



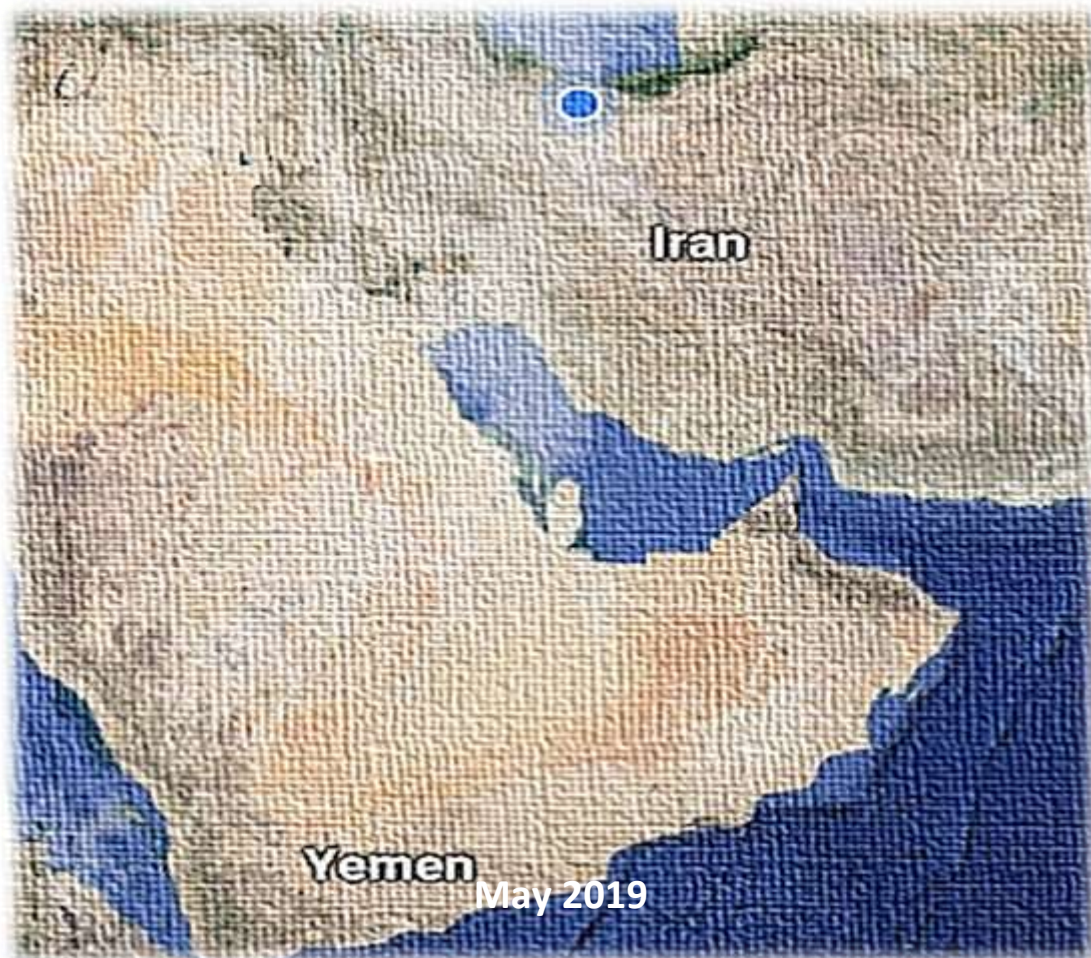
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The Requirement Analysis Report

EMME Project

Environmental Management in the Middle East (EMME):
Spatial Approaches



Requirements Analysis Report

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1. Introduction

Environmental Management in the Middle East (EMME) is one of the major issues and in some cases the main concern that are rapidly increasing and needs an appropriate action. In recent decades, environmental change, such as climate change, has created major challenges for human security in the region, the immediate impact of which is the shortage of biological resources. Production and use of energy, greenhouse gas emissions, industrialization and urbanization, which became global phenomena in the late 20th century, have led to serious environmental problems such as resource degradation, climate change, pollution and population growth. Consuming communities have aggravated these environmental problems through the massive exploitation of natural resources, polluting processes and transport infrastructures that they have created. The response to the environmental crisis has become widespread and has come in many forms.

In Middle East countries and more specifically, in Iran and Yemen, there has been specific short/ long-term plans using traditional methods and techniques to overcome environmental threats. Organizations (mainly governmental), who are in charge of that have been struggling with the lack of knowledge in general. More specific and considering the role of spatial data infrastructure technologies (SDI-T) to facilitate Environmental management, experts in charge need to improve their level of knowledge and skills on using SIST for EM. They also need easy access to proper tools for the management of spatial data as well as spatial analysis for a better decision-making.

2. Aim

Two main aims of the need analysis in line with the main objectives of the project are:

- Identifying the most important EM issues in Iran and Yemen to be used for the development of the innovative courses.
- Identifying the basic requirement for the development of emGeo.

3. Methodology

Visiting organizations, interview with experts and filling questionnaires were used together, for the requirement analysis. The questionnaires were developed by EMME participants during the kick-off meeting in Lund 2019 to collect information and identify need analysis (Annex-1). The organizations and the experts who were visited/interviewed are listed in annex-2. The meetings were held during the period 2019-03-02 to 2019-04-10.

4. Results

The results of the need analysis are separated for each partner in Iran and Yemen.

Country partners of the EMME project are as follows:

Islamic Republic of Iran:

- University of Tehran, UT (The scope is more in the national level)
- Bu-Ali Sina University, BASU (The scope is more in the Local level)
- Imam Khomeini International University, IKIU (The scope is more in the Local level)

Yemen:

- Sana'a University, SU (The scope is more in the national level)
- TU (The scope is more in the Local level)

4.1. Results in the scope of Iran

4.1.1. University of Tehran

ANSWERS FOR QUESTIONNAIRE 1:

1.How does the Organization perform Environmental Management?

Department of Environment (DOE)

Department of Environment is responsible for following tasks directly for the environmental management:

- Protecting the natural ecosystems of the country and restoring the adverse effects of the past on the environment Prevention and Prevention of Environmental Damage and Pollution
- Assess the environmentally tolerant capacity for sustainable and sustainable use of environmental resources Continuous monitoring of the exploitation of environmental resources
- Active exposure to critical environmental environments involves contaminants exceeding the permeability of the environment
- Review, study and research in order to achieve or obtain recognition in the following areas:
 - Pollution and environmental degrading agents in the field of water, air, soil, waste, pesticides, chemical fertilizers, sound and so on.
 - How to deploy the development and development phenomena of the country such as industrial units, power plants, dams, agricultural and human settlements, human settlements and the like.
 - Use of environmentally friendly technology
 - Areas that have unique ecological characteristics and determine their limits

- Specific and rare species of endangered species of plants and animals and their habitats and ecological relationships and their distribution
- Regional environmental issues using the cooperation of neighboring countries and international cooperation
- Provision and development of environmental standards and standards in the following areas:
 - Air includes free air, drainage limits, classification of sources and contaminating water, and changing and destroying river paths and destroying wetlands and the ecological transformation of lakes and seas
 - Soil resources that contain pollutants and soil erosion
 - The noise includes the limit and the spatial, temporal and temporal criteria
 - Solid and solid waste includes collecting, transporting, disposing or transforming and recycling waste materials from rural, urban, mineral, agricultural, etc. in different parts of the country.
 - Pesticides and chemical fertilizers including the residual limit in the environment, disposal or exclusion and spatial, temporal, type, quantitative and qualitative prohibitions
 - Vegetation and wildlife pollution of oil, heavy metals, agricultural toxins, human wastewater and in marine environments (water, sediment, aquatic)
- Evaluation and monitoring in order to ensure the application and performance of environmental standards and standards.
- Study of marine Eco-Biology and marine pollution and coastal wetlands
- Study and evaluation of quantitative and qualitative status of biodiversity and genetic resources of the country
- Economic valuation of natural resources and environmental costs of development
- Study and context for sustainable development

Forests, Range and Watershed management Organization (FRWMO):

By preserving, protecting, restoring, developing and exploiting the principles of forests, pastures, forest lands, natural habitats, coastal waters, protecting and protecting water and soil from the country through scientific management on watersheds and observing the principles of sustainable development.

Tehran Disaster Mitigation and Management Organization (TDMMO):

Tehran City Crisis Management and Management Organization is responsible for the coordination among the executive affairs due to the nature of the formation. Environmental Management issues are based on governmental rules and regulations, periodic and continuous governmental instructions. Strategic, annual and monthly plans of activities are developed for environmental protection in each regional branch according to the features and characteristic of the region in the city.

Ministry of Energy (MOE):

The Ministry of Energy is responsible for management of supply and demand of water, electricity, renewable energy and energy efficiency, and wastewater services and promoting the training, research and technology in water and electrical industry. The Ministry also plays a major role in preservation of natural resources, environment protection, public health promotion, welfare and self-sufficiency for sustainable development of the country.

Ministry of Agriculture- Office for Management and Reduction/Mitigation of Agricultural Risks and Crisis (MOA):

The core objective of this office is to manage and tackle with risks and crisis in all premises of agriculture sector. Environmental Management issues are based on governmental rules and regulations, periodic and continuous governmental instructions. Main EP activities are the followings: rational use of land resources, protecting land from degradation, improvement land use conditions. They are regularly monitored by the organization.

2. How does the Organization undertake/run Environmental Risk Management Programme(s)?

DOE:

Protecting actions are based on continuously monitoring, analyses, and evaluations. Actions are carried out by field studies, and sometimes by satellite images. Accordingly, decisions and protection activities plans are developed.

FRWMO:

- Formation of policies and strategies of natural resources and watershed management, and planning and implementation of natural resources and watershed development programs within the framework of sustainable development policies
- Maintaining, protecting, protecting and exploiting the principles of forests, rangelands, deserts and watersheds of the country.
- Recognition and separation of the legal rights of national lands from the exceptions of real and legal persons and the consolidation of state sovereignty over national resources of the country.
- Investigating and studying the watersheds of the country in order to plan and prepare comprehensive plans and implementation of natural resources and watershed management activities in the watersheds of the country.
- Development of forests and pasture lands, forest parks, improvement and restoration of ruined forests and rangelands and promotion of woody farming, with emphasis on conservation of genetic resources and vegetation biodiversity.
- Good study and planning to increase productivity in executive activities
- Study, design and optimization of production patterns and systems in the field of natural resources and watershed management using indigenous knowledge and global experiences.

- Attraction of participation of real and legal persons in the implementation of natural resources and watershed management
- Development, implementation and updating of information system for natural resources and watershed management in order to promote public knowledge and promote the culture of natural resources.
- Study and Planning for the Development of Human Capital Management and Organization to Improve Productivity and Effectiveness

TDMMO:

The organization has numerous plans to reduce the effects of a hazard. These programs include studies in a variety of areas, which in some cases have been converted to operational guidelines, such as construction codes in the fault zones that were notified, and construction regulations in the area of landscapes and landslides. List of the disasters known by experiences are continuously monitored. Disaster risk maps, mitigating plans, regular set of activities are developed by the result of monitoring. Disasters are modeled and mapped. EP actions are based on continuous monitoring, scientific-research works, scientific and practical experiences. The activities of this organization include the following.

- Topics related to prevention and risk reduction
- Readiness and Confrontation for any kind of
- Professional and general education

These activities are related to natural hazards such as floods and earthquakes

MOE:

The environmental challenges are not limited in the national borders and are influenced by the regional interactions so there is the need to collaborate with the neighbor countries. So, capacity building should not be concentrated on just one or two country. But also, other countries in the Middle East region need capacity building for a better environmental management. Culturing and motivating collaborative efforts are also important needs. It can be achieved by further investment of e.g. EU as well as support of countries like Iran which have a more stable situation and have potentials for e.g. training and culturing in the neighboring countries.

Power plants site selection and proper distribution are another important application of GIS in both Ministry level and subsidiary companies. Solar and other Renewable Energy resources are becoming more popular so there is the need for finding proper areas for power plants.

In transforming electricity networks, high power posts and distribution to the home users, a major challenge is to find optimize sites as well as proper web services for the citizens.

MOA:

The areas known as disastrous are regularly controlled by field studies, expeditions, and monitoring activities together with relevant organizations. As a result, source of disasters are identified, reports are presented to a relevant ministry. After analyzing the information, recommendation and explanations will be developed. If source of disasters is a natural person or a juridical organization, they will be warned, and fined.

Erosion, soil improvement issues, irrigated lands and soil ecological conditions are investigated in a regular basis. EP plans are developed and contracts with farmers for harvesting are signed according to the results.

