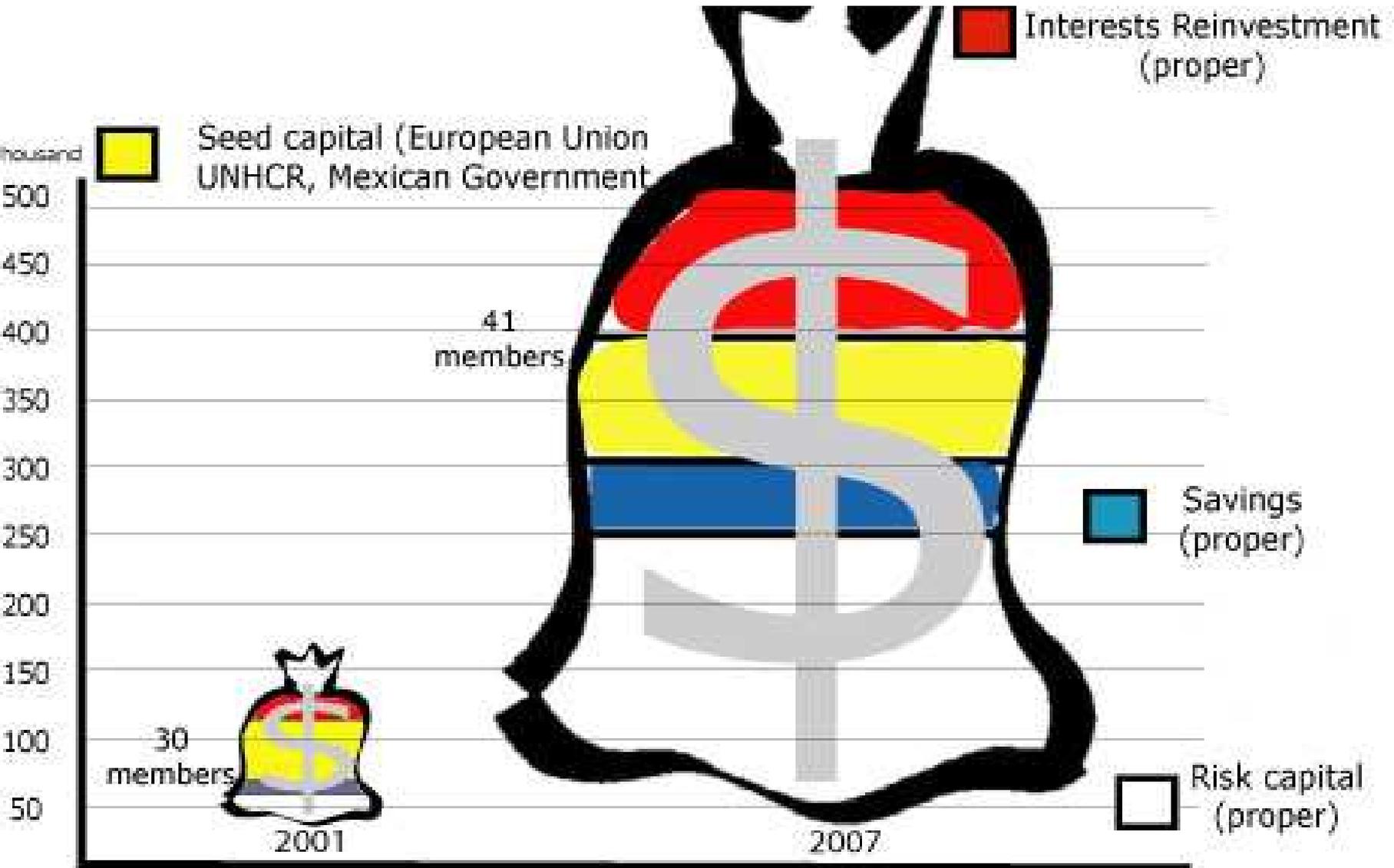
Traditional Rain Harvesting Microtunels, Organic Agriculture in Greenhouses, Reforestation, Environmental Services



Model of self-reliant entrepreneurship



Self-sufficient Micro-business with Micro-insurance in Campeche, Mex.



HUGE: Human, Gender & Environmental Security

- Human, Gender and Environmental Security (HUGE) is a widened concept of security that combines an **ample gender concept** (including children, elders, indigenous, vulnerable groups) with a **human-centered** focus on **environmental security** and **peace** challenges.
- HUGE analyzes **patriarchal, violent and exclusive structures** within family and society, questioning the existing process of **social representation-building** and **traditional role assignation** between genders for overcoming **violence & discrimination** against women .
- Reorients ‘human security’ to **equity and development** through social organization, specific governmental policies, private ethical investments and legal reinforcements.
- As a **holist concept**, HUGE revises ‘**environmental security**’ and proposes policy for a healthy environment, integral management of natural resources, prevention and remediation practices that reduce vulnerability of hazard impacts.

- It analyzes processes for empowering hazard-prone countries and vulnerable (women, exposed groups) to improve their **resilience** through **bottom-up organization** that is reinforced by **top-down policies** and **institutions**, (capable to guarantee effective early warning and evacuation, disaster support and reconstruction in regions affected by social and natural disasters).
- The concept examines the **consolidation of a ‘huge’ solidarity process** of **sustainable** and intra and intergenerational **equality** and development, reinforced by international and local **collaboration** and **nonviolent conflict management**.
- HUGE studies social, environmental, human, cultural and identity concerns together with solidarity, resilience, **peace-building** and **equity practices** in contexts of increasing insecurity, dangers and fragility. Alternatives by are **socialized** by social movements.

Thank you for your attention

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