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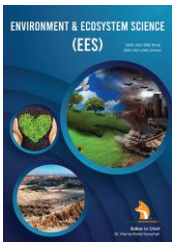

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RESEARCH ARTICLE

APPLICATION OF GEOGAPHIC INFOMATION SYSTEM FOR THE APPRIASAL OF ENVIRONMETAL ASSESSMENT

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ABSTRACT

Environmental assessment involved the overall monitoring of the atmosphere and biosphere where flora and fauna exist and interact as ecosystem. This environment is required to be assessed and monitored time to time to check the anomalies. The good tools for the measurement and evaluation in our habitable world is Geographic Information System and Remote Sensing. This technology can be applicable in solving environmental issues and create medium for decision making and planning. The consequences of the application of GIS and RS are time saving, accuracy, reduce cost, good planning, suitability and accessibility.

KEYWORDS

Environment, GIS, Remote Sensing, Monitoring, Technology

1. INTRODUCTION

In environmental assessment (EA), the term "environment" typically refers to virtually everything that surrounds the earth. This definition may necessitate the creation and analysis of massive, multidisciplinary, complex data sets. Programs for managing spatial databases are known as geographic information systems (GIS). As a result, they are well-suited for managing, analyzing, and displaying vast multidisciplinary datasets. A geographic unit, or cell, is the division of a GIS data base. Each cell's data can be derived from any combination of political, geographical, geological, or biological characteristics. After that, environmental and social statistics can be arranged in each cell as attributes or tables. Data can be easily interpreted and displayed in a standard map format with GIS. The map's ability to display the proposed development project and existing environmental characteristics as overlays or attributes makes it simple to visualize the impact potential. From other spatial display programs, such as computer-aided drafting (CAD) systems, other GIS programs, and spreadsheet or database files, data can frequently be directly imported into a GIS data base. Other spatial, spreadsheet, or database files can be exported from the GIS data base (Ogbodo et al., 2018).

(Adakayi, 2012) defines environmental planning and management (EPM) as "the initiation and operation of activities to direct and control the acquisition, transformation, distribution, and disposal of resources in a manner capable of supporting human activities with a minimum disruption of physical, ecological, and social processes." Adebayo's book "Integrated Environmental Planning" says that a development proposal should be compatible with the ecological system. It is also relevant for suitability in relation to the environmental site's and physical characteristics. A geographic data and information input, management, analysis, and output computer-based information system is known as a Geographic Information System (GIS). It deals with manipulation, storage, collection, and retrieval; updating, analyzing, displaying, and disseminating information and data with spatial references. Geographic information systems (GIS) are useful tools for managing natural and other resources at all scales, from the local to the global level.

1.2 Objectives

The major aim of this study to identify different application of GIS in the field of Environmental studies with the following objectives as follows to:

- Examine the new trend of the GIS technology.
- Analyse different Environmental issues

2. METHODOLOGY

2.1 Data Collection and Management

Information is Essential to Making Decisions because this data is processed from field data; it ought to be accurate, complete, and relevant to the particular environmental problem being addressed. Why are EIS and GIS tightly intertwined? The usual argument is that GIS is the best technology for dealing with environmental issues because most of them are spatial.

3. RESULT AND DISCUSSION

In this study, environmental impact was evaluated using our domain-specific criteria. The Map overlay, buffer zones, Trend Analysis, 3D modelling, and other forms of spatial analysis are all examples of these planning tools in an environmental assessment.

3.1 Spatial Analysis of Environmental Information

The majority of GIS software provides tools for in-depth environmental data analysis, enabling environmentalists and managers to make better decisions. GIS systems' capacity to combine various information layers

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within a single reference system makes this feasible. The tools for sophisticated querying, advanced analysis, and visualization are at the heart of the analysis systems. The primary database is the foundation of the analysis system; it is a process of actively producing information. In contrast to query systems, where information is subject to human interpretation, GIS directly produces information that is "machine readable. "You can see relationships and patterns in new ways by understanding the geographic context of your data with the analysis from GIS software.

