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RESEARCH ARTICLE

ECOSYSTEM SERVICES: IMPLICATIONS FOR CONSERVATION AND DEVELOPMENT

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ABSTRACT

This review highlights ecosystem services from a global perspective. The Earth holds diverse terrestrial and aquatic ecosystems. Ecosystems support all life on Earth. Humans derive enormous benefits, directly or indirectly, from ecosystems. Ecosystems provide supporting services, such as soil formation and nutrient cycling; regulating services, such as erosion control and climate regulation; provisioning services, such as water and food; and cultural services, such as recreational and religious values. The global economic value of ecosystem services in 1995 has been estimated to be in the range of US$16–54 trillion yr^{-1}, with an average of US$33 trillion yr^{-1}, while the Gross National Product (GNP) is US$18 trillion yr^{-1}. The total global value of ecosystem services in 2011 has been estimated to be US$125 trillion yr^{-1}. Thus, the total global value of ecosystem services is huge – but still it is an underestimate. At present, however, both terrestrial and aquatic ecosystems are being destroyed and degraded at an unprecedented rate due to anthropogenic activities. Biodiversity loss leads to loss of ecosystem services, thereby threatening human life. Thus, conserving biodiversity and ecosystem services is a global priority. Landscape approach should be well captured by the doers of conservation. Given the escalating impacts of humans on ecosystems, conservation action is highly and urgently needed to maintain biodiversity and ecosystem services and thereby achieve sustainable human wellbeing around the world. Applying integrated biodiversity and ecosystem-services conservation offers a global potential for conserving both biodiversity and ecosystem services. In a nutshell, there is a critical need to protect and restore nature. This is because, "We don't have Planet B."

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INTRODUCTION

Our planet – Earth – holds a vast diversity of living organisms (plants, animals, microorganisms [archaea, bacteria, algae, protozoans, fungi, lichens]) and an immense variety of ecological systems (ecosystems). Ecosystems consist of biotic (living) and abiotic (non-living) components and the interactions within and between them in a given geographical area. Ecosystems can be of different sizes – ranging from small (such as the surface layers of rocks and the tide pools found near the rocky shores of many oceans) to medium (such as the Amazon Rainforest in South America) to very large (such as the surface of the planet – the biosphere) (Chapin *et al.*, 2002). The Earth's ecosystems are so diverse. On a broad scale, they are classified as terrestrial and aquatic ecosystems. The natural terrestrial ecosystems include forests, woodlands, shrublands, savannahs, grasslands, deserts and wetlands (swamps). There are also human-modified or semi-natural ecosystems, which include agroecosytems (farmlands, grazing lands, agroforestry systems) and plantation forests.

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The aquatic ecosystems consist of marine ecosystems (oceans, seas) and freshwater ecosystems – lotic ecosystems (rivers, streams) and lentic ecosystems (lakes, ponds, artificial reservoirs). All these ecosystems contain many species of plants, animals and microbes. In ecosystems, both matter and energy are conserved; energy flows (unidirectional), while matter is recycled. Ecosystems can be grouped into categories based on climate and dominant plant form, which give them their overall character. These broad categories of ecosystems are known as biomes (Ricklefs, 2008). An example is the Amazon Biome, which covers a total land area of 6.7 million km^2 and spans across eight countries (Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana and Suriname), as well as the overseas territory of French Guiana. The area is covered predominantly by dense tropical rainforests, with relatively small inclusions of several other types of vegetation such as savannahs, floodplain forests, grasslands, wetlands (swamps), bamboos and palm forests. Biological diversity (biodiversity) is the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD, 1992).

Biodiversity includes a number of different levels of variation in the natural world. The most commonly used measures of biological diversity are genetic diversity, species diversity and ecosystem diversity (Heywood, 1995; Sodhi and Ehrlich, 2010; Zegeye, 2017). Biodivesity has environmental, social, economic, medicinal, cultural, religious, aesthetic, scientific and educational values. Ecosystems support all life on Earth, including human beings (*Homo sapiens*). Humans interact with almost all ecosystems – positively or negatively. Then in connection to the topic under consideration, I have to ask: What benefits ecosystems provide to humans?

