

Local vulnerability of agro-environmental processes facing climate change.

Mexican adaptation agendas

Pablo Torres-Lima
and
Lucero Sánchez-Ascencio
ptorres@correo.xoc.uam.mx



Introduction

Comprehensive assessment concerning the vulnerability of agro-environmental processes including agricultural production systems must refer to different temporal and spatial scales, as well as diverse levels of theoretical and methodological understanding. Agro-environmental vulnerability to climate change, understood as a function of biophysical and socio-economic variables and varying factors that comprise agricultural activities must offer the possibility of conceptual definition within a spatially determined typology, particularly in relation to the fundamental attribute of vulnerability itself, which consists of adaptive capacity.

Regional vulnerability and adaptative capacities

In Mexico, most agricultural and forestry systems are critically dependent on climate. It is estimated that the annual mean temperature for 2060 will increase between 1.1 and 3° C where as the average precipitation decrease from -3 to -15%, according to the GCM model. Because the varied topography in Mexico imposes climatic differences in different regions of the country, it is estimated that there will be a decrease in arable land and crop yields due to climate change, implying challenges to alleviating poverty and to ensuring the food supply and well-being of local and regional populations. It is considered that a 10% reduction in crop productivity will cause an additional 2% of emigration population rate to the United States. This means that as a result of the decline in agricultural production for the year 2080, climate change alone will result in the emigration of between 1.4 and 6.7 millions of Mexicans, representing from 2% to 10% of the current population within the age range of 15-65 years. In terms of public policy for adaptation to climate change in the Latin American region, the greatest benefits are likely to be generated by research and development on regional agro-environmental processes. There are also likely to be benefits from research to improve understanding and prediction of climate change and its impacts, including the local changes in hazard exposure caused by climate change, the geographic and spatial distribution of vulnerability, as well as underlying socioeconomic factors, since there are differences in vulnerability and coping and adaptive capacities among Latin American countries (see Table 1).

Table 1. World risk report for selected Latin American countries (2012).

Rank	Country	World Risk Index (%)	Vulnerability ² (%)	Lack of coping capacities ³ (%)	Lack of adaptive capacities ⁴ (%)
7	Costa Rica	17.38	40.80	65.63	35.19
19	Chile	12.26	39.60	57.84	40.01
81	Colombia	6.89	49.80	76.89	42.76
94	México	6.39	46.15	71.59	43.12
97	Venezuela	6.13	46.62	74.59	41.84
110	Bolivia	5.13	57.13	80.34	47.43
124	Brazil	4.30	45.18	68.39	41.83
126	Uruguay	4.12	37.06	51.31	39.19
133	Argentina	3.80	39.82	61.56	35.84

Source: Based on Alliance Development Works, (2012). Focus: Environmental degradation and disasters. Alliance Development Works, United Nation University and The Nature Conservancy, Berlin.

¹The World Risk Index is calculated by combining the four individually calculated components of exposure, susceptibility, lack of coping capacities and lack of adaptive capacities.

²Vulnerability comprises the components of susceptibility, coping capacities and adaptive capacities

³Coping capacities depending on governance, disaster preparedness and early warning, medical services and social and material coverage.

⁴Adaptive capacities are relating to forth coming natural events, to climate change and to other challenges.

Agro-environmental agendas and climate change

It is estimated that the potential impact of climate change may reduce yields from irrigated wheat and rice by 15 to 30%, respectively. Maize production in Africa and Latin America for the year 2050 will be reduced by 10%, equating to 2 billion U.S. dollars per year. Methodological tools will be required to test the response of agricultural systems (at specific sites) to environmental factors (i.e. temperature increase and change in hydrological regimes) and the provision of inputs (i.e. nitrogen fertilization and biofertilization) as part of construction of models to indicate functional change at the regional level. Important research includes comparison studies of vulnerability assessments to identify best practices, development of protocols for future assessments, use of agreed-upon protocols across groups, sectors and places and improved documentation and systems for recording, sharing and evaluating results. In this sense, some agro-environmental agendas in Mexico facing regional vulnerability to climate change are presented in Table 2.

Table 2. Agro-environmental agendas in Mexico facing regional vulnerability to climate change

PRIORITY	ACTIONS	ISSUES
Agriculture	Agro - ecological practices, soil conservation, sustainable harvesting techniques, delivering organic crops without polluting. Water harvesting techniques, wetlands recovery, participatory watershed management, irrigation systems and breakwaters. Compare moisture conditions between months and seasons. Establish trees on agricultural land in order to regulate soil, water and air quality. Improve regional and global agriculture trade systems.	Water management
		Environmentally - friendly soil management practices
		Crop and grain production
		Agroforestry
		Coastal crop vulnerability
		Agroecological practices
		Floods
Emission of greenhouse gases	Use of renewable energy sources.	Agroforestry payments
		Agriculture's carbon footprint
		Avoid oil pollution
Local environmental risk	Vulnerability.	Coastal flood vulnerability
		Water vulnerability
		Habitat degradation and loss
		Floods
		Soil preservation
Biodiversity	Management of the conservation units through monitoring, control and scientific development.	Deforestation, Forest Degradation and regeneration
		Depletion of natural resources
		Payments for forest conservation
Ecosystems	Reduce climate vulnerability and build climate resilience	
		Water recharges.
		Adaptive land planning
		Efficient nutrient cycling

Source: Diverse references (see full text).

Conclusions

Latin American countries need to identify their current vulnerability and adaptation needs at national, regional and local levels with an urgent obligation to promoting sustainable approach to ecosystems and communities in terms of the design and development of policies of multi-sectoral adaptation and planning within their territories. This must meet the requirement to fortify institutional capacity and scientific research related to the implementation of relevant policies.

Relevant references

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