



UNITED NATIONS
UNIVERSITY

UNU-EHS

Institute for Environment
and Human Security

Global Change and Human Health

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CRIM-National University of Mexico
MRF Chair UNU-EHS
Bonn, 26-30 of April, 2009



IHDP
Open Meeting
2009

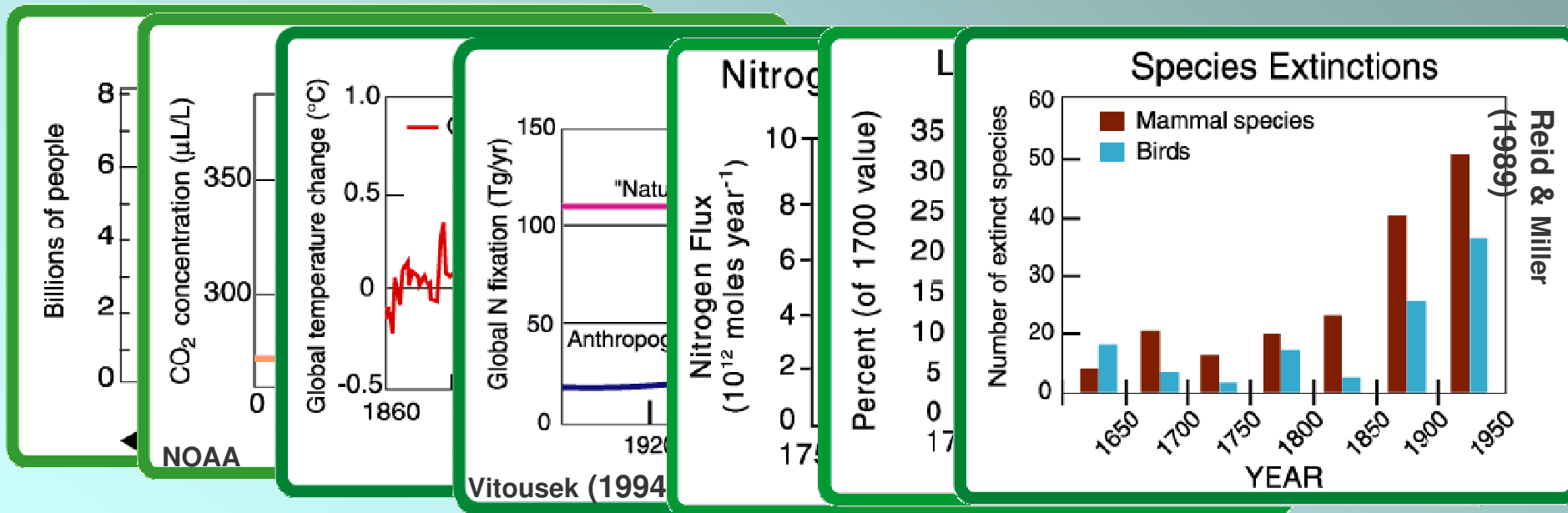
7th International Science Conference on the
Human Dimensions of Global Environmental Change

Index

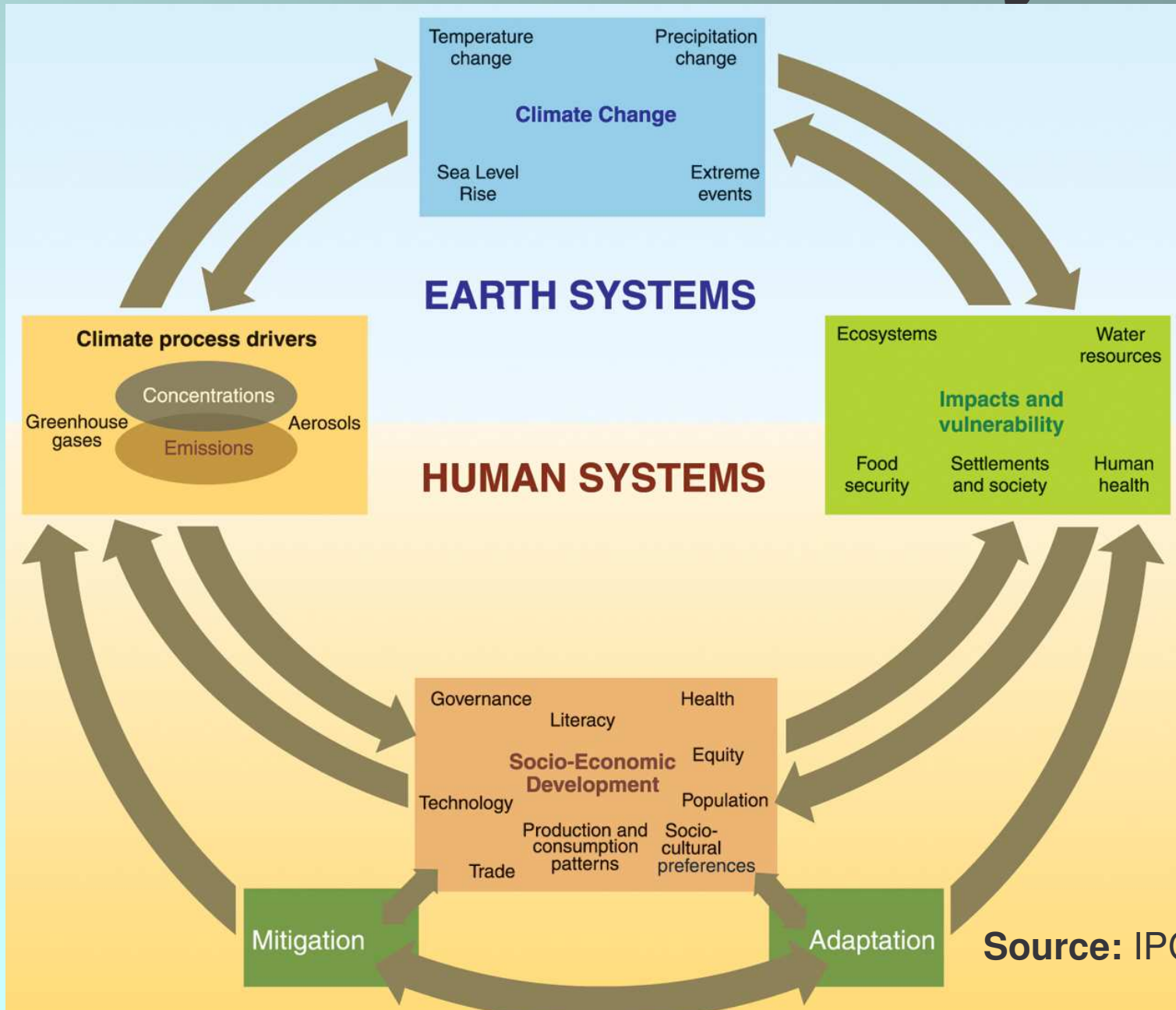
- 1. What is Global Environmental Change (GEC) and globalization**
- 2. Health security: a widening definition of security**
- 3. How does GEC affecting health?**
 - Water-born and vectors illnesses
 - Air pollution and GHG emissions
- 4. How does globalization affect health?**
- 5. Affectation of health in Mexico**
- 6. Future scenarios**
- 7. Strategies of adaptation to GEC: top-down and bottom-up**
- 8. Human, Gender and Environmental Security: a HUGE security**

Global Environmental Change

- GEC is more than climate change
- Includes natural **plus** human components
- It is a constellation of changes in different spheres, such as:



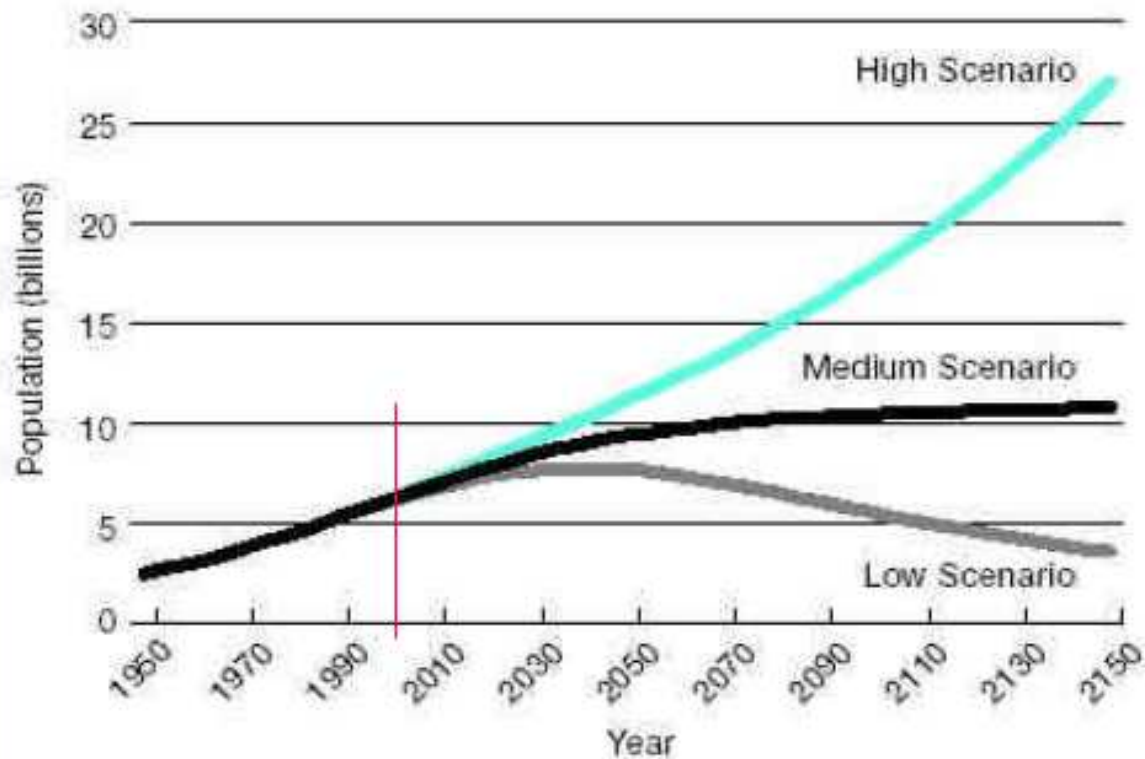
GEC: Earth and Human Systems



Source: IPCC, 2007

World Population: Three Alternative Scenarios

This chart shows three possible paths of future population growth.



Source: United Nations.



Globalization

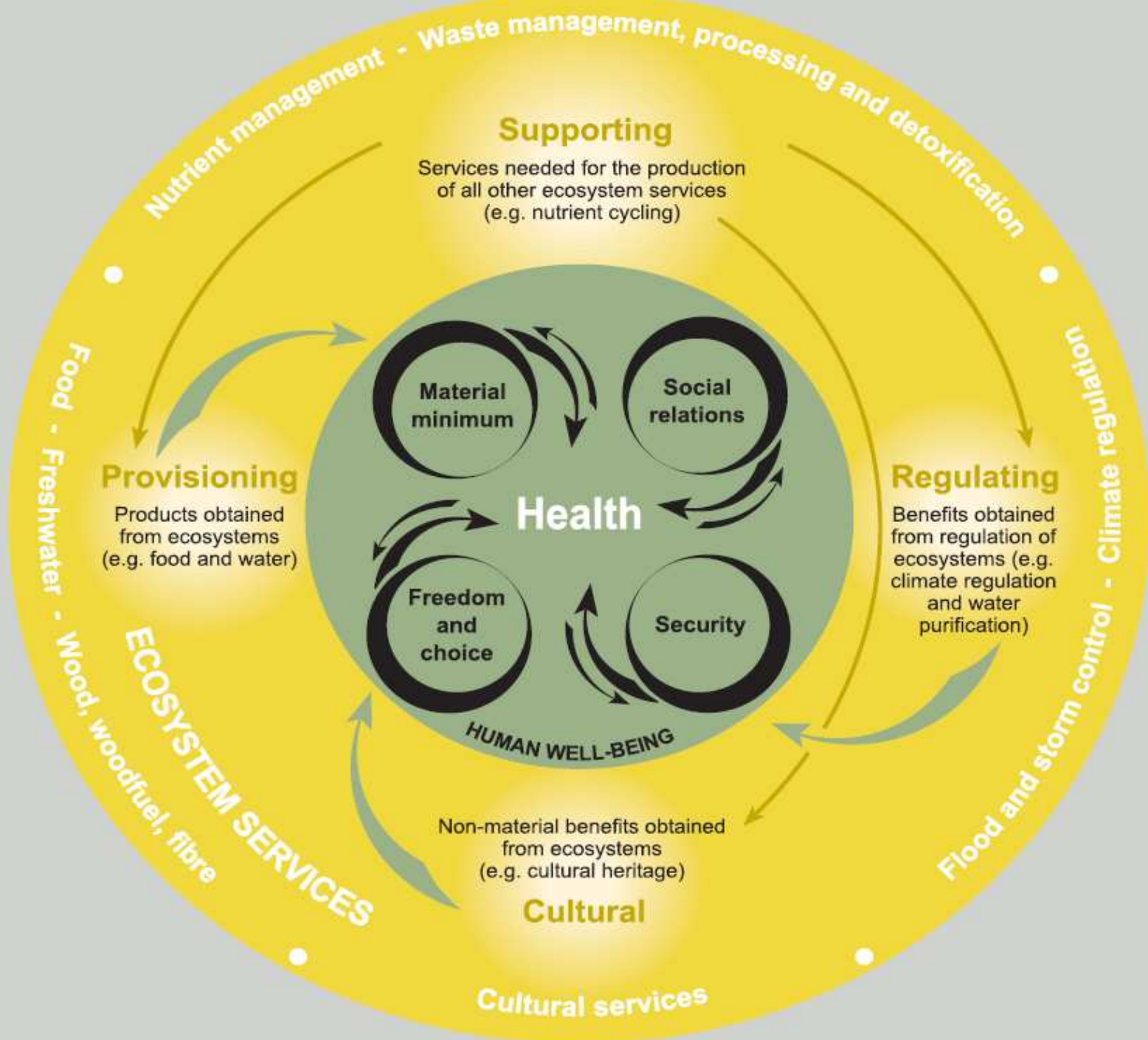
1. Global financial networks
2. Instant communication (internet)
3. Global trade system
4. Global multilateral system of negotiation within the UN and the UN Security Council
5. Global agreements on human rights and its reinforcement
6. International Council of Justice
7. Consolidation of democratic political systems
8. Increase of social gaps within countries and between North and South

Threats of globalization and GEC

1. *Economic crisis: most severe financial crisis* since 1929 (collapse of private banks, insurance companies and enterprises), reduction of economic growth, increased unemployment and decline of remittances from migrants.
2. *Population Growth:* The world population has tripled during the 20th century from 2 to 6 billion and it is projected to **grow to 9 billion** until 2050.
3. *Climate Change:* global temperature is projected to rise between **1.1 and 6.4 °C by 2100**; sea-level between **18 cm and 2.4 metres**; precipitation patterns change significantly, climate related **hazards** will increase in number and intensity affecting more people and economies.
4. *Water Security:* during the 20th century population **tripled** and water consumption increased **six fold**. By 2025, more than 2.8 billion people in 48 countries are projected to face water stress, most of them in Asia and Africa.
5. *Food Crises in 2008:* **963 million people are hungry**; 40 million more due to food price increase; more than 24,000 people die daily due to hunger-related causes

Regressive globalization

- Strategy of groups and governments that favor a globalization only to the extent to benefit them
- Administrative unilateralism makes use of global strategies of pre-emption and counter-proliferation in a clearly expression of national interest. This could create isolationism and an anarchic global system of governance.
- The rise of nationalistic and religious fundamentalist groups, which spawned a new geopolitical terrorism. This new groups are depend on global infrastructure such as internet, global funding, global financial system, communication, propaganda and technology.



