International Journal of Natural Sciences Research
2019 Vol. 7, No. 1, pp. 32-48
ISSN(e): 2311-4746
ISSN(p): 2311-7435
DOI: 10.18488/journal.63.2019.71.32.48

INTRODUCING AN APPROPRIATE GEOPORTAL STRUCTURE FOR MANAGING WILDLIFE LOCATION DATA

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Article History
Received: 13 December 2018
Revised: 25 January 2019
Accepted: 6 March 2019
Published: 19 April 2019

Keywords
Environment
Geoportal
Spatial data
SDI
Spatial service
Standard.

ABSTRACT

In recent years, access to spatial data, and also exchange them to achieve sustainable development in the country has been more and more in attention. Because with these spatial data and awareness of their existence, re-work and reproduction of data, the cost of time, and the cost to produce data are prevented. Environmental spatial data is one of the most important data that is very useful for planning and management. In this paper, we tried to show how to collect spatial information that is distributed in different organizations and databases, then we can provide this spatial information through geo-portal services based on managing wildlife. Knowing about the existence of such data and the ability to search and access them with a spatial geoportal, the user can have an important role in spatial data infrastructure. In addition, the user can make a decision that formed on environmental protection. Users can also search and access their spatial environment information with a geoportal if they exist. In addition, they will use spatial services of the layers. The spatial data is created in the form of standard spatial services, and is located in geo-portal to search and access to these layers. As a result, other organs can use these services or spatial data if necessary.

1. INTRODUCTION

Data obtained from the environment is transformed into information and having information lead to knowledge; decision-making and planning are consequently based on this information. Scientific studies, on the other hand, indicate that 80% of the data required by organizations in their various management, planning, implementation and even routine operations is inherently spatial or have spatial characteristics [1]. Therefore, in the present age, the importance of spatial data is not unobtrusive for anyone, because spatial data and related technologies generate spatial knowledge; as a result, it improves decision-making and coordinated planning. Spatial knowledge has a direct and significant impact on the economic, social and environmental development of countries; in other words, spatial data are considered as one of the sustainable development infrastructures of countries. Achieving sustainable development is the main goal of many societies and countries around the world. Although there are many perspectives and definitions for sustainable development, they all refer to almost the same point: "balanced and comprehensive development in the economic, social and environmental sectors" [2].

Currently, spatial information is generated in many public or private organizations and companies. Such environmental information is produced in various departments like the Environmental Organization, the Natural Resources Organization, and etc. By sharing spatial data that generated by different organizations, there will be significant decrease in costs to re-generate data because most of the spatial data generated by an organization can be used by other organizations. When the work of collecting and storing spatial data is divide into various organization, considerable savings can be made in time, cost, and effort. Meanwhile, financial and human resources can be spent on other tasks and activities, such as producing unnecessary data, keeping up existing data, improving data quality, and enhancing access networks and analytics tools. Most importantly, sharing information can bring about consistent and coherent decision making and planning in society [3].

By using GIS[1] system, many spatial information is collected and prepared. In GIS, both spatial and descriptive information can be combined and used for management and planning [4]. However, there are different formats for geospatial data in GIS systems. Moreover, it is not required to comply with single standards by custodians; therefore, it is difficult to share multiple layers of space with different structures using GIS system. Failure to pay attention to standards leads to:

- The spatial data produced by various organizations will not be integrated.
- The generated data does not respond to the needs of users; as a result, it is not being used.
- Exchange and share data will be in trouble.

Therefore, spatial data for use in different systems must be converted to one another, and these data must follow a single standard to provide an appropriate environment for sharing spatial data and interoperability.

For solving this problem, the International Consortium (OGC[2]), in collaboration with the International Organization for Standardization (ISO[3]), has provided a set of standards and guidelines for the creation of spatial services [5]. The standard defines the technical specification of the data set and increases the interoperability of spatial information systems [6]. The OGC has also developed a number of specific features, such as data exchange protocols like WFS[4] and WMS[5] mapping web services [7]. These special features and protocols have the proper structure to describe and access to spatial data [3].

The consortium defined several standard types of spatial services. Given the global welcome of this standard, it has gradually become universal standard. This globalization and adhering to a single standard make it easy to communicate and interact among GIS systems on the web. Therefore, the rapid development of these standards, and web services technologies have increased the spatial information sharing among different sources, and these facilities support the interoperability of spatial data [8].

For the optimal use of spatial data in an interactive environment, the evolution of spatial information systems has created the technology of spatial data infrastructure. According to the definition of the GSDI[6], SDI[7] is the concept of a related set of technologies, policies and organizational hierarchies that facilitate the availability and accessibility of data and spatial processing in a shared environment [9].

Since public and private organizations and companies that both produce and consume geographic information tend to use the best of spatial information, there is a need for appropriate documentation to search, evaluate, and use existing spatial data sets for most manufacturers. Data and user communities are an important priority, as this is the first important step in creating a data infrastructure [10]. For example, environmental spatial data exists at different servers in diverse departments, so all of this information should be read from different servers and made available to users.

[1] Geographic Information System

[2] Open GIS Consortium

[3] International Organization for Standardization

[4] Web Feature Service

[5] Web Map Service

[6] Global Spatial Data Infrastructure Association

[7] Spatial Data Infrastructure

Spatial Data Infrastructure (SDI) is also referred as a kind of GIS environment in which two requirements are met: in on hand, it work in the web environment, in other hand it is compatible with spatial standards [6]. Today, spatial data infrastructure is an appropriate and integrated structure for coordinating activities related to spatial information. It causes increasing awareness of the existence, status or quality of data; as a result, more and more appropriate use of them in different executive affairs and making decisions by different users in a distributed and interactive environment is provided [11]. SDI has been defined and interpreted by different communities in different ways. These different perceptions have been shaped by the background and specific problems of each country, organization, or society as a whole, and also with the view that the experts of that community have in relation to SDI. However, the goal of infrastructure development is the same in all societies, and it is access to information easily in such a way to meet the needs of organizations, offices, citizens, businesses, and, in general societies [12].

Indeed, by integrating and organizing spatial data generated in different organizations, SDI creates coherent spatial databases to improve the decision-making and planning system. Attracting the participation of devices in creating and maintaining this database, providing users with easy access to it, as well as using its data at different stages of decision-making and planning are three main goals of SDI [13].

The database of each organization consists of data and metadata. Metadata, information about existing data, is a type of important information that needs to be added to the existing spatial data set [14]. Metadata includes information such as: data scale, information content, data definition, data accuracy, manufacturer specifications, last update (date and method of updating), data collection, production methods, complete being, the area covered and etc [15].