The software aids businesses in making better decisions and solving issues more quickly. You can quickly and easily create new geographic data sets with the analysis software; create maps that are worthy of publication; manage your Internet data resources, databases, and files; adapt the user interface to meet your specific requirements. With spatial investigation frameworks, you can track down reasonable areas, perform land-use examination, anticipate fire risk, dissect transportation halls, decide contamination levels, decide disintegration potential, perform segment examination, and so forth (Wylie et al., 2019). The majority of GIS software allows for the following types of analysis:

3.1.1 Query Functions

Once a functioning GIS with spatial data has been set up, one can start asking questions like "Where are all the sites that are suitable for building new houses? "What kind of soil is most common in oak forests? How will traffic be affected if I construct a new highway here? According to decision makers can receive timely information from both straightforward and complex queries that make use of multiple data layers (Zuviría, 2011). There are two primary types of querying with GIS software: spatial and attribute (Xu and Zhang, 2022). The question "what is at this location?" is the focus of spatial querying. Typically, this is accomplished by listing the attributes of a feature by clicking on it. More complex spatial queries might ask, "What is close to this feature?" or "Select all features within a box or polygon. "Buffering or overlay techniques are frequently required for queries of this kind. The question "where does this occur?" is the focus of attribute querying. An attribute query could select all Catholic churches and then draw them with a particular symbol if a user has a layer that contains the locations of churches and some information about each church. The user could then select all Protestant churches from the database and draw each one using a different symbol to compare patterns, (Galán-Madruga, 2021).

3.1.2 Temporal Analysis

Temporal Analysis Time series analyses are used to keep track of how an environmental phenomenon changes over time. Monitoring the rate of desertification is one example. Trends from these analyses can be used to make predictions about the future.

3.1.3 Surface Interpolation Analysis

Surface Interpolation Analysis It is impossible to measure the temperature at each point when representing data over a specific area, such as temperature variation. In practice, data are gathered at sample points that cover the entire region. The sample points are then used to create a surface of temperature variation. When analyzing environmental data that needs to be represented as surfaces, GIS software includes tools for surface generation and analysis.

3.1.4 3D Analysis

Digital terrain models (DTM) are typically required for terrain information analysis. These DTM offer insights into environmental phenomena and can be generated and visualized in a GIS environment. Additionally, the models are utilized in the modeling of additional environmental issues like watersheds. Typically, elevation data is required for the creation of these DTMs. It comes from field surveys, aerial photos, satellite images, and other sources.

3.1.5 Connectivity Analysis

This kind of analysis looks at how points, lines, and other features in terms of distance, travel time, area, optimal path, etc. are connected to one another. Identifies proximity neighbourhood and network connectivity analysis has three distinct types. Distances between polygonal points, lines, and boundaries are measured using proximity analysis. Buffering, which creates a buffer around a point, line, or polygon, is one example. The characteristic of a region surrounding a specific point is evaluated in neighbourhood analysis. In contrast, network analysis employs predetermined decision rules to identify the best routes.

3.1.6 Data Overlay and Analysis

Pioneering approach to environmental planning employed an overlay strategy in which environmental (as well as socioeconomic and cultural) data were graphically displayed on mylar sheets that could be assembled in a variety of ways to identify areas of environmental constraint (Salako et al., 2016). Areas of still up in the air by visual translation of the fluctuating levels of murkiness as the mylar sheets set apart with requirements were overlain. Each area's constraints were manually measured and calculated to their fullest extent. This system is enhanced in multiple ways by GIS. The attribute layers are not stored on mylar sheets but rather electronically. At any time, various layers can be electronically combined, removed, or ignored. Computers can calculate the areas and degrees of multiple constraints' constraints. Additionally, constraints can be given numerical weights that can be mathematically compounded (González and Geneletti, 2021). The results of an analysis can be presented graphically or numerically in tables, with colours or shades chosen to represent areas where restrictions would prevent particular types of development.

3.1.7 Trend Analysis

The Trend Analysis tool can assist in the identification of trends in the dataset that is being used. The Trend Analysis tool presents the data in three dimensions. On the x, y plane, the locations of the sample points are plotted. Over each example point, the worth is given by the level of a stick in the z aspect. Long-term impact predictions that are more accurate can be made with GIS. In a real-time environment impacts can be predicted, data can be updated on a regular basis and predicting the effects of a changing environment in real time. The natural, social, and cultural environments are never static. They are constantly changing over time and space.

Table 1: Trend Analysis of Air Quality in the Atmosphere

Agents of Air Pollution	Chemicals Air Pollutants	Percentage in the Air
The Burning of Fossil Fuels	Carbon Monoxide.	74.00%
Industrial Emission	Lead.	82.00%
Indoor Air Pollution	Nitrogen Oxides.	57.00%
Wildfires	Ozone.	21.00%
Microbial Decaying Process	Particulate Matter.	26.00%
Transportation	Sulfur Dioxide.	89.00%
Open Burning of Garbage Waste	Automobiles	75.00%
Construction and Demolition	Fuel oil	84.00%
chemical and synthetic products	Gasoline	60.00%
Agricultural Activities	Natural Gas	78.00%

