CLIMATE-SMART Agriculture 2015

Global Science Conference

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Le Corum, Montpellier France

Climate Change Impacts in Watershed Management, Forest and Agriculture in the Yautepec River Basin in Mexico

Prof. Dr. Úrsula Oswald Spring

Regional Centre for Multidisciplinary Research at National Autonomous University of Mexico (CRIM-UNAM)

CLIMATE-SMART Agriculture 2015

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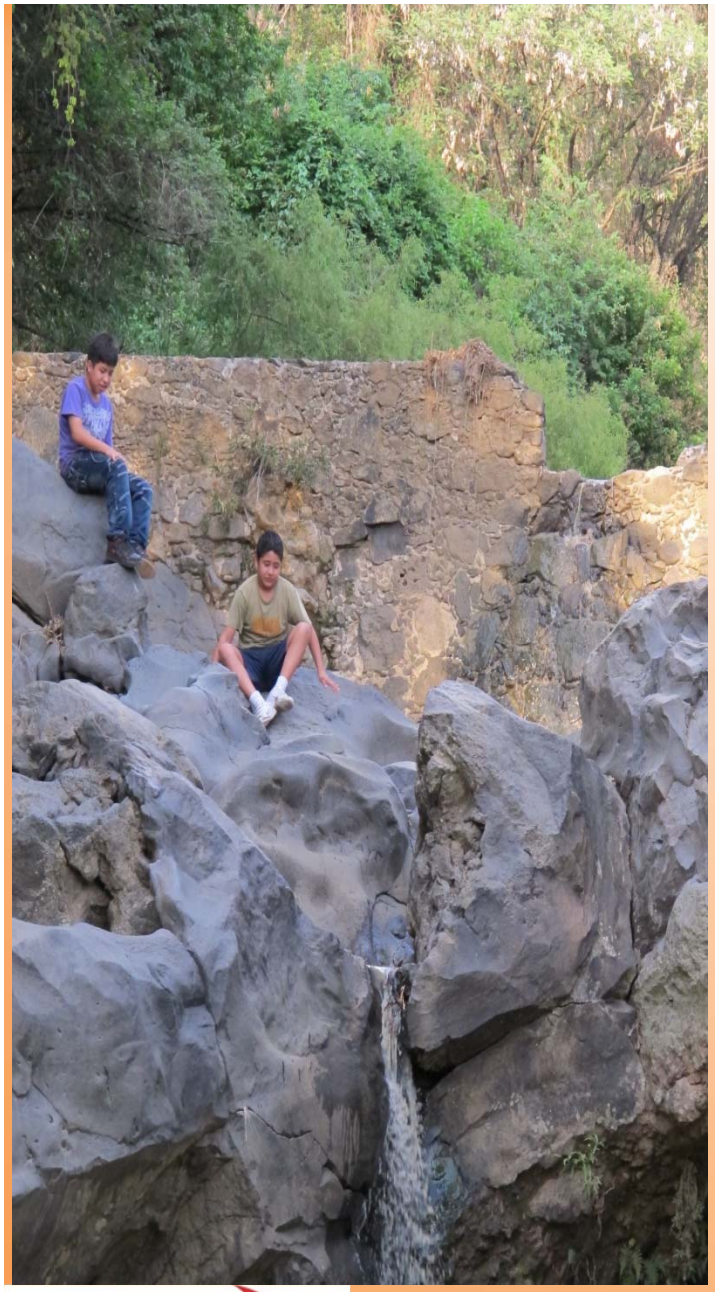

1. Research theme and research question

Climate change-induced extreme events -especially storms, floods and drought- have increased during the past decades, creating threats to food security, agricultural processes, human life, well-being, and infrastructure.

How could an integrated watershed management -including agriculture, forestry, food production, job creation and urban planning- enhance the resilience of highly exposed people -especially the vulnerable ones- to avoid negative effects of climate change?

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2. Triple approach to the theme

1. **IPCC: global assessment on climate change 2013, 2014**
2. **PINCC: Mexican Assessment Report, 2015**
3. **Regional watershed assessment report, 2015**

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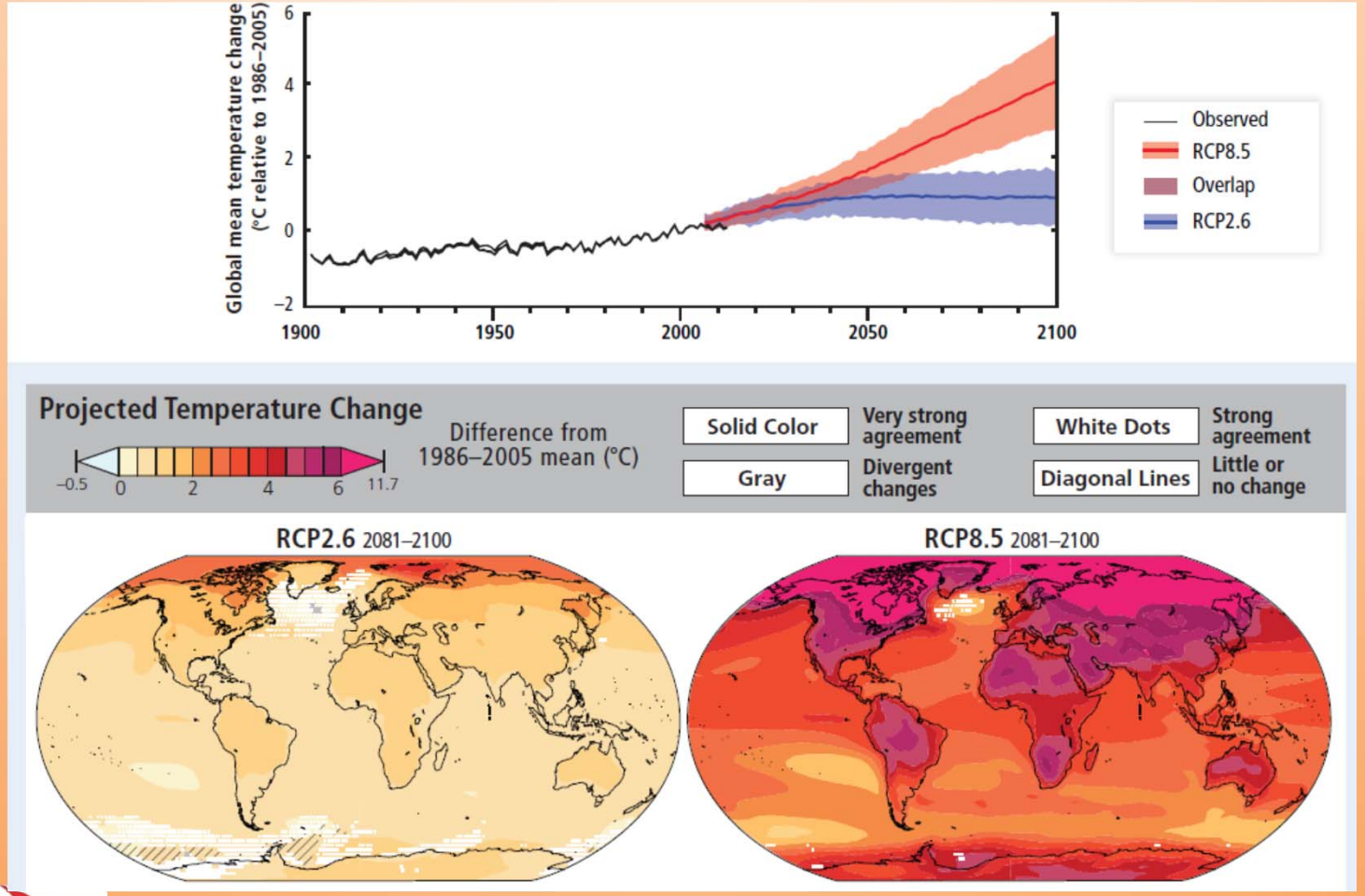
Observed and projected temperature rise (IPCC, 2014: 10)



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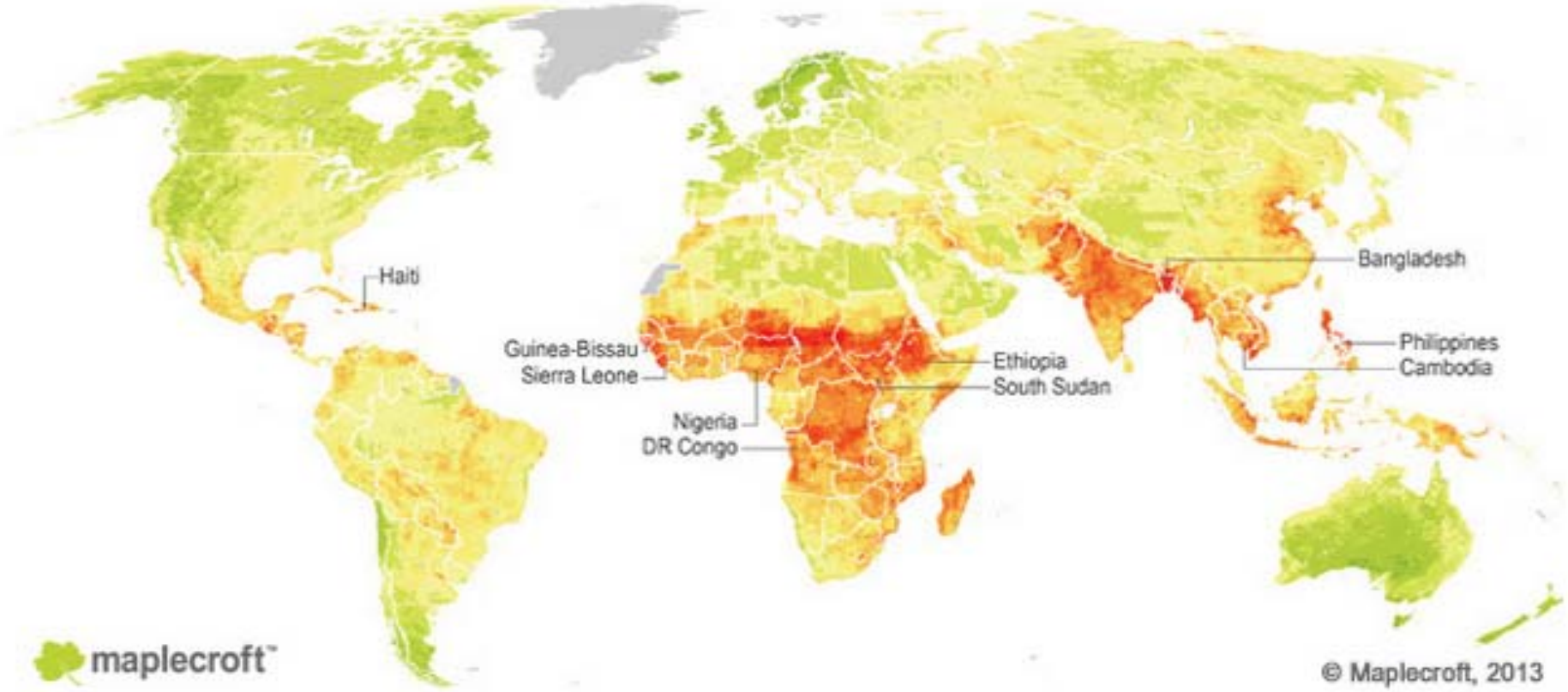
Risk Assessment

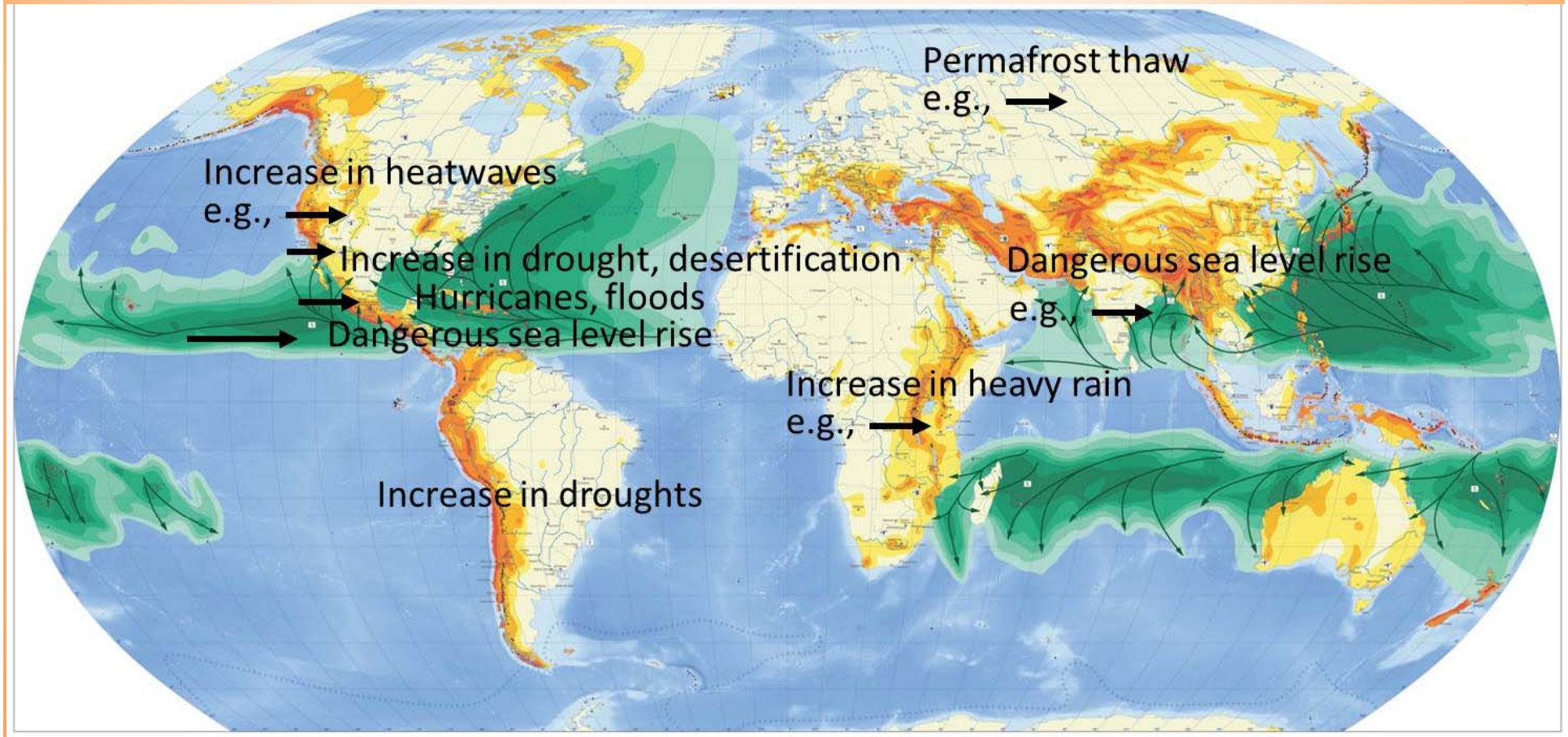


Rank	Country	Category
1	Bangladesh	Extreme
2	Guinea-Bissau	Extreme
3	Sierra Leone	Extreme
4	Haiti	Extreme
5	South Sudan	Extreme

Rank	Country	Category
6	Nigeria	Extreme
7	DR Congo	Extreme
8	Cambodia	Extreme
9	Philippines	Extreme
10	Ethiopia	Extreme

Legend
Extreme
Low
No data

Disaster impacts (MunichRe, 2008)



Earthquakes

- Zone 0: MM V
- Zone 1: MM VI
- Zone 2: MM VII
- Zone 3: MM VIII
- Zone 4: MM IX

MM: modified Mercalli scale

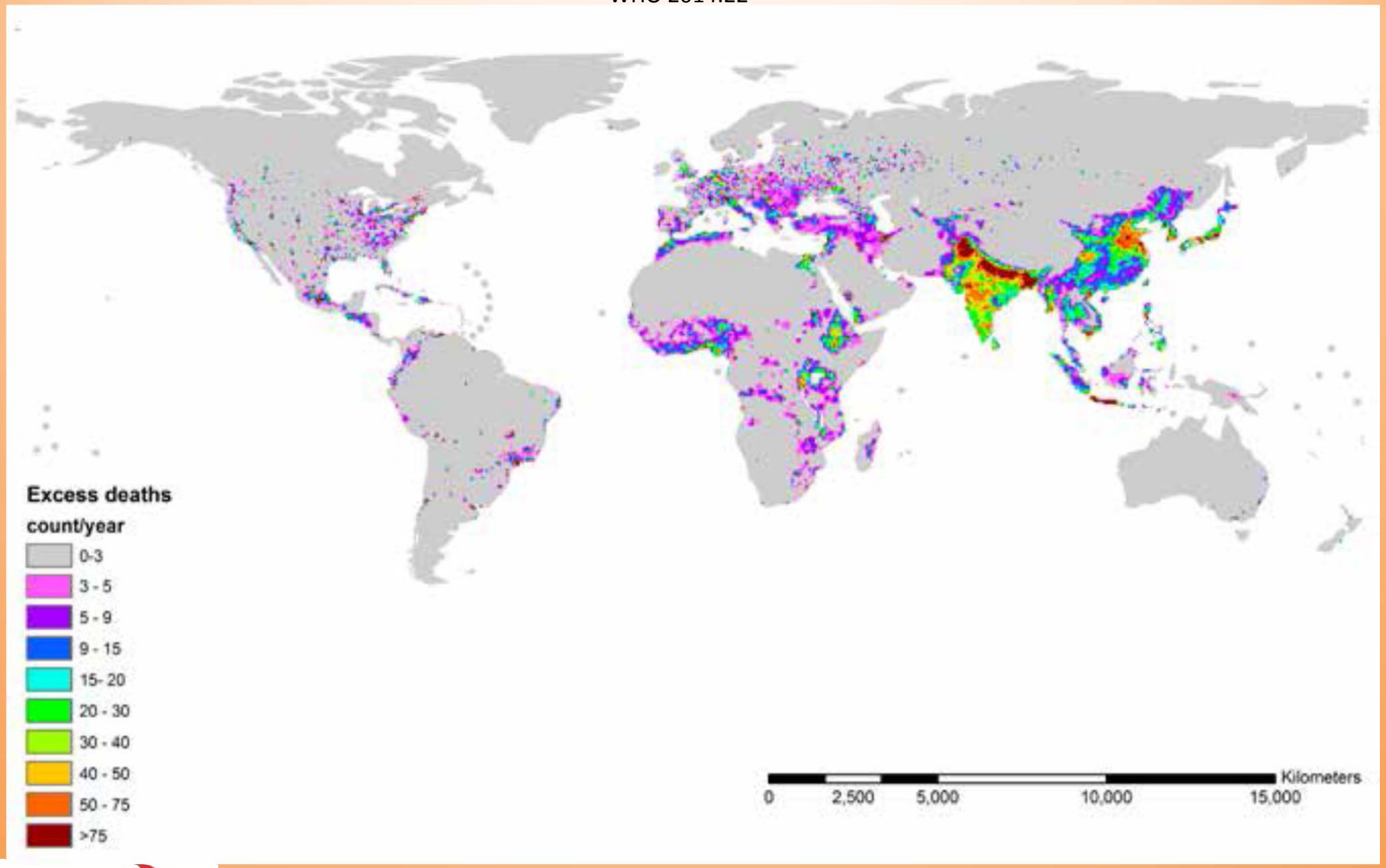
Tropical Hurricanes

- Zone 0: 76–141 km/h
- Zone 1: 142–184 km/h
- Zone 2: 185–212 km/h
- Zone 3: 213–251 km/h
- Zone 4: 252–299 km/h
- Zone 5: ≥ 300 km/h

