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POLICY BRIEF - 52

Economic Loss of Forest Ecosystem Services and Policy Implications in Karnataka

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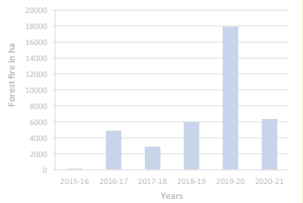

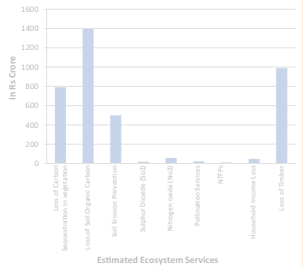

Introduction

Forest ecosystem services play an important role in human well-being. Examples of forest ecosystem services include provisioning services (food, water, and energy); regulating services (climate regulation, air purification, water conservation) and cultural services (aesthetic, recreation, and tourism), sometimes collectively referred to as natural capital. Therefore, a healthy forest and ecosystem have been maintained for a sustainable climate and livelihood for human beings as well as restoration of nature. Yet, continuing human activities and natural calamities often reduce the stock and flow of the forest ecosystem services (Kareksela et al., 2013). If the forest ecosystem goods and services fall below a certain threshold level, the natural capital stock and flow of services will change to a less favourable or non-functional state. Even a relatively small decline or damage to forest assets may add up to a significant loss across the landscape. The value of degradation or loss to the forest ecosystem services is often ignored in the economic decision-making process (Phillips et al., 2006). One of the main reasons is that most of the economic calculation is based on market prices. However, a few provisioning ecosystem goods and services selling in the market are incomplete (or) missing markets for regulating and cultural services. The reason for market failure is that most of the cultural services have public good characteristics (non-rival and non-excludability). Therefore, economic decision-makers have paid little attention to the value of forest ecosystem services. Hence, with a better understanding of the economic value generated by forest ecosystem services, effective policies can be framed for sustainable forest management at the local level.

Karnataka is endowed with a huge wealth of natural resources and biodiversity and is one of the most ecologically rich states in the Western Ghats region. Forests are a very important natural resource of the state covering an area of 38,575 sq km which is 20.11% of the state's geographical area (FSI, 2019). Karnataka forests provide several benefits to human beings. The direct tangible benefit includes non-timber forest produce and other life support ecosystem services. It also includes non-tangible benefits, for instance, many regulating ecosystem services like fresh air, water, and pollination services for agriculture production. In addition, climate regulation services, prevention of soil erosion, water conservation, disease regulation, pest regulation, natural hazard regulation, are of most importance for human survival and ecological sustainability. However, these aspects are often ignored in routine economic decision-making (Balasubramanian, 2019). This study has estimated the loss of forest ecosystem services due to man-made and natural calamities during last six years in Karnataka based on existing secondary data provided by Forest Department of the Government of Karnataka.

Loss and Degradation of Forest Ecosystem Services

The Food and Agriculture Organisation (2003) has defined forest degradation as "the long-term reduction of the overall potential supply of benefits from the forests, which include carbon, wood, biodiversity and other goods and services". Loss and degradation of forest ecosystem services have reduced their ability to provide sustainable essential services to human beings as well as nature. In addition, loss and degradation of the forest ecosystem challenge biodiversity, the livelihood of local communities, climate mitigation and adaptation loss of natural habitat. Further, there is an increased flood-related risk, freshwater shortage, and local climate change, especially when there is a loss of regulating forest ecosystem services. Loss and degradation of forest ecosystem services have an immediate impact on human wellbeing. The MEA (2005) framework offers a multi-dimensional perspective of human well-being, i.e freedom and choice, necessities for leading a good life, health, good social relations; security and concerning four ecosystem services categories like provisioning, regulating, cultural and supporting services (Balasubramanian and Sangha, 2021). Ecosystem services offer an integrated socio-economic and ecological view for better understanding the role of nature in human well-being. The loss and

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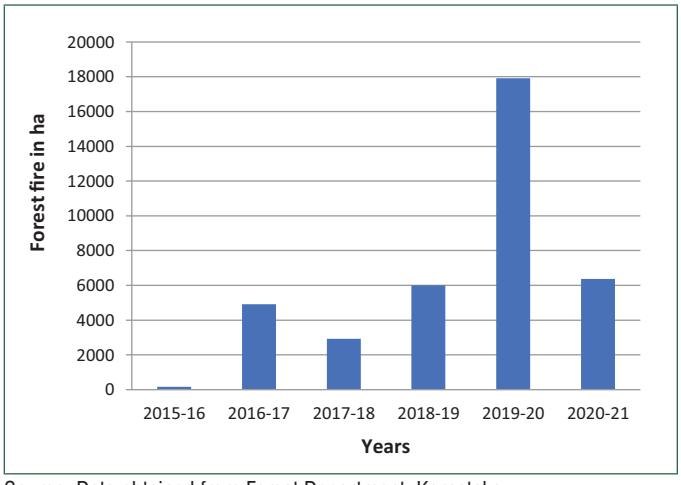
degradation of forest ecosystem services will negatively affect the poor who are most vulnerable in society, for example, subsistence farmers, the rural poor, and traditional societies. These groups face the immediate risks of any biodiversity and ecosystem services loss.

