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Environmental Analysis Using Integrated GIS and Spatial Configurations in Israel

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Abstract

The scope for environmental analysis constitutes a critical factor in recent times, yet demanding importance due to the concerns of environmental sustainability. The study aims at analysing the prospects of implementing an integrated GIS and spatial configuration for environment analysis in Israel. The study adopts an empirical study design to consider the multi-dimensional utilisation of an integrated GIS and spatial configuration for environment analysis. The study considers the materials and methods of the GIS system modelling as well, consisting of satellite imagery, GPS-based location identification, Esri ArcGIS, CyberGIS, and BIM integration to present a comprehensive system for the environmental analysis of Israel. The results of the study indicate that the threats of natural disasters and climate change can be identified based on the synergy of spatial data within an integrated GIS modelling. In many cases, it is also used in collaboration with a BIM to ensure that planning and decision-making processes are sustainable, economically beneficial and environmentally considered. Thus, it is concluded that environmental analysis through the projection of visually represented satellite imagery within an integrated GIS with spatial configurations in Israel can minimise the conflicts between the infrastructural designs, human activities, and environmental sustainability.

Keywords

GIS, GIS Modelling, Spatial Configuration, Environment Analysis, Israel, Geospatial Intelligence System, Spatial Data Analysis

1. Introduction

Environment analysis, using sophisticated technology such as Geographic Information System modelling (GIS) and spatial configurations contributes to the acquisition of accurate and reliable data which can be utilised for solving envi-

ronmental concerns. The integration of GIS, consisting of reliable hardware and software, is capable of presenting data, capturing, managing and analysing through visual representation of spatial imagery and data. In essence, using satellite images for analysis and monitoring of soil, natural resources and habitats of different species, both in water bodies and land is made possible. A study conducted on the livestock industry in Israel indicates that raising environmental awareness for promoting sustainable and healthy livestock management is essential [1]. Live-stock industry can cause certain environmental issues that are wide-scale. On the other hand, Israel is acknowledged as a resourceful oil and gas reserve that is mined to create a large-scale industry. Israel holds the 45th position globally for gas reserves and gas production with 6.22 trillion cubic feet (Tcf) of gas reserves as of 2017 [2] (**Figure 1**). It has a critical impact on the environment which may require proper management. Therefore, the article aims to analyse the prospects of environment analysis using GIS and spatial configurations in Israel, leading to sustainable environmental management and resource reservations.

Environment management and sustainability in Israel are heavily influenced by industrial operations as well. For example, it has been reported that globs of tar have been washing up on Israel's Mediterranean coastline, which is considered to be a serious environmental threat [3]. As a consequence of the spill, a 17 m-long fin whale was found dead on a southern Israel beach. The Mediterranean coastline of Israel is 190 km, and such grand-scale pollution is estimated to take months for clearing up. In such cases, satellite imaging of the oil spill can help in predicting the specific areas of pollution and its intensity. The report also included that wave patterns and satellite imagery are being used in Israel for tracing the origin of the oil spill, leading to the investigation of nine ships [3]. Thus, the environmental analysis using GIS and spatial configurations can be used to boost environmental investigations, portraying the effectiveness of the system.

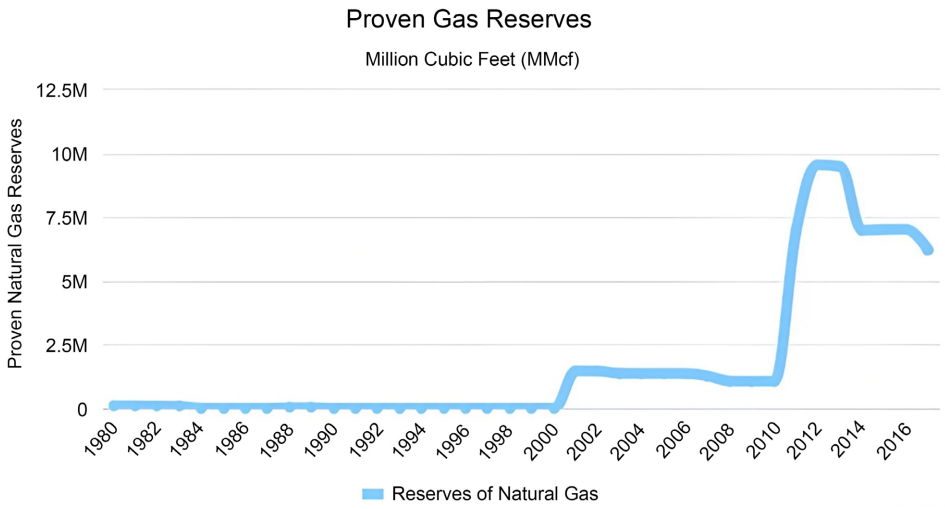

Figure 1. Reserve of natural gases in Israel as of 2017 [2].

On the other hand, oil exploitation in Israel has undergone multiple evolutions. Approximately 470 wells were drilled in Israel over the past 57 years (Figure 2). The concept of energy security is provided with utmost priority due to the economic developmental factors and rise in standards of living. Thus, gas and oil exploitations are marginally increasing, imparting the environment significantly. Historical data suggested that Israel had been dependent on imports of oil, gases and coal for meeting the energy demands, establishing gas relations

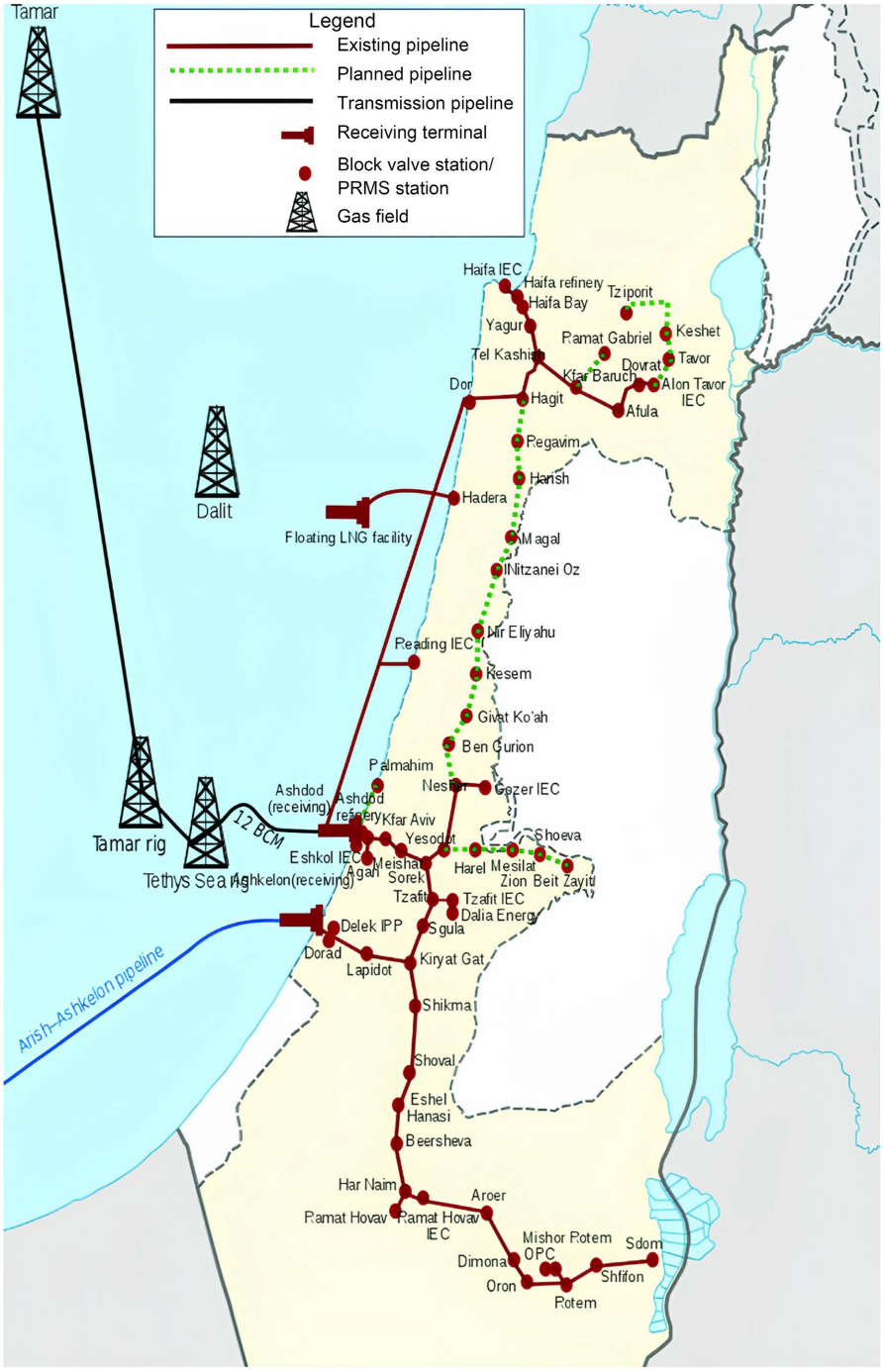

Figure 2. Oil and gas network map in Israel [5].

with Egypt [4]. However, Israel had been able to develop oil and gas resources gradually with good drilling and offshore strategy implementation.