2. Definition of Health Security: WHO

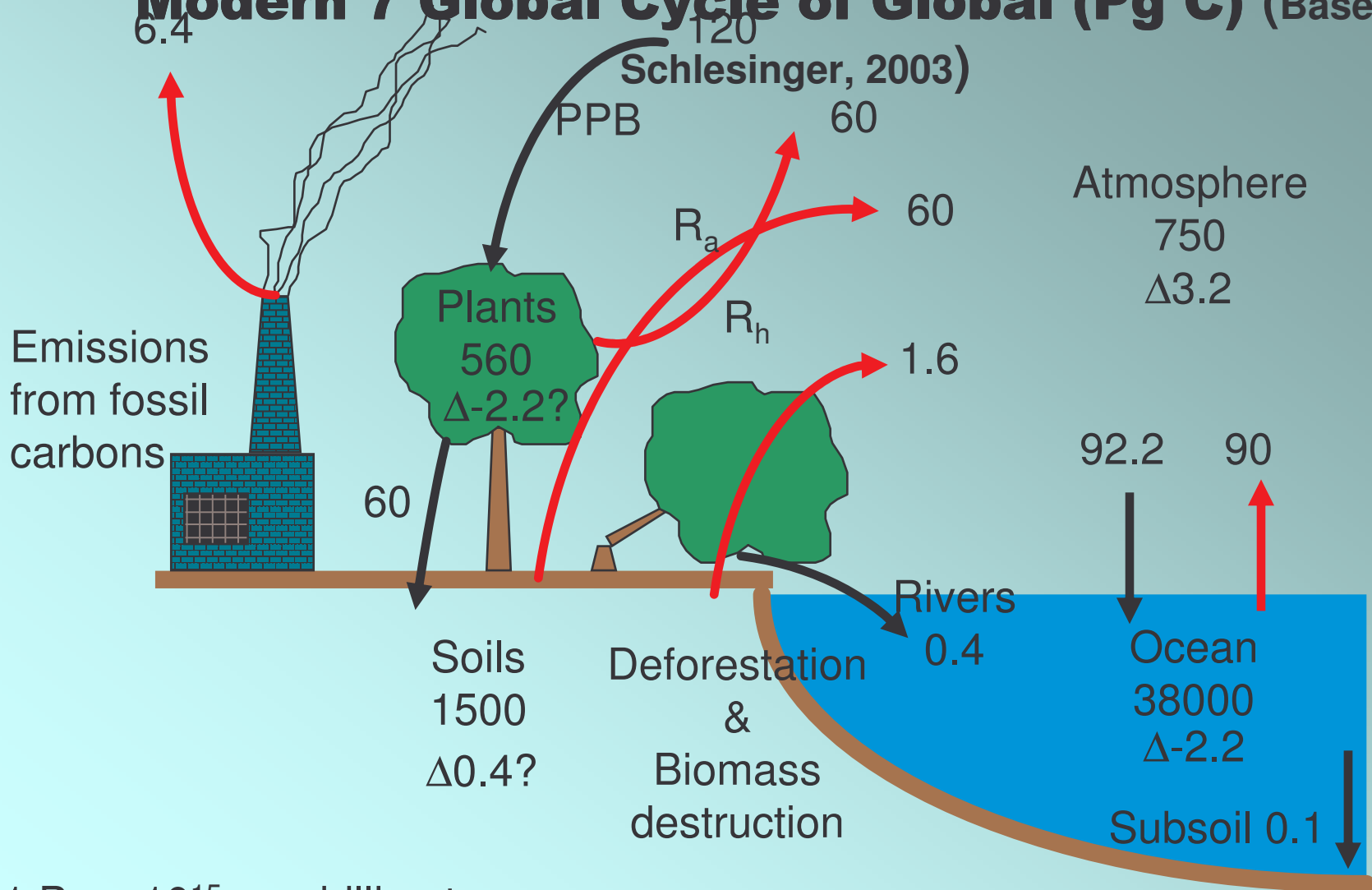
- There is growing acceptance of the concept of **health security**.
- Critics: various and incompatible **definitions**, incomplete elaboration of the concept of health security in public health operational terms, and insufficient reconciliation of the health security concept with community-based primary health care.
- Policymakers in industrialized countries emphasize protection of their populations especially against external threats, for example **terrorism and pandemics**
- **Health** workers and policymakers in developing countries and within the United Nations system understand the term in a broader public **health** context. Some developing countries: doubt that internationally shared health surveillance data is used in their best interests.
- UN agencies e.g. World **Health** Organization's restrictive use of the term 'global **health security**'.
- Divergent understandings of '**health security**' by WHO's member states, coupled with **fears** of hidden national **security** agendas, are leading to a breakdown of mechanisms for global cooperation such as the International Health Regulations (**William Aldis, 2008**) .

Definition of Health Security

- Governments prepared to cooperate to prevent the emergence and spread of infectious disease and provide public health security, **defined as the provision and maintenance of measures aimed at preserving and protecting the health of the population (WHO, 2007).**
- Public health security is also defined as the policy areas in which **national security and public health concerns overlap (USA: bioterrorism).**
- Broader dimensions of cross-border health risks: **transmission of anti-microbial resistant organisms**, as well as health risks associated with **noncommunicable diseases, environmental degradation and conflict.**
- **UNDP: inadequate health care and diseases**
- **Ogata/Sen: spread of HIV/AIDS**
- **Wikipedia:** Health Security aims to guarantee a minimum protection from diseases and unhealthy **lifestyles**. In developing countries, the major causes of death are **infectious** and **parasitic diseases**, which kill 17 million people annually. In industrialized countries, the major killers are diseases of the **circulatory system**, killing 5.5 million every year. According to the **United Nations**, in both developing and industrial countries, threats to health security are usually greater for poor people in rural areas, particularly children. This is mainly due to **malnutrition** and insufficient supply of medicine, clean water or other necessity for healthcare.

3. GEC and Threats to Health

Modern 7 Global Cycle of Global (Pg C) (Based on



1 Pg = 10^{15} g = billion tons

Desertification Land Degradation & Drought

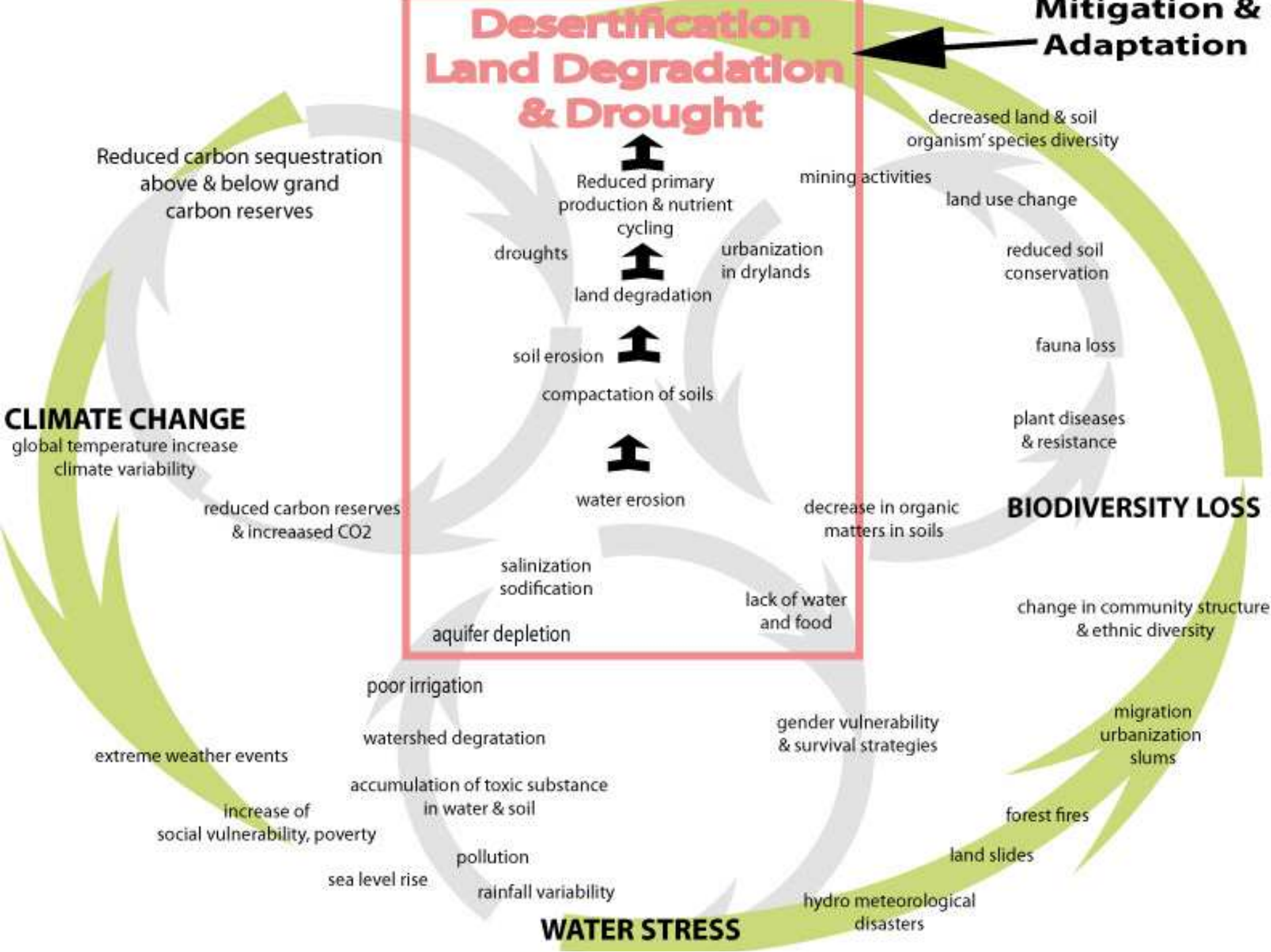
Mitigation & Adaptation

CLIMATE CHANGE

global temperature increase
climate variability

BIODIVERSITY LOSS

WATER STRESS



Reduced carbon sequestration
above & below ground
carbon reserves

reduced carbon reserves
& increased CO2

extreme weather events

increase of
social vulnerability, poverty

sea level rise

pollution

rainfall variability

poor irrigation

watershed degradation

accumulation of toxic substance
in water & soil

aquifer depletion

salinization
sodification

water erosion

soil erosion

compaction of soils

land degradation

droughts

Reduced primary
production & nutrient
cycling

urbanization
in drylands

mining activities

land use change

reduced soil
conservation

fauna loss

plant diseases
& resistance

decrease in organic
matters in soils

lack of water
and food

change in community structure
& ethnic diversity

migration
urbanization
slums

forest fires

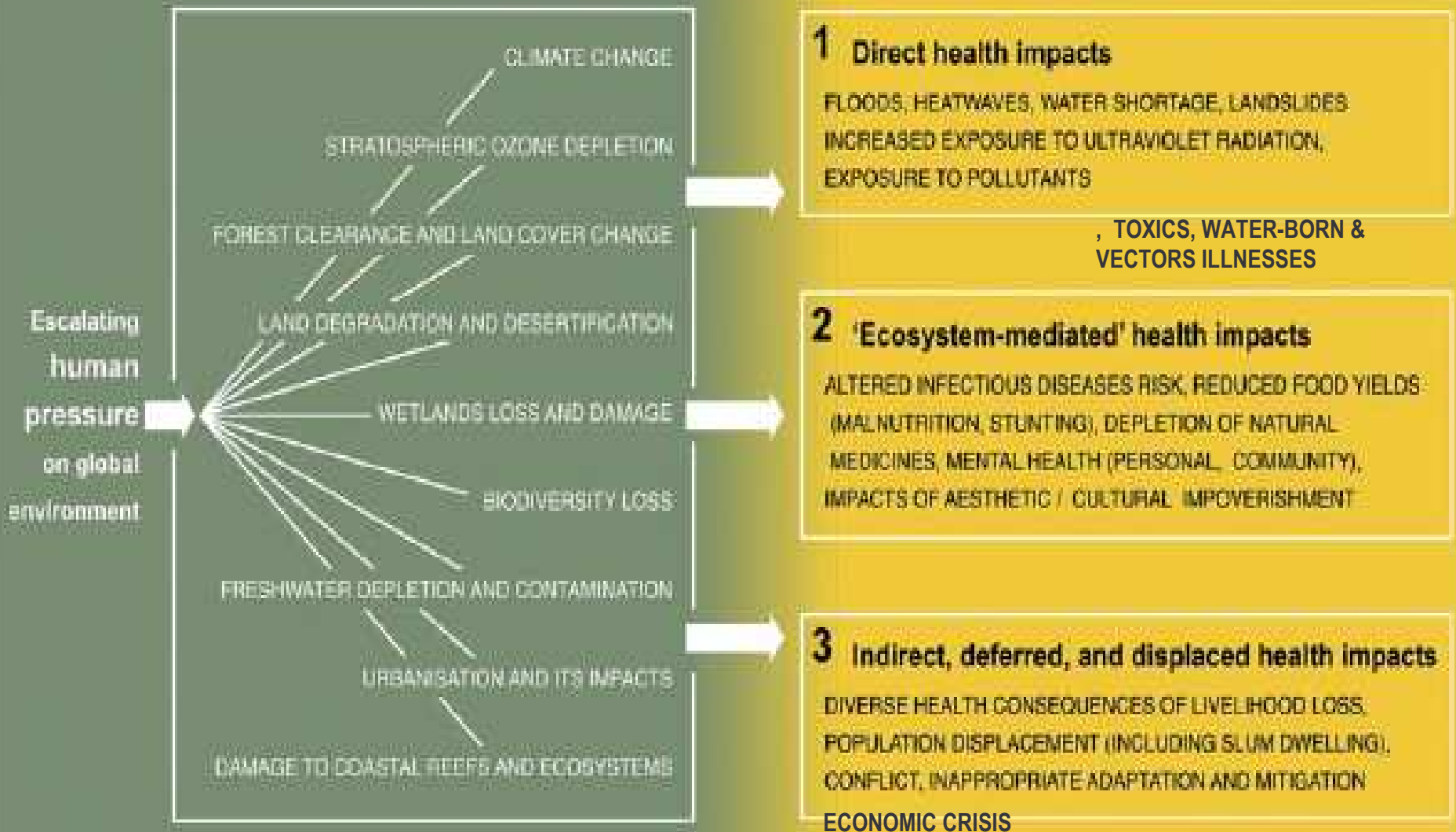
land slides

hydro meteorological
disasters

gender vulnerability
& survival strategies

Environmental changes and ecosystem impairment

Examples of health impacts



This figure describes the causal pathway from escalating human pressures on the environment through to ecosystem changes resulting in diverse health consequences. Not all ecosystem changes are included. Some changes can have positive effects (e.g. food production).

CONSTITUENTS OF WELL-BEING

ECOSYSTEM SERVICES

Supporting

- NUTRIENT CYCLING
- SOIL FORMATION
- PRIMARY PRODUCTION
- ...

Provisioning

- FOOD
- FRESH WATER
- WOOD AND FIBRE
- FUEL
- ...

Regulating

- CLIMATE REGULATION
- FLOOD REGULATION
- DISEASE REGULATION
- WATER PURIFICATION
- ...

Cultural

- AESTHETIC
- SPIRITUAL
- EDUCATIONAL
- RECREATIONAL
- ...

