Sustainable agriculture development and optimum utilization of natural resources: striking a balance

Abstract

There is a finite supply of natural resources, and unchecked exploitation may harm the ecosystem. The strategy for their sustainable use must be determined. The framework of sustainable development is used to define strategies of ongoing societal and state advancement that do not negatively impact the environment or the natural resources that will be needed for future human activities. A model that governs sustainable use takes into account the legal and strategic guidelines for the extraction of energy and natural resources. Ensuring the sustainable use of natural resources both nationally and internationally is the aim. Environmental protection and sustainable use of natural resources are closely intertwined. Additionally, a healthy environment's value and the degree to which the public is educated about its preservation are linked to the preservation of the working and living environments. All areas of human endeavour see improvements in quality of life as a result of faster technical development, but increased environmental deterioration is also a potential. Consequently, in order to achieve the objectives of the society's development policy, it is imperative to incorporate the appropriate standards that would support sustainable development. This review paper is a quick response to maintain the ecosystem's equilibrium and the surrounding area.

Keywords

Eco-efficiency, Natural resources, Technological innovation, sustainable development, environmental protection

Introduction

The sustainable use of the main natural resources such as land, water, air, minerals, forests, fisheries, and wild flora and fauna is known as natural resource management, or NRM. When combined, these resources offer the ecosystem services that raise the standard of living for people. Natural resources offer essential life support in the form of services that are both consumptive and public goods. Climate cycles, soil productivity, nutrient recycling, and water and air purification are all sustained by ecological processes [1-8].

The existence of various ecosystem types, species of creatures with the whole range of their variations and genes adapted to various temperatures and settings, as well as their interactions and processes, is known as biological variety, or biodiversity. The diversity of all species on Earth is included in biodiversity. India is one of the world's 17 mega-biodiversity nations [9-12]. Despite making up only 2.5% of the world's total land area, India is home to a vast and diverse array of plants and microorganisms, accounting for 7.8% of all known species. The term "genetic diversity" refers to the differences across species in terms of chromosome count, type, and quantity. A species' genetic variation rises as its size and the environmental

conditions of its habitat increase. The diversity of species within an area refers to the range in quantity and quality of spices found there. The arrangement and interactions of coexisting species as well as the surrounding physical environment are referred to as ecosystem diversity. The placement and magnitude of different ecosystems are included, which is why it is called landscape diversity. Australia, the Congo, Madagascar, South Africa, China, India, Indonesia, Malaysia, Papua New Guinea, Philippines, Brazil, Colombia, Ecuador, Mexico, Peru, United States, and Venezuela are among the nations known to possess mega-biodiversity.

Natural Resources

All things derived from nature that are valuable and abundant in general are considered natural resources. While climate and relief have an indirect use value since they are prerequisites for the growth of certain other economic activities, mineral resources, water, forests, land, solar, and wind energy have a direct use [18,19].

Natural potential, which refers to all natural resources and circumstances, is a more general word for natural wealth. They represent all of the material goods that humans use, including forests, coal, ores, biodiversity, climate, and relief. Once these products are used, they turn into an economic resource [20]. [21] classified natural resources into three categories based on their duration:

1. Non-renewable resources, which include raw materials or mineral resources;
2. Renewable resources, which include land, water, air, flora, and fauna; and
3. Sustainable resources, which include solar energy, wind, tides, and running water.

Non-renewable natural resource management

Because the stocks of non-renewable natural resources—such as minerals—constantly decline as they are exploited, managing them is extremely difficult. For the exploitation process to be highly efficient and effective, mineral resource management needs to be strategic. Applied strategy is predicated on rationality in application, which is predicated on the maximisation of natural resource utilisation principle. The first step in the strategic management of mineral resources is a local, national, and regional economic assessment.

The availability, structure, and quality of resources, the amount of capital invested, environmental factors, and public interests all play a role in determining management objectives at the local level. The goals of national strategic management are founded on the following: resource depletion, human resource security, availability of resources for mining exploitation (as a means of labour), exploration and assessment of available stocks, state of investment funding, and execution of the policies and initiatives envisioned by strategic planning. Reconciling primary production and processing is the fundamental regional goal of mineral resources strategic management [19, 20]. A balance between the exploitation of natural resources and the preservation of biodiversity is a prerequisite for sustainable development.

