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Research Article

Restoration of Ecosystem and Biodiversity Conservation for Management

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Abstract

Restoration ecology and conservation biology distribute many underlying biodiversity goals, but differ in remarkable ways. Ecological restoration is becoming regarded as a major plan for increasing the situation of ecosystem services as well as reverse biodiversity losses. Furthermore, improvement of biodiversity and services can be slow and incomplete. Despite this uncertainly, new methods of ecosystem service assessment are suggesting that the economic benefits of restoration can be more important than costs. Expenditure for ecosystem service schemes could therefore provide incentives for restoration, but need development to make certain biodiversity and multiple services are superior and the needs of different stakeholders are met. Such approach must be implementing widely if new global restoration target are to be achieved. Ecosystems in very harsh environments, such as the North and South Poles, are generally simple since only a few types of organisms can survive the freezing temperatures and poor living conditions. Some organisms can be found in a variety of environments around the world, interact with other or similar creatures in various ways. Ecological restoration has a rising role in policy aimed at reverse the broad effects of environmental degradation. It includes activities to support the improvement of ecosystem structure and function, and the related terms of goods and services. Rooted in ecological theory, ecological restoration requires an integrated approach of different disciplines; including soil science, hydrology and conservation biology, in concert with the appropriate socio economical and political frameworks.

Keywords: Ecosystem; Restoration; Biodiversity Conservation; Sustainable Biodiversity

Introduction

Biodiversity is an umbrella term to refer to all the living organisms present in an region. The term "biodiversity" was coined in late 1988 by E. O. Wilson. Biodiversity or Biological diversity, both these terms have been used synonymously in the scientific dialect. The term includes all life forms present on the earth starting from plants, animals, microorganisms, bacteria, virus, aquatic organisms and constant coral reefs. Biodiversity denote the species richness as well as species evenness. Genetic, organism and ecological diversity are all forms of biodiversity at diverse scale with different components. Biodiversity is considered as a repository of resources. It is used to manufacture the food, medicine, industrial products, etc. [3]. But biodiversity is frequently depleting with an increased demand of speedy population growth. A large number of plants and animal species have already become extinct and many are endangered and threatened.

The conservation of species within their natural habitats is called In-situ conservation. This way of conserving biodiversity is the most suitable method for biodiversity conservation. The high biodiversity areas are preserved in the form of sanctuaries/ National Park/ biosphere reserve etc. The conservation of biological diversity outside of their natural habitats is called Ex-situ conservation [4].

An ecosystem is an environmental area in which plants, animals, and other species, as well as climate and topography, work together to create a fizz of life. The ecosystem refers to how all of these different organisms coexist in close residence and interact with one another as well as the abiotic elements of the environment. Weather, earth, sun, soil, climate, and atmosphere are examples of abiotic habitat [1]. The biosphere is the world's largest ecosystem, surrounding all ecosystems. Separate ecosystems have emerged as a result of differences in physiographic, climate, natural vegetation, soil, and water bodies. There are different ecosystems operating on a global and micro scale around the planet. Ecosystems might be large, with hundreds of different creature and plants simultaneous in perfect harmony, or they can be small [2].

Ecological restoration is the process of supporting the improvement of an ecosystem that has been degraded, damaged or destroyed. It is a deliberate activity that initiate or accelerates an ecological pathway or trajectory during time towards a reference state. Ecological restoration has as its object an ecosystem that is elastic and self-sustaining with respect to structure, species composition and function, as well as being included into the larger landscape and supporting sustainable livelihoods. In forested ecosystems around the globe, ecological restoration can assist with climate change mitigation and adaptation whereas providing other physical co-benefits to humans and natural systems. The contribution of afforestation and reforestation to reducing greenhouse gas emissions was first popular under the Clean Development Mechanism of the Kyoto Protocol. More recently, the UN Framework Convention on Climate Change (UNFCCC) introduced reducing emissions from deforestation and forest degradation (REDD) as an international fund- or credit-based method for reducing carbon emissions and defending forest ecosystems [5]. Now known as REDD+, it embraces "policy approaches and positive incentive on issues relating to REDD in developing countries; and the role of conservation, sustainable management of forests and enrichment of forest carbon stocks in developing countries" (UNFCCC 2010).

