Current Environmental Issues and Challenges

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LANDSCAPE ECOLOGY: A SCIENTIFIC WAY OF SUSTAINABILITY

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Abstract

Landscape ecology is the study of the pattern and interaction between ecosystems within a region of interest, and the way the interactions affect ecological processes, especially the unique effects of spatial heterogeneity on these interactions. A landscape is part of the Earth's surface that can be viewed at one time from one place. It consists of the geographic features that mark a particular area.

Sustainability improves the quality of human life, protects natural ecosystem and preserves natural resources for future generations. In the corporate world, sustainability is associated with an organization's holistic approach, taking into account everything, from manufacturing to logistics to customer service. Sustainable development practices also help countries grow in ways that adapt to the challenges posed by climate change, which will in turn help to protect important natural resources for ours and future generations.

Key words

Landscape ecology, Sustainability, climate change, natural resources.

Introduction

Landscape ecology offers sustainability science a tangible system concept, the landscape that can be seen, perceived, enjoyed, and measured. Because of its tangibility, landscape can be a common platform, for different disciplines and sectors to work together to find common sustainable solutions [9]. Non-polluting, renewable resources provide the power to drive sustainable energy systems. More efficient farming techniques and new technologies are useful to improve yields to reduce consumption and to reduce waste. As a result, the environment can be preserved for future generations [4].

Ecological sustainability is defined as the maintenance or restoration of the composition, structure and processes of ecosystems including the diversity of plant and animal communities and in turn the productive capacity of the ecosystems. The scientific study of landscape ecology can considerably contribute to plan and manage sustainable development [8]. Thus, the landscape ecology provides an important framework for Critical Zone research through:

(a) Integrating 3D analysis of landscape systems.

(b) Contextualizing the Critical Zone processes both temporally and spatially.

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(c) Investigating problems related with scaling.

Landscape ecology describes and explains the landscapes characteristic patterns of ecosystems and investigates the flux of energy, mineral nutrients, and species among their component ecosystems, providing important knowledge for addressing land-use issues [10].

Sustainability Practices in 21st Century

By recognizing the impact of environmental and social issues, combined with changing technologies and consumer behaviour, companies will be able to integrate sustainability into innovation for 21st Century breakthroughs [7].It requires creativity communication and collaboration as the basic skill [13]. The aim is to forge a better understanding and help overcome the current gridlock on the most divisive issues. SD21 provides an empirical basis and a frame of analysis to better understand much of today's work on the key issues of sustainability.

Long-lived and healthy wetlands and forests are examples of sustainable biological systems. Invisible chemical cycles redistribute water, oxygen, nitrogen and carbon through the world's living and non-living systems, and have sustained life since the beginning of time. The quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance [15]. The committee is developing sustainability standards for products that use energy. The principles of ESD include to address issues associated with economic, environmental, social and equitable considerations [10]. The principles of ESD require the effective integration of environmental resources and decision making [12].

By the year 2050, it is estimated that our global population will likely reach 9 billion people. While now a days many community dynamics are at work [11]. Economy, ecology, and equity are particularly important to building healthy and prosperous communities over the long term. Some of the human activities like construction of dam may be considered as biological activity it may cause floods, waterlogging, soil degradation, etc. and that can change landscape structure as mentioned by Gustafson (1998) [16] Further the clearing of forest land for agriculture or the expansion of urban areas have also caused significant changes in landscape structure [13].

Central Focus of the Field of Landscape Ecology

In landscape ecology, the matrix is defined as the background ecological system. The connectivity of a matrix indicates how well an organisms can move through it. E.g. a forest with few gaps in the canopy has high connectivity while highly densed one has very low connectivity in terms of movements by macro animals and human beings [14]. The most salient characteristics of landscape ecology are its emphasis on the pattern-process relationship and its focus on broad-scale ecological and environmental issues.

