Chapter

Biodiversity Conservation of Western Himalayas: A Pluralistic Approach

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Abstract

The conservation of biodiversity has been a matter of serious concern all over the world. Regions of the world with rapidly changing land use and economies require transdisciplinary focus to adequately address today's challenges for conservation, local livelihoods, and development. Himalayan ecosystem sustainability is vital for the employment of approximately 1.3 billion people in Asia. The Indian Himalayan Region (IHR) are special for their natural geological wealth, forest, flora, fauna and biodiversity, snow, ice and water bodies, traditional knowledge, and mountain agriculture. It is now widely accepted that the rich and diverse Himalayan ecosystem is fragile. The regions are predominantly populated by local societies. Live in biodiversity wealthy regions of the country, the neighboring mountainous communities are dependent upon biodiversity for meeting their livelihood security. Hence, sustaining biodiversity in the mountain region also means defending the benefit of the people. Recognition of the Himalayas as one of 34 global biodiversity hotspots aptly reflects its wide-ranging ecological significance. Societies across the world have had long-standing traditions of using and caring for nature, but the formal, mainstream, and largely western 'conservation movement' is only about 120 years old. Biocultural approaches to conservation represent a synthesis of theory across multiple fields linked to biodiversity conservation, including social-ecological systems thinking, commons theory, bio-cultural diversity and heritage, indigenous natural resource management and traditional ecological knowledge, and different models of participatory and people-centered conservation. This synthesis points to the potential for pluralistic, partnership-based, and dynamic approaches to guide conservation processes.

Keywords: Western Himalaya, diversity, conservation, pluralistic

1. Introduction

The conservation of biodiversity has been a matter of serious concern all over the world. Regions of the world with rapidly changing land use and economies require transdisciplinary focus to adequately address today's challenges for conservation, local livelihoods, and development. Himalayan ecosystem sustainability is vital for the employment of approximately 1.3 billion people in Asia. The Indian Himalayan

Region (IHR) are special for their natural geological wealth, forest, flora, fauna and biodiversity, snow, ice and water bodies, traditional knowledge, and mountain agriculture. It is now widely accepted that the rich and diverse Himalayan ecosystem is fragile. The perennial rivers of north India depend heavily upon the sustainability of glaciers and the ecosystem of the Himalayan region. As defined in the Convention on Biological Diversity, biodiversity encompasses the variety and variability of life forms, ecosystems, and ecological processes, at all levels of biological organization, and is the foundation of human survival and economic well-being [1]. The popularity of the biodiversity concept rests on the fact that its three-tiered definition (diversity within species, between species, and of ecosystems) provides a 'big tent' that encompasses a variety of interests within the modern conservation movement.

Forests cover around 30% of the earth's surface and besides being the reservoirs of biologically rich and genetically diverse ecosystems also provide a wide range of services that include healthy soils, clean drinking water, climate regulation, and recreational and esthetic benefits [2]. About 410 million people are reported to be dependent on forests for subsistence and income and around 1.6 billion depend on forest goods and services [3]. Ever-increasing demands on forest ecosystem goods and services are increasing pressure on the natural resources of forests and making them more vulnerable. Ever increasing human population combined with unsustainable resource use, poor management, and limited investment in conservation further contribute to their vulnerability [4].

The biodiversity of mountain regions has been studied by scientists for a long period which suggests that they are a rich repository of biodiversity [5, 6]. The Himalayan forest landscape is a provider of a wide range of goods and ecosystem services to its inhabitants and downstream communities [7]. In the Himalayan regions, the altitude range (800–6000 m) particularly plays a major role in the distribution of different species and these species found at each altitude have their own importance in sustaining other associated flora and fauna. This interdependency of species with other various communities in the high altitudes has a significant role in maintaining the biodiversity of these areas. The IHR is a mega hot spot of biological diversity. The IHR supports vast natural diversity, consisting of 18,440 plant species, including 1748 and 675 species of medicinal importance and wild edibles, respectively. However, the Himalayan ecosystem is recognized as one of the most vulnerable ecosystems to the consequences of climate change and anthropogenic disturbances [8]. Most of the published literature adopts a singular approach to biodiversity, scientifically justified without reflecting on the indications of the central metrics which are available for equity and social justice in preservation practice. In this chapter, we take into account the role of conservation science, the definitions and concepts it employs, and their effects on conservation policy and practice. We contemplate some of the challenges and opportunities that would reveal in exploring a pluralistic perspective on biodiversity conservation.

2. Importance of IHR biodiversity

Forests support life for more than 70% of terrestrial biodiversity; regulate water cycles, sustain soil quality, and reduce the threat of natural disasters like floods and landslides, as well as directly and indirectly sustaining the livelihoods of >1.6 billion people on the globe [9]. IHR is continuously deteriorating despite its crucial importance in maintaining the ecosystem, as the value of ecosystems to human welfare

is still underestimated. The high Himalayan ranges and glaciers cover most of the northern parts of the Western Himalayan region of Indian sub-continents. Whereas, the adjoining lower reaches are under forest land use that occupies about 2/3rd of the landscape. The mountainous parts of the region are gifted with rich biodiversity having tree species from sub-tropical to alpine zones. The commonly collected NTFPs from these forests include a variety of wild edibles, medicinal, and aromatic plants such as pine resin, lichens, moss, wild mushrooms, fruits, and flowers and these also provide income and employment to its inhabitants through forest-based activities [10]. In India, Western Himalayas is one of the two important diversity hotspots, the other being the Western Ghats [11] and is unique because of the different geomorphic conditions, changing thermal regimes, and fast water current. The Himalayan Mountains are important sources of water to the Indo-Gangetic plains through the perennial glacier-fed rivers. The value of ecosystem services provided by the Himalayan forests was estimated to be $1150/ha annually.