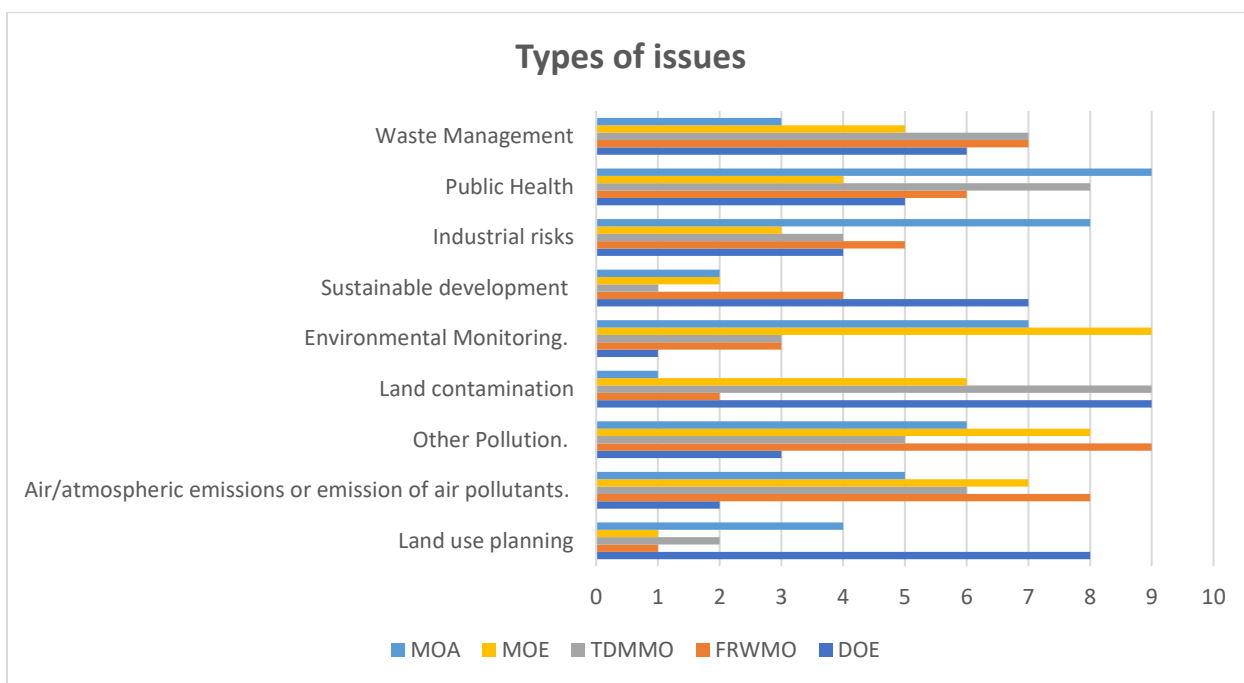
Other relevant issues are described as follows:

- Planning, coordination and supervision on risks and crisis in agriculture sector
- Conducting research on risks and crisis in agriculture sector
- Forecasting and prevention of risks and crisis in agriculture sector
- Preparedness
- Management of the incidence

3. What kind of Environmental Analysis/ Management do you work and rank them according to the importance of your country?

Types of issues	DOE	FRWMO	TDMMO	MOE	MOA
Land use planning	8	1	2	1	4
Air/atmospheric emissions or emission of air pollutants.	2	8	6	7	5
Other Pollution.	3	9	5	8	6
Land contamination	9	2	9	6	1
Environmental Monitoring.	1	3	3	9	7
Sustainable development	7	4	1	2	2
Industrial risks	4	5	4	3	8
Public Health	5	6	8	4	9
Waste Management	6	7	7	5	3

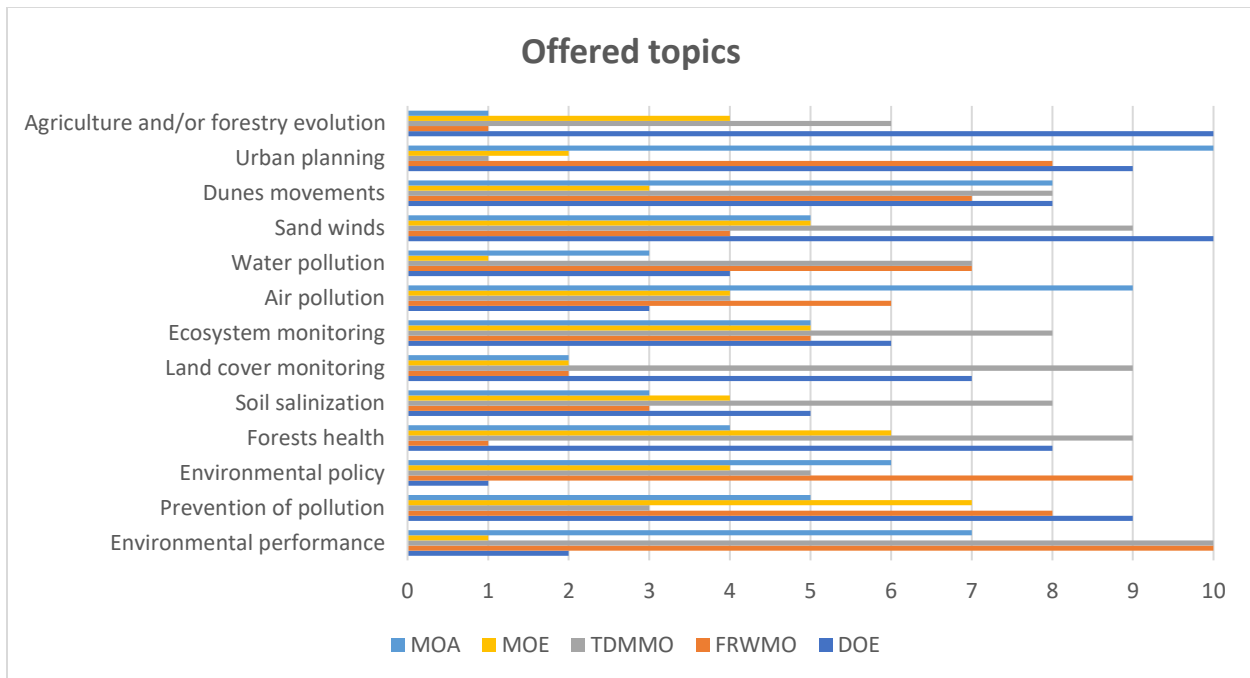
Others:					
- Forest fire		X			
- Extreme weather changes					



4. What types of topics and practical works on environmental Management should be discussed?

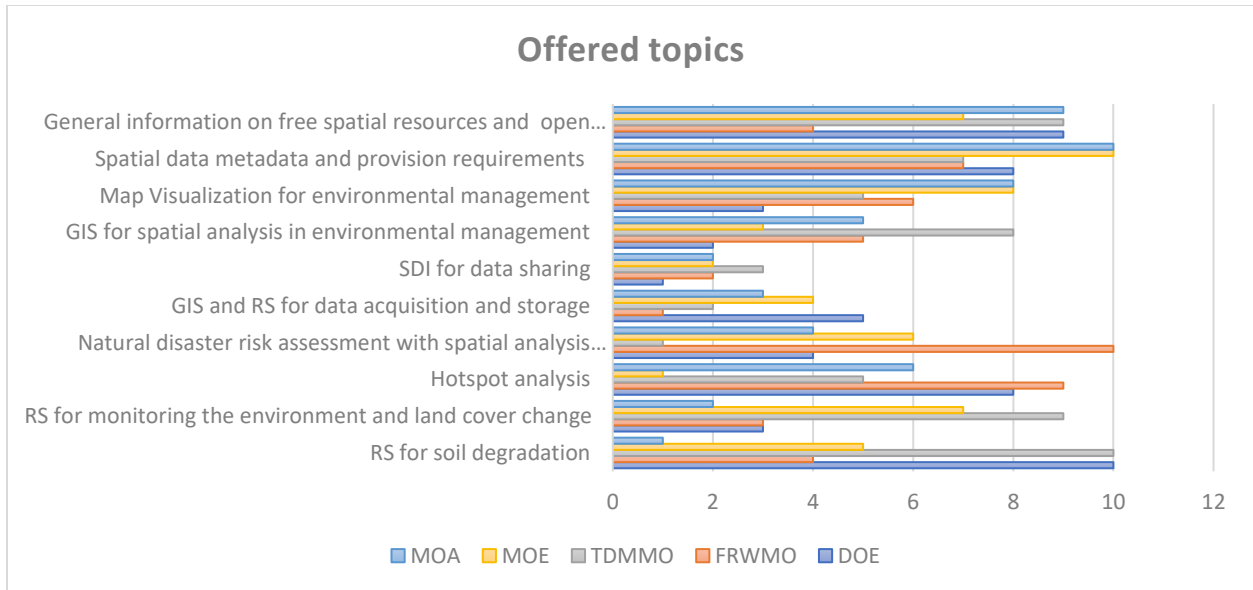
Offered topics	DOE	FRWMO	TDMMO	MOE	MOA
Environmental performance	2	10	10	1	7
Prevention of pollution	9	8	3	7	5
Environmental policy	1	9	5	4	6
Forests health	8	1	9	6	4
Soil salinization	5	3	8	4	3

Land cover monitoring	7	2	9	2	2
Ecosystem monitoring	6	5	8	5	5
Air pollution	3	6	4	4	9
Water pollution	4	7	7	1	3
Sand winds	10	4	9	5	5
Dunes movements	8	7	8	3	8
Urban planning	9	8	1	2	10
Agriculture and/or forestry evolution	10	1	6	4	1
Others: SDI Geostatistics GIS and RS in collecting, storing and monitoring crisis management information					



5. What kind of topics relevant to Geographical Information Systems (GIS), Remote Sensing (RS) and Spatial Data Infrastructures (SDI) do you think are more relevant for the course development?

Offered topics	DOE	FRWMO	TDMMO	MOE	MOA
RS for soil degradation	10	4	10	5	1
RS for monitoring the environment and land cover change	3	3	9	7	2
Hotspot analysis	8	9	5	1	6
Natural disaster risk assessment with spatial analysis methods and techniques	4	10	1	6	4
GIS and RS for data acquisition and storage	5	1	2	4	3
SDI for data sharing	1	2	3	2	2
GIS for spatial analysis in environmental management	2	5	8	3	5
Map Visualization for environmental management	3	6	5	8	8
Spatial data metadata and provision requirements	8	7	7	10	10
General information on free spatial resources and other types of open source data	9	4	9	7	9



6. Which type of indicators related to Environmental Management does your Organization use?

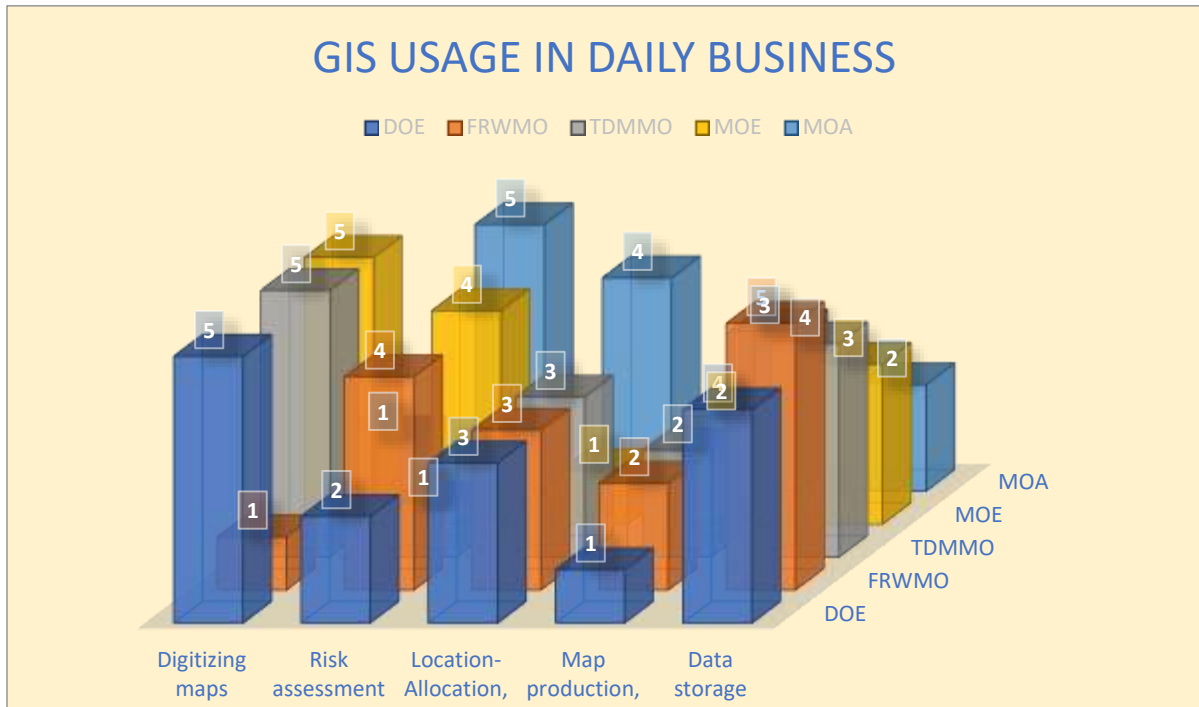
- Guidelines for Monitoring and Evaluation of Natural Resource Management and Watershed Management
- Underground and surface water, lake and reservoirs water tables, salinity, pollution
- Biodiversity Indicators
- Various types of land use
- Climate change indicators
- Climate conditions
- Physical and structural infrastructures
- Indicators of natural disasters
- Dynamics of lakes, their area and biodiversity, anthropogenic impact
- Indicator of carbon emission changes in the air
- Creating a monitoring system for water, air, and soil
- Creating, promoting, and developing new surveillance systems for monitoring environmental resources, improving the quality and quantity, and conserving biodiversity in protected areas
- Using terms, conditions, and standards related to the exploitation of resources for ecological resource management

