

# Ecoregional Planning: An Overview of Concepts and Approaches

Amir Moradi<sup>1\*</sup>, Saeed Rahmati<sup>2</sup>

<sup>1</sup>Independent Researcher, Tehran, Iran

<sup>2</sup>Department of Environmental Design Engineering, Graduate Faculty of Environment, University of Tehran, Tehran, Iran

Email: \*amir.moradi1987@ut.ac.ir, rahmati.saeed@ut.ac.ir

**How to cite this paper:** Moradi, A., & Rahmati, S. (2023). Ecoregional Planning: An Overview of Concepts and Approaches. *Current Urban Studies*, 11, 682-707.

<https://doi.org/10.4236/cus.2023.114035>

**Received:** November 29, 2023

**Accepted:** December 25, 2023

**Published:** December 28, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

---

## Abstract

An ecoregion is defined as an area delineated by natural boundaries, possessing a distinct ecosystem compared to its neighboring regions and disregarding political borders. Planning for these regions is referred to as ecoregional planning. Ecoregional planning aims to achieve a balance between ecology, economy, and society, emphasizing the integration of local and human needs with environmental conservation and biodiversity. This paper is a review article conducted through qualitative research, with the goal of providing an organized perspective on ecoregional planning using a descriptive-analytical approach. In this regard, the conceptualization of this type of planning, its historical evolution, various approaches and processes in implementing this type of planning, the development and presentation of the six-dimensional ecoregional models, and the examination of case studies based on the proposed approaches and processes were conducted. The findings indicate that the success of ecoregional planning lies in taking a holistic approach towards economic, social, cultural, and environmental factors and examining the connections between these factors with a focus on ecological issues.

## Keywords

Land Use, Ecoregional Planning, Regional Planning, Urban Ecology, Environment

---

## 1. Introduction

One of the important issues that garnered significant attention in the late 20th and early 21st centuries in developed countries was the focus on environmental problems arising from development processes and economic activities. These countries, which had been utilizing the environment as the primary source of

nourishment and growth without considering environmental conservation, and solely prioritizing economic growth, began to realize from the mid-20th century that such a trajectory would lead to failure. The Industrial Revolution in the late 18th and 19th centuries magnified the visible impacts of human actions. The skies of Britain, Europe, and North America turned dark due to the smoke from coal (McCammack, 2018). Forests were cleared for timber or charcoal production for iron smelting, and rivers became polluted by industrial effluents and waste (Daniels, 2019; Zimmerman, 1996). Deforestation and inappropriate agricultural practices such as plowing along slopes resulted in erosion and flooding. During that period, various authors praised nature as a rejuvenating alternative for industrial society (Abdi Daneshpour, 2017; Melosi, 1993).

During the 1960s and 1970s, social critics, futurists, feminists, and environmentalists criticized existing notions of development and proposed alternative paradigms that emphasized psychological, natural, and human values over economic profit and progress. An unofficial commission, led by the Chairman of the United Nations Conference on the Human Environment in 1972, issued a report warning about global threats to survival and explicitly outlined the effects of greenhouse gases and the warnings regarding the “unsustainable” growth resulting from automobile usage (Danneels, 2023; Wheeler Stephen, 2004). Political concerns regarding the interplay between industrial development, urban expansion, and the environment intensified after World War II. The massive expansion of the petrochemical industries during the war had led to numerous pollution, toxicity, and resource depletion issues in the post-war era. In many books spanning the years 1920 to 1970, prominent urban planning critic Lewis Mumford connected large-scale urbanization, technology, and warfare, and cautioned against the hazards of technopolises where dehumanizing technologies took precedence (Wheeler Stephen, 2004).

The emergence of urban ecology as a sub-discipline of ecology in the early 1970s was influenced by the documented human impacts on the planet and the serious environmental problems resulting from the growing size of human settlements (McCammack, 2018; McDonnell, 2011). Also, it was around the 1970s that, following extensive criticisms of the processes related to environmental design, sustainable design, regional planning, and ecological planning, an environmental approach was introduced in planning as a solution to address existing problems and prevent further issues. This approach placed the environment at the center of attention and aimed to create a balance between environmental resources and development processes. During the 1970s, resource and environmental planning took center stage in planning activities, with a heightened societal concern and focus on the natural environment. These planning activities, at the supra-national, national, and local levels, involved the introduction of regulations in areas related to air and water pollution, as well as the establishment of new official institutions and voluntary environmental conservation organizations (Abdi Daneshpour, 2017; Zimmerman, 1996).

Developing countries also became aware of the importance of the environment, albeit with a delay of about three decades compared to developed countries. This delay was due to the fact that these countries were still in the stage of development, and their focus was more on economic growth rather than environmental conservation. At the beginning of the 21st century, though the timing varied based on the level of development of each country, these countries began to experience the problems caused by excessive emphasis on economic growth (Douglas, 2013; Pourjafar & Moradi, 2015). As a result, they followed the pattern of experience set by more developed countries and started to formulate environmental planning strategies.

Among scientific perspectives, the environmental conservation approach in planning is the only approach that, with a holistic view, is capable of comprehensively addressing the ongoing processes in the environment and analyzing the interrelationships of planning components, as well as identifying potential inconsistencies (Taghvaei, Kamyar, & Moradi, 2017). Furthermore, it is able to apply a higher level of sensitivity in land-use planning and physical organization of the land towards protected natural areas and preserved natural spaces than ever before.

Based on these premises, the current paper is a review article that has been conducted using a qualitative approach to provide an organized perspective on the topics discussed in the field of ecoregional planning. Ecoregional planning involves the development of strategies and policies for the management and conservation of natural resources within specific ecological regions (Baldwin, Perkl, Trombulak, & Burwell, 2010). In this regard, the article first addresses the existing definitions and concepts of ecoregional planning and related terms. It then delves into the historical evolution of conceptualizing this term and examines the current approaches and processes in this field. It also presents a classification of spatial patterns in ecoregional planning by studying two case studies. These case studies are introduced based on the examined approaches and processes. In the end, considering all the aforementioned topics, it is pointed out that ecological knowledge is comprehensive knowledge that cannot achieve success within the framework of a sectoral planning system. Ecoregional planning is successful when it is approached with a wide perspective towards economic, social, cultural, and environmental factors and by examining their relationships.

## 2. Definitions and Concepts

The environmental dimensions in regional planning encompass a wide range of concepts, making it difficult to provide a single unified definition. However, in this section, in order to grasp the concept of ecoregional planning, at the first step, definitions of an ecoregion and its components are presented, followed by an explanation of the concept of ecoregional planning.

If we want to have a definition of a region in this perspective, we can say that through the natural divisions of land, we can achieve a real understanding of a

“region”. It can be considered as a distinct area or region characterized by specific environmental conditions, such as water mass, nutrient levels, and currents, which influence the distribution and abundance of species and ecosystems (**Figure 1** and **Figure 2**) (Bailey, 1998, 2004; Bailey & Ropes, 2002; Bhat, Bergstrom, Teasley, & Cordell, 1998; Mason, 2011; Thayer, 2003). In this case, this region is considered an ecosystem that is interconnected with other regions delineated in the same way through the cycles of matter, energy flow, and information exchange.

In addition, most ecosystems are interconnected (Bailey & Ropes, 2002; Loveland & Merchant, 2004), which means that in ecoregional planning, the effects of ecological regions on other regions are also evaluated (**Figure 3**). It can also be acknowledged that within each ecological region, there may be multiple sub-ecosystems.

In the process of regional planning, it is possible to allocate spatial tasks or functions to each area according to its ecological capacity, and distribute the factors of development accordingly (Smith, Hendershot, Nova, & Daily, 2020). In this context, the regional planning involves determining land use distribution, location, and placement for each function based on the ecological characteristics of the natural environment (Bahram Soltani, 2008; Bailey, 1998; Omernik, 2004).

In explaining the concept of ecoregional planning, it could be said that the main goal of this type of planning is the balance between the ecosystem, economy, and society, where the combination of local and human needs is highlighted with environmental conservation and biodiversity perspectives. However, various articles and books have approached this concept with different perspectives, but all of them share the consideration of the region based on its natural boundaries (**Table 1**).