Using metadata, data-producing organizations provide information through the clearinghouse. The clearinghouse network, which serves the local data coordination center network, provides users with digital data and the data which is based on the standard production in the network. The clearinghouse also uses an electric interface or geo-portal as the gateway to the spatial data entry, which can be searched easily [16]. This network is based on service-oriented architecture. As the web space and also the space features expand, the technology goes from the desktop, network, LAN and WAN environments to the web, the software have been more compatible with this environment since year 2004 [17]. As a result, Service Oriented Architecture software have been more and more in attention. SOA means providing services to users without the need for database sharing. This architecture is used to develop and integrate systems. Using the services embedded in this system, users can provide various services. Generally, this architecture makes it possible, very quickly and conveniently, the spatial data infrastructure is built up among collections of spatial data and operators who need these spatial data [18].

Establishing a clearinghouse network requires standards for organizations to generate and share information. Web-based spatial services that follow the OGC standard are numerous and have been expanding day by day. The most commonly known SDIs among which are Reichardt [19]:

- Catalog Service for Web (CS-W) for service catalog
- Web Map Service (WMS) for map display service
- The Web Feature Service (WFS) for the spatial data service (more applicable to vector reporting)
- The Web Catalog Service (WCS) for the spatial data service (used to provide Grid data, and simultaneous provision of vector data and raster data)

• Web Processing Service (WPS) for the processing service

It is generally accepted that standards are considered as one of the main needs in the development, continuous support and implementation of SDI. Based on these standards, each organization, such as environment organization, creates its own catalog of services, and this service catalog (which is a system of metadata and spatial services based on specified standards) is provided to the organization itself, and only a service of the data that many applicants provide is a user-friendly portal.

The placement of these services in the web environment and access to them through a geo-portal is possible. Users can search for spatial services and metadata by using a spatial portal to access the data and functions they need. The user searches for the location of his data by connecting to a portal, and then the site portal connects to the service catalog. The catalog services manage metadata seamlessly; through the service catalog, then the user's data is searched from the data warehouse. Therefore, the search result is available for user through the portal. In fact, the result of this search indicates the available data and services and also the method of accessing to them. These services are completely based on spatial data infrastructure [17]. Therefore, all environmental layers produced in different organizations are shared with the existing standards for building spatial services. As a result, organizations can present each layer of information for more users.

Since the 1990s, the importance of SDI and the creation of geoportal has been highlighted and implemented by many countries. For example, according to the 1994 presidential decree in the USA, the speed of progress in the SDI area was very high. The importance of this issue clearly highlight by many essays. David J. Maguire and his colleague highlighted the importance of creating a geo-portal, with particular reference to the US experience, outlining the significance of developments in enterprise GIS and national spatial data infrastructures. Geo-portal is the gateway to the World Wide Web, which organizes content and services such as search tools, data and applications, resource support, directories, and more. In fact, it is a gateway to the collection of information sources, databases, services, news, tools and links to other sites; and finally, they discussed the role of geo-portal in e-government. E-government benefits include reducing waste sectors, increasing the ability of systems and processes, building services for citizens, making better use of information, and more [20].

Peter Beaumont and his colleagues explored the geoportal development in England in 2005, they described the sources and levels of support for the central government of the UK for e-government, and the ways in which, along with existing resources, the framework for spatial data for expressed the progress of geo-portal, as well as the technical and organizational features of geo-portals created on a local, regional and national scale [21].

Lars Bernard and his colleagues presented some of the work done in connection with the creation of the European Spatial Data Infrastructure (ESDI) and the requirements for the creation of a geo-portal of the European Union. The prototype version of the geo-portal of the European Union demonstrates the feasibility of a link for the distribution of geographic information services, while presenting a number of challenges that should be considered in the path to interoperability.

To accelerate the implementation of ESDI and to solve related issues, collaboration is proposed in a variety of designs. European geoportal is known as one of the building blocks of the (ESDI). The geoportal perspective of the European Union is to allow users to discover, understand, observe, access, and query geographical information of their choice from the local level to a global level for a variety of uses, including the development of environmental policies and the assessment of impacts, natural disasters, readiness, monitoring, and so on use this system [22].

Yong Tian and his colleague in 2012 expressed the ability to locate and access spatial data via the internet as a great benefit for researchers who are trying to gather information about a particular study. In the paper, they have presented efforts to incorporate the OGC International Consortium, the global description, the discovery and integration of standards, and ontology [23].

According to the studies and the importance of creating geo-portal in the formation of SDI, in this study, we have shown how geoportal and information resources and services are formed through it.

Since the environment is one of the most important parts of each community, we intend to create a geo-portal for two purposes: an input port for environmental data, and also collecting environmental data that exists on different servers. Easy access to these data help to shape the infrastructure of spatial data. In addition, in today's technological advances, the redundancy of factories, machines and other factors contributes to environmental pollution, as well as environmental degradation and natural landscapes are destroyed [24]. Designing a geo-portal with an emphasis on environmental criteria can help to protect the environment. Because of this, access to these data has been made possible through the creation of a catalog services, and users can access to these data through a portal by organize of environmental data.

One of the key issues for the analysis and management of the environmental situation is the integration of information from various sources. The basic concepts of architecture are sensor network topology support, general use cases, sensor types, and information models [25]. In 2009, Jennifer Swift and colleagues presented a web-based form of support for environmental planning in Southern California, part of the Green Landscape Design project. The main goal is to provide tools for the municipality and community groups that can increase green parks by identifying suitable places. It also provide outdoor access to local residents, protect biodiversity, and protect the health of the watersheds. Using a service-oriented architecture, and its implementation are described in this article [26].

In this paper, we tried to show how to collect information that is distributed in different organizations and databases, then we can provide this spatial information through geo-portal services.

In this paper, the implementation of specific geoportal is described with the emphasis on environmental criteria. It contributes to the development of access to spatial data, and the also the creation of a framework for the proper use of geospatial data for better decision making and management in the environmental field, and moreover for maintenance and proper operation of the environment. Creating such a portal can also help to form SDI part.

2. METHODS

Given the importance of spatial data and sharing these data, Web GIS was gradually formed. In the Web GIS environment, a number of standards are followed. In addition, local protocols and service-oriented architectures are used to communicate between Client and Server [27].

The international consortium, specializing in spatial information with the development of spatial standards, has developed a service-oriented architecture in this area. As a result, by complying with the OGC standards, all servers provide their services to the requesters in a web service [8]. As a result, any organization converts to one of the spatial information infrastructure stations by complying with OGC's spatial standards, through setting up web-based spatial services.