The Himalayan region is known for the diversity and richness of its medicinal plants and it harbors a large number of ethnic communities, each with a distinct culture and traditional knowledge system [12]. IHR has been reported to house 8000 angiosperms, 44 gymnosperms, and 600 pteridophyte species [13], and of these, 1748 species fall under various traditional and modern therapeutic uses. The highest number (701) of medicinal and aromatic plant species (MAPs) have been reported from the Uttarakhand region [14, 15]. Among different biogeographic provinces, nearly 643 species of medicinal and aromatic plants are known from Himachal Pradesh and 701 from Uttarakhand in Western Himalayas. Nearly 26% of known MAPs are native to the Himalayan region while another 6% share their nativity with Himalayan and adjoining areas [15]. India has emerged as a strong destination in the herbal sector with 8.13% of the global share and 22% growth, which is highest in the world [16]. MAPs have been used for decades and serve both as a source of income and affordable healthcare in many developing countries [17]. Today, more than 90% of plant species used in the pharmaceutical industry are harvested from the wild, many of these come from the subalpine and alpine regions of the Himalayas. Depletion and loss of medicinal plant diversity and its knowledge base may have significant impacts on human health and livelihood [11]. Hence, protection of the genetic pool of this valuable wealth in nature is urgently required for long-run sustainability and making it available for future generations.

These are also used by pharmaceutical companies for developing herbal medicine and used for the synthesis of new molecules [18] which has directly increased their demand and also promoted their illegal collection from the wild. In the Western Himalayas, around 30% trade of MAPs operated from alpine areas, and 90–95% material is collected from wild habitats through destructive practices [19] and their population declined considerably.

3. Present status of biodiversity in IHR

The Indian Himalayan Region lies between 27°–38° N Latitudes and 72°–89° E Longitudes which covers about an area of 419,873 km^2 (nearly 18% of India) with >2800 km long and 220–300 km wide. The altitude ranges from 200 to >8000 m above mean sea level. Indian Himalayan region includes the parts of Trans, North-west, West, Central, and East Himalaya, and ranges from Arunachal Pradesh to Jammu and Kashmir and Ladakh Union Territories and rising to an altitude of more than

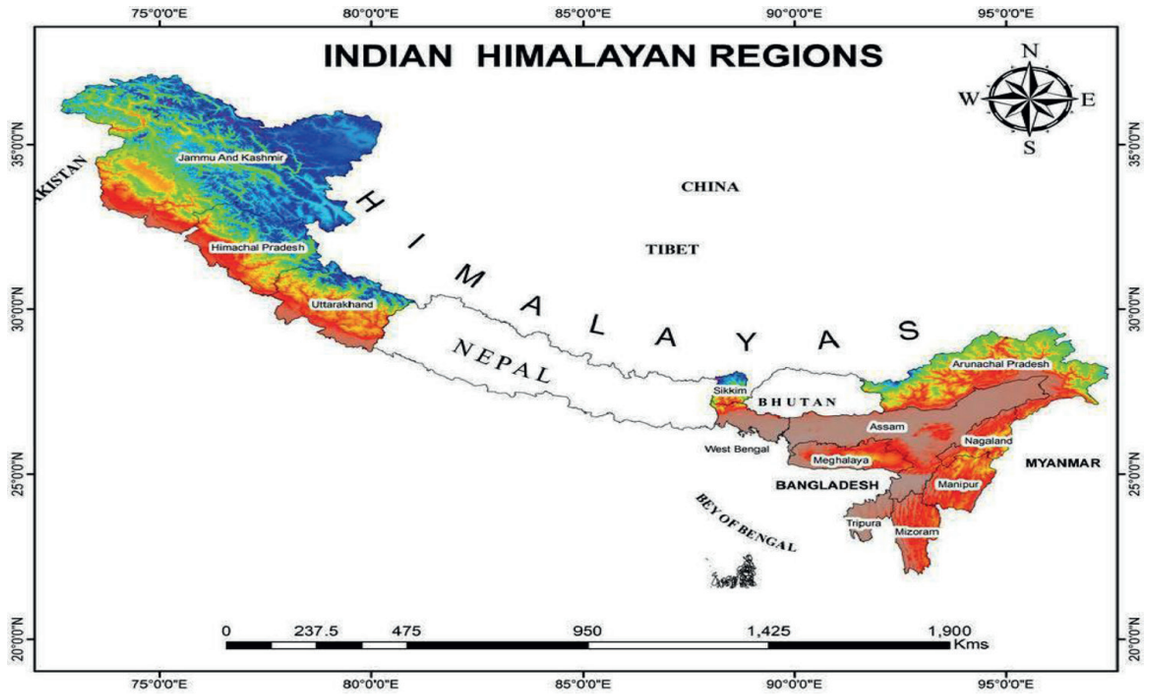


Figure 1.
Location map of the Indian Himalayan region.

