

The Current Status, Challenges and Ways of Conservation Efforts of Bio diversity in Ethiopia

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Abstract: Ethiopia is one of the richest centres in faunal, floral, and microbial diversity in the world. Conservation practices and policies have been variably successful in recent years. This review paper was initiated to assess the status of Biodiversity, threats, and conservation efforts in Ethiopia. The causes of biodiversity loss, including habitat destruction, invasive alien species, over-harvesting of biodiversity resources, and species homogeneity in agriculture, are all essential biological drivers of the loss of biological diversity. All of these factors share a commonality: they are all human-driven. More research is needed in this area. It is also debatable and questioned whether existing biodiversity-conservation strategies provide adequate responses to these core causes of biodiversity loss and are capable of effectively counteracting the loss of biodiversity-related cultural values, biological species, and ecosystems. Conservation of genetic resources may be warranted for future genetic improvement of plants and livestock. Through bio prospecting, which adds value to biodiversity by undertaking exploration, assessment, and conservation, the country will reap impressive economic, social, and cultural benefits. This review is relevant to the study area, which engages in participatory community-based management techniques, and sector-based conservation and integration should minimise biodiversity conservation loss, while also incorporating social, cultural, and economic considerations. Finally, the findings suggest that a widespread perception among local communities is that biodiversity is facing challenges. This implies that engaging with local communities and incorporating their perspectives in biodiversity and ecosystem conservation strategies is crucial for the adequate protection and restoration of biodiversity.

Keywords: Biodiversity, Bio Prospecting, Genetic Resources, Ethiopia.

Abbreviations:

EBI: Ethiopian Biodiversity Institute

CBD: Convention on Biological Diversity

I. INTRODUCTION

Biodiversity affects us in almost every aspect of our lives. Since Biodiversity provides us with food in the form of cereals, grains, fruits, vegetables, meat, milk and eggs [48]. On the other hand, biodiversity is essential for improving human well-being. Essential for sustainable development and human well-being. It underpins the provision of food and water, mitigates the effects of climate change, supports human health, and provides jobs in various activities, such as

agriculture, fisheries, forestry, and many other sectors [37]. Apart from the edible items, we obtain a variety of materials, including gum, resin, rubber, fibres, colours, hide, perfumes, pesticides, wax, lubricants, timber, and paper, which make our lives easier [45]. Many drug treatments and capsules are derived from direct plant products or synthetically produced compounds that mimic the movements of plant-produced chemical compounds. Additionally, Coal, petroleum, and herbal fuel are all products of biodiversity [31]. Many medicines and drugs are either direct plant products, derived from plant products, or synthetically produced compounds that mimic the actions of plant-produced chemicals. Additionally, coal, petroleum, and natural gas are all products of biodiversity [30]. It also has protective functions, such as protecting soil from erosion and reducing the impact of floods and tsunamis. Biodiversity also has aesthetic, as well as social and cultural, value to us [44]. Nevertheless, biodiversity is on the path of depletion, predominantly due to anthropogenic activities such as human development and encroachment on natural and wild habitats, which lead to the extinction of biodiversity through intensive agriculture, the conversion of forestlands, mining for energy demands, transportation development, and unregulated recreation [20]. Furthermore, the poor are most affected by biodiversity loss, as they directly depend on biodiversity to meet their daily subsistence needs [46]. Therefore, this requires more attention and urgent action from different stakeholders to conserve and protect biodiversity, which should be the primary response, since biodiversity plays a crucial role in human existence and the healthy functioning of natural systems. For sustainable biodiversity conservation, we should first consider four key aspects: why conserve, what to preserve, how to protect, and where to conserve. Then, after we can carry out the conservation activity with the necessary management methods in the essential place based on the conservation

Genetic variation is seen among the individuals within a species. For instance, in cattle, there are many varieties concerning colour, milk yield, size, and disease resistance. This genetic variability, contained within the genetic material, facilitates adaptations in an organism and constitutes the genetic diversity of a species [10]. The greater the genetic variability, the more likely a species is to adapt and survive natural selection and other environmental pressures [8]. The lesser the genetic variability, the more likely a species is to be vulnerable to threats such as fungal, parasitic, and insect infestations and diseases [13]. According to [34], a key source of biodiversity is genetic diversity, which refers to the significance of genetic variability within a population or the genetic makeup of organisms and species on

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earth [21]. Genetic diversity refers to the variation of genes among species and populations, as well as within those populations, that distinguishes distinct breeds or races from one another. A few species have as many as 400,000 genes; for example, humans have approximately 20,000 genes, while rice has around 56,000. In dynamic ecosystems, genetic variability is critical for population survival and often increases with environmental variability, as alterations in environmental variables affect genetic diversity within. Variability within a population or the genetic makeup of the variation of organisms and species on Earth [3]. Genetic diversity refers to the variation of genes among species and populations, as well as within those populations, that separates distinct breeds or races from one another. Some species have as many as 400,000 genes; for example, human beings have ~25,000 genes, while rice has more than 56,000. In dynamic ecosystems, genetic variability is crucial for population survival and often increases in response to environmental variability, as alterations in environmental variables affect genetic diversity within populations. Aggravated soil erosion removes nutrient-rich topsoil, declining its nutrient concentration and ecological functioning. Continuous soil erosion can reduce cultivable areas due to the abandonment of low-productivity lands and the formation of gullies [33]. The development of complementary conservation techniques, in which specific conservation tactics and strategies are combined, helps to achieve the maximum stable and cost-effective conservation effort for a given gene pool under locally prevailing conditions. Here, it is critical to note that both in-situ and ex-situ conservation have merits and demerits [43]. Larger ecological structures are composed of biomes, which can be fundamental to human well-being. Biodiversity conservation is crucial for human well-being and poverty reduction. This was the link between the degradation of ecosystems and the fight against poverty and its consequences, such as the state of health and well-being of populations.

The Convention on Biological Diversity, to which Ethiopia is a signatory, emphasises that every country has a responsibility to conserve, restore, and use its biological diversity sustainably within its own jurisdiction. The loss of biodiversity has significant economic and social costs for any country. While following the path of development, Ethiopia has been sensitive to the needs of conservation. The ethos of conservation and harmonious living with nature is deeply ingrained in the lifestyles of the Ethiopian people. There has been a growing realisation in society that nature is.

