



Biodiversity in the third millennium

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Abstract

Ecosystem health remains a human concern in the third millennium, and focusing on ecological processes is a key phenomenon in ecosystem management, so we must properly explore ecological interactions. Thus, environmental vulnerability indicators are important issues that should be well considered in planning and management. Systematic approaches in comprehensive environmental planning are one of the political priorities of resource protection as well. Collective participation will play a critical role in the reconstruction and conservation of biodiversity. Biodiversity assessment using quantitative models will also lead to a more proper understanding of ecosystem functioning. Comprehensive environmental strategies to prevent environmental threats are significant. A systematic comprehensive look at species conservation will be extremely effective in area management. Ultimately, environmental policies should be considered to reduce the crisis.

Keywords: Biodiversity, ecosystem health, management

Introduction

Biodiversity is a natural infrastructure that supports all life on Earth and is an essential element for human health and well-being (Budicker, 2019). It includes all stages of variability in terms of the presence or absence of species, as well as diversity within and between living organisms, within communities and between them, and within ecological collections and between them (Zargaran & Armideh, 2015).



An important part of biodiversity, resources, and natural environment are wildlife animals including mammals, birds, amphibians, reptiles, and fish (Ishraqian *et al.* 2010).

Different glacial periods began millions of years ago in the Northern Hemisphere and ended about ten thousand years ago, have had profound effects on the distribution of species, and have made a very large contribution to speciation, especially endemic species (Naderi, 2010).

Unfortunately, the rapid development of human activities on the one hand, and the direct reliance and livelihood dependence of large sections of the world's growing population on nature, on the other, are reducing the natural diversity of ecosystems and creating more constraints on wildlife survival (Pourkhabaz *et al.* 2010).

Opportunities, threats, and risks of biodiversity

Habitat is the bed of food, shelter, and environmental conditions and also determines the presence, survival, and reproduction of a population. In other words, habitat refers to all physical properties of the environment that it makes an area habitable for a species. It is also a place where wildlife managers recognize it as suitable (Kamali *et al.* 2010). Most of us put very little value on our natural inheritance and the study of how their behavioral attributes. Many people believe that if an animal has no economic value, this animal is not worth protecting and if it is seen as a pest, it should be eradicated (Ekmali *et al.* 2010). With increasing human understanding of the vital importance of biodiversity, attention to rare and endangered species has increased in recent years. Due to this, the need for study and research on wildlife becomes apparent, among which birds can be considered a good indicator of environmental status, biodiversity and sustainability (Omidi & kaboli. 2010).

Identification of animals in wildlife areas is one of the most necessary and important biological researches that can prevent many environmental damages with proper knowledge (Ismaili *et al.* 2010).

Today, one of the most challenging environmental problems in most societies is water scarcity. The water resources index can determine the vulnerability of regions that forced migration in all biological communities, including humans, is one of the problems that can be seen (Biniiaz & Akbarpour, 2010) so that it can affect the fauna and flora of habitats. Especially if the shortage of such resources occurs with the arrival of man-made projects to transfer water to the regions. The most severely damaged fauna in this construction operation is the reduction of the aquatic food chain (Biniiaz & Akbarpour, 2010).

In order to survive, human beings must use the resources available around the living environment, which is more evident in local communities (Ishraqian *et al.* 2010).



Today, human activities in the world's ecosystems have significantly reduced two important characteristics, including flexibility (resilience) and biological capacity. Ecosystem resilience means the ecosystem's sustainability and its ability to quickly compensate for damage including deforestation, desertification, invasive species and ecosystem biological capacity is its ability to provide sources of pollutants and residues (Ferdowsi, 2010). Nomadic life in some parts of the world can lead to environmental imbalances and reduced plant and animal biodiversity in the region, so changing the nomadic lifestyle can be effective in conserving natural resources. Here are some solutions:

- Comprehensive planning of the region with a systemic perspective (rural, nomadic, urban)
- Assignment of a part of the study stages and its implementation by the nomadic community (Yousefi Baseri & Moradi, 2010)

In general, the lives of all local residents depend on natural resources. Such a phenomenon is avoidable in terms of environmental and socio-economic conditions (Ishraqian *et al.* 2010). At the same time, it should be considered that the dependence of local communities on natural resources is a completely inseparable issue, but by identifying and controlling the causes of environmental degradation, efforts can be made to address such a global problem (Tahmasebi *et al.* 2010). On the other hand, a lack of awareness of the true value of natural resources through the ecosystem has a significant role in the destruction done in this area (Zarandian & musazadeh, 2010). As mentioned earlier, the lack of management of human activities and the indiscriminate use of natural resources in the region upset the balance of water and soil and lead to soil erosion, which is one of the most important sources of any ecosystem and the source of food production .As a result, it is gradually exposed to destruction (Ishraqian *et al.* 2010). However, carrying out development projects, especially in the field of water transfer in the source basin has negative effects and consequences (Biniiaz & akbarpour, 2010).