Münchener Rück
Munich Re Group

Heat related deaths of people >65 years

WHO 2014:22



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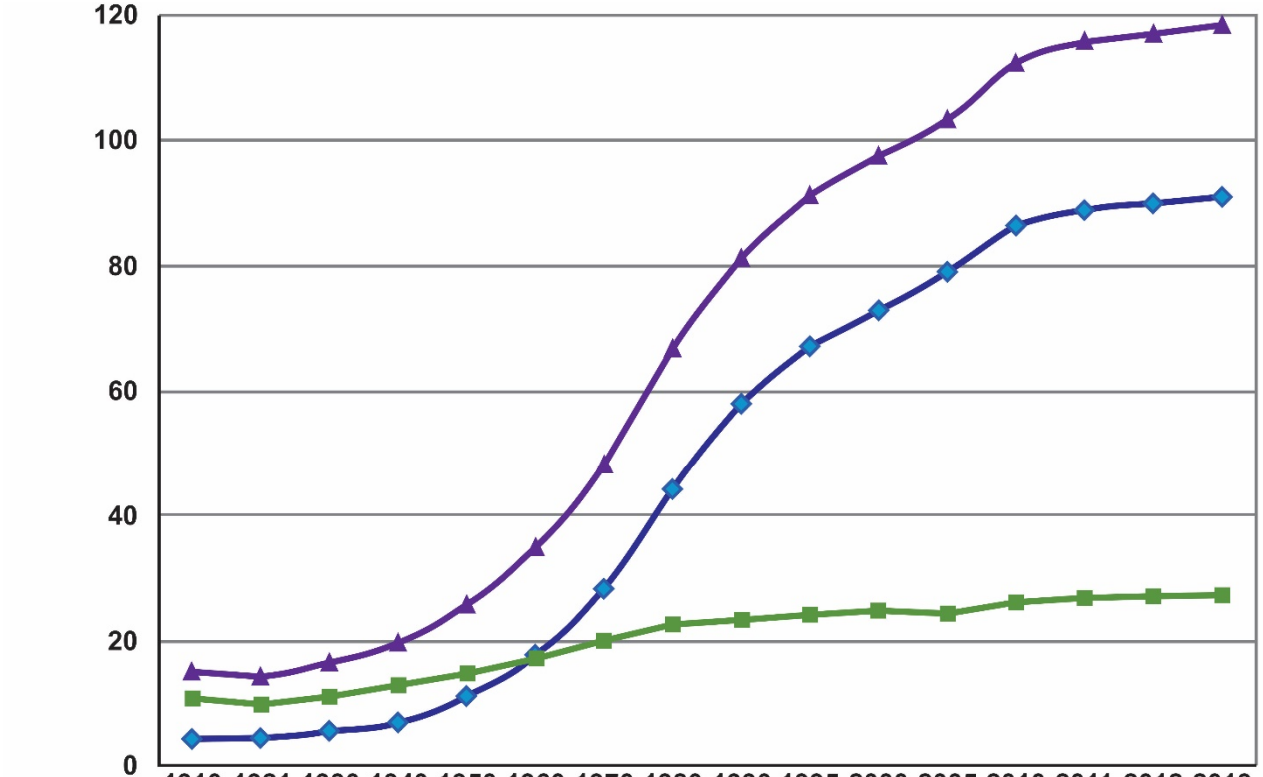
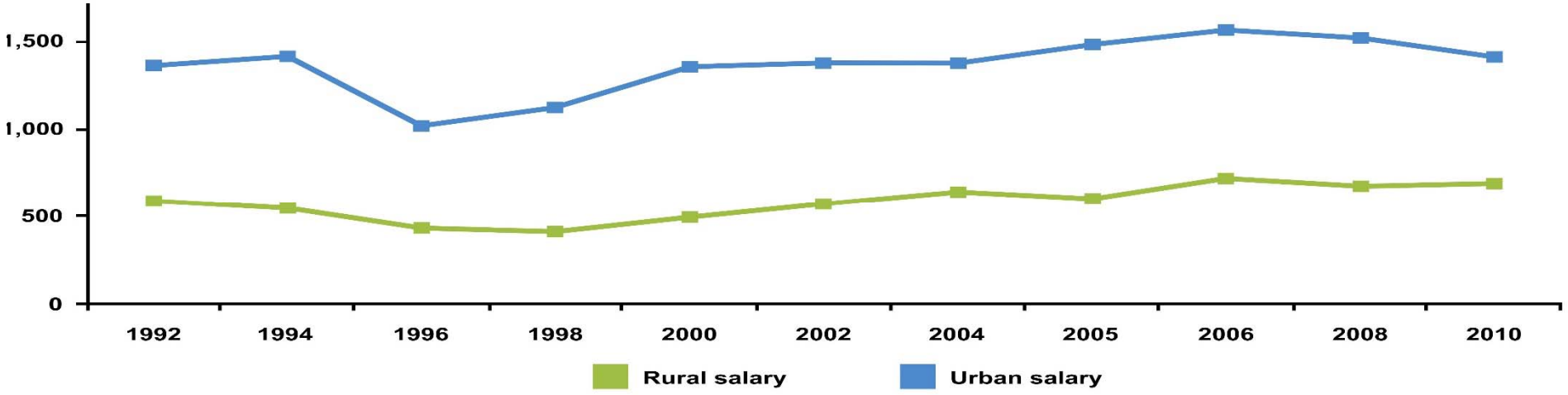
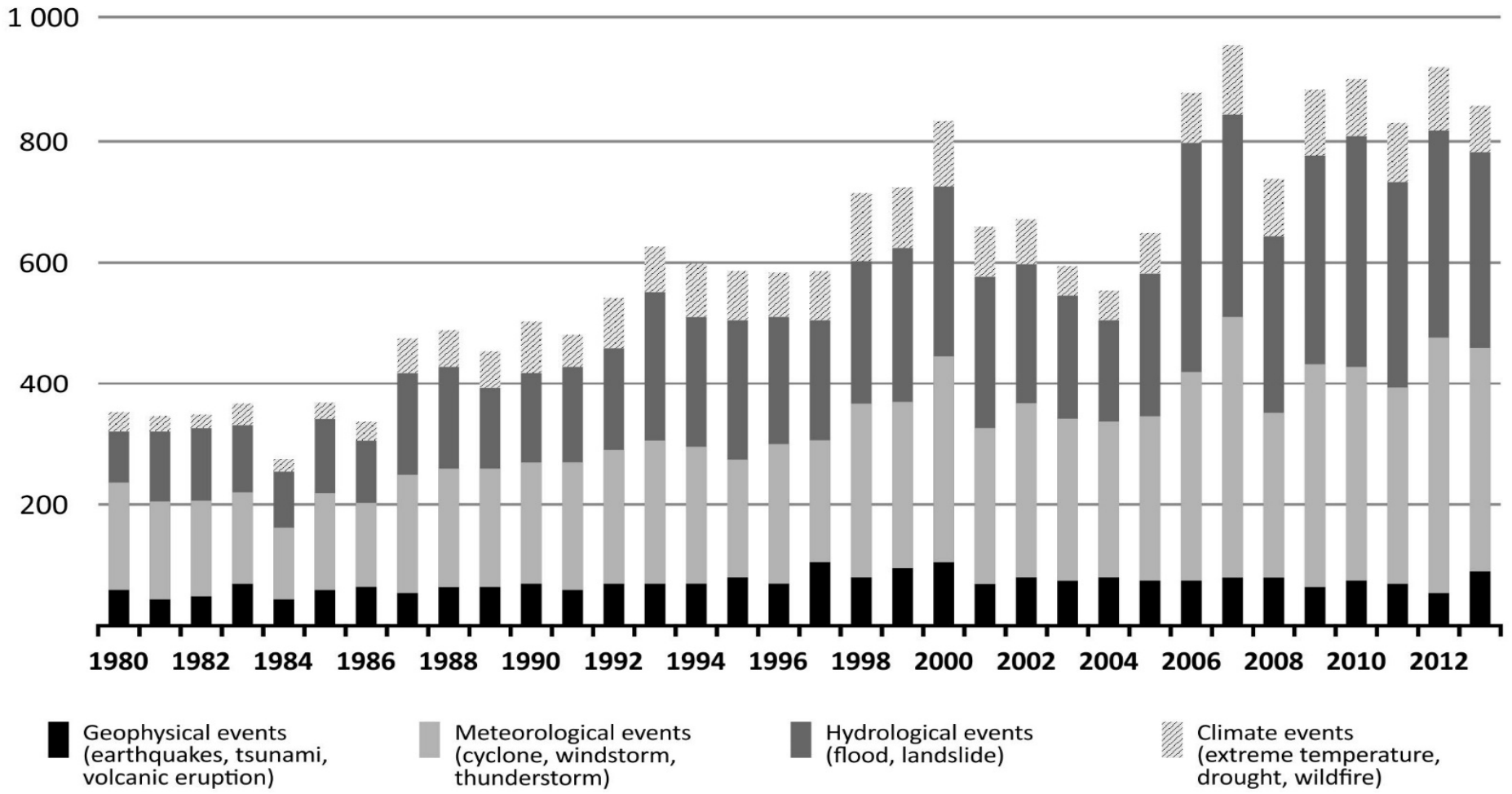
PINCC: Mexico´s population growth & rural/urban salaries in Mexico



	1910	1921	1930	1940	1950	1960	1970	1980	1990	1995	2000	2005	2010	2011	2012	2013
Total	15.2	14.3	16.6	19.7	25.8	34.9	48.2	66.8	81.2	91.2	97.5	103.3	112.3	115.7	117.1	118.4
Urban	4.3	4.5	5.5	6.9	11.0	17.7	28.3	44.3	58.0	67.0	72.8	79.0	86.3	88.9	90.0	91.1
Rural	10.8	9.9	11.0	12.8	14.8	17.2	19.9	22.5	23.3	24.2	24.7	24.3	26.0	26.8	27.0	27.3



Disaster impacts in Mexico (La Red 2014)



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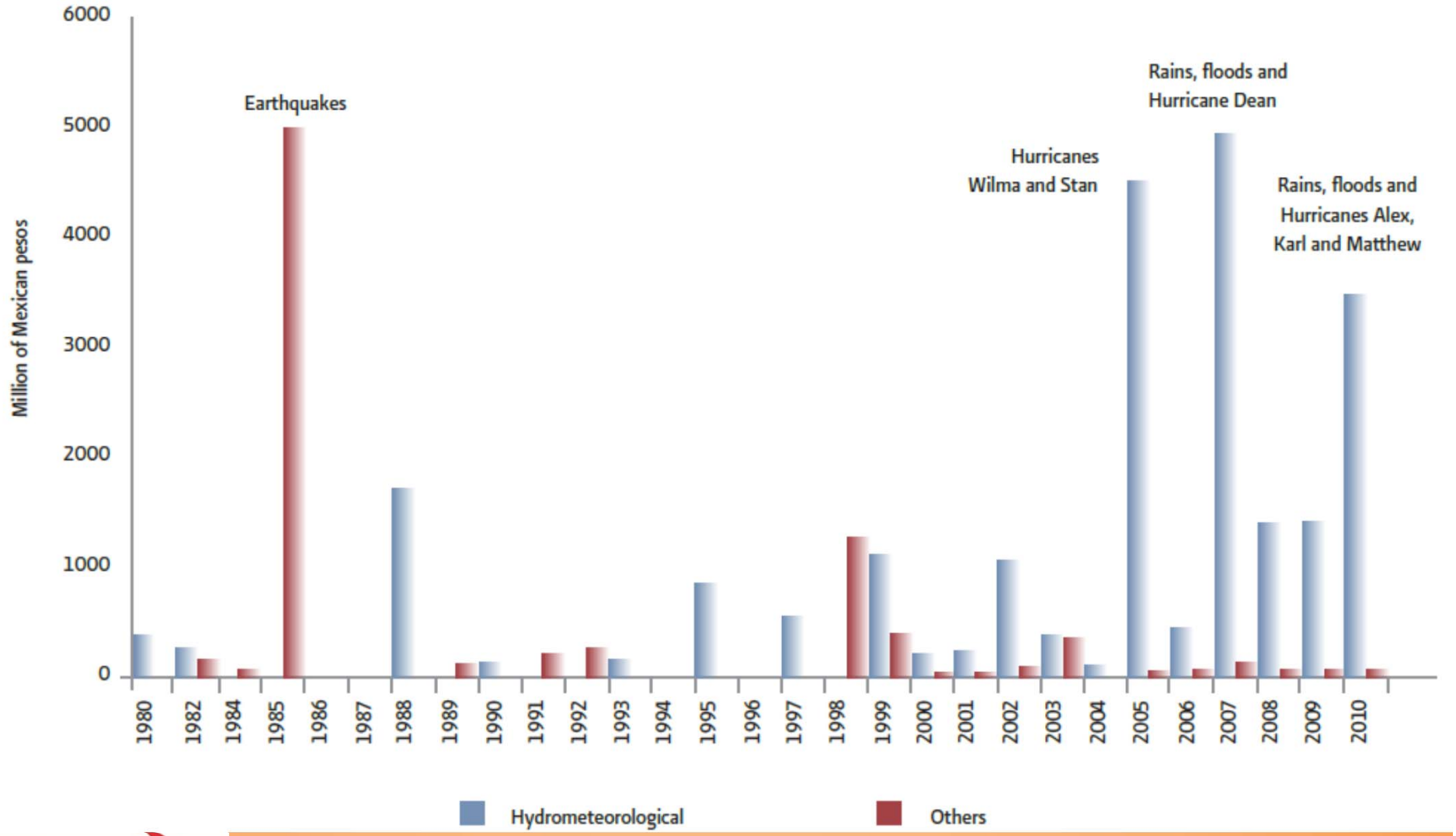
Disaster costs in Mexico (Cenapred 2013)



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River Yautepec: Centre of the country

Transect from volcano Popocatéptl (5,452 m) to the Sierra Madre del Sur

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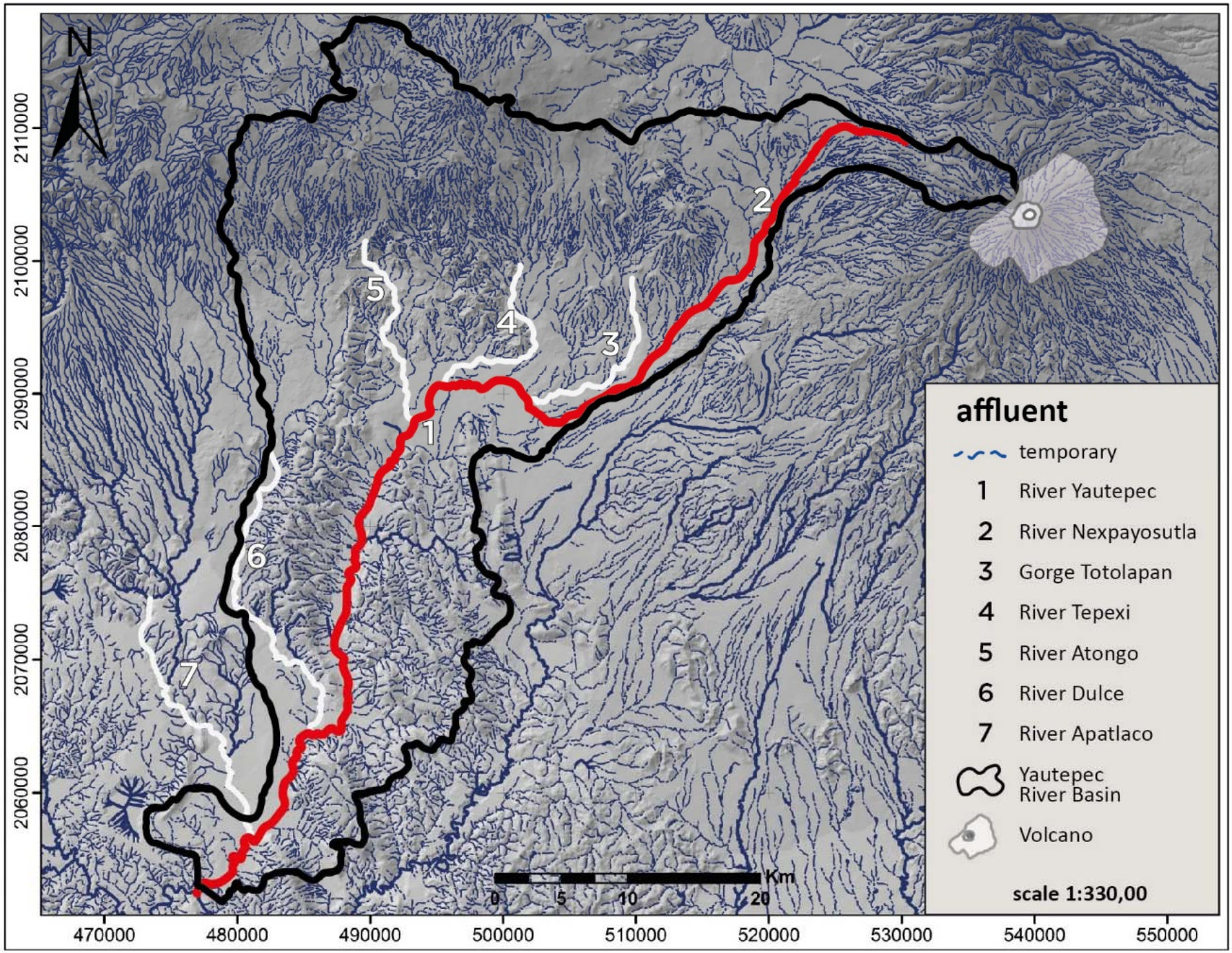
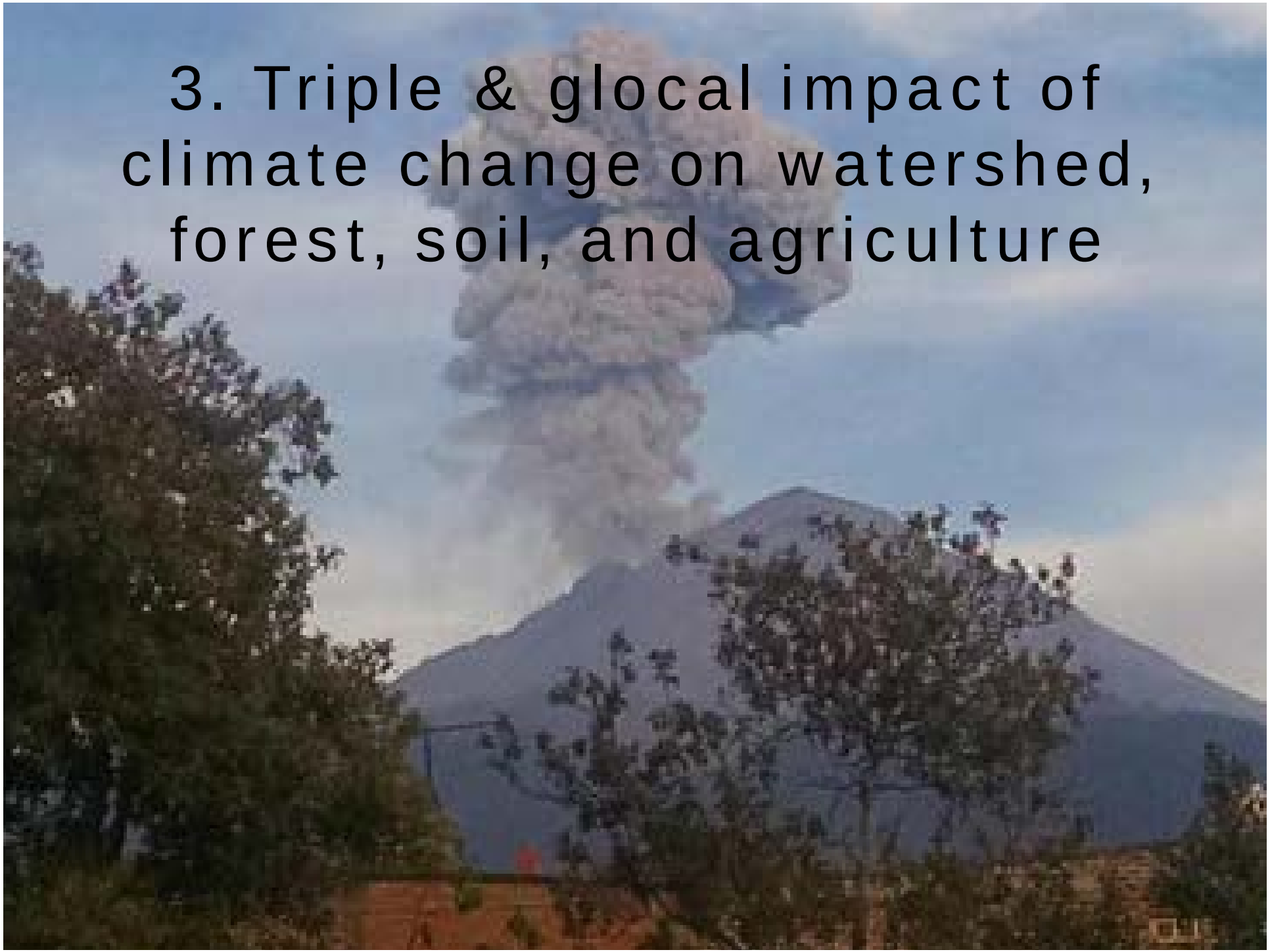
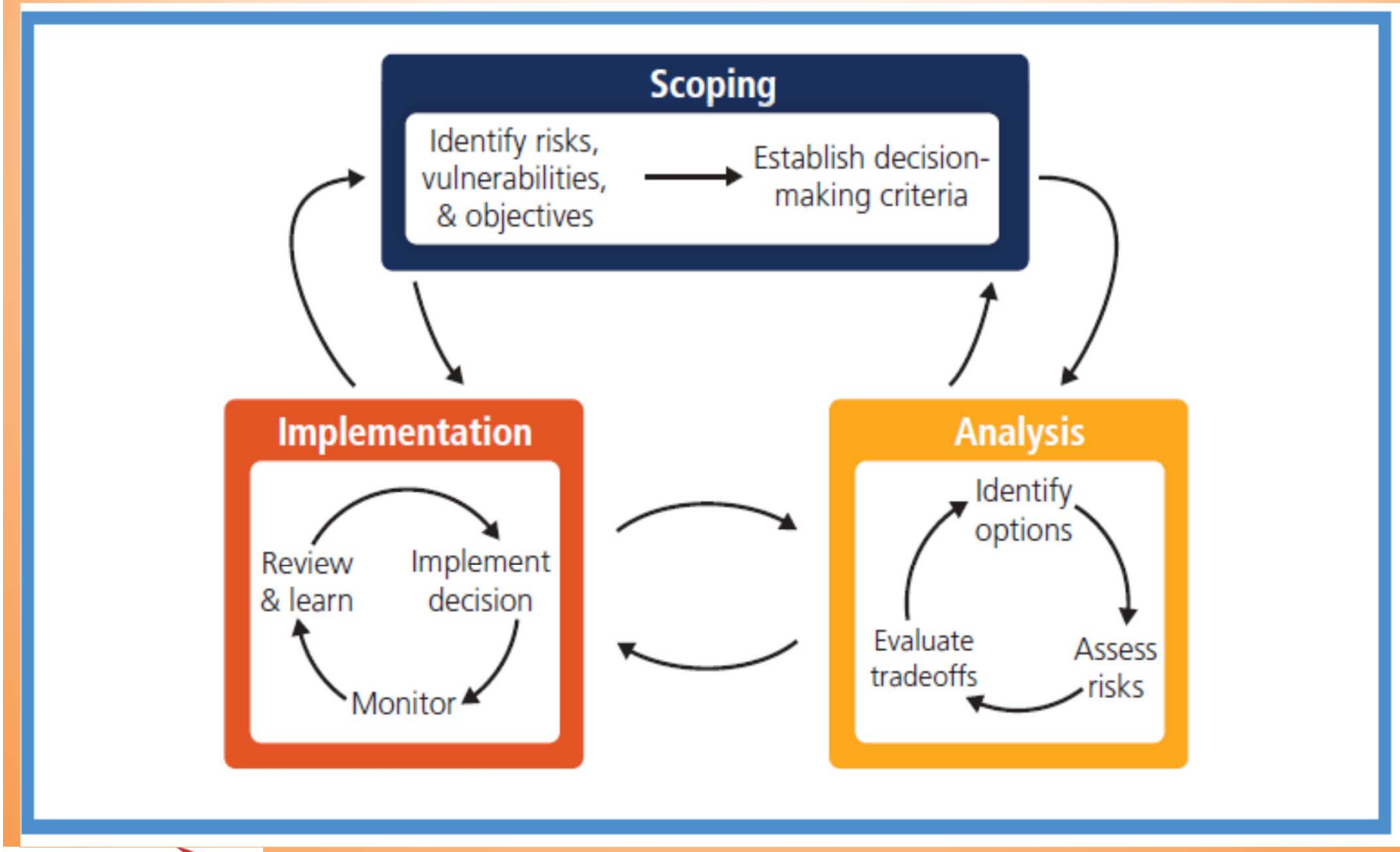