The scope for graphic modelling by GIS and spatial configurations, spatial analysis is defined essentially by analysing landscapes based on size, connectivity, density and fractal dimensions. GIS-based analysis using spatial data is used widely for system management, map production and computer-aided designing [5]. In essence, the contribution of GIS environmental modelling and spatial configurations for analysis is a simple yet effective design for the exploration of landscape and marine-related issues that are otherwise critical to analyse with traditional data. Hence, the article explores the strategies and technologies that are used to achieve the collection of high-quality and reliable spatial data, unearthing the environmental challenges that are faced by Israel in order to shift the traditional paradigm towards sustainability.

Furthermore, in the era of digital transformation of landscapes related to urbanisation, spatial configurations hold a significant position. Spatial configurations are used to enhance accessibility for aiding the urbanisation process [6]. The use of spatial data and planning in recent times are also essential for maintaining long-term sustainability. GIS systems can also be integrated with a BIM system (Building information modelling). Macro-level representations of various aspects of the external environment can be successfully conducted based on BIM and GIS integration [7]. However, accurate analysis of environmental factors using GIS and spatial configurations is critically related to the capacity of implementations which is considered a critical aspect related to the research problem. Factors effectiveness and effectiveness for environmental analysis of a specific area or areas using this particular system systematically demonstrates the recognizable patterns in the landscape that can be evaluated in comparison to historic geographical data for indicating significant shifts in the environment that opposes environmental sustainability. Critical shifts of boundaries are also recognised with GIS and spatial data analysis, impacting the economic and political conditions as well.

2. Literature Review

2.1. Environmental Analysis Using Integrated GIS and Spatial Configurations

GIS and spatial configuration are a powerful tool that makes an effective impact on the environmental analysis process. Environmental analysis is the lesson of the natural world and this is the technique that helps to recognize all internal and external factors that are related to nature. GIS or Geographic Information System is the essential satellite documentation and image that assist to save more trees and can control forest distribution. Through the satellite image, it can control and observe the distribution of the forest. GIS and spatial configuration technology is generally used for managing conservation areas to assist in environment preservation [8]. In addition, these techniques also help to gather data

and also track the movement of nature and their flow such as water bodies, air, and many more. There are several steps that help to analyze the data in the GIS system and the steps begin with creating a question frame, exploring and preparing the data. After that the next essential step is choosing the analyzing methods and the tools, then it is able to perform the analysis process. The last stage is to examine and verify the result and provide it transparently.

As mentioned previously, GIS is one of the best tools used in the environmental data planning and analysis process. This tool also analyzes and displays aerial photos and gives digital information for better understanding. It assists in the data analysis process and helps to provide more familiar views of associated and landscape data. On the other hand, GIS can provide a commemorative and quick view of highly prone and risky locations and cooperate to provide suggestions about the areas that need to be safeguarded. Moreover, the GIS system has the facility of after completion of data analysis, which helps to manage and plan for the environmental risk and hazards [9] (**Figure 3**). In this case for planning and monitoring the problems of the environment, it also focuses on the environmental risk and hazard assessments and after that, it is able to make strong and constructive decisions in the mitigation planning.

The GIS tool also allows detection of the actual areas and the actual amount of devastation through the environmental inspectors that are able to map the sites of waste storage, explain the content, and volume, and also state the container's waste [10] (**Figure 4**). It can be said that GIS is a tool that is generally based on

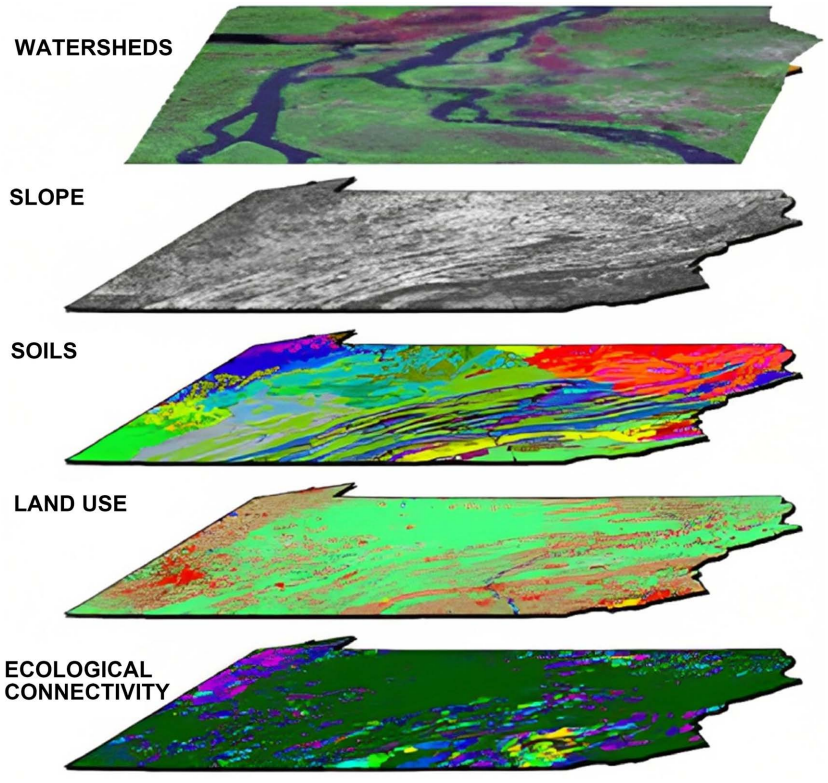

Figure 3. Environmental analysis using GIS [9].

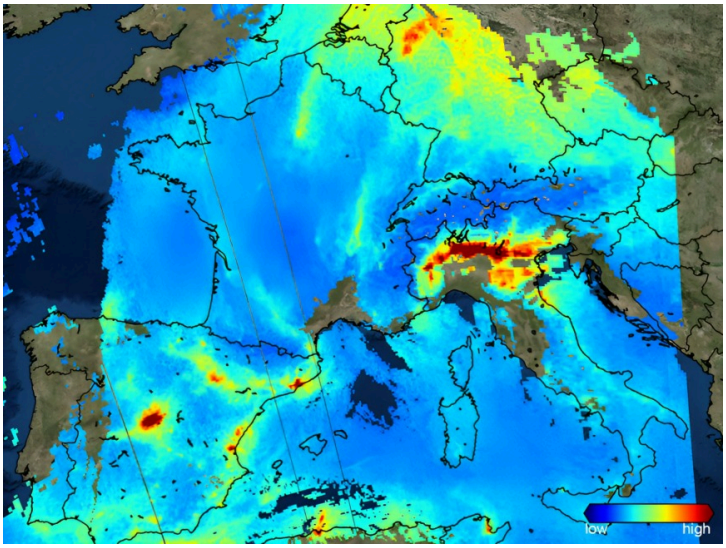

Figure 4. Satellite picture of air pollution [10].

geographic data and this application allows one to determine the parameters of environments and help to get an accurate result in the environmental analysis process. There are many kinds of factors that may impact help to improve the knowledge about public engagement and situational awareness. Apart from this, it can help to spread situational awareness and also monitor the natural resources, habitat of various species, soil flow of water bodies, and many more. In addition, GIS also plays a significant role in deserter management and emergency management that depend on various and varied sources of data [11]. It can provide all sets of data through the database by generating maps in a specific location. At last, it can be stated that GIS technology is a significant part of conservation efforts and it is more useful for mapping out any core area and resource distribution.

