Western Ghats: Water Tower of Peninsular India and Precious Heritage for Posterity

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Water is one of the fundamental elements of the universe from which early life originated millions of years ago on earth. Every life on the earth is primarily dependent on water which hosts innumerable aquatic species from single cell creatures to gigantic blue whales. As the evolution of human took place, civilized human settled down on the fertile river banks. In other words, river basins are the motherhood for civilized human and most of the civilization around the world. These river or lake banks gave water for drinking and also for cropping along with mineral rich soil. Adequate and clean water plays a key role in the sustainable development of a region.

The Western Ghats sustains perennial rivers, while ensuring the peninsular India's water and food security and hence aptly branded as the water tower of peninsular India. These series of hills lies in the western part of peninsular India with undulating terrains running in the North-South direction for about 1600 km parallel to the Arabian Sea along the west coast from south of Gujarat to the end of the peninsula (8°- 21° N and. 73°- 78° E) with the spatial extent of about 1, 64,280 km^2 (< 5% of India's geographical area), is interrupted only by a 30 km break in Kerala, the Palghat Gap. Ghats have an average height of 900 m, with several cliffs rising over 1000 m. The Nilgiri Plateau to the north and Anamalais to the south of the Palghat Gap exceed 2000 m in many places and towards the eastern side the Ghats merge with the Deccan Plateau which gradually slopes towards the Bay of Bengal. This region, being the source of numerous rivers flowing towards the Arabian Sea and three major rivers, joined by many of their tributaries flow eastward, towards the Bay of Bengal, forms an important watershed for the entire peninsular India. The complex geography, altitudinal gradients, varied geology and lithology with wide variations in annual rainfall from 1000-6000 mm have contributed to a diversity of flora in the Western Ghats. Tropical evergreen forest is the natural climax vegetation of western slopes, which intercept the south-west monsoon winds. Vegetation changes rapidly from semi-evergreen to moist deciduous and dry deciduous kinds towards the rain-shadow region eastwards, and finally characteristic vegetation of the semi-arid Deccan region. These fragile ecosystems sustain the biosphere and are characterised by a range of functions: nutrient cycling, bio-geo chemical cycle, hydrologic cycling, etc. The ability of ecosystems to cope with various kinds of environmental disturbances that have the potential of adversely changing the character of the natural landscapes is often termed as ecological sensitivity of ecosystems. Anthropogenic activities have been impacting the hotspots of biodiversity with the irreversible changes in the structure of biological communities (evident in number/ composition of species and their relative abundances) and their natural habitats.

Western Ghats, one among 35 global biodiversity hotspots with the exceptional biodiversity of endemic flora and fauna: 4,600 species of flowering plants with 38% endemics, 330 butterflies with 11% endemics, 197 reptiles with 52% endemics, 529 birds with 4% endemics, 161 mammals with 9% endemics, 343 fishes with 31% endemics and 248 amphibians with 62% endemics. The Western Ghats

with increasing dry period northwards, exhibit a progressive decline in tree endemics from south to the north. Of the 318 tree species considered endemic, 85% occur at 8-10° N, which receive maximum of 8-10 months of rainfall. At 10-12 °N, the region has 71% endemics, 43% in 12-14 °N, 22% in 14-16 °N, 17% in 16-18 °N and only 9% tree endemics north of 18° (the locality with only 3-4 rainy months). In higher latitudes, more sensitive, hygrophilous species persist only in favourable pockets. The rich biodiversity coupled with higher endemism is due to the humid tropical climate, topographical and geological characteristics, and geographical isolation (Arabian Sea to the west and the semiarid Deccan Plateau to the east). The Western Ghats forms an important watershed for the entire peninsular India, being the source of numerous west flowing rivers and three major east flowing rivers and their numerous tributaries. These fragile ecosystems are extremely important for the existence of humankind from the point of productivity, revenue generation, employment potential and subsistence. Valuation of forest goods and services indicates the benefit of Rs 2 lakhs per hectare per year (provisioning goods) to 10 lakh (one million Rs.) per hectare per year (total economic value: provisioning, regulating, cultural and supporting services). Valuation of ecosystem goods and services is essential to frame, prioritise and justify sustainable development policies oriented towards the protection or restoration of ecosystem. In absence of the prudent ecosystem valuation, policy decisions have been lopsided in favor of environmentally degrading practices and neglect of social interests. This necessitates sustainable management of the landscape by considering ecological, hydrological, climatic, economic, and social perspectives.