Resources provide a base for economic and social development. Drought and desertification have far-reaching consequences. However, biodiversity is critical for sustainable development and human well-being. It underpins the provision of meals and water, mitigating the impact of climate change and providing resilience. It enhances human fitness and affords jobs in diverse activities, such as agriculture, fisheries, forestry, and numerous other sectors [15].

Strategy-Final-Documents-Digital.pdf A lack of public awareness about biodiversity conservation is the leading cause of biodiversity loss, underscoring the importance of biodiversity conservation in Ethiopia and its connection to the well-being of its people. The Ethiopian Biodiversity

Institute (EBI) has the power and duties related to the conservation, promoting the sustainable utilisation of Ethiopia's biodiversity, and ensuring fair and equitable sharing of the benefits accrued from the use of genetic resources. Thus, the study aims to examine the Current Status, Challenges, and Ways of conserving biodiversity efforts in Ethiopia.

II. OBJECTIVES

The objective of this review paper is to compile information on Ethiopia's biodiversity, with a primary focus on highlighting key points.

- i. The review mainly focuses on compiling information to construct a situation analysis scenario on biodiversity loss, in addition to recommending current conditions for future conservation, and to identify bottlenecks and opportunities for biodiversity loss.
- ii. To review the causes and impact of biodiversity loss in Ethiopia.
- iii. To review the significant challenges encountered and ways of conservational efforts in the Ethiopian biodiversity.

III. METHODOLOGY

The methodology employed primarily involved reviewing articles from known Scopus-indexed journals, books, and reports. In compiling this review work, various published articles were also reviewed. The available materials were systematically selected based on content, relevance, and their publication time.

IV. RESULT AND DISCUSSION

A. Definitions of Biodiversity

Biological diversity is defined as the variety and variability among the living organisms from terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part [1]. Biodiversity includes genetic diversity, species diversity and ecosystem diversity. In other words, biodiversity is the variety of life on Earth and provides variation at all levels of biological organisation, from genes to species and ecosystems [12]. However, research indicated that biodiversity encompasses more than variation in appearance and composition, and includes diversity in abundance, distribution, and behavior, and incorporates human cultural diversity [11].

Biological diversity or biodiversity has been defined by the "Convention on Biological Diversity" (CBD) as "the variability among living organisms from all sources, i.e. terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part.

According to the World Resources Institute, the World Conservation Union, and the United Nations Environment Programme, "Global Biodiversity Strategy (1992), biodiversity is the totality of genes, species, and ecosystems in a region. It encompasses diversity within species, between species, and within ecosystems. In common

sense, biodiversity is about genes, species, and ecosystems. Despite some success in conserving biodiversity at the local level, biodiversity continues to decline due to a continued increase in human population, resource consumption, market factors, and policies. Ethiopian biodiversity, with its unique combination of genes/genotypes, has been well-adapted to the environment for ages. Considering climate change, these ageremplasm are going to be highly relevant for the rest of the world. Dwindling resources of sustenance will have profound implications for ecology, society, and the economy. Therefore, preserving floral, faunal, and microbial diversity is a significant concern in Ethiopia.

B. Biodiversity in Ethiopia

The major physiographic features are massive highland mountains and plateaus divided by the Great Rift Valley and surrounded by lowlands along the periphery. The Great Rift Valley, which runs from northeast to southwest in Kenya, creates a vast depression. There is Great altitudinal variation, ranging from 116 meters below sea level to 4,620 meters above sea level. Although Ethiopia is a tropical country with typically hot and dry lowland areas, it has varied macro and micro-climatic conditions. The rainfall is variable in different parts, with the highest at 2200 mm in the highlands (>1500 meters) and the lowest at 250 mm in the lowlands (< 1500 meters). All these factors have contributed to the richness of Ethiopian biodiversity, characterised by a high level of endemism and genetic diversity.

C. Importance of Biodiversity in Ethiopia

Benefits from biodiversity to humans are various, and essential services provided to society include material goods such as food, timber, medicines, and fibre; as well as multiple services that underpin ecological functions such as flood control, climate regulation, nutrient cycling, maintaining hydrological cycles, cleaning water and air, soil formation and soil storage [26], added to the cultural, social, aesthetic and ethical values, pollination and pest control, carbon sequestration and storage [14]. These functions are valued for securing long-term benefits from nature by providing resilience to disturbances and environmental change [5], as well as other economic and social contributions that are essential to human well-being.

D. Components of Ethiopian Ecosystems

Conservation of habitat diversity leads to conservation of species and genetic diversity. The major ecosystems include: Afroalpine and subafroalpine, Montane dry forest and scrub, Montane moist forest, Acacia-Comiphora woodland, Combretum-Terminalia woodland, Lowland humid forest, Aquatic, wetland, Montane grassland, and Desert and semidesert ecosystems. The country has two biodiversity hotspots: the Horn of Africa and the Ethiopian Highlands, which are part of the Eastern Afromontane hotspot (Biodiversity hotspots). The existence of diverse ecosystems has led to a rich floral, faunal, and microbial diversity.

V. FLORISTIC DIVERSITY

The flora of Ethiopia is very diverse, with an estimated number between 6,500 and 7,000 Species of higher plants, of which about 15 per cent or more are probably endemic.

Ethiopia is considered the fifth-largest country in tropical Africa.

Many workers have noted the richness and endemism of the floral biodiversity. The Horn of Africa (Ethiopia, Eritrea, Djibouti, and Somalia) is a major centre of plant diversity and endemism, harbouring more than 8,000 plant species, with 24 per cent endemic to the region [2].

A. Forest Plant Diversity

The revised estimate of the closed forest cover in Ethiopia is less than 3.5%. There are approximately 300 tree species reported in Ethiopia.

B. Diversity of Crop Plant Species

Ethiopia is one of the richest centres in the world in terms of crop diversity, including plants such as coffee (*Coffea arabica*), Safflower (*Carthamus tinctorius*), tef (*Eragrostis tef*), noug (*Guizotia abyssinica*), anchote (*Coccinia abyssinica*), enset (*Ensete ventricosum*), etc., which are known to have originated in Ethiopia. Local cultivars/farmers varieties of several major food crops (wheat, barley, sorghum, pea, faba bean Tef, noug), Ethiopian mustard, enset, finger millet, cowpea, lentil), industrial crops (linseed, castor and cotton), forage species (clovers, medics, oats), and cash crop (coffee) are having enormous genetic diversity are available in the Ethiopia. The genetic resources of plants are crucial for future crop improvement programs.