As a result, for providing spatial information services for users, first it is needed to place spatial information through GIS servers as standard OGC services on the Web, mostly WMS and WMTS services. In fact, any organization uses the GIS Server and converts its spatial data layers to spatial services, inters into the Web and SDI environments.

In the next step, there should be a service catalog where metadata information exists. Metadata is needed to search and interact with spatial servers. The catalog servers must provide their metadata services through the OGC standards, one of which is the CSW in the Web space [28]. Therefore, in order for an organization to be placed in the SDI, it has to compile its list of inventory information as a standard metadata service known worldwide. It can also handle its metadata services to their respective location services, which are WMS, WMST, and so on.

In the final step, a portal must be created for accessing spatial data; through which the metadata are searched by users, and after finding the metadata, they are using its spatial services. In this way, geo-portal services will be created on the web, providing users and applicants with location services.

Spatial information and services related to topography, geology, vegetation and soil are used in a region for the management and assessment of natural resources. As a result, by identifying such web-based location services, and creating a geoportal that is suitable for accessing these layers we can help to protect the environment and properly execute projects, programs and proper management of the environment [24].

2.1. Geo-Portal Software

There are plenty of open source and commercial software for geo-portal creation. Since open source software is available for free and it can be downloaded and used, it is possible to make changes and subsequent work on the software, and this new software can be duplicated under the same initial and original software terms [29]. In this research, for implementation, open source software has been used.

There are a lot of open source software to create an input port for spatial data (user access to spatial data), and to create a catalog service for collecting metadata. Each of these software has its own specifications and has their advantages and disadvantages that are considered for choosing the right software. In the next step, choosing the right software is expressed. Open source software can include Post GIS, Geoserver, Geonetwork Opensource, Deegree, and Esri Geoportal.

2.2. Appropriate Software Selection Criteria

There are many criteria for choosing the right software for designing and implementing geo-portals. Considering the environmental criteria and requirements and collecting expert opinions [15] the criteria for choosing the appropriate software in this study are:

1. Independence of metadata from data
2. Support for diverse metadata items according to the needs of the environment (such as scale)
3. Ability to search according to the needs of the environment
4. Possibility to exploit services and decentralized data (distribution)
5. Possibility to provide spatial services (WFS and WMS)
6. Compliance with the Spaceship in Service Provision (Interoperability)
7. Ability to add a specific service based on the standard (servility)
8. Ability to define user access levels tailored to the needs (user management)
9. Impose hardware constraints on the software
10. Ability to develop
11. Support other language
12. The possibility of automatic extraction of some metadata items
13. Commercialization and non-vulnerability to political decisions
14. Extension of use
15. Programming language and so on.

Taking into account the above criteria, the appropriate software is selected for geo-portal implementation in accordance with environmental criteria to meet the needs and aggregate information and update information.

2.3. Choosing the Right Software Using the AHP-SWOT Method

To select the appropriate software, the combination of SWOT method with hierarchical model has been used. Researchers have developed different patterns to identify all factors (both effective and ineffective) on the activities of an environment, organization or system, most of which have been used to analyze strengths, weaknesses, opportunities and threats, or SWOT. A system is always influenced by a series of intra-system and extraneous factors, in which the long-term or strategic planning of a system is affected by the process of interacting the internal factors with the external environment; therefore, predicting the future status plays a fundamental role in the system's success. SWOT analysis is one of the strategic tools for adapting strength and weakness within the system to outsourced opportunities and threats [30].

One of the strengths of the hierarchical model is the combination with other models such as SWOT. Analytic Hierarchy Process (AHP[8]) is one of the most comprehensive systems designed for decision making with multiple criteria [31]. This technique makes it possible to formulate the problem in a hierarchical way, and it is possible to take into account different quantitative and qualitative criteria in the problem [32]. This process involves various options in decision making, and the ability to analyze sensitivities to criteria and sub-criteria. It is also based on a paired comparison that facilitates judgment and computation. The result of the process shows the degree of compatibility and incompatibility of the decision [31]. At first, the weaknesses and strengths of the internal factors, threats and opportunities of the external factors have been identified. These factors are presented in Table 1.

Table-1. Internal and external factors of the SWOT model.

Internal factor		External factor	
Strengths (S)	**Weaknesses(W)**	**Opportunities(O)**	**Threats(T)**
1.Compliance with spatial standards 2. Support for metadata items 3. Ability to provide spatial service 4. Define hierarchy to facilitate entry of items	1. Inappropriate programming language 2. Inappropriate management 3. Not having the ability to collaborate with other software 4. Inability to search advanced (based on metadata items)	1.Easy to use 2. Development capability 3. Extent of use 4. Service-oriented architecture	1. Insecurity 2.Vulnerability 3. Failure to support the software 4. Failure to support Persian language

By identifying these factors, the strategies were achieved. After identifying all the weaknesses, strengths, threats and opportunities, the internal factor assessment matrix (IFE) and the external factors assessment matrix (EFE) are formed. The weaknesses and strengths of the IFE matrix, and also the opportunities and threats in the EFE matrix are analyzed.

IFE and EFE tables are designed for any software that can display and search spatial data through the web. At first, the weight of each criterion was determined using the AHP method. To assess the criteria, a binary adaptive approach has been used, in which the two criteria are compared based on their importance and the purpose of analysis.

After determining the weight of the criteria for each factor, a score of one to four is allocated based on the degree of system compliance with opportunities and threats or weaknesses and strengths. Score 1 to 4 respectively indicates the basic weakness, weakness, strength point and the very high power factor (here geoportal software) with relation to the desired criteria. Table 2 shows the internal factors. In the fourth column Table 2, the weighted score of each factor is calculated. To do this, the coefficient of significance of each factor is multiplied by the weight of each factor. The weighing is obtained between 1 and 4 with the sum of scores. As seen in Table 2, the internal factors for Geo Network software is obtained 3.50.

Then, the external factors strategy table for each software is also provided. The weighted score for the external factors of Geo Network software is 2.56. By comparing the weight of software weighs together, Geo Network software is superior to other software.

[8] Analytical Hierarchy process

Table-2. IFE Table.