7. Do you use GIS in your daily work?

Yes:

Type of usage	DOE	FRWMO	TDMMO	MOE	MOA
Digitizing maps	5	1	5	5	1
Risk assessment	2	4	1	4	5

Location- Allocation,	3	3	3	1	4
Map production,	1	2	2	2	3
Data storage	4	5	4	3	2



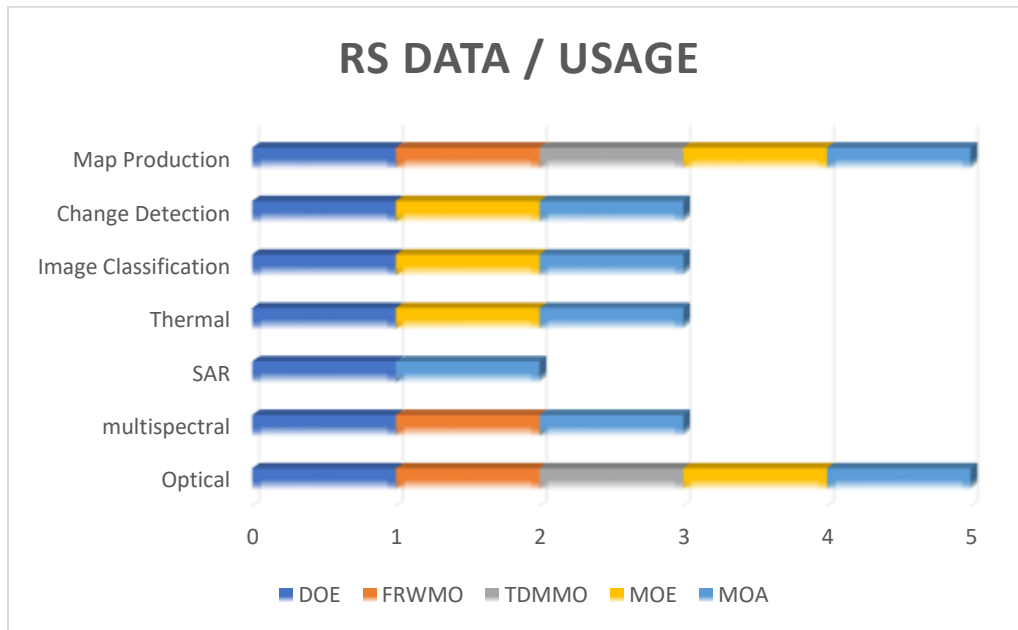
- Digitization of natural resource thematic maps
- Update existing maps
- Providing output in different scales
- Analyzing existing maps and prepare new maps
- Completing the local databases

8. Do you use Remote Sensing data in your daily work?

Yes:

Type of Data/Usage	DOE	FRWMO	TDMMO	MOE	MOA
Optical	X	X	X	X	X
multispectral	X	X			X
SAR	X				X
Thermal	X			X	X
Image Classification	X			X	X

Change Detection	X			X	X
Map Production	X	X	X	X	X



- Sentinel 2,3 images
- Landsat 7.0, 8.0 images
- ETMT
- SRTM
- ASTER
- MODIS
- Google earth images
- Optical and multispectral images for producing and updating maps
- RS data for classifying and diagnosing changes
- meteorological analysis

9. What GIS and Remote Sensing software do you use? Please include versions if available.

- ArcGIS 10.6.1
- QGIS
- ILWIS
- Global map
- ArcGIS 10.5
- IDRISI
- Google Earth
- ENVI
- ERDAS

10. Do you use other GIS and Remote Sensing software as intermediate?

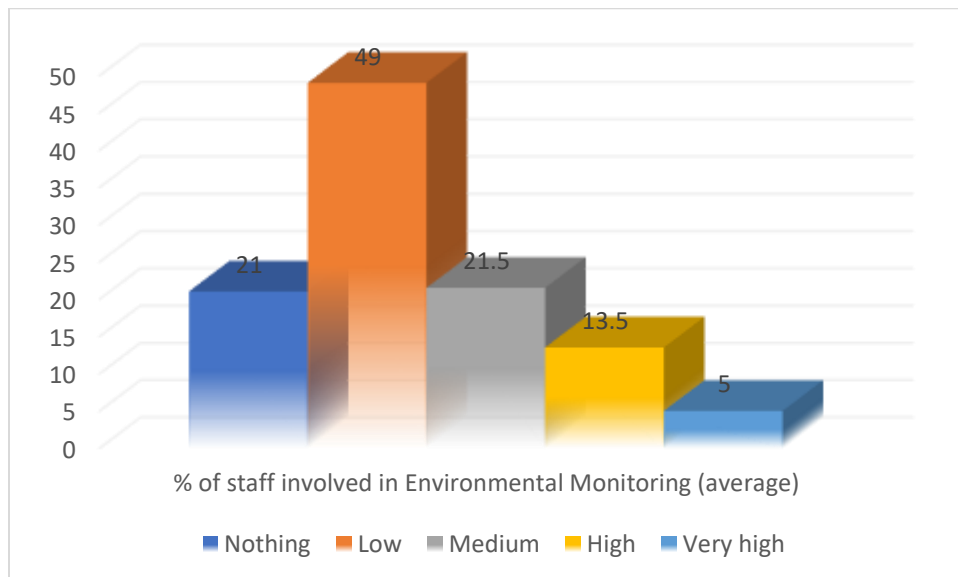
If yes describe them into more details.

-Yes,

The Google Earth application is used to check the changes and some of the daily needs, as well as to check the areas where field viewing is low.

11. General knowledge and skills of your organization employees on GIS and RS?

Average knowledge	% of staff involved in Environmental Monitoring (average)
Nothing	21
Low	49
Medium	21.5
High	13.5
Very high	5



12. Do you have any program / willingness to improve the competence attending distance courses?

- Everyone answered Yes

- Virtual and distance education promotes the basis for being up-to-date and coordinated
- Improvement of general knowledge on GIS and RS enhances supervisory skills

13. Would you like your staff to attend distance courses on GIS and RS to improve their competence?

	No
100%	Yes.

- Staff with relevant work field who have basic abilities to use the software and have interest in this area of education
- Promotes the managerial, calculation, and planning skills of the staff
- Participation in the relevant course is required to upgrade the staff's level of knowledge
- Improvement of the staff's software programming skills
- Courses for learning Python programming language, web operating system, and remote sensing software such as ENVI and IDRISI, and photogrammetry software such as LPS

QUESTIONNAIRE 2

1. What types of spatial data do you use/or collect and update in your Organization?

- Spatial data
- Non-spatial data (descriptive)
- Digital maps from the National Cartographic Center in the scale of 1:25,000
- Digital maps from the National Cartographic Center in the scale of 1:2,000
- Aerial Photos from over 60 years ago and after
- Satellite images from the google earth software / Sentinel images
- Vector data in SHP format
- Geodatabase
- Geo-scale data
- Files and spatial data in AutoCAD format

2. What are the data sources that your Organization uses to get GIS/ RS data?

- Maps are either on paper, an image, from satellites, or data
- From the National Cartographic Center, Geographic Organization of the Armed Forces, International websites which provide data, Consulting company offices in different scales.

- Fieldwork data
 - GPS datasets
 - google earth satellite images
 - Data from the Plan and Budget Organization
 - information from the Statistical Center of Iran (censuses results)
3. How does your Organization get the RS data it uses? (Download, buy, etc.)
- National Cartographic Center,
 - Forests, Range and Watershed Management Organization
 - Statistical center of Iran
 - International websites such as Google Earth
 - Satellite images from Google Earth and images from the "uses explore" website
4. What issues does your Organization face when downloading RS data?
- Low download speed
 - Out-of-date systems and software
 - Old data and information
 - High cost of access to information
 - Low accuracy of information
 - Out-of-date websites and information
 - Restrictions on access to some websites
 - Out-of-date information about Iran in some websites
5. What types of base maps/ spatial data does your Organization have? (Types, scale range, information content, metadata availability).
- Land use
 - Access Network
 - Connection routes
 - Maps in 1:25000 scale, from the National Cartographic Center
 - Landsat satellite images
 - Animal and herbal species
 - Surface and underground water
 - Distribution of natural and environmental resources
 - Geological maps
 - Soil classification
 - Ecological potential maps
 - Urban and industrial development maps
 - 1:5000 and 1:10000 scale maps
 - Statistical block maps

6. What kind of maps/ spatial data does your Organization have for environmental management? If possible, indicate if each entry is updated information or not.

- Basic SHP from land use data
- Updating data is very limited and time-consuming
- Land cover
- Geology datasets
- Topography
- Roads
- Animal and herbal species
- Soil classification
- Quality of resources
- Maps of protected areas
- Land use data

7. What kind of maps / spatial data does your Organization have for environmental risk analysis/ management?

- Maps of staff job description
- Basic urban maps
- Basic natural resources maps
- Topography maps
- Vegetation cover
- Land cover
- Infrastructure, herbal and animal species, and natural and environmental resources distribution
- Industrial and manufacturing centers
- Environmental hazards map in shapefile and AutoCAD format
- Geological maps (fault, slope, soil classification)
- Land cover
- Watercourse
- Ecological potential
- Waste

8. Is the data used by your Organization restricted, or free and available for use and/or publication?

- Data that can be provided and are not security data
- Data are provided freely specially to students, scholars, and researchers
- Supplying statistical maps and data with very low prices (introduction letter necessary)
- Free access for colleagues of executive organizations

9. Which functionalities does your Organization expect from emGeo?

✓	Digitizing maps
✓	Storing attributes
✓	Visualizing data
✓	Designing new patterns and symbols
✓	Uploading data
	Other functionalities

10. Does your Organization have a fast / medium or slow Internet connection? (if possible, specify upload/download speed)

measure (MBps)	Speed
256	<input type="checkbox"/> Slow * <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Fast

11. Does your Organization have any mechanism for data sharing? Describe it if any.

- Mostly said No
- The MOE is connected to the NSDI geoportal
- The FRWMO has a local sharing system via network
- Through creating a consistent and integrated database

ANSWERS FOR QUESTIONNAIRE 1:

1. How does the Organization perform Environmental Management?

The Regional Water Authority of Hamedan: related information is collected by some stations and observation wells. They analyze data to create maps and monitor the water table drop down. They are responsible for control the groundwater pumping and issuing the permit for digging new wells. They are also managing the surface water bodies and establish new dams and use them.

The Environmental Protection office of Hamedan: Protecting actions are mostly carried out by field studies. Protecting actions are based on continuously monitoring, analyses, and evaluations. Actions are carried out by field studies, and sometimes by satellite images. Accordingly, decisions, management and protection activities plans are developed.

The Agricultural Jihad Organization of Hamedan: They are responsible for monitoring agricultural fields and crop yield estimation, agricultural field diseases detection and protection, and agricultural planning and management. They distribute pesticides for crops and fertilizer to increase the crop yield. They are also monitoring soil erosion and soil ecological conditions.

The Forest, Range and Watershed Organization of Hamedan mostly use field observation and sometimes satellite images to environmental management. Main EM activities are the followings: monitoring the soil erosion and soil ecological conditions, rational use of land resources, monitoring land degradation and ranges.

2. How does the Organization undertake/run Environmental Risk Management Programme(s)?

All the organizations interviewed did not have any specific programs for environmental risk management and did not undertake an Environmental Risk Management program. The Regional Water Authority of Hamedan uses GIS to create the map for water table drop over all provincial plains. They collect the data and create maps and then prepare an annual report for each plain. In this report, they briefly talk about environmental risk management.

The Agricultural Jihad Organization of Hamedan uses satellite imagery, mostly Landsat images, to monitor vegetation changes over Hamedan Province. They produce land cover maps and monitor the land cover changes, then briefly report environmental risk.