C. Faunal Diversity

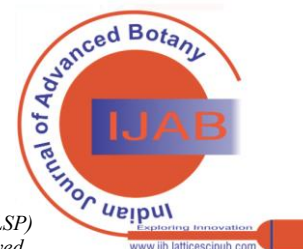
Ethiopia is rich in faunal diversity, boasting a diverse array of mammals (277 species), birds (861 species), reptiles (78 species), amphibians (54 species), and fish (101 species). Among these, some species are listed as critically endangered, endangered, and vulnerable; therefore, there is an urgent need to prioritise their conservation in national programs. Domestic animal species further add to secondary faunal diversification in Ethiopia. The number of domestic breeds by species is a total of 109- ass (6), cattle (31), chickens (14), dromedary (5), goat (26), horse (1), and sheep (26). However, there is limited information available on the diversity of invertebrates.

D. Microbial Diversity

Microbial diversity will lead to the discovery of new species and novel metabolic pathways, which may be important from both fundamental and applied science perspectives. A total of 44 species of Viruses, 61 genera and 89 species of bacteria, 97 genera and 248 species of algae, 35 genera and 45 species of fungi, eight genera of protozoa, and 20 species have been reported, as information gathered from different sources [23].

E. Threats to Biodiversity

Loss of biodiversity is a worldwide concern; one primary cause is habitat destruction and fragmentation. In addition to this, the rate of extinctions may be accelerated by other causes, such as invasion by alien species, overexploitation, climate change, habitat deterioration, and extinction cascades [42]. The continued growth of human populations and per capita consumption has led to the unsustainable exploitation



of Earth's biological diversity, which is exacerbated by climate change, ocean acidification, and other anthropogenic environmental impacts [22].

The diversity of flowering plants has been well-documented, and measures have been implemented to manage them. Land degradation is a significant threat to biodiversity. However, little information is available about the diversity of non-flowering plant species (Bryophytes, Pteridophytes, and Gymnosperms). With the genetic improvement of plants and animals, there is a significant threat of replacing local varieties and breeds, as they are not in frequent use and are likely to be lost if necessary conservation efforts are not made. In aquatic systems, flowering plants do not dictate their management; instead, Unsustainable exploitation of resources occurs [40].

Pollution is at a high level, habitat loss and degradation, as well as the effects of climate change, are significantly impacting the diversity of aquatic life. The biodiversity of invertebrates is largely unexplored. The current trend is that biodiversity is declining [17]. Approximately 50 per cent of Ethiopia is mountainous, and about 90 per cent of its land is arable, which is occupied by 90 per cent of the human population and 60 per cent of all livestock. In the past, the region has been rich in natural diversity and witnessed a seat for human development, „cradle of mankind“ with early hominids some 3-4 million years ago, and/ origin of Homo sapiens some 150,000 years ago. With the increase and spread of population throughout the highland parts of Ethiopia, which were once endowed with rich natural resources, it now faces a threat. Mountain tops above 3700 m, and the steepest slopes in the highland escarpments, some natural vegetation patches, and a few original wildlife species have been able to survive, untouched by human interference.

F. Significant Biodiversity Causes Loss in Ethiopia.

Natural land use changes, pollution, variations in atmospheric CO₂ concentrations, changes in the nitrogen cycle, acid rain, climate change, and the introduction of exotic species are all key contributors to biodiversity loss. The fragmentation, threat fragmentation, degradation, or loss of habitats, over-exploitation of natural resources, pollution of air and water (by various activities such as agriculture), the introduction of non-native (alien, or exotic) species, and climate change-induced biodiversity loss is all causes of human-induced biodiversity loss, with these factors inextricably linked with some or all of them. Exotic species are also less of a concern in tropical forests than in temperate regions because the vast diversity in tropical forests makes it difficult for newcomers to establish themselves [41].

G. Habitat Destruction and Fragmentation

Habitat destruction is the process through which natural habitats are rendered incapable of supporting the organisms that inhabit them. The species that formerly used the site have been relocated or exterminated as a result of this process, thereby diminishing biodiversity. Human activity primarily destroys habitats to extract natural resources for industrial production and urbanisation. The primary source of habitat degradation is the conversion of habitats for agricultural use. Mining, logging, trawling, and urban sprawl are all essential activities that contribute to the economy [47].

H. Edge Effect

The border, or interface, between two biological groups or between various landscape components is referred to as an edge. For example, where older forested patches meet recently harvested cut blocks, or where forests meet rock outcrops, riparian areas, grasslands, or other types of harvest or development stages, there are edges. Ecotone is a transition zone that exists between two natural populations [49].

I. An Invasive Species

A species is a plant or animal that is not native to a particular region (introduced species, invasive) and has a proclivity to spread, causing harm to the environment, the human economy, and/or human health. A non-native or introduced species that has spread widely is sometimes referred to as a weed. However, not all imported species have negative environmental consequences [4].

Ecosystems that are fully utilised by native species can be treated as zero-sum systems, where every gain for the invader results in a corresponding loss for the native. However, unilateral competitive dominance (and the extinction of native species due to the greater abundance of invader populations) is not the norm.

J. Pollution

Air pollution has a significant impact on biodiversity. Pollution has a deleterious effect on the atmosphere, lithosphere, and hydrosphere. Air pollution has a greater impact on lower life forms than on higher forms of life. On land, plants are often more harmed than animals, but this is not the case in freshwater. Most species are declining due to pollution, except for a few that are increasing in number. Plants consume atmospheric gases, such as oxygen, on a daily basis to sustain their biological activities. Pollution comes from two different types of sources: stationary and nonpoint sources. Wood-burning fires (on a small scale) and coal combustion in coal-fired power plants are examples of stationary point sources (on a large scale). Automobiles and other vehicles are typical examples of mobile multiple point sources. Environmental Protection Agency [53].