	Internal Strategic Factors	Weight	Current status rating	Weighted score
Weakness	1. Inappropriate programming language	0.055	1	0.055
	2. Inappropriate management of users	0.043	1	0.043
	3. Do not interact with other software	0.115	1	0.115
	4. No advanced search ability (based on metadata items)	0.028	1	0.028
Powers	1. Adhere to spatial standards	0.222	4	0.888
	2. Support metadata items	0.156	3	0.468
	3. Possibility of providing spatial services	0.311	4	1.244
	4. Define hierarchy to facilitate the entry of items	0.070	3	0.21
		1		3.05

3. RESULTS

3.1. Making Spatial Services

Creating web-based spatial services is one of the most important steps in the implementation of SDI. Providers of spatial data can prepare their services without having to share their data with others, they can only provide the services on the web. They are also able to provide their services through other global SDI network servers. In addition, they can provide the services of other standard spatial servers through their server with their facilities for building their own spatial services [33].

In this paper, Geo server software is used to create geospatial services. This software is one of the most commonly used open source software for web-based spatial services [30]. Geo server has the ability to communicate with most known databases and also provides all WMS, WFS, WMTS, and WPS services. In addition, it can be linked to the WMS service of other servers [8].

After installing the software, the relevant information layers Figure 1 is introduced, then spatial services are created. In Figure 1, WMS spatial services made for some environmental layers are shown on a map. Also, in Figures 2, 3, 4, 5, and 6, the WMS services of each environmental layers used in this study is presented separately. Thus, each environmental layer was built based on web-based services.

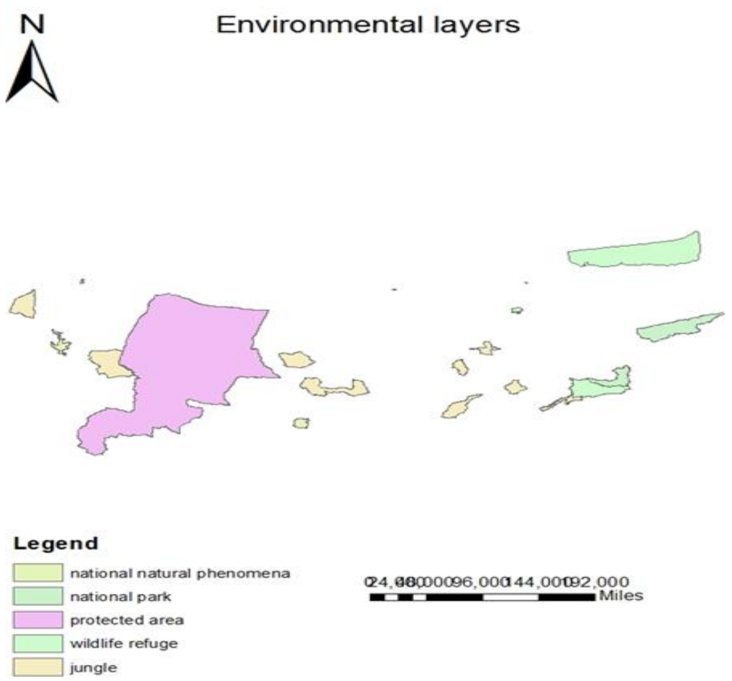

Figure-1. View the WMS service of environmental layers in general.

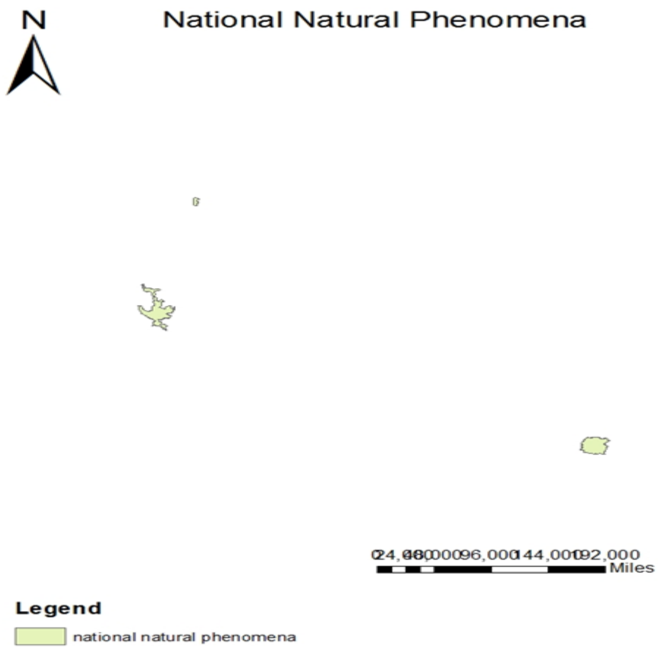

Figure-2. View the WMS service of the National Natural Science Layer.

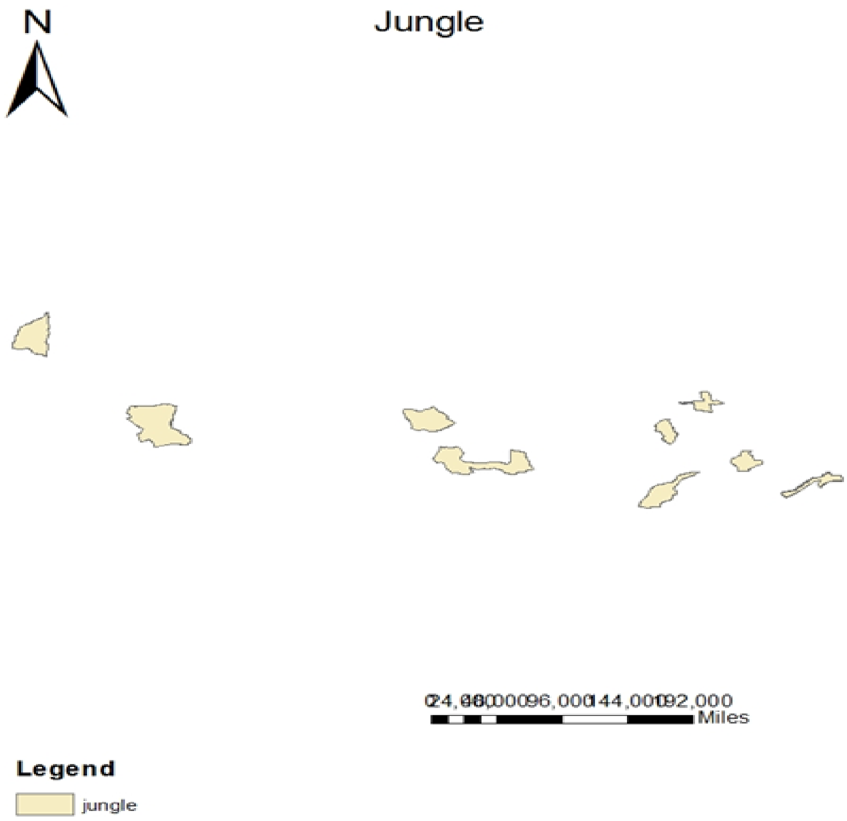

Figure-3. View the WMS Service of the forest Protected Area Layer.

