

# Environmental Indicators in Sustainable Rural Economic Development

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## ABSTRACT

Development environmental indicators in today's world, as socio-economic indicators in developed and developing countries are a statistic to measure progress rate in development programs and a criterion for assessment the rate of development as well. Utilizing these indicators in the process of planning and implementation is an undeniable necessity to be able to continually get feedback on the progress of the development programs and monitor them. Creating a balance between two terms of economic development apart from the ecological capability and sustainability, with special attention to the limited capacity of the planet earth, requires a special intelligence to use of these issues with complete awareness and proportionate to each decision making. Therefore, rural communities are seen in a combined and integrated approach in sustainable development so that the balance point is directed toward achieving development goals in each of social and economic aspects of rural community. The present article was written with the aim to get a more precise understanding of the basic environmental indicators in sustainable rural development areas.

**KEYWORDS:** Sustainable rural development; rural environment; Environmental indicators

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## 1. INTRODUCTION

The United Nations Development Program asserts in its Human Development Report that an indicator is a sign or signal that helps us to measure changes in terms of their quantity, quality and timeliness [1]. In other words, the indicator is the statistical expression of phenomena that provides the possibility to evaluate the phenomena in various space and time sections. It also allows the organizations and individuals to forecast, make policy and decision and plan in different areas.

Attention to issues of sustainability, environment and economic development led to the establishment of the World Commission on Environment and Development of the United Nations in 1984. The Commission, in 1987, during a meeting with the title of Brundtland Commission, asked the United Nations to invite various states to establish a joint cooperation and effort for achieving behavioral norms and the public interest. The meeting has been known as "Our Common Future", and the most important purpose of the meeting included international, mutual and reciprocal cooperation between different countries in the field of economic development and environmental issues [6].

By releasing the meeting's report, development at any price was contested as unsustainability, and sustainable development was replaced as an alternative strategy for progress. In the report, the term sustainable development was defined as: "Sustainable development is a development that meets the basic needs of the present generation without endangering the ability of future generations to achieve their needs (Declaration of Tokyo Commission). In recent years with abundant attempts of the United Nations to establish sustainable development, it has been revealed that knowledge and before industrialization methods are in the focus of how to achieve sustainability. Issues such as biodiversity, water and land management and cooperation customs, methods and knowledge of the local people have been employed as tested models for planning, progress and development over the time periods.

- Concept recognition
- Definition of Index (Indicator)

Index is defined in dictionaries as indicator, graph and representative. Indicators are individual or combined statistics that reflect the main characteristics of a system such as education, health or the economy [7]. Therefore, the purpose of setting parameters is quantitatively and accurately understanding of the existing conditions at a time section and the image of the trends and changes occurring over the years in the studied community. From the perspective of regional planning and development, the ultimate goal of developing the indicators is to provide objective tools for planning and programming the use of space and environment at nation level for improving the welfare of human beings, enhancing the quality of life, paying attention to the quality of the environment, preventing the environmental pollution and destruction and optimal land planning [6].

- Definition of development and sustainability

Sustainable development is a major constraint that since 1980s encompassed various aspects of development, has become today as the ideal aim for all communities. Although certain and widespread problems

have made the third world countries to focus mostly on achieving development rather than its sustainability, but it should be noted that removing the existing gap between the developed and developing worlds would not be possible without the sustainability of the development process. The term of development is directed to improving people's quality of life and improvement of the society's welfare, and its sustainability refers to the continuation of this process during the human race generations. Thus, sustainable development encompasses all aspects of the human life. Samson believes that the combination of sustainable development has a greater complexity than the concept of development. On one hand, the stability in sustainable development goes back to the Earth's carrying capacity issue regardless of focusing on concepts such as inequality and social justice. On the other hand, development requires continuous economic growth irrespective of the level of ecological strength and capacity of the Earth and the limitations imposing on the path of continuous growth. The combination of these two words creates a concept far beyond than the sum of the parts. With respect to the time or future factors, the meaning of sustainable development introduces three subjects or related and mutually encompassing environments (spaces), including environment, society and economy. Many authors have shown the unity of such spaces by illustrating the concept of sustainability [7].