N
2110000
2100000
2090000
2080000
2070000
2060000
470000
480000
490000
500000
510000
520000
530000
540000
550000
1
2
3
4
5
6
7
affluent
temporary
1 River Yautepec
2 River Nexpayosutla
3 Gorge Totolapan
4 River Tepexi
5 River Atongo
6 River Dulce
7 River Apatlaco
Yautepec River Basin
Volcano
scale 1:330,00
0
5
10
20
Km


3. Triple & glocal impact of climate change on watershed, forest, soil, and agriculture

IPCC assessment (2014: 9)



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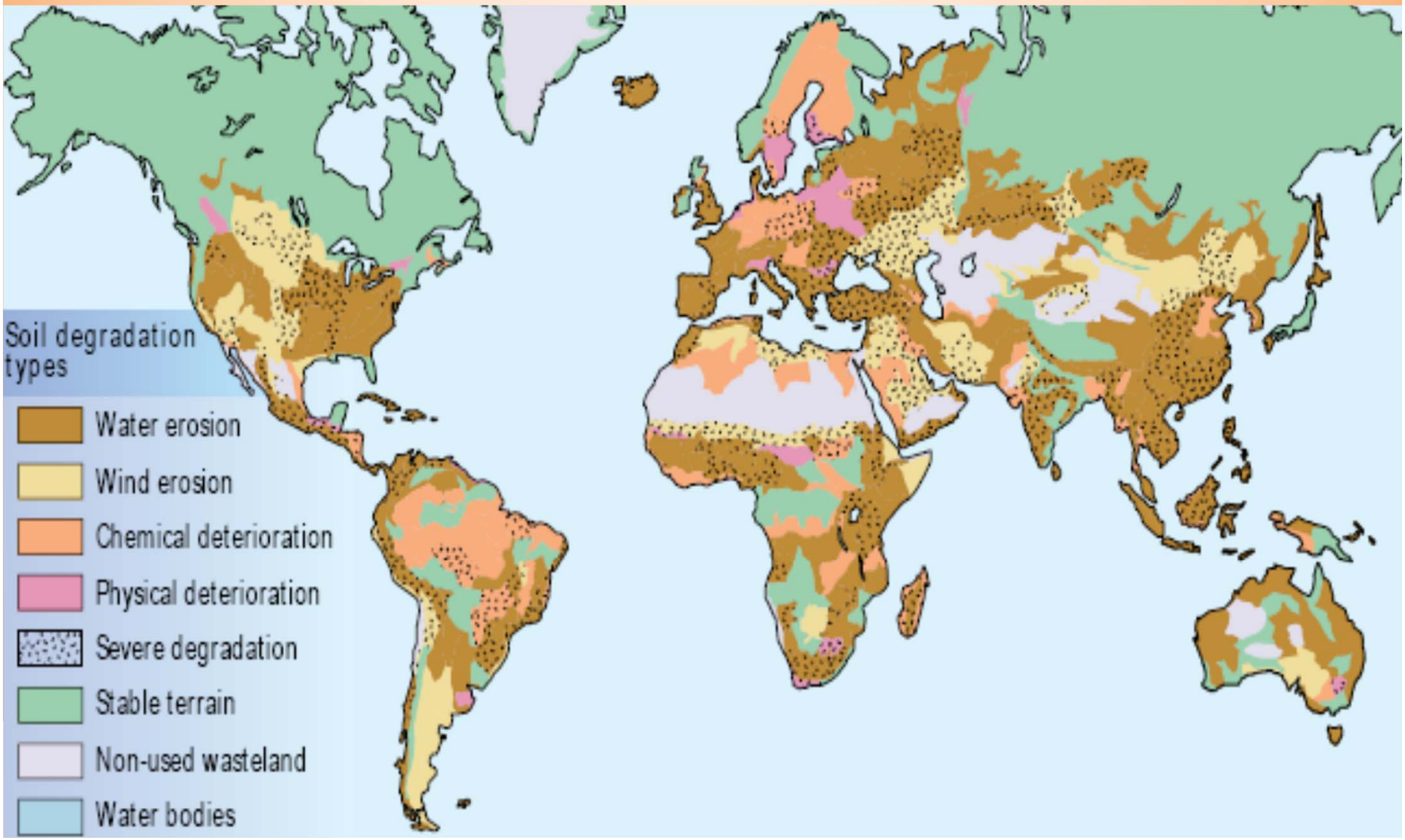
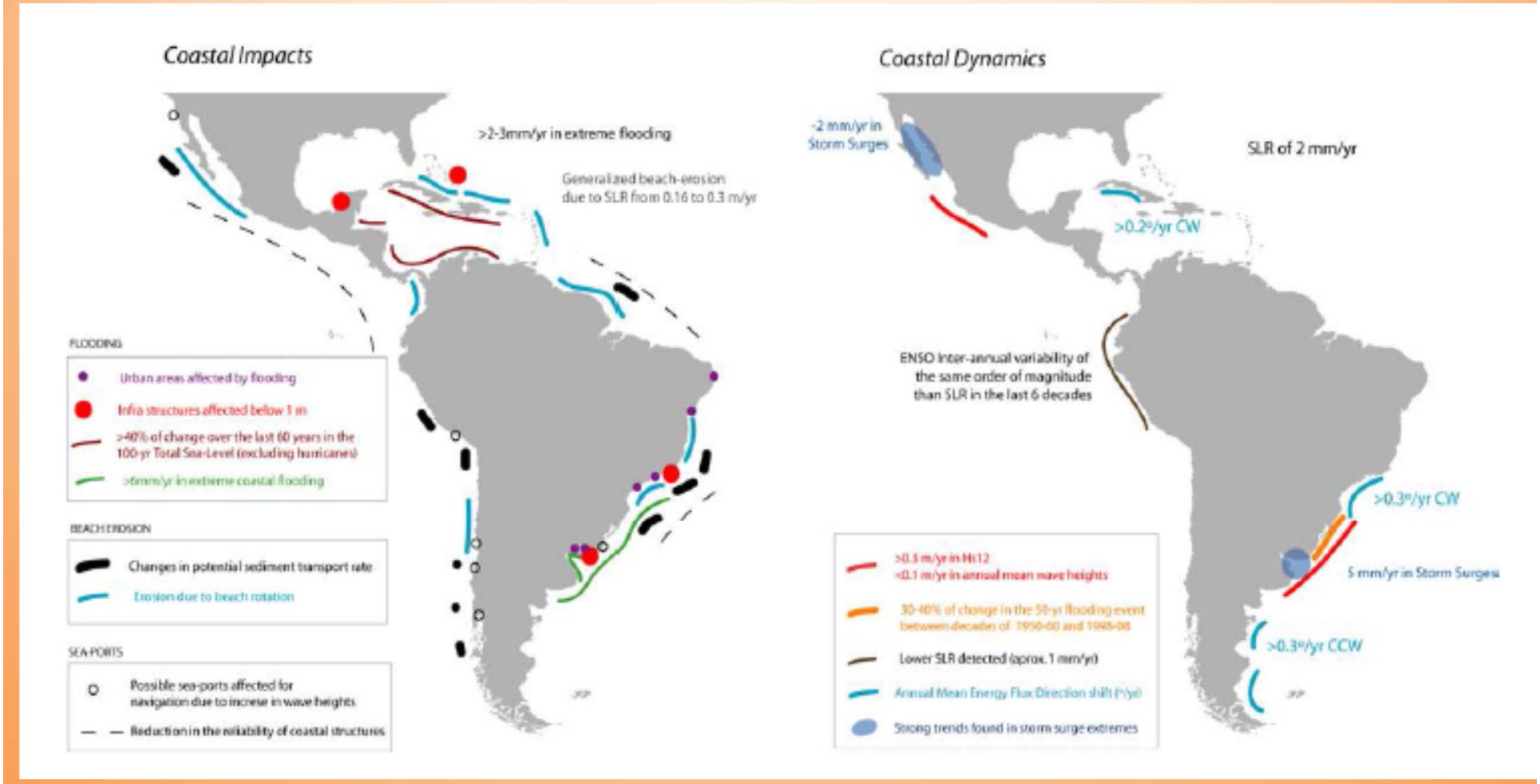
Degradation of soils due to anthropogenic impacts

Source: ISCRIC-UNEP (1996: 12)



Coastal impacts in LA



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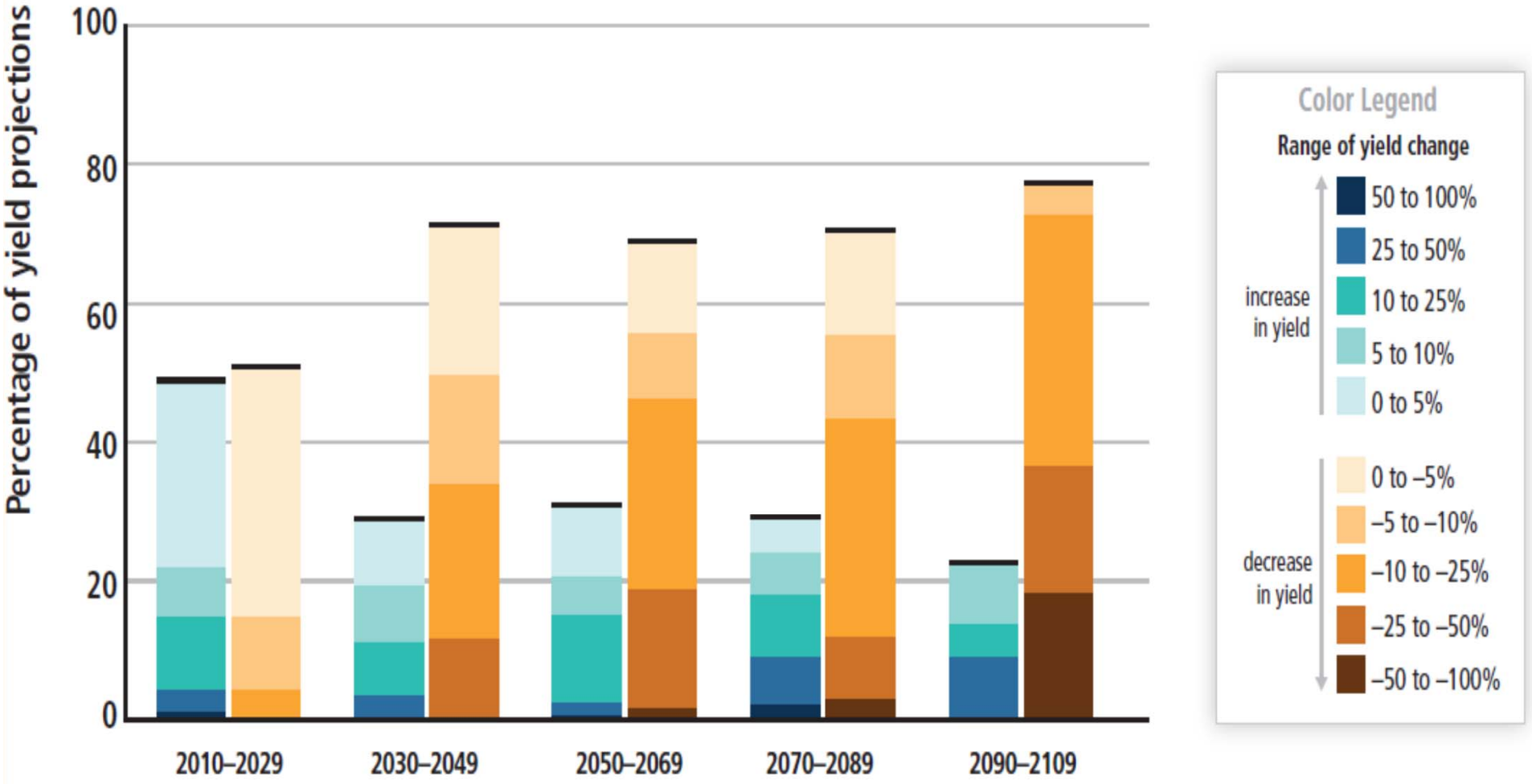
Projected crop yield changes (IPCC, 2014: 18)



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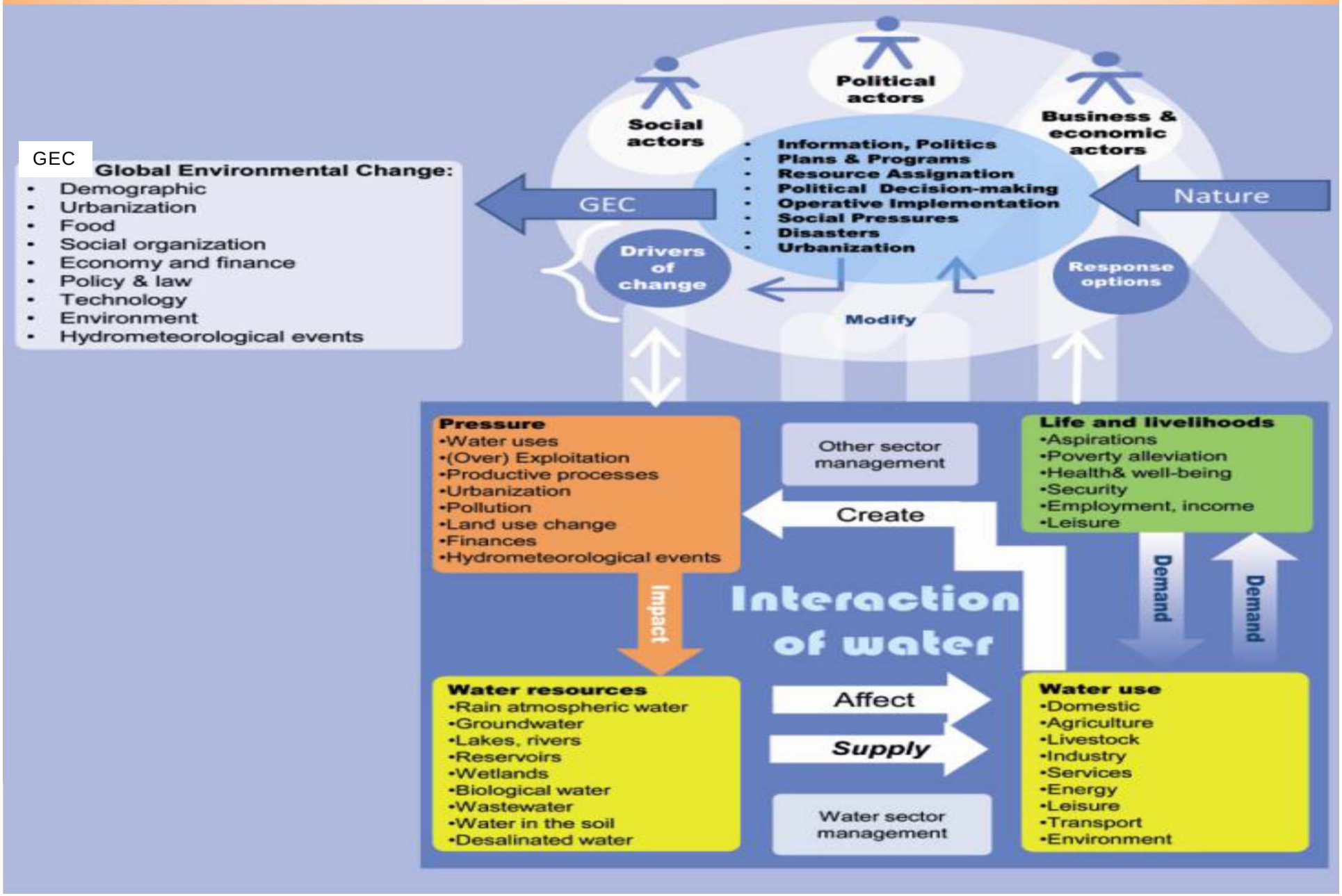
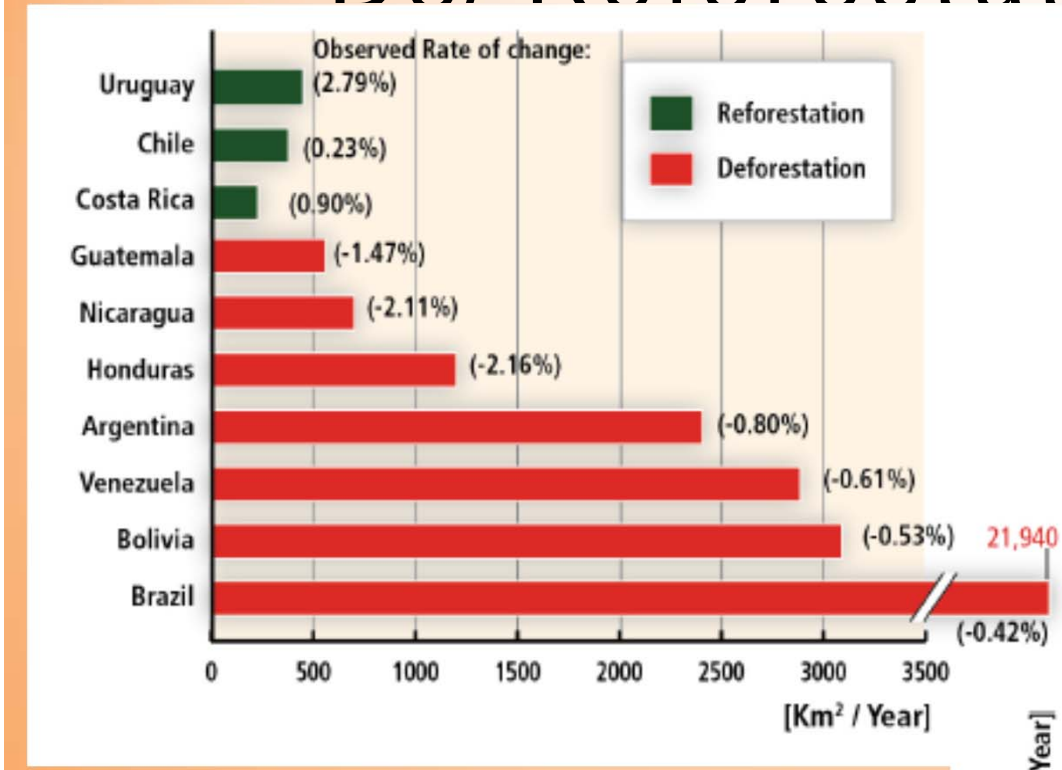
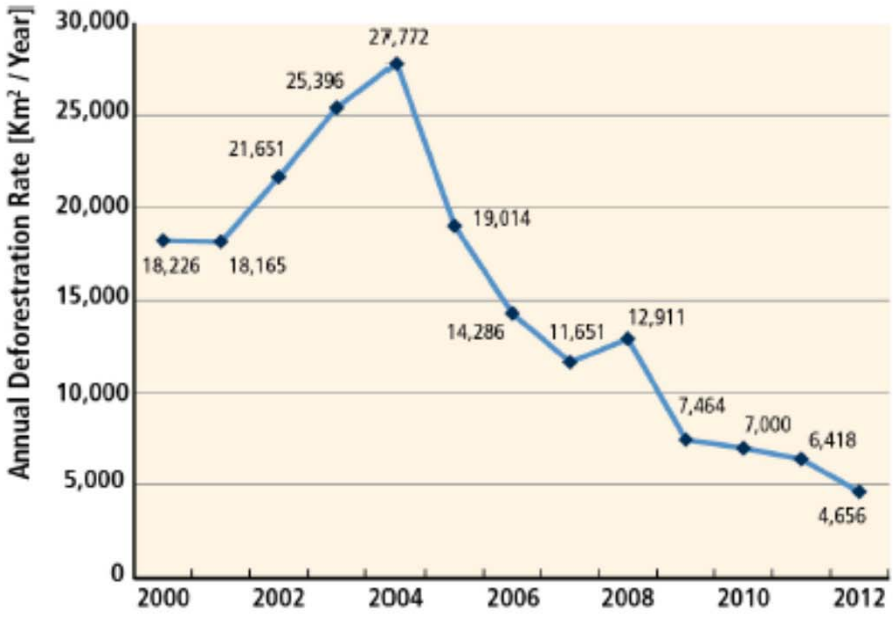
Systemic water management



De/ Reforestation in LAC





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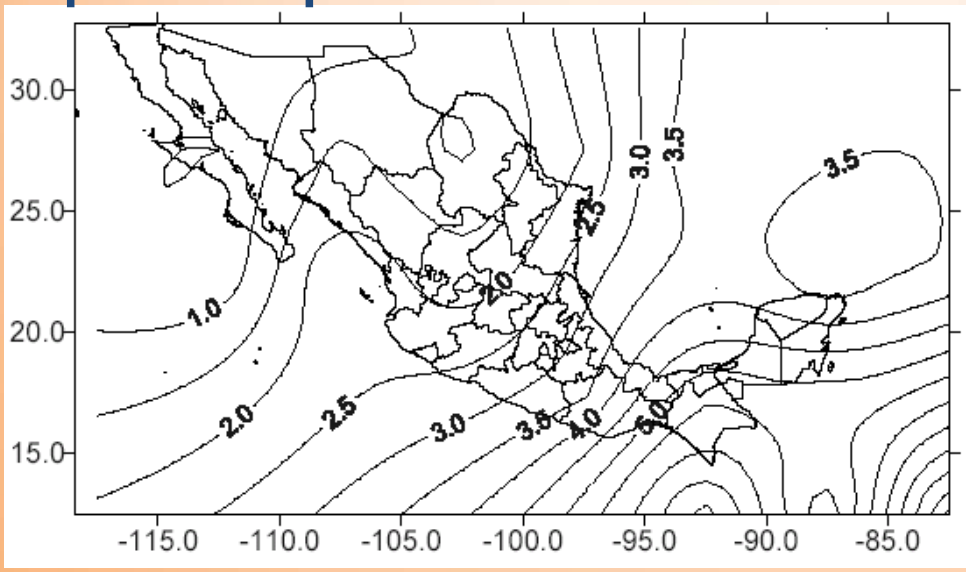
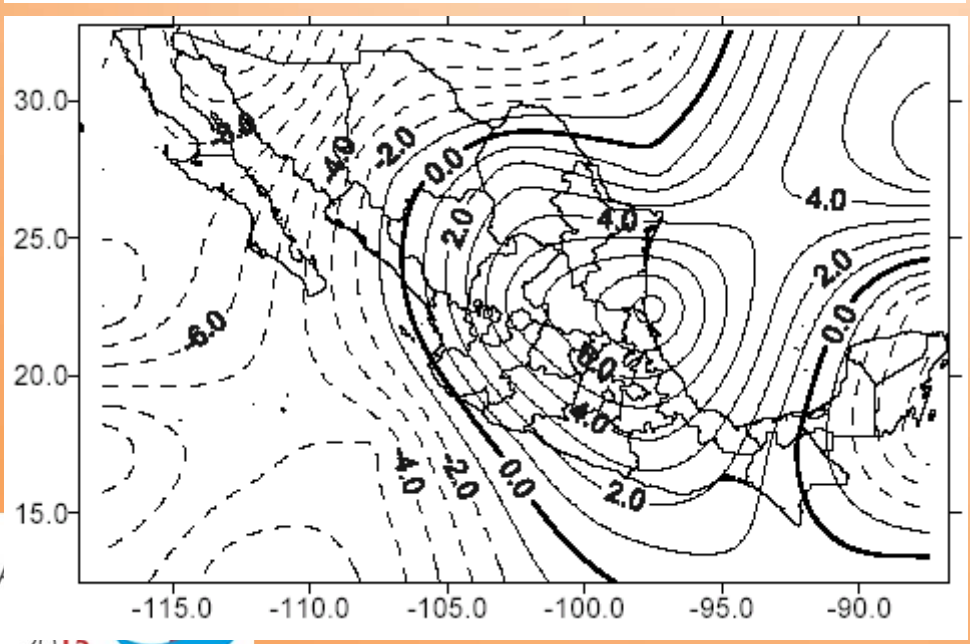
Potential changes in annual precipitation in Mexico for 2050