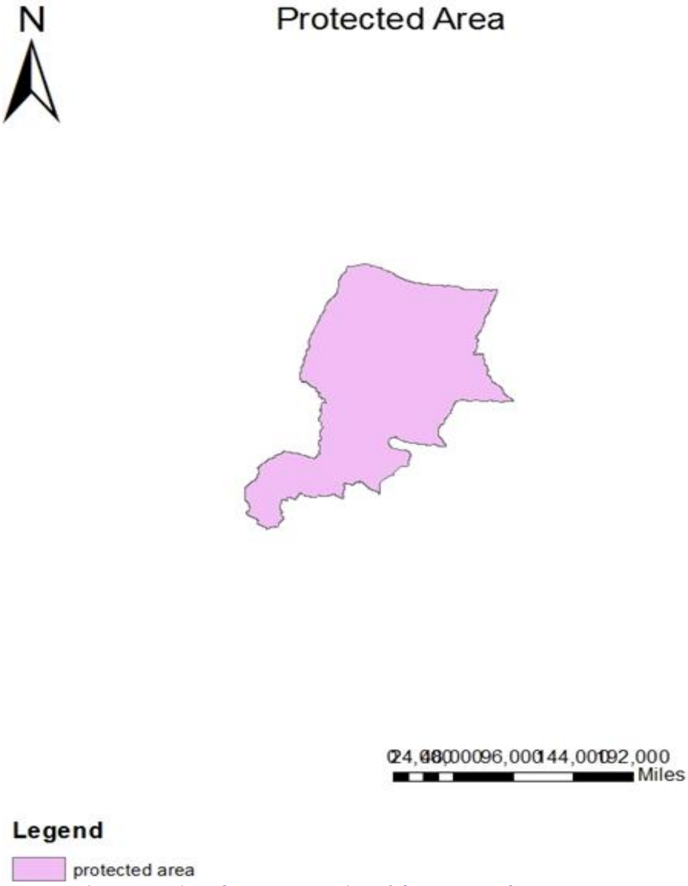

Figure-4. View the WMS Service of the Protected Area Layer.

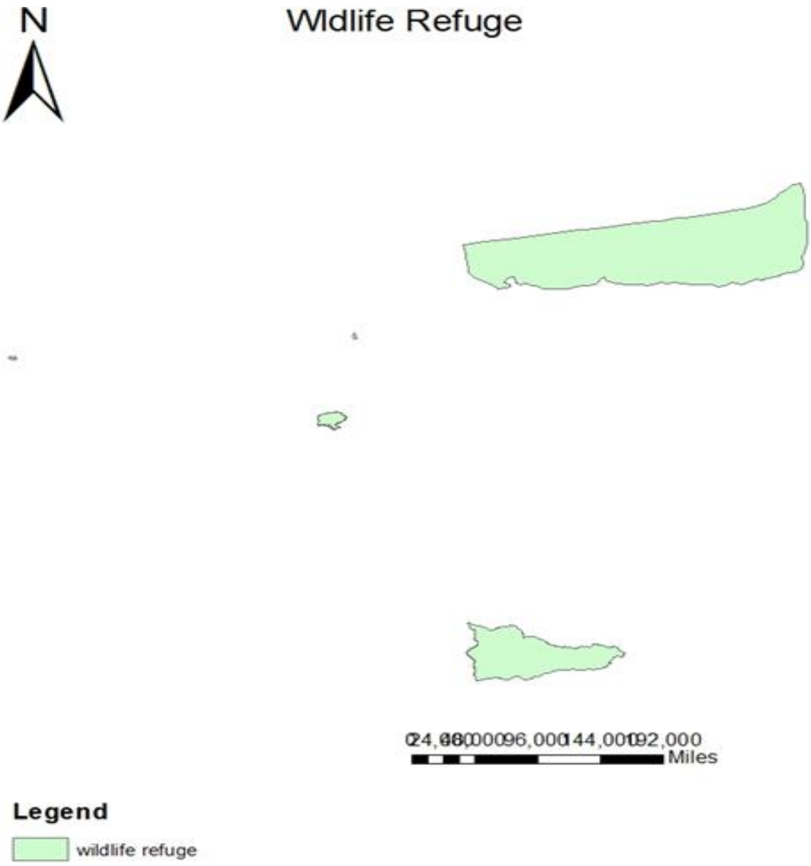

Figure-5. View the WMS service of the Wildlife Refuge Layer.

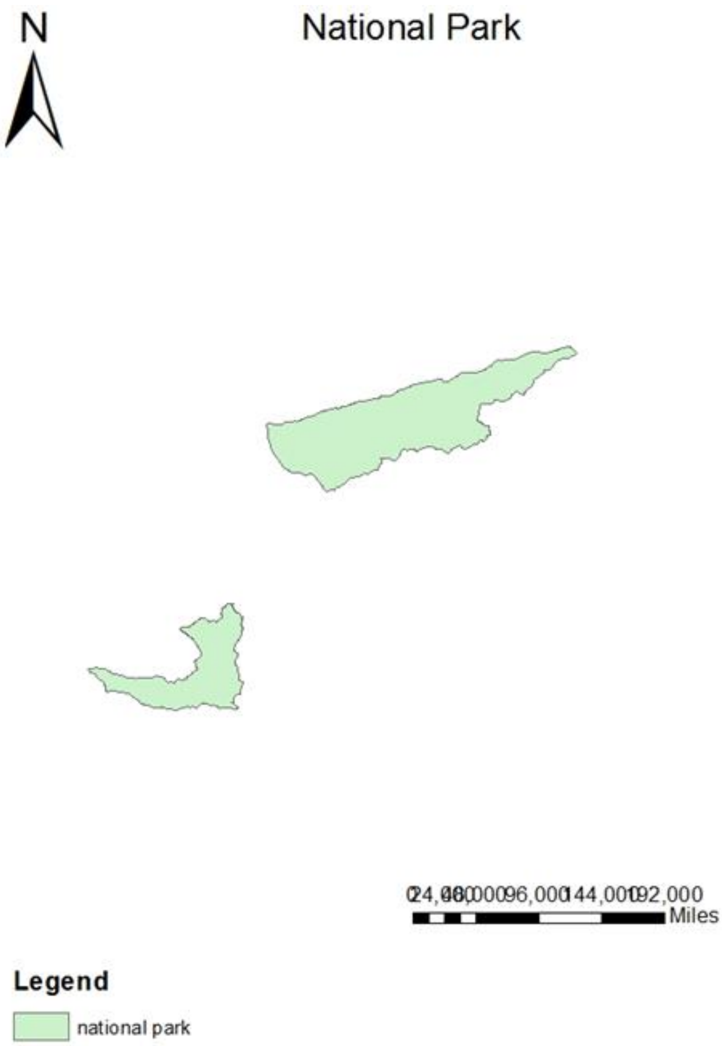

Figure-6. View the WMS service of the National Park Layer.