However, to consistently monitor the services, an assessment is needed for better management of natural capital through the System of Environmental-Economic Accounting (SEEA) framework. It will help to calculate the loss and damages related to the ecosystem goods and services for maintaining the stock of forest and natural capital assets (UN et al, 2012). So far, economic estimation of the loss and damage has focused only on the primary level in Karnataka. Therefore, this study has assessed the climate stress of the effects on forest ecosystem services and possible correlations and implications on the societal losses and damages based on existing secondary data from various line departments of Karnataka. Loss and degradation of forest ecosystem services remains a major socio-economic and ecological challenge in Karnataka. Various socio-economic factors determine the degradation of forests. For instance, natural factors such as flood, drought, forest fires, landslides etc., due to economic development, such as forest land conversion as non-forest land for irrigation, hydel & wind power projects, mining & quarrying, road, railway, transmission lines and others. Forest fires are another major issue that causes significant loss and degradation of ecosystem services. Forest fires have affected all types of ecosystem services such as provisioning, regulating and cultural services. For example, provisioning services provide benefits to local communities in the form of non-timber forest produce. Firstly, a forest fire may affect their income and consumption directly. In addition, cattle grazing and wildlife are affected (see fig 1). However, the lack of proper estimation on forest ecosystem services impacts on Karnataka, negatively disrupting the livelihood of a large population as these forest ecosystem services continue to be undervalued, or not valued at all. Therefore, the continuing loss and degradation of forest resources lead to loss of watershed values, loss of employment and economic opportunities, loss of biodiversity and ultimately, continue to cause air pollution and climate change in the future. Therefore, the present study has estimated the loss value of forest ecosystem services based on per hectare value through the various environmental valuation methods of Karnataka. For example, provisioning services based on local market price method with secondary data, regulating services such as carbon sequestration of both the above ground level and soil organic carbon based on the social cost of carbon, soil erosion prevention and air purification based on the benefit transfer method and this study has used various environmental valuation approaches for estimating the loss of forest ecosystem services in Karnataka.

Fig 1: Forest Fires in Karnataka from 2015-16 to 2020-21 (in ha)

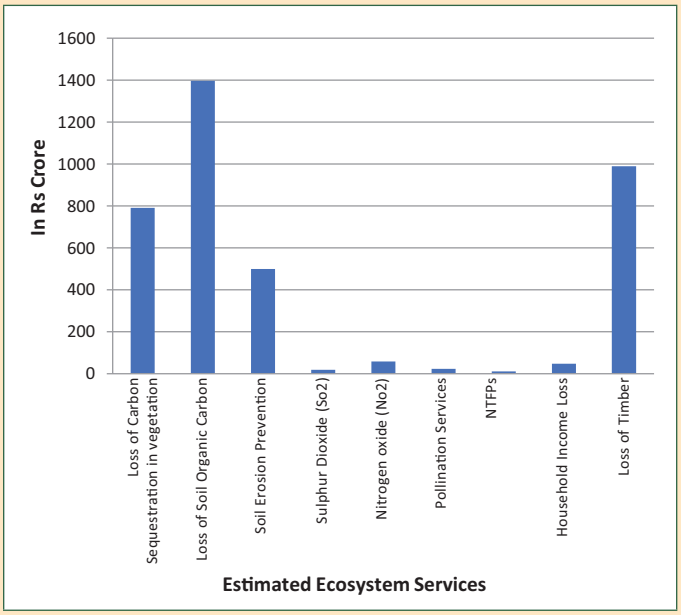


Source: Data obtained from Forest Department, Karnataka

Economic losses of Forest Ecosystem Services in Karnataka

The economic value of forest ecosystem services has been monitored and documented for major forest products based on the market price method in Karnataka. However, there is a lack of understanding of the full cost and benefits of forest ecosystem services. This reveals the unsustainable consumption and production of forest goods and services. Hence, not estimating the benefits or loss of forest ecosystem services may result in inadequate financial resources from the budget at the local level. Therefore, the allocation of resources or funds is inadequate for sustainable forest management at the state. In addition, forest ecosystem services are not able to maintain their regeneration capacity which is very important to human consumption and the maintenance of the ecological balance of nature itself due to manmade and natural disturbances to the forest ecosystem. Loss and degradation of the forest ecosystem have directly and indirectly affected the economy and society. For example, the Karnataka forest ecosystem services have incurred a loss to the tune of Rs 3831.28 crore during the last five years (Fig 2). The loss of forest ecosystem services is mainly due to forest land conversion for non-forest purposes followed by forest fires and other natural calamities in Karnataka. Due to forest loss and degradation, the loss value of carbon sequestration is estimated at Rs 1897.05 crore during the assessment period. Loss due to carbon sequestration in vegetation and soil is a major problem for the conservation of the ecosystem and biodiversity,

Fig 2: Economic Loss of Forest Ecosystem Services in Karnataka (In Rs Crore)



Source: Author's estimation based on secondary data

especially sustainable development, socio-economic impacts such as food insecurity, poverty, and inequality at the local level. In addition, the average mean temperature will increase depending on the rate of forest loss. Further, forest-dependents' income and livelihood will reduce.