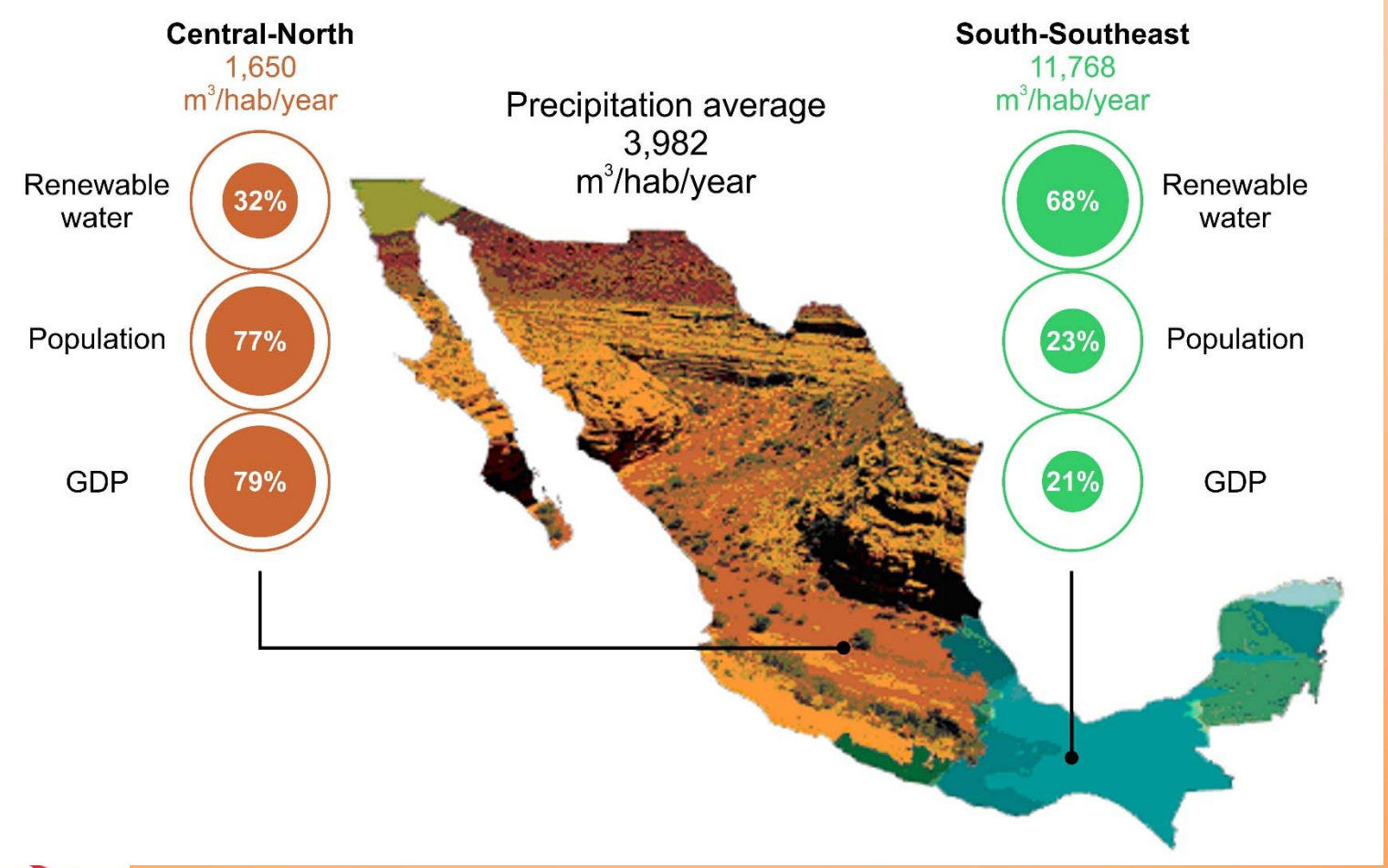
Scenario base (1961 – 1990) of average precipitation/year annual (mm/day)



% of changes in average annual precipitation depending on medium sensitivity. The interrupted lines represent decrease. Model ECHAM4

Conde C., 2006

Watershed management (Conagua, 2014)



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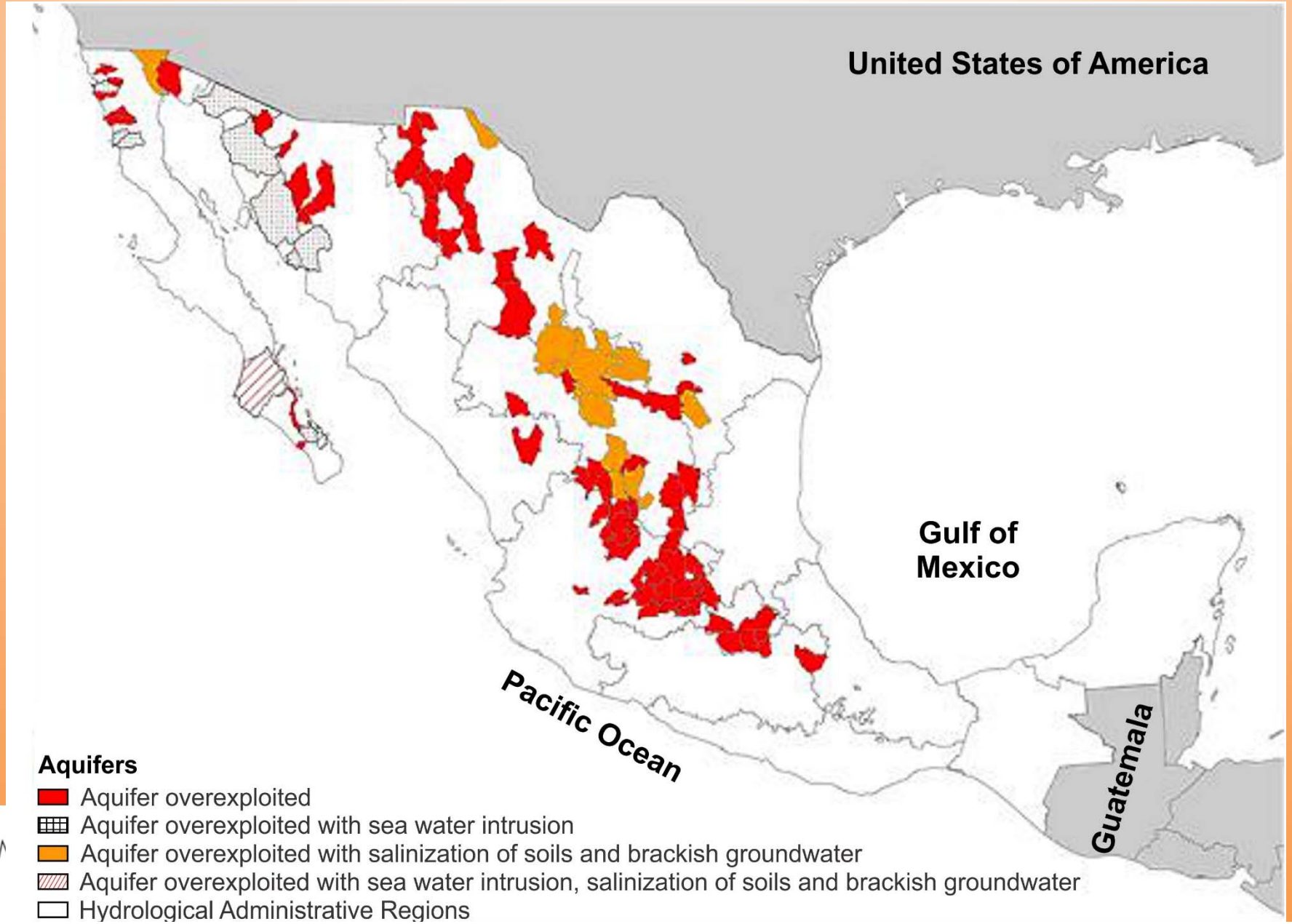
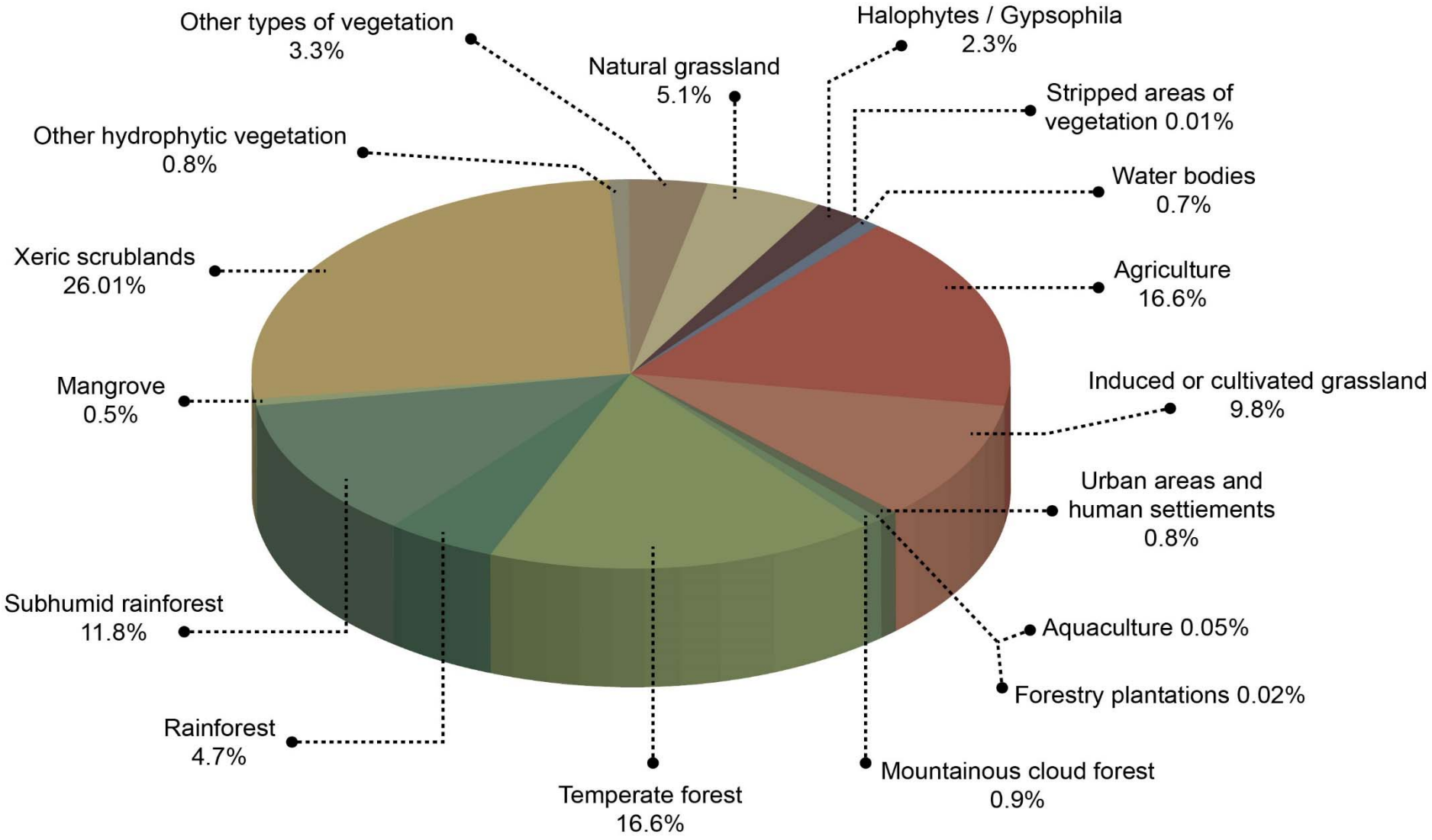
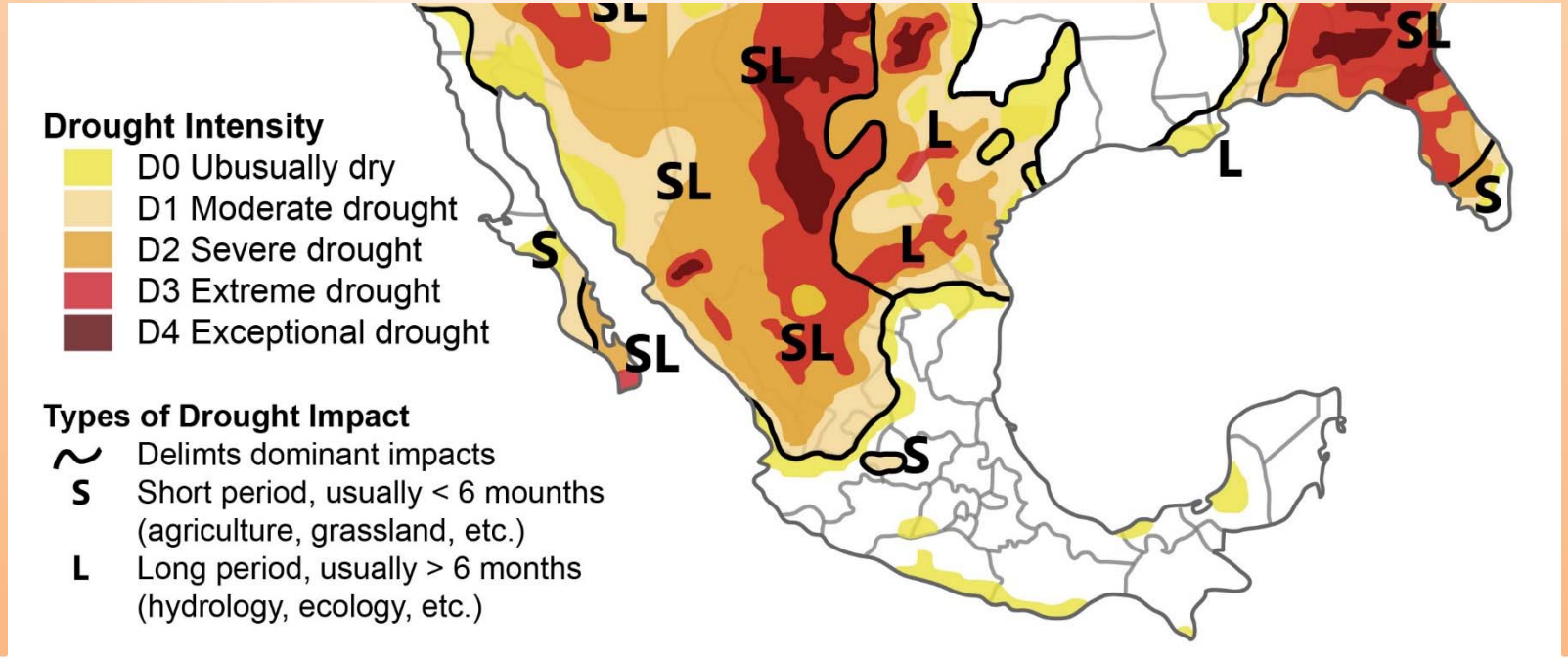
Intrusion of salt water on soil/ aquifers

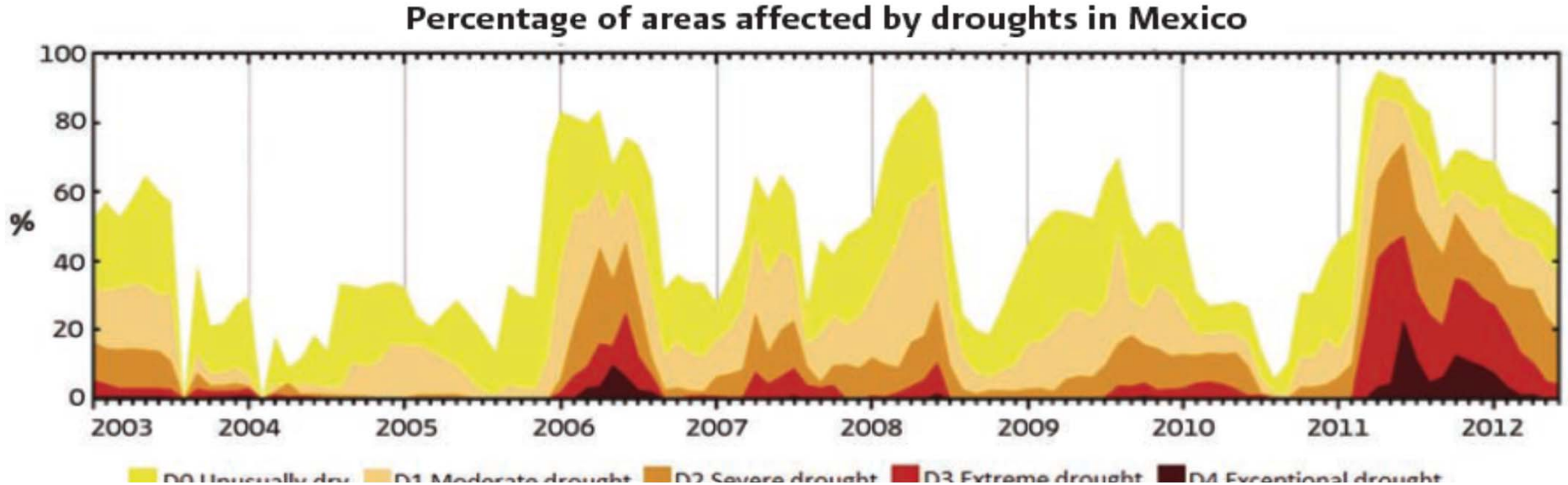


Land use change



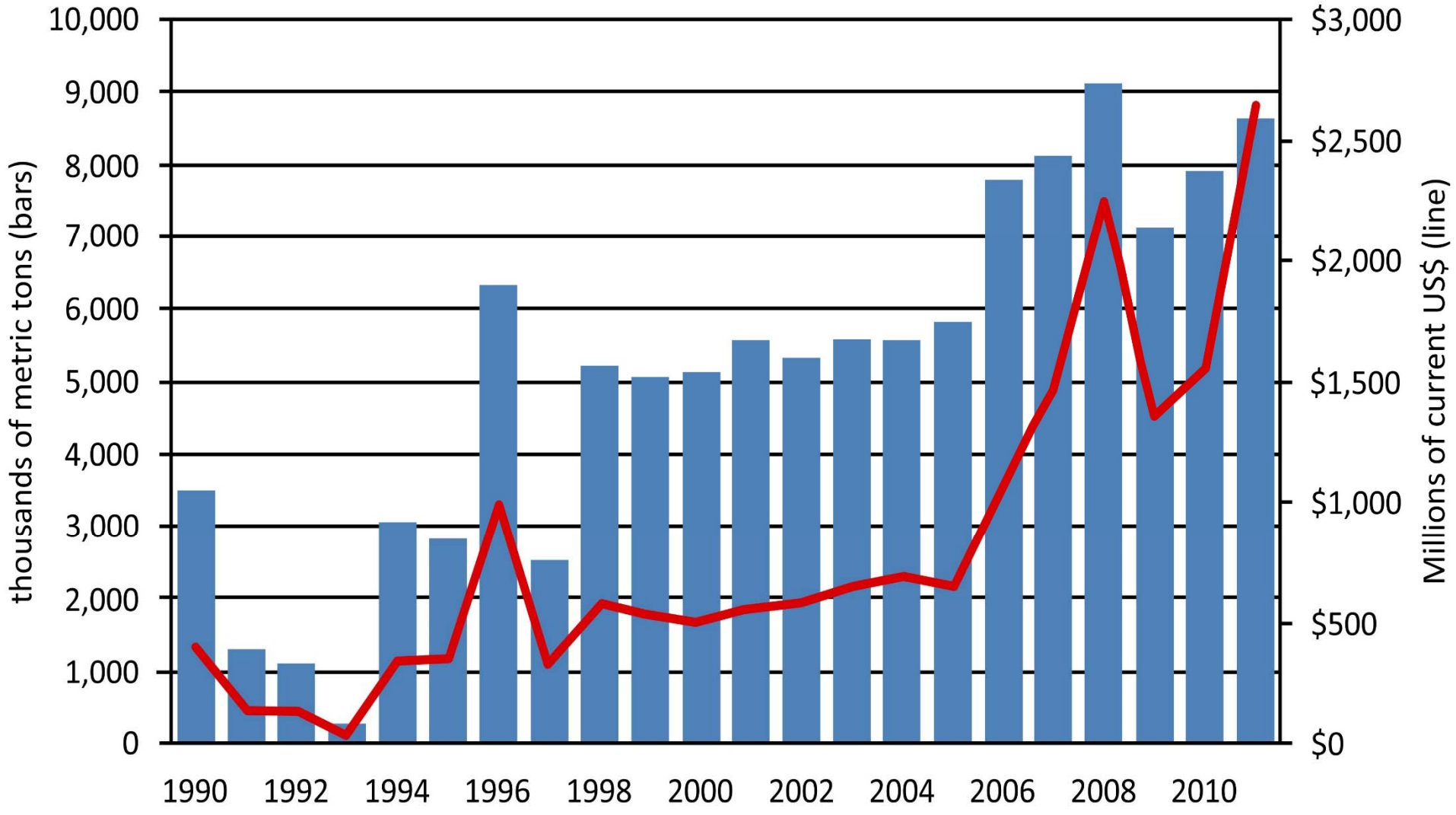
Droughts


Drought Intensity
D0 Ubusually dry
D1 Moderate drought
D2 Severe drought
D3 Extreme drought
D4 Exceptional drought
Types of Drought Impact
~ Delimts dominant impacts
S Short period, usually < 6 mounths (agriculture, grassland, etc.)
L Long period, usually > 6 months (hydrology, ecology, etc.)
SL
L
S