Ecosystem services: Ecosystem functions refer variously to the habitat, biological or system properties or processes of ecosystems. Humans derive enormous benefits, directly or indirectly, from ecosystem functions. The benefits humans obtain from ecosystems are known as ecosystem goods and services, preferably ecosystem services, ecological services, or ecoservices (Heywood, 1995; Ricklefs, 2008; Daily, 1997; Daily *et al.*, 1997; Costanza *et al.*, 1997, 2014; Farber *et al.*, 2002; MEA, 2005; Mace *et al.*, 2012; IPBES, 2019).

The various ecosystem services are grouped into four broad categories: supporting, regulating, provisioning and cultural (MEA, 2005). Supporting services are those that are necessary to maintain all other ecosystem services, and these include soil formation, provision of habitat for living organisms (biodiversity preservation), water cycling, nutrient cycling, nutrient and sediment retention, primary production (principally through photosynthesis but also chemosynthesis), oxygen generation, pollination and seed dispersal. Regulating services are the benefits obtained from ecological processes, and these include erosion control and maintenance/ improvement of soil fertility (regulation of land degradation), siltation regulation, regulation of the global hydrological cycle, carbon sequestration (regulation of the local and global climate), biological control (predation, pest control, disease control), drought and flood mitigation, purification and detoxification of air/water/soil (pollution control), protection from the sun's harmful ultraviolet (UV) radiation, and coastal protection (storms, tidal erosion – by strong waves). Provisioning services are the tangible, harvestable products obtained from ecosystems, and these include genetic resources (i.e., genetic material of actual or potential value – domesticated plants and animals and their wild relatives), clean water, wood (fuelwood, construction material, timber), food, natural medicines, fodder, bee forage, fibers, spices, gums, resins, plant and fish oils, skins, shells, ivory, sand and lime for construction, clay for pottery, minerals, and fossil fuels (oil, coal, natural gas). Food comes principally from agroecosystems (crops and livestock), but also from forests and other terrestrial ecosystems (e.g., bushmeat, wild edible fruits, edible mushrooms, honey), freshwater ecosystems (e.g., fish) and marine ecosystems (e.g., edible algae and other seafood). Cultural services are the non-material benefits humans obtain from ecosystems, and these include ecoethical, inspirational, aesthetic, recreational, tourism/ecotourism, ecotherapeutic [nature-based therapy], artistic, historic, cultural heritage, ritual, spiritual, scientific (research) and educational values. Categories of ecosystem services with some examples are shown in Figure 1. It is important to note that the categorization of ecosystem services is not clearcut and thus several services can be considered as being both supporting services and regulating/provisioning/cultural services. Ecosystem services and the systems that supply them are so interconnected that any classification of them is necessarily rather arbitrary (Daily *et al.*, 1997). For instance, pollination can be considered as a supporting service since it is an essential part of the reproduction process in plants (gymnosperms, flowering plants) – in both natural and managed ecosystems. From the aspect of agricultural (crop) production, it can be considered as a regulating service (see Daily *et al.*, 1997; MEA, 2005; de Groot *et al.*, 2002). If artificial pollination is performed, it can be considered a cultural (scientific) service. Ecosystems and their services are so complex.

Figure 1. Categories of ecosystem services with some examples. Source: https://www.earthwiseaware.org

Ecosystems – and the species that are part of them – provide an endless stream of functions, products and services that keep the world running and make human existence possible. Both nature and its services to people are vital for human survival and wellbeing (good quality of life) – economic prosperity (income and wealth), physical and mental health, human security, and so on. Although most of us live in a world dominated by technology, our wellbeing depends ultimately on ecosystem services provided by nature (Ricklefs, 2008). The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services (MEA, 2005). Moreover, nature and its contributions to people are essential to human civilization (Ehrlich, 1992; Daily *et al.*, 1997; IPBES, 2019). Humans are highly dependent on nature. Indeed, nature's services are pervasive. In 2005, the concept of ecosystem services gained broader attention when the United Nations (UN) published its Millennium Ecosystem Assessment (MEA). The MEA was a four-year (2001–2005), 1,300-scientist study for policy-makers. In 2008, a second independent global initiative called The Economics of Ecosystems and Biodiversity (TEEB) was established, hosted by the UN Environment Programme (UNEP). The TEEB is focused on making nature's values visible; its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making at all levels (TEEB, 2010). The Inter governmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is an independent intergovernmental body established in 2012 to improve the interface between science and policy on issues of biodiversity and ecosystem services.