Due to mismanagement and extreme exploitation of human nature, sometimes the biological balance of forest and marine ecosystems is disturbed and the density of some living components of the ecosystem is already under the control of natural factors such as natural enemies like parasitoids. Predators, insect pathogens, and non-living agents such as heat, drought, shady light, humidity, etc. have increased and their prevalence and outbreak in an area cause them to be considered a pest and harmful agents (Sadeghi *et al.* 2010). The pattern of increasing biodiversity slope at high latitudes toward the equator is a general and undeniable feature (Jafari *et al.* 2010).

Biodiversity assessment for understanding ecosystem structure and function and its evolution to protect genetic resources and control environmental changes is important so that the conversion of natural



ecosystems to easier ecosystems can make the changes to the structure and functioning of the ecosystem irreversible (Gholami *et al.* 2010). In other words, ecosystem simplification leads to reduced biodiversity. Habitats have always been threatened and invaded by various factors, including humans, and this has caused the destruction or extinction of many ecosystems, so we always see many changes in the structure of habitats and ecosystems, changes that upset the ecological balance. Each region leads to the loss of many living elements (Ekmali *et al.* 2010).

The most important factors threatening biodiversity in the regions are single crop cultivation, dam construction, mining, overgrazing, deforestation, and over-exploitation of marine resources (Faizollahi *et al.* 2010) which can be rationally controlled in the environmental management system. Threats to urban development and the advancement of biotechnology have led to the retreat of many species of animals in a way that this retreat continues until the basic ecological needs of the species are met (Naderi, 2010). Plowing mountainous lands to convert and use as agricultural fields is one of the next threats for many species whose habitat is located in the middle altitudes (Naderi, 2010). Today, the loss of traditional land management and exploitation poses serious threats to many ecosystems. So the removal of a species from a geographical area causes irreversible disturbances in the ecological chains of the habitat (Ghaffari *et al.* 2010). Endangering natural resources will decrease the chances of survival and biodiversity in soil and water (Tahmasebi *et al.* 2010)

Biodiversity conservation has become a global issue and concern today, which has increased due to the growing trend of the human population and dependence on natural resources. On the other hand, the development of new technology and tools has made the use of resources more possible (Malekian, 2010). The highest level of biodiversity is related to developing countries, but unfortunately, they do not have the necessary financial resources to pay enough attention to environmental issues (Ekmali *et al.* 2010). Biological hazards such as droughts are among the natural disasters that cause great economic damage and social consequences and pose a serious threat to environmental biodiversity (Ezzatian *et al.* 2010). With the correct knowledge of existing species and continuous monitoring of population structure and species diversity, we can be informed about the factors affecting environmental damage (Ismaili *et al.* 2010). Climate change and global warming have unknown and far-reaching consequences in various sectors, in a way that they will have a significant impact on ecosystems and biodiversity. On the other hand, comfort and well-being depend precisely on such ecosystems. One of the strategies in this regard is comparative strategies and comprehensive studies to determine the trend of climatic parameters using time sequences of 30 to 40 years (Pakzad *et al.* 2010).



Of course, it should be said that the existence of regional differences significant in terms of drought can be considered in terms of environmental threats (Ezatian *et al.* 2010).

Protection management

Unfortunately, the management of human relations with the environment does not lead to a clear and acceptable future for the protection of ecosystems due to the lack of direction and alignment of responsible organizations and agencies and section-seeing policies –of other agencies (Ekmali *et al.* 2010). Today, globalization through linking highways and coordinated global systems has brought the world closer together, but the current trend of the global environment is a worrying challenge in the third millennium (Pourkhbaz *et al.* 2010). There are several options for biodiversity management goals. Should management strive to maintain the current level of biodiversity in an area or to increase and enhance the biodiversity of that area? There is no doubt that half of the goal of environmental projects is to maintain the current level of diversity. Most biodiversity programs aim to increase genetic diversity in small populations (Ekmali *et al.* 2010).

