A Climate Risk Vulnerability Assessment for the Philippines

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AMIA PHILIPPINES

Overview

Climate change and variability continue to exert increasing pressure upon the agricultural sector of the Philippines. Therefore it is vital to identify and prioritise at a high resolution scale the municipalities and relevant crops that are most vulnerable to climate risks. Under the umbrella of the Department of Agriculture project "Adaptation and Mitigation Initiative in Agriculture" (AMIA) a climate risk vulnerability assessment for 10 selected provinces was conducted. The following presents the three key dimensions of vulnerability for the agricultural sector:

1. **Exposure:** The nature and degree to which a system is exposed to significant climate variations.
2. **Sensitivity:** The increase or decrease of climatic suitability of selected crops to changes in temperature and precipitation.
3. **Adaptive Capacity:** The ability of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies.

Exposure and sensitivity analysis are based on the assumption of a high emission scenario by 2050 (RCP 8.5) whereas the adaptive capacity component is derived from the most up-to date data mainly from 2015. The resulting vulnerability assessment enables evidence-based spatial targeting of agricultural extension and financial investment in areas most at risk or tailored to a specific hazard, crop or lack of adaptive capacity.

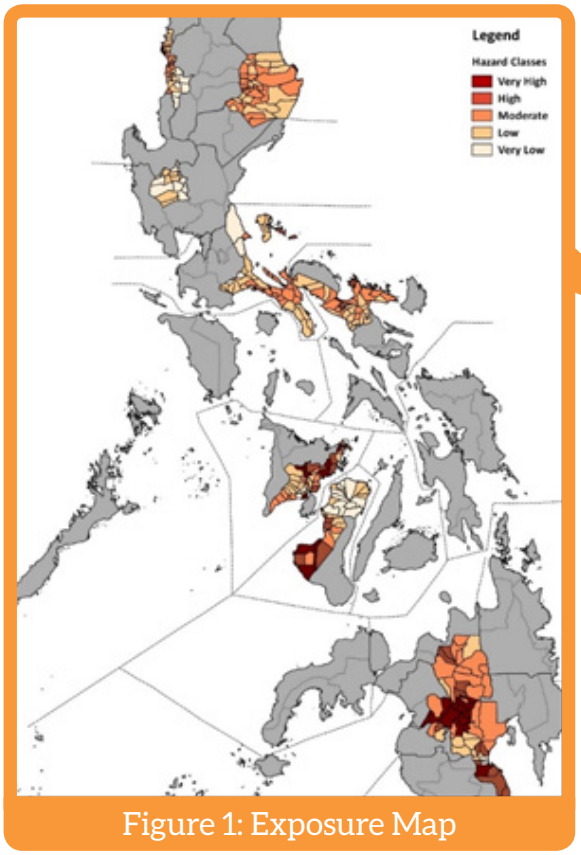

Figure 1: Exposure Map

Exposure Index

The exposure index is compiled by a range of relevant climate hazards for the Philippines, namely typhoon, storm surge, flood, drought, erosion, landslide, salt water intrusion and sea level rise.

The results of combining all these hazards show the relative highest risk in Central and Southern Mindanao, Negros Occidental and Iloilo. These regions account for an overall higher exposure risk index due to the combination of multiple and frequent climate hazards and secondary impacts in these regions, while Bicol and Isabela account for examples for the highest risk to typhoons.

Sensitivity Index

The sensitivity of crops to climate change was derived from changes in temperature and precipitation projected by an ensemble of 32 Global Circulation Models. Furthermore, current crop occurrence areas were mapped to understand the climatic niche of 20 bioclimatic variables modelled with MaxEnt, in cooperation with 10 State University and Colleges in each project region.

The modelled 11 crops included rice, corn, rubber, coffee, cacao, eggplant, tomato, napier, squash, banana and mango. When combining the layers of changes in suitability of all crops, high losses are projected in respective areas throughout the country. However, there are also opportunity areas appearing that are projected to become more beneficial for overall agricultural productivity, such as southwestern and northern and central Mindanao as well as coastal Isabela. Overall, Mindanao accounts for the highest gain of crop suitability.