Biodiversity—the diversity of life on Earth—is defined as the variability among living organisms from all source, including diversity within species, between species, and of ecosystems. Biodiversity thus includes not only the millions of different species on Earth, it also consists of the specific genetic variations and traits within species (such as different crop varieties), as well as the diverse types of different ecosystems, marine and terrestrial, in which human societies live and on which they depend, such as coastal areas, forests, wetlands, grasslands, mountains and deserts [6].

What is ecosystem restoration?

Restoration is defined as "any deliberate activity that initiates or accelerates the healing of an ecosystem from a degraded state"; whatever is the form or amount of degradation (IPBES, 2018). Restoration responses are varied depending on the type of ecosystem in which they are to be applied (croplands, forests, rangeland, urban land, wetlands, etc.). To permit ecosystems to provide required functions those responses should consider landscape-level strategies, responding to local and enabling conditions, as well as assimilate indigenous and local knowledge [13].

Environmental degradation and the role of restoration

Human exploitation and adaptation of the ecosystems of the world is causing widespread biodiversity loss and decline in ecosystem condition, leading to condensed provision of ecosystem services. International initiatives to address these impacts, including the Convention on Bio-logical Diversity (CBD), the Millennium Development Goals, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, unequivocally link the conservation of biodiversity with the terms of ecosystem services to maintain sustainable development and poverty reduction [8,9].

Although the science and perform of ecological restoration have developed quickly, the emerging policy focus on ecosystem services represents a considerable shift in the objectives of restoration. This might result in both conflict and opportunities. Some commentator have expressed fears that a focus on ecosystem services might be at the disbursement of biodiversity conservation, whereas others have suggested that markets for ecosystem services would provide funding for conservation activities. Here, we explore in feature the implications of this policy shift by examining whether ecological restoration could be efficient in reversing the decline of ecosystem services along with biodiversity [10].

Restoration of ecosystem services and biodiversity

The Ecosystem Assessment and many succeeding publications propose that biodiversity and the stipulation of ecosystem services are positively related, with the implication that management to enhance one should increase the other. However, analysis of experimental data shows that this relationship is complex and not always positive [11]. Species richness has been linked positively

Figure 1

to numerous ecosystem processes, leading to improved provision of ecosystem services. On this basis, actions that increase species richness should also advantage services. However, this cannot be considered to be a common rule. Most studies of the relationship between biodiversity and ecosystem function consider a limited number of ecological processes that relate about exclusively to resource utilization. Furthermore, the in-crease in ecosystem processes often reaches a highland at moderate species numbers. Species identity effects add an extra level of complexity, especially as the rare species frequently targeted by conservation efforts often have minor effects on ecosystem processes, whereas more common species can have a leading role [12]. Ecosystem diversity effects on services are even less clear. Studies are only now beginning to examine how the variation of ecosystems transversely landscapes affects service delivery.

Impacts of restoration on biodiversity and ecosystem

Some restoration initiatives demonstrate how benefits to both biodiversity and provision of ecosystem services can be achieve in practice. For example, the restoration of native forest on bauxite mines in Western Australia enhanced plant and vertebrate diversity as well as carbon sequestration and water storage [14]. Restoration management of the Arkansas River, by the cessation of heavy metal inputs, increased water quality and enable the revitalization of fish and invertebrate populations. Reinstatement of meanders in German rivers both decreased flooding risk and increased the diversity of the invertebrate fauna.

The use of non-native species to renovate specific services can reduce native species and instigate damaging invasions. Restored species-rich grasslands frequently produce less forage than do their fertilised agricultural predecessor. Restoration of boreal forest structure by felling to encourage the regeneration of broad-leaved trees also provides habitat for bark beetles, which reduce timber production in contiguous forestry. Finally, restoration of oyster populations to reduce eutrophication in estuaries has been predictable to have negative effects on pelagic consumer taxa [15].