Three categories describe the detrimental effects on the ecosystem that occur during the extraction of minerals, both below and above ground:

1. Depletion of reserves;
2. Environmental destruction; and
3. Environmental pollution.

Environmental deterioration is lower in regions with underground mining than it is in areas with surface mining. In general, the ecosystem may suffer from any kind of mining or exploitation. In this regard, laws also support the need for a close connection between environmental protection and mining [23-24].

Renewable Natural resource management

Constant renewal and regeneration processes coexist with the process of resource consumption, which defines renewable natural resources. The balanced link between consumption and renewal, or regeneration, is the foundation for the management of these resources. The state implements a number of policies, including economic, quantitative, and regulatory limits, to preserve natural resources [27,28]. Legislative actions govern resource property rights and prohibit unrestricted access and usage. The quantities of resource utilisation (amount of exploitation, amount of flora and fauna collected, etc.) are referred to as quantitative limits. According to certain analyses of the actions involved in managing renewable natural resources, applying economic measures yields the best outcomes. The adoption of the tax and subsidy system, together with other budgetary measures, helped to preserve and safeguard renewable resources. Fauna and plants comprise the majority of renewable resources.

The usage and sale of wild plants and animals received particular consideration. The Republic of Serbia's government has issued a special decree [29-31] that governs this matter. It lays out exactly when and to what extent protected species from their natural habitats may be taken, used, and transported [32-33].

India's natural resources include:

India's total cultivable area is 1,269,219 km², or 56.78% of the country's total land area. This amount is steadily declining as a result of growing urbanisation and pressure from the country's expanding population. India receives an average of 1,100 mm of rainfall annually and has a total water surface area of 314,40 km². Ninety-two percent of water use is attributed to irrigation, which accounted for 380 km² in 1974 and is projected to increase to 1,050 km² by 2025. Industrial and residential users make up the remaining portion. About 6 million people work in the fishing industry in India thanks to its marine resources, which include the east and west coastlines of the Indian Ocean as well as other gulfs and bays, and its inland water resources, which include rivers, canals, ponds, and lakes. India has the third-largest fishing industry globally in 2008 [13-15].

The world's fourth-biggest deposits of coal are found in India, along with iron ore, manganese, mica, bauxite, titanium ore, chromite, natural gas, diamonds, petroleum,

limestone, and thorium (which is found in the world's largest quantities along Kerala's coastlines). Twenty-five percent of India's oil needs are supplied by the reserves located in eastern Assam, Gujarat, Rajasthan, and Bombay High, off the coast of Maharashtra [16].

Sustainable Development

The term "sustainable development" has gained popularity in the development discourse despite having various definitions, connotations, and interpretations. Development that can be continued either indefinitely or for the specified time period is what SD, when taken literally, would indicate [35, 36, 37]. From a structural perspective, the idea can be expressed as a phrase made up of the terms "development" and "sustainable." Similar to how each of the two terms that make up the concept of sustainable development (SD), "sustainable" and "development," has been defined differently from different viewpoints, the notion of SD has also been examined from many views, resulting in a multitude of meanings for the term. While there are many definitions of SD available, the Brundtland Commission Report's definition is the one that is most frequently used [38]. According to the report, sustainable development (SD) is development that satisfies present demands without jeopardising the capacity of future generations to satisfy their own.

Both [39] and [40] contend that SD is a fundamental idea in global development policy and agenda, acknowledging the widespread application of WCED's definition. It offers a way for society to engage with the environment without running the risk of endangering the resource in the future. Accordingly, it is a development paradigm and concept that advocates raising living standards without endangering the planet's ecosystems or bringing about environmental issues like deforestation and air and water pollution, which can lead to issues like climate change and the extinction of species [41, 42].