3. In which areas of Environmental Analysis/Management does your Organization act (select from the list below)? Rank each of them according to their importance to your country.

Rank	Application areas
3	Land use planning. Please specify.....
4	Air/atmospheric emissions or emission of air pollutants. Please specify
8	Other type of Pollution. Please specify.....
4	Land contamination. Please specify
2	Environmental Monitoring. Please specify
1	Sustainable development. Please specify
6	Industrial risks. Please specify
9	Public health. Please specify
7	Waste management. Please specify.....
	Other areas. Please specify

4. What types of topics and practical works on environmental management should be discussed in this course?

Mark	Offered topics
3	Environmental performance

4	Prevention of pollution
1	Environmental policy
7	Forests health
6	Soil salinization
1	Land cover monitoring
3	Ecosystem monitoring
8	Air pollution
6	Water pollution
10	Sand winds
9	Dunes movements
2	Urban planning
5	Agriculture and/or forestry evolution
	Other topics

5. What kind of topics relevant to Geographical Information Systems (GIS), Remote Sensing (RS) and Spatial Data Infrastructures (SDI) do you think are more relevant for the course development?

Mark	Offered topics
6	RS for soil degradation
4	RS for monitoring the environment and land cover change
5	Hotspot analysis
3	Natural disaster risk assessment with spatial analysis methods and techniques
2	GIS and RS for data acquisition and storage
7	SDI for data sharing
1	GIS for spatial analysis in environmental management
2	Map Visualization for environmental management
8	Spatial data metadata and provision requirements

5	General information on free spatial resources and other types of open source data
	Other topics

6. Which type of indicators related to Environmental Management does your Organization use?

- Groundwater table measurements
- Land cover and Land Use maps
- Change detection
- Climate change
- Climate conditions
- Demographic maps
- Felor and
- Physical and structural infrastructures

7. Do you use GIS in your daily work?

*	No	Environmental Protection office of Hamedan
*	Yes.	

If yes, in which type of processes? (Digitizing maps, risk assessment, site selection, map production, spatial data storage, etc.)

- Digitizing
- Site selection
- Map production
- Spatial data storage

8. Do you use Remote Sensing data in your daily work?

	No	Environmental Protection office of Hamedan
*	Yes.	

If yes, with which types of RS data (optical / multispectral / SAR / thermal, etc.)? And with which type of processing (image classification, change detection, map production, etc.)? What is the last update of each entry?

- MODIS
- LANDSAT
- Visual interpretation and classification

9. What GIS and Remote Sensing software do you use? Please include versions if available.

ArcGIS

ENVI

10. Do you use other GIS and Remote Sensing software as intermediate?

If yes describe them into more details.

- In environmental protection office of Hamedan, they don't use GIS and RS actively. In other organizations average 60% said No and 40% said Yes.
- Some staff uses satellite imagery for interpretation and GIS for cartography and map production purpose.

11. General knowledge and skills of your organization employees on GIS and RS.

Average knowledge	Number of persons	% of staff involved in Environmental Monitoring
Nothing		60% Environmental Protection office of Hamedan average 20 % other organizations
Low		20% Environmental Protection office of Hamedan average 45 % other organizations
Medium		8% Environmental Protection office of Hamedan average 23 % other organizations
High		2% Environmental Protection office of Hamedan average 5 % other organizations
Very high		0% Environmental Protection office of Hamedan average 2 % other organizations

12. Do you have any program / willingness to improve the competence attending distance courses?

- Although they would like to learn about GIS and RS, they are busy with daily tasks and could not attend these courses. They are very keen to attend distance courses.
- Currently they don't have any distance courses in Geo-spatial processing and SDI and they are welcomed to join these courses.

13. Would you like your staff to attend distance courses on GIS and RS to improve their competence?

	No
*	Yes.

WP 2. emGeo (environmental management Geoportal) need analysis

QUESTIONNAIRE 2

12. What types of spatial data do you use/or collect and update in your Organization?

In Regional Water Authority of Hamedan, they use paper and digital maps, GPS data, Groundwater table measurements, surface water data measurements and satellite imagery

In Agricultural Jihad organization of Hamedan, satellite imagery, crop yield measurements, crop damage assessments data, paper and digital maps and GPS data

In Environmental Protection Office of Hamedan, Paper and digital maps and GPS data

13. What are the data sources that your Organization uses to get GIS/ RS data?

Paper and digital maps

Satellite imagery

Aerial photos

14. How does your Organization get the RS data it uses? (Download, buy, etc.)

Mainly download satellite imagery

15. What issues does your Organization face when downloading RS data?

Low download speed

16. What types of base maps/ spatial data does your Organization have? (Types, scale range, information content, metadata availability).

Maps mainly in 1:25000 scale, in digital format

They used several layers in shp file format include:

- Land use
- Geological data
- Soil classification data
- Water table data
- Surface water data
- Distribution of natural and environmental resources
- natural reserve areas
- Satellite imagery
- Animal and herbal species

17. What kind of maps/ spatial data does your Organization have for environmental management? If possible, indicate if each entry is updated information or not.

- Land cover and land use maps
- Water table data
- Soil classification
- Animal and herbal species data
- Topographic maps
- Satellite imagery

18. What kind of maps / spatial data does your Organization have for environmental risk analysis/ management?

- Land cover and land use maps

- Soil classification
- Topographic maps
- Satellite imagery

19. Is the data used by your Organization restricted, or free and available for use and/or publication?

Spatial data (not secure data) is free of charge for scientists and students

20. Which functionalities does your Organization expect from emGeo?

*	Digitizing maps
*	Storing attributes
*	Visualizing data
*	Designing new patterns and symbols
*	Uploading data
	Other functionalities

21. Does your Organization have a fast / medium or slow Internet connection? (if possible, specify upload/download speed)

measure (Mbps)	Speed
256-512 K	<input type="checkbox"/> Slow <input type="checkbox"/> Medium <input type="checkbox"/> Fast

22. Does your Organization have any mechanism for data sharing? Describe it if any.

No. they don't have any data sharing system

ANSWERS FOR QUESTIONNAIRE 1:

1, How does the Organization perform Environmental Management?

- Directly and indirectly
- Along with a set of actions including preparing plans
- Optimal management of the environment in all areas
- Implementation of mechanical and biological projects
- Reaching optimal management by promoting education on managing, and controlling the methods for utilizing the environmental and natural capacities
- Managing and controlling urban and civil projects
- Monitoring and controlling the construction of physical structures in order to adapt to environmental conditions (meaning supervision of industrial, mining, and urban activities)
- Managing man-made and natural resources
- Managing to protect and control environmental conditions
- According to the advice of the Department of Environment
- In accordance with the needs of the organization
- The representative of the organization participates in meetings held in the Department of Environment
- Expert spatial planning workgroups propose their ideas and are approved after being reviewed in meetings held by the Provincial Planning Council and the organization representative

2. How does the Organization undertake/run Environmental Risk Management Programme(s)?

- By understanding, and precise and in-depth examination of hazards
- Using scientific techniques
- Preparing Environmental Impact Assessment Plans (EIA)
- Controlling and surveying proposed reports regarding thematic-local plans periodically and distinctly
- Preparation of protective plans, including measures to protect areas and limits
- Maintaining and controlling environmental changes
- Fighting the acute issues ahead
- Providing preventive and pioneer plans in relation to mitigating the harmful effects of environmental risks
- Through coordinated meetings with related institutions
- Review of plans and programs in spatial planning workgroups

- Preparation and approval of the research projects and studies in the Provincial Planning Council

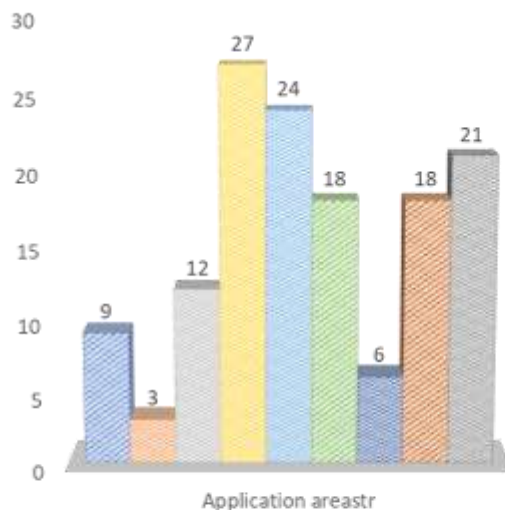
3. In which areas of Environmental Analysis/Management does your Organization act (select from the list below)? Rank each of them according to their importance to your country.

Rank	Application areas
3	Land use planning. Please specify.....
*4	Air/atmospheric emissions or emission of air pollutants. Please specify.....
8	Other type of Pollution. Please specify: Water
*4	Land contamination. Please specify
2	Environmental Monitoring. Please specify
1	Sustainable development. Please specify: Renewable and non-renewable resource management
6	Industrial risks. Please specify
9	Public health. Please specify
7	Waste management. Please specify.....
	Other areas. Please specify

	Underground water resources - Land subsidence – Quality and quantity of water resources - Rangeland resources and green space and vegetation-
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*Scores are equal

- Scores are according to the frequency of choices
- Land use planning and land contamination had close scores

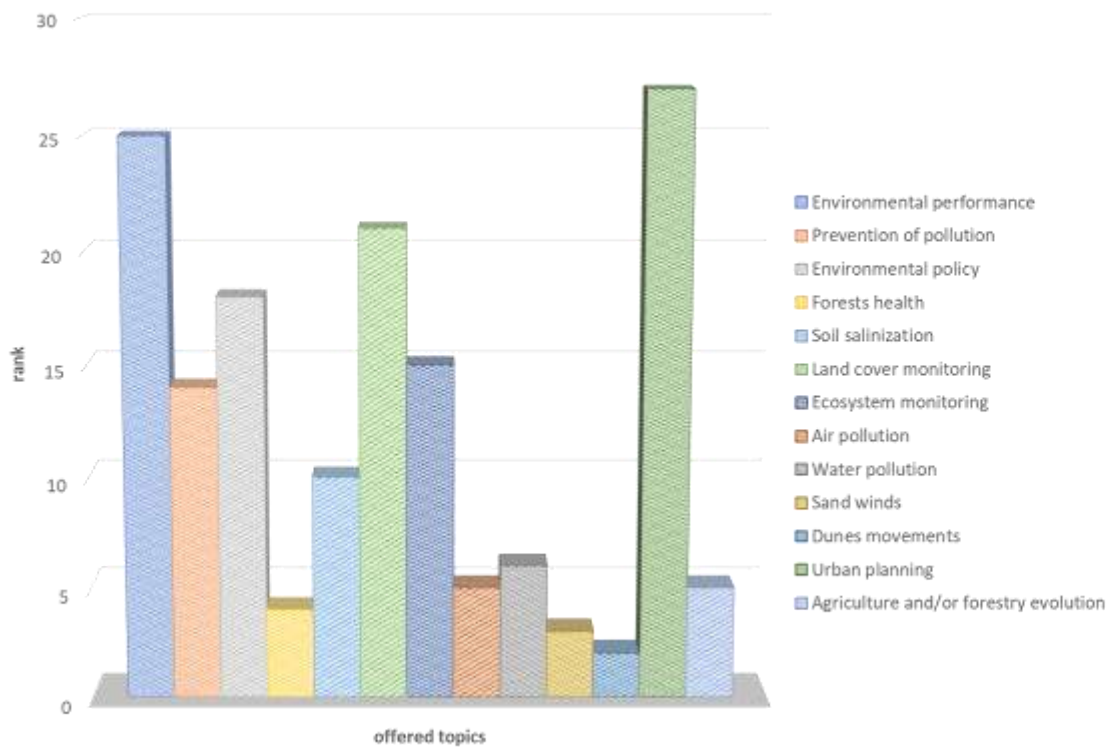


- Waste management.
- Industrial risks.
- Environmental Monitoring.
- Other type of Pollution.
- Land use planning.
- Public health.
- Sustainable development.
- Land contamination.
- Air/atmospheric emissions or emission of air pollutants.