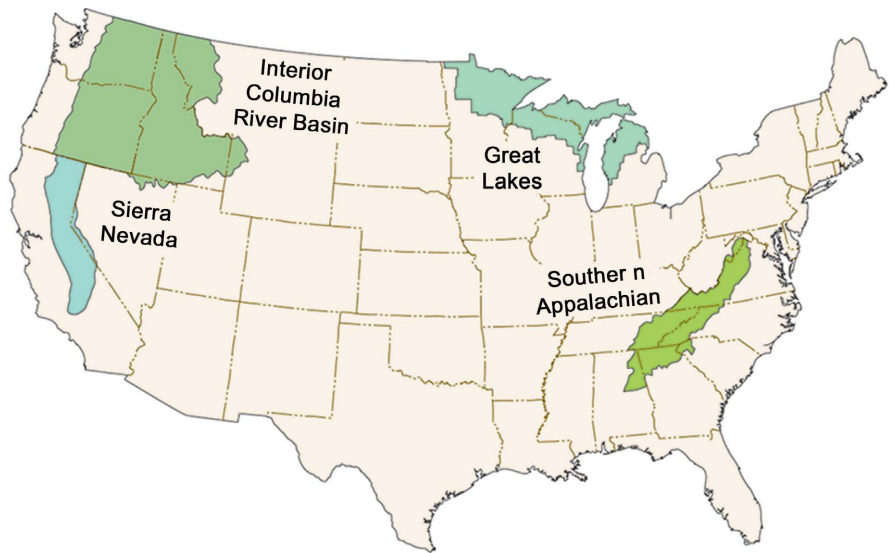
### 3. The Historical Evolution of Ecoregional Planning

The term “ecologically-oriented regional geography” was first coined by the French regional geography school. Later, this term was strengthened and refined by the works and theories of Élisée Reclus and Patrick Geddes (Noble & Costa, 1999). In the late 19th century, Ebenezer Howard introduced the theory of “garden cities” in England (Howard, 1965), while Geddes, in his book “Cities in Evolution” published in 1915, examined several major cities worldwide and focused on the unity of the city and its natural environment (Chabard, 2016). Subsequently, this concept found its way to the United States and was expounded by American regional planners.

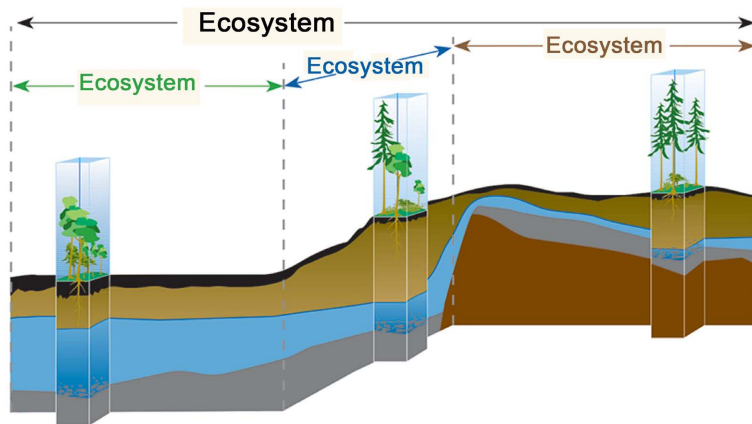
However, there is another perspective in the United States that believes the concept of ecoregional planning has deep roots in the country. The consideration of national parks and forest conservation can be regarded as the first initiatives in this regard in the United States (late 19th century), which later became a comprehensive and suitable approach in this field worldwide (Mason, 2011; Ndubisi, 2002). Based on this, the need for actions in the field of ecoregional



**Figure 1.** Natural boundary between Yellowstone National Park and Targhee National Forest in the United States: Two different ecological regions (Bailey & Ropes, 2002).



**Figure 2.** Spatial location of several important ecological regions in the United States and political boundaries of different states in America (Bailey & Ropes, 2002).



**Figure 3.** Interconnectedness of ecosystems within a region or across different regions (Bailey & Ropes, 2002).

**Table 1.** Concept of ecoregional planning in relevant books and articles.

The concept of ecologically oriented regional planning	Title of book or article
Combining human and environmental needs in land use planning (McHarg, 1969).	Design with nature
In this planning, the relationship between humans and nature is crucial for decision-making towards achieving balance between the ecosystem, economy, and society (Miller, 1996).	Balancing the scales: guidelines for increasing biodiversity's chances through bioregional management
This planning integrates biophysical and social information, with a focus on ecosystems, and does not rely on political boundaries as the unit of analysis (Johnson, Swanson, Herring, & Greene, 1999).	Bioregional assessments: science at the crossroads of management and policy
A way to develop regional governance and provide decision-making in the context of sustainability and environmental conservation (Hodge, Hall, & Robinson, 2017).	Planning Canadian Regions
Planning for the sustainable use of resources and conservation of biodiversity, simultaneously considering the "natural" environmental boundaries and local residents' uses (Thayer, 2003).	Life Place: Bioregional thought and practice
Planning in a specific ecological region where understanding and regulating the relationship between ecological, social, and physical components is necessary to achieve conservation goals at the landscape level (Bailey, 2004; Bailey & Ropes, 2002).	Ecoregion-based design for sustainability
Planning for a specific region defined by natural boundaries (Mason, 2011).	Ecoregional Planning Retreat or Reinvention

planning dates back to the late 18th and early 19th centuries when European migration to America increased. The destruction of grasslands for agriculture and livestock became prevalent, as did the quest for gold and the subsequent human invasion of mines, resulting in disturbances to natural plant cover and the threat to biodiversity (Anderson, 2010; Bailey & Ropes, 2002).

In the 1920s, members of the American Regional Planning Association combined the idea of "garden cities" with the aim of protecting natural resources and biodiversity to develop ecoregional planning (Miller, 2015). This group concluded that urban expansion into the periphery posed a serious threat to the natural en-

vironment. They emphasized the importance of preserving and enhancing natural systems, stating that human life should converge with plant, animal, and aquatic communities (Daniels, 2009; Lantitsou, 2017).

Daniels considers the period from 1920 to 1970 as the era of ecoregional planning in America, during which the use of environmental knowledge in planning became common. This knowledge was employed to conserve pristine lands, assess environmental impacts, and maintain a balance between nature and the built environment, the economy and the environment, nature conservation, public health, and the protection of natural resources were among the objectives of this era (Daniels, 2009; Wilkinson, Saarne, Peterson, & Colding, 2013). During this period, various theorists attempted to articulate the concept of ecoregional planning. Among them, the following individuals can be mentioned:

Clarence Stein produced the first comprehensive national land use program for the United States in 1925, which called for transportation networks, settlement nodes, and rural land conservation (Parsons, 1990; Stein, 1949). Inspired by biologist and Scottish planner Patrick Geddes, Lewis Mumford worked to advance the concept of ecoregional planning. He interpreted the region as a collection of ecological relationships among land, climate, and soils that, in turn, shape human culture (Miller, 2002; Novak Jr., 2014). Benton MacKaye drew on Mumford's regional ideas in his thinking, combining Mumford's concept of ecological region with ideas about natural resource conservation and wilderness preservation (MacKaye, 1990). He argued that sustainable economic development is connected to ecological planning, so that residents and visitors can have access to civilization and nature. McHarg also made significant strides in this direction through his writings, including the book "Design with Nature" in 1968 (Daniels, 2009, 2019; Mason, 2011).

Over the course of this 50-year period, ecoregional planning gradually gained success, giving rise to various programs and agencies. One of the most important projects was the Tennessee Valley Authority (TVA) plan along the Mississippi River, which utilized forest restoration, appropriate agricultural methods, and dam construction to restore the ecological integrity of the region and promote economic development in one of the most economically deprived areas of America (Friedmann, 1956; Menhinick & Durisch, 1953).

It can be confidently stated that the fundamental goals of these initiatives in the philosophy of ecoregional planning in America were the protection of natural resources, control of commodity flow, and environmental development (Daniels, 2009).

From the 1970s onwards, global conferences focused on the environment were held under the auspices of the United Nations. The declarations and achievements of these conferences, signed by most countries in the world, led to the adoption of ecological policies in regional planning, especially in developing countries. **Table 2** presents the most important conferences and their achievements.

**Table 2.** Major global conferences on environmental issues and their achievements.

Conferences	Achievements
The Stockholm Conference on the Human Environment, 1972	The issuance of the Human Environment Declaration. The presentation of an action plan and 106 recommendations, all emphasizing the dependence of humans on the environment and how to shape it. The rational use of resources, pollution reduction, universal environmental education, environmental research, the establishment of international organizations, the creation of the United Nations Environmental Program, and the designation of June 5th as World Environment Day were among its achievements (Baker, 2015; Kennet, 1972).
The Rio Summit, also known as Agenda 21, 1992	It outlines how to move towards sustainable development for more/less developed countries and specifies the actions that need to be taken by the global community to reconcile development with the environment (Blowers & Evans, 1997; Desai & Potter, 2008).
The World Summit on Sustainable Development, Johannesburg, 2002	This conference gave rise to concepts such as sustainable lifestyles, environmentally compatible municipalities, and sustainable regions, ultimately leading to the formation of various bases for regional sustainability in administrative, economic, cultural, and national dimensions with specific environmental characteristics (Button, 2002; Hens & Nath, 2005).

