Moving Away from False-Positive Climate Risk Assessments

This article is the first in the Risk Watch series of blogs by CSTEP, which examines the lacunae in the current ways of assessing climate risks.

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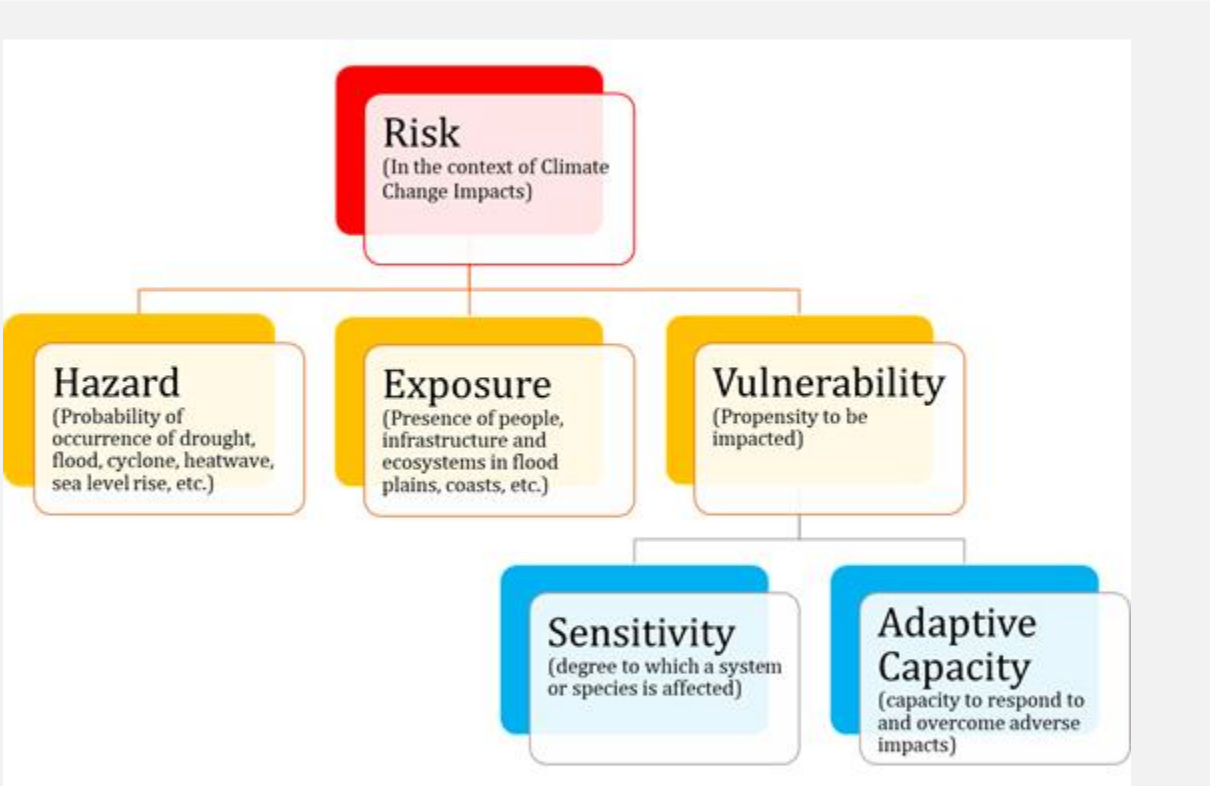
Nine months into 2021, and India, a country with a population of about 1.4 billion has already experienced two devastating cyclones, searing heatwaves, and disastrous floods resulting in the loss of hundreds of lives and destruction of crops and property. The sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC), released recently, warns that there is more to come.

Risk and climate change risk assessments

In the context of climate change impacts, risks result from the dynamic interactions between climate-related hazards, exposure, and vulnerability of the affected population or ecological system.



Components of Climate Risk (IPCC 2014)

Globally, practitioners have been using two fundamental types of assessments to gauge and report the extent of potential climate change impacts that systems are likely to face. They are:

