Impacts of Climate Change on Water Resources and Agriculture in Sri Lanka:

Vulnerability Hot Spots and Options for Adaptation

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There is ample evidence to suggest that Sri Lanka's climate has already changed. During the period 1961-1990, the country's mean air temperature increased by 0.016 ^{0}C per year (Chandrapala 1996a), and mean annual precipitation decreased by 144 millimeters (mm) (7%) compared to the period 1931-1960 (Chandrapala 1996b; Jayatillake et al. 2005). However, the bigger question of national importance is what Sri Lanka's climate will look like in 50 or 100 years and how prepared the country is to face it. Few studies attempted to project future climate scenarios for Sri Lanka and to identify climate change impacts on agriculture, water resources, the sea level, the plantation sector, the economy and health. Even the studies that have been carried out appear to have contradictory projections, especially with respect to future rainfall.

A recent review by IWMI on the status of climate change research/activities in Sri Lanka suggests that Sri Lanka's mean temperature may increase by about 0.9-4^0 C, over the baseline (1961-1990), by the year 2100 with accompanying changes in the quantity and spatial distribution of rainfall. These changes may lead to an increase in the *Maha* (wet) season irrigation water requirement for paddy by 13-23% by 2050 compared to that of 1961-1990 (De Silva et al. 2007). Future projections on coconut yield suggest that production after 2040 may not be sufficient to cater to local consumption (Peiris et al. 2004), and a reduction in the monthly rainfall by 100 mm could reduce productivity by 30-80 kilograms of 'made' tea per hectare (Wijeratne et al. 2007), thus impacting the country's exports.

Agricultural vulnerability hot spots

This study also attempts to identify the country's agricultural vulnerability hot spots, as well as identify existing knowledge gaps. It developed a pilot level Climate Change Vulnerability Index consisting of three subindices (Exposure, Sensitivity and Adaptive Capacity), which was subsequently mapped at a district level. Typically, a complete measure of exposure to future climate change would require consideration of projected changes in climate in each analysis unit. However, given the existing ambiguity in climate change projections for Sri Lanka, this assessment relies on data on exposure to historical climate extremes, since it is likely that this vulnerability will only increase under future climatic conditions.

The maps indicate that typical farming districts such as Nuwara Eliya, Badulla, Moneragala, Ratnapura and Anuradhapura are more sensitive to climate change than the rest of the country due to their heavy reliance on primary agriculture. Coupled with their low infrastructural and socioeconomic assets (or low adaptive capacity), and high level of exposure to historical climate extremes, these areas are the most vulnerable to adverse impacts of climate change (Figure 1).

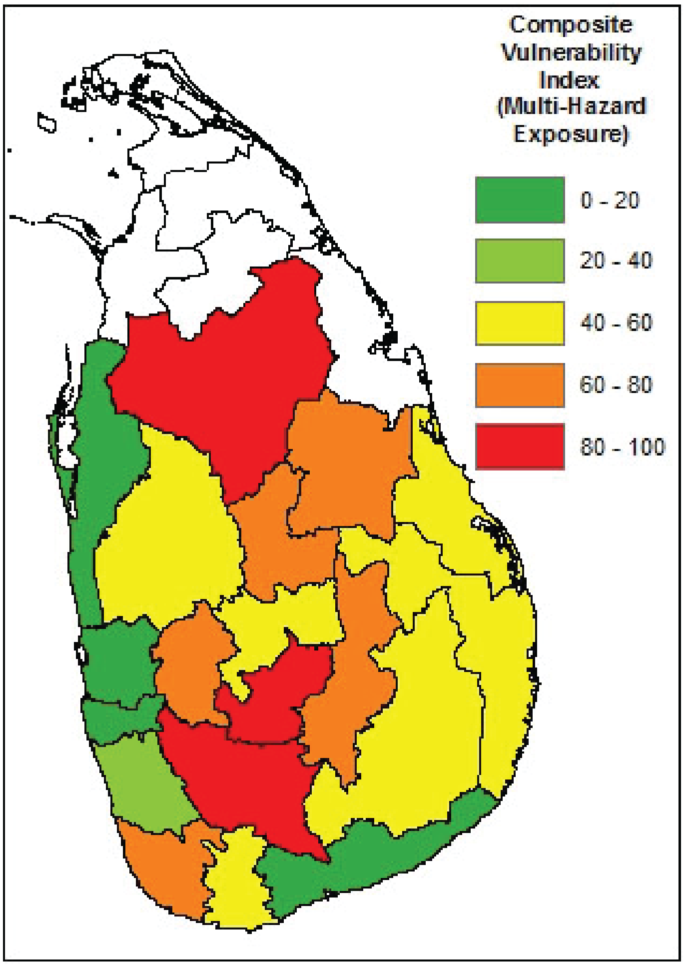

Figure 1. Climate change vulnerability index by district in Sri Lanka, considering each district's exposure to historical climate extremes, sensitivity and adaptive capacity.

Adaptation strategy and options

This study also points out that in the face of an uncertain climate, Sri Lanka needs to concentrate on "smart investments" and "no regrets" adaptation interventions that simultaneously deliver climate resilience and address current development needs. Both, rainwater harvesting, and restoration of the ancient tank system of the country, are two such adaptation options against future challenges in the water resources and agriculture sectors. De Silva et al. (2007) suggest providing rainwater harvesting systems to all households in drought-prone areas, making it a prerequisite to receive drought relief. Development of sustainable groundwater, promotion and adoption of micro-irrigation technologies, wastewater reuse, increasing water use efficiency and change of allocation practices are other adaptation options under consideration in the water resources sector. Studies on crop adaptation are performed mainly by six research institutes in the country conducting research on rice, field crops, horticultural crops, tea, rubber and coconut. The Coast Conservation Department (CCD) is in the process of formulating a Climate Change Action Plan for adapting to sea-level rise. However, equally important is creating awareness among different stakeholders on vulnerabilities, impacts and adaptation options, as well as encouraging farmers to take individual or communal action to prepare for climate change. Apart from the above, reliable and detailed quality controlled climate scenarios and a comprehensive national study on river basin or district scale on the vulnerability of Sri Lanka's water resources and agriculture sectors to climate change are also urgently needed. This will give a better idea of the risks and benefits of climate change for strategic planning towards adaptation. It is equally important that such a study takes stock of Sri Lanka's present water resources in the form of a national water resources audit such as the prototype developed by IWMI, which is accessible at: idistest.iwmi.org:8080/slwa/.

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Providing rainwater harvesting systems (like the water storage tank pictured here) to households in drought-prone areas can help communities adapt to the challenges of future climate change.