3.2. Create a Spatial Catalog Service

One of the first requirements in the spatial data infrastructure is to exchange and search information generated by the corresponding metadata records, and creates a database server directory. By creating a catalog service the search facility is available to find the information desired by users, while providing descriptive information about spatial information, Dashti and Mansourian [34]. As discussed earlier, it is appropriate to use common global standards such as OGC standards to define metadata records, and also communicate with catalog server.

In order to record metadata information and create a catalog service, Geo Network software has been used. Regarding the management of metadata, there are two types of standard, one of which is related to the metadata information structure (metadata standard), and the other is related to how metadata is interacting with the web (Catalog Service Standard).

Through the geoserver's spatial linking and introducing it to the catalog service software, a predefined spatial service is identified. The metadata items can be imported for each location service. The connection of Geoserver's geospatial services to Geo Network is shown in Figures 7 and 8. The metadata are then sorted for each data. Users use these metadata to easily search and identify their layers.

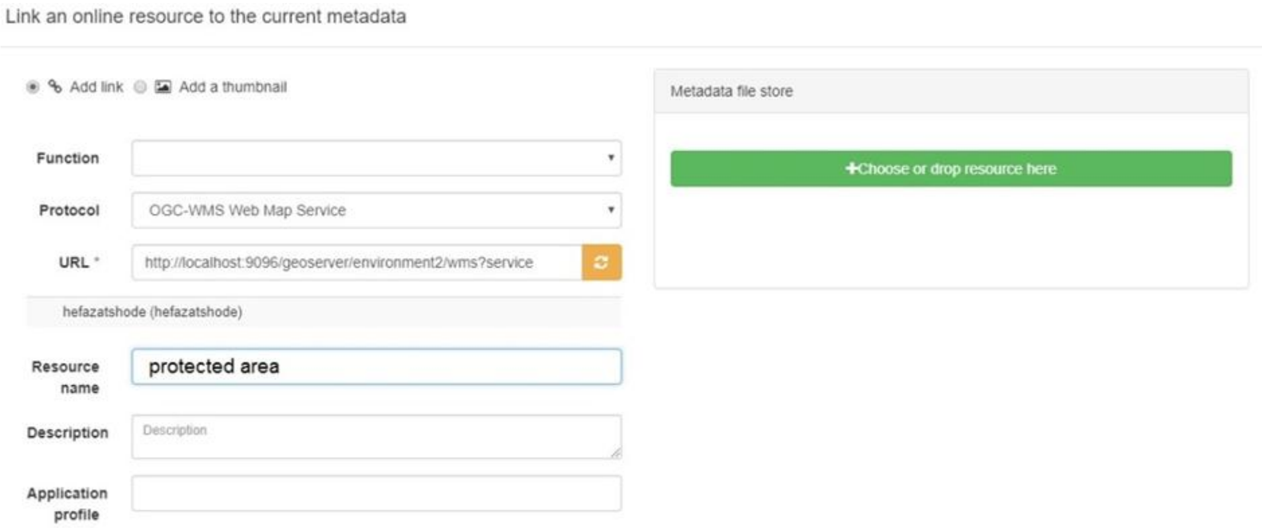

Figure-7. Enter a location service link to identify it in the catalog server.

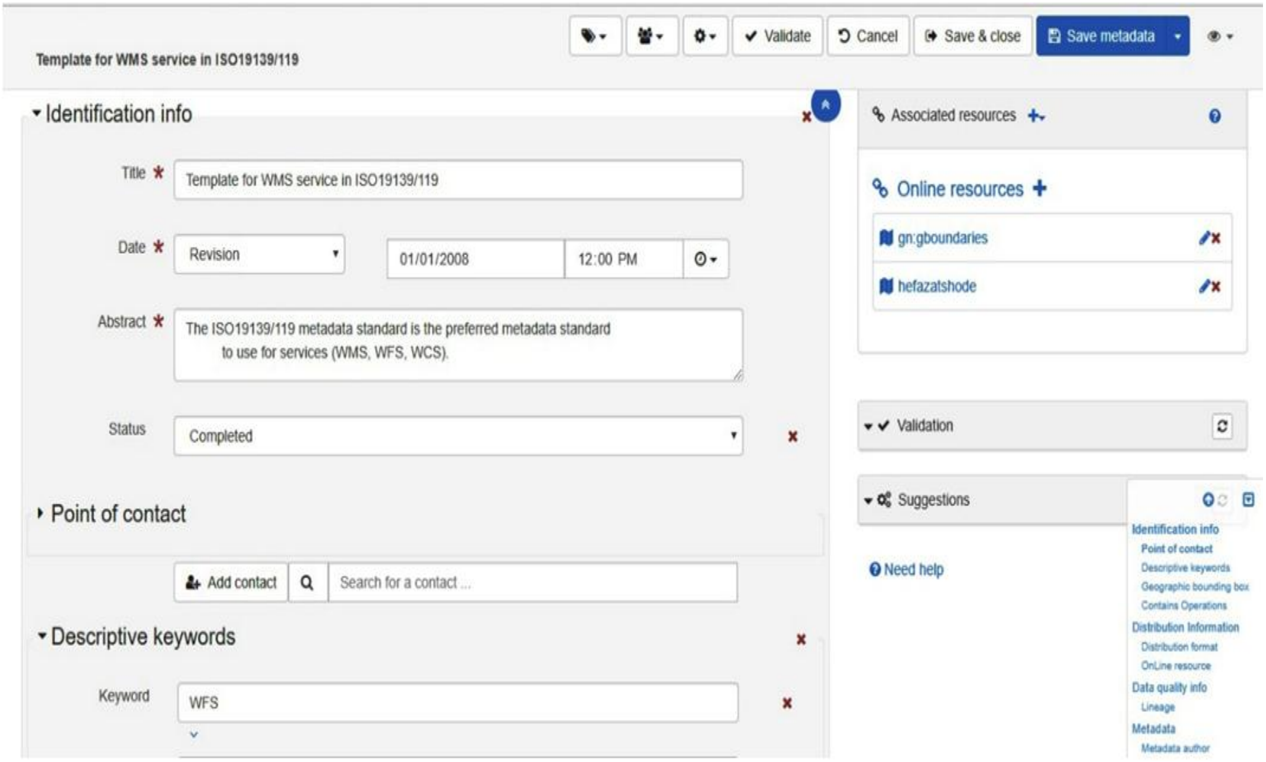

Figure-8. Displays the import of metadata items in the Geo Network environment.