Spatial configuration generally plays an important role in the decision-making process in specific interests and it is able to provide suggestions on the environmental layout and its effects that are made by individuals. On the other hand, it also can be able to identify the behavior of individuals and spatial configuration has a specific objective and goal that is able to reach some satisfying constraint. It is a part of spatial optimization and it is able to gather more data from the environment [12]. It is also able to predict upcoming difficulties and explore the data involved with maps and gathered data. Spatial configuration is the method that is able to describe the spatial patterns of landscape patches. It also is able to control the traffic and from this configuration, there are many fasciitis that makes the smooth pathway to extracting the actual data from the environmental activities. It is also able to keep records of geographic data and analyze it with zero percentage of human error.

2.2. GIS Environment Modeling and Spatial Analysis

GIS environmental modeling is the process that plays a role as a post and

pre-processor for preparing the data files input in the model. In addition, it also displays the result of the model in map form. GIS captures the data and it is appropriately captured while engineering and modeling techniques are implemented successfully to address the problems that are related to the environment. It has the major link between simulation modeling and also helps to build a versatile system for managing the environment. This model is generally focused on using GIS systems and other kinds of external models to mitigate real issues. The GIS environmental modeling generally represents the process that happens in the real world in time [13]. This is a dynamic model and it is based on various equations. Topology rules and spatial interactions are maximally managed by the GIS or Geographic information system. On the other hand, it is also able to monitor and provide information about rivers, hills, forest and many more by arranging some layers. In the simulation model GIS is also able to input required variables and also analyzes the data output [14]. GIS and the model operation may be completed differently or may be connected with the software that is able to arrange the exchanged data between shared data by using simulation tools. In this case, all data is generally managed by the GIS system.

The environmental modeling system also uses the technology of cloud computing that can take backup and restores the data set in any situation and it is generally focused on spatiotemporal data modeling and analysis. The GIS data models enable graphical elements of geographical elements [15] (**Figure 5**). A Geographic information system is much easier to monitor and observe the environment and it is always using satellite images and also making graphs for better understanding. In this context satellite images help to observe and monitor the natural resources, different species habitats and many other activities that are related to the environment. GIS is mostly incorporated with environmental modeling and as mentioned previously it is able to address environmental problems and issues. This technique helps to acquire the desired data with high concerns about the processing and study area. In this case, the GIS projects include the problem stating, explaining the area of study, preparing, automating, and

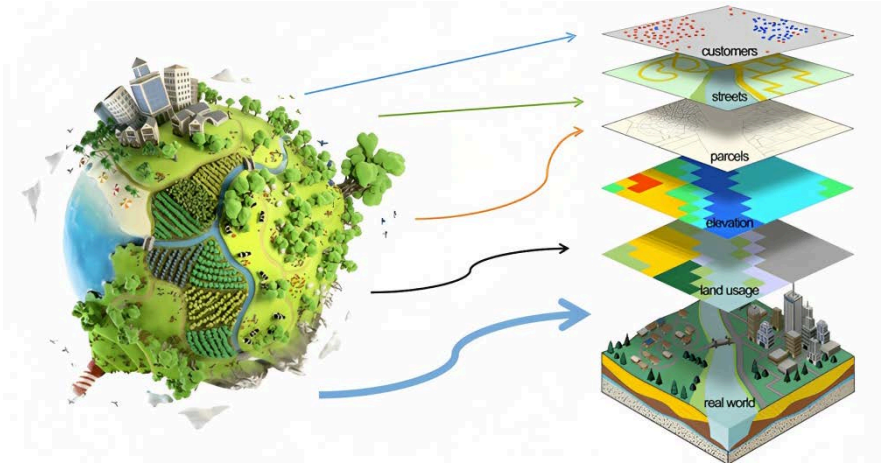

Figure 5. GIS environment modeling [15].

acquiring the data. After that, the next step is processing data and building a geodatabase. The data processing stage has also some sub-stages and the stage is preprocessing [16]. This stage involves atmospheric, radiometric, map projection, and geometric correction processes. The processing stage involves data classification, data validation, and data enhancement. And all extracted data are expert in GIS format in the last substage.

Spatial analysis is the process or method that is connected with the proper handling of spatial data that is able to analyze and manage environmental processes and problems. It can be called geospatial information or data and it can also represent the physical object in a specific geographic coordinate system. A spatial analysis system is able to identify the pollutant resources, and predict the changes and impacted areas. Through spatial analysis, process express is able to interact with the GIS queries, reveal the patterns, and support the decision. Spatial analysis is involved with the manipulation, transformation, and also the process that can be applied to the geographic data to use them as essential information.

It requires some software and the expert has to need advanced knowledge in mathematics [17]. There are many kinds of spatial analysis processes and all processes have different goals and objectives and also methods. In this context, it can be said that the GIS system allows the evaluation of the proximity of habitat types and also recognizes the classification of many significant constraints of the environment (**Figure 6**). Spatial analysis is the process that involves measuring the shape and distance also. It is also able to see the routes and track it for observation. It can be historical and live [18]. Geospatial analysis is the method of geographic information system data interpretation. It can be performed with spatial analysis software and a huge number of tasks and their complexity.

2.3. Prospects of Environment Analysis of Israel

Israel is the smallest country in the works and has few natural resources. This country is facing many kinds of difficulties that are related to its environment.

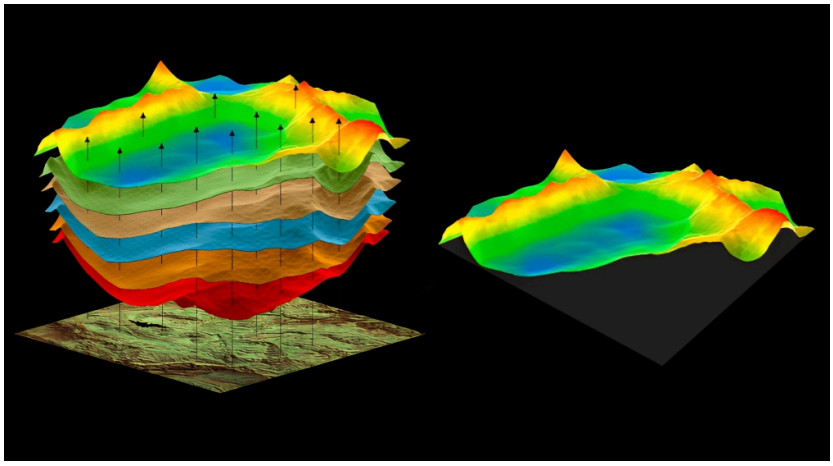

Figure 6. Spatial analysis [17].

They also face some issues related to the Dead Sea, water management, air pollution, and many kinds of things. As mentioned previously it has been seen that this system is able to measure the environmental parameters and it also helps to rectify the issues and try to resolve them by providing suggestions [19]. The environment analysis method helps Israel to mitigate its issues and suggests reverting the issues by using various kinds of technologies and many advanced things. The environmental analysis process has been conducted by the GIS advanced technologies and spatial analysis process. GIS and Spatial analysis are interconnected with each other. GIS is an essential tool that helps to capture images and documents in a real-time location.

GIS has the option of being able to recognize the source issues. Israel is one of the most polluted countries in the world. It puts pressure on the environment and also increases the consumption, destruction and transportation of natural space and waste production. Pollution is the main thing that slowly destroyed the country and it is also responsible for reducing the sea beach. On the other hand, one of the major issues is forest conditions which are much poorer in Israel due to the high margin of pollutants. It makes an impact on the trees and also changes the climate. It can be said that before environmental analysis recognizes the environmental issues are too complicated.