The Conceptual Framework of the IPBES includes six primary interlinked elements: nature; nature's benefits to people; anthropogenic assets; institutions and governance systems and other indirect drivers of change; direct drivers of change; and good quality of life (Díaz *et al.*, 2015).

Probably the most important contribution of the widespread recognition of ecosystem services is that it reframes the relationship between humans and the rest of nature. A better understanding of the role of ecosystem services emphasizes our natural assets as critical components of inclusive wealth, wellbeing, and sustainability (Costanza *et al.*, 2014).

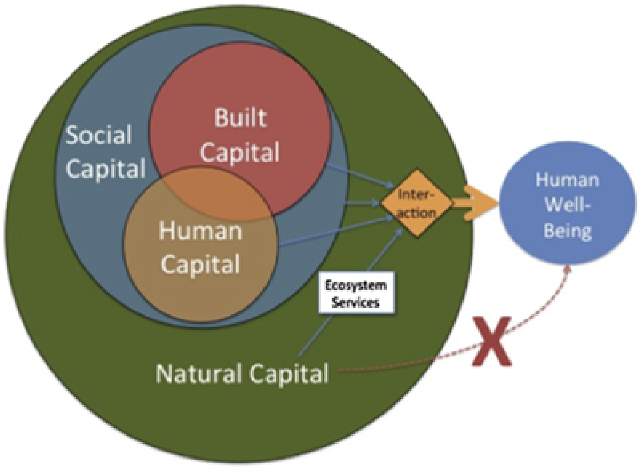
Valuation of ecosystem services (natural capital)

Capital is considered to be a stock of materials or information that exists at a point in time. Capital stock takes different identifiable forms, most notably in physical forms including natural capital, such as trees, minerals, ecosystems, the atmosphere and so on; built/manufactured capital, such as machines and buildings; and the human capital of physical bodies. Social capital generally refers to the set of networks together with shared norms, values and understandings that facilitate cooperation within or among groups. Thus, there are four major types of capital – natural, human, social and built (Costanza *et al.*, 1997, 2014; Basiago, 1999). In addition, capital stocks can take intangible forms, especially as information such as that stored in computers and in individual human brains, as well as that stored in species and ecosystems (Costanza *et al.*, 1997).

It is important to note that ecosystems cannot provide any benefits to people without the presence of people (human capital), their communities (social capital), and their built environment (built capital). This interaction is shown in Figure 2. Ecosystem services do not flow directly from natural capital to human wellbeing – it is only through interaction with the other three forms of capital that natural capital can provide benefits. The challenge in ecosystem services valuation is to assess the relative contribution of the natural capital stock in this interaction and to balance our assets to enhance sustainable human wellbeing (Costanza *et al.*, 2014). The role of biodiversity and ecosystem services (natural capital) in the economy and human wellbeing is often undervalued. Sustaining and enhancing human wellbeing requires a balance of all of our assets – individual people, society, the built economy, and ecosystems. This reframing of the way we look at nature is essential to solving the problem of how to build a sustainable and desirable future for humanity.

Natural capital and ecosystem services have economic value. Indeed, natural capital is a critical economic asset and a source of public benefits, especially for poor people whose livelihoods depend on natural resources – nature. Natural capital is the foundation of our economies. Around the world, leaders are increasingly recognizing ecosystems as natural capital assets that supply life-support services of tremendous value (Daily and Matson, 2008). The services of ecosystems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support systems (Costanza *et al.*, 1997). The Earth's ecosystems contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet.

Both the economy and human welfare depend on ecosystem services to maintain life and productive activities (Castro *et al.*, 2019).