When viewed as a methodology, SD is a development strategy that makes use of resources in a way that ensures their continued availability for future generations [43]. [44] goes on to connect the idea to the organising principle for achieving the aims of human progress while maintaining natural systems' capacity to deliver the ecosystem services and natural resources that are essential to society and the economy. When viewed from this perspective, the goals of SD are economic growth, environmental balance, and social advancement [45, 46]. [47] examined the demands of SD and underlined the need to switch from detrimental socio-economic activities to ones that have positive effects on the environment, the economy, and society.

Some say that the more people there are, the more important Sustainable Development is, since natural resources needed to meet human needs and desires are not keeping up with population growth. According to [48], aware of this phenomenon, there has always been a call for the wise use of the resources at hand to ensure that the needs of the current generation can always be met without jeopardising the ability of future generations to meet theirs. It suggests that sustainable development (SD) aims to ensure a balance between social progress, environmental preservation, and economic growth. This supports the claim that

intergenerational equity, which acknowledges the short and long-term implications of sustainability and SD, is implicit in the idea of SD [49, 50]. This can be accomplished, in accordance with [48], by including social, environmental, and economic considerations into decision-making procedures. Though it's usual for people to treat sustainability and SD as synonyms and analogies, the two ideas are distinct. Sustainability, according to [50] is the aim or result of a procedure known as sustainable development. In support of this argument, [50] argues that whereas "sustainability" describes a condition, SD describes the method by which this state is attained.

Development that is sustainable

Achieving a balance between the requirements of the present and the future, as well as between human economic progress and environmental preservation, is the definition of sustainable development. According to [17], it refers to equity in sectoral actions and growth throughout geography and time. It necessitates combining environmental, social, and economic development strategies. Achieving social justice and environmental preservation through urbanisation while lowering costs is known as sustainable urban development.

The idea behind sustainable urban development

In June 1972, the UN General Assembly [18] called a conference in Stockholm on the "human environment," which resulted in the publication of guiding principles. The statement underscores that humans possess an inherent right to a high-quality environment and that it is their duty to safeguard it for both current and future generations. It further argued that protecting the planet's natural resources is essential for the sake of both current and future generations. A decade or so later, in 1983, the World Commission on Environment and Development was established to address the concerns of unsustainable development and the ongoing depletion of natural resources. Sustainable development was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" by the Brundtland Commission (1983–1983). Following the Stockholm Declaration for twenty years, the UN Conference on "Environment and Development" (sometimes called the "Earth Summit") in Rio de Janeiro in 1992 adopted an action plan that became known as "Agenda 21." Aim 21 made several promises, including lowering poverty, protecting the environment, and supplying clean water and healthcare. It is also important to remember that a few of the UNDP's Millennium Development Goals 3 call for ensuring environmental sustainability and lowering the proportion of the population living in severe poverty. Similarly, the Intergovernmental Panel on Climate Change (IPCC) emphasises the significance of social and environmental equality in development when describing the implications of climate change for sustainable development. Therefore, in order to achieve sustainable development, the main international conferences and efforts on the environment and development to date have placed a strong emphasis on the need for socially and economically equal development as well as environmental protection.

Achieving a balance between urban growth and environmental preservation while keeping an eye on fairness in the areas of jobs, housing, essential services, social infrastructure, and

transportation is known as sustainable urban development. There is now widespread awareness of the need to reduce urbanization's negative environmental effects due to the world's fastest growing urban population. Environmental harm, the depletion of non-renewable resources, and the increase in pollution in metropolitan areas are all causes for concern. Cities have recently developed into hotspots for resource waste and urban environmental degradation, which is expensive for both the current and future generations. We must minimise the depletion of non-renewable resources and turn to ecologically sustainable economic development in order to address the issue. However, there are socially, economically, and politically acceptable ways to go about this. Climate change should be taken into consideration when developing towns for sustainable development. This means that in order to ensure environmental sustainability, actions must be taken to: a) incorporate the concepts of sustainable development into national policies and programmes; b) reverse the depletion of environmental resources; c) lower the percentage of the population without sustainable access to clean drinking water; and d) enhance the lives of slum dwellers.