LIFE ON EARTH - BIODIVERSITY

Security

- PERSONAL SAFETY
- SECURE RESOURCE ACCESS
- SECURITY FROM DISASTERS

Basic material for good life

- ADEQUATE LIVELIHOODS
- SUFFICIENT NUTRITIOUS FOOD
- SHELTER
- ACCESS TO GOODS

Health

- STRENGTH
- FEELING WELL
- ACCESS TO CLEAN AIR AND WATER

Good social relations

- SOCIAL COHESION
- MUTUAL RESPECT
- ABILITY TO HELP OTHERS

Freedom of choice and action

OPPORTUNITY TO BE ABLE TO ACHIEVE WHAT AN INDIVIDUAL VALUES DOING AND BEING

ARROW'S COLOR
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

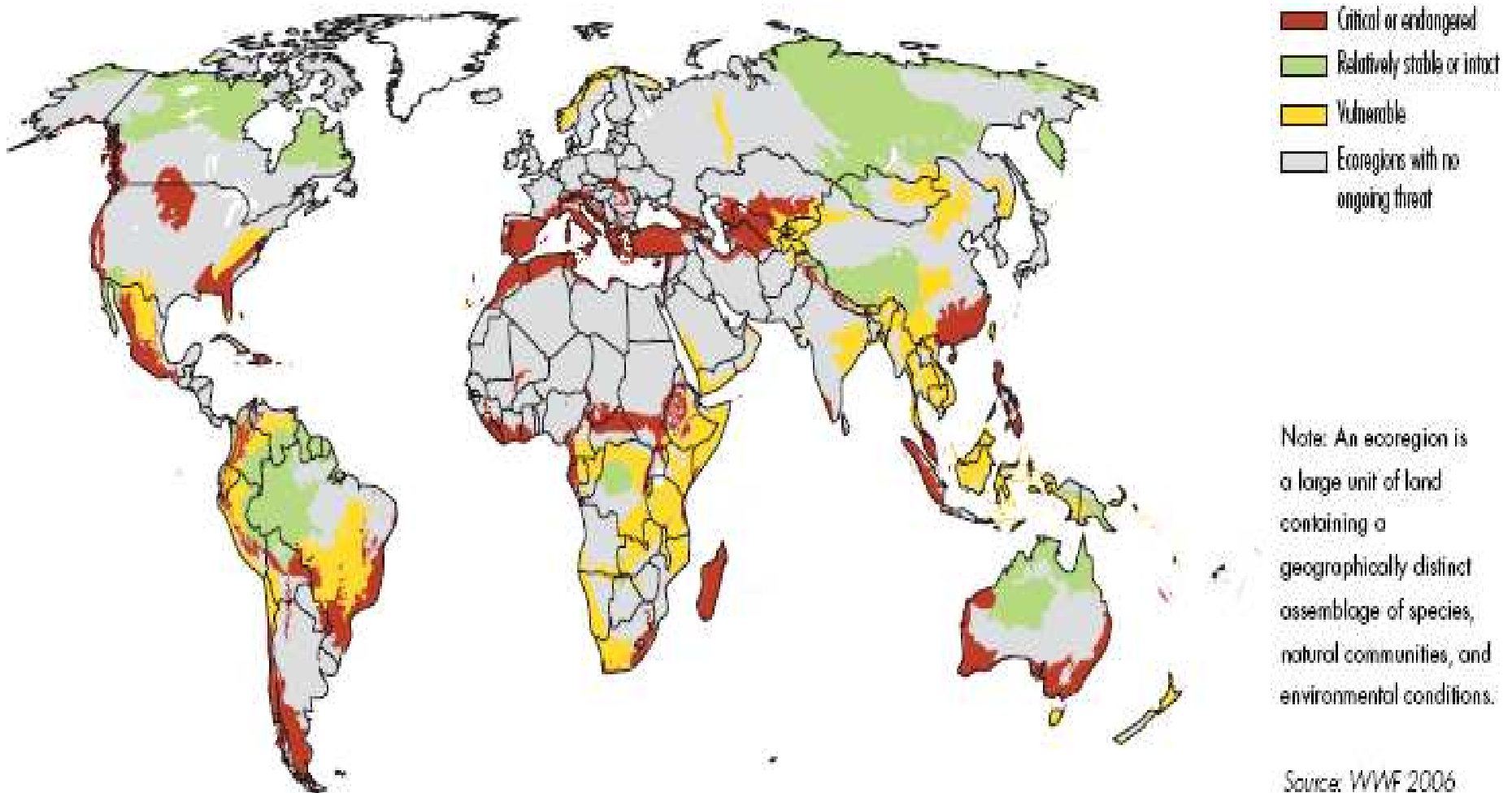
ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong

Source: Millennium Ecosystem Assessment

Threatened Ecosystems

Figure 5.1 Status of terrestrial ecoregions



4. How does globalization affects health



Figure 4. High Potential for Food Crisis 1901-1995.

Food insecurity scenario

Source: Alcamo, 2002

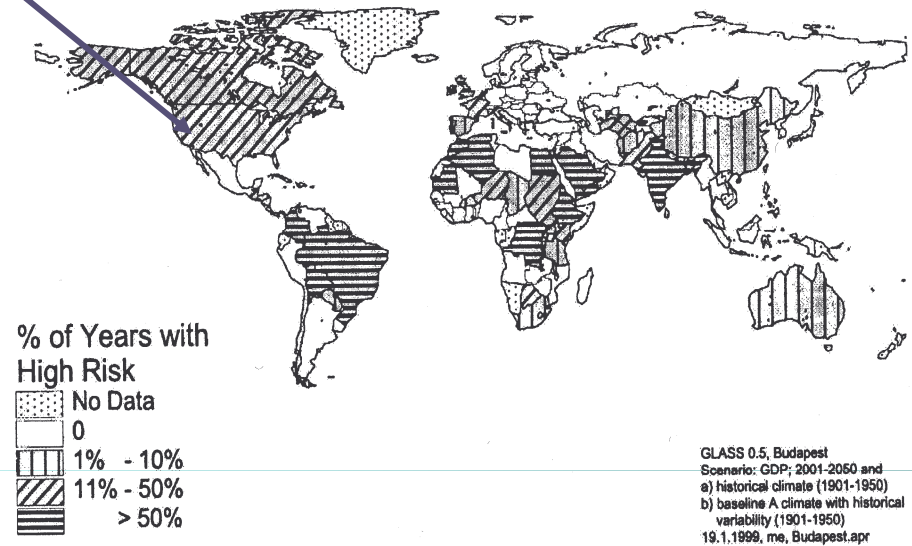
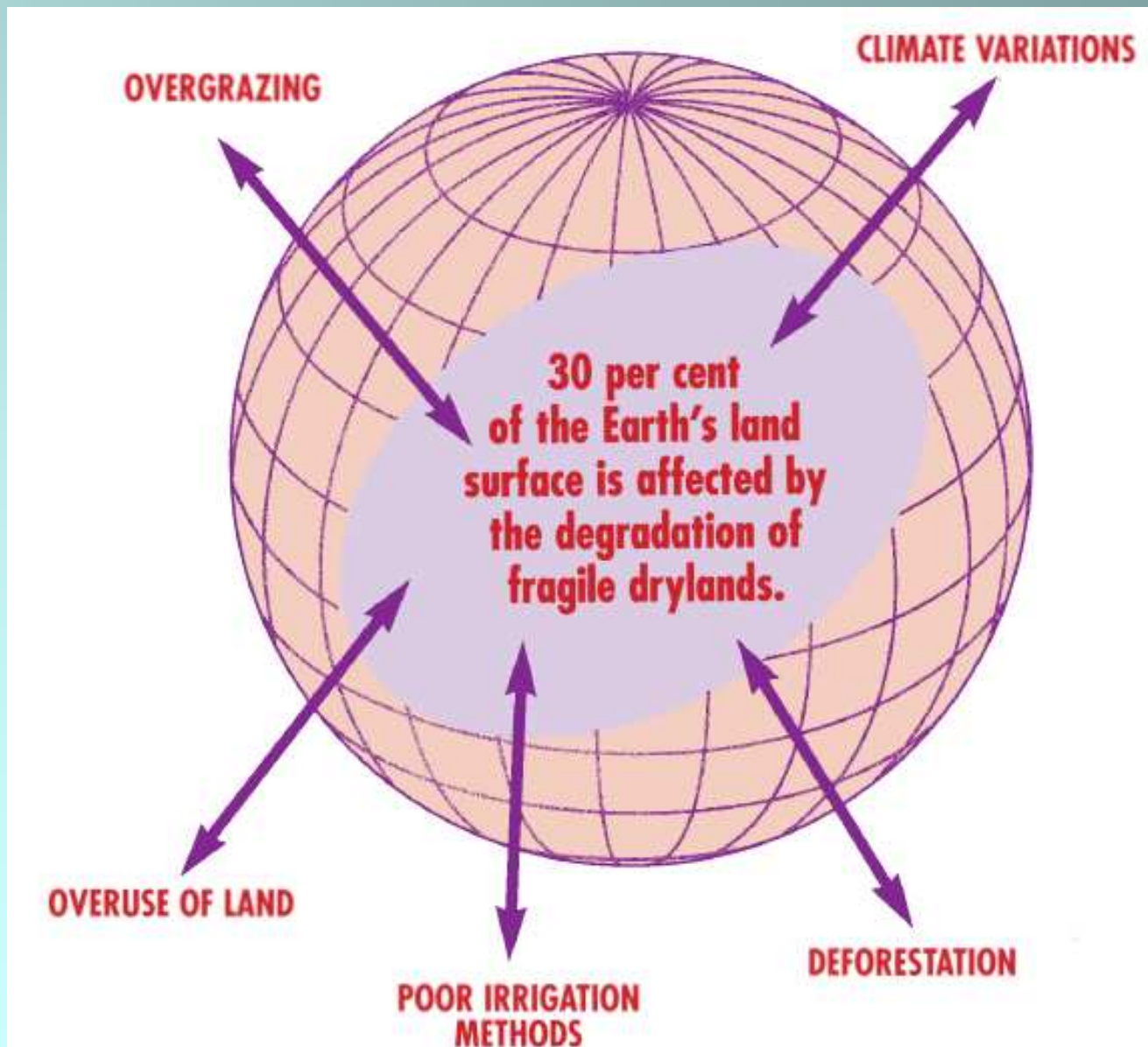


Figure 6. High Potential for Food Crisis 2001-2050 – with GDP Increase and Climate Change.

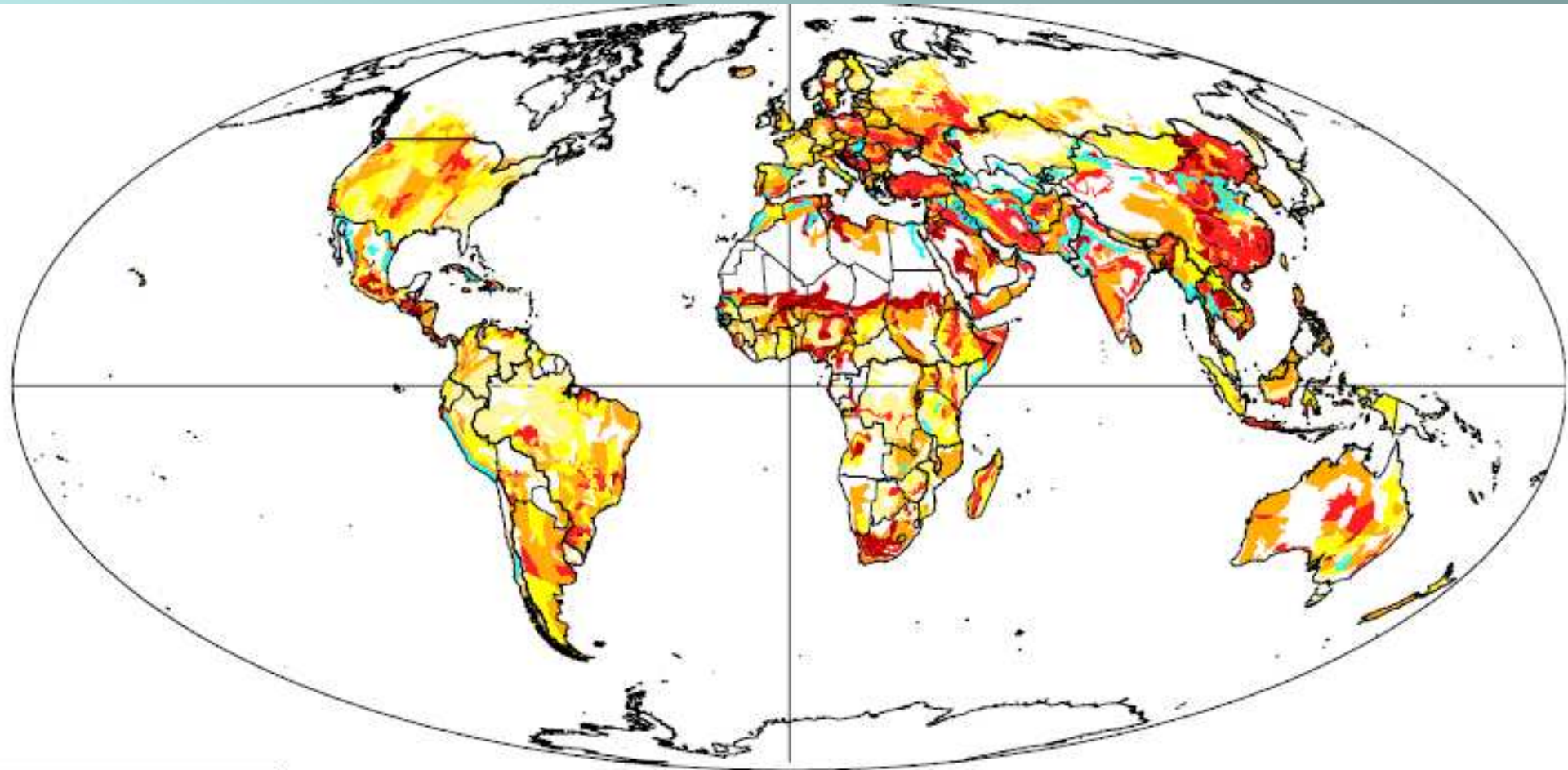
Key factors of drylands' degradation



Drought, desertification, land degradation

- **110 countries** are potentially at risk. UNEP estimates that desertification costs the world **US\$ 42 billion/year**. **Africa** alone loses some **US\$ 9 billion/year** (Lean 2008: 10). The continent with the highest proportion of severely or moderately desertified drylands is North America (74%), but also 13 European countries suffer from desertification.
- **30% of the earth** is deteriorated due to overgrazing, overuse of land, poor irrigation methods, deforestation, urbanization, climate variability and change, human-induced increase in food, water and soil due to population growth, modernization processes, livelihood changes and waste.
- **Loss of yield productivity**, water and food scarcity, inadequate land management and poverty are key drivers of forced migration of people from drylands to humid regions where new desertification trends surge from an increased **demand on the carrying capacity of the land**.

Global soil degradation (% of affected area)



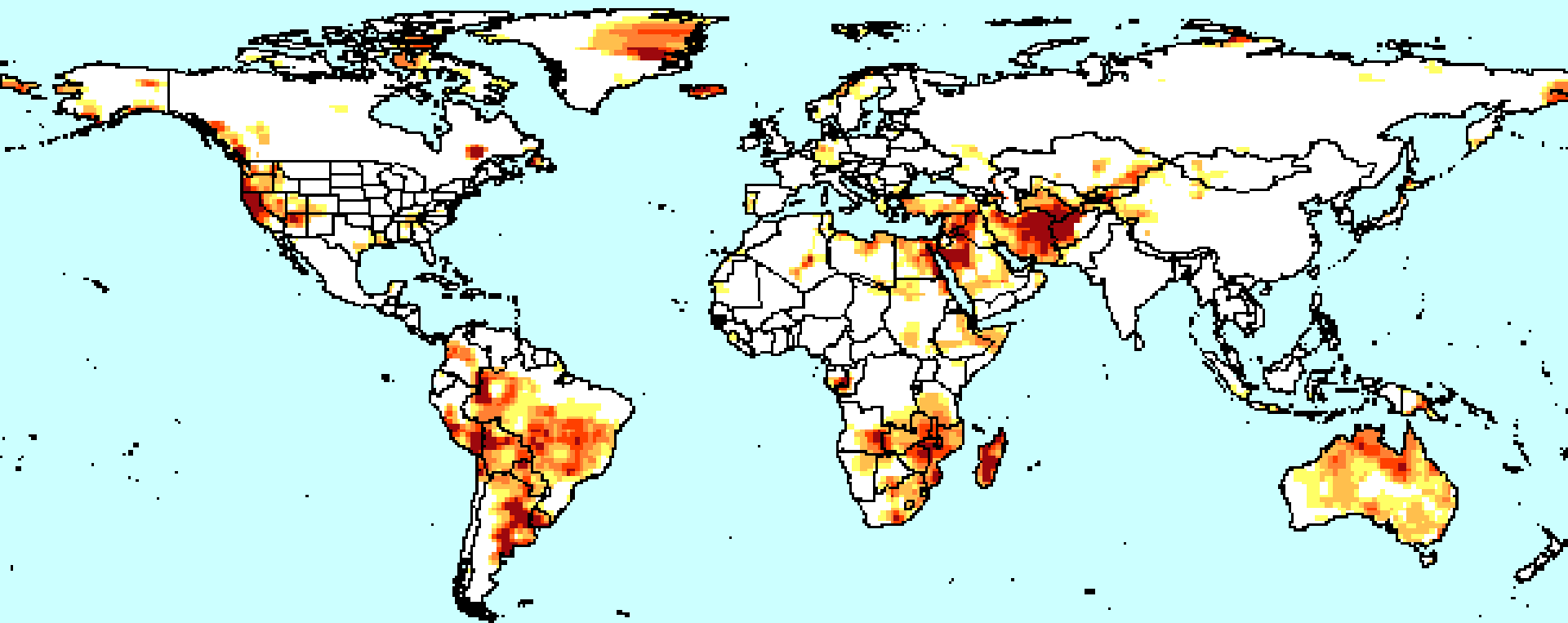
Source: WBGU (2006) based on GLASOD (1990).