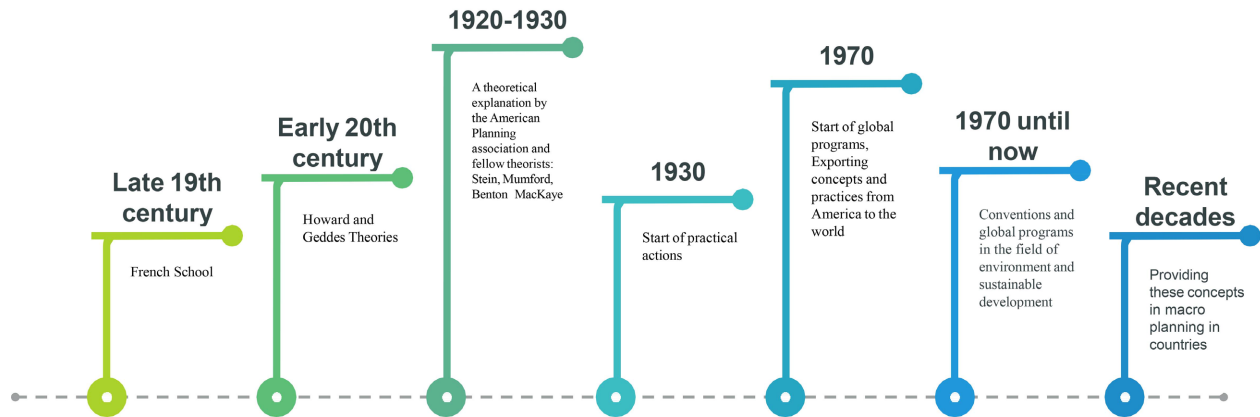
In summary of the historical evolution, it can be said that the emergence of an ecoregional planning approach dates back to the 19th century, originating from the French school of regional planning. From the 1920s, this approach spread from the United States to other countries, and ultimately, global congresses and declarations served as complements to the goals of ecoregional planning. **Figure 4** illustrates the historical evolution of the ecoregional planning approach.

#### 4. Ecoregional Planning Approaches

There are two commonly recognized approaches to ecoregional planning. The first approach views it as a sectoral planning, while the second approach takes a trans-sectoral perspective and emphasizes the need for integrated and cohesive ecological policies.

Until the mid-1990s, urban environments were primarily managed through regulations aimed at protecting air, water, soil quality, and restricting economic activities in residential areas. However, previous studies indicate that this





**Figure 4.** Historical evolution of the ecoregional planning approach source: Authors.

“command and control” approach, which relies solely on top-down legal instruments and a set of environmental standards (sectoral approach), will not be fully effective in addressing urban environmental issues (Anderson & Allen, 2003; Campbell, 1996; Chen & Lin, 2021; Simeonova & van der Valk, 2009).

Sectoral planning is a pattern of ecoregional planning that focuses on specific aspects of the environment affected by human activities and seeks to reduce or eliminate the negative impacts of human behavior while managing and conserving targeted environmental resources (Berke, 2015; Gama-Rodrigues, Müller, Gama-Rodrigues, & Mendes, 2021; Younge & Fowkes, 2003). In this pattern, the interrelationships between various environmental resources and different planning initiatives are not adequately considered, and the environment is only addressed in a fragmented manner. **Table 3** outlines the different aspects of sectoral planning with an ecological perspective.

However, regional planning at the regional scale should move towards integrated and interdisciplinary planning. The role of environmental interdisciplinary should be strengthened and maximized to ensure that “environmental conservation” becomes rich in its true and authentic content and meets the needs and expectations of regional planning. Accordingly, the approaches and processes introduced in this article all have an interdisciplinary approach to the ecological aspect of regional planning.

#### 4.1. Ecoregionalization

Proponents of this theory believe that each specific region has its unique ecological system. In such a system, water, soil, climate, and living organisms form a unified system in which these elements have organized or systematic relationships with each other. Humans, as living beings, are part of the system in which they live and, as a result, have constructive or organic relationships with other elements. Consequently, they influence and are influenced by them (Aberley, 1999; Garibaldi, Bonnaventure, Smith, & Duchesne, 2022; Lipschutz, 2005; López González, Sandoval, & Escobar Flores, 2023; Loveland & Merchant, 2004;

**Table 3.** Different aspects of sectoral planning with an ecological perspective (Daniels, 2017).

Section	Subsection
Planning for Sustainable Public Health	Planning for Sustainable Water Resources
	Planning for Sustainable Water Quality
	Planning for Sustainable Air Quality
	Planning for Solid Waste and Recycling
	Planning for Hazardous Materials and Toxic Waste
Planning for Natural Areas	Preservation of Scenic Reserves
	Planning for Wildlife Habitats
	Planning and Management of Wetlands
	Coastal Area Management
	Planning for Natural Disasters and Emergencies
Planning for Active Landscapes	Planning for Sustainable Active Landscapes: Agricultural Lands and Pastures
	Planning for Sustainable Active Landscapes: Forests
	Mining Planning
Planning for Human-Built Environment	Transportation and Environmental Planning
	Energy Planning
	Planning for Sustainable Human-Built Environment
	Planning for Sustainable Human-Built Environment: Green Space Development and Design

McGinnis, 1999). Civil society, within the regional ecological context, proposes this approach to achieve development, which is accompanied by preserving ecological relationships, a spirit of social cooperation, and the integration of material and spiritual needs.

The theorists argue that the ecosystem should be regarded as a holistic entity characterized by a perpetual and reciprocal relationship between the environment and living organisms. In this context, the environment directly or indirectly constrains the growth of every organism (McGinnis, 1999; Olstad, 2012). Consequently, each ecosystem possesses the capacity to accommodate a limited number of human beings, which is commonly referred to as carrying capacity.

#### 4.2. Sustainability

In the literature related to the methodology of sustainable development, there is a consensus on the concept of sustainability. This consensus acknowledges that sustainable development encompasses three dimensions: social, economic, and environmental. Today, we encounter two different models of sustainable devel-

opment, which are of great importance in sustainable regional development. The first model defines sustainability within the three corners of a triangle, and the second model portrays sustainability as an egg (Figure 5 and Figure 6). These models have a distinct difference.

The triangular model, defined by Serageldin (1995), harmonizes environmental, social, and economic goals in three corners of a triangle without hierarchical relationships between them (Serageldin, 1995). The Egg Model signifies a close interdependence among these dimensions. Here, the environmental domain encompasses the economic and social domains. In this model, the economy is defined as a subsystem of society, and consequently, society operates within the lower sphere of environmental implementation.

While the triangular model can lead to separate definitions of environmental, social, and economic goals, the Egg Model necessitates the inclusion of sustainability indicators and social goals within the environmental perimeter, while the economy, as a subset of society, requires a focus on social goals as a framework for its own specific objectives. If we understand the following statement regarding regional planning: “Regional planning, in retrospect, has been responsive to national and local shortcomings, and in the present context, it needs to address the needs of future generations. According to studies conducted in this field, the link between local and national interests can only be effective and feasible at the regional level, as regional planning is a multidimensional endeavor that can contribute to the realization of sustainable development at the regional level” (Sarafi, 1998).

Given the comprehensive nature of regional planning, the Egg Model is an appropriate model for sustainable regional planning. Regional planning, in which planning aligns with environmental and natural capacities, is nothing but sustainable development.

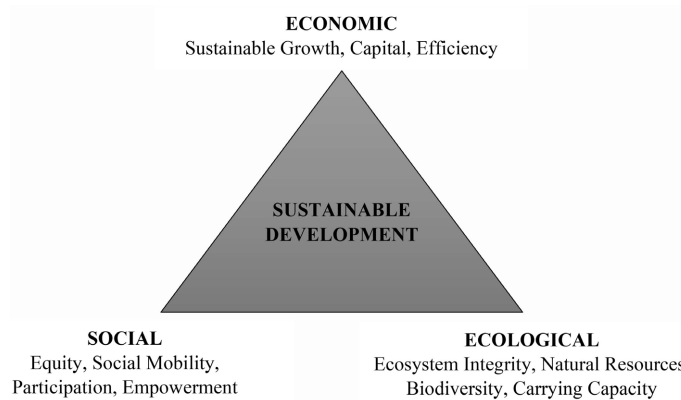
Considering the aforementioned definitions, the essential question now arises as to what specific processes must be undertaken in regional planning to achieve sustainable regional development. The answer is that for sustainable development, three fundamental and important objectives should be included in the agenda of regional planning:

- Conservation of valuable natural resources
- Balanced and appropriate utilization of natural resources
- Suitable economic and social mechanisms (Kidd, 2005; Peng, Wang, Wu, Shen, & Pan, 2011).

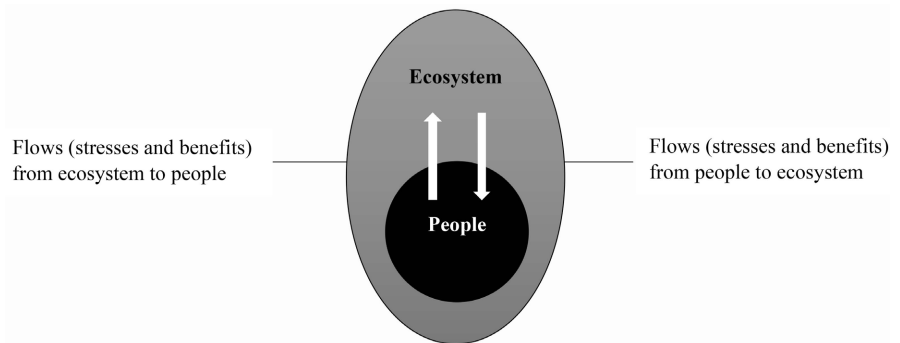
Table 4 provides a summary analysis of ecologically approaches to regional planning based on dimensions, variables, components, indicators, case examples, and analytical tools for each approach.