K. Eutrophication

One of the most noticeable long-term changes is eutrophication. Lakes, ponds, slow rivers, and river mouths are examples of aquatic habitats where this phenomenon happens. The steady supply of nutrients (mainly phosphorus and nitrogen) encourages the growth of certain algae. The decomposition of these algae consumes an excessive amount of oxygen. The number of species that can survive in such a suffocating watery habitat is reduced. The battle for space between humans and wildlife is raging worldwide [25].

L. Climate Change

Biodiversity is under threat from climate change. Although a certain amount of temperature volatility is necessary for ecosystem survival and function, a rapid shift is harmful to the diversity of life [6]. In the future, climate change is predicted to exacerbate biodiversity loss, despite the climate having consistently

altered throughout Earth's records, with ecological communities and species evolving and becoming extinct. Extended weather patterns disrupt environmental structures and the functionality of species, hindering their ability to acclimate, and as a result, the loss of biodiversity intensifies [52].

M. Overexploitation

Overexploitation, also known as overharvesting, occurs when a renewable resource is depleted to the point of being irretrievably depleted. Overexploitation is one of the five primary activities that jeopardise world biodiversity, according to ecology. Overexploitation of natural resources can lead to significant damage to resources, including the extinction of species. Overexploitation, on the other hand, can be sustainable, as explained below in the context of fisheries. The quantity of a resource can affect its quality [35].

N. Population Explosion

Essential habitats are being lost and damaged, as well as ecosystems. Biodiversity is vital to human well-being because it ensures the proper functioning of ecosystems that support human life. The word "biological diversity" refers to the genetic pool, range, and diversity of species and ecosystems. Over the last century, and particularly since 1950, when extraordinary levels of human population increase coincided with human activity, ecosystems have been subjected to significant changes and stress. Many species are declining to critically low population levels due to pollution, climate change, and direct human activities [7].

O. Opportunities

This section highlights some significant opportunities to enhance intervention quality and scale up effective strategies. Efforts made by the government and non-governmental entities to stem biodiversity degradation have yielded some promising results and several potential opportunities. To date, several lists of opportunities are available below to address the nationwide problem of biodiversity loss.

- **Existence of Environmental Policies and Strategies.** Ethiopia has made commendable attempts to mitigate environmental deterioration through policy and strategy responses. Ethiopia's Environmental Policy is one of the most crucial umbrella policies. This strategy comprehensively tackles a wide range of sectoral and cross-sectoral environmental challenges.

P. Rich Experience in Participatory Watershed Management.

One of the most essential requirements for successful land resource management projects is genuine community participation at all levels of the decision-making process.

Q. Availability of Both Indigenous Knowledge and Scientific Technologies.

Local communities possess a wealth of indigenous knowledge and practices that can be further developed to ensure long-term land resource management.

- **Conservation-oriented Crop Combination Land Management.** The core ideas include incorporating conservation into the farming work cycle and ensuring that farming methods not only involve a few new inputs

but also provide farmers with immediate economic benefits.

- **Agroforestry Practice.** Agroforestry is a new term for a collection of traditional activities. It is a catch-all term describing land-use systems and technologies in which woody perennials (trees, shrubs, palms, bamboo, and others) are intentionally employed alongside crops or animals on the same land-management units, in some sort of spatial arrangement or temporal sequence.

R. Conservational Approaches

The statement that we should conserve and sustain desired levels of biodiversity may seem challenging, but it is straightforward to manage. It is a broad, general statement that provides no basis for deciding how to manage this, as there are numerous measures of biodiversity. It has biological roots and serves as a political issue with as many meanings as it has advocates. There are several strategies for conserving biodiversity; however, popular conservation techniques can be broadly categorised into two methods: in-situ and ex-situ conservation methods. In-situ (on-site) conservation is the conservation of genetic assets within the natural ecosystem in which they occur, whereas ex-situ (off-site) conservation is the conservation of genetic resources outside their natural environment, where they arise [32].

Biological diversity manifests at three levels: species diversity, genetic diversity, and ecosystem diversity. Conserving biological diversity requires a significant effort in conducting surveys and inventories, establishing priorities, selecting protected areas, and managing resources [50].

- i. *In Situ Conservation:* It is the primary approach for biodiversity conservation ('on website online', 'in vicinity'). It refers to maintaining plants and animals in their original habitat where they have developed their distinctive properties/adaptations. Protected area-An area dedicated to in situ conservation. For example, establishment of National Parks, Sanctuary or Biosphere reserves, where there is no danger of hunters or poachers and most notably in farmers fields (also known as on-farm conservation) In-situ conservation techniques in general consists of the different included vicinity structures, and on- farm conservation in which cultivated plant life and domesticated animals are conserved within the agro ecosystems in which they had been developed and applied [38].
- ii. *National Parks:* These are government-maintained protected areas or reserves, where biodiversity is protected from any kind of exploitation, cultivation, grazing, hunting, etc., which are not allowed [29].
- iii. *Sanctuaries:* These are the areas where hunting is not allowed, but other activities like cultivation, razing, collection of forest products, etc., are permitted. Biological control can cause ecological imbalance, shifting cultivation, hotspots (species-rich, threatened areas), pollution, global climatic changes, high population, industrial agriculture, and economic systems that fail to value the environment, as well as insufficient knowledge and its



applications. However,

Biological diversity on many small islands is under increasing threat due to impacts such as the introduction of exotic species, the development of tourism infrastructure, inadequate waste disposal measures, and excessive harvesting of particular biotic groups (e.g., corals), among others.

Generally, island species tend to be much more vulnerable to changes in their environments [51]. Populations tend to be small, localised, and highly specialised, and they often lack developed defence mechanisms against a broad range of potential predators or competitors. Under these circumstances, they can easily be driven to extinction.