8000 m AMSL (**Figure 1**). The IHR support three bio-geographic zones namely Trans Himalaya, The Himalaya, and North-East India and eight biogeographic provinces including Ladakh Mountains, Tibetan Plateau, Northwest, West, Central & East Himalaya, Brahmaputra valley, and North East Hills. The IHR is very well known for its representative, natural, unique, and socio-economically important biodiversity [15] and is designated as one of the biodiversity hot spots [20]. The richness of the biological diversity is mainly due to its unique climatic conditions, topography, and diverse habitats. The rich plant diversity has been utilized by the natives in various forms such as medicine, food (edible), fuel, fodder, making agricultural tools, house building, small scale enterprises (i.e., basket, mat, hat, kilta, *etc*.), and religious ceremonies [21].

4. Plant biodiversity in IHR

In angiosperms, about 10,452 species belong to 2302 genera and 232 families and in gymnosperms, 51 species belong to 20 genera and 8 families are reported from the IHR, Nepal and Bhutan [22]. About 3160 species of vascular plants in the Himalayan region are endemic. The IHR represents 18,940 species of plants, among these 8500 species (40% endemics) characterized by angiosperms; 44 (15.91% endemics) by gymnosperms, 600 (25% endemics) of pteridophytes; 1737 (32.53% endemics) of bryophytes; 1159 (11.22% endemics) of lichens and 6900 (27.39% endemics) of fungi. In angiosperms overall, 6745 species of 225 families, belonging to 1768 genera have been noticed from the Trans, North West, and Western Himalayas. Among that, 604 were tree species, 1049 shrubs and herbs are 5092 [21]. About 3984 species of angiosperms and 21 species of gymnosperms are reported from Arunachal Pradesh; From Assam, 3010 species of angiosperms and 7 species of gymnosperms; In Manipur, 2376 angiosperms species and 5 of gymnosperms; from Meghalaya, angiosperms 1886 and 6 species in gymnosperms; 2141 angiosperms and 6 of gymnosperms from Mizoram;

In Nagaland, 2431 angiosperms and 9 of gymnosperms species; 1463 species in angiosperms and 13 of gymnosperms from Tripura, and 4458 species of angiosperms from Sikkim were recorded [23].

The gymnosperms group is represented by the families Cupressaceae, Cycadaceae, Ephedraceae, Ginkgoaceae, Pinaceae, Podocarpaceae, Taxaceae, and Taxodiaceae in the IHR [22]. The angiosperms are the biggest collection of plant species and consist of the families Acanthaceae, Apiaceae, Asteraceae, Brassicaceae, Fabaceae, Euphorbiaceae, Lamiaceae, Liliaceae, Orchidaceae, Poaceae, Polygonaceae, Rosaceae, Rubiaceae, Scrophulariaceae, etc. Some monotypic families represented only by single species are Actinidiaceae, Adoxaceae, Casuarinaceae, Biebersteiniaceae, Calycanthaceae, Cannaceae, Caricaceae, Ceratophyllaceae, Circaesteraceae, Clusiaceae, Coriariaceae, Daphniphyllaceae, Datiscaceae, Dipterocarpaceae, Droseraceae, Hippuridaceae, Icacinaceae, Iteaceae, Lardizabalaceae, Leeaceae, Marantaceae, Martyniaceae, Melianthaceae, Moringaceae, Myricaceae, Ochnaceae, Paeoniaceae, Platanaceae, Plumbaginaceae, Podophyllaceae, Podostemaceae, Proteaceae, Punicaceae, Rhizophoraceae, Saurauiaceae, Sonneratiaceae, Saururaceae, Sphenocleaceae, Stylidiaceae, Torricelliaceae, Trillidiaceae, Tropaeolaceae, Zannichelliaceae, etc. The dominating genera in Trans, North West, and West Himalaya are, *Carex, Taraxacum*, *Potentilla*, *Astragalus*, *Saxifraga*, *Cotoneaster, Artemisia*, *Cyperus, Polygonum, Corydalis, Berberis, Euphorbia, Silene, Poa, Primula, Pedicularis, Nepeta, Impatiens, Ranunculus, Persicaria, Veronica, Allium, Rubus, Ficus,* etc. [21].

In medicinal plants, a total of 1748 species belonging to 915 genera and 223 families are found in the IHR (**Table 1**). The families that signify the greatest number of medicinal plants in descending orders are, Asteraceae, Fabaceae, Lamiaceae, Rubiaceae, Euphorbiaceae, Ranunculaceae, Rosaceae, Poaceae, Orchidaceae, Polygonaceae, and Gentianaceae, respectively. The medicinal plant-rich genera are *Polygonum*, *Euphorbia*, *Piper*, *Ficus*, *Aconitum* and *Swertia*, *Artemisia*, *Solanum, Berberis, Desmodium,* and *Allium,* and *Saussurea*, respectively. A total of 675 wild edible plants representing 384 genera and 149 families are known in IHR. Of these, 285 species are herbs, 172 species of shrubs, 197 species of trees, 12 species of pteridophytes, 07 species of fungi, and 02 species of lichens (**Figure 2**).