### 4.3. Land Ecology Process

In this process, the stages of planning for determining suitable locations for human development activities or organizing the existing situation are carried out in

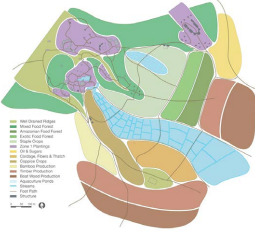
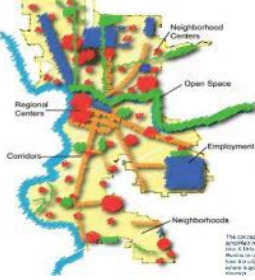


**Figure 5.** The triangular model of sustainable development, Source: Based on (Serageldin, 1995).



**Figure 6.** The egg model of sustainable development (Gujit & Moiseev, 2001).

**Table 4.** Analysis of ecological approaches of regional planning based on dimensions, variables, components, and indicators.

Approach	Dimensions	Variables	Component	Indicator	Regional Spatial Pattern	Case Studies	Analysis Tools	References
Bioregionalism	Ecological Morphological	Culture Society Environment	Ecosystem Restoration Resilience to Ecosystem Destruction	Population Biological Species Natural Factors Human Factors		Palouse Region in Washington	Geospatial Data Assessment Ecological Carrying Capacity Development Impact Assessment	(Klein et al., 2015; Pierson & Mulla, 1990)
Regional Sustainable Development	Economic Social Environmental	Social Justice Economic Development Environmental Sustainability Environmental Conservation/Protection	Economic Efficiency Environmental Quality Equitable Distribution of Services	Social Capacity Land Use Quality Equal Access Opportunity Economic Competitiveness		Tennessee Valley	Factor Analysis Taxonomy Ecological Footprint	(Mason, 2011; Steiner & Steiner, 2016)

four stages (Chan, Shaw, Cameron, Underwood, & Daily, 2006; Zonneveld, 1995). In this regard, the identification of ecological resources is performed by providing physical and biophysical resource maps and using GIS tools. In the next stage, the analysis and evaluation of ecological potential are usually carried out using a parametric approach, which includes techniques such as one-way matrix and AHP, or the use of specific models such as the Makhdoum model<sup>1</sup> for analysis in this stage. The next stage involves socioeconomic studies and estimation of socioeconomic needs, which includes the classification of socioeconomic information, analysis and summarization of socioeconomic information, and the preparation of a list of permissible land uses from an economic and social perspective. In the final stage, the organization of land uses takes place, where prioritization between land uses and achieving the objectives of land uses is determined.

#### 4.4. Landscape Ecology

Nowadays, the increase of human activities has caused structural disturbances, including the fragmentation of the land and natural habitats. Following this, the use of ecological concepts at the landscape scale for land use policies and design has evolved from isolation to connectivity and from site protection to the conservation of ecological networks. Thus, the concept of landscape ecology emerged by merging ecological sciences with spatial patterns in the framework of environmental planning and implementation, and concepts such as ecological network design received increased attention. The first book on landscape ecology was presented in 1986 by Forman and Godron (Bastian & Steinhardt, 2002; Beita & Murillo, 2020; Farina, 2000; Turner, 2005a, 2005b; Turner, Gardner, O'Neill, & O'Neill, 2001). Accordingly, the landscape's appearance is a distinct and measurable unit that is formed by interacting ecosystems that are spatially repeatable and arise due to the interactions of air, water, soil, altitude, fauna, plants, and humans (Forman & Gordon, 1986; Hou, Zhai, & Walz, 2023; Jongman & Pungetti, 2004). The main elements of landscape appearance include substrate, patch, and corridor, as shown in **Figure 7**.

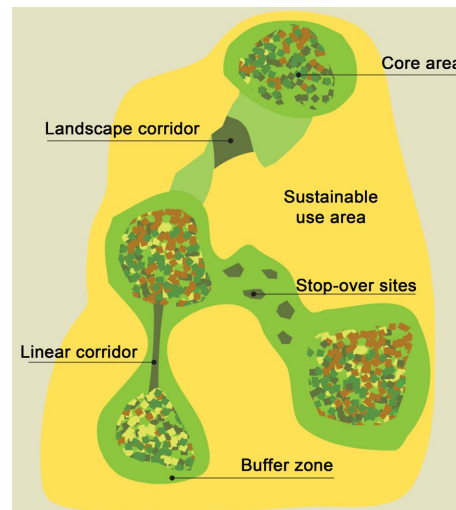
This process emphasizes four patterns for sustainable land character planning.

A: Preservation of large patches of natural vegetation cover.

B: Preservation of wide riparian corridors.

C: Maintaining connectivity for movement of key species among large patches.

<sup>1</sup>Dr. Majid Makhdoum has proposed a model for evaluating ecological potential, which includes the following three stages in brief: A: Preparation of physical and biological resource maps and their summarization to achieve a unified map consisting of subunits. Each subunit has its own specific combination of climate, water, topography, geology, soil, vegetation, fauna, and unique characteristics B: Comparison of the characteristics of each subunit with developmental ecological models (urban development, agricultural development, industrial development, forestry development, tourism development). C: Preparation of a list of permissible land uses from an ecological perspective. For further studies, refer to the book "Fundamentals of Land Planning" by Dr. Majid Makhdoum, published by the University of Tehran.



**Figure 7.** The main elements of landscape appearance include substrate, patch, and corridor (Forman, 2014).

D: Preserving heterogeneous natural elements within developed human areas (McGarigal & Marks, 1995).

In **Table 5**, the analysis of the described processes is summarized based on dimensions, variables, components, indicators, case studies, and analysis tools for each approach.

## 5. Spatial Patterns in Ecoregional Planning

Based on various articles and different theories, spatial patterns in ecoregional planning can be divided into six categories, as outlined in **Table 6**.

## 6. Case Study Analysis

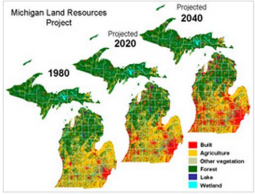
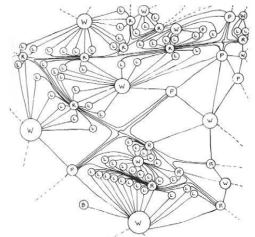
### 6.1. Ecoregional Planning of North Talgras Valley, USA

The aim of this study was to establish a framework for conserving the North Talgras ecoregion and propose the necessary strategies for its preservation, utilizing geographic information system (GIS) analysis as a tool. The location of the North Talgras Ecoregion on the United States map is shown in **Figure 8**. The research approach was grounded in the ecological process of the land and the rationale behind developing a plan for the region. Historically, this area encompassed wetland landscapes, coastal forests, scattered woodlands, and prairies. However, contemporary land use has predominantly transformed these ecosystems into agricultural lands (Decker, 2007; Prairie & Team, 2000).

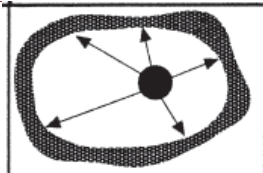
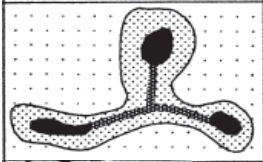


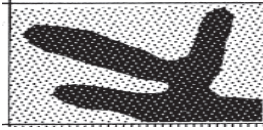
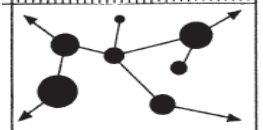
The research was conducted in three stages, as illustrated in **Figure 9** and elaborated below.

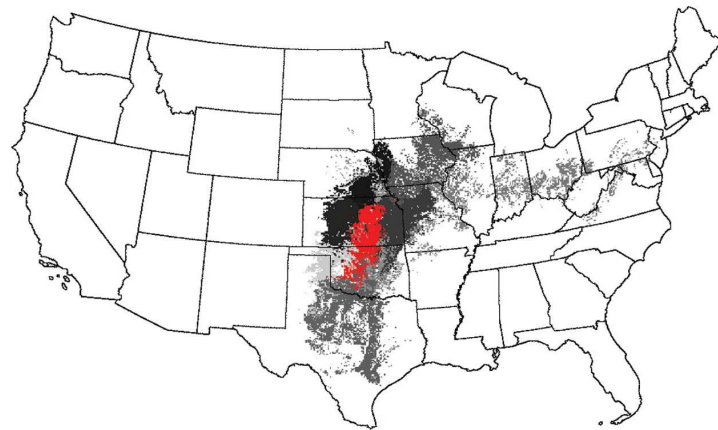
Stage 1: Evaluation was undertaken to identify conservation objectives, establish survival guidelines, and gather the necessary baseline data for designing exemplary projects. The process of this stage is depicted in **Figure 10**.

**Table 5.** Analysis of ecological process of regional planning based on dimensions, variables, components, and indicators.