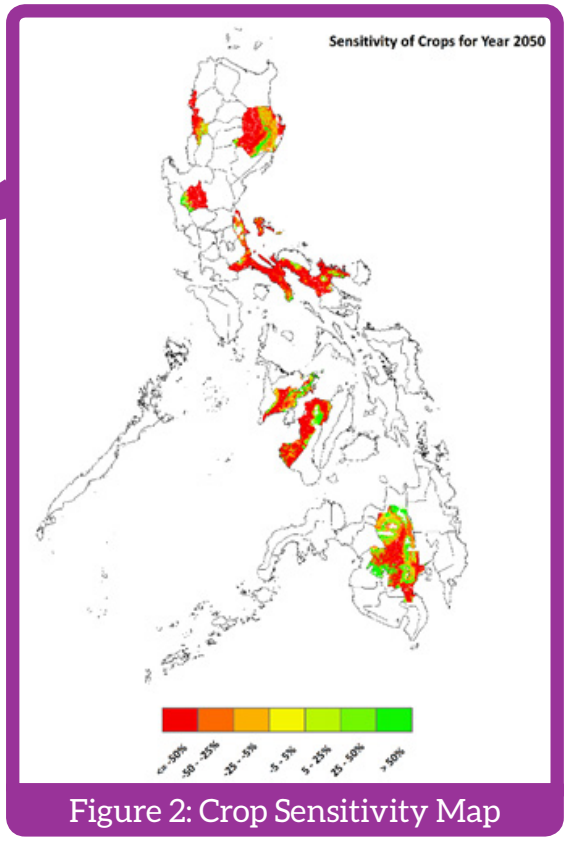

Figure 2: Crop Sensitivity Map

However, it is important to understand that the suitability assessment is always based on analysis compared to current conditions. A reduction in suitability does not mean that certain crops cannot be grown in the highlighted areas anymore, but that there will be less favourable climatic conditions in 2050 than today. This emphasizes the need for improved agricultural and natural resource management in order to maintain or increase yield.

Adaptive Capacity Index

The adaptive capacity index is compiled by a set of proxies: none of them alone can give a reliable statement of the level of adaptive capacity, but as an ensemble considering different capitals they become a powerful tool to understand how well and with which tangible and intangible assets a population can cope with climate change and variability.

Hence, a range of 16 indicators and various sub-indicators provide proxies for 5 relevant capitals to measure adaptive capacity: economic, natural, human, physical and institutional capital. While data availability is a driving factor in establishing the final index, the list of indicators in figure 4 is not restrictive but further socio-economic data can be added to have a better understanding of to what extent the population are able to cope with climate change and related risks.

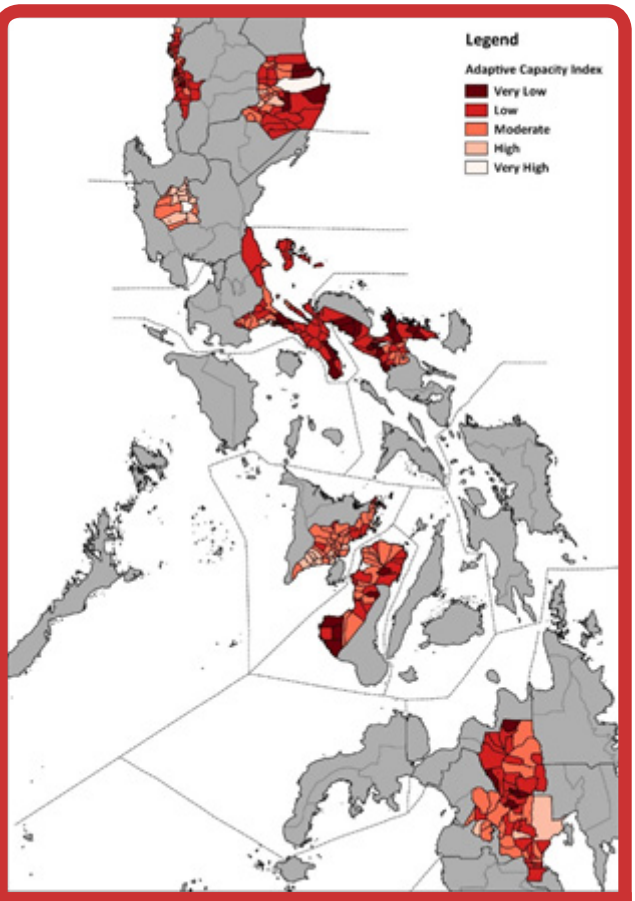

Figure 3: Adaptive Capacity Map

Results indicate various areas with a comparatively very low adaptive capacity, such as in Quezon, Camarines Sur, Negros Occidental as well as coastal areas in Isabela and Ilocos Sur. In contrast, municipalities in Tarlac and Iloilo display a higher adaptive capacity. Additionally, high adaptive capacity is predominantly accounted in larger cities, due to the extensive infrastructure as well as availability and access to resources and services.

Indicators	Sub-Indicator	Attribute Capital
Poverty		Economic
Inflation Rate		
Min. Wage (Agriculture)	Agri. Minimum Wage Non-Plantation; Agri. Minimum Wage Plantation	
Financial Institutions and Cooperatives	Total Banks & Financial Institutions; Number of Finance Cooperatives	
% of area irrigated		Natural
% of mangrove and forest		
Health	Ratio to Population: Public Health Services; Private Doctors; Private Health Services; Health Services Manpower; Public Doctors; Local Citizens with PhilHealth	Human
Education	Number of Secondary Schools (Public and Private); Ratio of Public School Teachers to Students	
Infrastructure Investment		Physical
Access to services	% of Household with Electricity Services and Water Services	
Infrastructure Network	Total Road Network; Road Density	
Number of Public Transport		
Telephone Companies and Mobile Services		
Number of DA Officers		Institutional
Buffer Stocks		
Presence of DRRMP		

Figure 4: Adaptive Capacity Indicators

Overall Vulnerability Index

The final climate risk vulnerability map for the year 2050 is an integration of the exposure, sensitivity and adaptive capacity components. The weighting of each of these indicators was discussed during expert workshops and resulted in 15% for exposure, 15% for sensitivity and 70% for adaptive capacity with sensitivity analysis for an equal weighting of 33% for each component being available.