Limitations on the restoration of biodiversity and ecosystem

The policy shift towards restoration of ecosystem services may lead towards the selection of references based on terms of a single service. An increase in the provisioning of a specific ecosystem service is the clear aim in some restorations, including examples focusing on coastal protection, soil stabilization or aesthetic appeal [17]. It has been suggested that ‘novel ecosystems’ could be shaped that do not resemble taxonomically any historical ecosystem, but distribute required services. These aims might be more easily attainable than restoring the characteristics of reference ecosystems, but they might lead to conflicts with biodiversity conservation, and might be better considered as rehabilitation rather than restoration [18].

Biodiversity science is much more than just identification and classification of species. As a science it is an amalgamation of diverse branches of science like Microbiology, Biotechnology, Bioinformatics, Biochemistry, Taxonomy, Physiology, Biophysics etc. Biodiversity science is indispensable if we want to preserve the present flora and fauna of the world. Many direct and indirect benefits arise from biodiversity and to utilize those resources sustainably we need to preserve the present life forms as best as we can [19].

The need for restoration

As the global economy has prospered, our planet's ecological health has suffered. Diverse ecosystems are depleted, from the 20 percent of croplands showing stressed or declining productivity, to the 66 per cent of ocean ecosystems that are now damaged, degraded, degraded or modified.

50 percent of city inhabitants, for example, are without right to use to safe drinking water and 80 percent live in areas of unsafe air quality. What's more, the brunt of the burden of speedy ecosystem degradation is being unevenly borne by marginalized groups such as women, indigenous peoples **and** people living in poverty, says the report, and the Covid-19 pandemic has exacerbated existing inequalities.

(Figure 2)

Figure 2

Global patterns of biodiversity distribution

Biodiversity is unequally distributed across the different biogeography regions with certain places being more biodiversity rich. Tropical forests stretching on or near the equator account for only about 7 percent of earth's geographical area but include around 70 percent of species documented till now. These biodiversity rich areas are called as biodiversity hotspots. These hotspots have a high rate of endemism and are under a high degree of danger of habitat destruction. Two gradients of biodiversity distribution are observed: Latitudinal and Altitudinal. As we move from equator towards poles, biodiversity decreases [20]. This example is seen not only in terrestrial ecosystems but freshwater and marine ecosystems as well Northern hemisphere generally shows a steeper rise than southern hemisphere. The amount and duration of sunlight, temperature, precipitation, humidity, seasonal variability and other environmental factors are the reasons for this kind of distribution. Altitudinal gradient is also affected by these factors and results in decreased biodiversity as we move towards higher elevations [21].

Biodiversity and ecosystem services

Ecosystems are significant not only for maintaining the global carbon cycle and climate change adaptation but also for a wide range of ESs that are necessary for human well-being and the accomplishment of the Millennium Development Goals [22]. ESs are the conditions and processes through which natural ecosystems and their component biodiversity add to the survival of life on Earth and the accomplishment of human needs [9]. Humankind derives considerable benefits not only from the products of biodiversity but also from services of ecosystems, such as water purification, erosion control, and pollination (National Research Council (US) Committee on Noneconomic and Economic Value of Biodiversity, 1999). The basic ESs provided by natural ecosystems are primary productivity, biogeochemical cycling, waste decomposition, soil formation and erosion control, climate extremes moderation, flood control, pollution mitigation, water, air, and soil quality protection and maintenance, and crop pollination [33].

Global climate change and change in atmospheric work are likely to have an impact on most of these goods and services, with significant impacts on socioeconomic systems [36]. Biodiversity is enormously complex and dynamic, and supports many ESs that are often not easily observable and plays an important role in regulating the atmospheric conditions, hydrological cycle, and recycling nutrients [16]. It also contributes to climate change mitigation and adaptation through the provisioning of ESs [34]. Ecosystems and biodiversity may be generally regarded as elements of our natural capital, and the flow of ESs is the concern that society receives from that capital [2].