Source: Costanza *et al.* (2014)

Figure 2. Interaction between natural, human, social and built capital required to produce human wellbeing. Human and built capital (the economy) are embedded in society which is embedded in the rest of nature. Ecosystem services are the relative contribution of natural capital to human wellbeing, they do not flow directly. It is, therefore, essential to adopt a broad, transdisciplinary perspective in order to address ecosystem services

Many of the ecosystem goods (e.g., coffee, fish, animal products including honey) are commonly traded in economic markets, and direct market valuation can be done easily using their prices. However, most of the ecosystem services (e.g., intake of oxygen from the atmosphere, water cycling, nutrient cycling, photosynthesis, pollination, seed dispersal, waste decomposition) are not traded in markets, and thus they carry no price tags – priceless (Daily, 1997; Sodhi and Ehrlich, 2010). To help inform decision-makers, many ecosystem services are now being assigned economic values, often based on the cost of replacement with anthropogenic alternatives. Thus, it is a non-market or indirect valuation. When there are no explicit markets for ecosystem services, we must resort to more indirect means of assessing economic values. There are six major ecosystem service economic valuation techniques: Avoided Cost (AC); Replacement Cost (RC); Factor Income (FI); Travel Cost (TC); Hedonic Pricing (HP); and Contingent Valuation (CV) (Farber *et al.*, 2002). A variety of economic valuation methods have been developed, refined, and applied to biodiversity and ecosystem services in a range of different contexts (TEEB, 2010). There are critiques on the importance of valuing ecosystem services. For instance, it is quite possible that basing biodiversity preservation decisions on market values could result in their destruction for economic gain (Gowdy, 1997). On the other hand, ecosystem services valuation has multiple potential uses (Costanza *et al.*, 2014). Knowing the economic value of ecosystem services is helpful for their effective management. In addition, it is important to note that valuation is unavoidable. We already value ecosystems and their services every time we make a decision involving trade-offs concerning them. The problem is that the valuation is implicit in the decision and hidden from view. Improved transparency about the valuation of ecosystem services (while recognizing the uncertainties and limitations) can only help to make better decisions. Valuation of ecosystem services allows us to build a more comprehensive and balanced picture of the assets that support human wellbeing and humans' interdependence with the wellbeing of all life on the planet. Valuation is about assessing trade-offs toward achieving a goal (Farber *et al.*, 2002). Valuation is seen not as a panacea, but rather as a tool to help recalibrate the faulty economic compass that has led us to decisions that are prejudicial to both current wellbeing and that of future generations (TEEB, 2010). Although it is certainly difficult and fraught with uncertainties, scientists have been able to estimate the economic value of ecosystem services. The economic value of the world's ecosystem services (17 services for 16 biomes) in 1995 has been estimated to be in the range of US$16–54 trillion yr^{-1}, with an average of US$33 trillion yr^{-1}, while the global Gross National Product (GNP) total is around US$18 trillion yr^{-1} (Costanza *et al.*, 1997). There, about 63% of the estimated value is contributed by marine systems (US$20.9 trillion yr^{-1}), mainly from coastal systems (US$10.6 trillion yr^{-1}); about 38% of the estimated value comes from terrestrial systems, mainly from forests (US$4.7 trillion yr^{-1}) and wetlands (US$4.9 trillion yr^{-1}). The total global value of ecosystem services in 2011 has been estimated to be US$125 trillion yr^{-1} (Costanza *et al.*, 2014). Thus, the total global value of ecosystem services is huge. To consider a more specific case, the economic value of the Munessa-Shashemene landscape (a highland area) in south-central Ethiopia in 2012 has been estimated to be US$111.1 million yr^{-1} (Kindu *et al.*, 2016). The total global economic value of (agricultural) pollination has been estimated to be US$868 billion yr^{-1}, and for USA US$219 billion, Canada US$25 billion, France US$53 billion, and United Kingdom US$18 billion (World Bank, 2003). The economic value of (agricultural) pollination in Ethiopia for the period 2003–2013 has been estimated to be a mean of about US$81.3 million yr^{-1} (Mulat, 2019). But all these are estimates! The total value of ecosystem services to the global economy and human welfare is infinite (Costanza *et al.*, 1997, 2014; Chaisson, 2002; Sodhi and Ehrlich, 2010).