3.3. Geo-Portal Implementation

Since SDI is a collection of technologies, services, spatial data and metadata, all of these resources can be easily accessible to users, and they can be arranged in the form of a spatial portal [20]. Access to spatial information and their distribution are the core of every project of spatial data infrastructure. For ease of access to a variety of spatial resources and their specifications, portals are designed and launched for interacting with spatial data infrastructure. These site hubs are referred as spatial portals for managing communication and accessing to resources [35]. Environmental data is one of the most important data which custodians need to place their spatial information with web-based spatial services, and place them on the localized portal with relevant metadata services.

Creating such a gateway allows users to get information about the existence of spatial data, data conditions, and how to access them. Users can also figure out who has the spatial data, as well as the quality and type of data. As a result, such an infrastructure makes more and more useful use of data (in this research environmental data) in different issues of execution and decision-making by different users in a distributed and interactive environment. It needs to be explained that this port can be implemented through any software or web environment capable of displaying services and searching them.

For this purpose, Geo Network software was chosen as the appropriate software for geo-portal implementation. By using this software, the release of spatial services using open source OGC protocols such as WMS and the publication of metadata in most existing standards is provided. The levels of user access to spatial services can also be determined. The spatial services and metadata built in this study are published in the Geo Network Software Services Figure 9. The location services can be easily searched in this environment. In Figure 10, an example of how to search is shown in this environment.

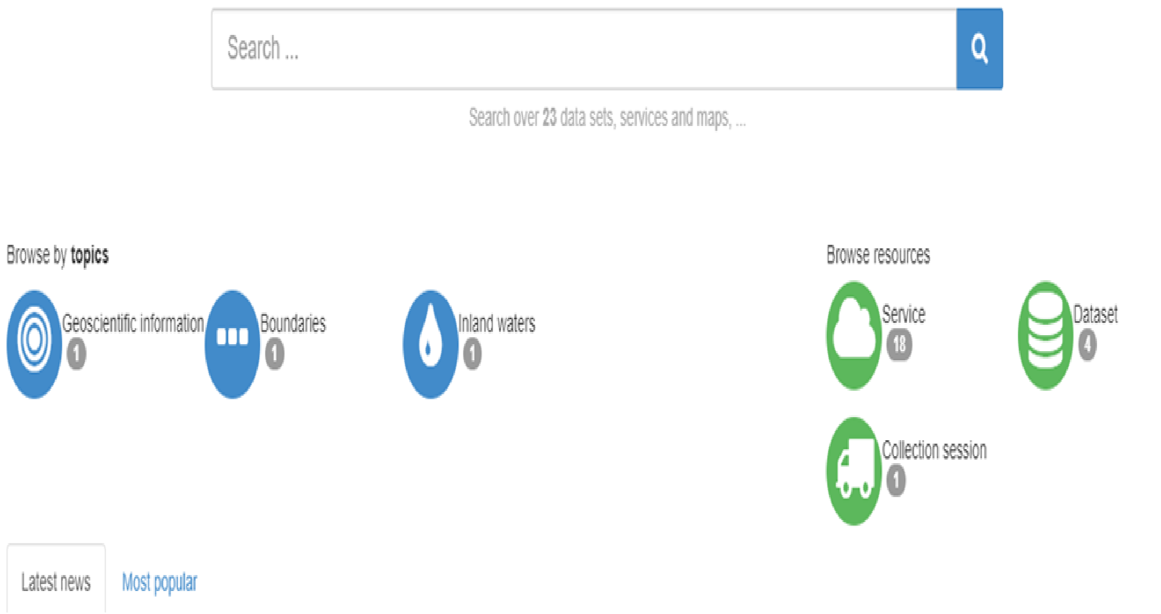

Figure-9. Spatial Services Published in Geo Network.

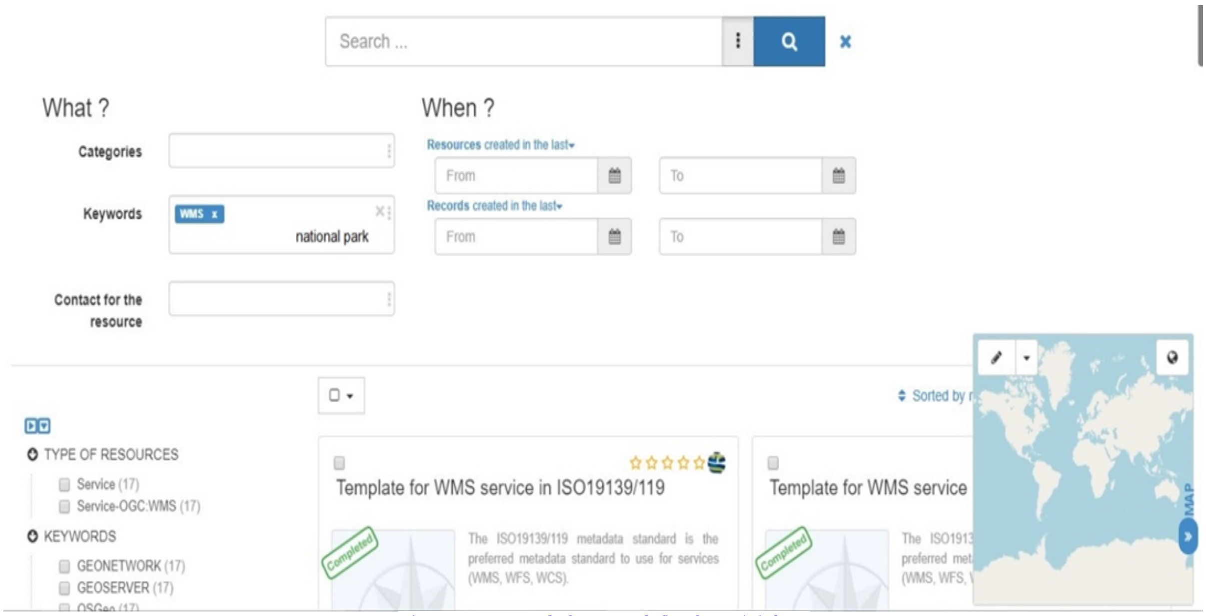

Figure-10. Search for user-defined spatial data.