4. What types of topics and practical works on environmental management should be discussed in this course?

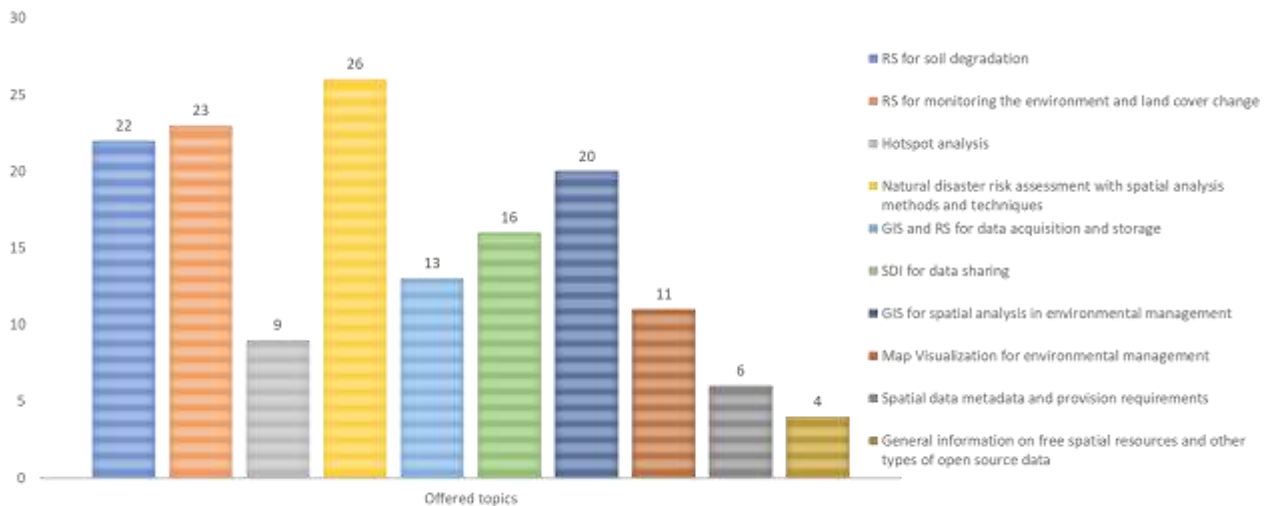
Mark	Offered topics
2	Environmental performance
6	Prevention of pollution
4	Environmental policy
10	Forests health
7	Soil salinization

3	Land cover monitoring
5	Ecosystem monitoring
9	Air pollution
8	Water pollution
11	Sand winds
12	Dunes movements
1	Urban planning
13	Agriculture and/or forestry evolution
	Other topics



5. What kind of topics relevant to Geographical Information Systems (GIS), Remote Sensing (RS) and Spatial Data Infrastructures (SDI) do you think are more relevant for the course development?

Mark	Offered topics
3	RS for soil degradation
2	RS for monitoring the environment and land cover change
8	Hotspot analysis
1	Natural disaster risk assessment with spatial analysis methods and techniques
6	GIS and RS for data acquisition and storage
5	SDI for data sharing
4	GIS for spatial analysis in environmental management
7	Map Visualization for environmental management
9	Spatial data metadata and provision requirements
10	General information on free spatial resources and other types of open source data
	Other topics



6. Which type of indicators related to Environmental Management does your Organization use?

- Biodiversity Indicators
- Type of land use
- Land slope
- Climate change

- Climate conditions
- Water resources capacity in the watershed and aquiferous basin
- Topology conditions
- People's participation rate
- Physical and structural infrastructures
- Indicator of carbon emission changes in the air
- Creating a monitoring system for water, air, and soil
- Creating, promoting, and developing new surveillance systems for monitoring environmental resources, improving the quality and quantity, and conserving biodiversity in protected areas
- Using terms, conditions, and standards related to the exploitation of resources for ecological resource management

7. Do you use GIS in your daily work?

	No
*	Yes.

If yes, in which type of processes? (Digitizing maps, risk assessment, site selection, map production, spatial data storage, etc.)

- 1- Digitizing maps and map production (the same importance)
- 2- spatial data storage
- 3- site selection
- 4- Risk assessment

*in order of importance

8. Do you use Remote Sensing data in your daily work?

	No
	Yes.

If yes, with which types of RS data (optical / multispectral / SAR / thermal, etc.)? And with which type of processing (image classification, change detection, map production, etc.)? What is the last update of each entry?

(Mostly answered No. Some said they are not up to date or are unclassified)

- Landsat images
- ETMT

- Sentinel images
- The changes and developments of the earth from the 1960s (40-year period)
- Bing and Google earth images
- Mostly optical and multispectral images for producing and updating maps
- RS data for classifying and diagnosing changes

9. What GIS and Remote Sensing software do you use? Please include versions if available.

- ArcGIS 10.6.1
- QGIS
- ILWIS
- Global map
- ArcGIS 10.5
- IDRISI
- Google Earth
- ENVI

10. Do you use other GIS and Remote Sensing software as intermediate?

If yes describe them into more details.

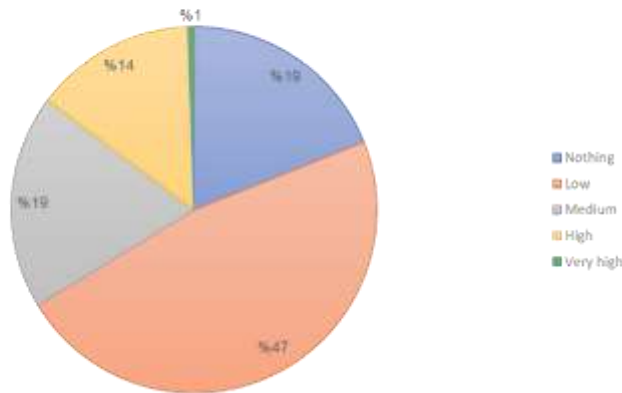
- 70% said No and 30% said Yes.
- They are used as intermediate or directly
- GPS utility and Global Mapper software

11. General knowledge and skills of your organization employees on GIS and RS?

- Basic GIS and RS courses are mandatory
- Most of the staff have low average knowledge

Average knowledge	Number of persons	% of staff involved in Environmental Monitoring (average)
Nothing	-----	19.04
Low	-----	47.6
Medium	-----	19.04
High	-----	14.28
Very high	-----	-----

% of staff involved in Environmental Monitoring (average)



12. Do you have any program / willingness to improve the competence attending distance courses?

- Everyone answered Yes
- Virtual and distance education promotes the basis for being up-to-date and coordinated
- Improvement of general knowledge on GIS and RS enhances supervisory skills

13. Would you like your staff to attend distance courses on GIS and RS to improve their competence?

	No
100%	Yes.

- Staff with relevant work field who have basic abilities to use the software and have interest in this area of education
- Promotes the managerial, calculation, and planning skills of the staff
- Participation in the relevant course is required to upgrade the staff's level of knowledge
- Improvement of the staff's software programming skills
- Courses for learning Python programming language, web operating system, and remote sensing software such as ENVI and IDRISI, and photogrammetry software such as LPS

WP 2. emGeo (environmental management Geoportal) need analysis

QUESTIONNAIRE 2

23. What types of spatial data do you use/or collect and update in your Organization?
- Spatial data
 - Non-spatial data (descriptive)
 - Digital maps from the National Cartographic Center in the scale of 1:25000
Aerial Photos from over 60 years ago and after
 - Satellite images from the google earth software / Sentinel images
 - Vector data in SHP format
 - Geo-scale data
 - Files and spatial data in AutoCAD format
24. What are the data sources that your Organization uses to get GIS/ RS data?
- Maps are either on paper, an image, from satellites, or data
 - From the National Cartographic Center, Geographic Organization of the Armed Forces, International websites which provide data, Consulting company offices in different scales.
 - google earth satellite images
 - Data from the Plan and Budget Organization
 - information from the Statistical Center of Iran (censuses results)
25. How does your Organization get the RS data it uses? (Download, buy, etc.)
- National Cartographic Center,
 - Forests, Range and Watershed Management Organization
 - Statistical center of Iran
 - International websites such as Google Earth
 - Satellite images from Google Earth and images from the "uses explore" website
26. What issues does your Organization face when downloading RS data?
- Low download speed
 - Out-of-date systems and software
 - Old data and information

- High cost of access to information
- Low accuracy of information
- Out-of-date websites and information
- Restrictions on access to some websites
- Out-of-date information about Iran in some websites

27. What types of base maps/ spatial data does your Organization have? (Types, scale range, information content, metadata availability).

- Land use
- Access Network
- Connection routes
- Maps in 1:25000 scale, from the National Cartographic Center
- Landsat satellite images
- Animal and herbal species
- Surface and underground water
- Distribution of natural and environmental resources
- Geological maps
- Soil classification
- Ecological potential maps
- Urban and industrial development maps
- 1:5000 and 1:10000 scale maps
- Statistical block maps

28. What kind of maps/ spatial data does your Organization have for environmental management? If possible, indicate if each entry is updated information or not.

- Updating data is very limited and time-consuming
- Basic SHP from land use data
- Land cover
- Topography
- Roads
- Animal and herbal species
- Soil classification
- Quality of resources
- Maps of protected areas
- Land use data

29. What kind of maps / spatial data does your Organization have for environmental risk analysis/ management?

- Maps of staff job description

- Basic urban maps
- Basic natural resources maps
- Topography maps
- Vegetation cover
- Land cover
- Infrastructure, herbal and animal species, and natural and environmental resources distribution
- Industrial and manufacturing centers
- Environmental hazards map in shapefile and AutoCAD format
- Geological maps (fault, slope, soil classification)
- Land cover
- Watercourse
- Ecological potential
- Waste

30. Is the data used by your Organization restricted, or free and available for use and/or publication?

- Data that can be provided and are not security data
- Data are provided freely specially to students, scholars, and researchers
- Supplying statistical maps and data with very low prices (introduction letter necessary)
- Free access for colleagues of executive organizations

31. Which functionalities does your Organization expect from emGeo?

*	Digitizing maps
*	Storing attributes
*	Visualizing data
*	Designing new patterns and symbols
*	Uploading data
	Other functionalities

32. Does your Organization have a fast / medium or slow Internet connection? (if possible, specify upload/download speed)

measure (Mbps)	Speed
256	<input type="checkbox"/> Slow * <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Fast

33. Does your Organization have any mechanism for data sharing? Describe it if any.

- Mostly said No
- This is the duty of intermediate and connector institutions
- Plan and budget organization answered → Through creating a consistent and integrated database
- producing an urban and regional SDI for cities of Qazvin province

4.2. Results in the scope of Yemen

4.2.1. Sana'a University

1. How does the Organization perform Environmental Management?

Performing Environmental Management:

1- Academic Institutions

a. Special Courses

For those academic institutions (Geography Department, Earth and Environmental Science department, Faculty of Agriculture, Water and Environmental Centre WEC) they deliver specialized courses in Bsc, Msc and Phd.

b. Conducting Research

For those academic institutions (Geography Department, Earth and Environmental Science department, Faculty of Agriculture, Water and Environmental Centre WEC, Yemen Remote Sensing and GIS Centre). They prepare researches related to EM using Remote Sensing and GIS techniques.

2- Environmental Protection Authority (EPA)

- Preventing and combating pollution causes.
- Monitoring environment.
- Protecting natural resources.

3- Public Work Development (PWD)

- pilot studies and field visits for the locations and their environments.
- Follow up studies after executing any project to detect environmental impacts.

4- Social Fund for Development (SFD)

- SFD has Environmental and Social Management Framework (ESMF) used in implementing its various service projects.
- Community consultations.

5- Ministry of Agriculture and Irrigation (MAI)

- they have environmental Impact Assessment (EIA) framework to measure environment impact before any project.
- Monitoring EIA during the project to evaluate negative and positive impacts.

6- Ministry of Fishery

- Surfing and diving to detect pollution along coastal zone and marine life.

7- General Authority for Land survey and Urban Planning

- Taking environmental standards into account according to environmental laws during urban planning.

8- Yemen Telecom

- No EM concerns.

9- Authority of Water and Sanitation

- Field investigations for water wells to find out polluted water using scientific laboratory tests.

10- Emergency Unit of the General Authority for Rural Water Supply Projects (EUGARWSP)

- Assessing environmental impacts before intervention as to improve water and sanitation services based on the WHO standards.

11- Civil Aviation and Meteorology Authority (CAMA)

- Monitoring climate and weather, recording and collecting daily meteorology data by using satellite and Doppler images.

12- Public Electricity Company (PEC)

- GIS electricity digital map to identify the locations of the transfer centers to access electricity to residential areas and the detection of sources of faults quickly.

13- Central Statistical Organization (CSO)

- Collecting, preparing, processing and disseminating of statistical data and information in Yemen.
- Doing field investigation for all social, environmental and natural resources.
- Sharing environmental data with other governmental authorities and sectors.

2. How does the Organization undertake/run Environmental Risk Management Programme(s)?

1. Academic Institutions

- Geography Department, earth and environmental science Department, Faculty of Agriculture, and Water and Environmental Centre (WEC) conduct projects and researches in environmental and risk assessment such as ground water pollution, air pollution, waste materials, flooding, landslide, geological hazards and civil war impacts.
- Yemen Remote Sensing and GIS Centre implements researches related to risk management using remote sensing and GIS

2. Environmental Protection Authority (EPA)

- According to the laws, regulations and environmental legislation.

3. Public Work Development (PWD)

- By using models and check lists.