Percentage of areas affected by droughts in Mexico
%
100
80
60
40
20
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
D0 Unusually dry
D1 Moderate drought
D2 Severe drought
D3 Extreme drought
D4 Exceptional drought

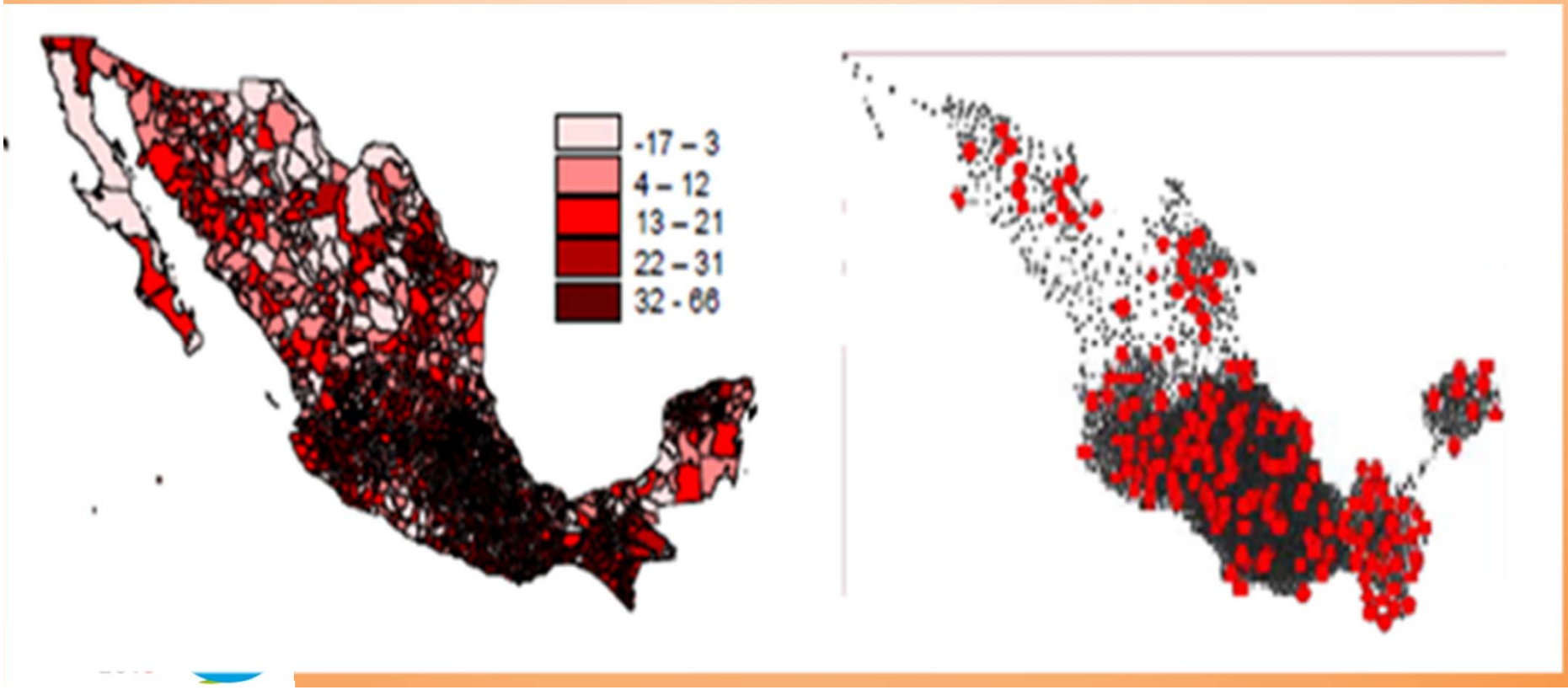
Sea level rise: 11,000 km of coast (Conagua 2013: 22)

Loss of food security (Siap 2013)

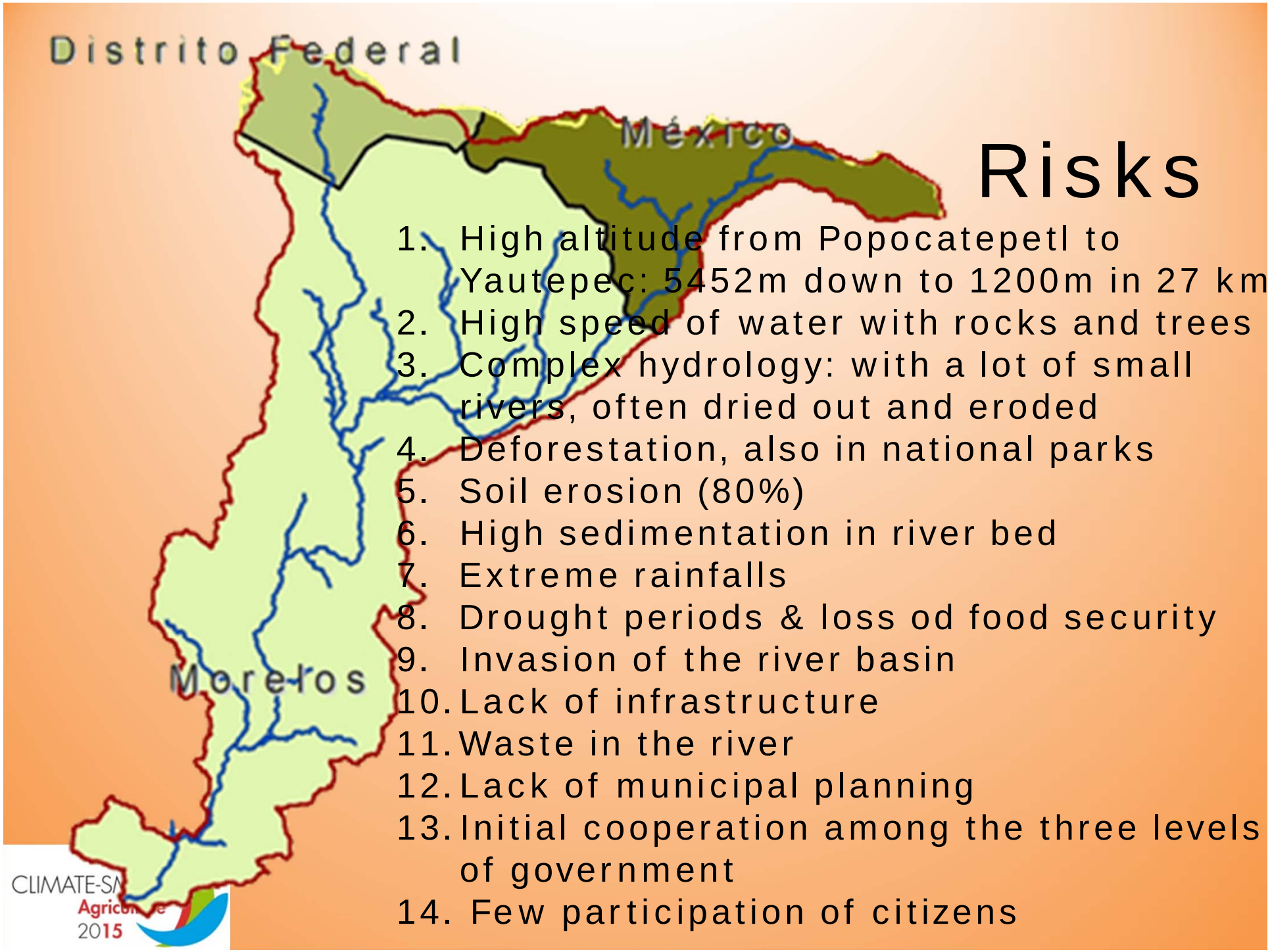


Dual vulnerability: poor and exposed to extreme events transformed into disasters

Left: income less 2 US$/day; right: Disaster costs over 500,000US$



Climate-smart agriculture & watershed management: from the Pacific through the Popocatepetl to the Atlantic



Risks

1. High altitude from Popocatepetl to Yautepec: 5452m down to 1200m in 27 km
2. High speed of water with rocks and trees
3. Complex hydrology: with a lot of small rivers, often dried out and eroded
4. Deforestation, also in national parks
5. Soil erosion (80%)
6. High sedimentation in river bed
7. Extreme rainfalls
8. Drought periods & loss od food security
9. Invasion of the river basin
10. Lack of infrastructure
11. Waste in the river
12. Lack of municipal planning
13. Initial cooperation among the three levels of government
14. Few participation of citizens

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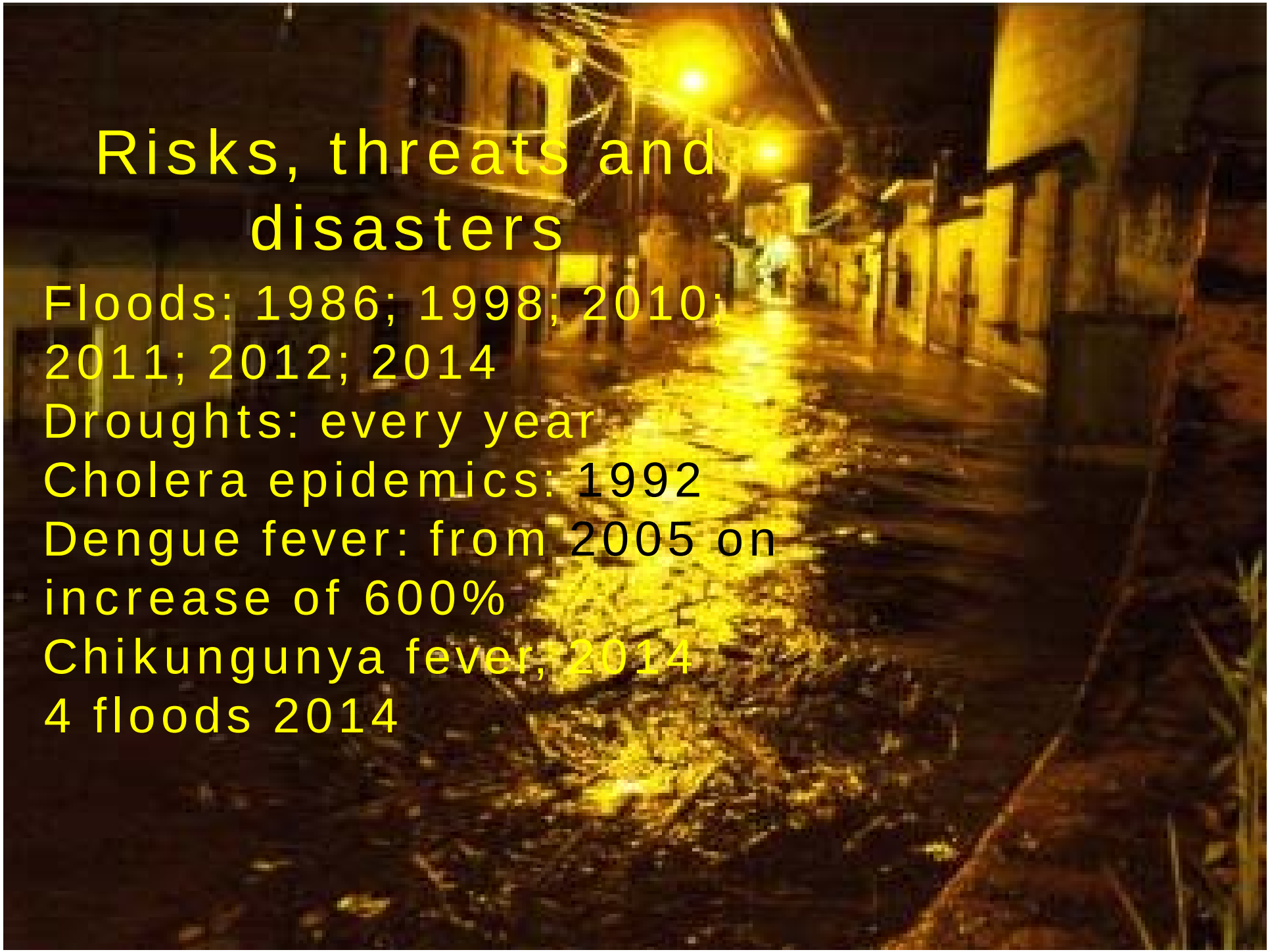
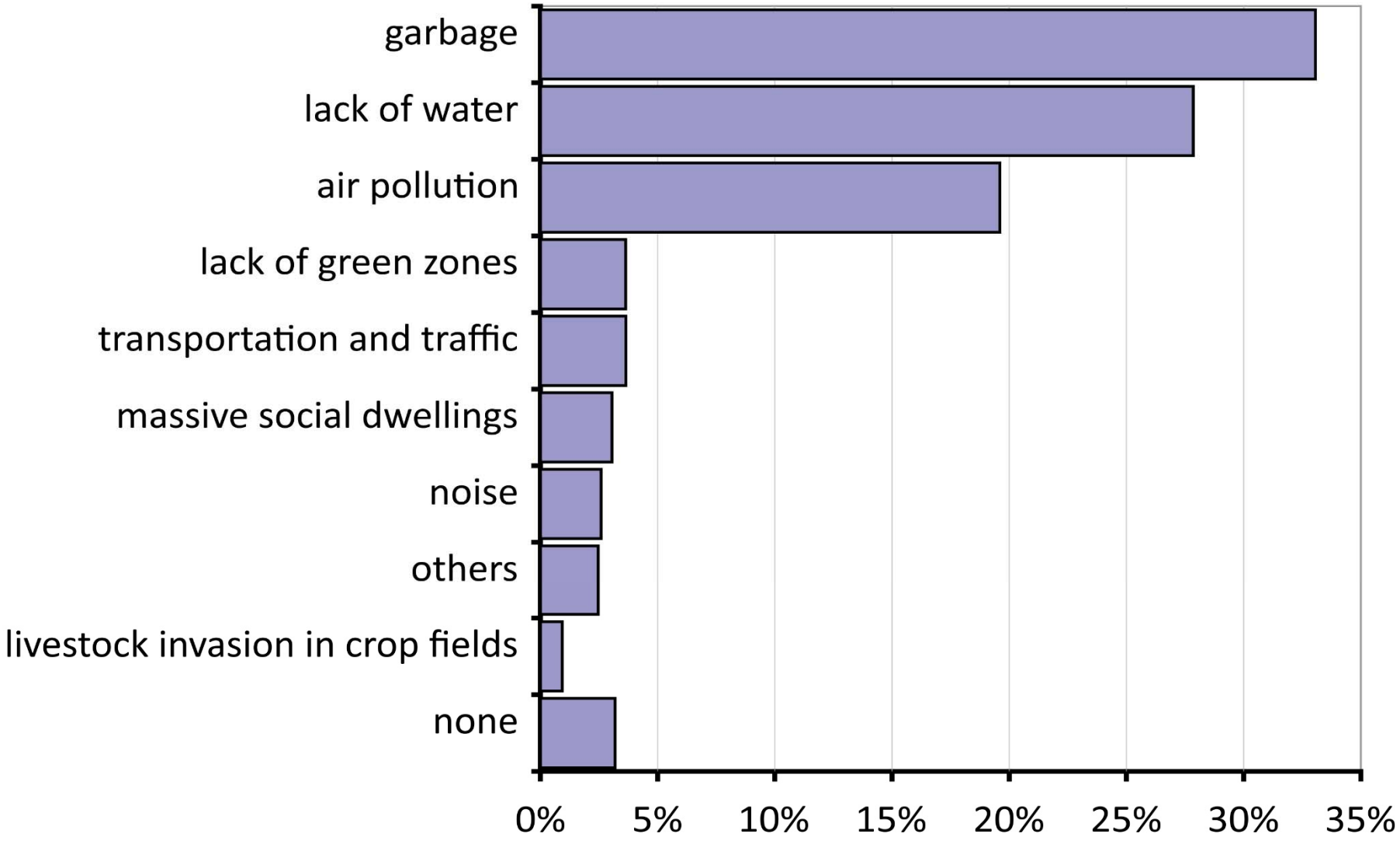
2015



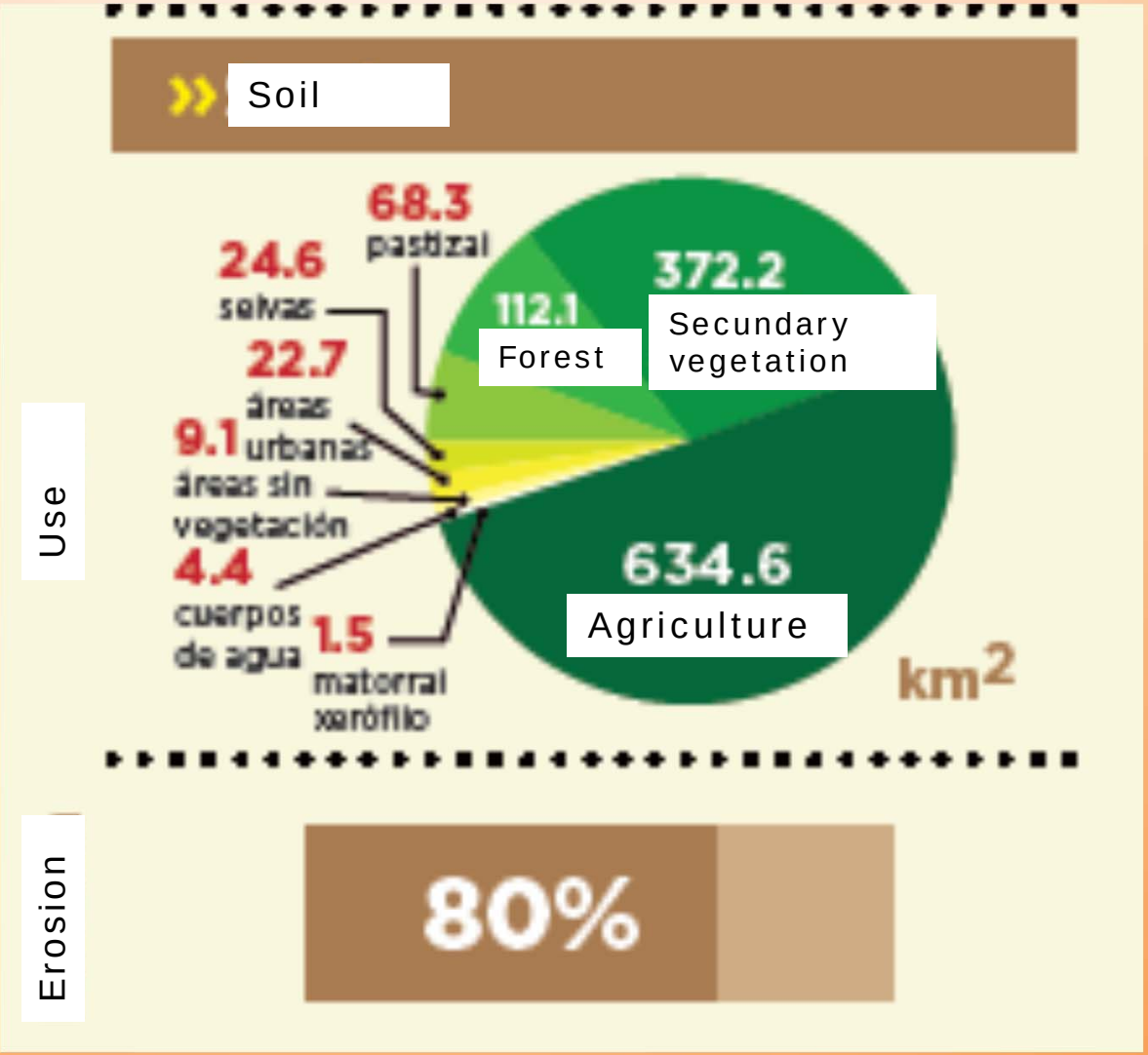
Risks, threats and disasters

Floods: 1986; 1998; 2010; 2011; 2012; 2014
Droughts: every year
Cholera epidemics: 1992
Dengue fever: from 2005 on increase of 600%
Chikungunya fever; 2014
4 floods 2014