Due to the dimensions of this paradigm, sustainability cannot occur in a single space and dominance the decision of development. In fact, each of these spaces or issues should be considered equally and proportional in each decision making. Therefore, rather than focusing only on the economic aspect, sustainable development designs a philosophy of social and environmental dimensions with economic dimension. In fact, the simultaneous operation of these three aspects pursues the collective achievement of goals of creating welfare, livelihoods, poverty eradication and everyone's benefiting from a desirable life and increased exploitation range of the future generations from natural resources in rural areas. Achieving such objectives requires doing changes and improvements in the way of managing the affairs in different sections and evaluating various aspects of sustainable development.

In the theoretical framework of sustainable rural development, the rural community is seen in a combined and integrated approach, since the sustainability of rural space is based on creating balance between man, his environment and economic activities; hence, the sustainable development follows the balance point towards the realization of development goals in each of environmental, social and economic dimensions of the rural society. This has led to a conflict between each of the development dimensions within the pervious paradigms. With this attitude, rural development would be a comprehensive and sustainable process that within its framework, the capacities of rural communities will grow and improve to meet material and spiritual needs and to effective control over the forces forming the local residency system.

Definitions of environment and development from a legal perspective Environment Some authors have doubts to be able to provide a comprehensive and legal definition of environmental; since, the civil rights of Iran and many countries are silent on the definition of the environment, and have mostly used the environment in relation to the elements of nature, natural resources, cities and the landscapes. Therefore, the concept of environment in every country can be different given the importance of each of the elements of the environment. To provide a comprehensive definition for environment, we should inevitably define some concepts that understanding the environment depends on their recognition. Finally, we would be able to provide the desired definition of the environment.

#### A. Nature

If we want to name a word with a vague concept, the best candidate would be the word of nature; since, all the beings created by the Lord in this without end world are called nature; in other words, anything that the man is not involved in its creation is called nature.

#### B. Ecology

Ecology is a knowledge that studies the organisms' relationships with the environment in which they live. With regard to the "not so clear" content of the environment, the public opinions do not differentiate much between ecology and the environment.

#### C. Ecosystem

Ecosystem in any area of the nature in which, interactions occur between the living and non-living objects to exchange material between them. For example, a lake or a forest is an ecosystem and consists of four major components, i.e., non-living objects, producers, consumers and degraders. Hence, the environment could be considered an ecosystem that is composed of countless number of smaller ecosystems, and humans are dependent on all these ecosystems for life and its continuing. There are different types of ecosystem, such as terrestrial ecosystems and marine ecosystems, which also have their own types.

#### D. Earth

The Earth is divided into the following sections based on environmental measures:

1. Lithosphere, which includes solid rocks and the internal melting part.
2. Pedosphere, which is formed due to the erosion of the lithosphere and remains of animals and organic waste material, and its thin upper layer is used for agriculture.

3. Hydrosphere, which consists of three quarters of fresh and saline water that engulfed the Earth's surface.
4. Atmosphere, which forms the gas region of the earth's atmosphere. It is composed of several layers. Environment includes air, water, soil, plants, trees, woods, grassland, sea, lake, river, stream, aquatics and fish, animals, mountains, plain, flat, desert, town or village(including alleys, streets, buildings, both historical and normal, factory, etc.).

Some have defined the environment as follows:

A part of the earth's atmosphere or crust that is at least suitable for a type of living is called the environment. Therefore, the environment includes a small part of the atmosphere, hydrosphere and lithosphere. In other words, the environment is a thin layer of air, land and water that encompasses all of the life.

Alex believes that the term environment can refer to a limited region or the entire planet, and even the outer space that surrounds it. The biosphere or the so-called critical layer used particularly by UNESCO conforms to one of the widest definitions: The humans' life environment or that part of the world that according to current knowledge of mankind, all the life is going on within. To summarize the above definitions, we must say:

Environment refers to the entire environment that humans are directly or indirectly dependent on it, their life and activities are associated with it [3].