4. Social Fund Development (SFD)

- By using Environmental and Social Management Plan (ESMP) developed by both SFD and local communities.

- SFD supervises and monitor projects to mitigate risks.

5. Ministry of Agriculture and Irrigation (MAI)

- Recieves risk information from farmers and conducts field investigation, suggesting solutions

- Intervention as to avoid or reduce risk impacts.

6. Ministry of Fishery

- Detecting and investigating pollution areas and informing the governmental authorities to take actions.

7. General Authority for Land survey and Urban Planning

- According to the laws, regulations and environmental legislations of urban planning.

8. Yemen Telecom

- No risk.

9. Local Authority for Water and sanitation

- Closing the polluted water wells.

- Field investigation.

10. Emergency Unit of the General Authority for Rural Water Supply Projects (EUGARWSP)

- Investigating of the clusters where Colera cases.

- Media awareness

11. Civil Aviation and Meteorology Authority (CAMA)

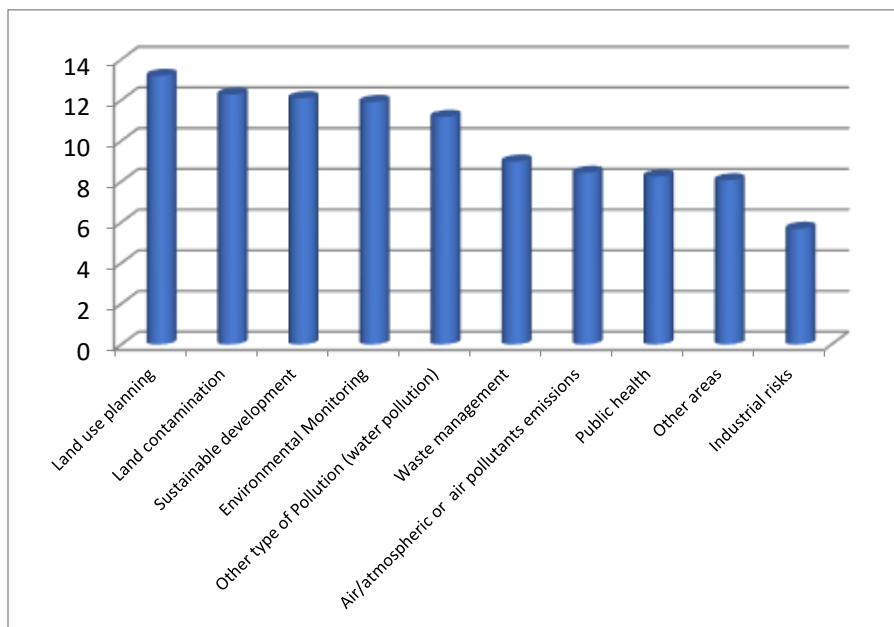
- Daily media awareness about the weather condition.

12. Public Electricity Company (PEC)

- No risk awareness.

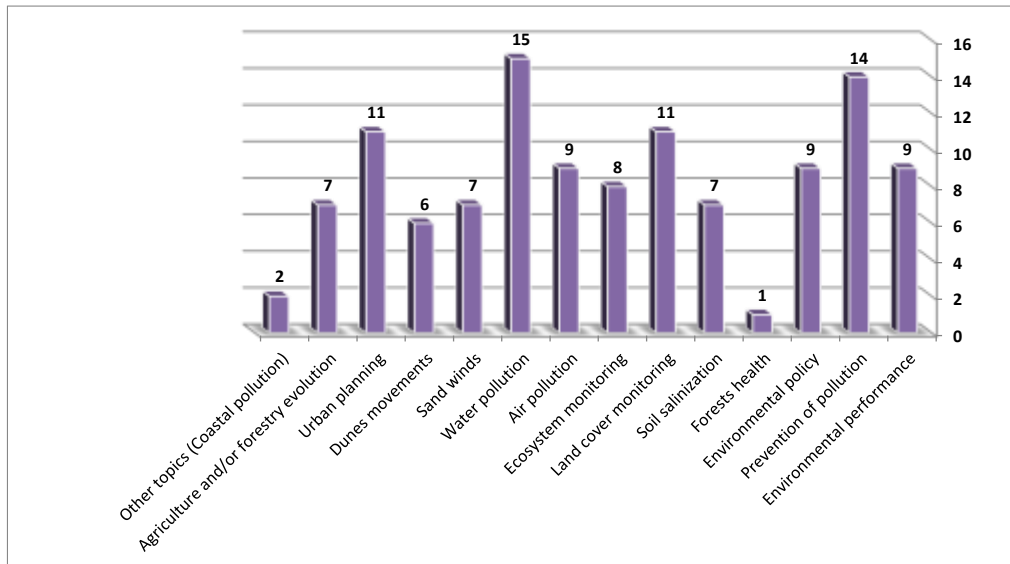
3. In which areas of Environmental Analysis/Management does your Organization act (select from the list below)? Rank each of them according to their importance to your country.

Application areas	%
Land use planning	13.18681
Land contamination	12.27106
Sustainable development	12.08791
Environmental Monitoring	11.90476
Other type of Pollution (water pollution)	11.17216
Waste management	8.974359
Air/atmospheric or air pollutants emissions	8.424908
Public health	8.241758
Other areas	8.058608
Industrial risks	5.677656



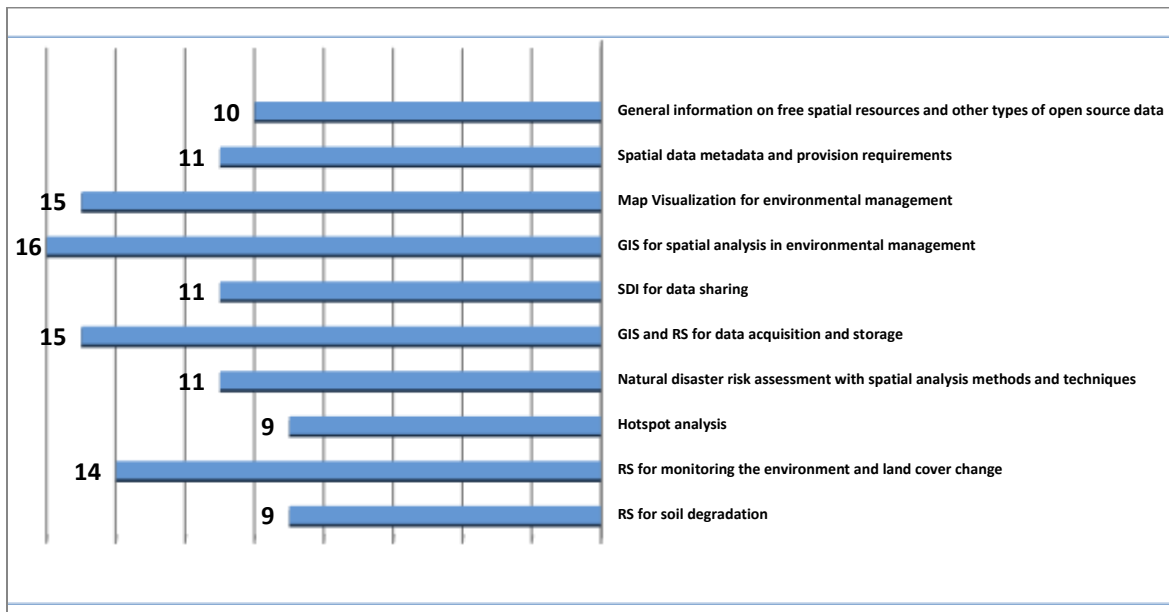
4. What types of topics and practical works on environmental management should be discussed in this course?

Offered topics	Frequency	%
Environmental performance	9	7.76%
Prevention of pollution	14	12.07%
Environmental policy	9	7.76%
Forests health	1	0.86%
Soil salinization	7	6.03%
Land cover monitoring	11	9.48%
Ecosystem monitoring	8	6.90%
Air pollution	9	7.76%
Water pollution	15	12.93%
Sand winds	7	6.03%
Dunes movements	6	5.17%
Urban planning	11	9.48%
Agriculture and/or forestry evolution	7	6.03%



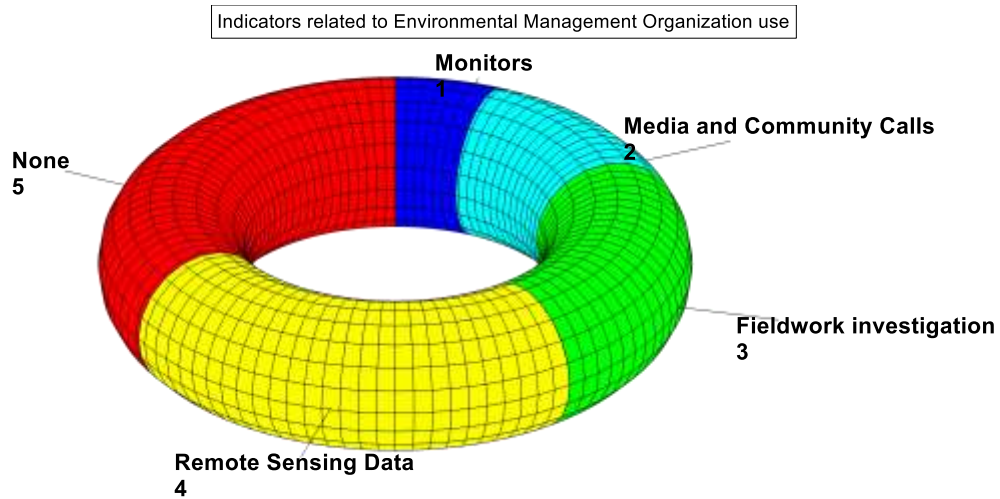
5. What kind of topics relevant to Geographical Information Systems (GIS), Remote Sensing (RS) and Spatial Data Infrastructures (SDI) do you think are more relevant for the course development?

Offered topics	Frequency	%
RS for soil degradation	9	7.44%
RS for monitoring the environment and land cover change	14	11.57%
Hotspot analysis	9	7.44%
Natural disaster risk assessment with spatial analysis methods and tech	11	9.09%
GIS and RS for data acquisition and storage	15	12.40%
SDI for data sharing	11	9.09%
GIS for spatial analysis in environmental management	16	13.22%
Map Visualization for environmental management	15	12.40%
Spatial data metadata and provision requirements	11	9.09%
General information on free spatial resources and other types of open so	10	8.26%

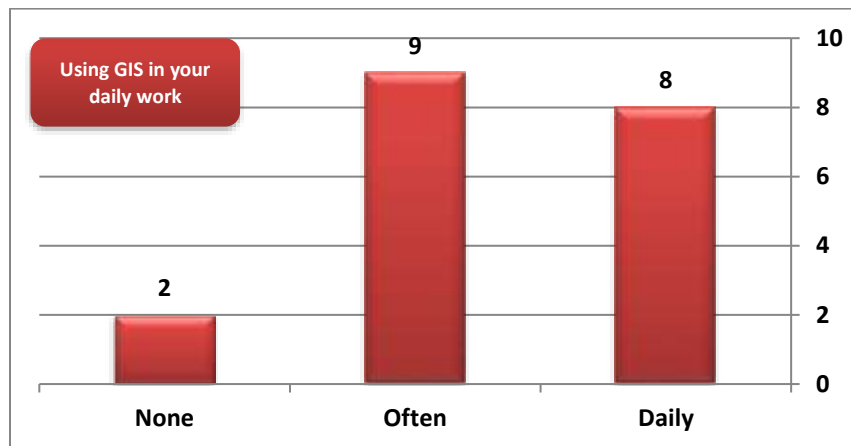


6. Which type of indicators related to Environmental Management does your Organization use?

Topics	Frequency	%
Monitors	5	13.89%
Media and Community Ca	9	25.00%
Fieldwork investigation	15	41.67%
Remote Sensing Data	6	16.67%
None	1	2.78%

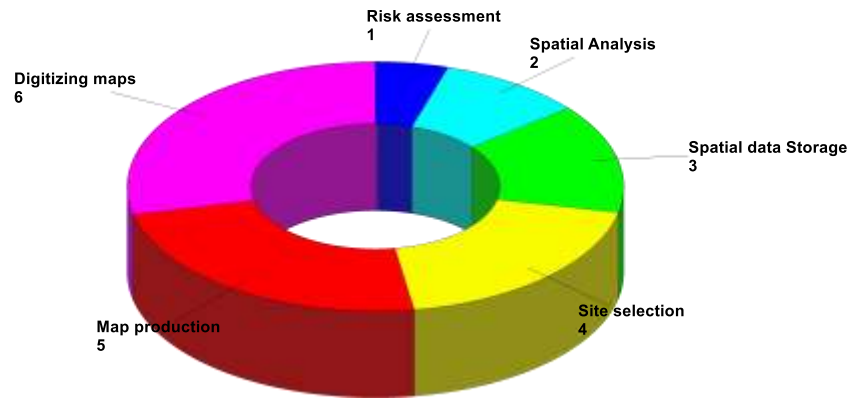


7. Do you use GIS in your daily work?

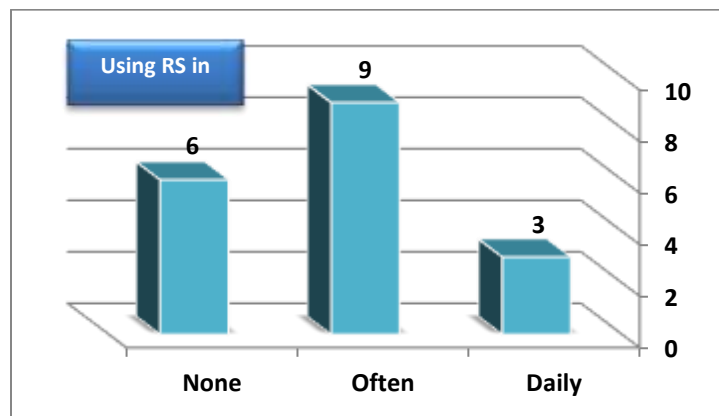


If yes, in which type of processes? (Digitizing maps, risk assessment, site selection, map production, spatial data storage, etc.)