Existing risks in the river bassin



Soil mangement



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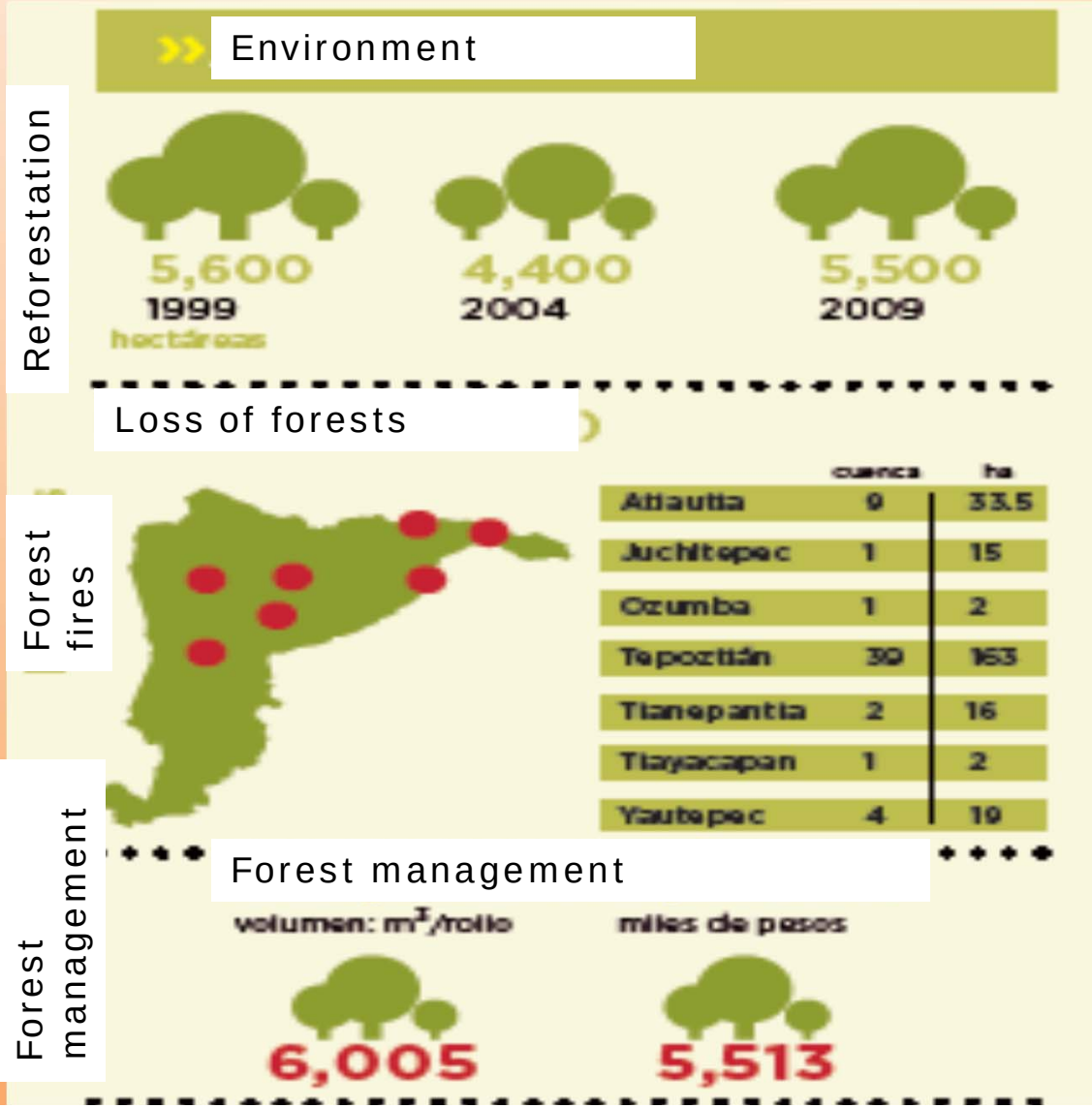
Forest management



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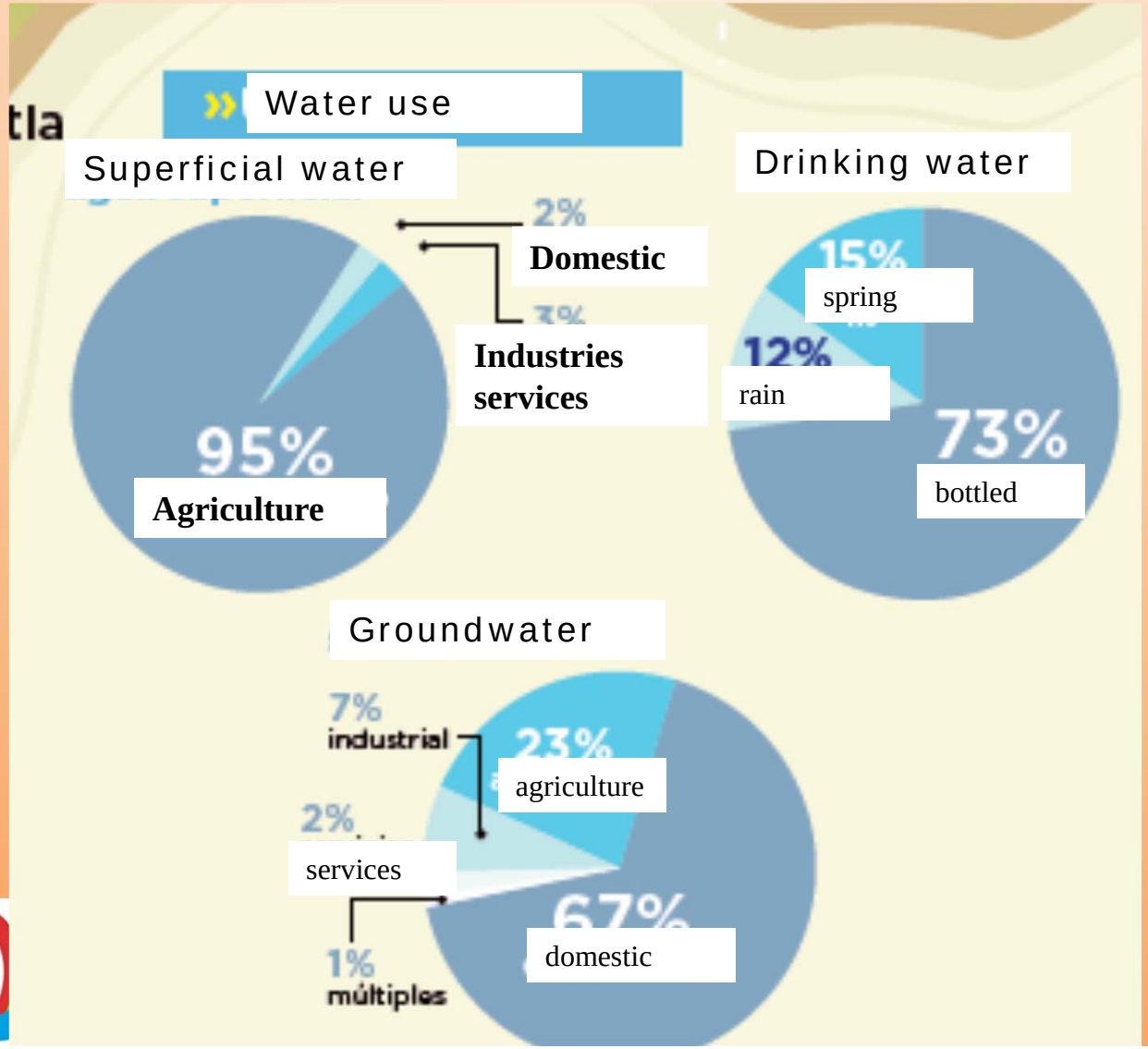
Unsustainable water use



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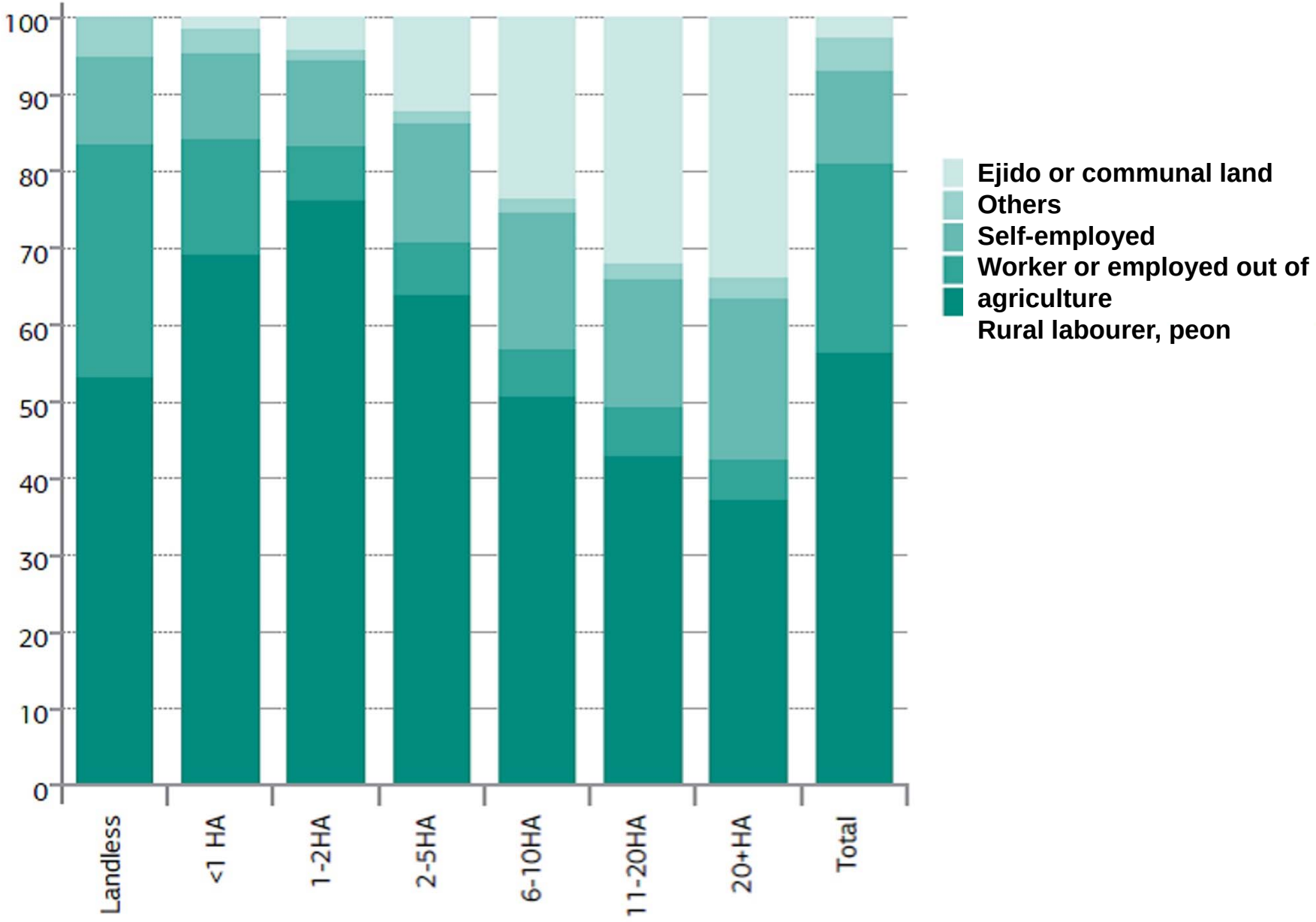
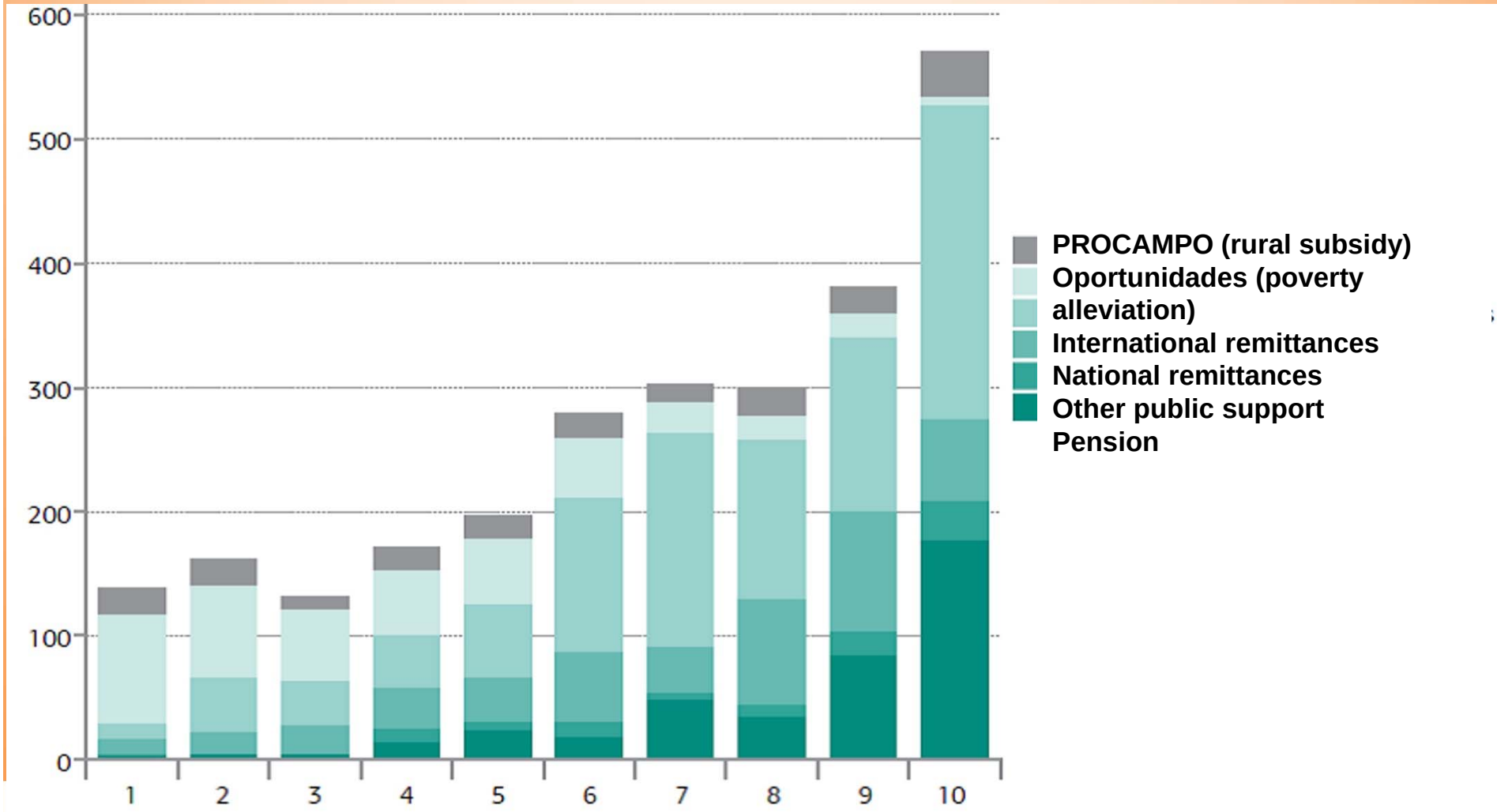
Land tenure


100
90
80
70
60
50
40
30
20
10
0
Landless
<1 HA
1-2HA
2-5HA
6-10HA
11-20HA
20+HA
Total
Ejido or communal land
Others
Self-employed
Worker or employed out of agriculture
Rural labourer, peon

Complexity of economic incomes



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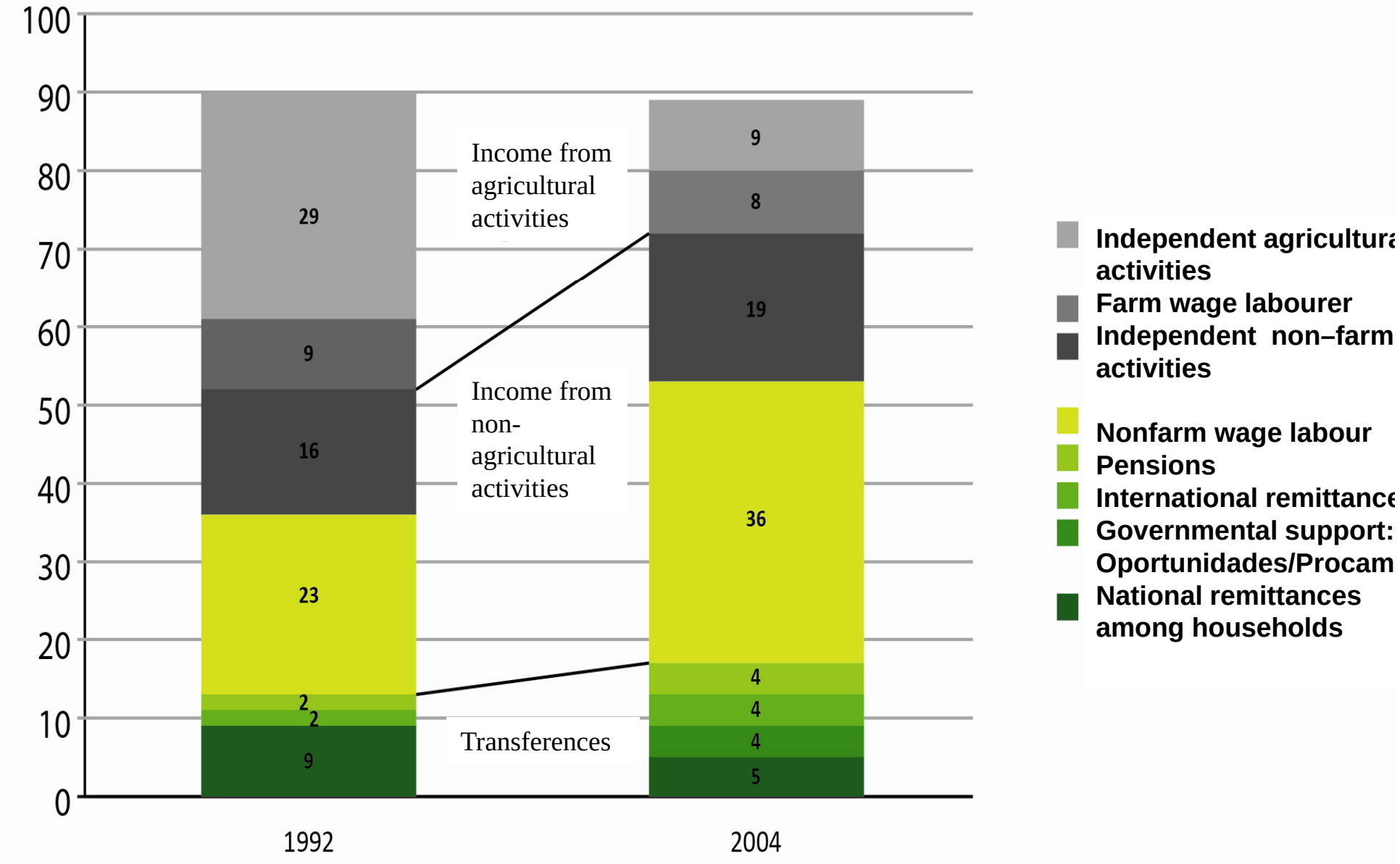
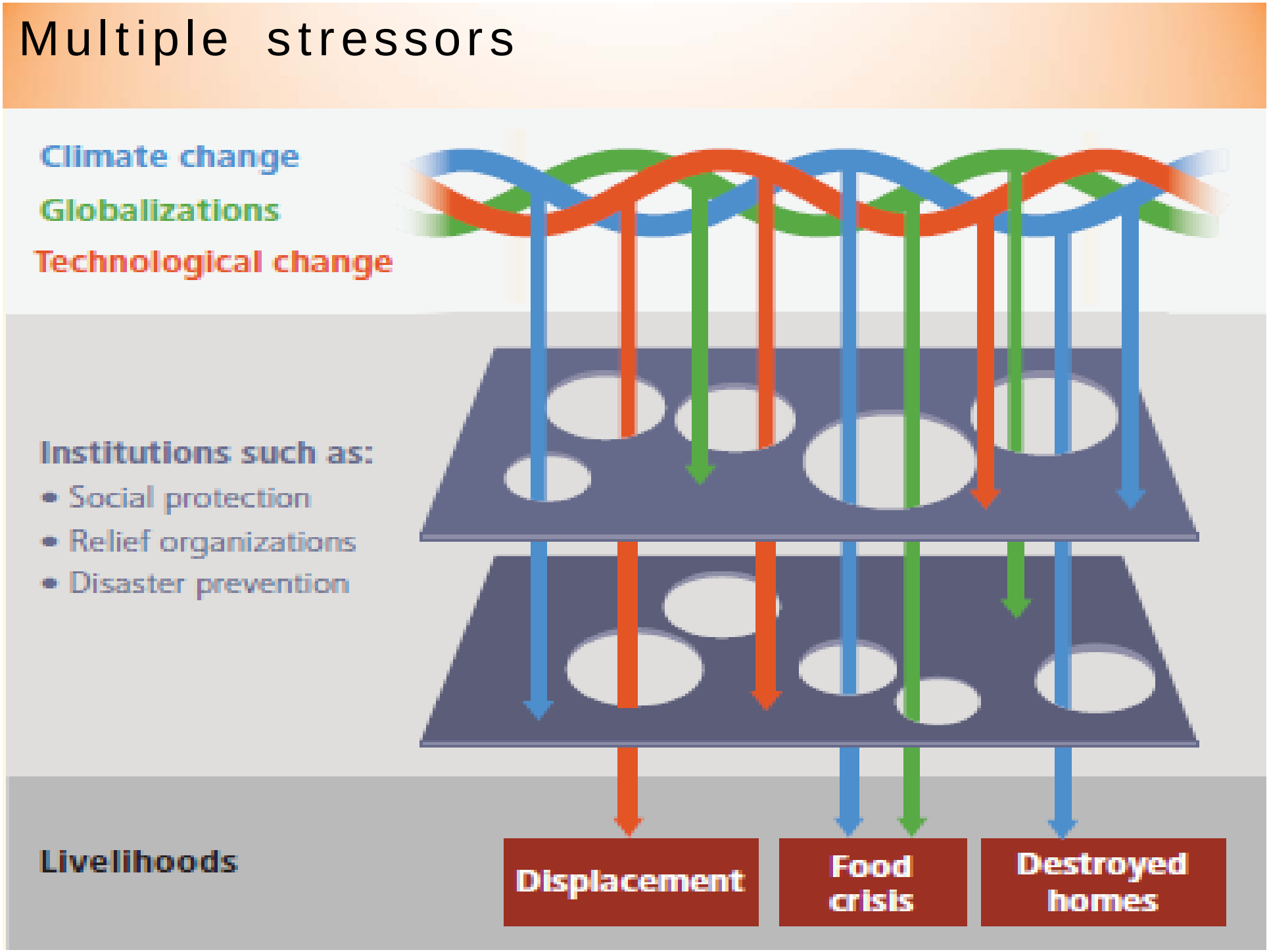
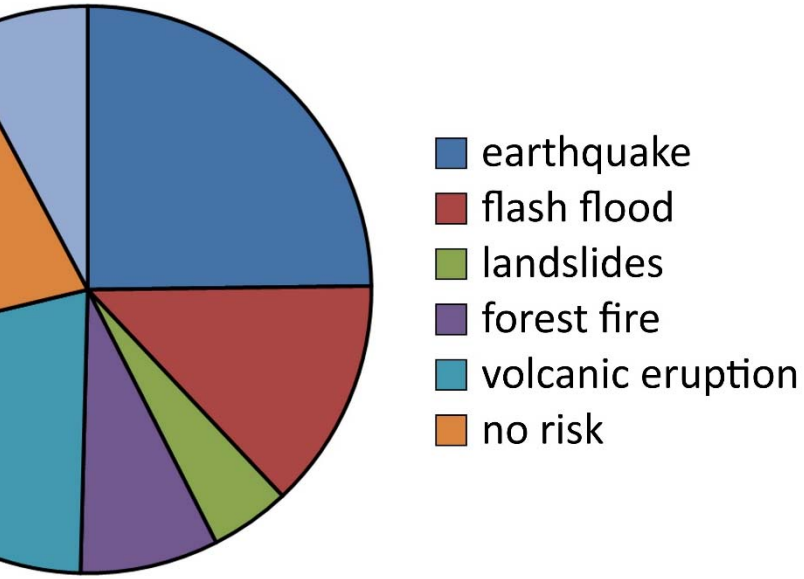
Nonfarm incomes dominates