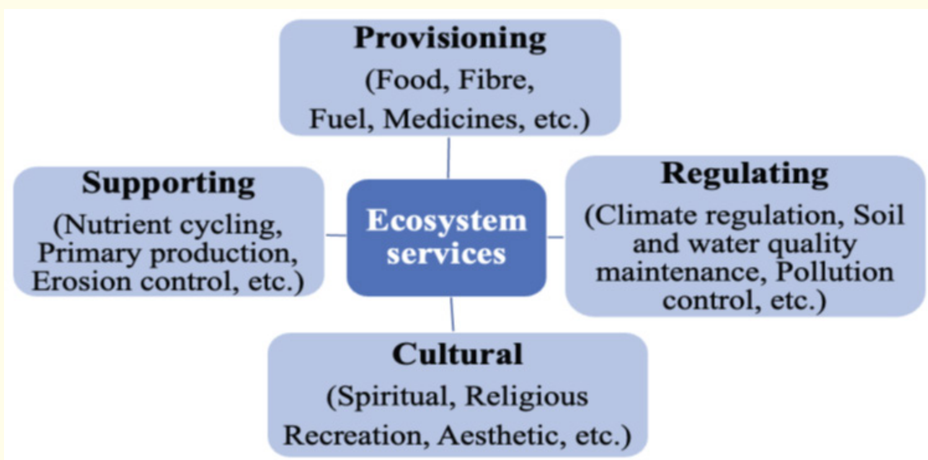

Figure 3

Biodiversity conservation for sustainable development

Biodiversity the diversity of life on Earth is defined as the variability between living organisms from all sources, including diversity within species, between species, and of ecosystems. Biodiversity thus includes not only the millions of different species on Earth, it also consists of the specific genetic variations and behavior within species (such as different crop varieties), as well as the different types of ecosystems, marine and terrestrial, in which human societies live and on which they depend, such as coastal areas, forests, wetlands, grasslands, mountains and deserts.

Agro-ecosystems

The interacting elements of environmental and genetic characteristics of a farm and the surrounding area are described as agro ecosystems. An agro ecosystem is defined as a region that is touch by agricultural activity, such as changes in the density of species assemblage and energy flows, as well as the net nutrient balance, and is not limited to the instant location of agricultural activity (e.g. the farm). Agro ecosystems are intricate and difficult to maintain, and as a result, they are often the most troubled of the planet's ecosystems. In comparison to a natural environment like a forest, an agro

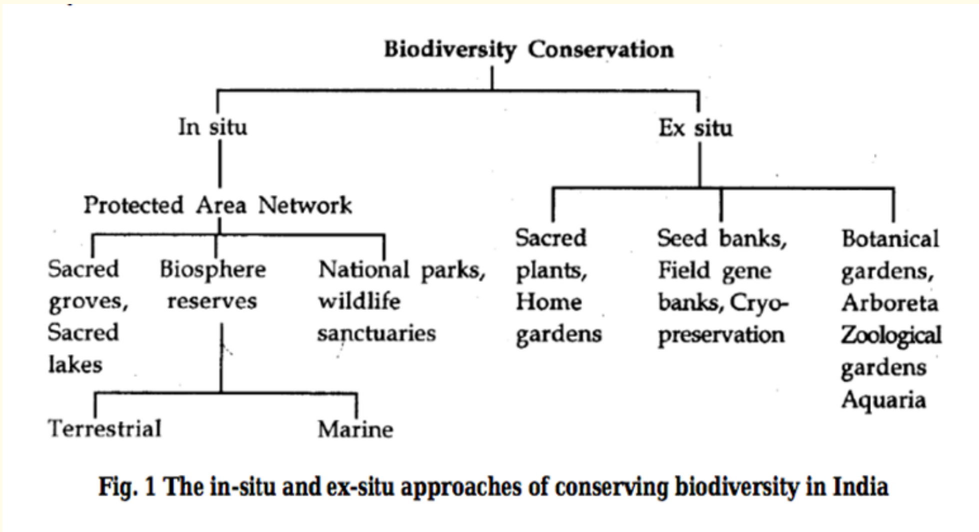

Figure 4

ecosystem has a inferior diversity of animal and plant species. Only one to four major crop species and six to ten major pest species are found in a typical agro ecosystem. Both intentional and natural diversity characterize agro ecosystems.