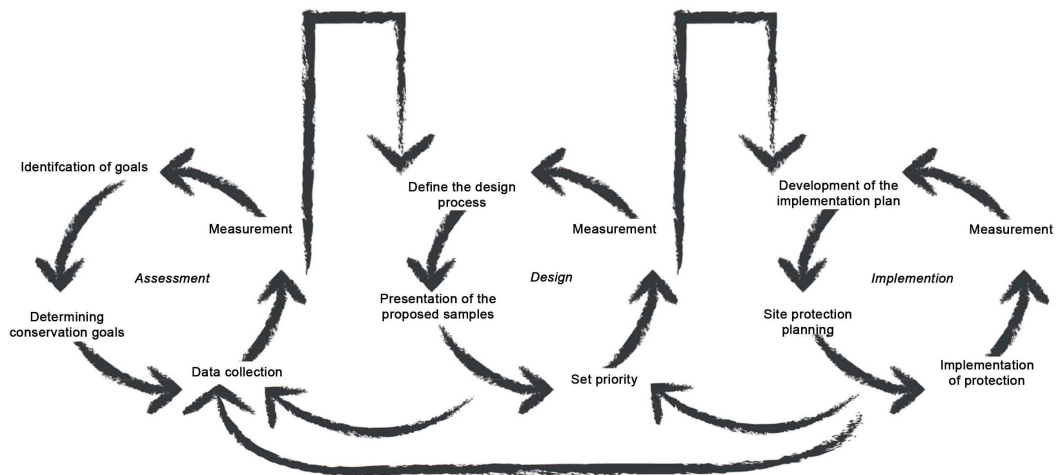
Process	Dimensions	Variables	Component	Indicator	Regional Spatial Pattern Model	Case Studies	Analysis Tools
Land Ecology	Ecological Economic	Physical/Urban Design Agriculture Compatibility/Adaptation	Ecological Capacity Ecological Resources Economic Needs	Groundwater Surface Water Soil Type Plant Species Native Animals Terrain/Topography Urban Development Agricultural Development		Tallegross Valley Regional Planning	Remote Sensing Geographic Information System (GIS) Landscape
Landscape Ecology	Ecological	Physical/Urban Design Mobility/Transportation Ecological Network Ecological Connectivity Ecosystem Conservation/Preservation	Core Area Patch Corridor	Forest Development Native Plant Species Dominant Plant Species Natural Rivers Coastal Areas Protected Areas Cultural Zones		Florida Ecological Network Model	Metrics Geographic Information System (GIS) Graph Model Gradient Analysis

**Table 6.** Spatial patterns in ecoregional planning.

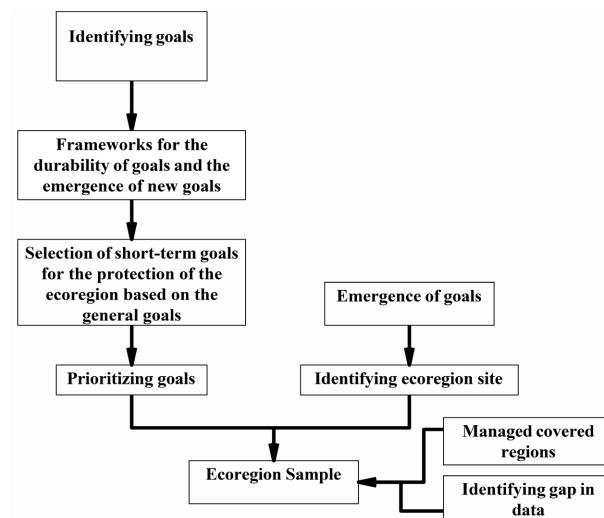
Title	Sample	Spatial Crystallization	Approach and Supporting Process	Spatial Pattern Representation
Containment	Greenbelt (Ahern, 1999)	Ecological Boundaries	Sustainable Development, Landscape Ecology	
Framework	Future of Riverine Edge Areas (Forman, 1990a)	Ecological Corridors	Bioregionalism, Landscape Ecology	
Laissez faire	Sprawl in Edge Areas (Ahern, 1999)	Edge of Areas	Landscape Ecology	
Grid	Land Survey Laws in the United States in 1785 (Forman, 1990b)	Ecological Spatial Justice	Land Ecology	
Interdigitating	Relationship between Ecosystem and Governance (Forman, 1990b)	Coexistence and Interdependence	Sustainable Development, Landscape Ecology	
Network	Ecological Network (De Montis et al., 2016)	Centers and Ecological Valleys	Sustainable Development, Landscape Ecology	



**Figure 8.** Visualization of the North Talgras Ecoregion location in the United States.



**Figure 9.** Process of ecoregional planning of north talgras valley, based on: (Prairie & Team, 2000).



**Figure 10.** Process of evaluation in ecoregional planning for north talgras valley, based on: (Prairie & Team, 2000).



Stage 2: The design process aimed to prioritize a set of sites that possess more effective and sustainable ecoregion segmentation and biodiversity conservation. This stage entailed developing and adopting a process for designing exemplary projects. Scientific insights provided crucial foundations for the design of these projects, ensuring the preservation of species and communities. Additionally, this stage involved prioritizing the sample sites for conservation actions. Based on the prioritization of objectives established in the previous stage, the positioning, connectivity, and representation of each objective within the targeted ecoregion were examined, utilizing GIS data, to determine suitable sites for conservation (Prairie & Team, 2000).

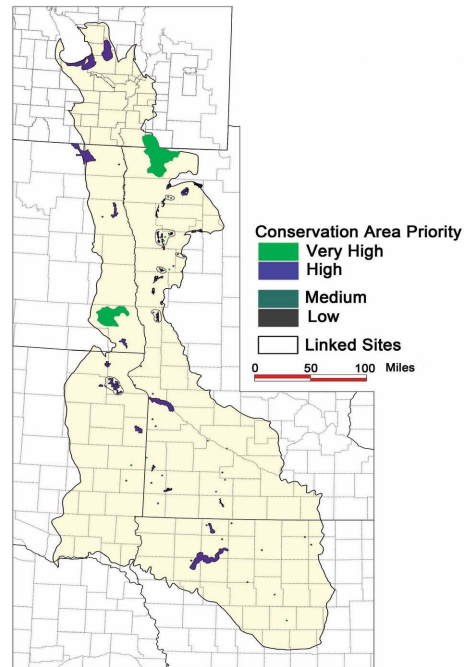
Stage 3: Implementation, in its truest sense, refers to the execution of a practical plan aimed at addressing long-term biodiversity conservation in the ecoregion and prioritizing and bridging data gaps for future crises (Prairie & Team, 2000). In this stage, based on the analysis of the conservation sites identified in the previous stage, each site is prioritized for conservation. The findings of this research are presented in **Figure 11**.

## 6.2. The Florida Ecological Network Model

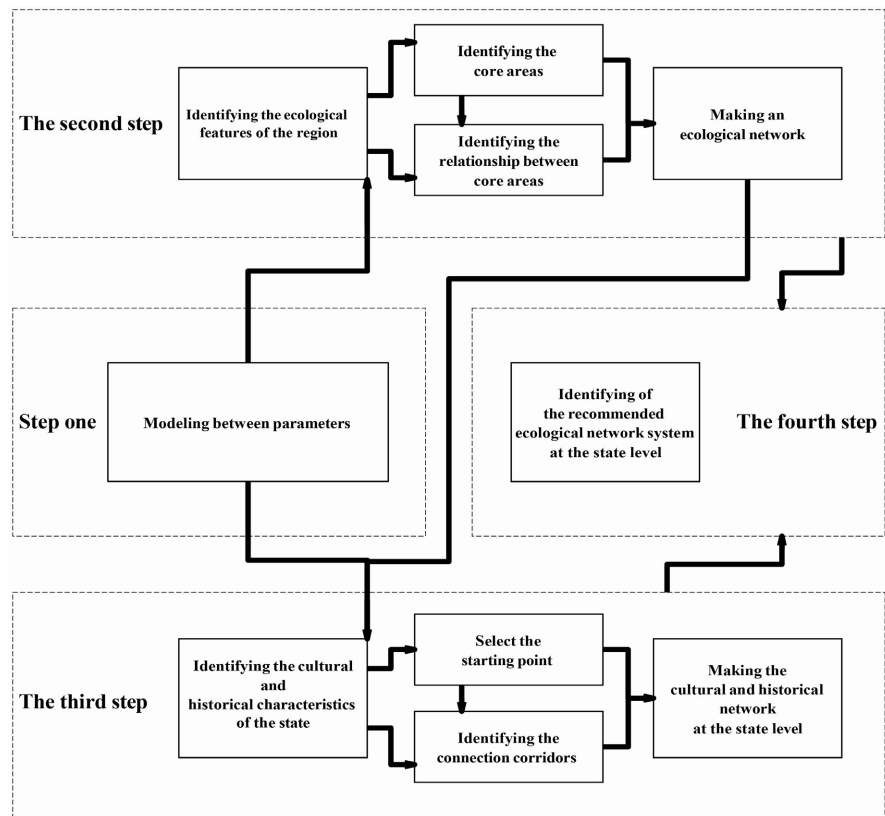
The Florida Ecological Network Model is a decision support model that uses land-use data and information on significant ecological areas to identify larger areas of ecological priority and potential ecological linkages in Florida (Hector, Carr, & Zwick, 2000). It was designed with the objective of establishing a system of landscapes and ecosystems that support native plant and animal species, preserve clean air, water, fisheries, and other natural resources, and maintain the scenic beauty of the region. Geographic Information System (GIS) tools were utilized for the design process. Factors such as soil type, water and geological information, wildlife habitats, and ecological data were examined and analyzed, along with pedestrian pathways, parks, transportation, infrastructure facilities, educational and historical sites, and political boundaries. In this regard, the University of Florida and the Environmental Conservation Group played a crucial role in developing this ecological network. Key elements shaping this network included important and vital habitats for native species, significant environmental communities, wetlands, floodplains, and important aquatic ecosystems (Dixon et al., 2006; Hector et al., 2000; Larkin, Maehr, Hector, Orlando, & Whitney, 2004; Meegan & Maehr, 2002; Trias & Garcia-Zamor, 2015).