5. Services of IHR biodiversity

Biodiversity provides several facilities and services such as food, fodder, fuel, medicine, timber, resins, oil, climate regulation, pollution control, soil and water

Taxonomic group	Families	Genera	Species	Herbs	Shrubs	Trees	Ferns
Angiosperms	191	878	1685	1020	335	330	—
Gymnosperms	4	6	12	—	3	9	—
Pteridophytes	28	31	51	—	—	—	51
Total	**223**	**915**	**1748**	**1020**	**338**	**339**	**51**
Threatened: 165, **Agro-techniques**: 30							

Source: Samant et al. [15].

Table 1.
Biodiversity of medicinal and aromatic plants in IHR.

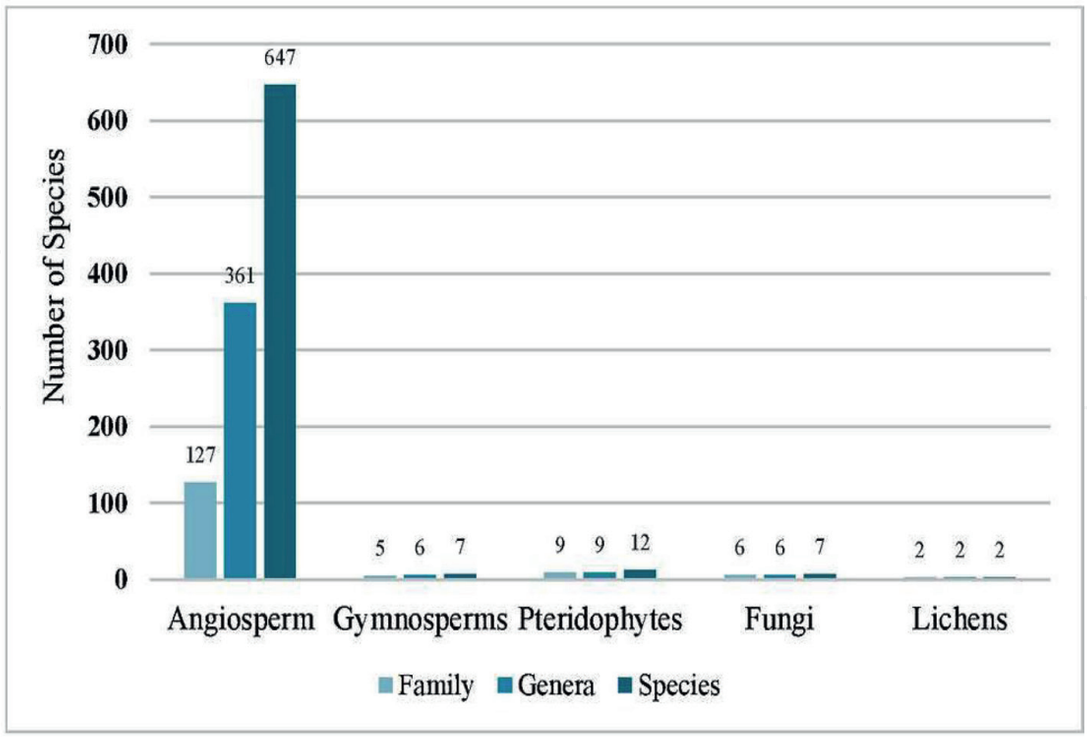


Figure 2.
Taxonomic groups, families, genera, and species representation of wild edible plants in the IHR.

conservation, nutrient cycling, pollination, and recreation [24]. Humans depend upon a variety of ecosystem services (ES) provided by forest ecosystems which are generated as a consequence of interaction and exchange between biotic and abiotic components of an ecosystem [24]. Brown et al. [25] described that "ecosystem services are derived from the functioning of an ecosystem and are of direct value to humans". Direct benefits obtained from the forests such as fuel, fodder, and food are known as ecosystem goods while indirect benefits such as detoxification and decomposition of waste, purification of air and water, etc. are known as ecosystem services. Costanza et al. [26] identified 14 types of services derived from forest ecosystems and estimated the economic value of the services provided by the Earth's ecosystems to be at least US$33 trillion/year. Classification of ecosystem services in the Western Himalayan region specified in the Millennium Ecosystem Assessment (MEA) (2003) has been categorized into the followings:

1. **Provisioning services**

   - Food
   - Fuel
   - Fodder and grazing land
   - Timber
   - Leaf litter
   - Ornamental resource

- Non-timber forest products (NTFPs)

2. **Regulating services**
   - Climate regulation
   - Air quality
   - Water regulation
   - Water quality
   - Flood and erosion control
   - Pollination
   - Pest regulation
3. **Supporting services**
   - Soil formation
   - Nutrient cycling
   - Water cycling
   - Primary production
4. **Cultural services**
   - Cultural diversity
   - Knowledge systems
   - Recreation and ecotourism
   - Esthetics