Most severe droughts (1900-2008)

By the number of people killed on the country base			By the number of people affected on the country base		
Country	Date	Killed	Country	Date	Affected (million)
China P R.	1928	3,000,000	India	1982	300
Bangladesh	1943	1,900,000	India	2002	300
India	1942	1,500,000	India	1972	200
India	1965	1,500,000	India	1965	100
India	1900	1,250,000	India	Jun 82	100
Sov. Union	1921	1,200,000	China P. R.	Jun 94	82
China P R.	1920	500,000	China P. R.	April 2002	60
Ethiopia	May 83	300,000	India	April 2000	50
Sudan	April 83	150,000	China P. R.	June 1988	49
Ethiopia	Dec 73	100,000	China P. R.	Jan. 2003	48

Source: EM-DAT: The OFDA/CRED International Disaster Database, at: < www.em-dat.net > (created on 5 January 2009)

Global drought monitor



Source: Lloyd/Huges/Saunders (2009)

Drought Severity



Minor Drought



Moderate Drought



Severe Drought



Extreme Drought



Exceptional Drought

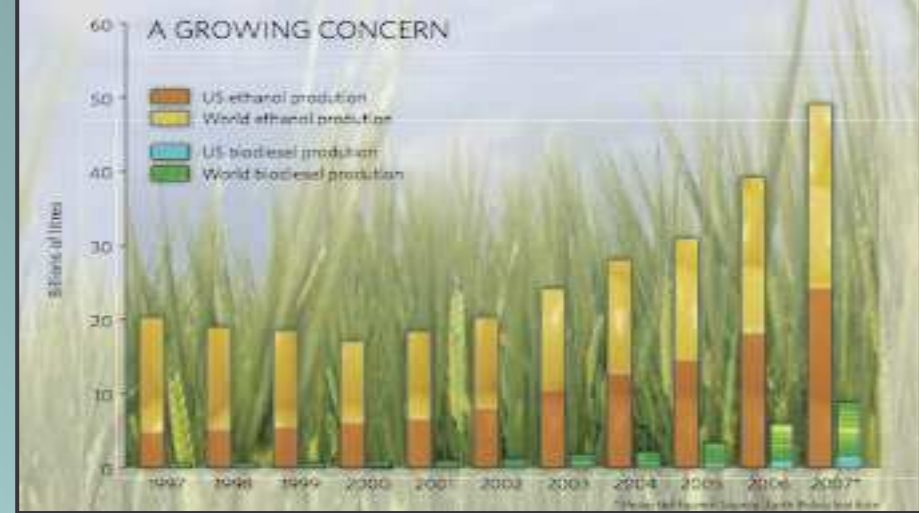
Annual change in % in world grain yields by decade (3 years average)

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

Source: **Benton Jones (2003: 44)**

Hunger and bioenergy

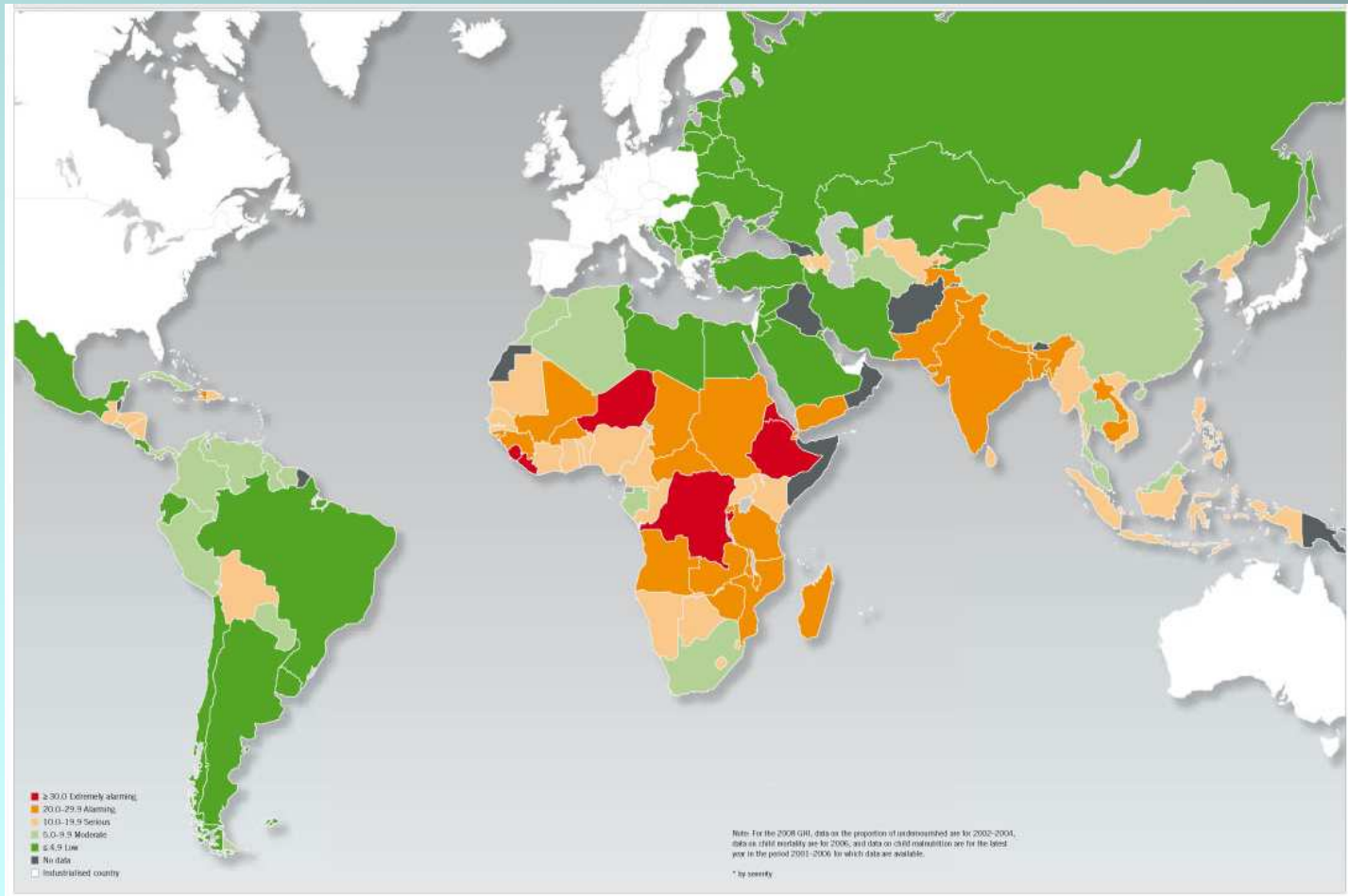
- Cultivation for bioenergy, electricity and heat
 - Crops (grains and agricultural waste)
 - Forest waste
 - Solid municipal waste
- Who produces? OCDE; Brazil
- Why?
 - Energy security
 - Climate change mitigation
 - Rural development
- Required characteristics
 - Native, perennial, rapid growth, resistance to illnesses, no competition to food, not invasive
 - Switchgrass (*Panicum virgatum*)
 - Alamo



Accidents with Genetic Modified Organisms: Transgenics



Global Hunger Index 2008



Source: IFPRI (2008). at: <<http://www.ifpri.org/media/20081014ghi.asp>>

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
300 injured in bread protests.

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

GUINEA
Jan 2007: 130 killed in 18-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: 6 killed in food and fuel protests.

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

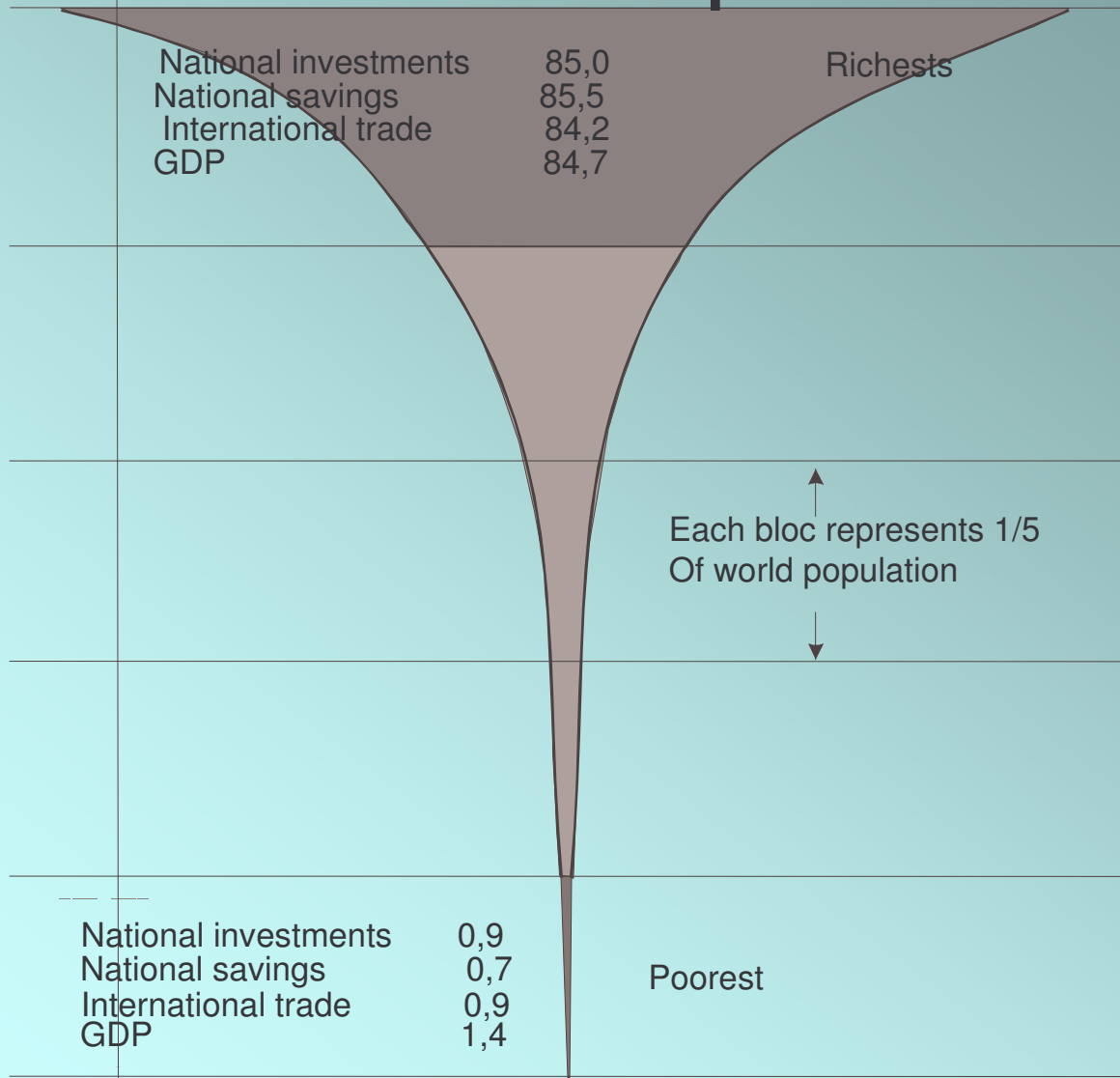
INDIA
Sep 2007: At least 6 die in mob attacks on West Bengali rice sellers in rationing protests. Aug 2008: Food riots follow flooding in eastern India.

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.

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

Globalization created unequal access to goods and crises



Migration currents

Distance no object

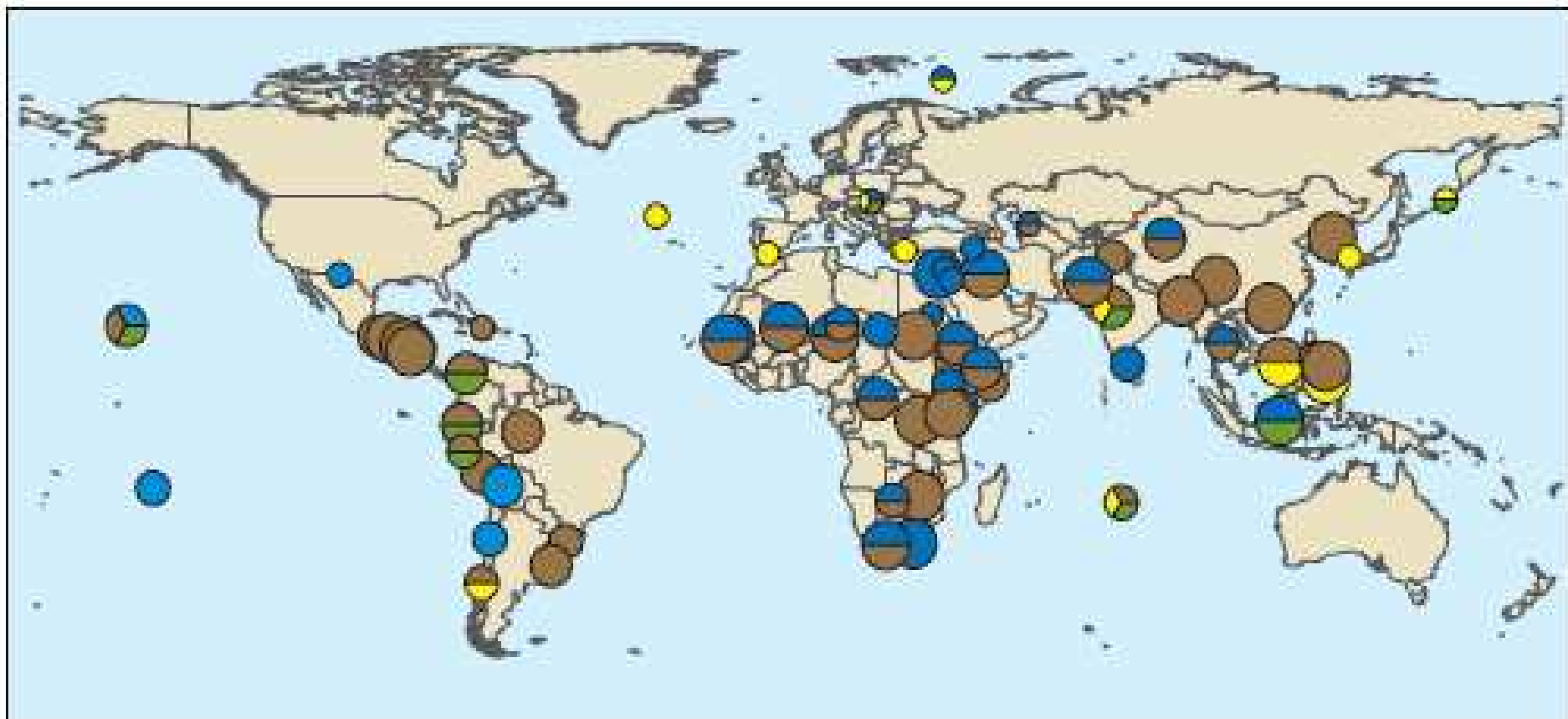
Some of the world's more important current migration routes



Sources: National Public Radio;
The Economist

Source: <<http://www.economist.com/images/20080105/CSR900.gif>>

Environmental conflicts (1980-2006)



Conflict intensity

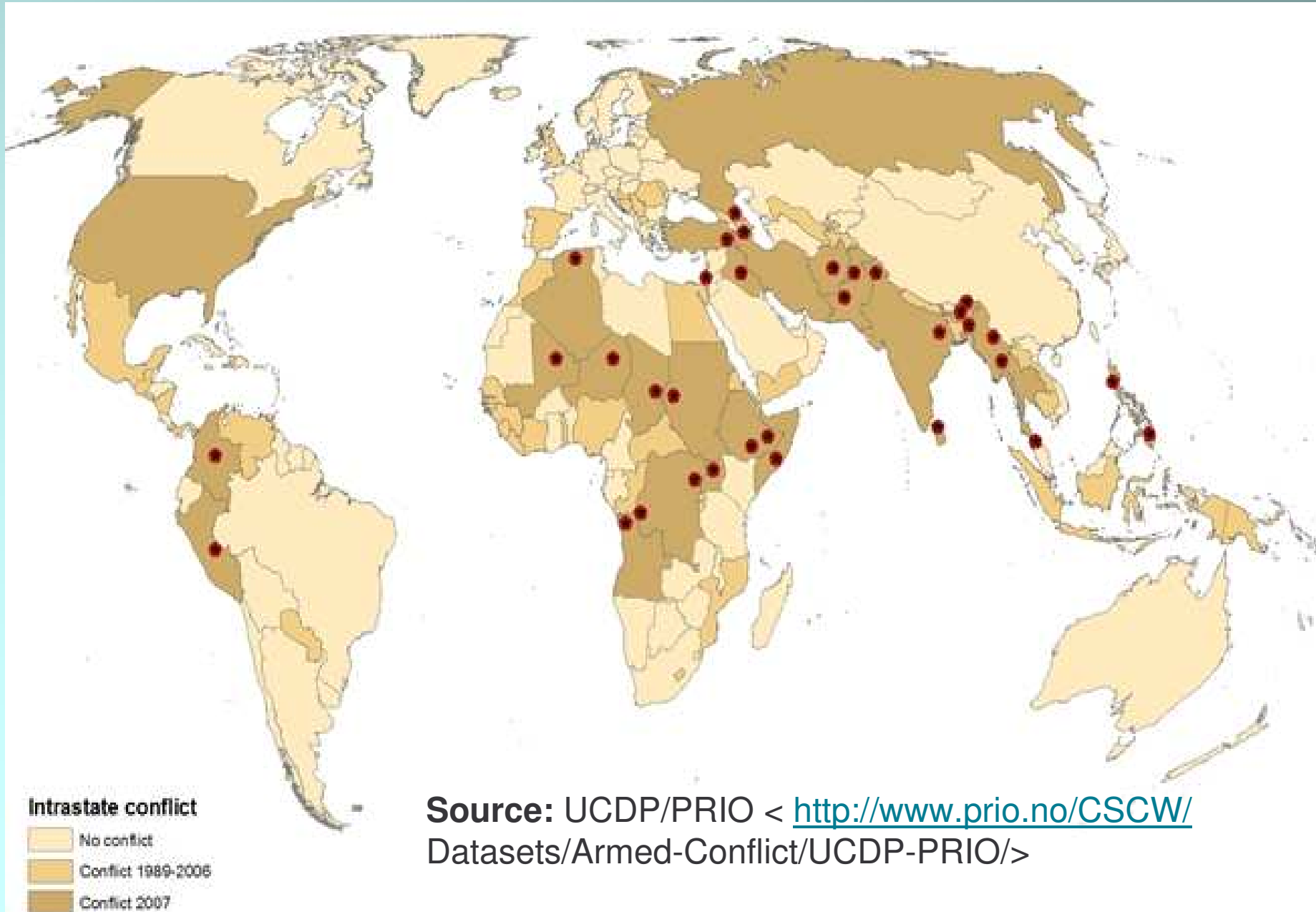
- Diplomatic crisis
- Protests (partly violent)
- Use of violence (national scope)
- Systematic/collective violence