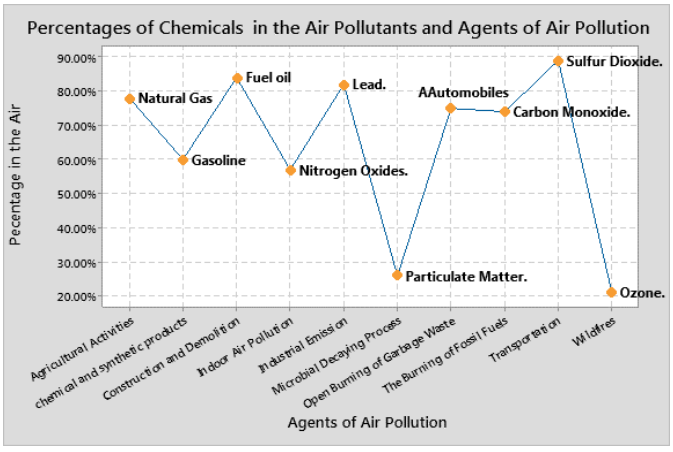

Figure 1: Agents of Air Pollution and the Analysis Pollutants in the Air

The replacement, expansion, and maturation of natural populations over time, annual seasonal changes, or long-term changes like global warming can cause this change (Güçlü, 2020). Because of this, the standard approach to environmental assessment, which is based on data collected at a particular time and location, may frequently be out-of-date prior to the

completion of the planning or development. Additionally, many developments are not static. Over time, things like agriculture, town sites, and harvesting forests change. In the GIS environment, such developmental and natural shifts in time and space can be modelled, making it possible to predict environmental interactions in real time.

3.1.8 Modeling 3D, Hydrologic and Climate Change

Another area in which GIS and mathematical models can be combined for long-term trend analysis and impact assessment is climate change modelling. In a development area, changes in the type of vegetation or the use of wildlife species can be predicted. Climate change may be an important parameter in long-term studies like nuclear waste management. In one study for the Canadian Atomic Energy Control Board predictions of potential impacts were made over a 10,000-year period (Gelman, 2004). Models were used to predict how the nuclear waste would change and move during this time. The watershed study, in which stream flow and the sub-basin parameter can be calculated, is the best application for the 3D simulation. A group researchers defines modelling in the context of geographic information systems (GIS) as the process by which GIS operations attempt to replicate real-world processes at one point in time or over an extended period (Goodchild et al., 2005). From straightforward evaluation to the prediction of future landscapes, a wide range of GIS applications benefit from using models. If the input and the output are both from the same point in time, a model is either static or dynamic. A dynamic model is one in which the output is from a later time than the input. Whether these models are used to create complex indicators from input layers or to represent time steps in the operation of a dynamic process, they all share the characteristic of operating the GIS in multiple stages (DeVantier and Feldman, 1993).

3.1.9 Site Impact Prediction Urban Development

By overlaying various development scenarios, impacts can be predicted. For each ecosystem or type of land use that is impacted by construction or other development activities, areas can be calculated. Impacts of any areal, linear or point can be calculated. A construction project-affected area could be found in an ecological database, and the GIS program could then figure out how big each resource is in that area.

3.1.10 Wider Area Impact Prediction Buffer Analysis

Impacts in a given area of influence can be calculated using buffers in GIS, which indicate how far into the environment they penetrate. Within a kilometre (km) of any new access road, for instance, large game hunting quickly affects animal populations in northern regions. Calculating the area where big game animals will be at risk can be accomplished by erecting a buffer that is one kilometre in width on either side of the access road. Numerous species, including spotted owls and bald eagles, are vulnerable to the effects of significant human activities in their nesting areas. One can depict the area of constraint or potential impact by placing appropriate buffer circles around known nesting habitats (MohanRajan et al., 2020).

4. Conclusion

GIS tools are widely applicable and play a significant role in Environment Monitoring (EM). It is a powerful tool in the management of environmental information and is an important component of environmental information systems. In addition to other functions, GIS provides a platform for efficient data input, retrieval, update, visualization, analysis, and modeling. GIS will continue to provide the tools necessary to effectively carry out these activities as EPM strives to meet human needs sustainably and with the least amount of impact on the environment.

Recommendations

Due to its adaptability and wide range of applications, GIS can be a useful and recommended tool for impact assessments. It is able to:

1. Reflect these characteristics. archive massive, interdisciplinary data sets.
2. Identify intricate connections among environmental characteristics.
3. Analyse alterations over time.
4. By regularly updated and utilized for multiple projects.
5. Serve as a collection of data for a number of mathematical models.
6. Files in both two dimensions and three dimensions can be stored and manipulated.
7. Serve the public's interests as well as the technical analyst's.
8. It is recommended to apply GIS in all environmental science and management.
9. The Analysis was performed in a shorter time
10. GIS provides tools that help in visualization of the real world in real-time

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