Principles of Landscaping

They are virtually a retreat for the public from the harsh strains and stresses of public life. Landscaping is done with a view to create a natural scene by planting of lawn, trees and shrubs. It

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is the imitation of nature in the garden and improves the total living environment of the people [9]. Sustainability is important for many reasons including environmental quality. In order to have healthy communities, we need clean air, natural resources and a nontoxic environment. Growth – UNTHSC's (*University of North Texas Health Science Centre)* enrolment continues to grow, so we require more resources such as energy, water, and space [7]. To attain an environmentally sustainable society, the progress of the society should be taken care of in relation to the environment. The needs of the society should be met to elongate their life and to enable them live a fulfilling life with health. [12].

A Scientific way of Sustainability

To live a more sustainable lifestyle we will try to, save energy by using less energy, we can help to reduce carbon emissions. Eat less meat, use reusable alternatives, go paperless, use renewable energy, recycle and reuse, grow our own produce, donate unused items. Environmental education promotes critical and creative thinking skills and inspires kids to become more engaged with their communities [8]. It helps kids understand why the environment is important and provides them with the building blocks they need to live eco-friendly and sustainable lives.

The term sustainability is broadly used to indicate programs, initiatives and actions aimed at the preservation of a particular resource [7]. The concept is based on ultimate human value like intergeneration equity. It refers to four pillars of sustainability viz. human, social, economic and environmental. Environmental sustainability is important because of how much energy, food and human-made resources we use every day. Rapid population growth has resulted in increased farming and manufacturing, leading to more greenhouse gas emissions, unsustainable energy use, and deforestation [9].

Sustainability is crucial to conserving natural resources and living a more fruitful life. We need to make decisions today that are sustainable for years to come. We need to stop making decisions that only provide quick near-term benefits [5]. Sustainability means meeting our own needs without compromising the ability of future generations to meet their own needs. In addition to natural resources, we also need social and economic resources [3]. There are four elements of environmental sustainability and environmental regulatory compliance i.e. air, water, management, and risk reduction. Sustainability looks to protect our natural environment, human and ecological health, while driving innovation and not compromising our way of life [9]. Environmental sustainability is responsibly interacting with the planet to maintain natural resources and avoid jeopardizing the ability for future generations to meet their needs.

Sustainable practices include planting new seedlings in deforested areas and reducing the number of trees cut down each year. Especially as the human population grows, it is critical that we reduce our depletion of forests, precious metals, and other natural resources [1]. Ecological sustainability is defined as the maintenance or restoration of the composition, structure, and processes of ecosystems including the diversity of plant and animal communities and the productive capacity of ecological systems [6]. Sustainable development is development that meets

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the needs of the present without compromising the ability of future generations to meet their own needs.

Ecologically sustainable development means development which uses, conserves and enhances the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased. Sustainability has three main pillars: economic, environmental, and social. These three pillars are informally referred to as people, planet, and profits [2]. There are three interconnected spheres of sustainability that describe the relationships between the environmental, economic, and social aspects of our world [4]. These spheres are a related set of concepts that, when taken together, can form a solid ground from which major decisions and actions can be made.

For sustainable development to be achieved, it is crucial to harmonize three core elements: economic growth, social inclusion and environmental protection. These elements are interconnected and all are crucial for the well-being of individuals and societies. Landscape ecology provides an important framework for Critical Zone research through (1) integrating 3D dimensionality in the analysis of landscape systems (2) contextualizing the Critical Zone processes both temporally and spatially and (3) investigating problems related with scaling [16].

Changes in Landscape Ecology structure

The goal of a landscape ecologist is to understand and describe landscape structure, how this structure influences the movement of organisms, material, or energy across the landscape and how and why landscape structure changes over time [15]. The goal of landscape ecology is to understand the relationships between landscape pattern and ecological process, the role of humans and other forces of landscape change on these pattern-process relationships and the principles required to make informed decisions in natural resource management [14].

