Executive Summary

Economics of Desertification, Land Degradation and Drought in India

Vol I: Macroeconomic assessment of the costs of degradation in India

The Energy and Resources Institute

...towards global sustainable development

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Executive Summary of Volume-I

Land is a vital resource for producing food, preserving forests and biodiversity, facilitating the natural management of water systems and acting as a carbon store. Appropriate land management can protect and maximize these services for society. Conversely, desertification, along with climate change and the loss of biodiversity were identified as the greatest challenges to sustainable development during the 1992 Rio Earth Summit. The United Nations Convention to Combat Desertification (UNCCD) is one of 3 Rio Conventions which focuses upon Desertification, Land Degradation and Drought (DLDD).

In this study, we determine the costs of land degradation for the country. In addition, six case studies from the dry lands that encompass a range of land degradation causal processes and ecosystems have been carried out for the States of Gujarat, Uttarakhand, Madhya Pradesh, Andhra Pradesh, Uttar Pradesh and Rajasthan to determine the costs of degradation or the foregone benefits of those who are not benefitted by interventions to reduce land degradation-e.g. farmers lacking flap gates and sub-surface drainage to reduce salinity in the coastal rice fields of Andhra Pradesh. This report is divided into two volumes. The first volume introduces the problem and includes a literature review of DLDD in India and analyses the economic approaches used globally to estimate the costs of DLDD. This is followed by a macro-economic assessment of the costs of degradation for the country and an assessment of the costs of reclamation in 2030. Volume 2 discusses and summarises the results of the individual case studies. Here we highlight the results of the macro-economic study.

This study aims to carry out an economic analysis of some of these costs of land degradation in India. In India, the task is made more complex due to the close linkages between land degradation and livelihoods. Most existing efforts at assessing the economic cost of land degradation in the country have been limited to the loss of provisioning services in the case of agriculture though some more recent work has looked at provisioning, regulating and supporting (both direct and indirect) services in the case of forests. It is important to look beyond those directly affected by land degradation - a recent global study attempted to value land degradation using the TEV approach and found that only about 46% of the global cost of land degradation due to LUCC (land use/ cover change) is borne by land users while the remaining 54% is borne by consumers of ecosystem services off the farm (Nkonya et al 2016).[1]

We make an attempt in this study to take a wider perspective of land degradation. We cover two major aspects of land degradation- first, the cost of land degradation on a given land use, and second, the cost that arises when land moves from a more to a less productive (as measured by the Total Economic Value or TEV) use. In the first category, we look at losses within agriculture, forestry and rangelands, the sectors where arguably the costs of land degradation are felt the most. In the second category, we look at change within the official nine-category land use classification followed in India, as well as wetlands. The resulting costs of degradation are included in the Table below.

[1]Due to the limited number of available TEV values for different land uses in different eco systems, the study relied heavily on “transferring” the results from micro studies to national and regional and even to a global scale. This is meant not as a critique of the study but to highlight the severe limitations in assessing the costs of land degradation at any appreciable level of aggregation.

Costs of land degradation and land use change

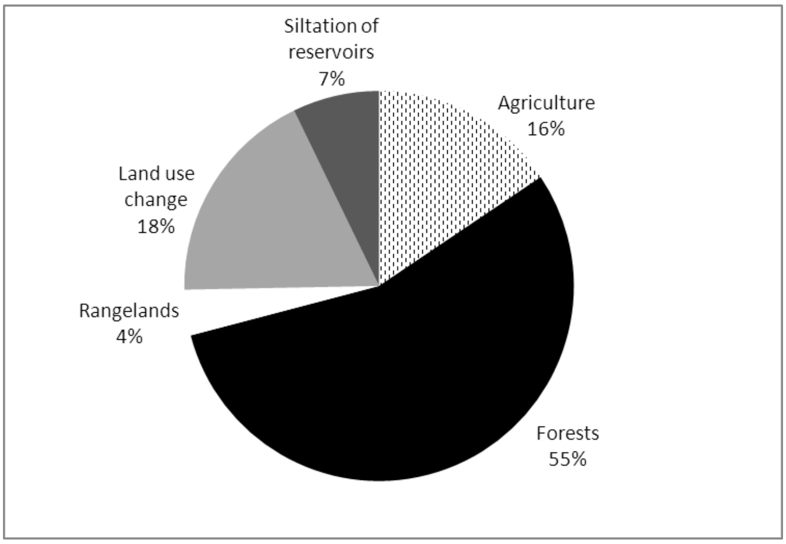
	Category	Economic cost		
		Value (Rs million in 2014/ 15 prices)	% of gross value added from agriculture and forestry (2014/ 15)	% of GDP (2014/ 15)
	Loss in agricultural production due to:			
1a	Water erosion			
	Onsite losses in rain-fed agriculture	208496	1.04	0.17
	Offsite losses	228585	1.15	0.18
1b	Sodic soils	162809	0.82	0.13
1c	Saline soils	86753	0.43	0.07
1d	Wind erosion	36675	0.18	0.03
1 (1a+1b+1c+1d)	Total agricultural loss	723319	3.63	0.58
2	Loss due to degradation of rangelands	120245	0.60	0.10
3	Loss due to forest degradation	1758574	8.81	1.41
4 (1+2+3)	Total due to land degradation	2602138	13.04	2.08
5	Loss due to land use/ cover change	575252	2.88	0.46
6 (4+5)	**Total cost of land degradation and land use change**	**3177390**	**15.92**	**2.54**