The overall process of designing the Florida Ecological Network is illustrated in **Figure 12**.

After analyzing the ecological network through decomposition and overall analysis of the mentioned layers based on spatial distribution metrics and patch diversity, practical solutions were proposed for network issues such as uneven distribution of patches, lack of connectivity and continuity, absence of large patches and essential patterns, fragmentation of patches, etc., based on the objectives and the ecological landscape process. The solutions are as follows:



**Figure 11.** Identification of environmental conservation priorities in ecoregional planning for north talgas valley (Prairie & Team, 2000).



**Figure 12.** Overall process of designing the Florida ecological network, based on: (Hector et al., 2000).

- Identifying and preserving the integrity of the ecological network at the state level in Florida, which includes a wide range of Florida's ecosystems and landscapes.
- Identifying the cultural and historical network of Florida and considering its overlap with the ecological network.
- Utilizing Florida's rivers, springs, lakes, and surface waters as strategic blocks of the state's ecological network.
- Linking a wide range of regional landscapes, including public lands, private-owned natural ecosystems, forests, and agricultural lands, in the state's ecological network.
- Restoring and establishing connections between native ecological systems and their interrelationships.
- Preserving the evolutionary potential of ecosystem components to adapt to future environmental changes (Anderson, Hilbert, & Lewis, 2009; Hoxtor et al., 2000). **Figure 13** illustrates the ecological network model of Florida.

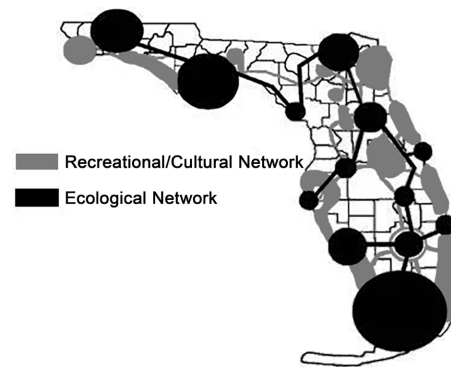
**Table 7** summarizes the objectives, approaches, processes, and achievements of the two case studies presented.

## 7. Conclusion and Summary

It is safe to say that the need to change the planning system at different levels is not only for the sake of protecting the environment. Basically, since the Rio conference, there has been a shift in the planning pattern, and the acceptance of the sustainable development template by a large number of European countries is a clear sign of this shift in the planning model.

The goal of regional planning is to address injustices and imbalances between regions. To achieve this goal, regional planning has undergone theoretical developments, leading to its greater universality and comprehensiveness. These developments have resulted in significant changes, to the extent that some researchers have referred to a paradigm shift in regional planning. This type of development, which is more prevalent in developing and underdeveloped countries, has led to adverse consequences such as the destruction of natural resources, forests, and pastures in human communities. This type of development is called as sustainable growth. The traditional form of regional development, due to its excessive focus on economic aspects and economic viability, has faced challenges. Alongside social inequalities, the awareness of the ecological impacts and environmental problems caused by existing patterns has prompted regional forms of development to actively seek ways to be more environmentally sustainable. Based on this, recognizing the environmental dimensions in regional planning became necessary, and in the late second half of the twentieth century, attention to these dimensions in the planning process was felt.

However, achieving an ecologically-oriented perspective in regional planning is the most important objective of this planning, which is addressed through approaches such as bioregionalism and sustainable development. The discourse on



**Figure 13.** Ecological network model of Florida (Hector et al., 2000).

**Table 7.** Summary of objectives, approaches, processes, and achievements of the examined case studies.

Case Study Title	Objective	Approach and Process	Achievement
Ecoregional Planning for North Talcgrass Prairie, America	Achieving the Conservation Framework for North Talcgrass Prairie Ecological Area	Bioregionalism, Ecological Landscaping	Prioritizing Conservation Sites
Ecological Network Model of Florida	Providing an Ecological Network System of Landscape and Ecosystems in the Region based on Cultural, Social, and Economic Issues	Sustainable Development, Ecological Landscaping	Offering Practical Solutions to Achieve an Ecological Network considering Social, Cultural, and Economic Connections

sustainable regional development emphasizes that ecological policies alone cannot prevent or solve environmental issues in regions. In order to reduce the ecological issues caused by economic activities and ensure a high quality of life in cities, ecological policies must be integrated with other policy sectors, and this is the essence of the transformative perspective.

Environmental conservation, alongside social, economic, and cultural sectors, has gained its appropriate position in the planning system. This way, it moves away from a passive state and becomes an active force throughout the planning process. It seems that one of the tools to achieve this objective is the use of strategic environmental assessment, starting from the stage of setting goals and designing national-level programs.

Ecoregional planning is a holistic approach to land use planning that seeks to balance ecological, social, and economic goals. It recognizes the importance of ecosystem services and biodiversity, and seeks to ensure that land use decisions are informed by the best available science. Ecoregional planning recognizes the importance of ecosystem services, such as clean water, air, and soil, as well as biodiversity and cultural values. These services can be incorporated into land use planning decisions to ensure that they are protected and maintained. Also, it re-

cognizes that ecosystems are complex and dynamic, and that land use decisions may need to be revised over time. Adaptive management involves monitoring and evaluating the impacts of land use decisions and making adjustments as needed to ensure that ecological and social goals are being met.

Ecoregional planning is a process of identifying and managing natural resources within a specific geographic area to achieve ecological and socioeconomic goals. The main contribution of ecoregional planning is the integration of ecological, social, and economic factors to manage natural resources and promote sustainable conservation. This approach is significant, because it helps to address complex environmental challenges, such as habitat loss, climate change, and biodiversity conservation, by considering the unique characteristics of different ecoregions and the interconnectedness of natural systems. Ecoregional planning also provides a framework for collaboration among various stakeholders, including government agencies, non-profit organizations, and local communities, to work together towards common conservation and development objectives. The presentation of ecoregional planning should consider protected areas, existing conservation programs, national and regional plans, attention to public and private lands, and the natural, economic, and socio-cultural capacities of the target region. In this regard, it can confidently be stated that ecological knowledge is a transdisciplinary knowledge that cannot succeed within the framework of a compartmentalized planning system.

### **Acknowledgements**

We thank Dr. Hashem Dadashpour from Tarbiat Modares University, for comments that greatly improved the manuscript.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

### **References**

- Abdi Daneshpour, Z. (2017). *An Introduction to Planning Theories with Special Emphasis on Urban Planning*. Shahid Beheshti University, Printing & Publishing Center. <http://opac.nlai.ir/opac-prod/bibliographic/5610209>
- Aberley, D. (1999). Interpreting Bioregionalism: A Story from Many Voices. In M. V. McGinnis (Ed.), *Bioregionalism* (pp. 13-42). Routledge.
- Ahern, J. (1999). Spatial Concepts, Planning Strategies, and Future Scenarios: A Framework Method for Integrating Landscape Ecology and Landscape Planning. In J. M. Klopatek, & R. H. Gardner (Eds.), *Landscape Ecological Analysis: Issues and Applications* (pp. 175-201). Springer. [https://doi.org/10.1007/978-1-4612-0529-6\\_10](https://doi.org/10.1007/978-1-4612-0529-6_10)
- Anderson, D., Hilbert, K., & Lewis, D. (2009). *Solutions Network Formulation Report. The Potential Contributions of the Global Precipitation Measurement Mission to Phosphorus Reduction Efforts in the Florida Everglades*. No. SSTI-2220-0154.
- Anderson, M. (2010). Integrating Ecoregional Planning at Greater Spatial Scales. In S.