The link between biodiversity and ecosystem-services conservation: Biodiversity is of critical importance to the health of ecosystems and even for the long-term survival of the human species (Gowdy, 1997). Biodiversity underpins ecosystem services. Indeed, biodiversity has key roles at all levels of the ecosystem service hierarchy: as a regulator of ecosystem processes, as a final ecosystem service and as a good (Mace *et al.*, 2012). Biodiversity and ecosystem services significantly contribute to human wellbeing. The importance of biodiversity conservation is generally well understood, and various efforts are being made by concerned bodies at local, national, regional and global levels to preserve the Earth's biodiversity. Despite the vital importance of ecosystem services, leaders in both the public and private sectors have been slow to incorporate these benefits into decision making. This slow incorporation traces to a complex of factors well beyond science, but at the core is the poor characterization of the flow of services in the necessary biophysical and economic terms at the local and regional scales most useful to decision-makers (Daily, 1997; Heal, 2000; Balvanera *et al.*, 2001). In recent years, however, there have been tremendous advances in the science, economic valuation, institutional design, and social capacity needed for ecosystem services conservation (Chan *et al.*, 2006). Hundreds of projects and groups are currently working toward better understanding, modeling, valuation, and management of ecosystem services and natural capital (Costanza *et al.*, 2014). Notable of these is the Ecosystem Services Partnership (ESP), a worldwide network founded in 2008 to enhance the science, policy and practical application of ecosystem services for nature conservation and sustainable development (https://www.es-partnership.org). Biodiversity conservation is critical and ensures ecosystem services conservation (the flow of services from ecosystems to people). Conversely, targeting ecosystem services alone can meet the multiple ecosystem-services and biodiversity conservation goals more efficiently but cannot substitute for targeted biodiversity conservation (Chan *et al.*, 2006). Furthermore, planning for ecosystem services conservation is inherently more complex. Thus, aligning conservation goals for biodiversity and ecosystem services has been suggested, for example, by Chan *et al.* (2006), Turner *et al.* (2007), Naidoo *et al.* (2008) and Nelson *et al.* (2008). On the other hand, it remains unclear whether biodiversity and ecosystem services co-occur only under narrow sets of conditions, or concord broadly enough that global strategies for both goals could realize widespread and productive synergy (Balvanera *et al.* 2001; Turner *et al.*, 2007). Although there are trade-offs and opportunities, integrating biodiversity and ecosystem services in conservation planning offers a global potential for safeguarding biodiversity and ecosystem services simultaneously. In fact, identification of synergies at fine scales and development of economic and policy tools to exploit synergies are required (Chan *et al.*, 2006; Turner *et al.*, 2007). Advances are required on three key fronts: the science of ecosystem production functions and service mapping; the design of appropriate finance, policy, and governance systems; and the art of implementing these in diverse biophysical and social contexts (Daily and Matson, 2008).