Continuation of such unfortunate trends, on one hand, and lack of sufficient information about the living conditions of such areas, on the other, make protection and sustainable management more and more impossible every day (Ghaffari *et al.* 2010). In order to protect important habitats in the region, a management strategy should be specifically formulated for the entire ecosystem (Pourkhbaz *et al.* 2010).

Policy and sustainable planning and development

With a Systemic attitude toward nature, a need to adopt a targeted policy to manage natural resources in interaction with other components of the ecosystem is felt, but unfortunately, this strategy is often not achieved and even worse becomes a dangerous goal (Mohammadi *et al.* 2010). Elements such as biodiversity hierarchy, and ensuring the long-term survival of species can be defined in this management plan (Jafari *et al.* 2010). Suggestions in regard to species conservation in habitats include the following:

- Observing the ecological capacity of the ecosystem and the amount of authorized exploitation
- Observing the operation season
- Equipping personnel and equipment of environmental protection areas
- Education and enlightenment of public opinion and local communities (Omidi & Kaboli, 2010).

Today, the failure of protected area projects to achieve predetermined goals has made stakeholders reconsider the quantity (total area) and quality of land distribution based on the distribution of biodiversity in existing areas at different levels both globally and locally (Jafari *et al.* 2010). Of course, it should be said that the potential of each region should be considered in proportion to its geographical



location (Tahmasebi *et al.* 2010). Using the habitat suitability model, the conservation priorities of the species can be determined so that the selection of suitable areas for re-introduction of species will be used in management measures to upgrade protected areas (Shams Esfandabad *et al.* 2010). We should always try to make momentary analyses in ecosystem services so that the value of the ecosystem can be overestimated with the current management, such as in marine and forest ecosystems in which harvesting is done in an unstable manner (Zarandian & Musazadeh, 2010).

We must pay attention to the existing resources of nature and their preservation for livelihood.

Conservation biologists introduced two conservation units in regard to some problems arising from conservation classification, including the management unit and the important evolutionary unit: Management unit includes a population that has very few immigrants and very little gene exchange with other populations and is genetically different from them. The important evolutionary unit consists of one or more populations that have been isolated from each other for a considerable period of time in terms of reproduction and have gone through a separate evolutionary path (Malekian, 2010). Conservation activities usually focus on specific species or habitats with high species diversity, so in most cases, it is assumed that individuals belonging to each species are correctly classified, but it is not always true (Malekian, 2010).



Provisioning	Food	Provisioning	Food provision
	Fresh water		Water storage and provision
	Ornamental resources		Biotic materials and biofuels
	Genetic resources		
	Biochemicals		
Fibre			
Regulating	Air quality regulation	Regulating and maintenance	Air quality regulation
	Natural hazard regulation		Coastal protection
	Water regulation		
	Erosion regulation		Climate regulation
	Climate regulation		
	Pollination		Weather regulation
	Pest regulation		Life cycle maintenance
	Disease regulation		Biological regulation
Water purification and waste treatment	Water purification		
Supporting	Nutrient cycling		Ocean nourishment
	Nutrient cycling		
	Soil formation		
Cultural	Spiritual and religious values	Cultural	Symbolic and aesthetic values
	Cultural heritage values		
	Cultural diversity		
	Sense of place		
	Aesthetic values		
	Recreation and ecotourism		Recreation and tourism
	Social relations		
	Inspiration		Cognitive effects
	Knowledge systems		
Educational values			

Figure 1. Ecosystem services and people obtain from ecosystems (Andrew J. Boulton *et al.*, 2016)

Collective participation

International participation in the restoration of terrestrial ecosystems with the attitude of wise management of wildlife heritage can be the basis for ensuring the environmental sustainability of the development process in this millennium (Zarandian & Musazadeh, 2010). Local community support is the key to success, in other words, the local community should be involved in designing plans (Alborzi Manesh, 2010). The involvement of people in executive decisions is considered one of the points of principled management (Ishraqian *et al.* 2010). To prevent environmental damage, the support of the government, local communities, and non-governmental organizations is essential (Shams Esfandabad *et al.* 2010). Today, it has been proven that in fisheries communities, people’s awareness of the conditions and adverse consequences of an ecosystem is able to have a significant impact on reducing the degradation of marine habitats through supportive planning.