- Trombulak, & R. Baldwin (Eds.), *Landscape-Scale Conservation Planning* (pp. 393-406). Springer. [https://doi.org/10.1007/978-90-481-9575-6\\_18](https://doi.org/10.1007/978-90-481-9575-6_18)
- Anderson, M. G., & Allen, B. (2003). *Ecoregional Conservation: A Comprehensive Approach to Conserving Biodiversity*. The Nature Conservancy, Northeast & Caribbean Division.
- Bahram Soltani, K. (2008). *Environmental Issues and Methods of Urban Planning* (Vol. 2). Iranian Research of Urban and Architectural Studies.
- Bailey, R. G. (1998). *Ecoregions*. Springer. <https://doi.org/10.1007/978-1-4612-2200-2>
- Bailey, R. G. (2004). Identifying Ecoregion Boundaries. *Environmental Management*, 34, S14-S26. <https://doi.org/10.1007/s00267-003-0163-6>
- Bailey, R. G., & Ropes, L. (2002). *Ecoregion-Based Design for Sustainability*. Springer.
- Baker, S. (2015). *Sustainable Development*. Routledge. <https://doi.org/10.4324/9780203121177>
- Baldwin, R. F., Perkl, R. M., Trombulak, S. C., & Burwell, W. B. (2010). Modeling Ecoregional Connectivity. In S. Trombulak, & R. Baldwin (Eds.), *Landscape-Scale Conservation Planning* (pp. 349-367). Springer. [https://doi.org/10.1007/978-90-481-9575-6\\_16](https://doi.org/10.1007/978-90-481-9575-6_16)
- Bastian, O., & Steinhardt, U. (2002). *Development and Perspectives of Landscape Ecology*. Springer Science & Business Media. <https://doi.org/10.1007/978-94-017-1237-8>
- Beita, C. M., & Murillo, L. F. S. (2020). Ecological Regional Planning in Costa Rica: An Approach to Protected Areas and Environmental Services. In R. Thakur, A. Dutt, S. Thakur, & G. Pomeroy (Eds.), *Urban and Regional Planning and Development: 20th Century Forms and 21st Century Transformations* (pp. 129-136). Springer. [https://doi.org/10.1007/978-3-030-31776-8\\_8](https://doi.org/10.1007/978-3-030-31776-8_8)
- Berke, P. (2015). *The Environmental Planning Handbook for Sustainable Communities and Regions, by Tom Daniels: (2014)*. Chicago, IL: APA Planners Press. 792 pages. \$99.95 (paperback). Taylor & Francis.
- Bhat, G., Bergstrom, J., Teasley, R. J., & Cordell, H. (1998). Ecoregion Classification. *Environmental Management*, 22, 69-77. <https://doi.org/10.1007/s002679900084>
- Blowers, A., & Evans, B. (1997). *Town Planning into the 21st Century*. Psychology Press.
- Button, K. (2002). City Management and Urban Environmental Indicators. *Ecological Economics*, 40, 217-233. [https://doi.org/10.1016/S0921-8009\(01\)00255-5](https://doi.org/10.1016/S0921-8009(01)00255-5)
- Campbell, S. (1996). Green Cities, Growing Cities, Just Cities?: Urban Planning and the Contradictions of Sustainable Development. *Journal of the American Planning Association*, 62, 296-312. <https://doi.org/10.1080/01944369608975696>
- Chabard, P. (2016). Patrick Geddes and Cities in Evolution: The Writing and the Readings of an Intempestive Classic. In *Manifestoes and Transformations in the Early Modernist City* (pp. 149-162). Routledge.
- Chan, K. M. A., Shaw, M. R., Cameron, D. R., Underwood, E. C., & Daily, G. C. (2006). Conservation Planning for Ecosystem Services. *PLOS Biology*, 4, e379. <https://doi.org/10.1371/journal.pbio.0040379>
- Chen, C.-Y., & Lin, J.-R. (2021). Environmental Efficiency and Urban Ecology. *Theoretical Economics Letters*, 11, 422-446. <https://doi.org/10.4236/tel.2021.113028>
- Daniels, T. (2017). *Environmental Planning Handbook*. Routledge. <https://doi.org/10.4324/9781351179270>
- Daniels, T. L. (2009). *A Trail across Time: American Environmental Planning from City*

- Beautiful to Sustainability. *Journal of the American Planning Association*, 75, 178-192. <https://doi.org/10.1080/01944360902748206>
- Daniels, T. L. (2019). McHarg's Theory and Practice of Regional Ecological Planning: Retrospect and Prospect. *Socio-Ecological Practice Research*, 1, 197-208. <https://doi.org/10.1007/s42532-019-00024-4>
- Danneels, K. (2023). THE POLITICS Of URBAN ECOLOGY: Paul Duvigneaud and the Rise of Ecological Urbanism in Brussels during the 1970s. *International Journal of Urban and Regional Research*, 47, 792-808. <https://doi.org/10.1111/1468-2427.13197>
- De Montis, A., Caschili, S., Mulas, M., Modica, G., Ganciu, A., Bardi, A. et al. (2016). Urban-Rural Ecological Networks for Landscape Planning. *Land Use Policy*, 50, 312-327. <https://doi.org/10.1016/j.landusepol.2015.10.004>
- Decker, K. (2007). *Central Mixedgrass Prairie Ecological System: (Central Shortgrass Prairie Ecoregion Version): Ecological Integrity Assessment*. Colorado State University.
- Desai, V., & Potter, R. B. (2008). 6.3. The Rio Earth Summit. In *The Companion to Development Studies*. Routledge.
- Dixon, J. D., Oli, M. K., Wooten, M. C., Eason, T. H., McCown, J. W., & Paetkau, D. (2006). Effectiveness of a Regional Corridor in Connecting Two Florida Black Bear Populations. *Conservation Biology*, 20, 155-162. <https://doi.org/10.1111/j.1523-1739.2005.00292.x>
- Douglas, I. (2013). *Cities: An Environmental History*. Bloomsbury Publishing.
- Farina, A. (2000). *Landscape Ecology in Action*. Springer Science & Business Media. <https://doi.org/10.1007/978-94-011-4082-9>
- Forman, R. (2014). Land Mosaics: The Ecology of Landscapes and Regions (1995). In F. O. Ndubisi (Ed.), *The Ecological Design and Planning Reader* (pp. 217-234). Island Press. [https://doi.org/10.5822/978-1-61091-491-8\\_21](https://doi.org/10.5822/978-1-61091-491-8_21)
- Forman, R. T. (1990a). The Beginnings of Landscape Ecology in America. In I. S. Zonneveld, & R. T. T. Forman (Eds.), *Changing Landscapes: An Ecological Perspective* (pp. 35-41). Springer. [https://doi.org/10.1007/978-1-4612-3304-6\\_3](https://doi.org/10.1007/978-1-4612-3304-6_3)
- Forman, R. T. (1990b). Ecologically Sustainable Landscapes: The Role of Spatial Configuration. In I. S. Zonneveld, & R. T. T. Forman (Eds.), *Changing Landscapes: An Ecological Perspective* (pp. 261-278). Springer. [https://doi.org/10.1007/978-1-4612-3304-6\\_14](https://doi.org/10.1007/978-1-4612-3304-6_14)
- Forman, R., & Gordon, M. (1986). *Landscape Ecology*. John Wiley & Sons.
- Friedmann, J. R. (1956). The Concept of a Planning Region. *Land Economics*, 32, 1-13. <https://doi.org/10.2307/3159570>
- Gama-Rodrigues, A. C., Müller, M. W., Gama-Rodrigues, E. F., & Mendes, F. A. T. (2021). Cacao-Based Agroforestry Systems in the Atlantic Forest and Amazon Biomes: An Ecoregional Analysis of Land Use. *Agricultural Systems*, 194, Article 103270. <https://doi.org/10.1016/j.agsy.2021.103270>
- Garibaldi, M. C., Bonnaventure, P. P., Smith, S. L., & Duchesne, C. (2022). Active Layer Variability and Change in the Mackenzie Valley, Northwest Territories between 1991-2014: An Ecoregional Assessment. *Arctic, Antarctic, and Alpine Research*, 54, 274-293. <https://doi.org/10.1080/15230430.2022.2097156>
- Gujit, I., & Moiseev, A. (2001). *IUCN Resource Kit for Sustainability Assessment*. World Conservation Union.
- Hens, L., & Nath, B. (2005). *The World Summit on Sustainable Development*. Springer. <https://doi.org/10.1007/1-4020-3653-1>

- Hector, T. S., Carr, M. H., & Zwick, P. D. (2000). Identifying a Linked Reserve System Using a Regional Landscape Approach: The Florida Ecological Network. *Conservation Biology*, 14, 984-1000. <https://doi.org/10.1046/j.1523-1739.2000.99075.x>
- Hodge, G., Hall, H. M., & Robinson, I. M. (2017). *Planning Canadian Regions*. University of British Columbia Press. <https://doi.org/10.59962/9780774834155>
- Hou, W., Zhai, L., & Walz, U. (2023). Identification of Spatial Conservation and Restoration Priorities for Ecological Networks Planning in a Highly Urbanized Region: A Case Study in Beijing-Tianjin-Hebei, China. *Ecological Engineering*, 187, Article 106859. <https://doi.org/10.1016/j.ecoleng.2022.106859>
- Howard, E. (1965). *Garden Cities of Tomorrow* (Vol. 23). MIT Press.
- Johnson, K. N., Swanson, F., Herring, M., & Greene, S. (1999). *Bioregional Assessments: Science at the Crossroads of Management and Policy*. Island Press.
- Jongman, R. H., & Pungetti, G. (2004). *Ecological Networks and Greenways: Concept, Design, Implementation*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511606762>
- Kennet, W. (1972). The Stockholm Conference on the Human Environment. *International Affairs (Royal Institute of International Affairs 1944)*, 48, 33-45. <https://doi.org/10.2307/2613625>
- Kidd, S. (2005). The Environmental Dimension of Sustainable Regional Development in the English Regions: Reflections upon the Experience of North West England. *European Environment*, 15, 266-281. <https://doi.org/10.1002/eet.391>
- Klein, L. R., Hendrix, W. G., Lohr, V. I., Kaytes, J. B., Sayler, R. D., Swanson, M. E. et al. (2015). Linking Ecology and Aesthetics in Sustainable Agricultural Landscapes: Lessons from the Palouse Region of Washington, USA. *Landscape and Urban Planning*, 134, 195-209. <https://doi.org/10.1016/j.landurbplan.2014.10.019>
- Lantitsou, K. (2017). Eco-Development and Environmental Spatial Planning. *Fresenius Environmental Bulletin*, 26, 1291-1300.
- Larkin, J. L., Maehr, D. S., Hector, T. S., Orlando, M. A., & Whitney, K. (2004). Landscape Linkages and Conservation Planning for the Black Bear in West-Central Florida. *Animal Conservation*, 7, 23-34. <https://doi.org/10.1017/S1367943003001100>
- Lipschutz, R. D. (2005). Bioregionalism, Civil Society and Global Environmental Governance. In M. V. McGinnis (Ed.), *Bioregionalism* (pp. 115-134). Routledge. <https://doi.org/10.4324/9780203984765-17>
- López González, C., Sandoval, S., & Escobar Flores, J. G. (2023). An Ecoregionalization of the Sierra Madre Occidental, México, Based on Non-Volant, Small Mammal Distributions. *Ecoscience*, 30, 65-81. <https://doi.org/10.1080/11956860.2023.2207947>
- Loveland, T. R., & Merchant, J. M. (2004). Ecoregions and Ecoregionalization: Geographical and Ecological Perspectives. *Environmental Management*, 34, S1-S13. <https://doi.org/10.1007/s00267-003-5181-x>
- MacKaye, B. (1990). *The New Exploration: A Philosophy of Regional Planning*. University of Illinois Press.
- Mason, R. J. (2011). Ecoregional Planning: Retreat or Reinvention? *Journal of Planning Literature*, 26, 405-419. <https://doi.org/10.1177/0885412211411091>
- McCammack, B. J. (2018). The American City and Environmental Pollution. In *Oxford Research Encyclopedia of American History*. Oxford University Press. <https://doi.org/10.1093/acrefore/9780199329175.013.597>
- Mcdonnel, M. (2011). The History of Urban Ecology: An Ecologist Perspective. *Urban*