Conflict cause

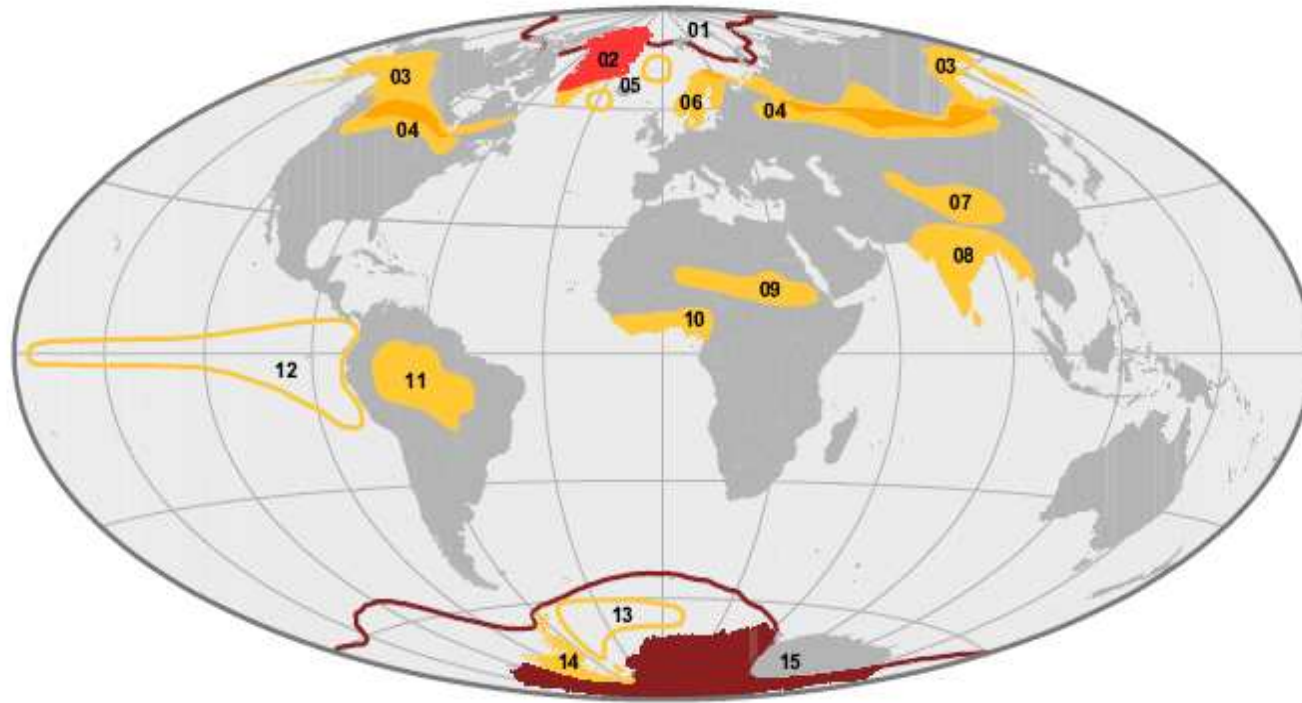
- Water
- Land/soil
- Fish
- Biodiversity

Source: WBGU (2008: 32)

Armed conflicts



Potential anthropogenic tipping points in earth system



Source: H.J. Schellnhuber (2008)

tipped already
 in limbo
 still stable

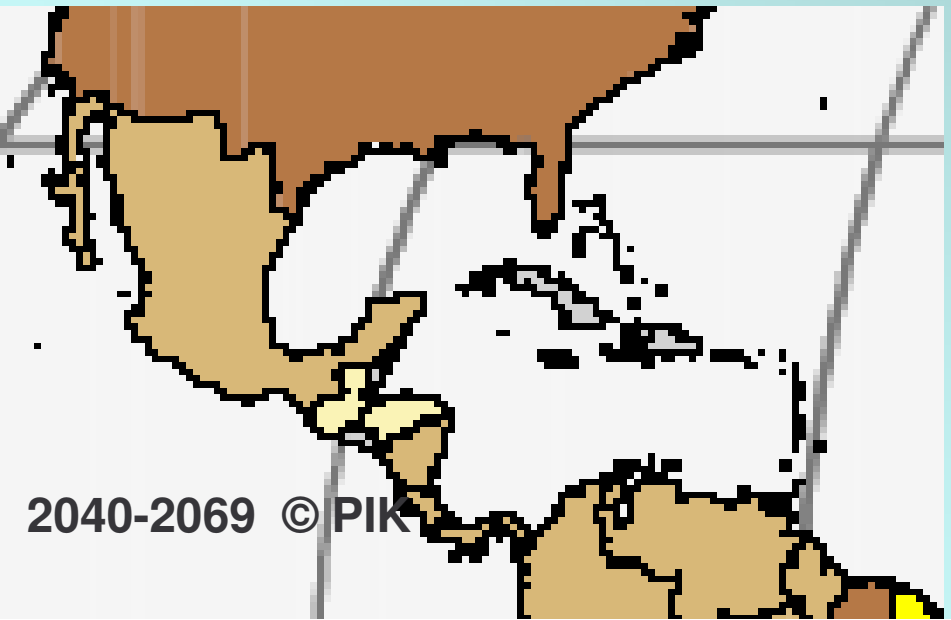
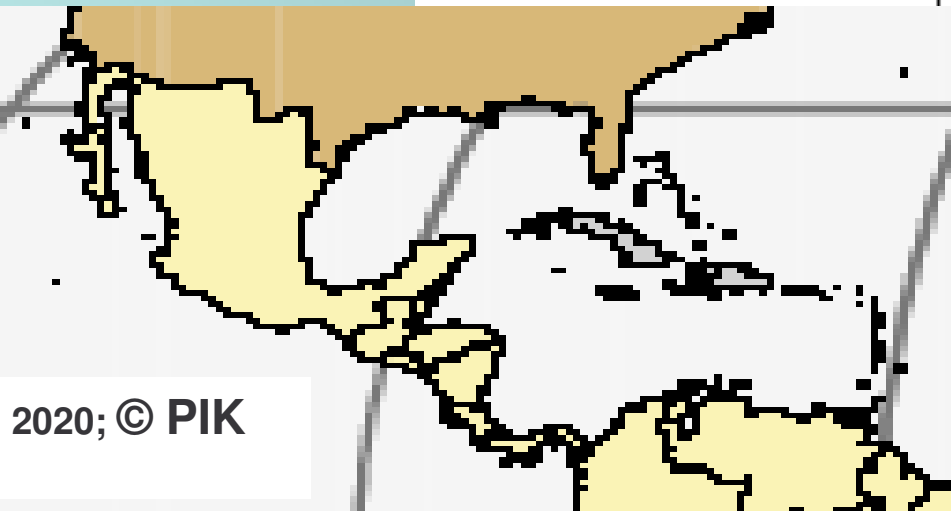
- | | | |
|----------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------|
| 01 Arctic Sea Ice Loss | 06 Climatic Change-Induced
Ozone Hole over Northern Europe | 11 Dieback of Amazon Rainforest |
| 02 Greenland Ice Sheet | 07 Albedo Tibetan Plateau | 12 Southern Pacific Climate Oscillation |
| 03 Thawing Permafrost /
Methan Escape | 08 Indian Monsoon | 13 Antarctic Deep Water Formation /
Nutrients Upwelling |
| 04 Boreal Forest Dieback | 09 Re-Greening Sahara /
Sealing of Dust Sources | 14 Westantarctic Ice Sheet |
| 05 Suppression of Atlantic
Deep Water Formation | 10 West African Monsoon | 15 Antarctic Ozone Hole |

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 increase poverty or empower** affected people and prepare them to cope with disasters and new risks.

5. Affectation of Health in Mexico

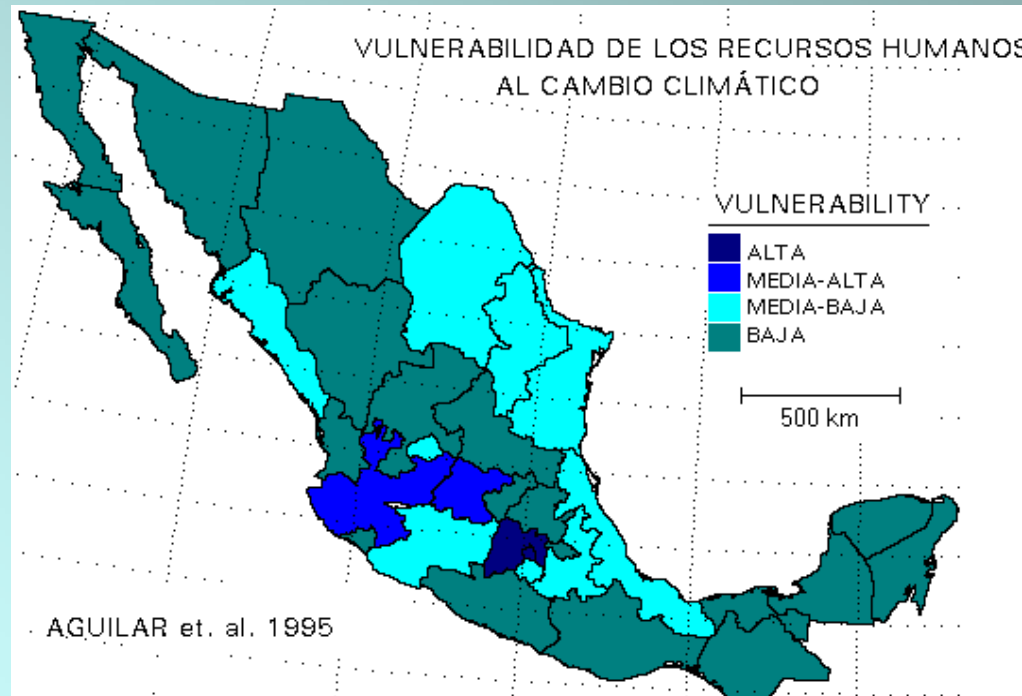
potential yield change [%]



Biodiversity in Mesoamerica



People's Vulnerability and Human Settlements



Taking into account distribution, density, growth of population, local mobility, emigration/immigration, consumption of water/person, sewage water and solid waste: the **central region of Mexico** is the most vulnerable zone due to CAG and its high population density

Mexico: Emissions of Greenhouse Gases

1. 643 million tons of GHG emissions (INEGI: 1990-2002)
 2. Rank 13 in volume of total GHG emissions
 3. Rank 15 for historical emissions of GHG
 4. Rank 16 for historical emission of GHG due to deforestation
 5. Rank 93 for GHG/capita in 2000
- (National Institute of Ecology, 2006)

6. Air pollution and Health Effects

Effects in Health

Mortality

11, 066'610

Chronic Bronchitis

2,754,470

Hospitalization due to air-born illness

4,456

Hospitalization due to cardio-vascular illn.

65,851

Loss of working days

46,908

(Pulmonary atrophy in children in Netzahualcoyotl & Iztapalapa)

Very high, when living beside roads

Microbus drivers in Morelos

98% of drivers

Water-born illnesses

1. Arsenic pollution affects 400,000 people in Mexico (Source: Millennium Environmental Assessment, 2005)
2. Diarrhea: dead: 1984: 212.3; 1993: 60.4/100,000 children less than 5 years old
3. Malaria: 2.77 to 7.27 cases by 100 000 people/year between 2000 a 2005; estimation: 30% of people are at risk.
4. **Dengue:** 2004 to 2008: increase in Mexico: 800%: 80% in South-Southeast: 6 months 2007: 5,520 cases: 4,359 classic type; 1,161 hemorrhagic type (Source: General Direction of Epidemiology 1984-2008)

Drought Threats 1975-2004 and Projections 2050 and 2080 © PIK

1975-2004,

Hydrological balance (mm)

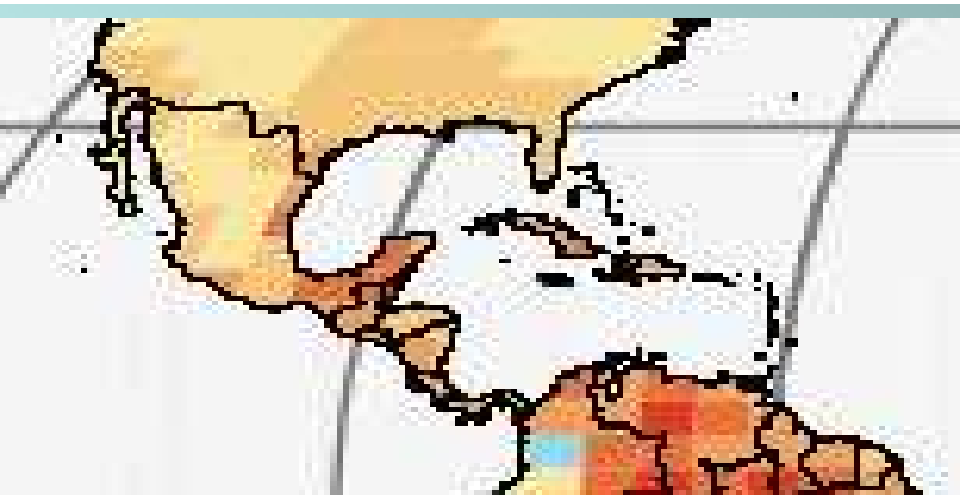
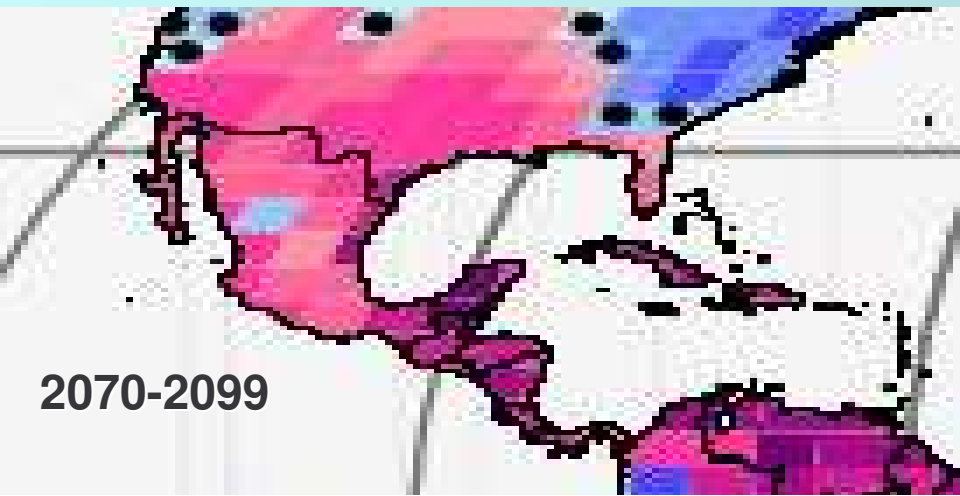
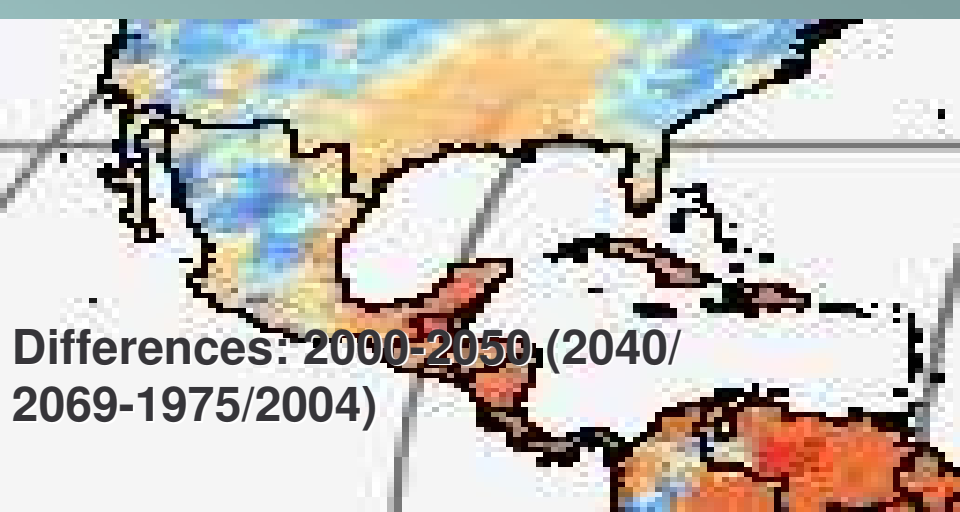
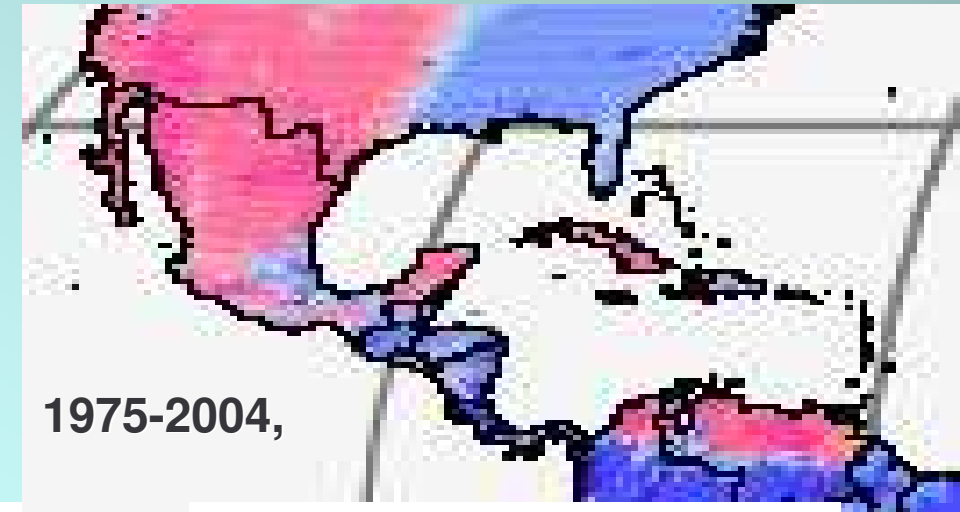
-18 -15 -12 -9 -6 -3 0 3 6 9 12 15 ^ 3