This cost is estimated at 2.5% of India's GDP in 2014/15 and about 15.9% of the GVA from the agriculture, forestry and fishing sectors. Almost 82% of the estimated cost is on account of land degradation and only 18% due to land use change (see Figure below). This result suggests that while loss of productive land for forests, wetlands, rangelands and other ecosystems is a concern, a larger concern is the degradation of existing ecosystems.

This is a serious concern particularly given that India aims to be land degradation-neutral in 2030, where any increases in land degradation are balanced by equivalent gains in land reclamation to ensure no additional net loss of land-based natural capital.

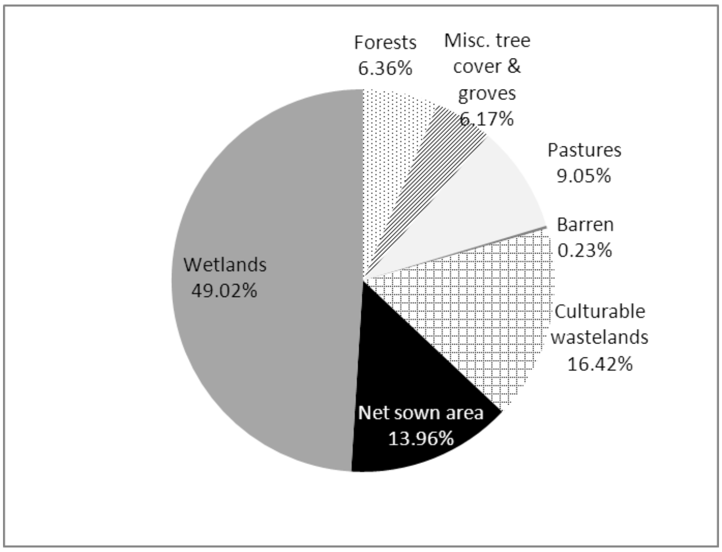
Also it can be seen that the distribution of the economic burden of losses due to different types of land degradation is different from the distribution of the physical extent of degradation itself. For instance, according to recent SAC (2016) figures, water erosion accounts for 37.4% of the total area affected by degradation, followed by vegetation degradation (30.4%), wind erosion (18.9%) and salinity (3.8%). However, ***in terms of the cost of land degradation and use change, the economic cost of forests degradation accounts for***

over 55% of the total, although in physical terms it ranks second in its contribution to India's degraded land area. This is on account of the higher cost per hectare of vegetal or forest degradation. ***In contrast, onsite and offsite losses due to water erosion account for about 14% of the total economic cost.***



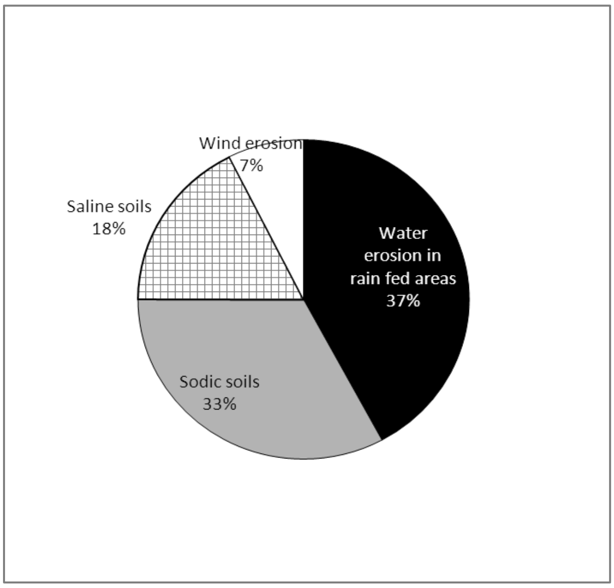
Distribution of the total costs of land degradation in India

The figure below gives the costs of land use change by category. The largest value is accounted for by wetlands followed by culturable wastelands, followed by pastures and forests. These losses are partly compensated by a gain in the value of land due to the increase in land area under fallow lands (not shown in the Figure).



Costs of land use change: distribution by category

Production losses due to agriculture alone are close to 4% of Gross Value Added (GVA) from the agriculture sector in 2014/ 15 at a very conservative level (See Fig. below) These are conservative figures since the losses have not been estimated for all crops (e.g. cash crops are not included in estimates of soil erosion), regions (e.g. water erosion has been estimated only for rain-fed agriculture), or degradation (e.g. losses due to water logging are not included). Given the scope of this exercise, we find that water erosion in rain-fed areas accounts for the majority share (37%), followed by losses due to sodic soils (33%), saline soils (18%) and wind erosion (7%).