It can be said that through the environmental analysis process the experts are able to get the satellite view and gather more data that is related to the issues. The GIS system has the facilities to analyze the data properly and creates queries from the gathered data. On the other hand through its own data management system, this process also creates a database and also all data is exported in the GIS format. In that case, through the spatial configuration, and GIS system, it has been recognized that the pollution is making an effect on the sea level and also changing the climate [20]. Through GIS mapping, it can measure a core area and distance of an object from the satellite view. In Israel GIS also plays an essential role in protecting various species and many things. This system is also able to track the biodiversity and also monitor the restricted and priority species. It can be said that the environmental analysis process also manages the irrigation process and finds out the difficulties. GIS has an efficient and quick way that farmers are able to utilize the water in a correct process. In Israel soil is most sensitive for the people and soil mapping is the process that provides the essential resources and data for a particular location [21]. It is one of the essential components that are able to prevent the deterioration of the environment. On the other hand, it also helps to identify the actual soil nutrients and help to provide maximum yields for the crops. In Israel GIS also predicts the emergency situation and also manages disasters.

3. Materials and Methods

3.1. GIS Tools

This study has used many kinds of GIS tools that are able to get the desired re-

sults from the examination. This study has various tools that make an impact and effectiveness in this study. This study also uses some essential software that is more essential for the environmental analysis process with GIS. ArcGIS is divided into two stimuli and it also helps to create the mapping. This section will describe the tools and software that are essential for the GIS system and those are described below.

QGIS3 it is used to break the commercial GIS mold with equal cartography, analysis tools and editing. It is not a great choice as 3D is native part of it. ArcGIS desktop is cutting edge in this procedure. It increases the bar to the next stage by that other GIS software cannot use or do; it is the powerhouse of all. Hexagon geomedia, it has more than 40 years of history, nowadays it is not popular that much. At the time it is share with ERDAS imagine can available best suite in the sensing of remote. MapInfo professional it is all about intelligence of location. It can be used as powerful geocoding and addressing, also help in improved visualization integration. Global Mapper it is like a Swiss army knife in this field. It is straightforward management; also, it is powerful in elevation and LiDAR application. Cadcrop involve in both CAD and GIS, it is flawless method in this study. It adds proper functionality in styling and mapping.

3.2. Esri ArcGIS

This is cloud-based mapping software and it is used to create, map, and analyze the data. On the other hand, this software also helps to share data and collaborate with others [22]. This application is involved with creating the map and 3D map and exploring and visualizing the data. This software also assists to manage and collect the answer from the imagery documents. This software also allows the collection of data easily and sharing and accessing of the data securely and efficiently [23]. This software is also able to analyze the data and it also gives accurate outcomes. It has beautiful options in cartography for web mapping and print. It also has opportunities for editing as per the requirements. ArcGIS software has two major extensions Geostatistical Analyst and Spatial Analyst and that is generally able to build the analytics factors.

3.3. Satellite

Satellite is another GIS tool that enables efficient monitoring and mapping of the earth's resources. It helps to provide the imagery document and also recognize the pollution by capturing images. On the other hand, satellites have the facility to observe all natural resources and notice the activities of the environment. This system has the facilities that it is able to record all the activities and also take part in the tracking process. It can be said that it is able to manage disaster recovery, and also assess the risk to the environment. This is the process that helps to get the imagery data for prediction. Satellite has some source that monitors the climate and environmental activities. It can also build the communication process with the ground and help to provide information to the earth via producing im-

agery documents.

3.4. GPS

GPS is one kind of tracking software that is able to capture the application and it is also performed on mapping. It is able to maintain the balance between environmental activities and human activities. On the other hand, it also tracks the movement of the water. Generally, GPS is used for capturing the location of things [24]. On the other hand, it is also able to provide real-time location with exact signals. It has an atomic clock and all kinds of emergency services are dependent on the GPS location. All kinds of GPS are able to transmit the same kinds of instants. At the speed of light signals are moved and it is arrived at by the GPS receivers.

3.5. Conceptual Framework

The independent variable is GIS System Modeling as it does not depend on anything. The operational variables are BIM integration, Cyber GIS, Esri ArcGIS, and Satellite imagery as these all can be changed by different operations. And the dependent variable is GPS-based location identification as this is based on the previous sectors of independent and operational variable (**Figure 7**).

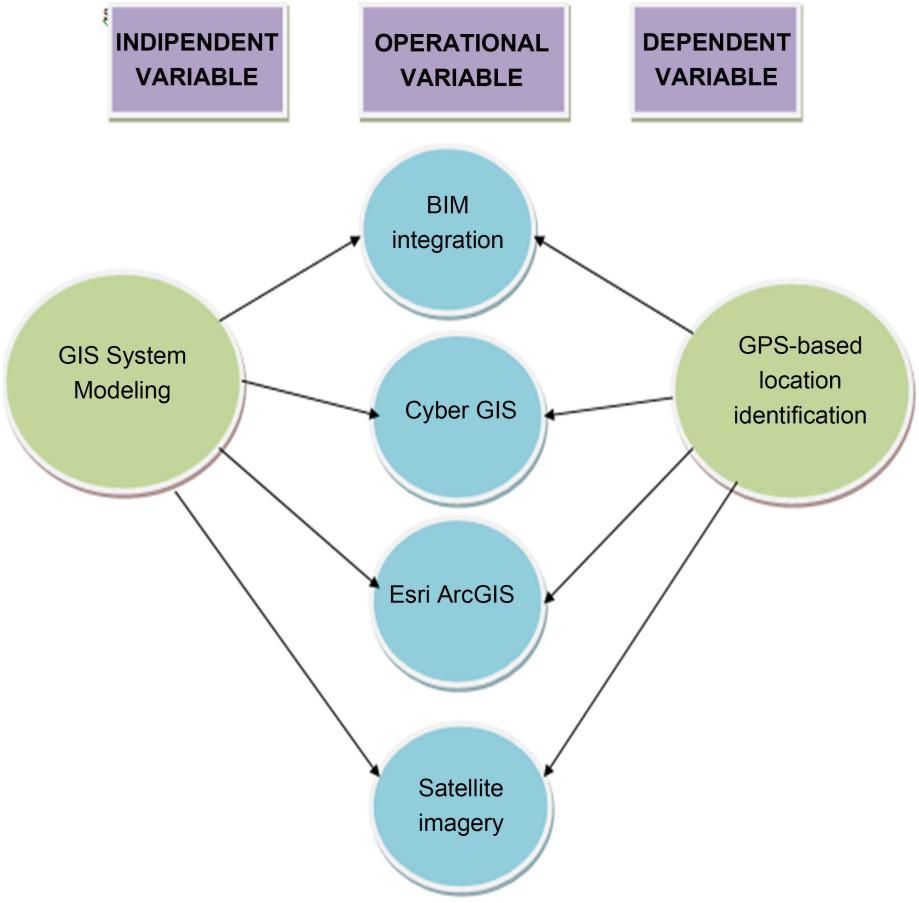

Figure 7. Conceptual framework (Source: Self-made).

4. Results and Discussion

4.1. Environmental Analysis Using an Integrated GIS and Spatial Configurations in Israel

Environmental analysis with GIS and spatial configurations in Israel provides scope for planning and monitoring the patterns of sea and landscapes that align with the shifting impact of human behaviour on the environment. Additionally, this particular system is also used to define the geographical coordinates using satellite-generated data and images. Manipulation of data also occurs to ensure that the received data is understandable with the aid of specific software. The GIS system is used for planning energy grids and networks based on spatial data analysis as well. The site selection process for energy networks in Israel for environmentally sustainable and socially acceptable large-scale onshore Photovoltaic Farms (PVFs) and Wind Farms (WFs), can be conducted successfully using Geographic Information Systems (GIS) and Analytical Hierarchy Process (AHP) as spatial planning tools [25] (**Figure 8**). These systems are used by corporations and government organisations to ensure spatial planning for developing a high-value and operable plan in Israel. Such an approach minimises the prospects of unsustainability and obstacles.