Differences: 2000-2050 (2040/
2069-1975/2004)

CC and hydrological balance (mm)

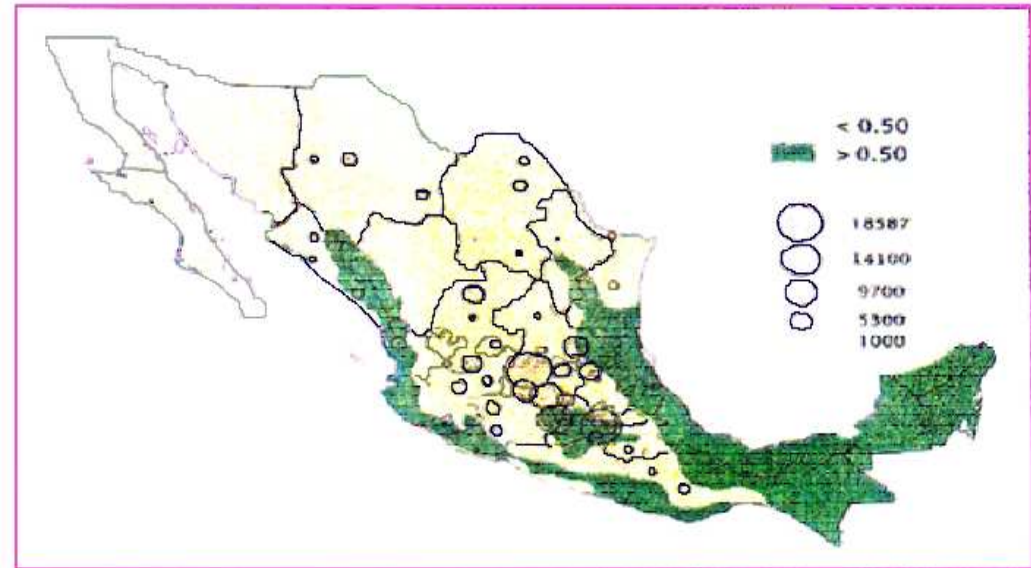
-18 -15 -12 -9 -6 -3 0 3 6 9 12 15 ^ 3

2070-2099



Drought and Migration

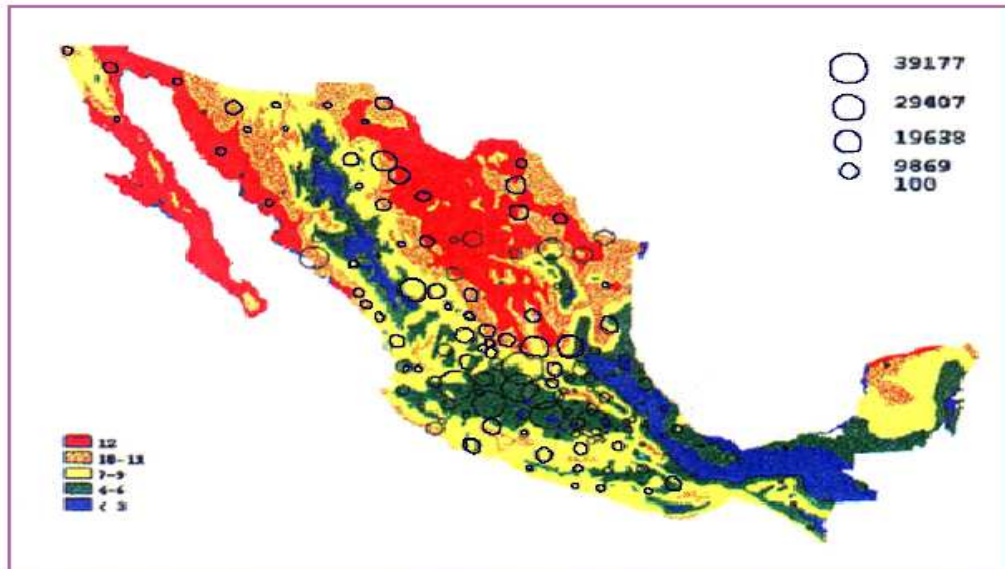
Rural Migration and Aridity



- 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 of last residence in rural localities)

Sources:
 Survey on Mexican US Migrants and Flow (ICORE)
 Atlas Nacional de México de INEGI
 Sistema de Información Geográfica y Estadística de la Frontera Norte (SIGEF-INEGI)

Number of Dry Months and Migration



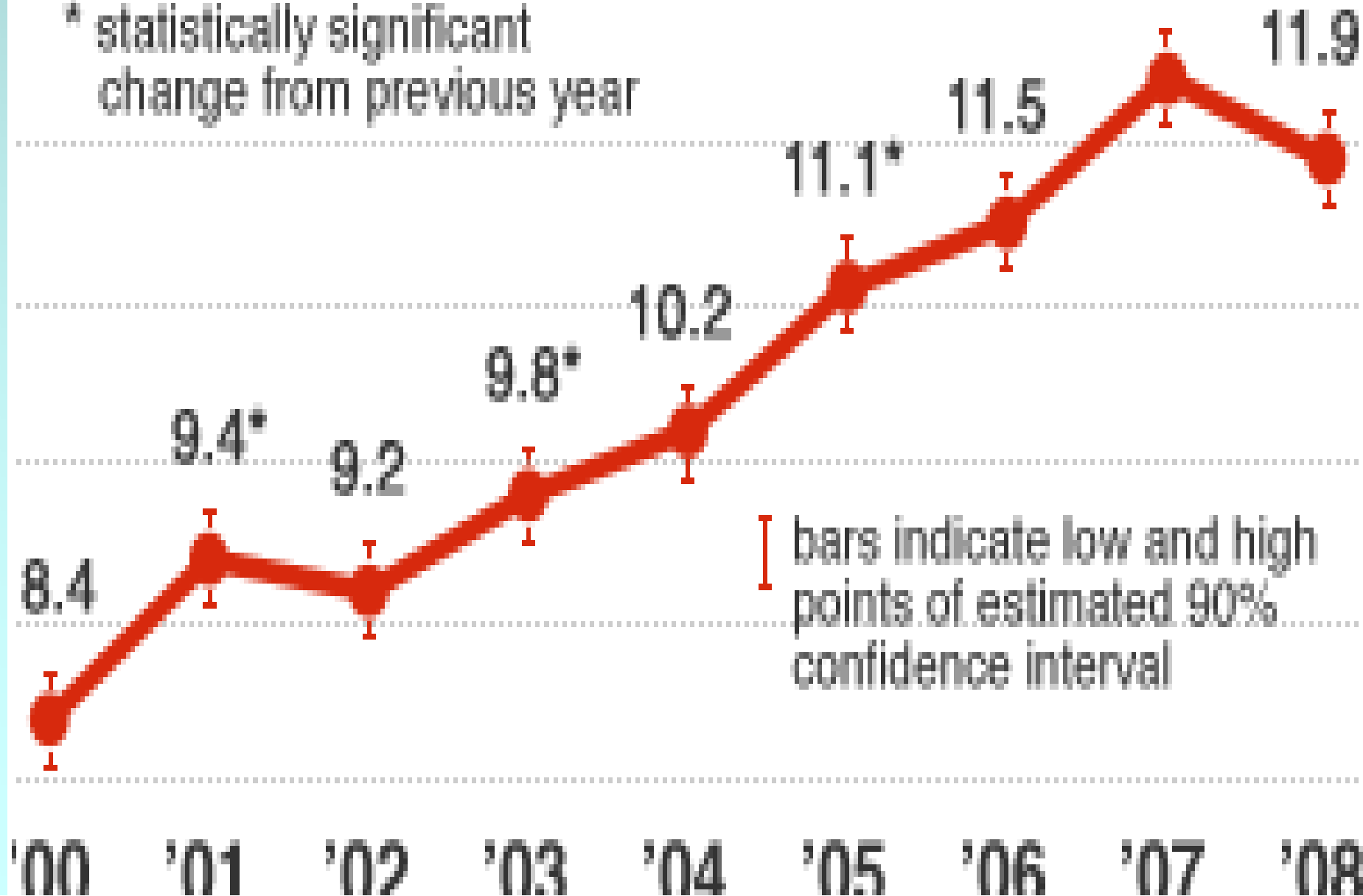
Number of dry months and flow (estimation for 1993) of Mexican migrants living and working in the US, surveyed on the border on their return to Mexico (spatial distribution according to their region of birth in Mexico, rural and urban localities).

Sources:
 Survey on Mexican US Migrants and Flow (ICORE)
 Atlas Nacional de México de INEGI
 Sistema de Información Geográfica y Estadística de la Frontera Norte (SIGEF-INEGI)