- iv. *Biosphere Reserves*: These are multipurpose protected areas of different representative ecosystems which are meant for conservation of biodiversity or wildlife, the traditional lifestyle of tribals and their domesticated animals and also plant resources. Each biosphere reserve has a core zone (where no human activity is permitted), a buffer zone (with limited human activity), and a management zone (where human activity is allowed without degrading the ecology).
- v. *On-farm Conservation*: On-farm conservation involves the conservation of plants and their wild relatives, as well as cattle, and the agroecosystems in which they occur. They are better options for building the scientific basis of in-situ conservation of agro-biodiversity on-farm. For instance, the farmers' indigenous understanding and practices in germplasm choice, storage, and exchange are predominant elements in the preservation of agricultural biodiversity through community gene banks [39].
- vi. *Ex Situ Conservation (Off-Site Conservation)*: Preservation, maintenance, and breeding of components of biological diversity outside their natural habitat. Complementary to in-situ preservation [18]. Examples include zoos, Aquaria, Hatcheries, Botanical gardens, Arboretums, nurseries, seed banks, and gene banks. Nonetheless, ex-situ conservation interrupts evolutionary and ecological processes, thereby limiting the genetic variability and flexibility of species in response to changing environmental conditions [19]. When the extinction of a species is imminent, ex situ conservation becomes the only viable option for conserving the species. It involves the preservation and maintenance of samples of living organisms outside their natural habitat in the form of whole plants, seeds, pollen, vegetative propagules, tissue, or cell cultures. Among ex situ conservation methods, the most common are cultivation in botanical gardens, seed storage, and in vitro cultivation.

S. Botanical Gardens

Botanical gardens are institutions that retain documented collections of living plants for medical studies, conservation, display, and education [24]. Botanical gardens have played a critical role in preserving the area's plant diversity [16]. Botanical gardens are concerned with the conservation of

plant life that is important for food and agriculture, in addition to those used for many other economic purposes. Additionally, botanical gardens are involved in habitat management and restoration, plant reintroduction, control of invasive species, and environmental education [9].

T. Field Gene Bank

A field gene bank is one of the strategies within the approach for plant genetic conservation. It's an ex-situ approach where genetic variation is maintained far away from its natural area and samples of a species, subspecies, or range are transferred and conserved as living collections [27]. Area gene banks are critical for the conservation of plant species that do not produce seeds and propagate vegetatively, or produce the so-called recalcitrant seeds (seeds that cannot be saved at low temperatures [36]).

U. Gene Bank

It is a far ex-situ approach, where a genetic variant is maintained far from its native area, and samples of species, subspecies, or geographic range are transferred and conserved as residing collections. This is not an unusual approach for preserving genetic resources with recalcitrant or vegetatively propagated flora [28]. Gene banks are essential for the conservation of genetic resources. Germplasm that can be conserved or saved in gene banks encompasses seeds, pollen, spores, sperm (spermatids), eggs, embryos, cells, and tissues.

V. The Ways of Conservation Efforts of Biodiversity in Ethiopia

To conserve or reduce biodiversity loss an assessment on awareness creation on attitude and perception about biodiversity were conducted in four region of Ethiopia by s NGO involvement four regional states of Ethiopia special in (Oromia, SNNP, Amhara and Sidama) for conservation and sustainable development biodiversity suggested by different opinion were responded from the interviewer accordingly with these finding Overall, the result obtained underscores the diversity of the views on biodiversity changes, emphasizing the importance of considering regional nuances and specific habitats. .

W. The Following Points are the Major Takeaway Messages for Conservation Efforts

- i. There is a high level of awareness and shared concerns among the public regarding biodiversity degradation, loss and ecosystem service decline. This includes declining wildlife populations and their habitats.
- ii. The respondent show a substantial agreement on the causes of these changes which include shifts in the natural environment, such as deforestation, urbanization, or land-use changes. Climate change also emerged as a significant concern for the local community. The shared recognition of decreasing vegetation cover underscores the importance of acknowledging and addressing the direct and indirect drivers that lead to habitat loss and biodiversity decline, with potential consequences for



- ecosystem services. This shared awareness could serve as a critical foundation for fostering community engagement in conservation initiatives and sustainable land management practices that aim to mitigate the identified threats to the local environment.
- iii. There are high concerns about the sustainability of agriculture and its potential impacts on food security. The respondents express concern about soil degradation and declining productivity resulting from changes in the seasonality of rainfall and precipitation amounts, indicating a heightened awareness of climate-related shifts within the surveyed population.
 - iv. In terms of the engagement of the respondents in conservation activities, a substantial number of participants have engaged proactively in planting tree seedlings as a contribution to the Ethiopian Green Legacy initiative. Additionally, participation in watershed development programs and soil and water conservation activities is widespread among respondents across various regions. This active engagement of the respondents substantiates the overall awareness of the people regarding the state of the environment and biodiversity. This involvement signifies a notable commitment to reforestation and environmental sustainability, aligning with broader efforts to address climate change and promote biodiversity conservation.
 - v. In terms of the need for increasing productivity of the land, the vast majority of respondents in all regions duly recognize the need for improving productivity while paying attention to the environment. In addition, over 90% of respondents agree on the need for crop and livestock diversity to diversify farming and livestock breeding. These results demonstrate the respondents' awareness of the genetic diversity of local crop and livestock varieties, highlighting the need to pay attention to this aspect.
 - vi. One of the impressive findings of this survey is the overall consensus reached by the respondents on the environmental responsibility of the current generation. The respondents agreed that the generation must discharge its ecological responsibility. There is also a strong consensus on the need to promote local knowledge and varieties for maintaining a healthy and productive environment, with over 92% of respondents strongly agreeing, and the remaining 8% agreeing.
 - vii. The vast majority of the respondents agree that the farmer must better utilise locally sourced farm inputs such as organic fertilisers for increasing productivity and must avoid or minimise the use of artificial fertilisers, and the need for averting pollution through waste plastic bottle management practices.

VI. CONCLUSIONS

Ethiopia is one of the world's centres of biodiversity, and it also has aesthetic and recreational value. The biggest threat to biodiversity is habitat destruction, not the destruction of individual plants and animals. Human settlements expand as a result of population growth, leading to an increased need for food, fuel, and building materials. Modernisation of agriculture also poses a threat to potentially significant local

crops. This review examines various real-world scenarios where biodiversity loss is attributed to the interaction of multiple socio-economic variables, as well as decision-making and policy decisions, across diverse environmental contexts. By focusing on marine, coastal, wetland, and forest ecosystems, this study draws on real-world examples while also situating the extensive literature and ongoing research on biodiversity loss in context. The loss of biodiversity is predicted to accelerate in the future decades, according to most scenario projections. Several frameworks have been developed in the past to examine the complex interaction of stressors and factors that impact biodiversity, encompassing pathways that span multiple physical and temporal dimensions. Biome, geography, and climate, as well as the type of pressure (i.e., over-exploitation of wildlife vs. habitat modification), the economic backdrop in the biodiversity host country, trade patterns, and the type of governance are the major factors contributing to Ethiopia's biodiversity loss. Due to the increasing levels of biodiversity loss, environmental consequences such as air pollution, edge effects, invasive species, habitat destruction and fragmentation, as well as climate change (e.g., global warming), are of significant concern. However, problems connected with biodiversity loss not only worsen environmental circumstances but also have negative consequences for a country's economy, long-term growth, and people's health, ultimately leading to species extinction.