Cost of productivity losses in agriculture: distribution by type of land degradation

Excluding wind erosion, which is concentrated in Rajasthan we find that Gujarat suffers the highest losses on account of land degradation (about 26% of the value of national losses) largely due to losses on account of alkalinity and salinity – it makes up for 34% and 61% of total agricultural losses in the country due to these two factors, while accounting for less than 5% of the losses due to water erosion. This is followed by Uttar Pradesh, which accounts for about 22% of the national losses due to agriculture, mostly because of alkalinity. The other states that have a high share of the value of all Indian crop loss due to degradation are Madhya Pradesh (about 8%), Karnataka and Maharashtra (7% each), and Andhra Pradesh (6%). Rajasthan accounts for about 3% of the losses due to water erosion in rain fed agriculture, salinity and alkalinity but all of the losses due to wind erosion included in this study are borne by the State.

Apart from providing an estimate of the costs of land degradation and land reclamation in the country, our study also flags some important issues. From a policy perspective, the study underscores the gravity of degradation as compared to land use change. Degradation accounts for 81.9% of the total costs of land use change and land degradation. The results underline the costs of forest loss and degradation to the economy, although this may be partly because of the high TEV values for forests in comparison with croplands. ***Overall, forest degradation accounts for 40% of the costs of land degradation in the country and forest loss and forest degradation together account for 56.6% of the total costs of land degradation and land use change in the country***. Therefore, any strategy to ensure that India becomes land degradation-neutral by 2030 must address the critical issue of reducing forest dependence for fuelwood, fodder and non-timber forest products.

Projections of land area that is likely to be degraded in 2030 under two different scenarios are estimated at 94.53 mha and 106.15 mha, respectively. In scenario 1, which is based on the reported estimates for 2003 and 2011 (SAC, 2016), the trend indicates a decrease in area affected by wind erosion and salinity, while area affected by water erosion, water logging and under open forests increase over time. In scenario 2, three distinct time points (1995, 2003 and 2011) with a gap of 8 years between each time point were considered for future projections. In scenario 2, degraded land that is saline and waterlogged is projected to decrease in the future. However, both wind and water erosion, two dominant causes of land degradation, in addition to the area under open forests are projected to increase.

That area affected by water erosion is projected to rise in both scenarios, suggests that India will need to strengthen her reclamation efforts in this area. In both scenarios considered, the area affected by salinity shows a decline, suggesting successful reclamation efforts.

Wind erosion and water logging show conflicting trends in the two scenarios. This difference is accounted for by the use of additional time series data in scenario 2. The addition of a mere data point alters the entire trend of land degradation. This underscores the need to maintain, accurate and consistent, longitudinal data to clarify the trends in land degradation in India. Without this, it is hard to assess the efficacy of on-going reclamation programmes, or to give successful policy prescriptions. Wind erosion is the third largest contributor to land degradation in India, but is either increasing or decreasing depending on the data used.

The overall observed and projected increase in land degradation in both scenarios clearly suggests that India needs to scale up reclamation efforts. This makes economic sense, since the ***annual*** costs of land degradation (Rs 3177 billion), outstrip the ***total*** costs of reclamation (Rs. 2948 billion in scenario 1 and Rs 3175 billion in scenario 2). If we take 2003, as the baseline year for setting the LDN target, our projections suggest that physical estimates of land degradation in the country outstrip this target in 2011 itself and keep increasing in 2030. To counter this, reclamation efforts will need to be scaled up, particularly for water erosion (in both scenarios), for wind erosion (in scenario 2) and for forests (in both scenarios).

Several definitional and measurement issues must also be addressed to get an accurate picture of the actual costs of land degradation in the country and prevent land mismanagement. Because of a lack of consensus of what constitutes a wasteland or the difference between degraded lands[2] and wastelands, estimates of land degradation for the country vary widely. For example, the Wasteland Atlas, the Atlas of Degraded Areas (ICAR-NAAS, 2010) and the recent Desertification and Land Degradation Atlas (SAC, 2016), provide different estimates due to definitional and other issues. This makes an effective assessment of the extent of land degradation or the costs of reclamation in the country imprecise and open to interpretation. Importantly, this also has policy implications since it fosters inappropriate land use and conversion to other land uses that might exacerbate land degradation. Greater clarity and convergence between agencies in reporting of land-use figures in India will contribute to effective governance of natural resources commensurate with their value, and promote rational policy and decision making.

[2], "land degradation refers to a, "reduction or loss of biological or economic productivity and complexity of rain-fed cropland, irrigated cropland or range, pasture, forests, & woodlands resulting from land use or from a process or combination of processes arising from human activities & habitation patterns."