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Identifying Environmental Changes by Remote Sensing

Erin Persil*

Department of Organic Chemistry, University of Murcia, Spain

Abstract

With the continued growth of urbanisation, several issues that are detrimental to sustainable development demand further attention. The deterioration of the natural environment, such as air pollution, water quality reduction, and land occupancy, is a serious issue caused by urbanisation. Human survival and progress rely on a proper environment, yet our economic and social growth has already harmed the environment, posing a threat to long-term development. Pollution of air, water, soil, and land, as well as garbage, noise, and light, are the most common urban environmental issues. These challenges cause a number of problems for the urban living environment and economic growth. As a result, an effective urban ecological environment evaluation is required.

Keywords: Plasmonic Sensor • Air Pollution • Metal Nanowire • Electromagnetic field • Plasmon Resonance

Introduction

National research organisations often use indices to describe an area's biological and environmental characteristics. These indexes encompass all elements of the ecological environment, such as the Air Quality Index, Water Quality Index, soil health, and land use and land cover. Instead of focusing on a single environmental indicator at the macroscale, numerous essential ecological factors have been merged into a single indication that represents the total ecological environment. This method decreases the number of indicators, resulting in a more comprehensive evaluation of the status of the environment, while also boosting comprehension of environmental quality by simplifying the complex processes involved.

This is an important and useful aim for planning reasons. However, when the classic remote sensing expert programme ENVI is used to analyse long-term changes in ecological environmental quality on a broad scale, the compilation of these indices is more subjective, difficult, and time-consuming than the single index. In ecological environment evaluations, several comprehensive indexes are utilised. For example, the US Environmental Protection Agency utilised the Environmental Quality Index to perform an environmental assessment of all counties from 2000 to 2005 to research the natural environment and its implications on human health.

Its findings represent the cumulative influence of several environmental domains, assisting public health experts in determining which domains contribute the most to the total environment. The EQI is good for expressing the overall state of the environment, but it is ineffective for characterising individual surroundings. Another Eco-functional Quality Index, which consists of eight water quality features, may properly evaluate the environmental quality of the lagoon, but its adaptability and use in long-term monitoring must be confirmed.

The Forest Affinity Index is a good tool for assessing the ecological complexity of poplar forests, and it is very variable. Nonetheless, it proved to be strongly reliant on the age of the poplar stands in a linear regression model. Eleven criteria of the environmental quality assessment of the Nakdong River Basin in South Korea were fully studied using cluster analysis and factor analysis/principal component analysis methodologies, and the key variables impacting water quality were determined. The Chinese government's most extensively used evaluation standard is the current Ecological Index of Chinese ecological environment standards, however some of its constituent indices are difficult to get, and visualisation of this index is problematic. These indices indicate the natural environment's comprehensiveness, integrity, and hierarchy.

A number of new forms of environmental indices are evolving from fundamental indices, taking into account data collecting, environmental factors, political systems, and so on. The Environmental Stress Index, for example, would improve our understanding of the relationship between environmental conditions and human health by adding different parameters relating heat stress to meteorological measurements, and the Energy Security and Environmental Sustainability Index would improve our understanding of the relationship between environmental conditions and human health. These new indexes take into account the scientific aspect of environmental assessment more. Taking into account the rationale of the EI weight, the choice of the normalisation coefficient, the ease of access to essential indicators, and the presentation of ecological circumstances, the Remote Sensing Ecological Index was developed.

However, the RSEI views the research region as a complete entity and does not take spatial correlation into consideration. The equalisation of the weights of environmental elements will not be representative, especially when the research region employs cities, nations, or a greater range as the unit of computation. It is argued that this simplified approach of regional disparities might readily lead to the equalisation of assessment in environmental research, rendering the variety of environmental evaluation outcomes irrelevant. The first rule of geography states that substrates with comparable geographical features have a high significance; consequently, appropriate ecological assessment scales must be established.

In this study, we used a window to limit the geographical scope of the research. When analysing the eco-environment, the goal of this strategy is to decrease the influence of distant characteristics on a specific study block, allowing each feature to reflect a local adaption type. The RSEI was initially suggested in 2013 and used to track eco-environmental changes in Tingchow, Fujian Province. The RSEI's goal is to analyse the natural environment in a timely, easy, objective, and visually appealing manner. This index was then used to study the ecological environments of cities like as Fuzhou, Nanjing, and Freetown. The RSEI framework-based enhanced index is also used for urban environmental monitoring.

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***Address for Correspondence:** Erin Persil, Department of Organic Chemistry, University of Murcia, Spain, E-mail: epersil@odu.edu*

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easy, objective, and visually appealing manner. This index was then used to study the ecological environments of cities like as Fuzhou, Nanjing, and Freetown. The RSEI framework-based enhanced index is also used for urban environmental monitoring. The RSEI uses four components to reflect the regional ecological environment: greenness, wetness, heat, and dryness. PCA was used to assess the significance of each environmental component. PCA is a popular objective weighting approach.

There are also other established indices that use the PCA approach. The Eutrophication Index, for example, was used to assess eutrophication in accordance with the European Water Framework Directive, while the Pollution Human Development Index was used to measure human development while taking into account the impacts of ambient PM2.5 concentrations. The comprehensive index is calculated by linearly weighing the original features, with the feature weight matching to each eigenvalue.

A regional environment's influence range is limited. As a result, selecting an appropriate analytical scale for ecological environment evaluation is required. Various quantitative analytic approaches in landscape ecology will have varying degrees of effect on landscape patterns. In landscape study, the usage of a movable window to designate the research region has been widely used. The experimental findings show that the established moving window is better in accordance with nature's physical diffusion effect and improves monitoring and assessment of the ecological environment. RSEILA disregards the effect of distant items in favour of the relationship of objects closer at hand, which is more consistent with the fundamental rule of geography [1-5].

Conflict of Interest

None.

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