Planned diversity refers to the spatial and temporal arrangement of domesticated plants and animals that farmers deliberately put in the system, as well as the adding of beneficial organisms. Weedy plants, herbivores, predators, bacteria, and other creatures that survive after the system has been transformed to agriculture or colonies it from the surrounding landscape are examples of unplanned variety. Both types of diversity have a significant impact on agro ecosystem production, stability, pest control, soil processes, and organism mobility among agriculture and natural habitats in the agricultural landscape. An agro ecosystem is heavily managed by humans and subjected to abrupt changes such as ploughing, inter cultivation, and pesticide cure.

Biodiversity is essential for sustainable development

The 2030 Agenda for Sustainable Development, agreed by the 193 States Members of the United Nations, sets out an ambitious framework of universal and inseparable goals and targets to address a range of global societal challenges. Biodiversity and ecosystems feature prominently across many of the Sustainable Development Goals (SDGs) and linked targets. They contribute directly to human well-being and development priorities. Biodiversity is at the centre of many financial activities, particularly those related to crop and livestock agriculture, forestry, and fisheries. Globally, almost half of the human population is directly dependent on natural resources for its livelihood, and many of the most vulnerable people depend directly on biodiversity to realize their daily subsistence needs [26].

Conservation and sustainable use

While there is considerable discuss over the scale at which biodiversity destruction is occurring, there is little doubt we are presently in an age where species loss is well above the recognized biological norm. Extinction has certainly occur in the past, and in fact, it is the providence of all species, but today the rate appear to be at least 100 times the conditions rate of one species per million per year and may be head towards a scale thousands of times greater.

Mainstreaming biodiversity for sustainable development

Biodiversity underpins all life and provides vital profit to our societies and economies. Yet despite this, pressures from land use change, over-exploitation of natural resources, pollution and climate change are causative to an alarming loss of living diversity. We have to reverse these trends. Biodiversity and ecosystem services provide invaluable but often invisible benefits at global, regional and local scales. These include services such nutrient cycling, envi-

Figure 5

ronment provisioning, pollination, erosion manage and climate instruction. The need to typical biodiversity and ecosystem services more efficiently into national and sectored policies has recently gained renewed impetus on the global policy agenda. In line with the Convention on Biological Diversity and the 2011-2020 Aichi Biodiversity Targets, the 2030 Agenda for Sustainable Development places strong emphasis on biodiversity for achieving these global goals.

Existing policy responses

There are so many International as well as nationwide legislations relating to conservation and sustainable use of the natural resources. Some of them are discussed below.

- The Convention on Biological Diversity.
- Biological Diversity Act, 2002
- Wild Life Protection Act

Conclusion

Ecological restoration has as its goal the re-establishment of degraded ecosystems to resemble, or imitate more closely conditions that prevailed before disturbance of natural structures and processes. A key concept in renovation ecology is that of the reference conditions defined as the range of ecosystem conditions (including structure and function) which have prevail over current evolutionary time. Underlying the idea of reference conditions is the thought of the evolutionary environment the environment in which species have evolve. Ecological restoration consists of managing actions designed to accelerate revival by complementing or reinforcing natural processes. The indirect links biodiversity and ecosystem services as demonstrate by different outcomes of restoration activities on aspect of biodiversity and ecosystem service. Species-poor agricultural grassland can be changed to a species-rich hay meadow with the aim of ornamental native species diversity. compare with the original ecosystem, this causes a small raise in carbon sequestration, but has no effect on water use and the lack of fertilizers leads to a decline in forage production, Although current data indicates that restoration can be doing well in increasing both biodiversity and ecosystem services, it should not be assumed that restoring biodiversity will certainly enhance ecosystem services, or vice versa. Biodiversity and different ecosystem services might show different trajectory during restoration, leading to conflicts and trade-offs. Restoration actions focus on a particular ecosystem service could lead to negative impact on biodiversity or provision of other services, which will need to be considered during the scheduling process. Resolution of conflicts in release of different services and biodiversity will almost certainly require a participatory process to land-use planning. This approach would need a better understanding of how the condition of ecosystem services varies at a range of balance in relation to ecosystem condition; for example, water provisioning is complex processes that can only be manage efficiently at the catchment scale in relative to patterns of land use.

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