On the other hand, it is seen that environmental infrastructure projects are aided tremendously by the implementation of an integrated GIS and spatial configuration system. Spatial data analysis (SDA) tools are widely available now as

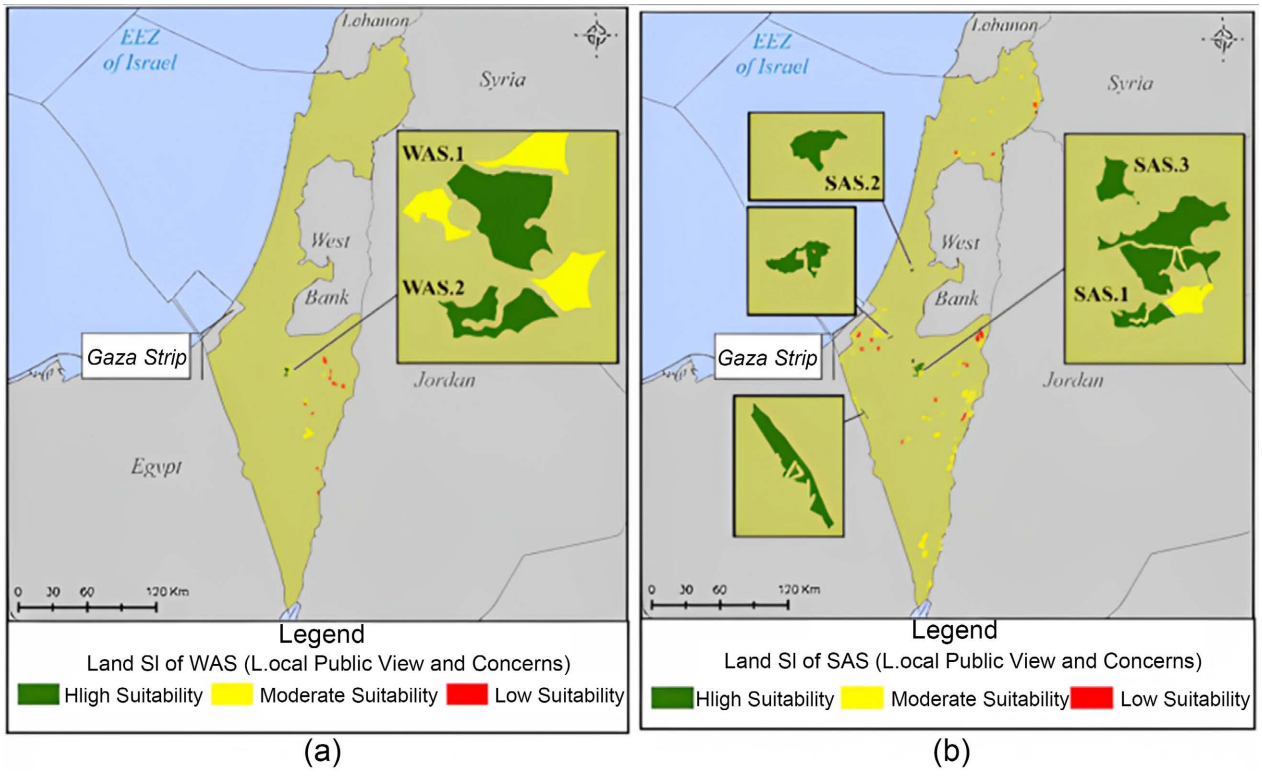

Figure 8. Suitability index for spatial allocation based on Local Public (LP) for (a) Wind Appropriate Sites (WAS) and (b) Solar appropriate Sites (SAS) [25].

technological advancement is witnessed in all spheres of human operations. An integrated GIS system using Spatial Analysis using ArcGIS Engine and R (SAAR), helps to constitute an integrated GIS and SDA environment which is utilised as an effective tool for general and advanced environment analysis [26]. The scope of advanced environmental analysis using an integrated GIS system in Israel solidifies the scope for sustainable development within the country.

Environment sustainability and protection are considered by the government of Israel to be crucial factors. The general government of Israel recorded an estimated 2.62 billion USD (nearly 8.39 billion Israeli shekels) expenditure in 2020 towards environmental protection [27] (**Figure 9**). On the other hand, scholars have indicated that sustainable development in environmental justice is not witnessed in Israel. It is stated that without environmental justice, sustainability cannot be achieved, by analysing the environment of the Occupied Palestinian Territories (OPT) [28]. Since the occupation of OTP in 1967, proper environmental justice policies have been addressed related to oil, land, air, water and biodiversity. In essence, the position for environmental analysis aids sustainability for natural and built environments.

The development of potential ground-mounted solar photovoltaics is also made possible by GIS modelling and spatial data analysis. Solar photovoltaic is considered to be one of the most efficient and sustainable renewable energy technologies. A GIS-based land sustainability design can help in large-scale energy grid installation, which was tested in an existing electrical grid in Israel, indicating

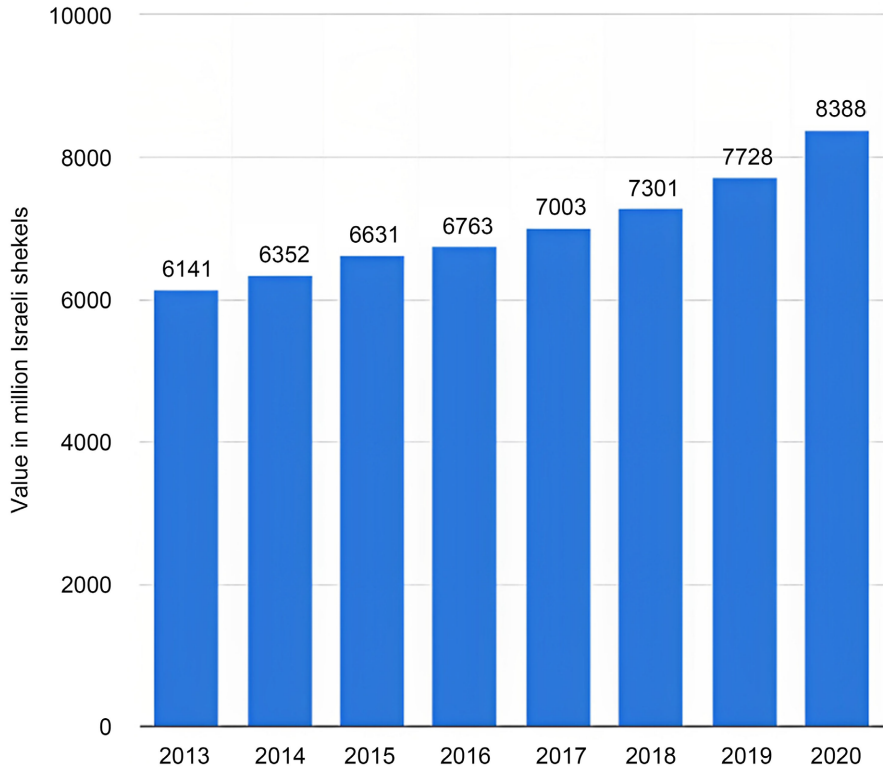

Figure 9. Government expenditure on environmental protection in Israel [27].

that 15% and 7% of the total country's installation capacity can be accommodated resulting in 17% - 30% of energy production nationally by 2030. The effectiveness of sustainable installation planning using the GIS system essentially helps in demonstrating accurate network opportunities based on spatial data. On the other hand, the issue of accurate mapping was also aided by integrating the GIS system and spatial configurations, using visually identifiable data and imagery to make required conclusions. The map-making process in Israel and Palestine has always been complicated by contradictive spatial identities, however, the implementation of an integrated GIS system for OpenStreetMap was presumed to be useful [29]. The capacity of GIS systems to provide accurate and reliable information on geographical locations based on imagery data management in Israel is therefore expected to deliver positive results in marking the territories properly.

4.2. Environmental Rehabilitation Scopes for Israel

Environmental analysis for environmental rehabilitation is a prospect highly related to sustainability. Using advanced technology for planning, mapping and monitoring, Israel's capacity for rehabilitation must be discussed. As the global threat of unsustainability leading to climate changes and global warming is becoming a topic of concern on a larger scale, environmental rehabilitation can minimise the impact of human practices on air, water, land and biodiversity. As per the words of [30] the Yarqon River Rehabilitation project (Israel) is expected to create positive water allocation networks, benefiting the farmers and agricultural lands and the net present value is expected to reach approximately $139 million in thirty years, contributing to the preservation of a river ecosystem. An integrated GIS system can widen the scope of such a rehabilitation process. For example, as stated by [31] the river recovery system in NSW, Australia was aided by ArcGIS analysis which supported the decision-making process for spatial variability. In essence, the recovery and rehabilitation process of rivers in Israel using an integrated GIS system is expected to contribute significantly to accurate decision-making to ensure that such projects are successful.