Determining the pattern of ecosystems can be an effective help in predicting the behavioral patterns of human societies in their time and also, it is a suitable solution for preserving natural resource areas so that optimal time management of conservation-protection projects will be one of the effective causes of natural resources (Heidari *et al.* 2010). Unfortunately, the hope of correcting the abnormal environmental procedures in the implementation of projects by applying the inevitable condition of the environmental assessment will face many social challenges. Land potential assessment as well as improving the organizational level of regulatory bodies can be effective in improving the management of renewable natural resources. Also, the credibility of the planners and implementers of other development projects will play a key role in this regard (Ebrahimi, 2010). In other words, successful management in the zoning of sensitive natural areas depends on targeting biological and geological components (Alborzi Manesh, 2010). Efforts should be made to consider the set of protected areas in terms of specific elements of biodiversity as a substitute for the biodiversity structure. With this strategy, the efficiency of the protection system can be managed in a favorable condition (Jafari *et al.* 2010).

The type of planning unit, study scale, and large or small evaluation units can affect the performance of the selected network (Jafari, 2010). Policies and management actions of popular institutions are an important factor influencing the management of natural resources; such institutions are aware of the extent of these effects because they focus primarily on the livelihoods and lives of local communities. Therefore, the views and opinions of such institutions should be emphasized more at the policy level (Mohammadi *et al.* 2010). Reducing dependence on an ecosystem should not reduce its importance in policy and management (Mohammadi *et al.* 2010). There is an increasing need for appropriate management decisions in order to preserve and improve biological populations in each protected area (Shams Esfandabad *et al.* 2010). Environmental policies in agricultural activities should be included in agricultural development programs directly and indirectly with the aim of reducing crises caused by the inappropriate use of technology in agro-ecosystem conditions (Sharifi & Bozorgnia, 2010).

New approaches

Ecological-economic modeling requires a standardized framework for the comprehensive valuation of ecosystem functions, goods, and services. In environmental programs, more attention should be paid to determining the range capacity of the region's environment in order to determine the level of resource use (Jafari, 2010). Quantification of ecosystem services in the form of biophysical units is a necessary condition for economic valuation that is used (Zarandian & Musazadeh, 2010).



Residents of environmentally sensitive areas can be the most effective component in preventing environmental threats with their knowledge of the area (Khosropour *et al.* 2010). Presentations of conservation strategies, how to respond to threats, and sustainable tensions are the main determinants of long-term living of conservation goals (Varjavand *et al.* 2010). The purpose of habitat utility modeling is to quantify the relationship between species distribution and the living and non-living environment. Management of endangered species, ecosystem regeneration, and biodiversity analysis to analyze the conflict between humans and wildlife, and identification of suitable habitats for conservation relies mainly on modeling the relationship between habitat and species distribution (Goljani *et al.* 2010).

Habitat suitability models determine the suitability of each part of the land for the species (Shams Esfandabad *et al.* 2010). Determining ecotone areas in biological zoning can be very important because in these areas we encounter species of transitional habitats that can have conservation values (Alborzi Manesh, 2010). In five-dimensional methods, instead of relying on rare and endangered species, the ecosystem and landscape are addressed. In such methods, hotspots are less considered and evaluated, but are more widely considered than conservation goals such as genes, species, populations, communities, and ecosystems, and landscapes (Varjavand *et al.* 2010). The purpose of using five-dimensional conservation models is to restore habitats that are healthy populations and represent biodiversity (Varjavand *et al.* 2010).

One of the basic strategies according to each of the protection goals is to prioritize the most important roots for each stress (Varjavand *et al.* 2010). Evaluation of ecosystem services is used to inform users as well as the economic costs of degradation and the benefits of sustainable land management (Zarandian & Musazadeh, 2010). Today, the preparation of local, regional, and supra-regional maps with the participation of governments can become an important issue in natural resource management in assessing and examining changes in the structure of biological communities (Abdul Alizadeh *et al.* 2010). The use of geographical tools and analysis has been able to create a more accurate and informed view in planning and decision-making (Abdolalizadeh *et al.* 2010). Determining changes is a management accuracy that has been able to monitor natural landscapes. The amount, speed, and spatial distribution of changes are the three main components in the success of biodiversity monitoring and is generally the most appropriate solution (Abdul Alizadeh *et al.* 2010). Among the factors guaranteeing the long-term sustainability of biodiversity elements in a set of protected areas include:

-Composition and structure of species and focal ecosystems

Disorder regimes (human exploitation, energy transmission lines, agricultural lands, large dams)



-Minimum dynamic area

-Communication between security sites in the network (Jafari *et al.* 2010)

The authenticity of biodiversity elements must have already been proven. In addition, the factors that guarantee the biological elements in this strategy include environmental slopes and communication corridors between protected areas that have genetic diversity and are known as speciation factories (Jafari *et al.* 2010). The use of ecosystems must be subject to correct scientific rules and principles so that the result of the work leads to the enrichment of the function and ecological production of ecosystems (Ekmeli *et al.* 2010).