Topics	Frequency	%
Digitizing maps	18	33.33%
Risk assessment	4	7.41%
Site selection	9	16.67%
Map production	10	18.52%
Spatial data Storage	8	14.81%
Spatial Analysis	5	9.26%

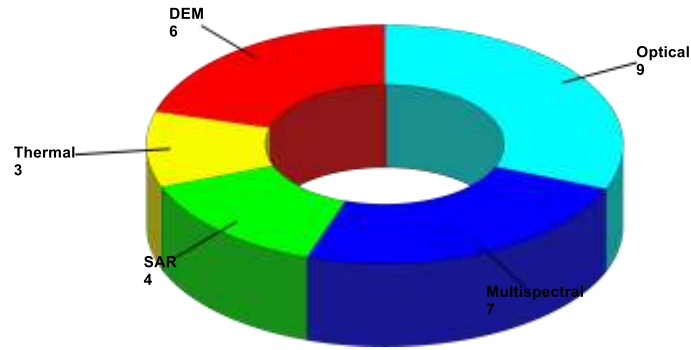


8. Do you use Remote Sensing data in your daily work?



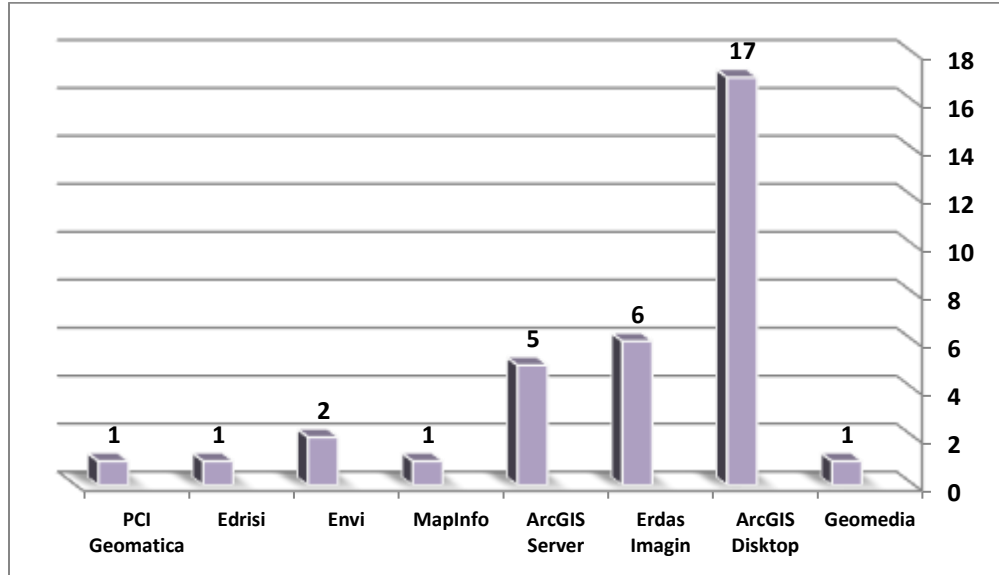
If yes, with which types of RS data (optical / multispectral / SAR / thermal, etc.)? And with which type of processing (image classification, change detection, map production, etc.)? What is the last update of each entry?

Topics	Frequency	%
Optical	9	31.03%
Multispectral	7	24.14%
SAR	4	13.79%
Thermal	3	10.34%
DEM	6	20.69%



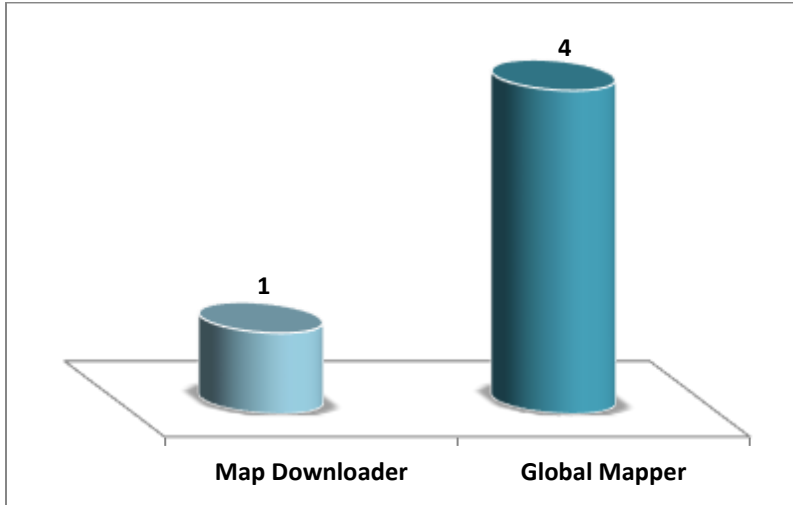
9. What GIS and Remote Sensing software do you use? Please include versions if available.

Topics	Frequency	%
Geomedia	1	2.94%
ArcGIS Disktop	17	50.00%
Erdas Imagin	6	17.65%
ArcGIS Server	5	14.71%
MapInfo	1	2.94%
Envi	2	5.88%
Edrisi	1	2.94%
PCI Geomatica	1	2.94%

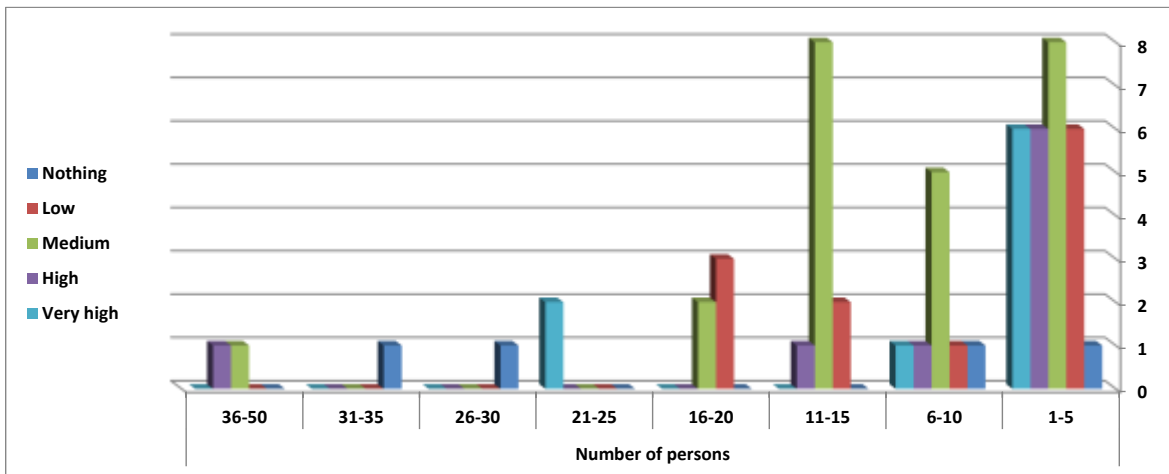


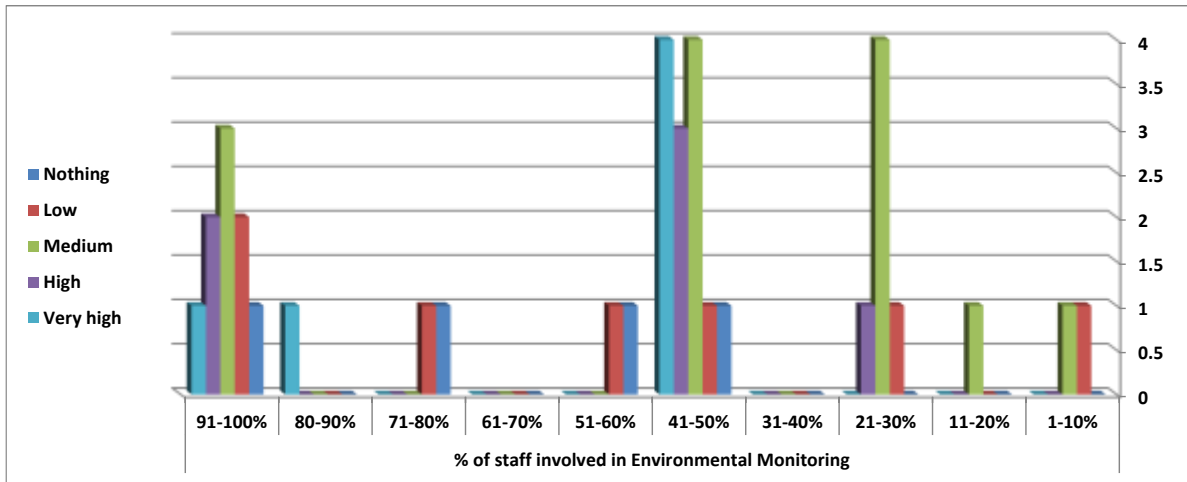
10. Do you use other GIS and Remote Sensing software as intermediate?

If yes describe them into more details.

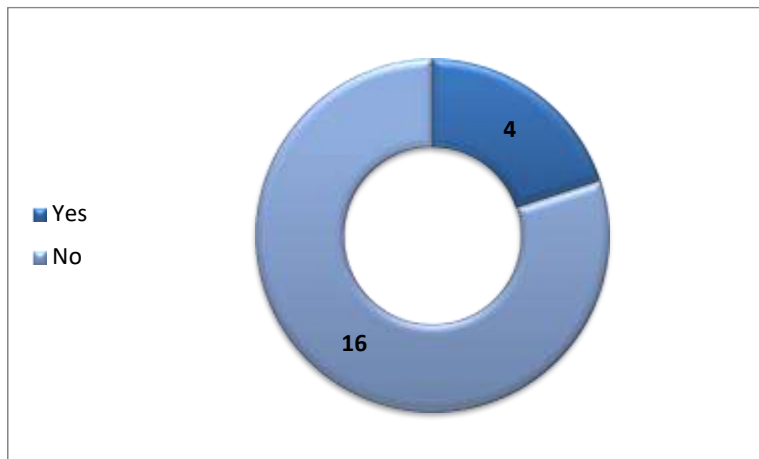


11. General knowledge and skills of your organization employees on GIS and RS.

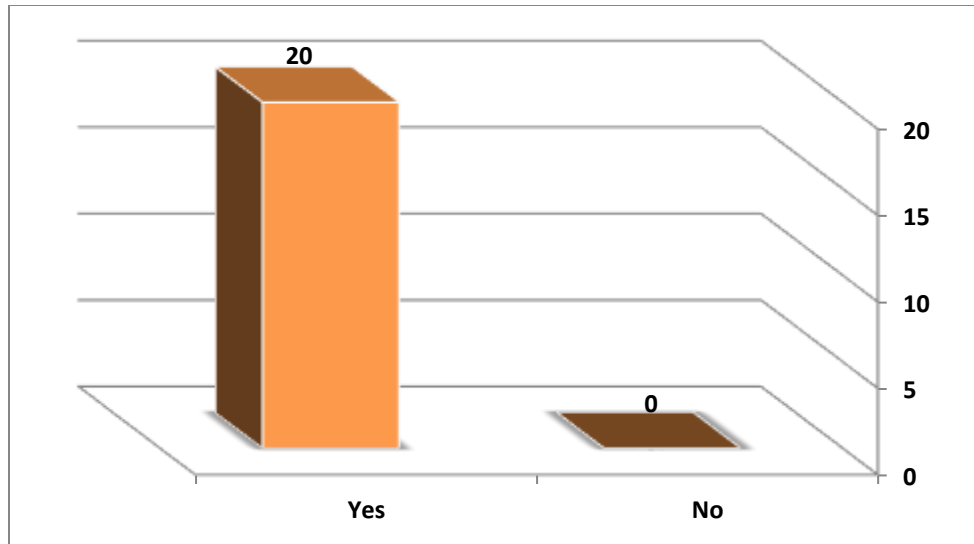




12- Do you have any program / willingness to improve the competence attending distance courses?