Types of environmental

Scientists and environmental experts believe that the environment can be divided into two parts:

A. Natural environment

Natural environment refers to that part of the environment that the man has had no role in its formation, but it is of God's graces and consists of forests, meadows, mountains, plains, rivers, seas, marshes, landscapes, etc. The constituent elements of the natural environment include biotic factors (plants and animals) and the non-living objects (soil, water and air).

B. Human environment

The human environment, or in other words, the man-made environment refers to that part of the environment that is made by the man and is the result of his thinking.

In addition to IMO (International Maritime Organization), there are other organizations with environmental authorities, such as: International Atomic Energy Agency, United Nations Educational, Scientific and Cultural Institute, United Nations Food and Agriculture Organization and WHO. These institutions, in addition to their duties and responsibilities regarding the environment, have common cooperation in the form of joint representation. Today, in addition to global institutions, many regional institutions are also active in various environmental issues. In addition to the foregoing, thousands of non-governmental organizations and groups also have active role in the field of environmental issues. Among the Associations and NGOs, the International Union for Conservation of Nature is of particular importance so that the first draft of the World Charter for Nature has been prepared by experts from this union.

In international human rights law and environmental law, the right to compensation has been established effectively. At various international instruments, the point is emphasized that human beings have the right access to judicial and administrative authorities on environmental matters. This right is not limited to nationals and citizens of a state. Some international agreements have practical requirements on granting of access to judicial and administrative proceedings for foreign citizens equal to their own citizens. Equal access to the means of redress under consideration in domestic law is an enforcement tool of making the contaminator to pay for the damages. Also, similar implementation of the access right to the means of redress in domestic law requires the governments to remove the barriers within the competence area of national legislation, or to take appropriate measures with respect to other means of redress for damages caused to the environment.

Right to development

The right to development is an inalienable right of human beings, based on which, the individuals and peoples are entitled to participate and benefit from economic, social, cultural and political development in a form that all human rights and fundamental freedoms can be understood. The right to development has progressed well in a position where can be globally recognized as a human right. The content of the right to development is based on the human rights for the enjoyment of development policies relying on human being material and spiritual satisfaction and participation in development processes as well as collective rights in developing countries to create a new justly economic order to overcome the obstacles to the development of these countries.

UN indicators for measuring development sustainability

The UN in new approaches for measuring development sustainability in different countries has provided four main criteria:

- Social indicators (including education, employment, health, housing, welfare and social justice, cultural heritage, etc.)

- Economic indicators (such as economic dependence and independence, energy production and consumption patterns, etc.)
- Environmental indicators (including groundwater, fresh water, agriculture and food security, etc.)
- Institutional indicators (including integrated decision, capacity building, science and technology, public awareness, etc.)

In general, assistance to targeting programs based on quantitative criteria, the possibility of evaluation and measurement of specified quantitative targets, analysis of socio-economic and environmental situation of the studied area and formulating appropriate and efficient policies are as the main objectives of social - economic and environmental indicators [8]. The rural development measures, as a part of the economic - social and environment indicators measure the rural development phenomena at different levels and provide the information system to describe the rural residence system. In the early 1990s, rural development was almost equal to the agricultural sector. But today, in addition to agricultural sector, it includes other aspects of development, such as industry development, job creation, diversification of the rural economy, education matters, health care, infrastructure, etc. [7].