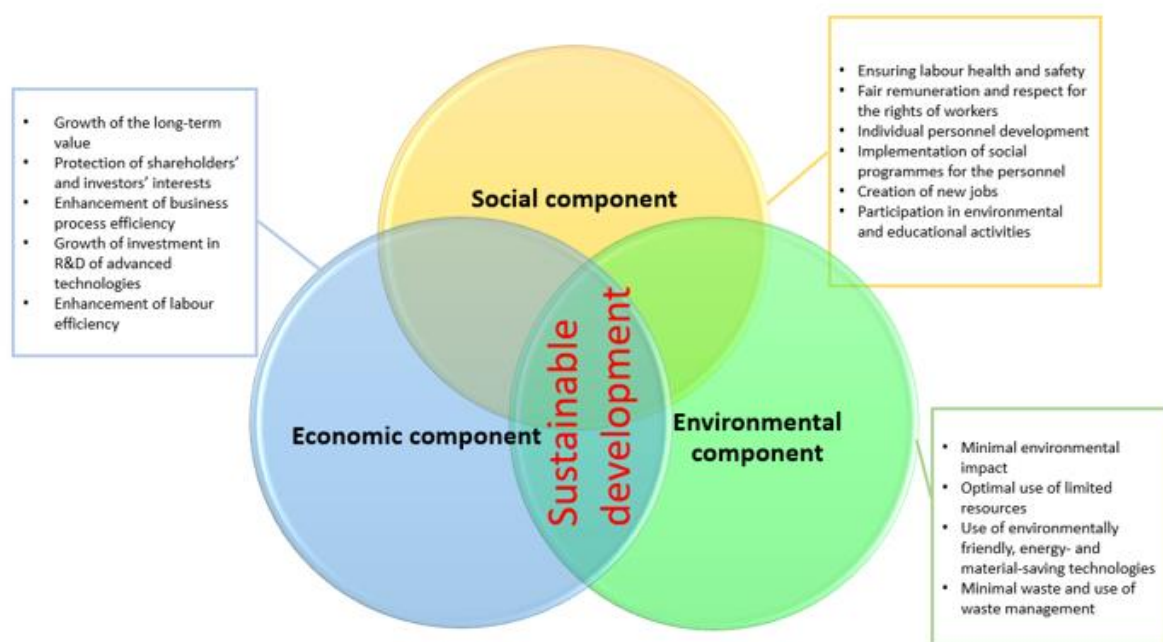


Figure 2. Ecosystem services concepts and biodiversity

Discussion

Evolutionary natural environments have been carrying their ecological potential and have stored energy for millions of years with the necessary care to be able to retain their living elements due to their diversity and practically keep the survival machine active in them

Therefore, the planned environmental planning should move in the direction that the priority is to preserve the full face of the environment while preventing the extinction and genetic erosion of species of conservation value.



We need to pay more attention to suitable places for the reconstruction of genetic resources and try to manage more negatively impactful activities and have a special look at fragile ecological environments. Our awareness of the services of nature, which is undeniable, should be in a way that its valuation is accurate and depending on the ecological conditions of the regions, and also our wise decision should be considered as an approach to support this environmental field. The method of participatory evaluation of local communities in executive plans is very important for the protection of environmentally sensitive areas, so the role of local cultures in this participatory path shows itself for the protection of incito conditions. Sustainable agriculture literally must be able to create ecological harmony, economic efficiency, and social adaptation, and have rational management in protected areas. Changes in the insight, knowledge, and behavior of environmental users are a key element in the process of health and participation, as well as solving common environmental problems and reducing environmental risks can be of a significant role. The common goal of the relevant institutions and organizations in the principled and scientific exploitation of the environment is one of the best tools that will cause the least damage in terms of broader and deeper focus on environmental issues in the implementation of defined projects.

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