This study estimates the loss of ecosystem services such as carbon sequestration in vegetation and soil, soil erosion prevention, air purification, Sulphur Dioxide (SO_2) and Nitrogen Oxide (NO_2), non-timber forest products, loss of household income of forest-dependent communities, pollination services and timber loss associated with the forestry sector in Karnataka. Provisioning services such as timber and non-timber forest products are direct contributions to the state's income and household economy. For example, the economic loss of timber production or timber provisioning services is estimated at Rs 988.73 crore during the assessment period. This study has used the System of Environmental-Economic Accounting Methodology (SEEA) for calculating the loss of standing timber based on the opening stock and closing stock of timber resources of Karnataka. Trees play an important role in reducing air pollution through the absorption capacity that depends on the size and other components. The loss of air purification value is estimated at Rs 18.26 crore (SO_2) and Rs 58.08 crore (NO_2) in Karnataka (See fig 2). Diminishing air purification services have a direct impact on the health of human beings and plants and cause damage to wildlife in the forest.

This study also estimates the loss of household income of forest-dependent communities based on a previous study by Balasubramanian (2020) and calculated the value of non-timber products collected from forests through the socio-economic survey of tribal communities in Karnataka. Non-timber forest products contribute 40 per cent to 50 per cent of household income per year. The average annual value (season) of non-timber forest products ranges from Rs 10,000 to Rs 12,000. This was estimated based on a primary survey in Karnataka. Therefore, this study has used this value for total loss in hectares multiplied by average household income from non-timber forest products. The loss of household income is estimated at Rs 47.44 crore during the assessment period. Loss or reducing income from non-timber forest products is a major issue for forest-dependent communities, especially food insecurity. One of the recent empirical studies found that non-timber forest products play a major role in tribal food security in Karnataka (Balasubramanian, 2021). Loss and degradation of the forest ecosystem is another challenge to Sustainable Development Goals (SDGs) in Karnataka, especially zero-hunger, good health, and well-being.

Policy Implications

In response to huge ecological deterioration, there is a lack of forest-related policies for the conservation of forest ecosystem services in Karnataka. Therefore, in the context of sustainable forest management as a policy interposition, ecosystem services loss compensation is put forward as one of the important tools. This study also suggested some policy instruments for forest ecosystem services loss compensation associated with five categories such as: i) mitigation, ii) calculating damages, iii) analysing compensation needs, iv) choosing compensation and v) evaluating and monitoring outcomes.

1. **Mitigation:** Mitigation, in the context of loss of forest ecosystem services, is reducing man-made disturbance to forest resources in terms of stock and flow. Calculating Damages: Estimating the loss and degradation of the forest ecosystem is the second step in the model. Most of the loss and degradation has not been accounted for due to the lack of market price of many ecosystem services. Analysing Compensation Needs: The third step is analysing compensation on where and how it is needed for the affected areas. Four components have been identified for this purpose: i) structure, ii) function, iii) services and iv) benefits of analysing components of loss of forest ecosystem services. An economic loss needs to be compensated fully or partially based on the direct assessment method. The final compensation should achieve socio-economic and environmental goals at the local level. Choosing compensation: Choosing compensation is one of the important steps in this model. For example, there are two components involved. The first is on-site and the second is off-site compensation. On-site compensation is based on higher risk affected areas. Off-site compensation is based on lower risk affected areas. Therefore, decision-makers need to have extra consideration for more vulnerable groups regarding compensation (environmental resources or money distribution). Equal and immediate compensation should be aimed at avoiding further forest degradation or deforestation. Evaluating and monitoring outcomes: As final steps in the model, evaluating and monitoring outcomes of post-project evaluation should compare the compensation outcomes - for example, how the compensation objectives are met.

2. **Payment for Ecosystem Services (PES)** is an economic instrument paying to local communities, landowners, forest dwellers to avoiding ecological loss in the context of present and future negative environmental externality especially in the forestry sector.

3. **Large scale ecological restoration programmes,** for example, different landscapes require separate forest ecosystem restoration projects such as i) ecosystem restoration programme for Western Ghats (natural regeneration), ii) ecosystem restoration for coastal and marine areas (Blue carbon storage), iii) riverine ecosystem restoration especially water bodies, lakes, river sides, iv) ecosystem restoration in landslide prone areas, v) ecological restoration for fire prone areas. Forest ecosystem restoration programmes will improve the socio-economic benefits of local communities as well as improve ecological services as sustainability perspective in Karnataka.

4. The economic cost of ecosystem services damages should be considered in the budget preparation such as Government of Karnataka's recently introduced **"Eco-Budget"** for fair compensation to negative externality, especially the forestry sector. The present eco-budget framework needs to be strengthened in two aspects such as sustainable finance and innovative technologies for achieving forest and sustainable development goals at the local level.

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Ecosystem Servcies Damaged

Source: Karnataka Forest Department

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