Every disturbance to the eco-environment will prime to the subsequent alteration of disease patterns and our human exposure to the altered and later disease outbreaks that in effect guide to the increasing burdens on global health [15]. Landscaping has both negative and positive impacts on the environment. The negative impacts include deforestation, pollution (air, water, and land), as well as the modification of the ecosystem [2].

Exploring Variability in Landscape Ecology

Sugar mills impact the environment by producing wastewater, emissions and solid waste. The massive quantities of plant matter and sludge washed from mills which decompose in freshwater bodies and absorbing all the available oxygen. Due to this massive fish are kills. There are various agricultural practices on a sugarcane farm such as fertilisation and spraying. It increases leaching and water contamination with nutrients and agrochemicals, leading to Eco- toxicity, eutrophication, and acidification in atmosphere [20].

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Also the cultivation and processing of sugar produce environmental impacts through the loss of natural habitats, intensive use of water, heavy use of agro-chemicals, discharge and runoff of polluted effluent and air pollution. Sugarcane production often pollutes freshwater ecosystems with silt and fertilizers washed from farms, as well as plant matter and chemical sludge from mills. In the Great Barrier Reef and Mesoamerican Reef, those contaminants are flowing out to sea and damaging coral ecosystems [21].

Humans impact the physical environment in many ways such as overpopulation, pollution, burning fossil fuels, and deforestation. Changes like these have triggered climate change, soil erosion, poor air quality, and undrinkable water. The effects of soil erosion go beyond the loss of fertile land [18]. It has led to increased pollution and sedimentation in streams and rivers, clogging these waterways and causing declines in fish and other species. Degraded lands are also often less able to hold the water, which can worsen flooding. Deforestation, desertification, biodiversity loss, loss of productivity potential, soil erosion, and pollution are ongoing processes associated with landscape degradation. Reversing degradation requires time and consistent effort [22].

Lift irrigation is a method of irrigation in which water instead of being transported by natural flow requires external energy through animal, fuel based or electric power using pumps or other mechanical means. Groundwater depletion is primarily caused by sustained groundwater pumping. Negative effects of groundwater depletion are drying up wells, reduction of water in streams and lakes [15].

Groundwater is a prime natural resource in the Earth. It not only supports all types of life forms to exist in the Earth but also helps in the growth of human civilization. Contamination of ground water can result in poor drinking water quality, loss of water supply, degraded surface water systems, high clean-up costs, and high costs for alternative water supplies and potential health problems [23]. The consequences of contaminated ground water or degraded surface water are often serious. Various human activities like abstraction of the groundwater, its overexploitation, the building of reservoirs, and overuse of land have caused changes in groundwater levels and led to its depletion [11].

From a positive perspective, irrigation would reduce the erosion risk within the basin and also increase the opportunities for environmental enhancement. From a negative perspective, irrigation increases the risk of contamination of ground and surface waters and could adversely impact upon landscape values. The most effective solution to high evaporation losses of soil water is a cover of plant residues on the soil surface. Agronomic practices that increase shading of the soil surface, and physical structures that concentrate rainwater, encouraging percolation to deeper layers, also reduce evaporation losses [23].

Dairy cows and their manure produce greenhouse gas emissions which contribute to climate change. Poor handling of manure and fertilizers can degrade local water resources. And unsustainable dairy farming and feed production can lead to the loss of ecologically important areas, such as prairies, wetlands, and forests [19].

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The Agricultural Revolution impacted the environment, transforming forests and previously undisturbed land into farmland, destroyed habitats, decreased biodiversity and released carbon dioxide into the atmosphere [20]. Agriculture is the leading source of pollution in many countries. Pesticides, fertilizers and other toxic farm chemicals can poison fresh water, marine ecosystems, air and soil. They also can remain in the environment for generations.

Hence there is urgent need to developing pest- and disease-resistant seeds through traditional breeding or genetic engineering can increase yields and reduce pesticide use. Cultivars suited to local conditions and weather extremes, such as drought and heat, can also help farmers produce more food without degrading ecosystems.

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