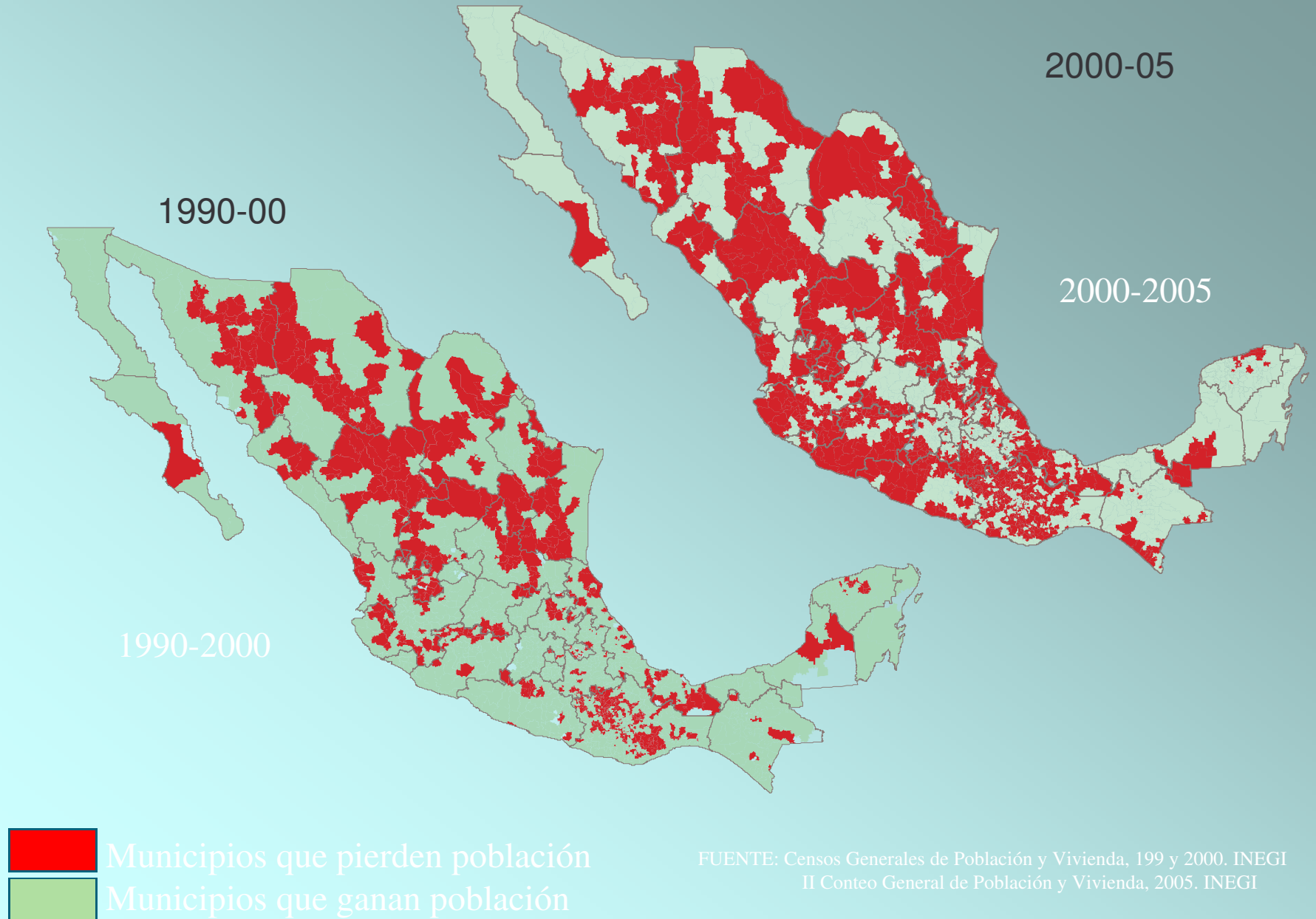
Source: Pew Studies, 2005

Unauthorized immigrants in the USA

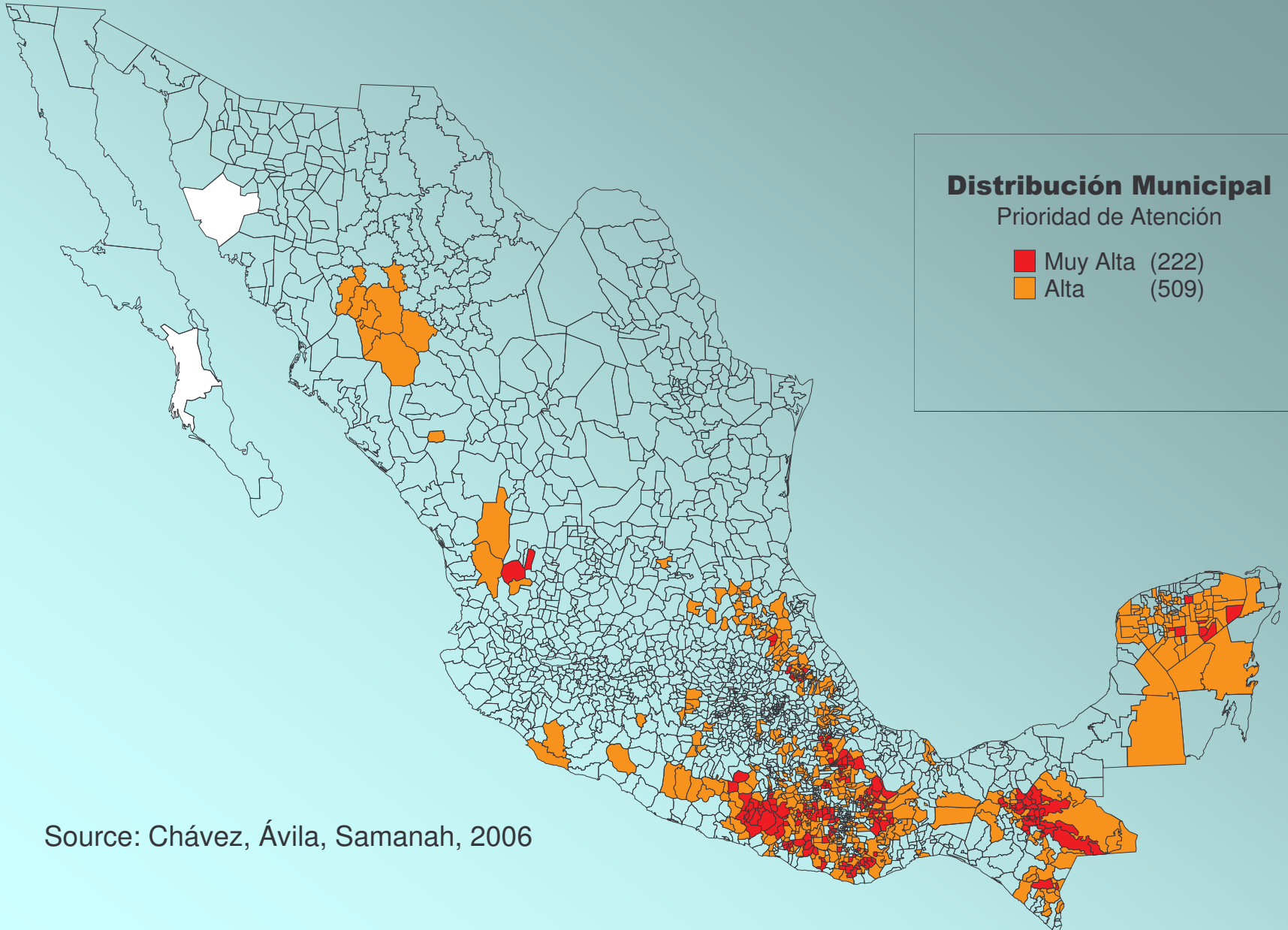
* statistically significant change from previous year



Loss of Population in Mexico

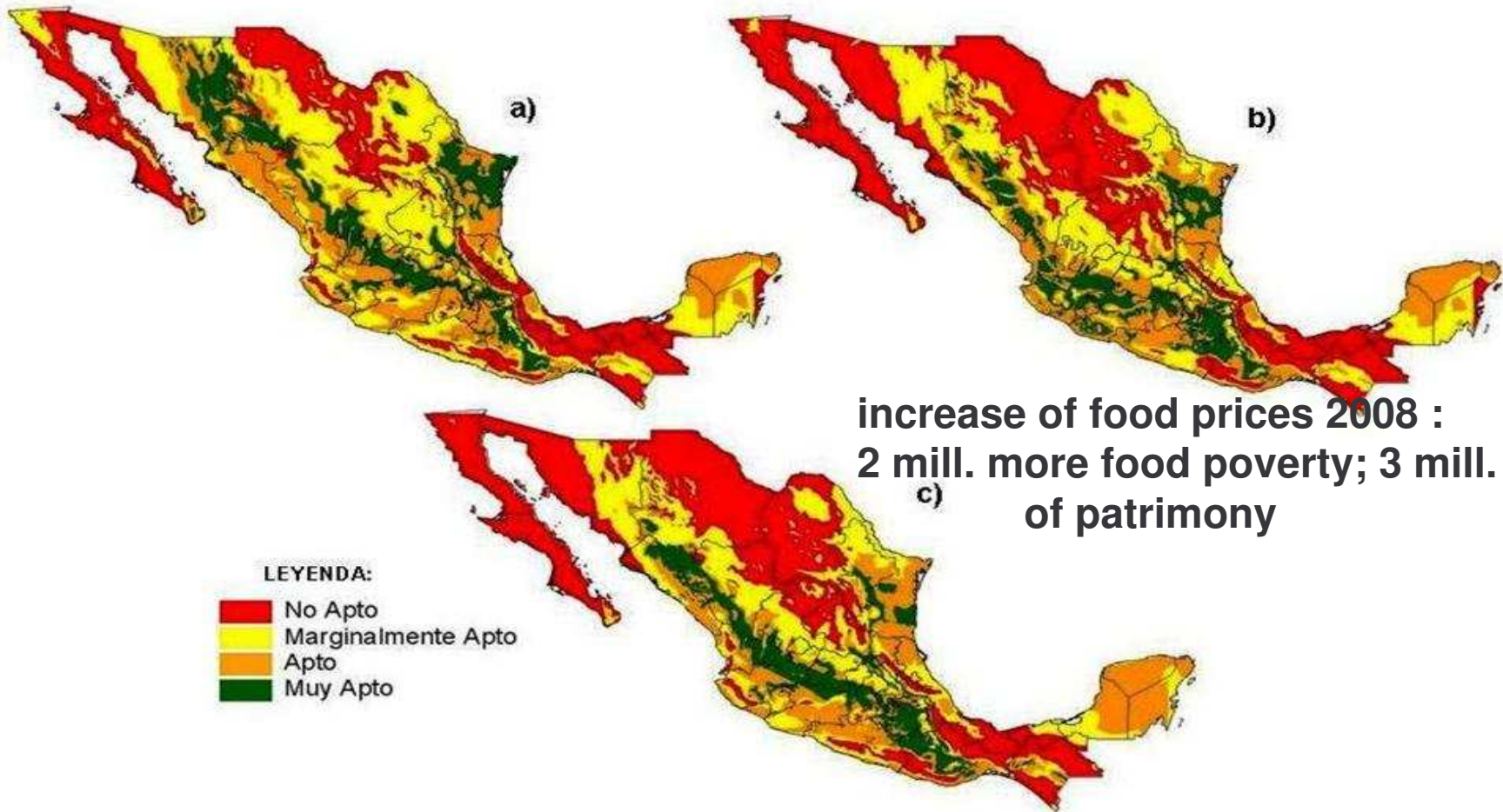


Very High and High Marginalization: Mexico



Source: Chávez, Ávila, Samanah, 2006

Affectation of Corn Production

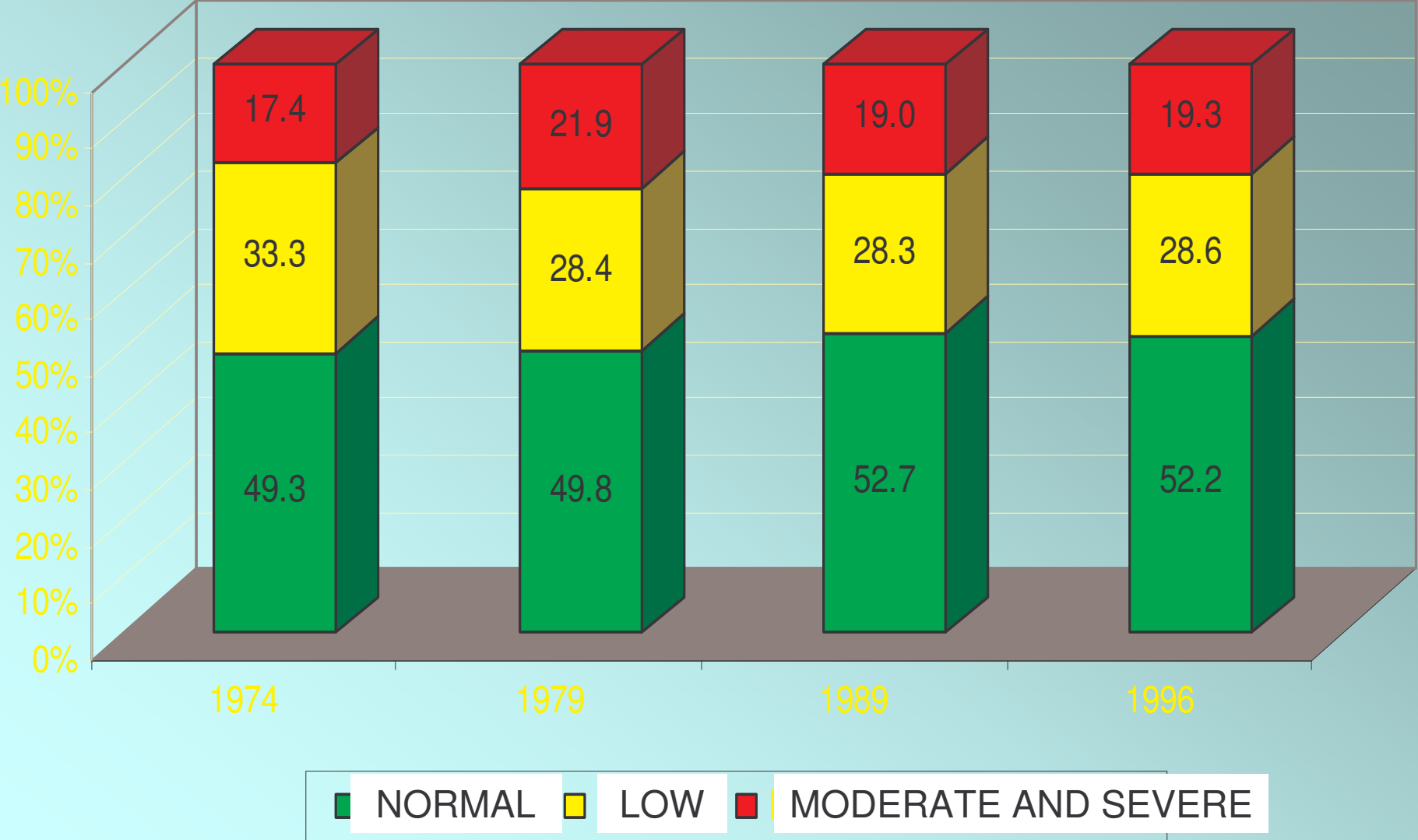


increase of food prices 2008 :
2 mill. more food poverty; 3 mill. Poverty
of patrimony

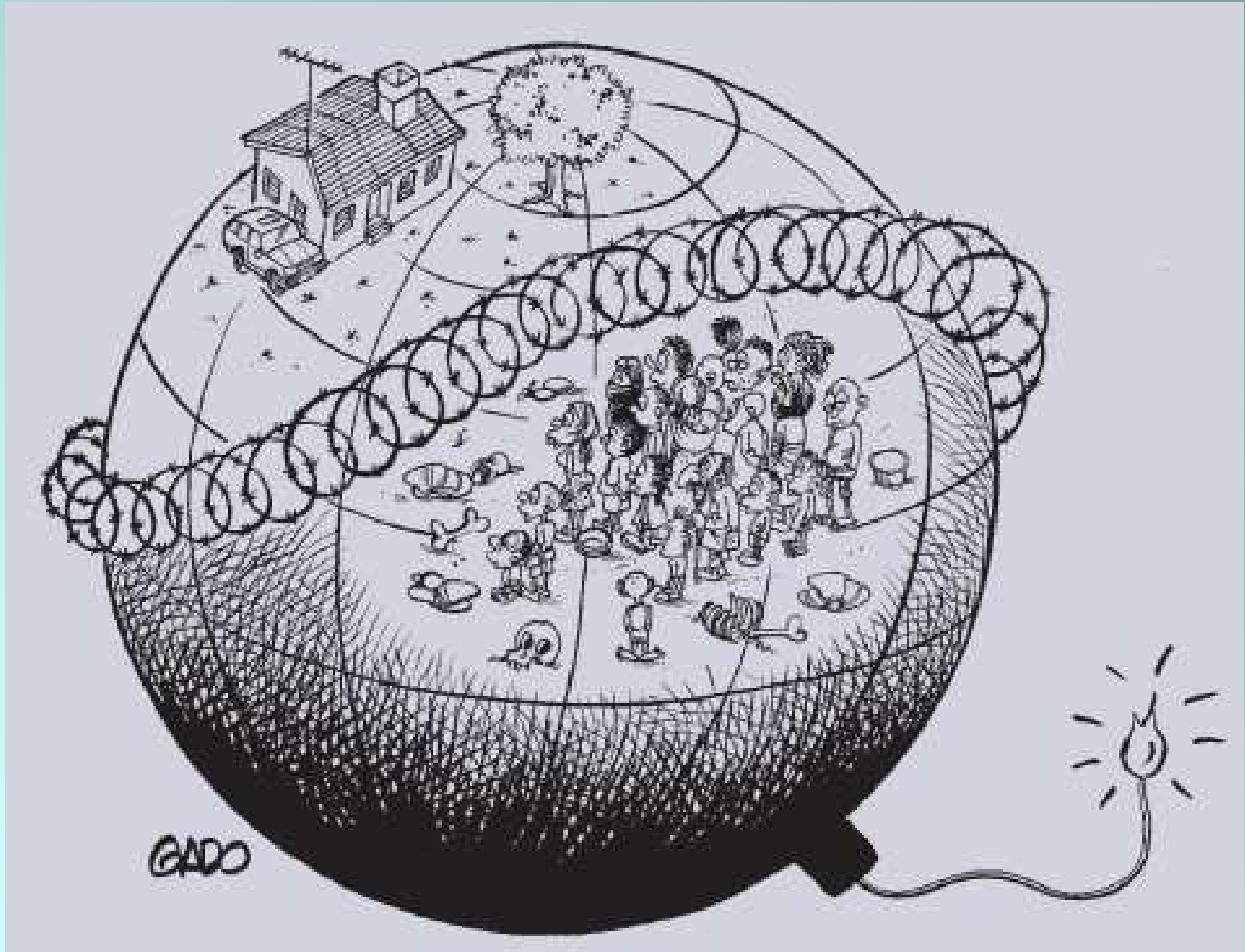
Monterroso, A. G, Rosales, 2006. Community food security exists when all citizens obtain a safe, personally acceptable, nutritious diet through a sustainable food system that maximizes healthy choices, community self-reliance and equal access for everyone.