The role of climate change and the natural environment in India's sustainable urban development

Climate change should be taken into consideration when developing towns for sustainable development. The Intergovernmental Panel on Climate Change notes 4 provide an explanation of how climate change affects sustainable development."Sustainable development is striking a balance between the requirements of the present and the future, as well as between the objectives of environmental preservation and human economic growth. It denotes fairness in addressing people's demands and coordination of sectoral initiatives over time and space [19]. Climate change is one of the biggest problems the world is now experiencing. The alteration in the earth's global climate throughout time is known as climate change. It deals with variations in the atmosphere's average condition or variability over periods of decades to millions of years. The dynamic processes occurring on Earth, as well as external factors such as variations in solar intensity and, more recently, human activity, can all be responsible for these changes. Human affects include the burning of fossil fuels, the production of aerosols, the making of cement, and other processes that raise CO_2 levels. Climate change is also caused by other things, such as deforestation, animal husbandry, and ozone depletion. Among other things, rising sea levels that could hasten coastal erosion, rising temperatures, a rise in the severity of natural disasters, and most importantly vector-borne diseases are all impacted by climate change. The yearly mean temperature in India has been trending upward. While the northwest has been receiving a strong summer monsoon, the east coast has seen less wet days in recent decades. In India, there have also been a few extreme weather phenomena, including heat waves, torrential rains, floods, and droughts. Over the past century, there has been a recorded increase in the frequency of hot days and multiple-day heat waves by researchers. On July 26 and 27, 2005, Mumbai, India experienced record-breaking rainfall that resulted in numerous fatalities. Millions of people in Orissa suffered from catastrophic famine and crop failures as a result of consecutive droughts that struck between 2000 and 2002. Moreover, growing water stress is a serious issue for India. Accelerated glacier melt is anticipated to result in slope instability, a drop in river

flows as glaciers recede, and a rise in the frequency and intensity of floods due to glacial melt.

According to study, the Ganga, Indus, Brahmaputra, and other rivers may soon become seasonal rivers and have an impact on the lives of those who live nearby due to the current trend in glacier melt [20]. Because climate change increases the demand on natural resources and the environment associated with rising urbanisation, industrialization, and economic development, it is expected to impede India's sustainable development. National development projects must incorporate climate-proofing strategies to mitigate the effects of climate change. The main issues that urban regions face include poor sanitation and water supply, unsustainable consumption, greenhouse gas emissions, and pollution of the air.

Thus, when it comes to legislative measures, environmental sustainability of urban form should focus on energy-efficient structures and transportation, as well as the best possible planning solutions in terms of distances, locations, and spaces, all of which will lessen pollution from the air and noise. In addition, it ought to encourage fairness in the distribution of services, manage sewage and water supplies sustainably, and, of course, lessen deforestation.

The Prime Minister's June 2008 National Action Plan on Climate Change, which was just released, aims to make India's economic growth more energy-efficient. Sustainable city shapes have been the subject of discussions and experimentation as a result of all the worries, inquiries, and initiatives around climate change and a sustainable environment. It would be appropriate to address the sustainable management of urban basic services as well, the inefficiencies in India's land policy and its consequences for sustainable city design and growth in India before talking about the important city forms.

Areas that India should prioritise for sustainable development Deficiencies include

The goal of sustainable city planning should be to enhance people's quality of life while attaining social and environmental fairness. In order for it to occur, we also need a sustainable city form in addition to adequate service provision and administration. Thus, in order for a city or metropolitan region to be considered sustainable, it must adhere to the principles of sustainable development when producing and managing necessities such as electricity, water, garbage, and transportation. To put it another way, the city needs to be able to provide services in a way that is equitable, sustainable, and profitable. The lack of basic amenities in developing country cities contributes to environmental pollution. It should be highlighted that, despite certain distinctions between wealthy and developing countries, urban infrastructure systems are typically developed with little regard for the effects they will have on the environment and society. Non-renewable energy sources are mostly used in the delivery of services like water, energy, garbage, and transportation [21]. In addition, there is a great deal of inequity in the way these services are provided. High population density, a lack of facilities, and air pollution define Indian cities. Let's examine India's current situation with them. Only 35% of urban Indian households had closed drainage systems in 2001, while 95 percent of households had access to potable drinking water and 16 percent had washrooms