Users can enter their desired items, such as the name of the layer, in the search field portal search. By connecting the portal to the catalog server, the user's spatial data is provided to users (if available), and users can access it. Users can see the spatial services they see on the map, Figures 11 and 12, and make sure they are accurate.

Figure-11. Displays the protected area on the map in the Geonetwork environment.

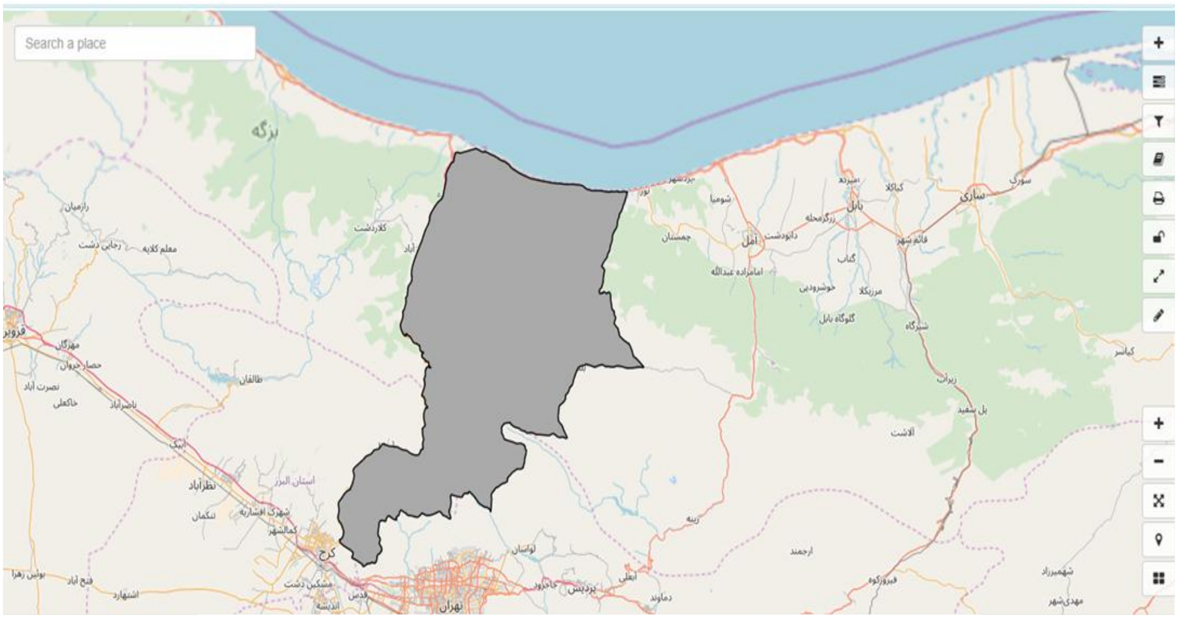

Figure-12. Displays a sample of spatial service on a map in the Geonetwork environment.

4. DISCUSSION AND CONCLUSION

The importance of spatial data is huge in every community. The spatial data facilitates make the decision making easy on complex issues that have internal and external affinities and often relate to the location. Spatial data are vital for economic development, improved monitoring of natural resources and environmental protection [36].

There are many organizations that collect and provide spatial data based on their needs. As a result, re-production of these data is time consuming and costly. Most of the data produced and even up-to-date are not available to users. Various factors may prevent users from accessing existing data, or create barriers for users to access existing data. Organizational and administrative barriers, technical characteristics of data, cultural issues, security issues and access policies are among these main factors. In some cases, specific spatial data is available, but it is not in accordance with the standards required by users. And users cannot use these data in their software environments. Some data sets may be available, but in terms of format, geometric structure, information content, classification and definition of data, coordinate system, accuracy, etc., are not tailored to the needs of users; therefore, users have to spend a lot of time and money editing and preparing information for their application.

By creating a spatial information infrastructure, many problems with the access and use of spatial data are solved. Users can access and use their data according to a specific system. To form this platform, all organizations need to collect and categorize their spatial data in an appropriate database. They must also make spatial services from their spatial data in accordance with defined standards. Moreover, they must provide complete metadata information in the catalog of specified services according to specific standards. Finally, all the information are put in a geo-portal to search and access these information. Environmental parameters are among the most important parts of each country, and should be given special attention. Everything that is necessary for the survival of mankind depends on the environment; the environment is only the home of man and is the most important aspect of life, because the health of man and any other are directly related to the health of the environment [37]. Therefore, by designing and implementing a geo-portal to enter spatial data generated with emphasis on modeling environmental data organizations that are responsible for environmental affairs can help to integrate this infrastructure with the emphasis on mentioned criteria, and thus can be gained in achieving the national SDI. There is also a better and more forward-thinking management and planning in order to maintain the environment. In this study, a series of environmental spatial layers that were scattered across servers and organizations were gathered. Then the spatial services of each of these layers were built to allow them to be placed on the web. The WMS service is the simplest and most common place for the SDI platform, which built from environmentally-friendly layers, and standard web services. In this service, the data will not be migrated, only the services of disposal of those data will be provided to users. Metadata were also created for spatial services. In fact, users can search and access their desired layers in the site portals by creating a catalog service that contains metadata information for these layers.

When the environmental spatial layers are interconnected as web services, and each organization provides its own layers, the number of layers increases rapidly; therefore, user cannot manually and directly search and find the layer they want. Consequently, there should be facilities for data searching which creating catalog server is one of them. With the implementation of a geoportal as a gateway of spatial data, various data and metadata will be available for organizations and users for exchanging information. Usually, each set consisting of a large number of metadata and catalog servers, creates a geoportal or gateway. This geo-portal is created as an interface for all these relevant metadata and spatial information. Geo-portal responds to user queries, and it is a factor in quicker access to responses.The geo-portal is the gateway for entering spatial information, which has to be implemented with respect to several elements such as services, the creation of a platform for ordering, managing users, and so on. As a result, geo-portal is one of the requirements for the formation of SDI, and all organizations will place their spatially generated services within a geo-portal to become part of the spatial information infrastructure. For example, environmental organization produces its own spatial data such as: protected areas, wildlife refuges, hunting areas, national parks, green spaces, etc. Each of these layers has its own descriptive information as metadata. By creating a site for environmental layers, all of these layers are categorized and provided with the provision of web-based spatial services. As a result, environmental data are integrated based on the needs of the users. In addition, these layers are provided through the local portal with different levels of access.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Contributors/Acknowledgement: Both authors contributed equally to the conception and design of the study.

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