

Ecosystem Restoration Can Ensure Water, Food, Health, Livelihood Benefits—Lessons from the Western Ghats

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"The development goals need to be ecologically, economically, and socially sustainable, which can be achieved through the conservation and sustainable management of ecosystems. Sustainability implies the equilibrium between society and natural resources."

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Nature functions holistically! A great diversity of biotic species, including humans, has been associated with each other for long periods, and co-evolution is at the centre of all ecosystems. The individual cannot live independently of the living environment. Current human societies, however, have been overriding the integrity of ecosystems, shaking the very foundations of life itself to their detriment.

For the long-lasting well-being of communities, humans need to learn more about ecosystems. Humans form a part, assess their complexities and carrying capacity, and modify or derive resources from ecosystems without straining their ability to provide goods and services perpetually. Therefore, the development goals need to be ecologically, economically, and socially sustainable. This can be achieved through the conservation and sustainable management of ecosystems.

Sustainability implies the equilibrium between society and natural resources! Nowhere is this more evident than the Western Ghats in India, one of the 8 'hottest' biodiversity hotspots in the world.

Rich diversity of Western Ghats



A part of Western Ghats (Rahul Gaikwad/TOI, BCCL)

The Western Ghats (WG), a range of ancient hills extends from the tip of peninsular India at Kanyakumari to Gujarat. It runs parallel to India's west coast, covering an approximate area of 160,000 sq. km—less than 5% of India's geographical extent. In addition to being one of the 8 'hottest' hotspots of biodiversity, the WG is also among 36 global biodiversity hotspots with exceptional endemic flora and fauna.

Bestowed with enormous natural resource potential, the region is endowed with diverse ecological regions depending upon the altitude, latitude, rainfall, and soil characteristics. The natural forests of Western Ghats have been providing various goods and services and are endowed with a plethora of plant and animal species.

The rich biodiversity of WG includes, 4,600+ flowering plants (38% endemics), 330 butterflies (11% endemics), 156 reptiles (62% endemics), 508 birds (4% endemics), 120 mammals (12% endemics), 289 fishes (41% endemics) and 135 amphibians (75% endemics).

The fragile Western Ghats

The mandate of sustainable development based on the foundation of prudent management of ecosystems is, however, yet to be a reality in this region. Various developmental programmes, which proclaimed to be functioning on sustainability principles, have only been disrupting the complex web of life, impacting ecosystems,

and causing a decline in overall productivity, including four major sectors: forestry, fisheries, agriculture, and water.

The prevalence of barren hilltops, conversion of perennial streams to intermittent or seasonal streams, frequent floods and droughts, changes in water quality, soil erosion and sedimentation, a decline of endemic flora and fauna, etc. highlights some of the unplanned developmental activities, which occurred during the last century.

'Water Tower' of peninsular India



Aghanashini river.
(Ashwin Bhat)

Numerous streams originate in the Western Ghats, which drain millions of hectares. These water resources ensure water and food security for 245 million people and hence are aptly known as the 'water tower' of peninsular India.

Water sustenance in streams and rivers depends on the integrity of the catchment, as vegetation helps in retarding the velocity of water by allowing impoundment and recharging of groundwater through infiltration. Therefore, the water moves in the terrestrial ecosystem, part of it are percolated, while another fraction gets back to the atmosphere through evaporation and transpiration.

Forests with native vegetation act as a sponge by retaining and regulating water transfer between land and atmosphere. The mechanism by which vegetation controls flow regime is dependent on various bio-physiographic characteristics, including the type of vegetation, species composition, maturity, density, root density and depth, as well as hydro-climatic condition.

Moreover, roots of vegetation help in binding soil and improving soil structure by enhancing the stability of aggregates, which provide a habitat for diverse microfauna and flora. As a result, there is higher porosity of the soil, thereby creating the conduit for infiltration through the soil.

The vital role of native species



Sharavathi River
(Vinay S)

An undisturbed native forest has a consistent hydrologic regime with sustained flows during lean seasons. Native species of vegetation with the assemblage of diverse species help in recharging the groundwater, mitigate floods, and other hydro-ecological processes. Hence, it necessitates safeguarding and maintaining the existing native forest patches and restoring existing degraded lands. Such measures can sustain the hydrological regime, which caters to biotic (ecological and societal) demands.

An assessment in the Western Ghats reveals that streams in catchments with 60% vegetation of native species are perennial with higher soil moisture. The higher soil moisture due to water availability during all seasons facilitates farming of commercial crops with higher economic returns to the farmers.

In contrast, the catchments dominated by monoculture plantations lead to streams that are intermittent in nature. With water flow for just 6-8 months, farmers in such regions face water crises during the lean seasons. Further, catchments that have vegetation cover lower than 30%, streams tend to be seasonal with water for only 4 months during the monsoon period. Also, lower instances of COVID-19 in villages

with native forests highlights the role of ecosystems in maintaining the health of biota.

The need to maintain native vegetation in the catchment and its potential to support people's livelihood with water availability at local and regional levels is evident in research. In villages with perennial streams, farmers grow cash crops or up to three crops a year due to water availability, leading to yearly revenue of Rs.2,74,658 per hectare. In contrast, villages with intermittent streams and seasonal streams see farmers' annual revenue dropping to Rs. 1,50,679 per ha and Rs. 80,000 per ha respectively.

Also, the crop yield is higher in agriculture fields due to efficient pollination with the prevalence of diverse pollinators in the vicinity of native forests. Our study emphasizes the need for maintaining the natural flow regime and prudent management of watersheds as this can simultaneously help sustain higher faunal diversity, maintain the health of the water body and sustain people's livelihood with higher revenues.

Restoring the ecosystem



IISc mini forest
(Subhash Chandra N)

The recovery of an ecosystem with respect to its health, integrity and sustainability is evident from an initiative of planting (500 saplings of 49 native species) in a degraded landscape (dominated by invasive species) of two hectares in an institutional campus of Bengaluru in the early 1990s.

After efforts, the region has now transformed into a mini forest with numerous benefits such as improvements in groundwater at 3-6 m (compared to 30-40 m in 1990), moderated microclimate (with lower temperature) and numerous fauna (including four families of Slender Loris).

While confirming the linkages of hydrology, ecology, and biodiversity, the experiment advocates the need for integrated watershed approaches based on sound ecological and engineering protocols to sustain water and ensure water for all.

Hence, the premium should be towards conserving the forests with native species to sustain water and biotic diversity in the water bodies, which are vital for food security. There still exists a chance to restore the lost natural ecosystems through appropriate conservation and management practices to ensure adequate and clean water for all.

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