RECOMMENDATIONS

Policy makers should make decisions in partnership with connections between communities and national governments to safeguard biodiversity conservation and promote sustainable development.

Continuous supervision ensures smooth communication with key stakeholders, including youth from the local community, females, elders, women, and other relevant parties such as environmental protection experts, forestry officials, and NGOs working on these issues, to transfer knowledge about Biodiversity and sustainable utilisation. The best practices of community participation, ensuring conservation and sustainable development, as well as fair and equitable sharing of biological resources, and integration with other governmental sectors, should be thoroughly applied to maintain biodiversity.

The effort to make conservation based on the creation of protected areas, the integration of communities in conservation activities, revenue sharing, and the establishment of various laws, such as the Access and Benefit Sharing Proclamation, which governs biodiversity.

For conservation, the sustainable utilisation of biological resources involves undertaking multiple research activities, as well as assessing the impact of these activities through monitoring and evaluation. Additionally, educating people about biodiversity is crucial.

In an implementation of the Convention on Biological Diversity (CBD), an international accord aiming at preserving the planet's biodiversity and equitably



sharing its benefits, set a goal of “substantially reducing” biodiversity loss by 2010 in 2002. However, this goal was not realized [28].

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REFERENCES

1. Abdubasit, Hussein. (2022). Factors of Biodiversity loss and conservation difficulties and opportunities in Ethiopia. *Biodiversity Journal* 13(1), p.p 145-154 https://www.biodiversityjournal.com/images/publicazioni/biodiversity-journal-2022/biodiversity-journal-2022-13-01/biodiversity-journal-2022-13-01_145-154.pdf
2. Agathokleous, E., Feng, Z., Oksanen, E., Sicard, P., Wang, Q., Saitanis, C. J., ...& Calatayud, V. (2020). Ozone affects plant, insect, and soil microbial communities, posing a threat to terrestrial ecosystems and biodiversity. *Science Advances*, 6, eabc1176. DOI: <https://doi.org/10.1126/sciadv.abc1176>
3. Albert, J. S., Destouni, G., Duke-Sylvester, S. M., Magurran, A. E., Oberdorff, T., Reis, R. E., ...& Ripple, W. J. (2021). Scientists' Warning to Humanity on the Freshwater Biodiversity Crisis. *Ambio*, 50, 85–94. DOI: <https://doi.org/10.1007/s13280-020-01318-8>
4. Ashford, O. S., Kenny, A. J., Barrio Frojan, C. R., Bonsall, M. B., Horton, T., Brandt, A., ...& Rogers, A. D. (2018). Phylogenetic and functional evidence suggest that deep-ocean ecosystems are susceptible to environmental change and direct human disturbance—Proceedings of the Royal Society B, 285, 20180923. DOI: <https://doi.org/10.1098/rspb.2018.0923>
5. Baker, D. J., Hartley, A. J., Pearce-Higgins, J. W., Jones, R. G., & Willis, S. G. (2017). Neglected issues in using weather and climate information in ecology and biogeography. *Diversity and Distributions*, 23, 329–340. DOI: <https://doi.org/10.1111/ddi.12527>
6. Birhanu, A., Faris, G. (2022). The Current Status, Challenges and Efforts of Conservation of Biosphere Reserves in Ethiopia. *International Journal of Advanced Multidisciplinary Research* 9, pp. 48–69. <https://ijarm.com/pdfcopy/2022/june2022/ijarm6.pdf>
7. Blackmore, S. (2017). The future role of botanical gardens. *Tropical Plant Collections. Scientia Danica. Series B, Biologica*, 6, 285–297. http://publ.royalacademy.dk/backend/web/uploads/2020-02-14/AFL%206/SDB_6_00_00_2017_6005/SDB_6_24_00_2017_6028.pdf
8. Borrelli, P., Robinson, D. A., Panagos, P., Lugato, E., Yang, J. E., Alewell, C., Wuepper, D., Montanarella, L., & Ballabio, C. (2020). Land use and climate change impacts on global soil erosion by water (2015–2070). *Proceedings of the National Academy of Sciences*, 117(36), pp. 21994–22001. DOI: <https://doi.org/10.1073/pnas.2001403117>
9. Boopathi, N. M., & Hoffmann, L. V. 2016. Genetic diversity, erosion, and population structure in cotton genetic resources. In *Genetic Diversity and Erosion in Plants: Case Histories*, pp. 409–438. <https://scholar.google.com/vn/citations?user=he54U00AAAAJ&hl=h>
10. Burger, P.A., Ciani, E., Faye, B. 2019. Old world camels in a modern world—a balancing act between conservation and genetic improvement. *Anim Genet*. 50, pp.598–612. DOI: <https://doi.org/10.1111/age.12858>
11. Butt, M. A., Zafar, M., Ahmed, M., Shaheen, S., & Sultana, S. 2021. *Wetland Plants: A Source of Nutrition and Ethnomedicines*. Springer Nature https://www.researchgate.net/publication/350085540_Wetland_Plants_A_Source_of_Nutrition_and_Ethno-medicines
12. Coates, D. J., Byrne, M., & Moritz, C. 2018. Genetic diversity and conservation units: Dealing with the species population continuum in the age of genomics. *Frontiers in Ecology and Evolution*, 6, pp. 165. DOI: <https://doi.org/10.3389/fevo.2018.00165>
13. Costello, M.J., Chaudhary, C. 2017. Marine biodiversity, biogeography, deep-sea gradients, and conservation. *Curr Biol*. 27, pp.511–527. <https://www.sciencedirect.com/science/article/pii/S0921344923000447>
14. Eekhout, J. P., & de Vente, J. 2022. The global impact of climate change on soil erosion and the potential for adaptation through soil conservation. *Earth-Science Reviews*, 226, 103921. DOI: <https://doi.org/10.1016/j.earscirev.2022.103921>
15. Elechi, J. O. G., Nwiyi, I. U., & Adamu, C. S. 2022. Global food system transformation for resilience. DOI: <http://dx.doi.org/10.5772/intechopen.102749>
16. Faraji, L., & Karimi, M. 2022. Botanical gardens are valuable resources in the field of plant sciences. *Biodiversity and Conservation*, 31, pp.2905–2926. DOI: <https://doi.org/10.1007/s10531-019-01926-1>
17. Fogi S., (2024). Current status, Threats and Strategic solutions for Ethiopia's Biosphere Reserves *Journal of Forestry and Natural Resources*, 3(1),12-22. <https://journals.hu.edu.et/hu-journals/index.php/jfmr/article/view/987>
18. Gasparatos, A., Doll, C. N., Esteban, M., Ahmed, A., & Olang, T. A. 2017. Renewable Energy and Biodiversity: Implications for Transitioning to a Green Economy. *Renewable and Sustainable Energy Reviews*, 70, pp.161–184 <http://www.elsevier.com/locate/rsr>
19. Gurdak, D. J. 2018. Assessing Arapaima conservation and management through actionable research. *State University of New York College of Environmental Science and Forestry*. <https://experts.csf.edu/esploro/outputs/graduate/Assessing-Arapaima-Conservation-and-Management-Through/99871079404826>
20. Himshikha, Dobhal S, Ayate D, Lal P. 2022. The Influence of Anthropogenic Activities on the Biological Diversity of Forest Ecosystems. Newyork, Springer Publications, USA. DOI: http://dx.doi.org/10.1007/978-3-031-06443-2_12
21. Hoban, S., Archer, F. I., Bertola, L. D., Bragg, J. G., Breed, M. F., Bruford, M. W., ...& Grueber, C. E. 2022. Global genetic diversity status and trends: Towards a suite of Essential Biodiversity Variables (EBVs) for genetic composition. *Biological Reviews*, 97(4), pp.1511–1538. DOI: <https://doi.org/10.1111/brv.12852>
22. Jaisankar, I., Velmurugan, A., & Sivaperuman, C. 2018. Biodiversity conservation: Issues and strategies for the tropical islands. In *Biodiversity and Climate Change Adaptation in Tropical Islands*. Elsevier. DOI: <https://doi.org/10.1016/B978-0-12-813064-3.00019-3>
23. Jonas, H. C. 2017. Indigenous peoples' and communities' conserved territories and areas (ICCAs): Evolution in international biodiversity law. In *The Elgar Encyclopedia of Environmental Law*. Edward Elgar Publishing. https://parksjournal.com/wp-content/uploads/2017/11/PARKS-23-2-Jonas-et-al-10.2305IUCN.CH_2017.PARKS-23-2HDI.en_.pdf
24. Krishnan, S., & Novy, A. 2017. The Role of Botanic Gardens in the Twenty-First Century. *CABI Reviews*, pp.1–10.