within their homes [23]. In 2001, 88% of urban families had access to electricity, whereas 2% of them used solar power [22]. In Delhi, the Indian capital, 63 percent of urban houses had a latrine on their property, 52% of households had closed drainage, and 79 percent of urban households had a tap as a source of drinking water facilities in 2004–0512, Delhi produced 5922 tonnes of solid trash per day.

In Indian cities, air pollution has grown to be a serious issue. Using Delhi as an example, we discover that there are roughly 54 lakh automobiles in Delhi. Approximately 70% of Delhi's air pollution is caused by automobiles. According to a World Bank analysis based on air quality data from 1994 to 1995, air pollution causes 10,000 premature deaths in Delhi alone each year. Asthma incidence in Delhi is ten times higher than the national norm, according to the Delhi Medical Association [23-26]. Indian cities have extremely high densities. The shortfall in services, the effects on the environment, and the disparities in service delivery should all be taken into consideration while managing the fundamental services. Therefore, there are two concerns at hand: the first deals with service shortcomings, and the second is how to deliver the services in an environmentally responsible manner.

Natural resource management: obstacles and possible courses of action

Environmental issues and natural resource management are inextricably linked, and natural resource management must consider how its actions will affect environmental protection. A clean and healthy environment is a fundamental human right that needs to be upheld. As the entirety of space (cosmos) with all of its contents (physical, biological, and cultural elements) and conditions, the environment can be defined as the one in which humans, both individually and collectively, emerge as the dominant living species among all other living things, acting as a single system of influence (causality) in a single chain of interdependence regarding existence and function [34]. It follows that there is unquestionably a significant relationship between people and their surroundings. Humans manage natural resources, hence it is their responsibility to preserve the environment. Humans use natural resources, both directly and indirectly, through the management and processing of these resources. Although it is important to use natural resources wisely and manage them for the benefit of all people, maintaining the environment and considering the common good are equally important aspects of natural resource management. This is because the environment contains life, which is a fundamental human right.

The Twelve Principles of Agrarian Reform and Natural Resource Management are outlined in the Arrangement. These guidelines need to serve as a guide when crafting legislation related to agriculture and managing natural resources. This has an impact on the requirement to reevaluate and harmonise different sector legislation and rules pertaining to natural resources and agriculture. The twelve agricultural reform tenets that have been mentioned can be distilled down to three primary principles, which are as follows:

- The democratic ideal of equality between the people and the government, community empowerment, and the growth of good governance in the management and use of agricultural resources.

- The concept of justice, including both intragenerational and intergenerational justice, as a conceptual tool for gaining access to agricultural resources.
- The sustainability principle, as it relates to the viability of successful and beneficial activities and outcomes [34].

The aforementioned concepts of natural resource management and agricultural reform are inextricably linked and cannot be separated. Democracy must be able to eliminate and/or rectify structural inequities in the management, ownership, and use of natural resources in light of the issues that Indonesia is currently facing [35]. In terms of human rights, this is an instance of the marginalised people of Indonesia being deprived of their civil, political, economic, social, and cultural rights due to the laws, rules, and policies of the State regarding natural resources.

Conclusion

A balance between the conservation of biodiversity and the exploitation of natural resources is necessary for sustainable development. The goal of sustainable development cannot be achieved until environment and economy are in balance. Man and his understanding of the value of protecting the environment and its existence within the bounds of natural laws serve as the primary connecting factor for all activity on this topic. We are approaching the idea of sustainability by increasing population knowledge from the local to the global levels. In other words, it is a state in which natural resources are used by humans, but they are constantly managed and restored with care. However, non-renewable resources necessitate the development of a plan for their sensible exploitation and utilisation.

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