Multiple stressors



Disaster management in the Yautepec River



River Yautepec bassin risks and disaster management

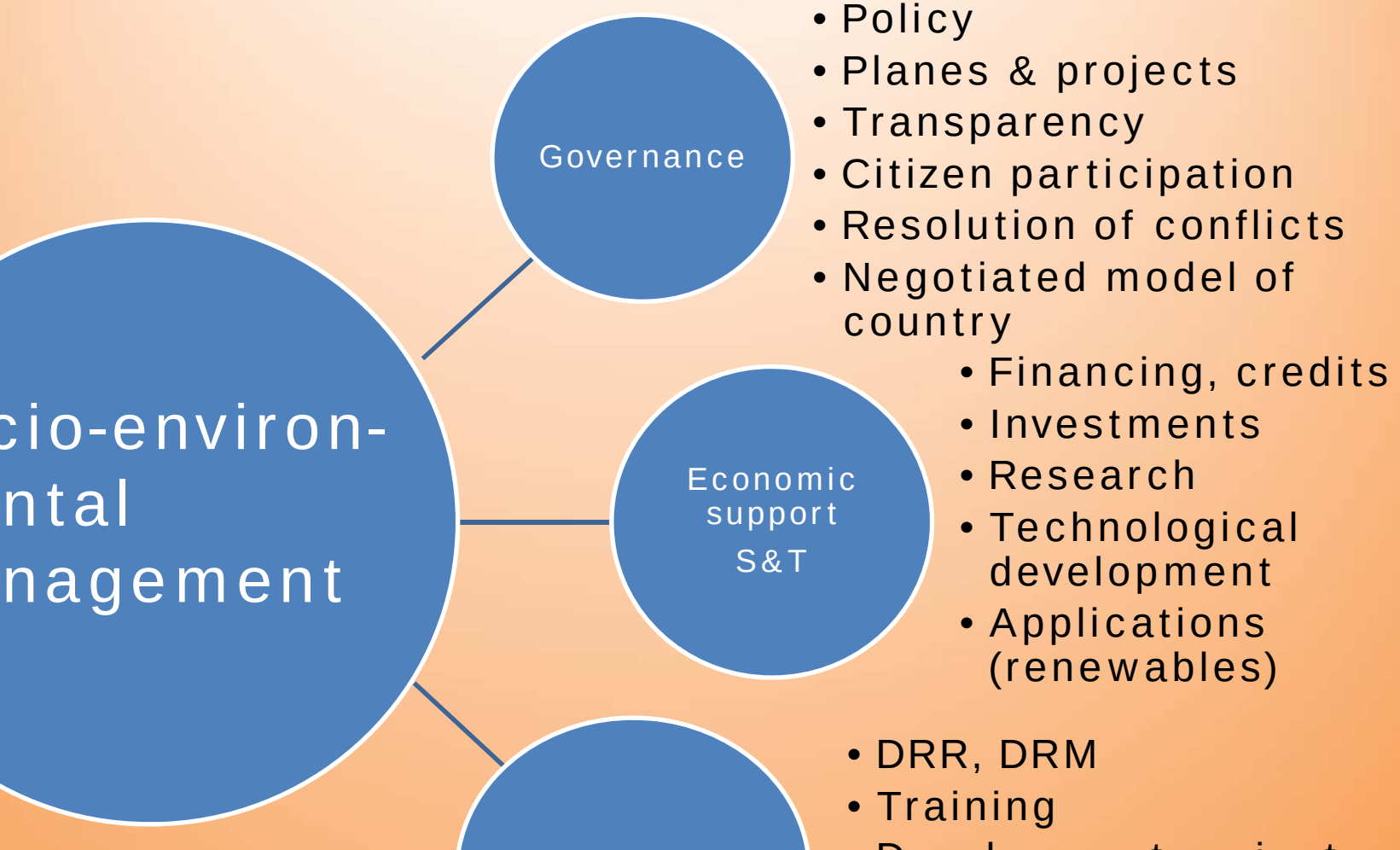
Environmental perception

	Environmental understanding
renzo Vázquez	62.6%
la Nicolás Zapata	75.8%
Cañada	59.0%
Pañuelo	

Index of social and environmental vulnerability

ndexes	Lorenzo Vázquez	Nicolás Zapata	La Cañada	El Pañuelo
of social ability	253.12	263.8	202.58	290.11
of environmental tion	273.4	286.6	220.3	307
nces in %	8.01	8.64	8.75	5.82

Obstacles to a dignified livelihood without migration

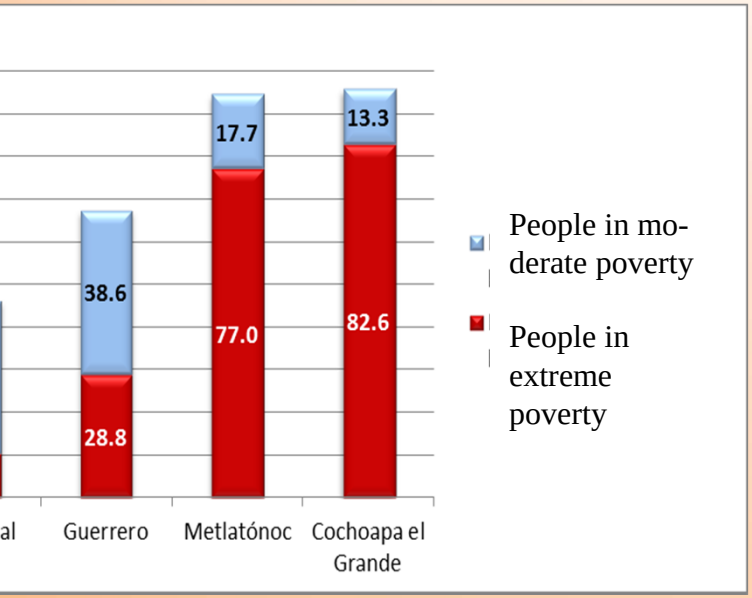


- Policy
- Planes & projects
- Transparency
- Citizen participation
- Resolution of conflicts
- Negotiated model of country

- Financing, credits
- Investments
- Research
- Technological development
- Applications (renewables)

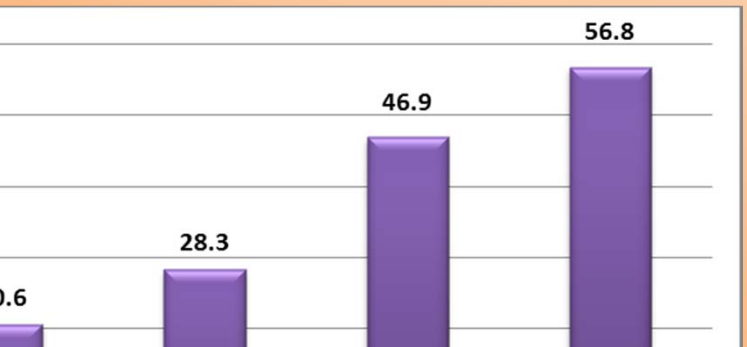
- DRR, DRM
- Training

onomic deadlocks in Cochoapa

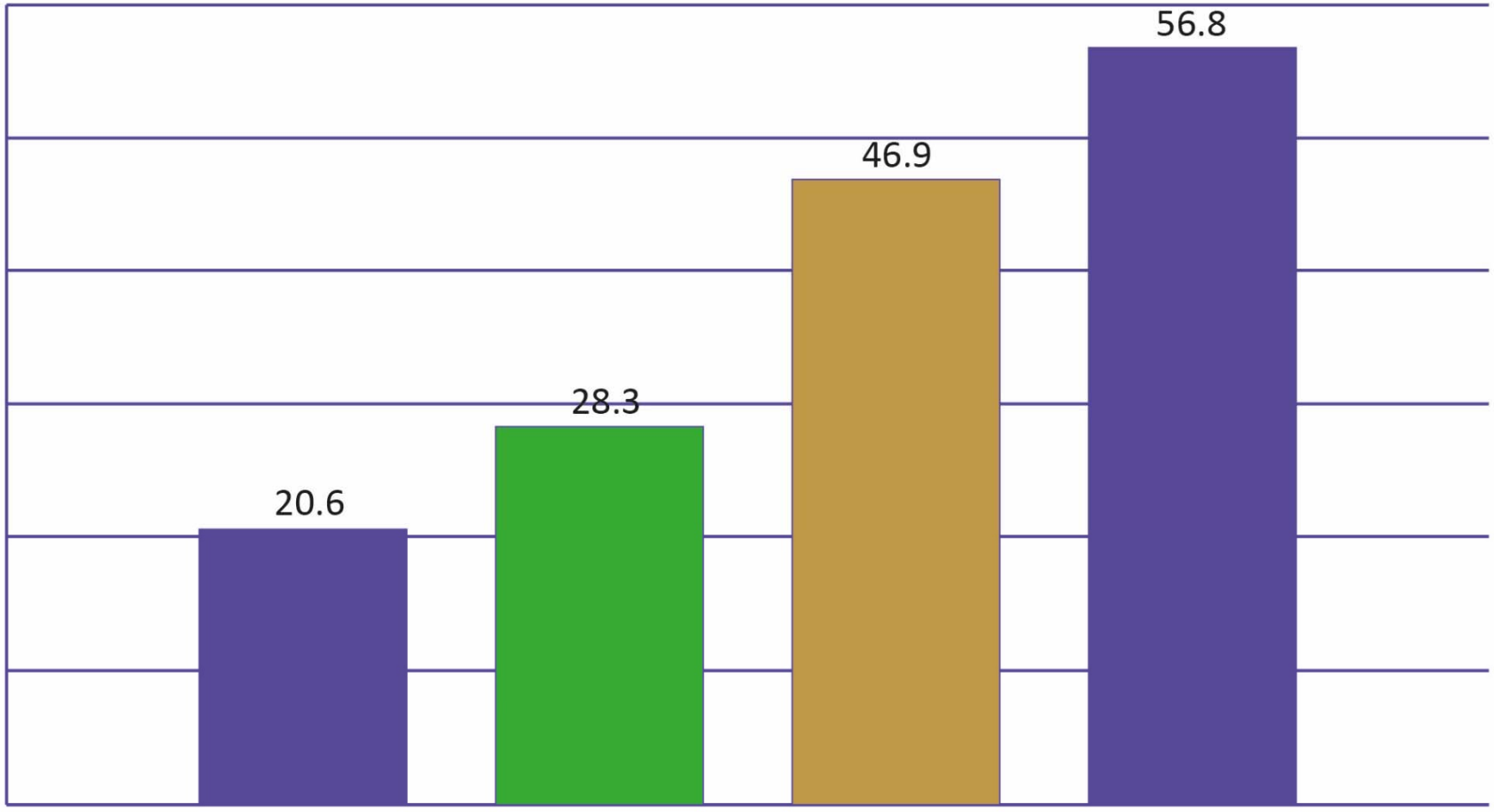


1. Poorest municipality in Mexico
2. 82.6% extreme poor
3. 98% indigenous
4. 56.8% analphabets
5. 70% of women without school
6. Studying prevents marriage
7. Girls at 12 years are sold for marriage
8. Temporary and permanent migration: Day laborers & family in the fields with toxic pesticides (including children)