6. Causes of biodiversity loss

The biodiversity losses in the IHR are due to several natural and anthropogenic (man-made) factors. Though natural factors have less effect on biodiversity loss, mitigation of these factors plays a major role since the increased human activities in mountain forests have caused a direct link between anthropogenic and natural factors. Periodic assessment and mitigation of various anthropogenic disturbances affecting Himalayan biodiversity are of crucial importance for the survival of mankind. Anthropogenic disturbances, however, play a major role in shaping the structure of forest stands and landscapes even in remote mountain areas of the world. In India, although the degree of anthropogenic pressure varies in different parts of

the country, the anthropogenic disturbance has become a widespread feature in most of the forests throughout the Himalayas [27]. Humans have extensively altered the global environment by changing global biogeochemical cycles, transforming land, and enhancing the mobility of biota. Many species have been exterminated from the areas dominated by human activities. The causes of decline in the Himalayan ecospheres have been more radical because they are measured as ecologically delicate and the re-establishment of such ruined ecosystems is very complex due to the physical volatility and environmental uniqueness of the area. Any usual or artificial disturbance is a vital force adept of molding plant population structure and dynamics [28]. There are different causes of biodiversity losses in IHR including natural causes (wildfire, drought), Pollution (air, water, and soil), habitat destruction (deforestation, land fragmentation), wildlife trade and hunting, overexploitation of resources, climate change, and introduction of invasive species [29].

Due to the limited employment opportunities and dependence of local inhabitants and tribes, the forest ecosystem is an important source of income for them in the Western Himalayas [6]. Humans are dependent on the forest for their basic needs, such as fuel, food, fodder, cattle grazing, timber, and raw material for forest-based industries and other NTFPs. Rapid demographic changes and over-exploitation of valuable forest resources and plant products have led to the fast-track degradation and destruction of natural flora and fauna of this region. Since IHR consists of a number of religious places and snow-clad hilly stations, it is a major destination for pilgrimage, tourism, and adventure activities which are responsible for causing disturbances in the region. Several developmental projects such as the construction of roads, dams, tunnels, and hydroelectric projects also create excessive disturbances.

In mountainous regions, biodiversity is being vanished or endangered due to land deprivation and the over-exploitation of resources, e.g., IPCC [30] reported that in 1995, nearly 10 percent of the known species in the Himalayas were listed as *`threatened'*. The increasing scale of degradation of bio-resources in the Himalayas [31] has emerged as a conservation priority at the global level [20]. The importance of biodiversity conservation leading toward the sustenance of ecosystem services is a prevailing theme worldwide. The loss of biodiversity has been the part of international policy agenda for several decades [32] and this loss has not stopped yet, and still, we are facing many challenges regarding biodiversity conservation. The biodiversity conservation action and its success vary greatly, depending on the paradigms represented by various professionals in charge of conservation, as well as social-cultural and political context [32].

Beyond habitat degradation, fragmentation, and hunting, other threats to the conservation of biodiversity in protected areas include climate change, invasive species, and interactions between all threats. Mountains are early indicators of climate change [33]. Himalayan regions are one of the few regions where climate change might be rapid and where the penalty of climate change is likely to be as severe for biodiversity, ecosystem services and human well-being [34]. The increase in average temperature is expected to rise higher in the Himalayan region as compared to the global average temperature [35, 36]. A study indicates that the mean annual temperature in the Alaknanda valley (Western Himalaya) has increased by 0.15°C from 1960 to 2000 [37]. Further, climate change modeling studies for India exhibit that the Indian subcontinent is likely to experience an increase in temperature of 3–5°C. Also, anthropogenic pressures have emerged as a major contributing factor for increased vulnerability of the Himalayan

forests [38]. Such changes in IHR ecosystems are bound to affect the livelihoods of millions of people living in the Himalayas and many more in the adjoining Indo-Gangetic plains those are directly depending on the goods and services of mountain ecosystems for their survival and development [33, 39]. Invasive plant species are likely competent to a particular climate change with assumed impacts on indigenous flora [40, 41]. Manish et al. [42] noticed that native plant species of higher altitudes were largely in danger due to global climate change. This might be attributed due to the reason that these are the elevations with the most confined area coverage [43].

7. Biodiversity conservation

Biodiversity conservation is important for maintaining ecological balance among different life forms of the planet and keeping natural ecosystems healthy and functional. Plant biodiversity is one the most crucial components which sustain humankind by meeting its demands for food, fodder, fiber, and fuel. Therefore, the need for the conservation of biodiversity should be mutually accepted. On the other hand, there lies a basic difference in views on what should be the major objectives focus on the conservation of biodiversity. Moral objectives oriented toward preserving all accessible biodiversity which stands in opponent to anthropocentric aims that believe plant diversity importantly maintaining only the coverage that it serves livelihood security in long run. This includes the preservation, maintenance, sustainable use (conservation), revival, and enrichment of the components of biological diversity. There are two approaches to achieving the objectives of conservation measures: (i) *ex-situ* conservation and (ii) *in-situ* conservation. The choice of the conservation measures depends on the nature of the material to be conserved i.e., the life cycle, mode of reproduction, size, and ecological strains.