#### Environmental indicators for measuring sustainable rural development

In this section, environmental indicators are provided to measure and analyze the achievement of sustainable rural development in 8 sub-groups. The notable point is that some of the criteria have been considered multi-dimensionally, and some may also be used in several subgroups. As a result, the correlation coefficient of these indicators should be considered equal to zero in various subgroups to influence the statistical analysis:

- Sustainability of forest areas and SPAD: Vegetation of the village environment of the whole rural context, percentage of forest land under protection of the whole forested areas, percentage of forest / pasture lands of the whole rural agricultural lands, the severity of exploitation of forest areas, ratio of commercial forested areas, changes in forest regions area
- Conservation and utilization of water resources and water management: Separation rate of drinking water from agricultural water, number of existing absorbing wells, ratio of lands with piping pressurized irrigation (sprinkling or dripping) to the whole lands, the annual harvest from surface water and underground sources to the total needs of the village, annual changes of surface water and groundwater levels, ratio of water waste in irrigation (negative index), ratio of lands under machine irrigation, rate of protection and utilization of water resources in compared to international standards
- Health and safety: Emission rate of pollutants ( $\text{kg}/\text{m}^2$ ), number of available health houses, the diversion rate of drinking water pollution of international standards (negative index), number of patients with infectious and parasitic diseases to the number of village people (negative index), the ratio of using animal manure or chemical fertilizer to the proportion of total fertilizer used, the using rate of compost and waste recycling to the village total waste, the value of segregated waste to the total waste of the village, the level of people satisfaction with the quality of environmental health / natural landscape, percentage of villages with proper sewage disposal systems , percentage of vaccinated animals / breeding livestock to the total livestock , village waste collection system, the amount of consuming modified / disinfected seeds per every tone of used seed, per capita household waste generation, collection and disposal costs (negative index)
- Sustainability of Soil and Land Use: Ratio of man-made environment to the whole rural environment, percentage of integrated / mechanized lands to the whole village agricultural lands, percentage of lands covered by modern irrigation systems / concrete streams of total agricultural lands, percentage of salinized lands / land under severe water stress, ratio of drainage lands to the total agricultural lands (negative index), ratio of irrigated lands to the total arable lands, reverse land with slope above -15 degrees, reversed land use change from agriculture to other uses, percentage of grade 1 pasture rangeland of total grassland, percentage of fallowed land / with crop rotation to the total land area per year, ratio of dried land to the total lands (negative index), ratio of terraced lands to the total lands, ratio of land use, land use change, soil erosion
- Natural risks and technologies (negative index): Number of interventional plans (negative index), the rate of high-risk areas, estimated economic impact of natural disasters, fire districts in one year
- Safe treatment with pesticides and chemicals: Amount of used pesticides / fertilizers per ton of product (L / kg) (negative index), amount of pesticide / fertilizer consumption per hectare (L / kg) (negative index), amount of nitrogen / phosphorus / potassium / urea / nitrate / pesticides / herbicides / consumption per hectare ( $\text{kg} / \text{l}$ ) (negative index), ratio of land with green manure to the total land area under cultivation, ratio of pest controlled lands by biological method to the total lands, amount of breeding / disinfected seeds consumption per ton of seed, per capita household waste generation, waste collection and disposal costs (negative index), ratio of waste recycling and reuse of waste to the entire village waste, acute toxicity of chemicals (negative index), use of pesticides and agricultural chemical pesticides
- Fossil fuels: Ratio of using fossil fuels to the total fuel consumption, using rate of geothermal reservoirs, percentage use of biomass energies to the total energy consumption of the village

- Environmental protection and monitoring: Percentage of hunting of animals in the natural environment to the natural mortality [4, 5]

## **2. Conclusion**

Removing the existing gap between the developed and developing worlds would not be possible without the sustainability of the development process. The term of development is directed to improving people's quality of life and improvement of the society's welfare, and its sustainability refers to the continuation of this process. Therefore, rather than focusing only on the economic aspect, sustainable development designs a philosophy of social and environmental dimensions with economic dimension. In fact, the simultaneous operation of these three aspects is needed. On the other hand, for designing and planning the use of existing space to provide the human welfare, at present and in the future, and paying special attention to the quality of the environment, scientific instruments are needed as guidance in this path, which can be divided into eight subgroups, including forest areas and SPAD sustainability, conservation and utilization of water resources and water-management, environmental monitoring, fossil fuels, safe behavior with pesticides and chemicals, natural risks and technologies (negative index), stability of soil and land use, health and safety.

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