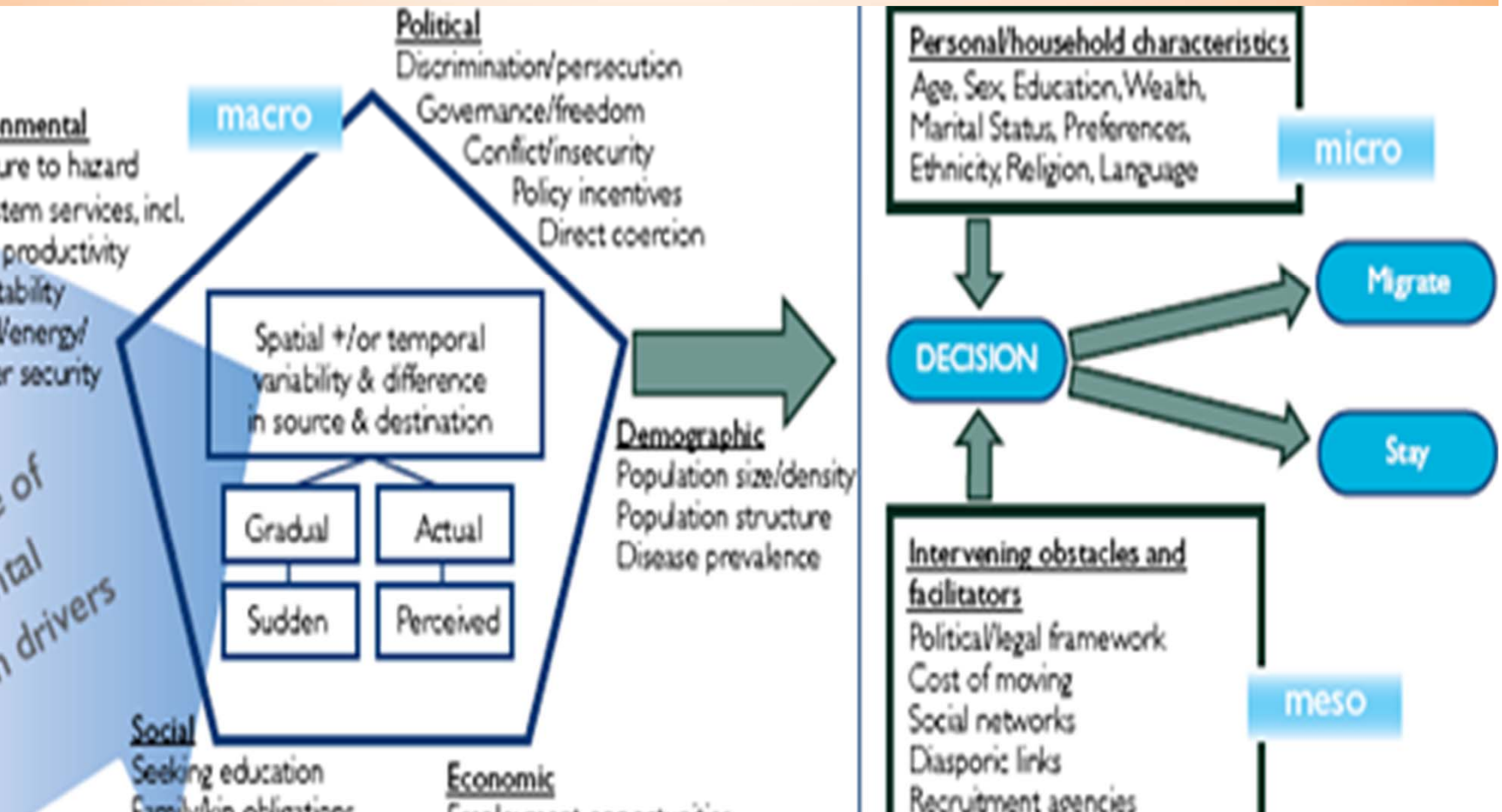
Without school training



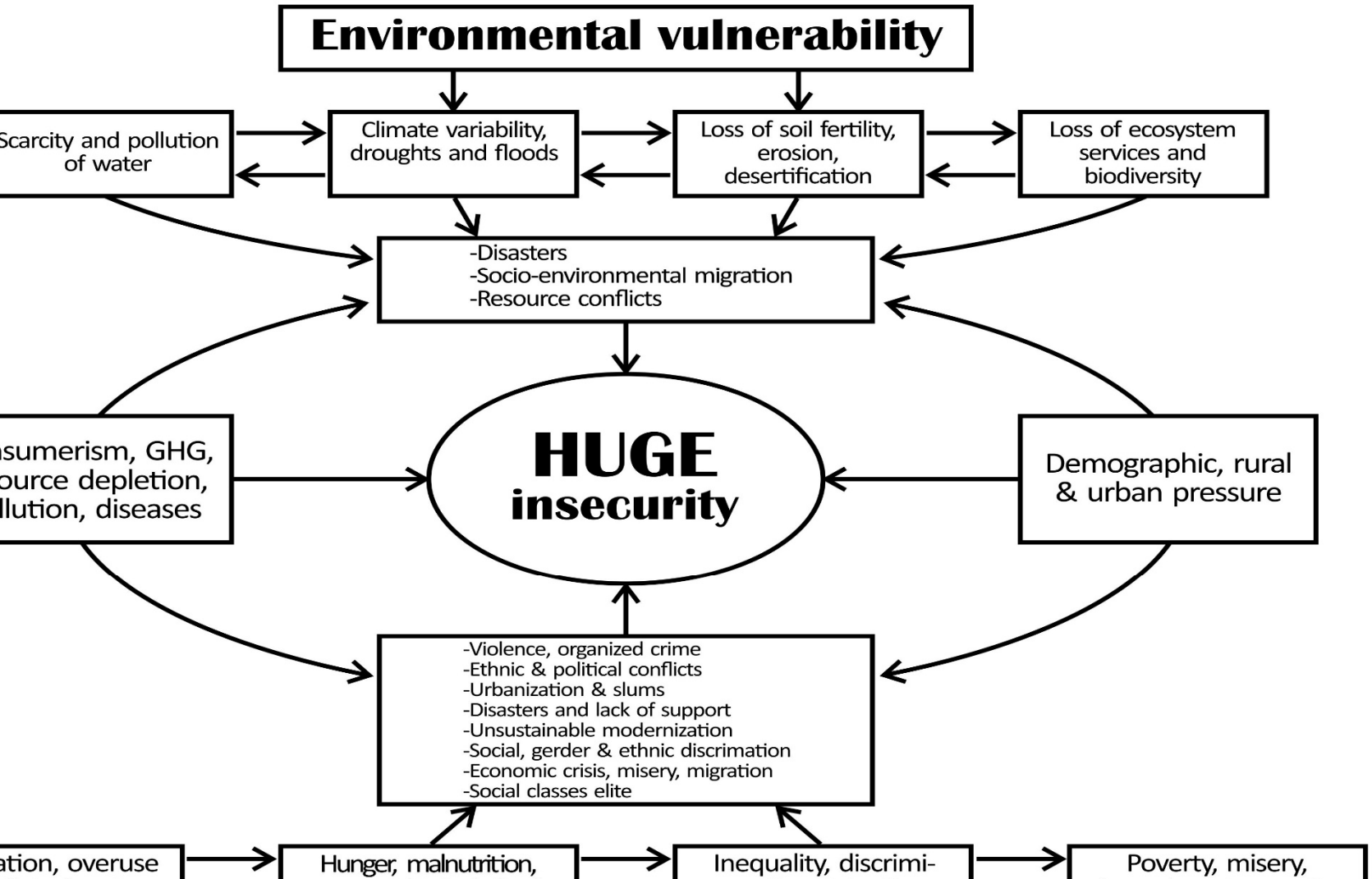
Educational backwardness



Complex factors & levels of nvironmental induced migration



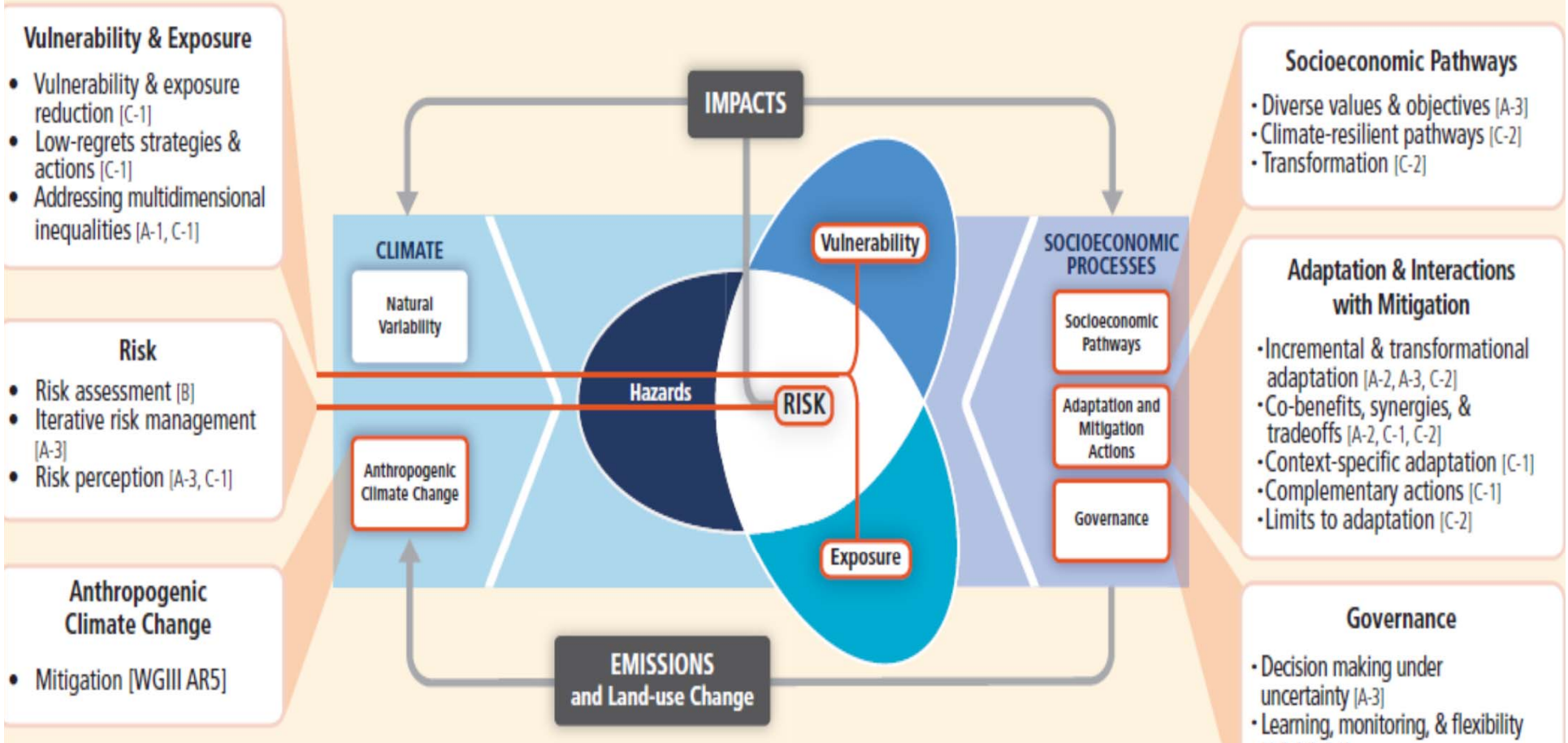
Dual vulnerability




mate-smart agriculture and
tershed management in the
utepec River

CLIMATE-SMAR
Agricultu
2015

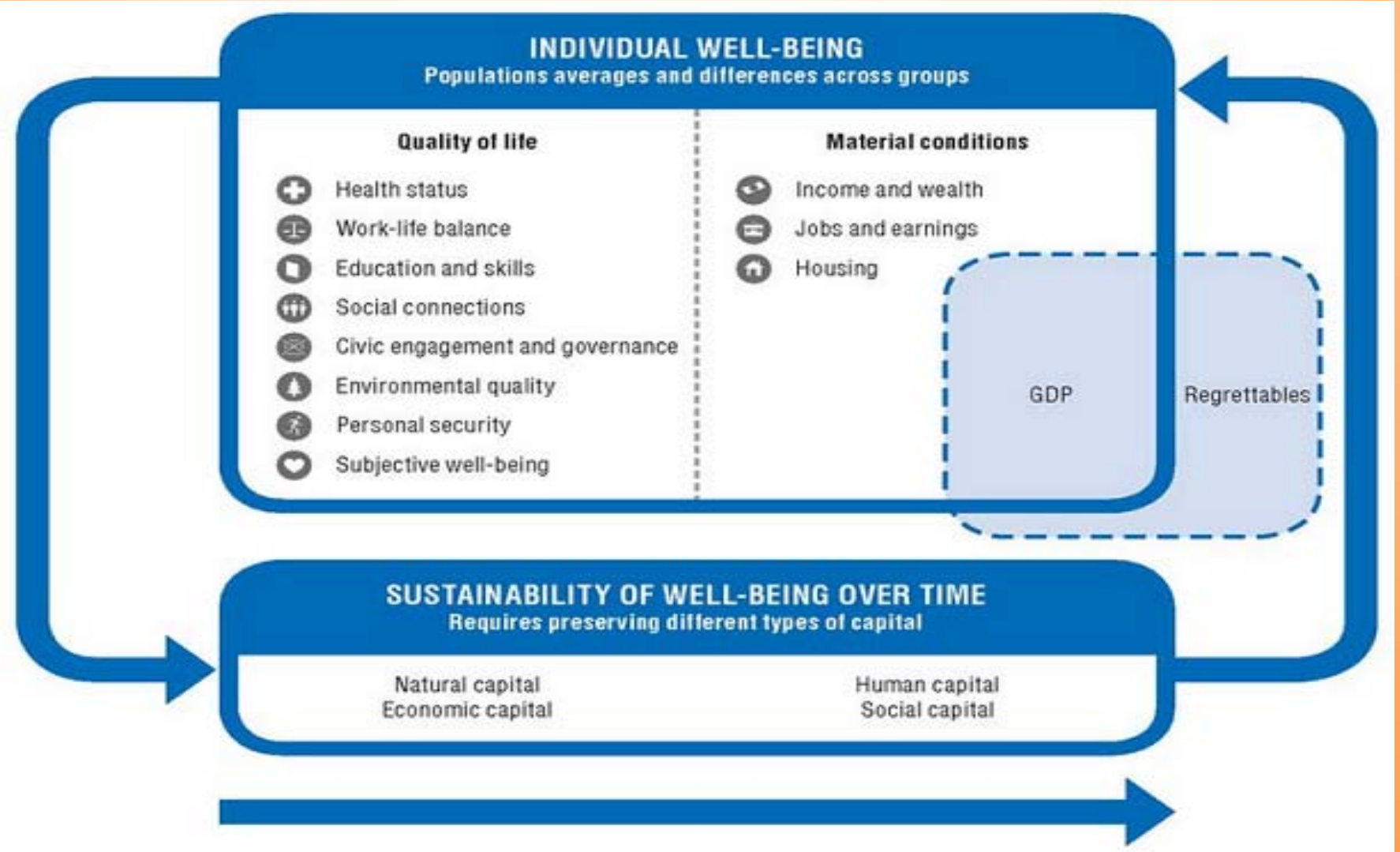
Integration of epistemic communities (IPCC: 26)



CLIMATE-SMART Agriculture 2015

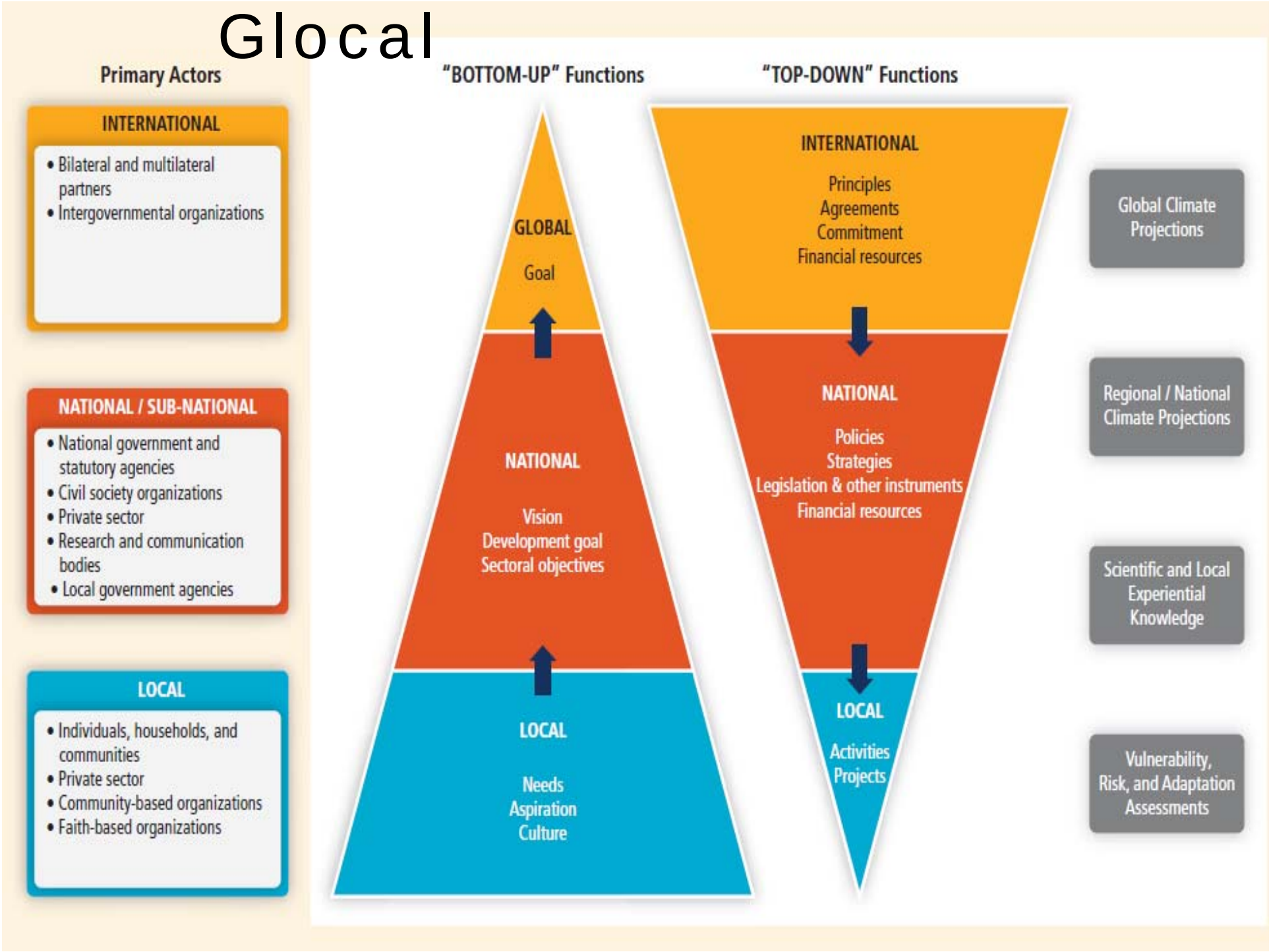
OECD wellbeing conceptual framework

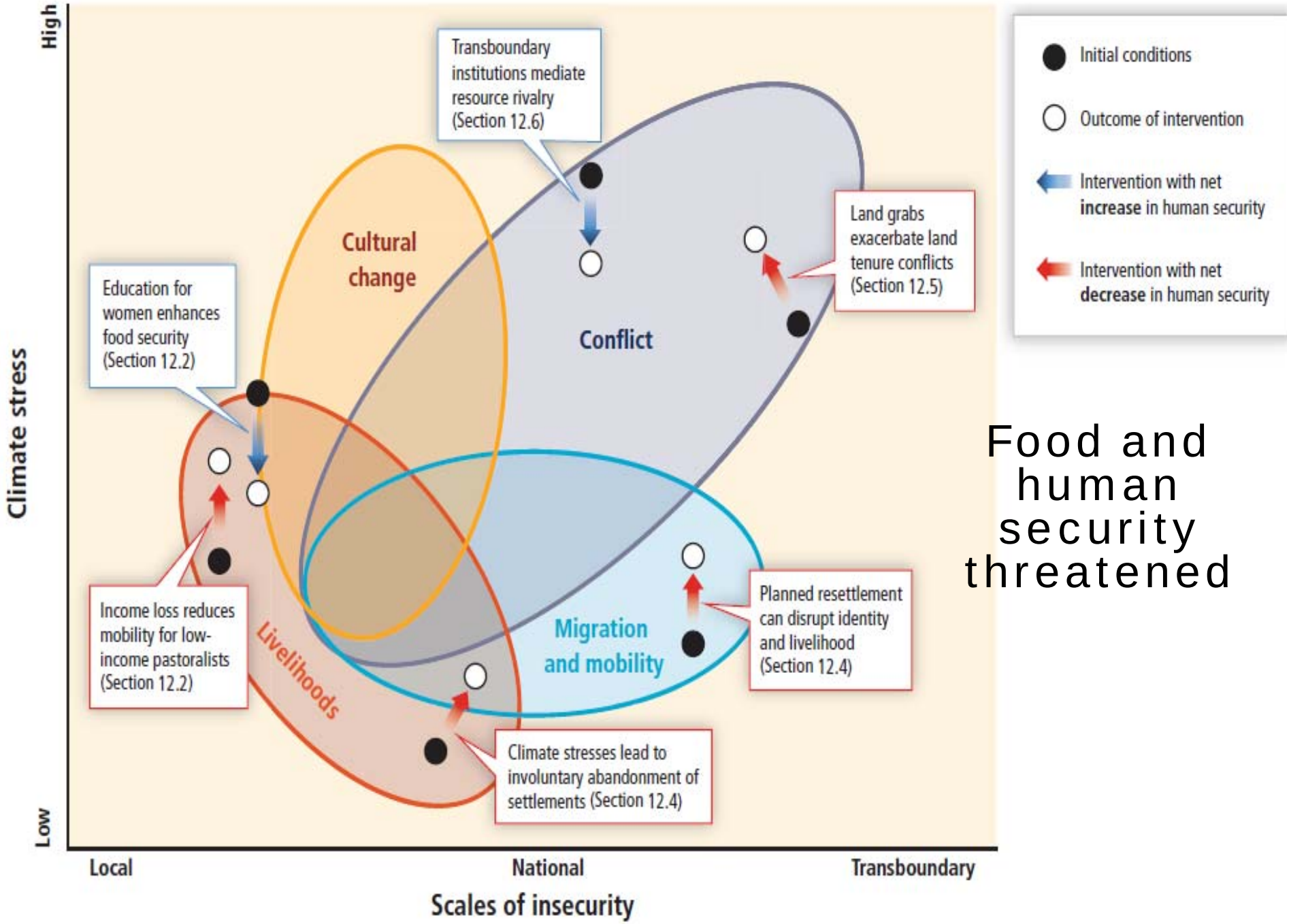
2013



CLIMATE-SMART Agriculture 2015

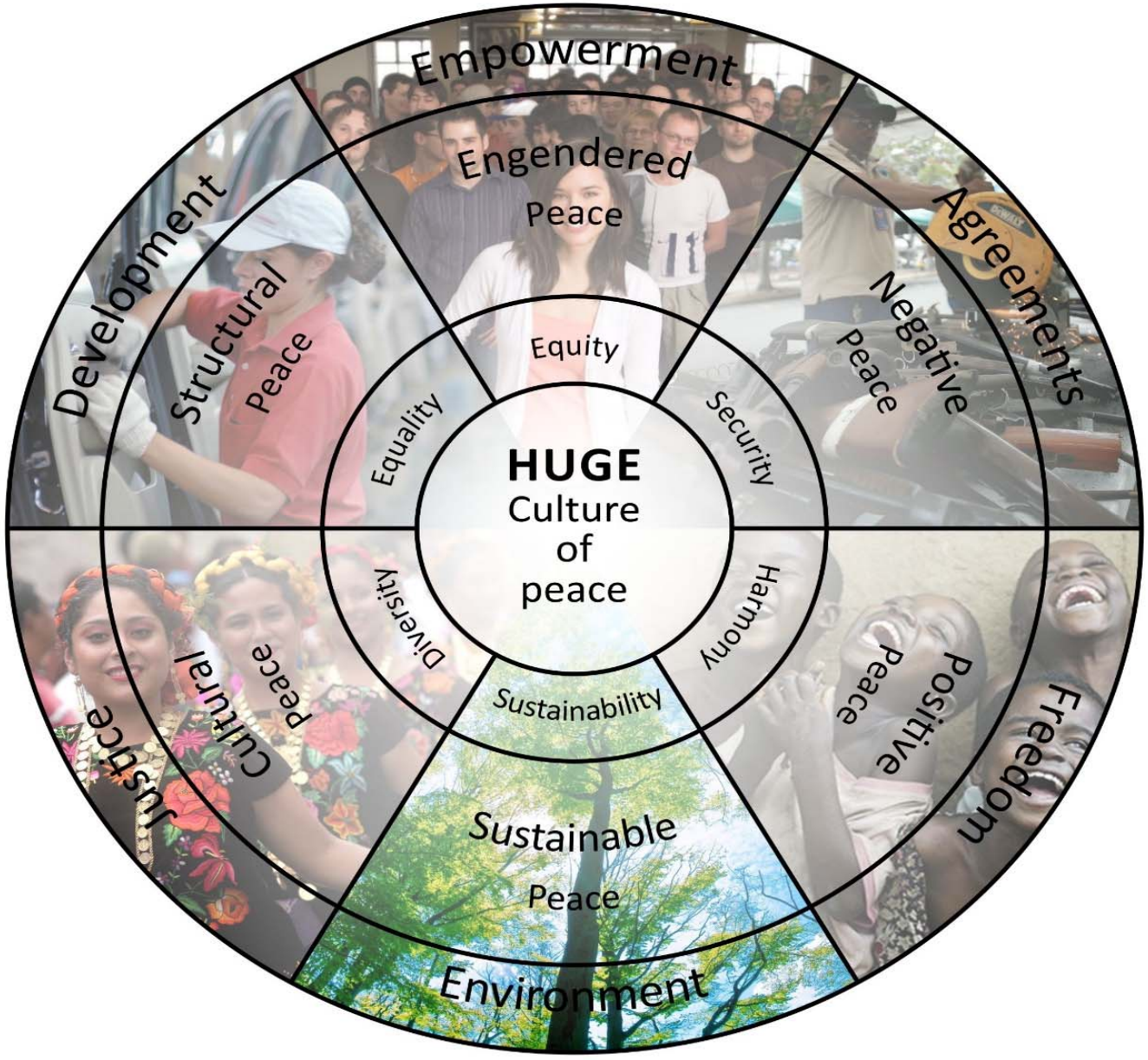
Glocal


Primary Actors
INTERNATIONAL
• Bilateral and multilateral partners
• Intergovernmental organizations
NATIONAL / SUB-NATIONAL
• National government and statutory agencies
• Civil society organizations
• Private sector
• Research and communication bodies
• Local government agencies
LOCAL
• Individuals, households, and communities
• Private sector
• Community-based organizations
• Faith-based organizations
"BOTTOM-UP" Functions
GLOBAL
Goal
NATIONAL
Vision
Development goal
Sectoral objectives
LOCAL
Needs
Aspiration
Culture
"TOP-DOWN" Functions
INTERNATIONAL
Principles
Agreements
Commitment
Financial resources
NATIONAL
Policies
Strategies
Legislation & other instruments
Financial resources
LOCAL
Activities
Projects
Global Climate Projections
Regional / National Climate Projections
Scientific and Local Experiential Knowledge
Vulnerability, Risk, and Adaptation Assessments

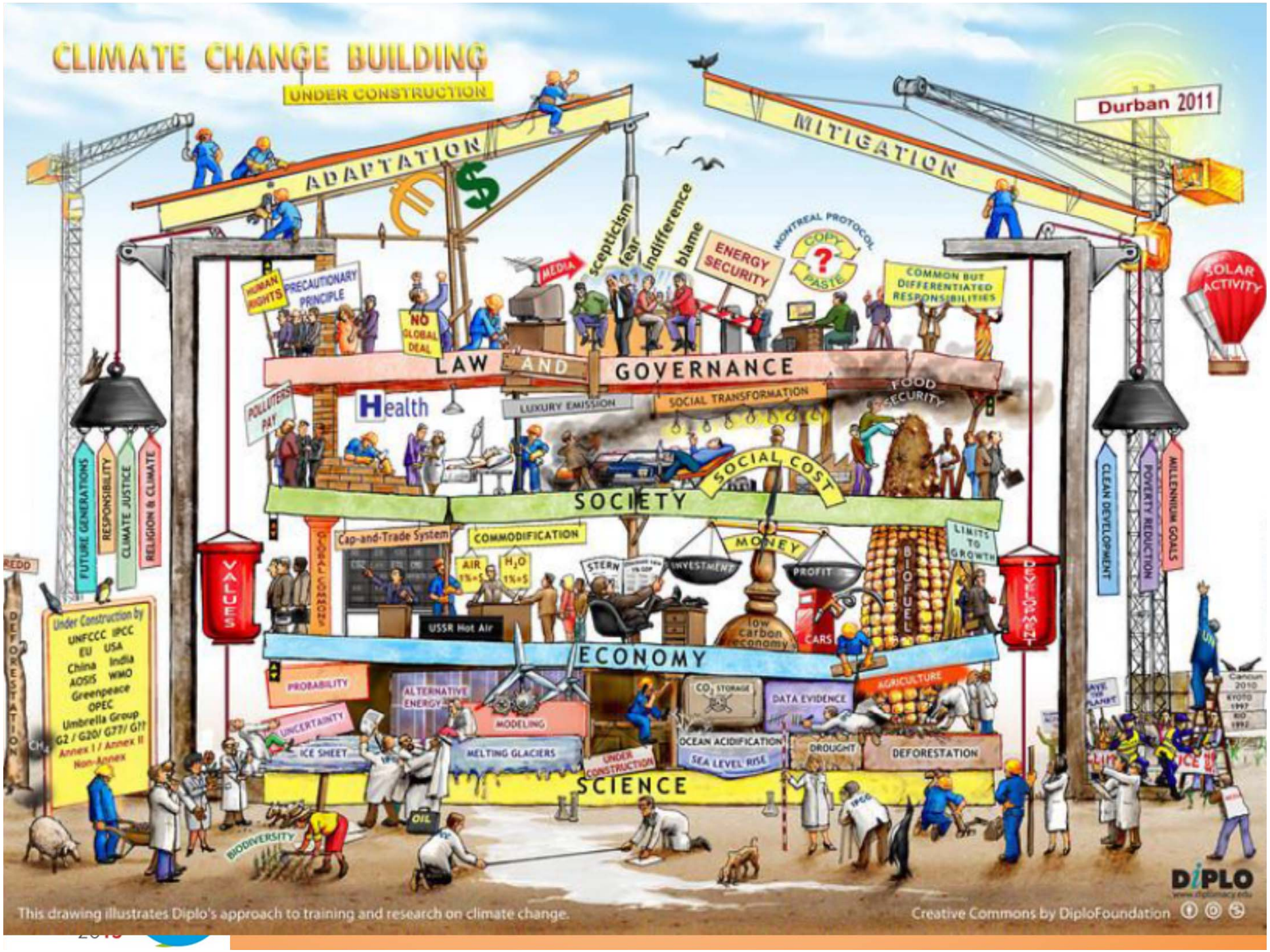


Food and human security threatened

Glocal integrated management



CLIMATE-SMART Agriculture 2015


CLIMATE CHANGE BUILDING
UNDER CONSTRUCTION
Durban 2011
ADAPTATION
MITIGATION
scepticism
fear
indifference
blame
MEDIA
ENERGY SECURITY
MONTREAL PROTOCOL
COPY
?
PASTE
HUMAN RIGHTS
PRECAUTIONARY PRINCIPLE
NO GLOBAL DEAL
COMMON BUT DIFFERENTIATED RESPONSIBILITIES
SOLAR ACTIVITY
LAW AND GOVERNANCE
POLLUTERS PAY
Health
LUXURY EMISSION
SOCIAL TRANSFORMATION
FOOD SECURITY
SOCIAL COST
SOCIETY
FUTURE GENERATIONS
RESPONSIBILITY
CLIMATE JUSTICE
RELIGION & CLIMATE
CLEAN DEVELOPMENT
POVERTY REDUCTION
MILLENNIUM GOALS
Cap-and-Trade System
COMMODIFICATION
AIR
H_2O
STERN
INVESTMENT
MONEY
PROFIT
LIMITS TO GROWTH
VALUES
USSR Hot Air
low carbon economy
CARS
ECONOMY
PROBABILITY
ALTERNATIVE ENERGY
UNCERTAINTY
MODELING
ICE SHEET
MELTING GLACIERS
UNDER CONSTRUCTION
CO_2 STORAGE
DATA EVIDENCE
AGRICULTURE
OCEAN ACIDIFICATION
SEA LEVEL RISE
DROUGHT
DEFORESTATION
SCIENCE
REDD
DEFORESTATION
Under Construction by
UNFCCC IPCC
EU USA
China India
AOSIS WMO
Greenpeace
OPEC
Umbrella Group
G2 / G20/ G77/ G77
Annex I / Annex II
Non-Annex
BIODIVERSITY
OIL
DIPLO
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