- Ecology: Patterns, Processes and Applications*, 9, 5-13.  
<https://doi.org/10.1093/acprof:oso/9780199563562.003.0002>
- McGarigal, K., & Marks, B. J. (1995). *FRAGSTATS: Spatial Pattern Analysis Program for Quantifying Landscape Structure* (pp. 1-122). General Technical Report PNW-GTR-351, US Department of Agriculture, Forest Service, Pacific Northwest Research Station.  
<https://doi.org/10.2737/PNW-GTR-351>
- McGinnis, M. V. (1999). *Bioregionalism*. Psychology Press.
- McHarg, I. L. (1969). *Design with Nature*. American Museum of Natural History New York.
- Meegan, R. P., & Maehr, D. S. (2002). Landscape Conservation and Regional Planning for the Florida Panther. *Southeastern Naturalist*, 1, 217-232.  
[https://doi.org/10.1656/1528-7092\(2002\)001\[0217:LCARPF\]2.0.CO;2](https://doi.org/10.1656/1528-7092(2002)001[0217:LCARPF]2.0.CO;2)
- Melosi, M. V. (1993). The Place of the City in Environmental History. *Environmental History Review*, 17, 1-23. <https://doi.org/10.2307/3984888>
- Menhinick, H. K., & Durisch, L. L. (1953). Tennessee Valley Authority: Planning in Operation. *The Town Planning Review*, 24, 116-145.  
<https://doi.org/10.3828/tpr.24.2.p5118n80l363m271>
- Miller, D. L. (2002). *Lewis Mumford, a Life*. Grove Press.
- Miller, K. R. (1996). *Balancing the Scales: Guidelines for Increasing Biodiversity's Chances through Bioregional Management*. World Resources Institute.
- Miller, M. (2015). *English Garden Cities: An Introduction*. Historic England.
- Ndubisi, F. (2002). *Ecological Planning: A Historical and Comparative Synthesis*. JHU Press.
- Noble, A. G., & Costa, F. J. (1999). *Preserving the Legacy: Concepts in Support of Sustainability*. Lexington Books.
- Novak Jr., F. G. (2014). *Lewis Mumford and Patrick Geddes: The Correspondence*. Routledge. <https://doi.org/10.4324/9780203430477>
- Olstad, T. A. (2012). Understanding the Science and Art of Ecoregionalization. *The Professional Geographer*, 64, 303-308. <https://doi.org/10.1080/00330124.2011.603656>
- Omernik, J. M. (2004). Perspectives on the Nature and Definition of Ecological Regions. *Environmental Management*, 34, S27-S38. <https://doi.org/10.1007/s00267-003-5197-2>
- Parsons, K. C. (1990). Clarence Stein and the Greenbelt Towns Settling for Less. *Journal of the American Planning Association*, 56, 161-183.  
<https://doi.org/10.1080/01944369008975757>
- Peng, J., Wang, Y., Wu, J., Shen, H., & Pan, Y. (2011). Research Progress on Evaluation Frameworks of Regional Ecological Sustainability. *Chinese Geographical Science*, 21, 496-510. <https://doi.org/10.1007/s11769-011-0490-0>
- Pierson, F., & Mulla, D. (1990). Aggregate Stability in the Palouse Region of Washington: Effect of Landscape Position. *Soil Science Society of America Journal*, 54, 1407-1412.  
<https://doi.org/10.2136/sssaj1990.03615995005400050033x>
- Pourjafar, M., & Moradi, A. (2015). Explaining Design Dimensions of Ecological Greenways. *Open Journal of Ecology*, 5, 66-79. <https://doi.org/10.4236/oje.2015.53007>
- Prairie, F. H., & Team, E. P. (2000). Ecoregional Conservation in the Osage Plains/Flint Hills Prairie.
- Sarafi, M. (1998). *Planning Basics of Regional Development*. Sazman Barnameh va Boud-jeh

- Serageldin, I. (1995). Sustainability and the Wealth of Nations: First Steps in an Ongoing Journey. In *Sustainability and the Wealth of Nations: First Steps in an Ongoing Journey* (p. 25).
- Simeonova, V., & van der Valk, A. (2009). The Need for a Communicative Approach to Improve Environmental Policy Integration in Urban Land Use Planning. *Journal of Planning Literature*, 23, 241-261. <https://doi.org/10.1177/0885412208327022>
- Smith, J. R., Hendershot, J. N., Nova, N., & Daily, G. C. (2020). The Biogeography of Ecoregions: Descriptive Power across Regions and Taxa. *Journal of Biogeography*, 47, 1413-1426. <https://doi.org/10.1111/jbi.13871>
- Stein, C. S. (1949). Toward New Towns for America. *The Town Planning Review*, 20, 203-282. <https://doi.org/10.3828/tpr.20.3.w821lg2403n58618>
- Steiner, F., & Steiner, F. (2016). The Ecological Region. In *Human Ecology: How Nature and Culture Shape Our World* (pp. 95-123). Island Press. [https://doi.org/10.5822/978-1-61091-778-0\\_6](https://doi.org/10.5822/978-1-61091-778-0_6)
- Taghvaei, A. A., Kamyar, M., & Moradi, A. (2017). Human, Nature, City: From Oblivion to Review. *Open Journal of Ecology*, 7, 433-446. <https://doi.org/10.4236/oje.2017.77030>
- Thayer, R. L. (2003). *LifePlace: Bioregional Thought and Practice*. University of California Press.
- Trias, R., & Garcia-Zamor, J.-C. (2015). The Seven50 Plan and Regional Governance in Southeast Florida. *Current Urban Studies*, 3, 300-312. <https://doi.org/10.4236/cus.2015.34025>
- Turner, M. G. (2005a). Landscape Ecology in North America: Past, Present, and Future. *Ecology*, 86, 1967-1974. <https://doi.org/10.1890/04-0890>
- Turner, M. G. (2005b). Landscape Ecology: What Is the State of the Science? *Annual Review of Ecology, Evolution, and Systematics*, 36, 319-344. <https://doi.org/10.1146/annurev.ecolsys.36.102003.152614>
- Turner, M. G., Gardner, R. H., O'Neill, R. V., & O'Neill, R. V. (2001). *Landscape Ecology in Theory and Practice* (Vol. 401). Springer.
- Wheeler Stephen, M. (2004). *Planning for Sustainability: Creating Livable, Equitable and Ecological Communities*. Routledge.
- Wilkinson, C., Saarne, T., Peterson, G. D., & Colding, J. (2013). Strategic Spatial Planning and the Ecosystem Services Concept—An Historical Exploration. *Ecology and Society*, 18, 37. <https://doi.org/10.5751/ES-05368-180137>
- Younge, A., & Fowkes, S. (2003). The Cape Action Plan for the Environment: Overview of an Ecoregional Planning Process. *Biological Conservation*, 112, 15-28. [https://doi.org/10.1016/S0006-3207\(02\)00393-2](https://doi.org/10.1016/S0006-3207(02)00393-2)
- Zimmerman, U. (1996). Futures by Design: The Practice of Ecological Planning. *Landscape Journal*, 15, 171-172. <https://doi.org/10.3368/lj.15.2.171>
- Zonneveld, I. S. (1995). *Land Ecology: An Introduction to Landscape Ecology as a Base for Land Evaluation, Land Management and Conservation*. Science Publishers.