Public Health Association of
British Columbia (PHABC)
(2004)

State of Nutrition of Children Under 5 Years: Weight/Age

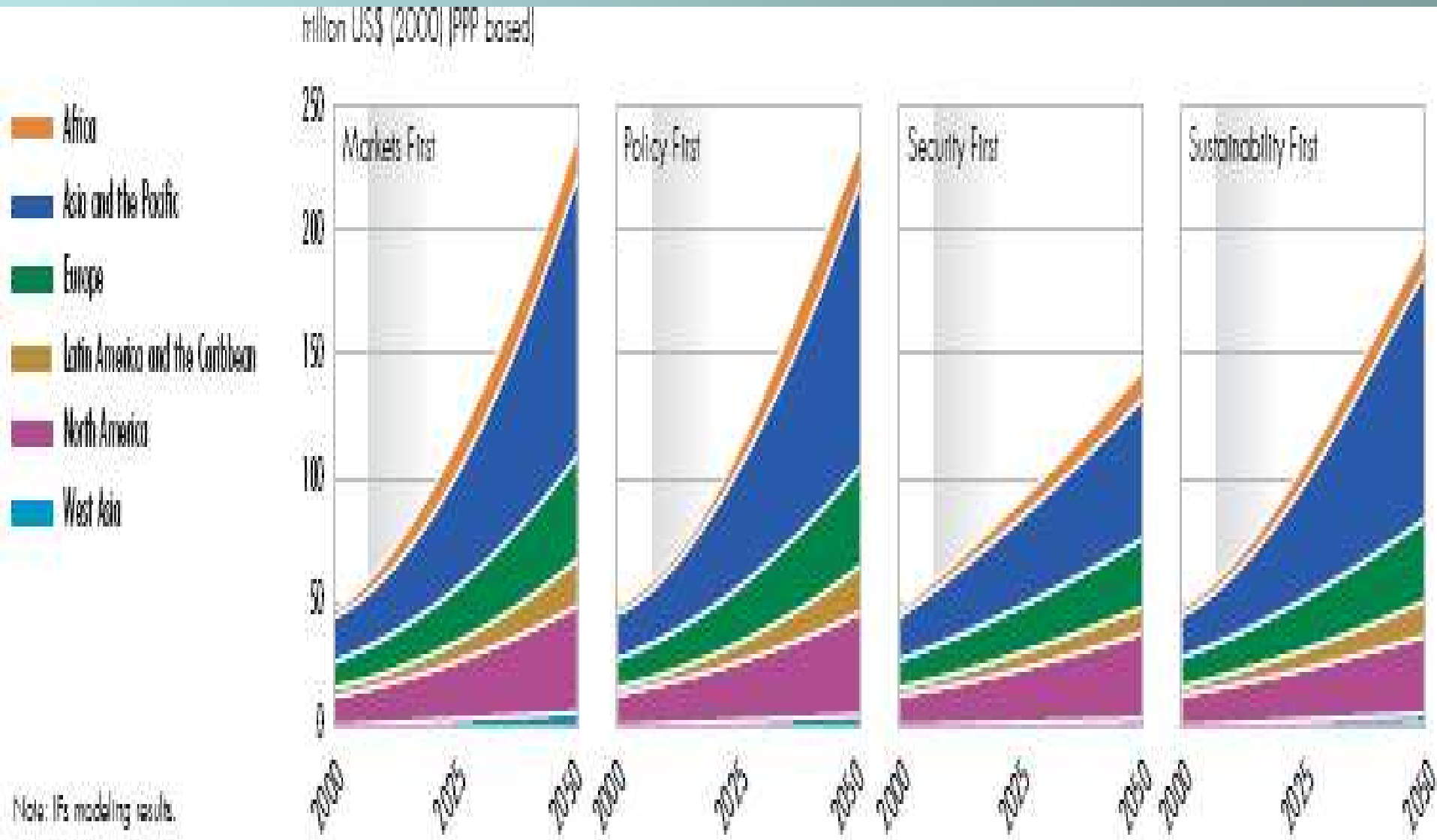


6. Future Scenarios



Four Models of Development

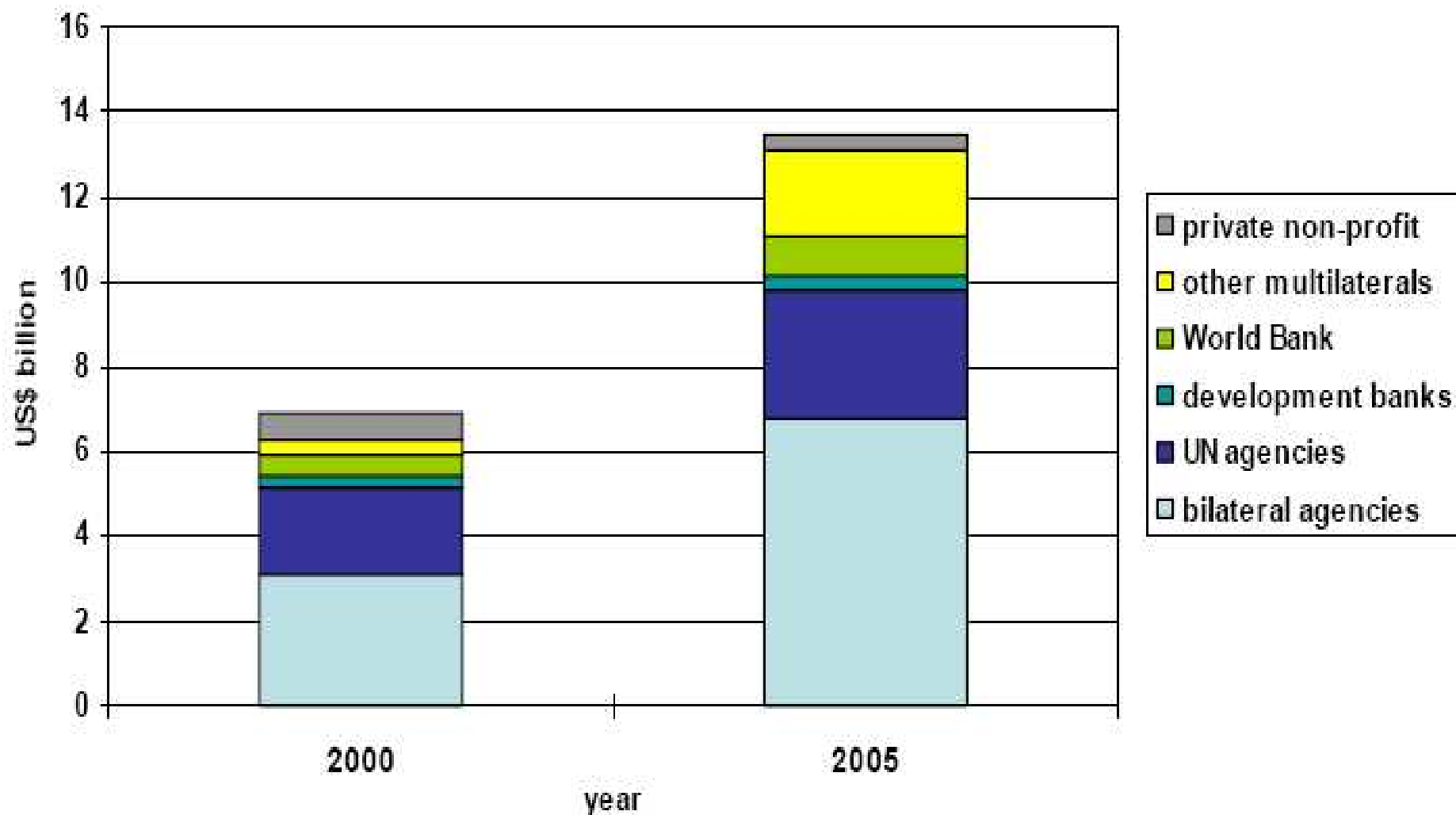
(Source: UNEP, GEO-4, 2007)



Integral proposal of poverty alleviation and environmental recovery to reduce migration



Development Assistance for Health by Source, 2000 and 2005



Source: Catherine M. Michaud, Harvard School of Public Health, January 2007.

Fig Notes: (1) The category of 'other multilateral' includes the European Union, the Global Alliance for Vaccines and Immunization (GAVI), and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (GFATM). (2) World Bank total includes only IDA lending.

7. Strategies of adaptation: top-down and bottom-up



Strategies of Adaptation

❖ Definition of resources:

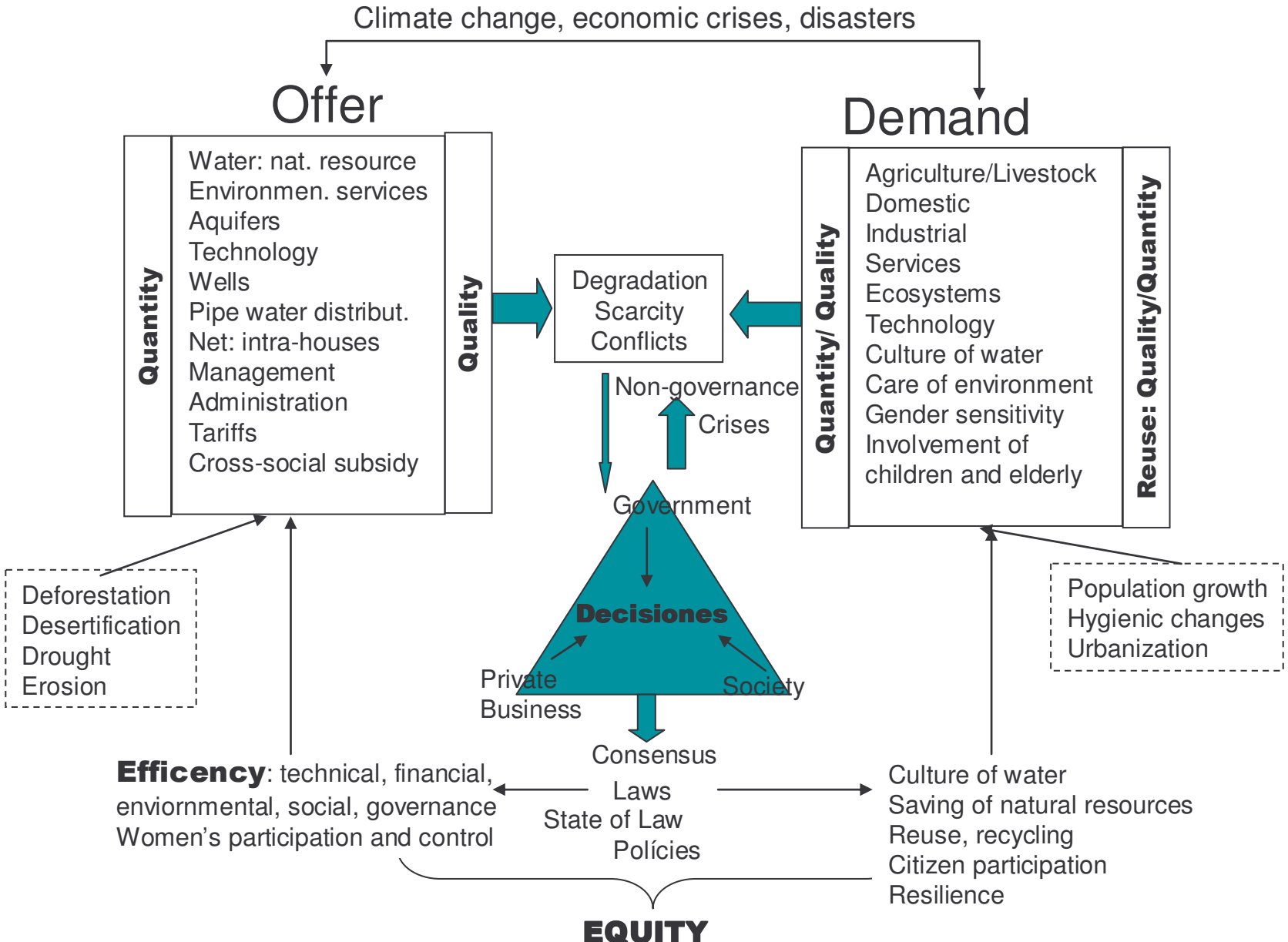
- **Economic:** financing, infrastructure, poverty alleviation, ethical business, international aid and compensation, participative budget, sustainable job creation, environmental services
- **Social:** peasant organizations, research, science and technology, experts, NGO, Consultation Councils for Government, 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**

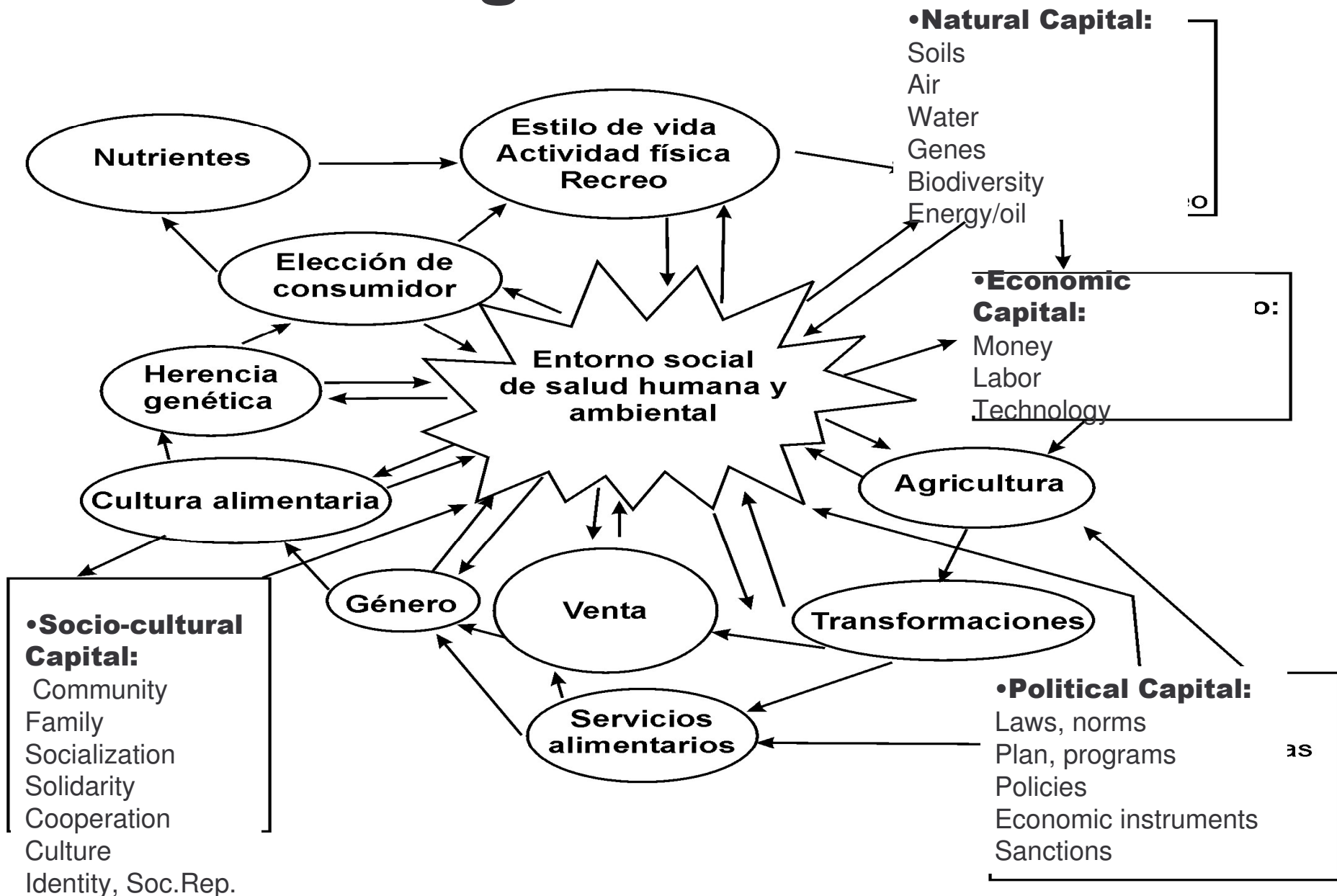
❖ Prevention and permanent monitoring

❖ Rigorous evaluation and modification

Efficiency and Equity with Natural Resources



Health integrated in environment





**8. Human, Gender and
Environmental Security: a
HUGE security**

Four Pillars of Human Security

- **“Freedom from want” human development agenda: poverty** (stimulated by Asian economic crisis of 1990s) by reducing social vulnerability through poverty eradication programmes (UNDP 1994; CHS: Ogata/Sen: Human Security Now, 2003, Human Security Trust Fund, HSU of OCHA), **Japanese approach.**
- **“Freedom from fear”:** humanitarian agenda: **violence, con-flicts, weapons** (Canada, Norway, Human Security Network) (UNESCO, HSN), **Canadian approach:** Human Security Rep.(2005).
- **“Freedom to live in dignity”:** agenda: **rule of law, human rights, democratic governance** (Kofi Annan: *In Larger Freedom* (2005))
- **“Freedom from hazard impact”:** **environmental (GEC) & natural hazard agenda:** Bogardi/Brauch vision, goal: securitize: “environment” (GEC as pressure) and “natural hazards” as impact by reducing environmental & social vulnerability & enhancing coping capabilities of societies confronted with natural & human-induced hazards (Bogardi/Brauch 2005; Brauch 2005a/b).

Why a HUGE Security?

Confronted with global environmental change, globalization, urbanization and a homogenizing culture, the traditional narrow military security concepts is insufficient to deal with the new dangers. Poverty and marginalization is increasing, resources are getting scarce and polluted, and profit interests of small elites are creating a risk society. Additionally, gender violence is still the most common aggression worldwide. To deal with these new challenges an integral concept of security is proposed: Human, Gender and Environmental Security: a HUGE security.

A group of people, possibly a jury or audience, looking towards the camera. The image is heavily blurred and pixelated. The text is overlaid on the lower left portion of the image.

Thank you for your attention

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download_oswald.html](http://www.afes-press.de/html/download_oswald.html)**

Water and Health

- Consejo de Derechos Humanos de Naciones Unidas diagnóstica que la mayor cifra en decesos recae en niños.
- Catarina Albuquerque, autora del informe, señaló que el 40 por ciento de la población mundial carece de servicios básicos de saneamiento. La experta de la ONU para el Derecho al Agua y al Saneamiento indicó que el 23 por ciento de la población defeca al aire libre, una práctica que "pone en peligro la salud de toda la comunidad".
- La Organización Mundial de la Salud (OMS) señaló durante el informe que, "el acceso a un mejor saneamiento disminuiría en un 32 por ciento las enfermedades diarreicas" .
- Falta de agua potable causa un millón de muertes al año: ONU
Los niños son quienes se ven más afectados, sobre todo por diarreas; 23% de la población defeca al aire libre, según el informe presentado por Naciones Unidas