- ***Ex-situ* conservation:** It means the conservation of biodiversity outside their natural habitats, for instance within museums, national and international gene banks, and botanical gardens/arboretums with the objective to protect the endangered species and stop their destruction. Various institutions, scientists, scientific societies, and NGOs are addressing the task of protecting biodiversity. The rare, endangered, threatened, and vulnerable medicinal plants such as Saussurea costus (Kut), and *Picrorhiza kurroa* (Kutki), have been brought under cultivation to the large extent. Seed banks, botanical gardens, and horticultural and recreational gardens are also important centers for *ex-situ* conservation of biodiversity.

- ***In-situ* conservation:** *In situ* **conservation refers** to protecting the biodiversity in their natural habitats. The highest priority has been given by the Convention on Biological Diversity to this approach of conservation, which includes the protection of species in the wild as well as landraces and other cultivated forms maintained by farmers. It involves the coordination of a broad range of economic and social activities within a country. In India, about 4.8% of the total geographical area has been earmarked for wide *in-situ* conservation of habitats and ecosystems. A protected area network of 96 national parks and 510 wildlife sanctuaries have been created for the purpose.

8. Biodiversity conservation: a pluralistic approach

Societies across the world have had long-standing traditions of using and caring for nature, but the recognized, conventional, and largely western 'conservation movement' is only about 120 years old. Discourses about why biodiversity matters and how it should be governed are dominated by ideas nurtured by this movement, in turn, aligned with—and legitimized by—normative positions in science, particularly by conservation biology. In reality, people have always related to the variety of living things in a range of different ways, determined by their own value systems, experiences, and ability to work with nature [44]. In view of its broad explanations, biodiversity must be developed as a thought in a multiculturalism way. It would be seen as prospect to accept people's diverse ideas on what needs to be preserved and at what cost. If the belief of ecosystem is helpful as a means for preservation, it should be a part of a wider commitment with diverse informations and value systems about biodiversity. A pluralistic perspective on biodiversity could also facilitate communication across academic disciplines by applying a shared vocabulary, even though its precise interpretation may vary [45].

The pluralistic approach in biodiversity conservation should necessitate an unbiased commitment via two questions: (i) what the humankind desire from the rest of the living world? (ii) How we can mutually get from there? Subsequently, it should be recognized that the answers to these questions would essentially be multiple and consequently arrived to any answers through a process that is reasonable and communally acceptable. Additionally, the recognition of a pluralistic view of biodiversity protection should require the recent conservation advancement to give up its place of ethical authority and power to answer these above questions. Meanwhile, it demands the movement to put its thought on what needs and why to conserve, together with other understanding of the importance of nature and interactions between humans and nature to answer the first question, instead insisting that their concepts are scientifically derived and therefore, definitely better. Biodiversity science is, in fact, well positioned to promote such a pluralistic agenda given the multiple ways in which biodiversity is represented in academic disciplines, such as ecology and biology, economics, and social sciences and humanities. It may also be essential to recognize and include the layman's views in the combination of conservation knowledge; mainly the sited, emotional and cherished trait of much of the rest of knowledge (local or indigenous) about nature [46] and its focus on how to live healthy with nature. It suggested that the manifold associations of human and non-human life must be recognized. One way to do this is by mesmerizing with intense interdisciplinary and extensive stakeholder involvement in knowledge sharing [47]. By mobilizing an appropriate mix of scientific and lay knowledge, conservation science, policy and practice would be better equipped to identify and facilitate more legitimate and effective goals and actions, for instance through different approaches to protected areas [48] or through payments for ecosystem services [49].

9. Plural drivers of biodiversity losses

To acquaint with what biodiversity is and why it should be important is the major step toward pluralism; however, it is not sufficient on its own. It is also important to recognize why bio-diversity in its diverse forms is being lost and what are different

combinations of activities at various labels might reduce or repeal the damage to nature meticulously. Specifically, one has to take out what is generally called the causes of biodiversity loss and degradation of nature [50, 51] or—drawing on our plural characterization above—what kinds of human actions and social processes are leading to the undermining of facets of nature and what makes those actions and processes persist.

Firstly, there should be a strong tendency to cast explanation in universal or globalized terms. Even though it is useful to categorize the biggest drivers of biodiversity decline as a resource over and land-cover change for agriculture purposes at a large scale, these analyses have often been conducted in a collective way without distinguishing these processes in terms of localities or actors [52]. Thus, the driver-based studies should go further to find out what sectors are responsible for detrimental activities and who benefited from them.

Secondly, scientific analysis of drivers normally hazards reducing bio-diversity, to a set of the singular index, reflecting a desire to let science drive policy at the cost of opening space for other means to know the natural world and as a result for consideration. Adding to that, biodiversity cannot be just lessened to a singular index, but the issue itself is much more complex than, for instance, the conventional drivers—pressures—state—impacts—responses structure can be handled [53, 54]. There are manifold clarifications for several causes behind the continued reduction of biodiversity. Economists thought that mankind as mostly independent realistic drivers and thus, motivate the utilization of biodiversity to observe win-win solutions. Conversely, ecologists should give priority to dependent and post-colonial structures of authority that relieve local communities of land rights which leads to state community differences and as a result, may advocate restitution of these human rights, and chiefly respect to the world views of native local communities as the first step toward sustainable management of nature. Others may emphasize macro-level institutional failure based on ever-expanding capital accumulation as the overarching single cause of the ongoing ecological crisis [55].