- DOI: <https://doi.org/10.20933/40000102>
25. Kolawole, A. S., & Iyiola, A. O. 2023. Environmental Pollution: Threats, Impact on Biodiversity, and Protection Strategies. *In the sustainable utilisation and conservation of Africa's biological resources and environment*. Springer.
DOI: https://doi.org/10.1007/978-981-19-6974-4_14
 26. Mackinnon, K., Smith, R., Dudley, N., Figgis, P., Hockings, M., Keenleyside, K., Laffoley, D., Locke, H., Sandwith, T., & Woodley, S. 2020. Strengthening the global system of protected areas post-2020: A perspective from the IUCN World Commission on Protected Areas. Parks Stewardship Forum.
<https://www.jstor.org/stable/48798948>
 27. Mariani, M., Casabianca, F., Cerdan, C., & Peri, I. 2021. Protecting Food Cultural Biodiversity: From Theory to Practice. Challenging the geographical indications and the slow food models. *Sustainability*, 13, pp. 5265. DOI: <https://doi.org/10.3390/su13095265>
 28. Marques Mano Ivo Peres, S. 2017. *Saving the Gene Pool: Genebanks and the Political Economy of Crop Germplasm Conservation*. UCL (University College London). <https://discovery.ucl.ac.uk/1547662/>
 29. Mascher, M., Schreiber, M., Scholz, U., Graner, A., Reif, J. C., & Stein, N. 2019. Genebank genomics bridges the gap between the conservation of crop diversity and plant breeding. *Nature Genetics*, 51, pp 1076–1081
DOI: <https://doi.org/10.1038/s41588-019-0443-6>
 30. Meyer, HP. 2016. Biotechnology for the production of chemicals, intermediates, and pharmaceutical ingredients. *Green Biocatalysis*. Pp.643-674
<http://www.diva-portal.org/smash/get/diva2:1135110/FULLTEXT01.pdf>
 31. Meyer, K. E., & Peng, M. W. 2016. Theoretical foundations of emerging economy business research. *Journal of International Business Studies*, 47, 3–22.
DOI: <http://dx.doi.org/10.1057/jibs.2015.34>
 32. Mukanov, Y., Chen, Y., Baisholanov, S., Amanambu, A. C., Isanova, G., Abenova, A., Fang, G., & Abayev, N. 2019. Estimation of annual average soil loss using the revised universal soil loss equation (RUSLE) integrated in a geographical information system (GIS) of the Esil River Basin (ERB), Kazakhstan. *Acta Geophysica*, 67, pp.921–938.
DOI: <https://doi.org/10.1007/s11600-019-00288-0>
 33. Murad, M.O.F. 2021.Acquiring in situ high-resolution soil information using cost-effective technology.
DOI: <https://doi.org/10.1007/s11600-019-00288-0>
 34. Nicholson, E., Watermeyer, K. E., Rowland, J. A., Sato, C. F., Stevenson, S. L., Andrade, A., Brooks, T. M., Burgess, N. D., Cheng, S.-T., & Grantham, H. S. 2021. Scientific foundations for an ecosystem goal, milestones, and indicators for the post-2020 global biodiversity framework. *Nature Ecology &Evolution*, 5, pp. 1338–1349. DOI: <https://doi.org/10.1038/s41559-021-01538-5>
 35. Ogunkunle, T., Adewumi, A., & Adepoju, A. 2019. Biodiversity: An over-exploited yet underutilised natural resource for human existence and economic development. *Environment & Ecosystem Science (EES)*, 3, pp.26–34. <https://ssrn.com/abstract=4467179>
 36. Opoku, A. 2019. Biodiversity and the built environment: Implications for the Sustainable Development Goals (SDGs). *Resour Conserv Recycl*. 141, pp.1-7.
<https://www.sciencedirect.com/science/article/abs/pii/S0921344918303768>
 37. Panis, B., Nagel, M., & Van Den Houwe, I. 2020. Challenges and prospects for conserving crop genetic resources in field genebanks, in vitro collections, and/or in liquid nitrogen. *Plants*, 9, 1634
<https://cgspace.cgiar.org/items/7d75d393-381f-435e-acc8-c43bdeac474e>
 38. Patra, A. K. 2022. *Introductory agroforestry*. CRC Press.
<https://www.taylorfrancis.com/books/mono/10.1201/978100>
 39. Perrino, E. V., & Wagensommer, R. P. 2021. Crop wild relatives (CWR) priority in Italy: Distribution, ecology, in situ and ex situ conservation, and expected actions. *Sustainability*, 13, pp.1682.
DOI: <https://doi.org/10.3390/su13041682>
 40. Piaggio, A. J., Segelbacher, G., Seddon, P. J., Alphey, L., Bennett, E. L., Carlson, R. H., Friedman, R. M., Kanavy, D., Phelan, R., & Redford, K. H. 2017. Is it time for synthetic biodiversity conservation? *Trends in Ecology & Evolution*, 32, pp.97–107.