Unplanned developmental activities coupled with the uncontrolled resource exploitations has stressed the resource availability and biodiversity, evident from barren hill tops, and the decline in quantity and duration of water flow in streams and rivers. Linkages of ecological functions (i.e regional hydrology, remediation, etc.) with landscape structure and composition necessitates conjoining of ecological principles in ensuring the quality and sustenance of natural resources, etc. For example, streams are perennial in the catchment dominated by native vegetation cover (>55%), and are seasonal when the vegetation cover is less than 35%, **which highlights the need for maintaining green cover of native species in the watershed to sustain water and people's livelihood**. Other benefits of maintaining native species vegetation cover are regulation of micro climate and the regional energy budgets, improving air quality, remediation of contaminants, arresting siltation, mitigation of landslides etc. Mismanagement of fragile ecosystems will have serious repercussions evident from the recent devastations in Kodagu and Kerala. Devastations in these regions were mainly due to deforestation (loss of 36% forest cover in Kerala, 24% evergreen forest cover loss in Kodagu) during the past five decades) leading to (i) flooding due to loss of water retention capability, (ii) erosion of soil binding ability, (iii) loss of life and property threatening the livelihood of the people. The region needs to develop but not at the cost of natural resources (water, land, food, etc.) sustenance with degradation of ecologically fragile and sensitive regions. Egotistical and ill-advised decision makers need to understand the importance of watershed integrity for sustenance of water and adopt integrated watershed management approaches such as:

- green cover of native vegetation in the catchment to enhance water retention capability, reduction of soil erosion and hence sedimentation of rivers; sequestering carbon and
- mitigation of instances of landslides and instances of frequent floods and drought.

Persistence of Western Ghats endemics, and relic species in the forest with perennial aquatic ecosystems calls for serious attention from decision makers to initiate programs immediately for recognizing and salvaging more fragments of such ancient forests that lie hidden amidst a sea of secondary forests. The fact that water course forests have not only rare species but also high biomass and greater carbon sequestration potential also calls for revision of forest management policies, as the innumerable stream

courses of Western Ghats offer tremendous potential for carbon stocking per unit area while also bettering the hydrology of these mountains, which form the main watershed for the entire Indian Peninsula. Millions of subsistence farmers and other forest dwellers of Western Ghats can not only be partners in micro-level planning for prudent water use but also stand to gain in a big way from carbon credits for their new role as promoters and guardians of watershed vegetation. Rendering such service for mitigating global climatic change can also, same time, serve well the cause of conservation in an otherwise much impacted biodiversity hotspot.

In the highly human impacted global biodiversity hotspot, small farmers and tribal population can be more fruitfully used as guardians of watershed forests and partners in more restrained use of water resources for agriculture. Need to adopt a watershed based forest management system for Western Ghats and similar humid tropical mountains in which the relic forests and water course forests have huge scope for carbon sequestration and preserve precious heritage for posterity. Such services while serving the cause of biodiversity conservation can mitigate global climatic change and uplift the livelihoods of local population due to carbon credits. The premium should be on conservation of the remaining evergreen and semi-evergreen forests, which are vital for the water security (perenniality of streams), minimisation of disasters (landslides, etc.) and food security (through sustenance of biodiversity, enhances the pollination services). There still exists a chance to restore the lost natural evergreen to semi-evergreen forests through appropriate management strategies.

The conservation and sustainable management of ecosystems are the vital components in the pursuit of development goals that are ecologically, economically and socially sustainable. Sustainable development of a region requires an understanding of the complex functioning of ecosystems, diversity of resources, values, ecological services and their significant ability in influencing climate at local as well as global scale. In this regard, an approach with holistic integrated strategies considering all components and functions of the ecosystems in developmental planning is quintessential. The ecosystem approach entails the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Resilient path of development necessitates design based on ecological tenets, which are socially inclusive and sensitive to the environment of multi-dimensional sustainable human communities within harmonious environment. Lopsided development path (chasing the unscientific GDP mirage) at the cost of ecology and environment will only aid irresponsible land, water and timber lobby while threatening the water and food sustenance in the peninsular India.