The rehabilitation process for the Jordan River is also to be noted as it is acknowledged as one of the most famous and culturally enriched rivers in the region. According to [32] the rehabilitation of the lower part of the Jordan river is expected to benefit the overall net economy as well as contribute to the mitigation of international border issues in the region. Rivers being subjected to deterioration can impact the overall economy and biodiversity as various human occupational practices are associated with it. Using GIS integration for environmental recovery can create optimal opportunities for countries to boost sustainability and economy simultaneously. The feasibility of GIS systems can be extended with risk and resource analysis that ultimately helps to map the current position of a river and assume logical projects for recovery. The planning process using spatial configuration is rather accurate, contributing to accurate mapping

and designing of resources and networks to ensure that positive outcomes are achieved.

On the other hand, in Israel, solar energy implementation can be considered a factor related to environmental rehabilitation as it seeks to transform the energy usage paradigms towards sustainability using GIS and spatial configurations. Israel's control over current energy systems can be reduced and transformed towards a more renewable path using a Digital Elevation Model (DEM) in the GIS environment. The prospect of energy efficiency increment is attributed to the definitive efficacy of GIS modelling and a system that considers the parameters of land and rivers objectively to be viewed and utilised for logical decision-making. Therefore, the essential benefits of environmental rehabilitation in Israel for river, land and energy are to be acknowledged to ensure that the adoption of an integrated GIS and spatial configuration leads towards sustainability and overall economic and political stability in the region.

4.3. Integrated GIS and Spatial Configuration System Modelling

The system modelling of an integrated GIS and spatial configuration that can be utilised effectively for the environmental analysis of Israel requires the development of a structured technological approach. In other words, the purpose of data analysis, measurements and application of data contributes to the field of spatial analysis that leads to the long-term creation of geographical solutions. The distinct lack of technology integration and spatial data analysis constricts the capacity of GIS. The integration of spatial configuration in GIS systems takes the system beyond the present constraints, contributing to data exploration, manipulation, designing and so on. On the other hand, the relatively recent use of an integrated GIS system aids the prospect of accuracy significantly. GIS models are utilised for building a data system with BIM for enhancing the capacity for exploration. Emphasis on accurate data building and spatial analysis provide the scope for authorities or users to implement it effectively.

The progress seen in the technology of an integrated GIs system and spatial configurations presents both opportunities and challenges as well. The associated challenges with building an effective GIS model are enhancement of GIS's analysis functions, human-oriented geographic information presentation and so on. The study also describes that a data-oriented approach for GIS system modelling is expected to mitigate such issues for developing an effective virtual geographical scenario. The associated opportunities for creating a sophisticated and automated data filtering and manipulation system for data spatial data representation constitute the scope for delivering better results. For example, [33] stated that the potential of a Geographical Information System (GIS) used for transport modelling is significant, indicating the presence of more accurate and reliable results. The diverse and flexible usage of GIS systems for such transport modelling using spatial data creates avenues for substantial growth due to reliable environmental analysis.

Integration of GIS with BIM, with specific importance to spatial configuration, leads to accurate environment analysis that accommodates large-scale state-of-the-art review. As demonstrated by [34] the integration of two highly-advanced concepts for data analysis leads to a higher capacity for methodical data structuring and analysis. The potential for performative capacity enhancement provides the overall system modelling with solution generation abilities that can be used for effective environment analysis. On the other hand, [35] spatial arrangement of trees in urban residential neighbourhoods using an integrated GIS system can lead to effective cooling. Using a temporal resolution microclimate model ENVI-met, different arrangements can be explored to indicate the most effective cooling solution for highly urbanised neighbourhoods. Thus, through such an integrated system the use of spatial configuration and by extension the flexible SPD within the GIS system modelling contributes to incorporating solutions within the built environment that are in alignment with the natural resources. The concerns of sustainability are largely minimised by such technological integration.

4.4. Benefits of Adopting Integrated GIS and Spatial Configurations in Israel

The benefit of adopting an integrated GIS and spatial configuration is attributed to its synergy for accommodating robust spatial data for SDA including OpenGeo and DaGeoDa. Multiple GIS tools used for environmental analysis, incorporated within the main software of the system have often shown support and ability for easy customisation such as in an open-source software environment. As stated by [36] considering a case study of Japan in the face of natural disasters, climate changes and energy shortage, spatial configurations were used to build a system for heating by utilising waste heat, which resulted in energy-saving, reduced carbon emission, sustainable land-use and cost-effective planning and implementation. While analysing the environment of Israel, it can be stated that it has been affected by the rising concerns of global warming and climate change itself. According to a recent report, the 90% collapse of native mollusc populations by the coast of Israel in the recent decade is due to the rising water temperature and disruptions in the ecosystem [37]. A thorough mitigation plan can be devised using the spatial configuration in Israel to conduct a proper environmental analysis and approach the issues of climate change effectively.

The concerns of energy shortages can be mitigated using an integrated GIS system with spatial configurations to determine the most sustainable planning patterns in the built environment in alignment with the natural ecosystem of Israel. A GIS modelling with a Multi-Criteria Decision Analysis (MCDA) was used, resulting in the identification of anthropocentric environmental impacts by turbines [38] (**Figure 10**). The use of GIS modelling helped to support the decision-making process that was based on sustainable goals and efficiency maximisation of the turbines without harming the environment. The government of Israel is heavily invested in initiating a meaningful change in its energy

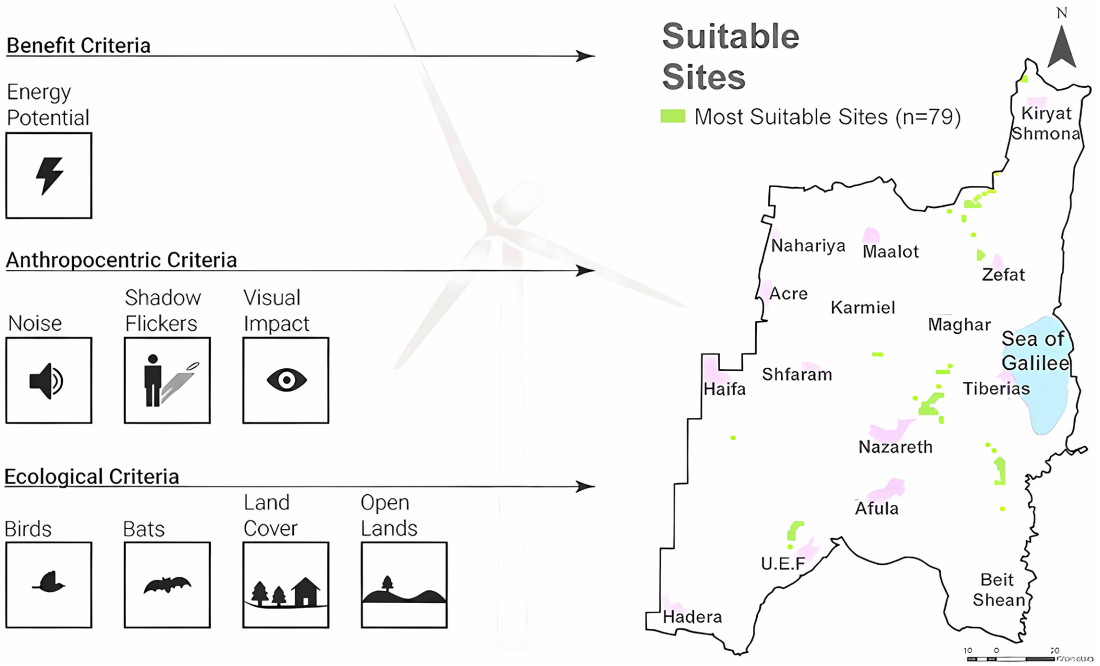

Figure 10. Turbine site identification with GIS analysis [38].

sector. The Israeli Ministry of Energy has set its 2030 goal for electricity by substituting coal which is its primary energy resource with natural gas by 70% and using renewable resources by 30%, aiming at closing all the coal plants [39]. The government is expected to be benefited by adopting an integrated GIS modelling with spatial configuration to ensure that new establishments of renewable power plants are sustainable and serve the long-term goals of rising energy demands.