Each of the ten target regions show municipalities that are particularly vulnerable to climate risks. As this assessment focusses on the agricultural sector, urban areas appear throughout the country as comparatively less vulnerable than rural areas.

Given the nature of data collection and availability, currently the vulnerability is displayed on a high, municipality-level resolution. However, climate risks and vulnerability of communities and ecosystem services do not have administrative boundaries. Thus the created municipality-level maps can be used to take the analysis a step further and assess vulnerability to climate change and sensitivity on a landscape dimension.

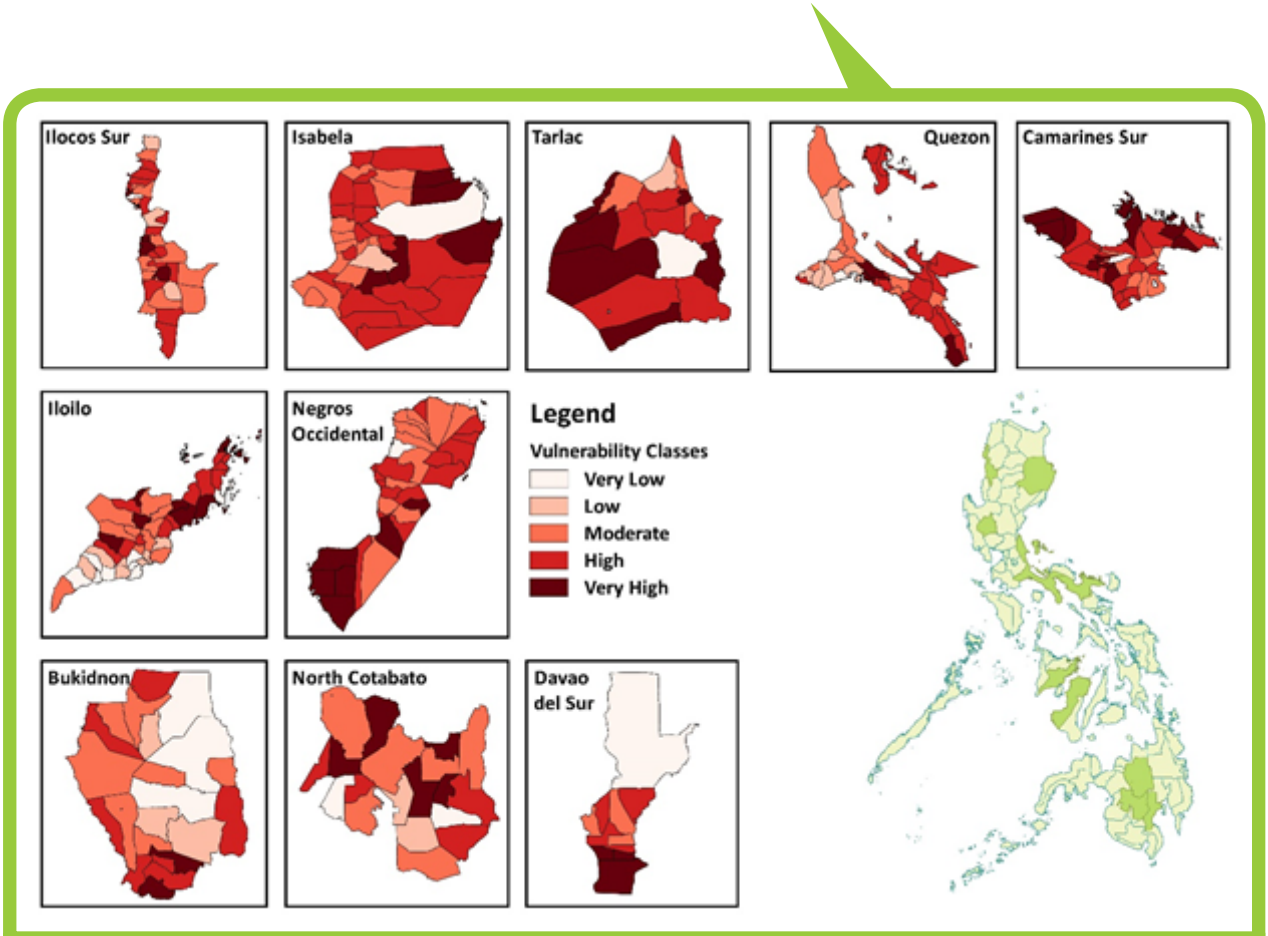

Figure 5: Final Vulnerability Map for 10 Selected Provinces

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