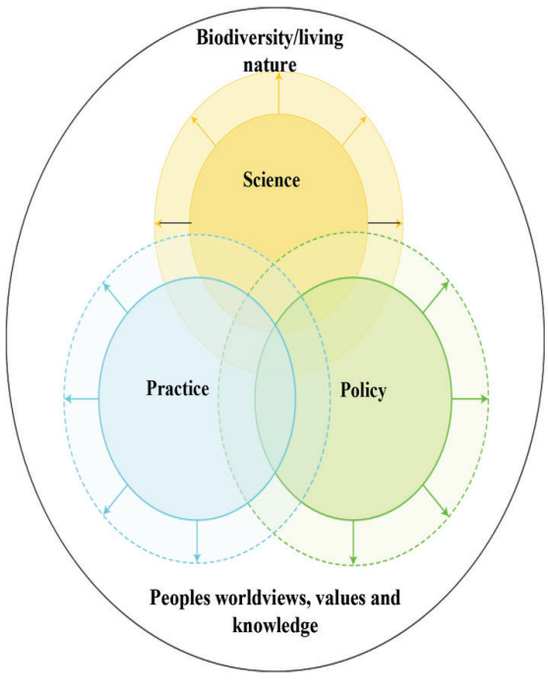
Finally, communal analytic effect on biodiversity change has been assembled into 'a political' clarification that directly emphasizes population pressure-based descriptions for the loss of interpreted pristine environment and more political descriptions that unite concern for communal justice, and acceptance of racially co-established concept about the natural world, with other justifications like widespread property conjecture placed in the middle. This divergence allows conservation groups to accentuate what looks doable and gives the existence of leading economic-political structures rather than what desires to be done.

10. Role of science, policymakers, and practice

Visualization of a pluralistic approach to biodiversity conservation requires profound reflexivity by every social activist toward identifying the normative positions propagate their own justifications of the biodiversity concept, as well as the values of another player, leading to an perceptive of the various causes why humankind care it, and what is its importance. Many anthropologists, bureaucrats, and environmentalists need to recognize the reality of a kind of opinion, together with those of traditionally criticized people whose livelihood mostly depends on mother nature, to come up with equitable conservation intercessions. Such social approaches could be constructed, but the main root cause of the matter would still lie in the perceptive

of what the community really wants to capture into decision making the diversity of interventions on what needs to be governed; what the objectives of conservation should be, and what alternate options present for perspectives to achieve such objectives. For conservationists and practitioners to take on these challenges, the first step is to come to up with the reality that present ways of working have created problems. Hence, it is imperative to reflect on not just due to the paucity of success of conservation perspectives in lessening biodiversity losses but also needs to reflect their harmful consequences for social justice.

Due attention should be disposed of by which ways the conception and information used in these approaches are adept in preserving, converting, and mitigating the pessimistic outcomes. Improvements in the current conventional conserving paradigm that overlook the wider picture are eventually bound to fail. It should be accepted that many communities, particularly those which are rightly reliant on bio-diversity may not value the ecosystem in the ways shown in the management movements, dominant discourses and approaches, and that the conservation of fascinating species is frequently an expansion of the destructive lifestyles of more wealthy societies. Many questions that must be addressed keeping in view the human and nature associations that accounts for peoples needs and desires includes: (1) what design of biodiversities are required in order to achieve set objectives viz., obtain esthetic satisfaction, maintain ecosystem processes, deliver good ecosystem benefits, and meeting an ethical imperative in respect to other species? (2) what may be the trade-offs among these nature-related goals, and among them and other interests like welfare and poverty improvement, social equality or democracy and are there any ways to ascribe expenses and powers fairly and curtail these trade-offs?, and (3) what micro- and macro-level drawbacks, such as a political one, would make it hard toward attaining specified outcomes with its socio-ecological associated trade-offs? These questions could be managed as pluralistic perceptions, keeping in mind the amount of



Science

•Improve understanding of biodiversity value systems to describe living nature.
•Co-produce interdisciplinary knowledge.
•Address place-based multi-layered drivers of change.
•Reflect on our own latent values.

Practice

•Engage with diverse legitimate biodiversity perspectives
•Deliberate and negotiate conservation action with local actors.
•Practice procedural ethics for openness, learning and adaptation.

Policy

•Recognize biodiversity-society interactions across sectors.
•Address the political structures that conditions dichotomous thinking about conservation and development.