Landscaping and urban planning using GIS modelling are also considered to be highly beneficial as they can accurately measure physical activities and provide required data for effective planning. As demonstrated by [40] the issues of planning urban park constructions and effective architectural engineering based on the survey were inconsistency in responses, on the other hand, GIS methods can be used in urban park typology for providing opportunities for physical activities with linearity, leading to social, environmental and community health benefits. In essence, the multi-dimensional usage capacity provided by integrated GIS modelling highlights its benefits. Israel faces critical issues and various criticisms due to political turmoil with Palestine. It was reported that the Israeli government has approved 2700 housing units located in illegal and occupied settlements of the West Bank while advancing plans for additional 160 units, legalising 60% of the West Bank landscape under Israeli control. These issues of geospatial boundaries can be resolved using GIS modelling which uses satellite imagery of the region to identify the problematic areas that are to be considered when planning urban units.

The benefits of GIS modelling is acknowledged worldwide in recent years, encouraging its use with spatial configurations and integrating it with BIM that can accommodate operational, economic and environmental concerns. As arti-

culated by [41] "The European Directive 2014/24/EU" and its "Italian transposition law DM 560/2017" have shown encouragement for integrating BIM with GIS for removing the conflict that arises between environmental constraints and infrastructural designs. The scope of sustainability is drastically enhanced, making this particular methodology an effective solution-based approach in recent times. On the other hand, the demands for sustainable housing can also be fulfilled with GIS modelling, incorporating a hedonic pricing method. As per the words of [42] analysing the case study of Subang Jaya, Malaysia, it was seen that the incorporation of the Hedonic pricing method with GIS for assessing the pricing of greenhouses or spaces led to accurate results. In essence, the received data was representative of the dynamic urban setting and process of regeneration, ultimately encouraging large-scale sustainability as environmental amenities are used in housing planning. With the growing demands for green and smart houses, environment analysis is expected to benefit from integrated GIS and spatial configurations as it shows the potential to establish long-term sustainability.

GIS and spatial analytical tools are capable of ensuring that proper waste management is being achieved, taking a further step towards sustainability. As stated by [43] considering the case study of the Haifa district of Israel concerning the issue of indiscriminate waste dumping and demolition, it was seen that the potential risk factors can be mitigated with an accurate waste management planning using geo-statistical modelling and GIS tools. This particularly helped to map out forest proximity, depth of ravine and locational parameters for future monitoring. Such an approach to risk identification and minimization portrays the beneficial scope of an integrated GIS and spatial configurations for saving resources and extension sustainability in all areas related to geographical spaces and human activities. On the other hand, [44] stated that a "cyber infrastructure-based geographic information system" or CyberGIS is considered to be an advanced GIS system that can be integrated with intensive "spatial analysis and modelling" (SAM) used for a holistic synthesis of road mapping. This particular tool is scalable, highly efficient, collaborative, user-centric and service-oriented. Thus, the operational capacity of such a GIS modelling is capable of serving multiple activities, transforming the geospatial communities.

Furthermore, the scope of sustainability can be extended to its potential for reducing the heat of day and night time in urban heat islands. According to a study by [45] in Phoenix, Arizona, a framework using integrated geographic information systems, remote sensing, spatial optimization and spatial statistics was used to effectively plan a reduction of 1˚C - 2˚C land surface temperature and 0.5˚C regional temperature. The capacity for mitigating environmental issues is highlighted which can be highly beneficial for the development of environmental management plans in Israel. The incorporation of an integrated GIS model with spatial configuration is tremendously beneficial for achieving sustainable goals that are pivotal as concerns of global warming and consequent climate change are rising.

4.5. Limitations of Integrated GIS and Spatial Configurations for Environment Analysis in Israel

The considerable limitations of the implementation of an integrated GIS and spatial configuration for the environmental analysis of Israel are demonstrated based on operational capacity and implementation capacity. The highly sophisticated technology of the GIS system is modelled simply; however, the amalgamation of spatial data configuration and analysis with the GIS system requires modification of the traditional modelling. As per the words of [46] the connection of different spaces using GIS when establishing smart urbanisation projects in recent years is seen to be quite limited due to the lack of proper technological infrastructure. The inherent capacity to build and practically implement an integrated GIS system effectively requires the country to become more equipped to facilitate an open and innovative space for GIS development. On the other hand, environment analysis in Israel is largely dictated by the capacity to establish and use a data management and presentation system that will benefit the environment. The GIS system is facilitated by high-volume datasets and complex environments for structured modelling which creates limitations. It is further stated that the "FREEWAT" platform combines the post-processing and geo-processing tools of spatial analysis within the GIS system for even distribution of large-scale data leading to a transport and hydrologic process (**Figure 11**).

The limitations with the acquisition and representation of data while using the spatial data analysis tool further limit the overall capacity of the system. In the projection of climate variability, the integrated GIS system provides appropriate spatial data that is analysed with spatial configuration tools [47]. However, the

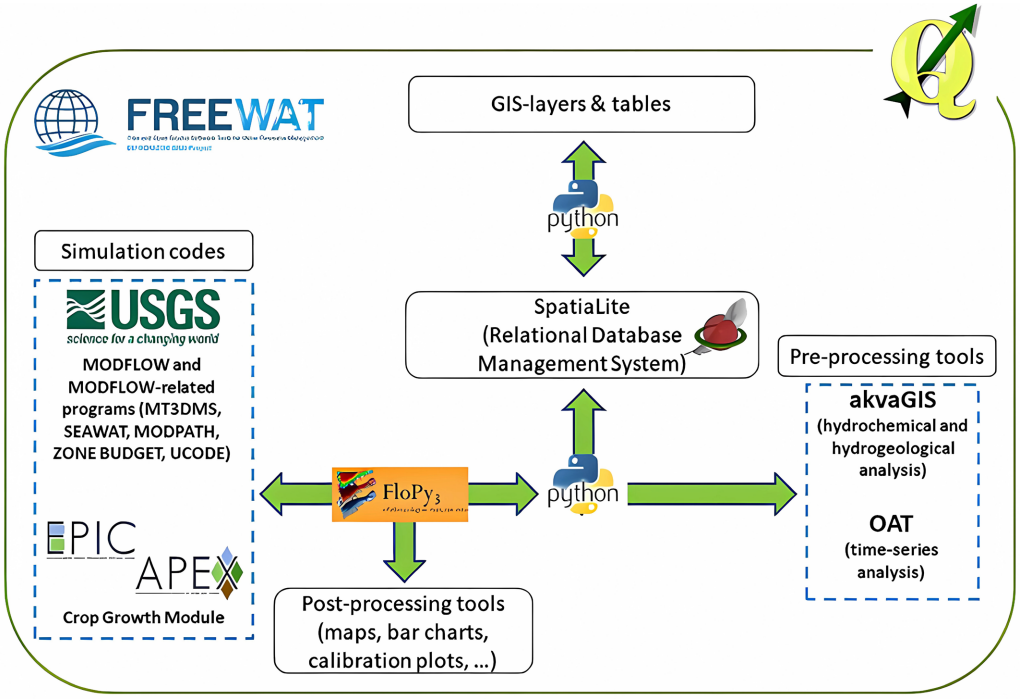

Figure 11. FREEWAT architecture [10].

challenges of data integration limitations of both social and meteorological data create complexities in the system, demanding a high-range integration process. The capacity for accommodating and aligning diverse data within a singular system and presenting them logically requires further technological development which must be considered.

The GIS model can be utilised to gather and analyse data related to measurements of physical activities for widespread health research. As demonstrated by [48] geographic information systems can be used to create SmartMap that can capture spatial and temporal data. However, the critical limitations due to the dynamic nature of the variables constrict the capacity of the model. Regardless, the study shows a positive utilisation framework that incorporates these data within an integrated system to indicate patterns of human activities. On the other hand, [49] articulated that advanced 3D acquisition systems can be employed in GIS systems to accommodate both present and archaeological data. Advancement of the visualisation system in 3D GIS modelling provides ample scope for the user to demonstrate content accurately and reliably. The prospect of integration may be challenging due to the large-scale engineering process required for integration. Thus, such limitations of the system impact its utilisation for the environmental analysis in Israel. However, with advanced modelling tactics and enhancement of technological infrastructure, an integrated GIS and spatial configuration can be possible.