Threats to biodiversity and ecosystem services: The world's human population is increasing at a faster rate. The world's population has currently reached about 7.9 billion (https://www.worldometers.info/world-population), and is estimated to reach about 10.8 billion by 2100 (Roser *et al.*, 2013). As human population and per capita consumption grow, so do the resource demands imposed on ecosystems and the impacts of humans on ecosystems. The ever more voracious habits of production and consumption are the greatest threat to natural capital (Basiago, 1999). Our relentless demand for the Earth's resources is devastating the world's ecosystems and accelerating extinction rates (IPBES, 2019). Humanity is affecting the living world. Earth's ecosystems are under serious threat. Both terrestrial and aquatic ecosystems are being destroyed and degraded at an alaming rate due to human activities. Changes in land and ocean use are threatening biodiversity. The major threats to biodiversity and ecosystem services are agricultural expansion (farmland expansion, overgrazing), overexploitation of natural resources (logging, overhunting, overfishing), soil erosion and land degradation, siltation and eutrophication of water bodies, freshwater withdrawal for irrigation and other purposes, urbanization and industrialization, environmental (air, water and soil) pollution including plastic pollution in aquatic ecosystems, mining (extraction of minerals and fossil fuels), wild and anthropogenic fires, exotic species (particularly invasive alien species) and global climate change, which are all driven by human population growth and policy/institutional/ economic /political issues (Heywood, 1995; Daily *et al.*, 1997; Gowdy, 1997; Hoekstra *et al.*, 2005; MEA, 2005; Stern, 2006; World Bank, 2006; Ricklefs, 2008; Dumont, 2009; Sodhi and Ehrlich, 2010; TEEB, 2010; Zegeye, 2017; IPBES, 2019; Schwarz *et al.*, 2019; Hannibal, 2021). Globally, agricultural expansion is the biggest cause of habitat loss and fragmentation, and consequently reduction in biodiversity. The Earth is experiencing a growing degradation of ecosystems throughout the world (MEA, 2005; IPBES, 2019). About 75% of the land surface is significantly altered, 66% of the ocean area is experiencing increasing cumulative impacts, and over 85% of wetlands (area) has been lost; across much of the highly biodiverse tropics, 32 million hectares of primary or recovering forest were lost between 2010 and 2015 (IPBES, 2019). The degradation of ecosystems has had a devastating impact on both people and the environment. Over 60% of the world's ecosystem services are being degraded or used unsustainably (MEA, 2005). Nature and its vital contributions to people, which together embody biodiversity and ecosystem functions and services, are deteriorating worldwide (IPBES, 2019). Global land use changes between 1997 and 2011 have resulted in a loss of ecosystem services of between US$4.3 and US$20.2 trillion yr^{-1} (Costanza *et al*., 2014). Humans are part of the natural world and any damage humans do to that world has the potential to increase the risk to ourselves (Gowdy, 1997). To the extent that we degrade natural environments, we have to make up for the services they provide in other ways, or suffer their loss (Ricklefs, 2008). Habitat destruction has driven much of the current biodiversity extinction crisis (loss of ecosystems, species and populations), and it compromises the essential services that humans derive from functioning ecosystems (Turner *et al.*, 2007; Ricklefs, 2008). In addition to the extinction crisis, biomes are at risk – the Earth has faced a broader biome crisis (Hoekstra *et al*., 2005). The Earth is experiencing mass extinction, specifically anthropogenic extinction – extinction caused by humans (Ricklefs, 2008). The most recent assessments of global biodiversity find that species are continuing to decline and that the risk of extinction is growing (TEEB, 2010). At present, more than 38,500 species of plants and animals around the world are threatened with extinction (IUCN, 2021).

Conservation strategies and measures: The unparalleled human impacts on Earth's ecosystems and their constituent species call for an effective and efficient biodiversity conservation. Thus, we need to embrace nature conservation as a way of life. There is a critical need to protect and restore the world's ecosystems and the services they provide to people. The healthier the ecosystems are, the healthier the planet – and its people. Maintaining planetary health is essential for both biodiversity and humanity. Humans must live in harmony with nature. Moreover, the present generations have the responsibility to bequeath to future generations a planet that is not irreversibly damaged by human activity (IPBES, 2019).

Preserving the Earth's natural ecosystems is of paramount importance. In order to ensure the maintenance of biodiversity, there is a need to employ complementary *in situ* and *ex situ* conservation (CBD, 1992; Heywood, 1995; Jeffries, 1997; Wolf, 1999; Zegeye, 2017). There is a need to strengthen the management of different protected areas around the world and promote the establishment of new ones. There is also a need to prioritize ecosystems, species and populations for conservation actions. High priority should be given to the conservation of the global biodiversity hotspots – terrestrial ecoregions with spectacularly high species diversity and endemism and, at the same time, have been significantly impacted and altered by human activities (Myers *et al.*, 2000; Mittermeier *et al.*, 2004; Sodhi and Ehrlich, 2010). The Amazon Biome, the most biologically diverse region on Earth (harbouring over 10% of Earth's known species), requires the highest priority. Moreover, endemic, rare and threatened species should receive top priority.

Most of the areas on Earth are (agri)cultural landscapes, where human influence on the environment is much pronounced. Thus, considerable attention should be given to the conservation and sustainable management of agrobiodiversity. In addition, proper silvicultural practices are required in plantation forests to meet ecological, social and economic needs.

The different ecosystems in a given geographical area are interconnected – directly or indirectly, in one way or another. Thus, conservation planning and action should be based on the landscape/ecosystem approach. The Global Landscapes Forum (GLF), a science-led, multi-stakeholder and independent platform established in 2013, is promoting the landscape approach (https://www.globallandscapesforum.org). The GLF aims to create sustainable landscapes worldwide (forests, farms, waterways, settlements) and thereby save biodiversity, solve the climate crisis and improve the lives of people. The landscape approach should be well captured by the doers of conservation.