Figure 3.
An outline for a pluralistic view of biodiversity in science, policy and practice. Arrows show the desire for growing connections among science, policy, and practice to tackle the plurality of the living world, given people multiple world views, ethics, and information systems (source: [56]).

plurality and what views are officially measured is a complicated political issue. Based on all the above-mentioned arguments, we suggest different means to move conservation science, policy and practice forward, while fostering a pluralistic concept of biodiversity as a meeting point (**Figure 3**). First we emphasize conservation science. By precisely equating biodiversity with living nature, instead of treating biodiversity as one possible framing of living nature mostly conceived, conservancy skill risk omitted the spirit of a plural outlook on biodiversity as well as cut-off scientific values and layman applications. It indicates that the difficulty in the formulation should not start with the ecological level, and then addresses the social aspects or the other way around. Conservationist desires to adept a comparative lens [57] that is sensitive to how the ecological and the socio-cultural constantly conspire with each other and helps to develop a more affluent set of definitions, matrices and procedures to know human–nature relations and practices and formulate proper responses and policy interventions.

Secondly, conservationists understand the requirements to expand from a predominant focus on pristine ecospheres to incorporate what is habitually called distressed ecological community, it is important also to acknowledge that almost all ecospheres are adapted by humans to some extent [58]. Awareness in respect of ecosystems should itself appear through a process of co-production with particular liberty for traditionally marginalized groups, likewise, this will advance both the robustness and authenticity of the knowledge created. Thirdly, environmentalist needs to acquire a multiple causal approaches to perceptive biodiversity change, categorize who affects and benefited from the spoiling of nature and unpack how, when, and why assured values and people's interests may or may not take into conservation policy and practice. This requires not only collaboration among diverse disciplines but also some cohesion in their descriptive capacities. One approach to facilitate this may be, to support much more region-based research. Even though the diminishing trend of biodiversity is a worldwide challenge, the shape it takes, the welfare that defines it, and the mixture of processes that form it are environment-specific, and so are the solutions. Fourth, we as a scientific community, should be more irresponsible about our own concealed principles and normative positions about the environment [45, 59]. This will raise the question about how we define the research and what morals and presumptions are integrated or mistreated in attaining research goals, whose returns the resulting knowledge serves, whose voices might not be heard, and whose needs might not be met by the research process [60]. To support this indication, we must identify and find out the non-mainstream ways of understanding. However, what is essential is a dedication to diversity, directness to debate, and additional humility and answerability to all those who are directly or indirectly influenced by systematic research. As regards to conservation practices, it is suggested that the conservation groups should acknowledge that there is no fixed generic 'we' in conservation nor an exclusively obvious 'what'; its therefore necessary to differentiate that the conservation practices and envisage results have to be calculated upon and ultimately discussed, given wrong trade-offs stemming from conservation action. How to accomplish conservations should finally depend on what people need and consider authentic and satisfactory. This will need the conservation movement to reflect about socially procedures for making conservation decisions [47]. Despite technocratic projects, which are introduced in a top to the down manner, practices need to be guided by procedural ethics that is committed to openness, learning and adaptation [59]. Finally, what are the results of pluralistic thinking for biodiversity policy? As long as policymakers see only urban people as the voice

of conservation and uncritically accept their particular understanding, and ethics about bio-diversity, as the only ones that are official, they will mainly depend on a narrower set of policy approaches, for example, those depend on conserving certain areas while turning a blind eye to the destruction of the rest of living surroundings in the name of economic growth. Although, if a new concept of conservation science captures the multiple objectives and values of biodiversity, brings together a broader set of nature-concerned societies, and questions the structure that forms the nature vs. human wellbeing disagreements, this would ultimately result in mainstreaming nature concern into policies across the sectors by legislative. In conclusion, what anthropologists, conservationists, and governmental organizations name biodiversity may be demonstrated and can be used in different manners, all of them should be significantly relevant and legitimate. It's the need of the hour that one should be more responsive toward this extent of values and their suggestions, such as analysis of the wide causes following the damage of the natural environment. This should be united with conservation policies and practices that encourage impartial decision-making, clearly considering the harmony of social justice when carrying out conservation actions.

11. Conclusion and future perspective

The plants play a significant role in food and nutritional security at the household level. The local people depend greatly on traditions and values that are rooted in nature. Farmers gave more importance to those species which provides them a multitude of benefits such as medicinal and harvested as edible food. Though, there is rising pressure on these species, which advocates that there is an urgent need for management and conservation, which requires proper research and policy support. It is essential to think about how such wild and non-cultivated edible plant species used for food, medicine, and other purposes can contribute to future food security. This requires a proper understanding of how to deal with the cultural changes affecting the use of species diversity and how to ensure sustainable availability. Integrated research and development approaches are immediately required to tackle the issue. To conclude, what scientists, conservationists, and policymakers describe biodiversity is interpreted and used in different ways all of which are potentially relevant and legitimate. Conservation of biodiversity will continue to fail to meet targets if scientists and practitioners are not efficiently able to partner with stakeholders and Indigenous landowners to form novel and dynamic institutions. Local peoples are the central point of any conservation program; attempts should be made to maintain balance among scientists, conservationists, policymakers, and people's livelihoods. Participations of local communities in the preparations and execution of conservation policies and management plans could facilitate to attain the biodiversity conservation objectives. Creation of understanding and educational programs on conservation and permissible utilization of plant genetic resources, and intensification coordination with the help of various governmental departments, NGOs, and local institutions is immediately required.

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