4.6. Discussion

Based on the above results, it can be assessed that integrated GIS and spatial configurations are highly efficient and effective for mitigating the conflict between infrastructural design and environmental factors, by creating a data-based environment for sustainability. Analysing the scope for environment analysis in Israel, it is seen that the current demands for urban landscaping, sustainable waste management, environment rehabilitation, pollution control and energy demands are critical factors that can be accommodated with proper planning. Spatial data analysis uses GPS and satellite imagery for providing a detailed, accurate and reliable visual representation of the current landscape, air, water and natural habitats. It can also be used to collect data regarding human activities that impact the environment.

The use of an integrated GIS system is widely used in power site selection in Israel. Large-scale onshore Photovoltaic Farms (PVFs) and Wind Farms (WFs) development sites can be accurately selected based on spatial data analysis. The Israeli government aiming for complete sustainability in the energy segment is expected to benefit considerably from such an integrated modelling system which holds the potential for supporting sustainability through the decision-making process. Similarly, Spatial Analysis using ArcGIS Engine and R (SAAR) is considered to aid both advanced and general environment analysis. All these operational factors indicate the capacity to facilitate sustainability by establishing a

ground for definitive measurements of the environment.

The study further confirms the large-scale capacity of an integrated GIS modelling system by testing it on an existing Israeli energy grid, It resulted in the accommodation of 15% and 7% of the total country's installation capacity and 17% - 30% of energy production nationally by 2030. Similarly, the satellite-based data and their visual representations provide ample scope for accurate map mapping that can aid Israel tremendously in face of political conflicts based on geospatial boundaries. Confirms that an integrated GIS system for Open Street Map can be considered highly useful for the map-making process in Israel and Palestine, which has been the centre of political disputes. The beneficial use of an integrated GIS and spatial configuration, capable of analysing the environment through the management and monitoring of robust data, highlights the efficiency of the entire system.

The results further indicate that the adoption of an integrated GIS and spatial configuration will be highly beneficial for modern landscaping projects, supporting architecture and engineering operations. The linearity projection of human activities holds importance that can lead to economic, environmental and community health benefits. However, certain limitations in technological structuring and implementation are seen as well that may constrict the operational efficiency of the system, as a simple GIS modelling is not capable of accommodating large-scale spatial analysis. Articulate that the complexity of environment creation based on spatial configurations can cause limitations in application.

On the other hand, certain limitations in the acquisition and representation of spatial data must be highlighted that require the implementation of logical tools for further efficiency. CyberGIS, however, must be considered to deliver efficient results, operating simultaneously in monitoring and representing data. Integration of BIM with GIS is also considered by many scholars as an efficient solution to information building. The scope for environment analysis, by minimising the conflicts of interest and extending sustainability in practice in Israel is expected to produce beneficial results. Especially in recent times, as the environmental crisis has become a global concern, environmental analysis can lead to efficient and effective monitoring and management systems, accommodating environmental sustainability and human activities simultaneously.

The scope for environment analysis aims to initiate practices that are sustainable in Israel. The study aims at analysing the prospects of implementing an integrated GIS and spatial configuration for environment analysis in Israel [50]. Each industry and landscaping practice in urban Israel demands the implementation of an integrated GIS and spatial configuration to ensure that sustainability is maintained. For example, considered the environmental concerns related to the livestock industry. On the other hand, oil spill issues and climate change have become significant environmental issues in Israel. Israel, being a prominent participant in oil and natural gas extraction, also puts the environment at high risk as these practices are unsustainable, and expected to lead to energy shortag-

es, global warming and the destruction of natural habitats. The impact of the urbanisation process can be effectively steered in the direction of sustainability based on an integrated GIS system modelling with spatial configurations that can accommodate large-scale data management, monitoring, manipulation and representation.

The capacity to use visual data derived from satellites makes the imagery more reliable and accurate. The reliability and accuracy are further supported by accessibility and flexibility which enhances the operational quality of an integrated GIS modeling [38]. The core protocols of GIS modelling are considered to be simple, which often leads to functional limitations. However, with the advancement of technology, a synergy between BIM and GIS along with spatial data analysis tools is made possible, enhancing the capacity to minimise and even dissolve the conflicts between human activities, infrastructural issues and the environment.

The study observes the demands of sustainability and the scope of achievement in Israel using this particular system modelling. The scope for environmental preservation is heightened with GIS tools, by tracking past and present data and creating a visual representation of it that can aid environment management. On the other hand, the GIS system has the facility after the completion of data analysis, which helps to manage and plan for environmental risks and hazards. A sustainable environmental model can be adopted based on the spatial analytical data presented in the integrated GIS system. It is also capable of predicting upcoming difficulties and exploring the data involved with maps and gathered data.

5. Summary and Conclusion

5.1. Summary

The conduct of GIS based method to analyze the ecological corridors and cores routes are described in this study. Less environmentally disturbed area was identified using standard database and ARC/GRID least cost-path function. Two broad corridors showing an agricultural ring with low-density pattern of village enclose in central rural zone are suggested to the conservation of landscape of the region. The national outline plan 35 described in general definitions of ecological elements of network. Approaches of GIS access the delineation of relatively large-scale corridors with minimum contour line. It is assisted that it would be applied broadly throughout the entire country in progressive planning from theoretical to practical stage.

The GIS modelling utility software analyses the data based on certain environmental parameters and the satellite imageries are manipulated to be represented properly to the users. In the simulation, model GIS is also able to input required variables and also analyse the data output. On the other hand, it indicates that the data processing stage consists of sub-stages such as atmospheric, radiometric, map projection, and geometric correction processes. The mitigation of environ-

mental issues and construction of a definitive management plan in Israel can be based on the exploration of geospatial data, firmly indicating the currency issues to aid the rehabilitation process. On one hand, Israel faces issues due to high demands for urbanisation and energy. On the other hand, one of the major issues is forest conditions which are much poorer in Israel due to the high margin of pollutants. Thus, these critical issues that have led to climate change can be identified swiftly and accurately with an integrated GIS system and spatial configurations.

The GIS system is often adopted to forecast natural disasters and help the environmental recovery process. In Israel GIS also predicts the emergency and also manages disasters. Through the tracking systems, it helps to track and predict in the assisting to rescue relief and recovery efforts. The GIS process helps to identify the type of soil, classification of soil and its boundaries. On the other hand, it also helps to identify the actual soil nutrients and helps to provide maximum yields for the crops. GIS modelling is also efficient for the site selection process identified the use of Geographic Information Systems (GIS) and Analytical Hierarchy Process (AHP) as spatial planning tools. Furthermore, "The European Directive 2014/24/EU" and its "Italian transposition law DM 560/2017" have shown encouragement for integrating BIM with GIS for removing the conflict that arises between environmental constraints and infrastructural designs. Hence, it is highlighted as an efficient and effective spatial analysis tool for environment analysis in Israel leading to sustainable environmental goals.

5.2. Conclusions

Therefore, it can be concluded that the development of proper technological infrastructure for the implementation of an integrated GIS system and spatial configuration for environment analysis in Israel can lead to sustainable environmental management. The threats of natural disasters and climate change can be identified based on the synergy of spatial data within an integrated GIS modelling. In many cases, it is also used in collaboration with a BIM to ensure that planning and decision-making processes are sustainable, economically beneficial and environmentally considered. On the other hand, with the growing demands for green and smart houses, environment analysis is expected to benefit from an integrated GIS and spatial configurations as it shows the potential to establish long-term sustainability.

Analysis of various case studies has indicated that site selection of energy plants in Israel using an integrated GIS model with spatial configurations has contributed to beneficial results. Using GPS, satellite and cyber-based infrastructure, the current capacity of an integrated system is considered to be highly impactful in environmental analysis. However, the complications of implementation and establishment of a functional system architecture can be difficult. On the other hand, the constraints of the system itself must be considered while analysing the built and natural environment in Israel to ensure a thorough miti-

gation process. Thus, it can be stated that environmental analysis through the projection of visually represented satellite imagery within an integrated GIS with spatial configurations in Israel can minimise the conflicts between the infrastructural designs, human activities, and environmental sustainability.

Conflicts of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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