Many terrestrial and aquatic ecosystems across the globe are degraded, calling for restoration. On 01 March 2019, the United Nations General Assembly declared 2021–2030 the UN Decade on Ecosystem Restoration. This global movement has been designed to prevent, halt and reverse the degradation of ecosystems worldwide (https://www.decadeonrestoration.org). It is expected that nations of the world strive to restore degraded ecosystems within their territory. Forests have tremendous environmental, social, economic, medicinal, cultural, aesthetic and recreational values. Thus, due emphasis should be given to halt deforestation, achieve sustainable management of all types of forests, restore degraded forests, and substantially increase afforestation and reforestation globally. Because of the prevalent deforestation, tropical and subtropical regions should receive high priority for forest protection, afforestation and reforestation. Ecosystem restoration is expected to contribute to all the 17 UN's Sustainable Development Goals (SDGs) (https://sdgs.un.org/goals), particularly SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), SDG 14 (Life below Water) and SDG 15 (Life on Land). As such, ecosystem restoration can help to alleviate poverty, ensure food and nutritional security and provision of clean water, conserve biodiversity and tackle climate change. All countries of the world should make rigorous efforts to the implementation of the SDGs in order to ensure conservation and development (thus sustainable development).

In recent years, economic models regarded as the "green economy" and "blue economy" have emerged in response to the need for adequately incorporating natural (terrestrial and aquatic) resources conservation in economic policies and strategies. Both green and blue economies aim to achieve the three pillars of sustainable development – economic efficieny, social equity and ecological sustainability (Serageldin, 1993; Basiago, 1999). They help to improve human life, reduce environmental degradation and combat climate change. Thus, nations must strive to develop and implement green and blue economies. For instance, Ethiopia developed the Climate-Resilent Green Economy (CRGE) strategy (CRGE, 2011), and is striving for its implementation. Indigenous people are custodians of biodiversity. Indigenous resource management systems and practices should be recognized and promoted, and the best practices to be scaled up to other parts of the world. In Ethiopia, for instance, there are forests around churches and monasteries, known as "church forests," which are important in conserving forest biodiversity, as well as wildlife. The church forests are also sources of genetic material for restoration of surrounding degraded landscapes (see Kindu *et al.*, 2022). Developing the science of ecosystem services and its application in policy and practice for sustainable development; ensuring the involvement of all relevant stakeholders at local, national, regional and global levels (policy- and decision-makers, scientists, local communities, academic institutions, conservation organizations, natural resource managers, practitioners, non-governmental organizations, the private sector) in conservation planning and activities; development of fair and equitable benefit-sharing mechanisms for benefits derived form the conservation and sustainable use of biodiversity (especially those that benefit local communities); pomotion of indigenous resource management systems and practices; integration of scientific and indigenous knowledge; and provision of adequate human, financial and physical resources for conservation efforts worldwide, are all important measures that should be taken in order to ensure the global conservation of biodiversity and ecosystem services. There is a need to think globally and act locally. And tree planting should be the rule of the world and the rule of the present and future. Above all, conservation requires a multidisciplinary, interdisciplilnary, transdisciplinary and participatory approach, and needs to be a continuous endeavour – not fashionable.

Conclusions

The Earth's ecosystems provide gigantic services to humans. Ecosystems services are the direct and indirect contributions of ecosystems to human wellbeing. At present, however, both terrestrial and aquatic ecosystems are being destroyed and degraded at a fast pace as a result of heedless human activities. Biodiversity loss leads to loss of ecosystem services, thereby threatening human life. Thus, the preservation of biodiversity and ecosystem services is a global priority. Biodiversity conservation ensures the conservation of ecosystem services, but the vice versa does not.

Thus, biodiversity conservation should be at the core of any conservation planning and action. Biodiversity conservation is not a luxury, but a necessity. Landscape approach should be well captured by the actors of conservation. Given the ever-increasing global population and impacts of humans on ecosystems, conservation action is highly and urgently needed to maintain biodiversity and ecosystem services and thereby improve human life across the globe. Applying integrated biodiversity and ecosystem-services conservation offers a global potential for conserving biodiversity and ecosystem services simultaneouly. In a nutshell, there is a critical need to protect and restore nature. This is because, "We don't have Planet B."

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