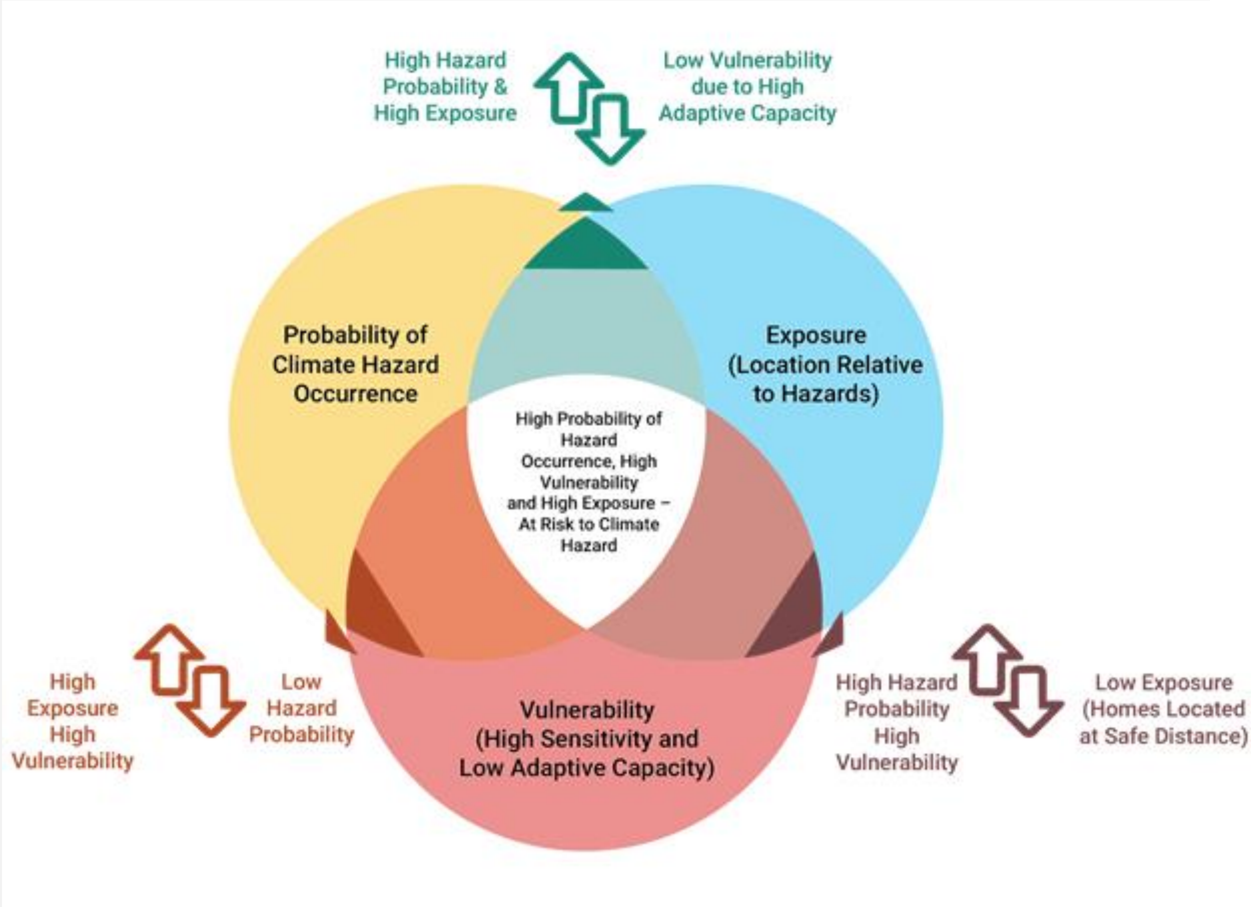
a. Downscaling of climate model outputs to map the future climate, as well as the possible climate hazards (top-down approach) — identify which regions (at different scales) will be impacted; and

b. Vulnerability assessments to estimate the inherent state of a system (bottom-up approach) — to identify regions, communities, infrastructure, ecosystems, etc., that are sensitive to climate variability and change or lack the capacity to respond and adapt to potentially adverse impacts.

The risk of false positives

Such studies report the assessed climate hazards and vulnerabilities as "risk", using the term in a generic way to describe "something bad that may happen in future" or as a substitute for the probability of occurrence of a hazard. This is not consistent with how IPCC defines "risk", which is — "potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems". While the top-down approach accounts for the probability of occurrence of a hazard, it excludes the consequences of the hazard on human or ecological systems; and in the bottom-up approach, it is vice versa. Therefore, in studies that use either one of these approaches (separately), the results should not be described as "risks".

Let us consider a hypothetical example of sea-level rise and risk from coastal flooding to human settlements. If the two approaches are adopted separately, then either the probability of occurrence of coastal flooding due to sea-level rise (hazard mapping) or the vulnerability of coastal communities will be assessed. If the term "risk" is used to describe the results, the following three "false-positive" risk scenarios may emerge: there is (i) high probability of sea-level rise, and thus of flooding and high exposure of communities (houses within projected flood zones), but no vulnerability (resource-rich and technologically-advanced communities); (ii) high probability of flood occurrence and high vulnerability, but no exposure (homes are located at a safe distance from the coast); (iii) high vulnerability and high exposure, but no probability of flood occurrence.



Integrated approaches for accuracy

Risk is measured as a function of three variables:

Risk= ƒ (Hazard ×Exposure ×Vulnerability)

Though the three scenarios above bring on a sense of danger, they do not actually capture the true climate risk to coastal settlements, as they do not account for all the variables.

Therefore, the climate risk to communities should be measured by aggregating the results of top-down and bottom-up approaches to identify communities living on coasts (exposure) that are more likely to experience flooding due to sea-level rise (hazard) and lack protective infrastructure or risk-mitigating measures (vulnerability).

Another drawback of adopting stand-alone approaches is that they fail to consider the interdependencies between various sectors. These interdependencies can exponentially multiply the risk from climate hazards and create cascading impacts. For example, OECD modelled the potential impacts of a major flood in Paris and found that 35% to 85% of business losses were caused not by the flood itself, but by the disruption of transportation and electricity supply.

Hence, it is essential to profile climate risk accurately in order to devise appropriate climate risk management strategies.

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