DOI: <https://doi.org/10.1016/j.tree.2016.10.016>
 41. Pilli, K., Dash, B., Dey, A., Patel, R., & Singh, P. 2023. Establishing linkages among changes in land use, vegetation, and croplands to arrest soil erosion and desertification. Enhancing the Resilience of Dryland Agriculture under a Changing Climate: Interdisciplinary and Convergence Approaches. Springer.
<https://scholar.google.com/citations?user=bhx9HGoAAAAJ&hl=en>
 42. Roos, E., Patel, M., Spangberg, J., Carlsson, G., Rydhmer, L.2016. Limiting livestock production to pasture and by-products in a search for sustainable diets. *Food Policy*. 58, pp.1-13
https://fenix.isa.ulisboa.pt/downloadFile/844497944586986/6-Livestock%20in%20EU.en_Cap1.pdf
 43. Rounsevell, M. D., Harfoot, M., Harrison, P. A., Newbold, T., Gregory, R. D., & Mace, G. M. 2020. A biodiversity target based on species extinctions. *Science*, 368(6496), pp.1193–1195. DOI: <https://doi.org/10.1126/science.aba6592http://dx.doi.org/10.17352/ojps.000026>
 44. Sewale, B., Mammo, S. (2022). Analysis of floristic composition and plant community types in Kenech Natural Forest, Kaffa Zone, Ethiopia. *Trees, Forests and People*,7, 100170
[https://www.sciencedirect.com/science/article/pii/S26667193210010101096](https://www.sciencedirect.com/science/article/pii/S266671932100101096)
 45. Silva, R., Lithgow, D., Esteves, L.S., Martinez, M.L., Moreno-Casasola, P., Martell, R., Pereira, P., Mendoza, E., Campos-Cascaredo, A., Winckler Grez, P. 2017. Coastal Risk Mitigation through Green Infrastructure in Latin America. *Proceedings of the Institution of Civil Engineers-Maritime Engineering*. Thomas Telford Ltd. 170:39-54
<https://eprints.bournemouth.ac.uk/28806/1/2017%20Maritime%20Engineering.pdf>
 46. Singh, V., Shukla, S., & Singh, A. 2021. The principal factors responsible for biodiversity loss are. *Open Journal of Plant Science*, 6(1), pp. 011–014. DOI: <http://dx.doi.org/10.17352/ojps.000026>
 47. Seymour, F., & Busch, J. 2016. Why forests? Why now?The science, economics, and politics of tropical forests and climate change. Brookings Institution Press
<https://www.cgdev.org/publication/why-forests-why-now-science-economics-and-politics-tropical-forests-and-climate-change>
 48. Tadese, S., Soromessa, T., Bekele, T., Gebeyehu, G. (2021) Woody Species Composition, Vegetation Structure, and Regeneration Status of Majang Forest Biosphere Reserves in Southwestern Ethiopia. *International Journal of Forestry Research* 8,1-22
<https://www.scirp.org/reference/referencespapers?referenceid=3164454>
 49. Tesfu, F., Weidemariam, T., Asersie, M. (2018). Impact of human activities on biosphere reserve: A case study from Yayu Biosphere Reserve, Southwest Ethiopia. *International Journal of Biodiversity and Conservation* 10(7), pp.319-326.
DOI: <https://doi.org/10.5897/IJBC2016.1005>
 50. Verma, K. S., Ul Haq, S., Kachhwaha, S., & Kothari, S. (2017). RAPD and ISSR marker assessment of genetic diversity in Citrullus colocynthis (L.) Schrad: A unique source of germplasm highly adapted to drought and high-temperature stress. 3 *Biotech*, 7(5), 1–24. DOI: <https://doi.org/10.1007/s13205-017-0872-9>
 51. Wang, W., & Li, J. 2021. In-situ conservation of biodiversity in China: Advances and prospects. *Biodiversity Science*, 29(2), pp. 133. DOI:<https://doi.org/10.17520/biods.2021013>
 52. Zegeye, H. 2017. In situ and ex situ conservation: Complementary approaches for maintaining biodiversity. *International Journal of Research in Environmental Studies*, https://www.researchgate.net/publication/320800480_In_situ_and_ex_situ_conservation_complementary_approaches_for_maintaining_biodiversity 4, pp.1–12.
 53. Zerihun, M., Mohammedyasin, M. S., Sewnet, D., Adem, A. A., & Lakew, M. 2018. Assessment of Soil Erosion Using RUSLE, GIS, and Remote Sensing in NW Ethiopia. *Geoderma Regional*, 12, pp. 83–90. DOI: <https://doi.org/10.1016/j.geodrs.2018.01.002>

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