13. Would you like your staff to attend distance courses on GIS and RS to improve their competence?

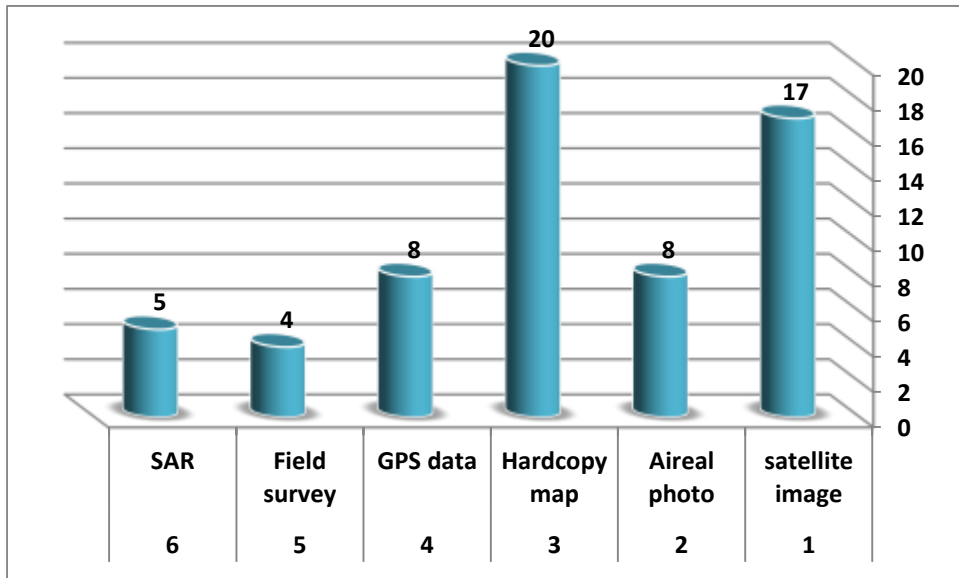


WP 2. emGeo (environmental management Geoportal) need analysis

QUESTIONNAIRE 2

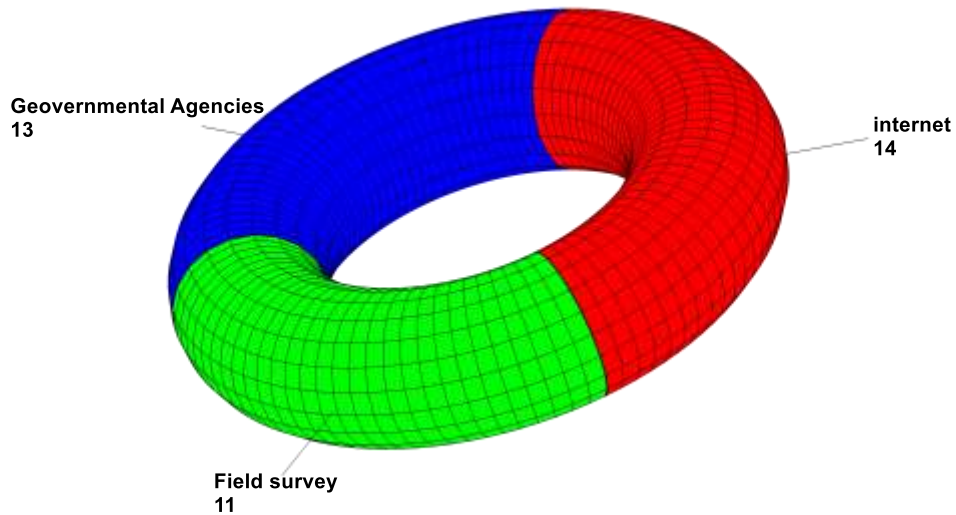
34. What types of spatial data do you use/or collect and update in your Organization?

Topics	Frequency	%
satellite image	17	27.42%
Aireal photo	8	12.90%
Hardcopy map	20	32.26%
GPS data	8	12.90%
Field survey	4	6.45%
SAR	5	8.06%

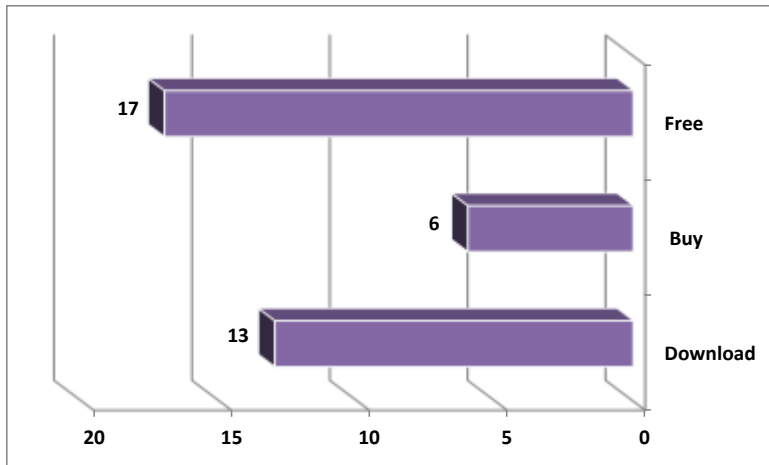


35. What are the data sources that your Organization uses to get GIS/ RS data?

Topics	Frequency	%
Internet	14	36.84%
Field survey	11	28.95%
Governmental Agencies	13	34.21%

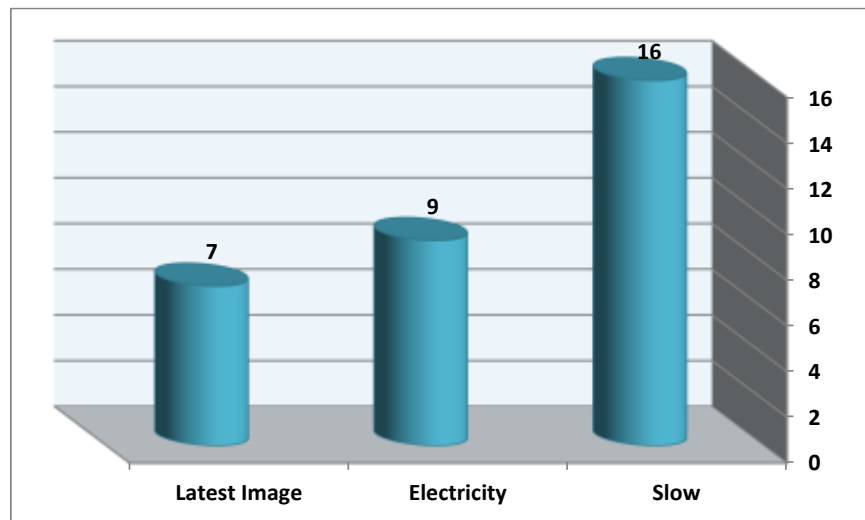


36. How does your Organization get the RS data it uses? (Download, buy, etc.)



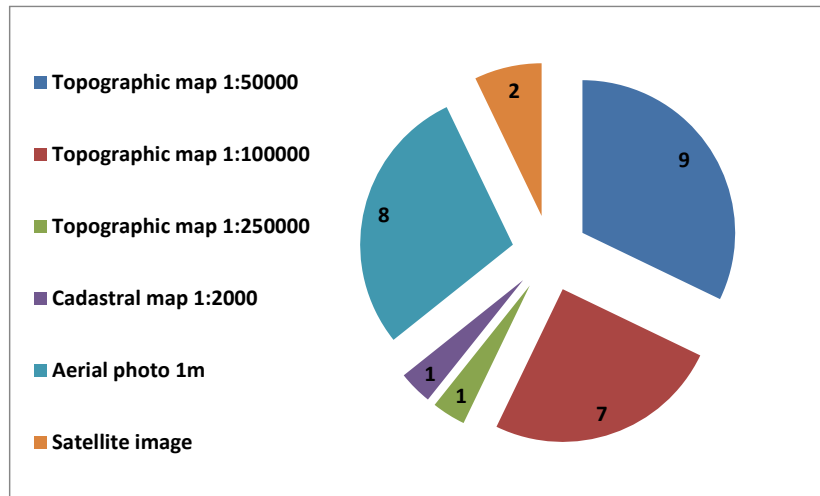
37. What issues does your Organization face when downloading RS data?

Topics	Frequency	%
Slow	16	50.00%
Electricity	9	28.13%
Latest Image	7	21.88%



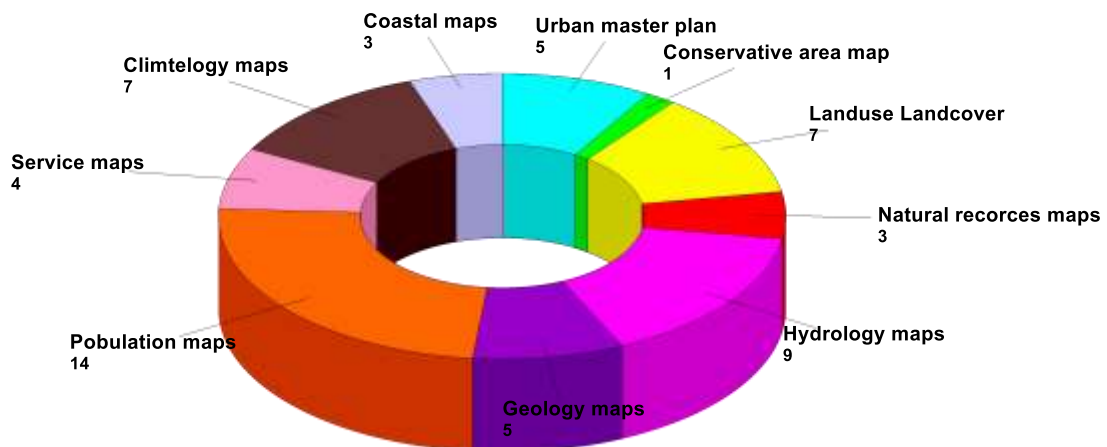
38. What types of base maps/ spatial data does your Organization have? (Types, scale range, information content, metadata availability).

Topic	Frequency	%
Topographic map 1:50000	9	32.14%
Topographic map 1:100000	7	25.00%
Topographic map 1:250000	1	3.57%
Cadastral map 1:2000	1	3.57%
Aerial photo 1m	8	28.57%
Satellite image	2	7.14%



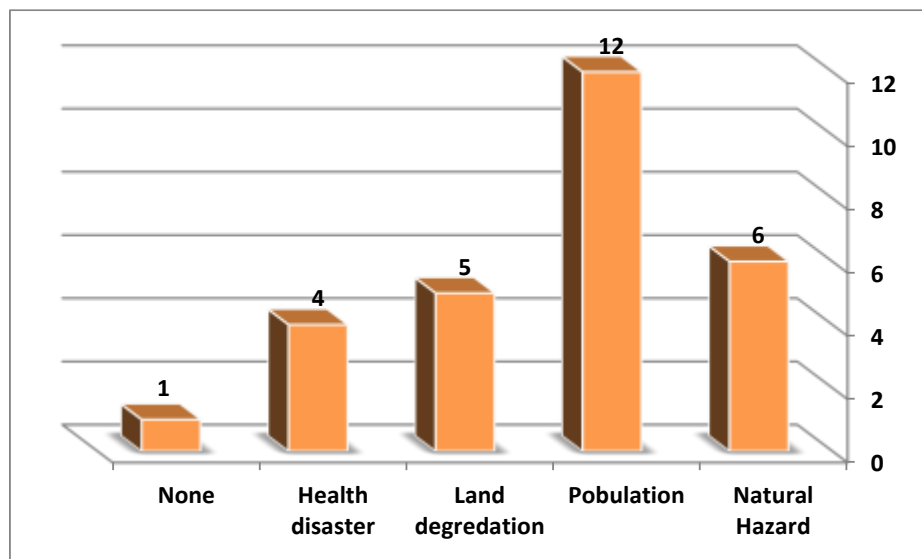
39. What kind of maps/ spatial data does your Organization have for environmental management? If possible, indicate if each entry is updated information or not.

Topics	Frequency	%
Urban master plan	5	8.62%
Conservative area map	1	1.72%
Landuse Landcover	7	12.07%
Natural recources maps	3	5.17%
Hydrology maps	9	15.52%
Geology maps	5	8.62%
Pobulation maps	14	24.14%
Service maps	4	6.90%
Climtelogy maps	7	12.07%
Coastal maps	3	5.17%



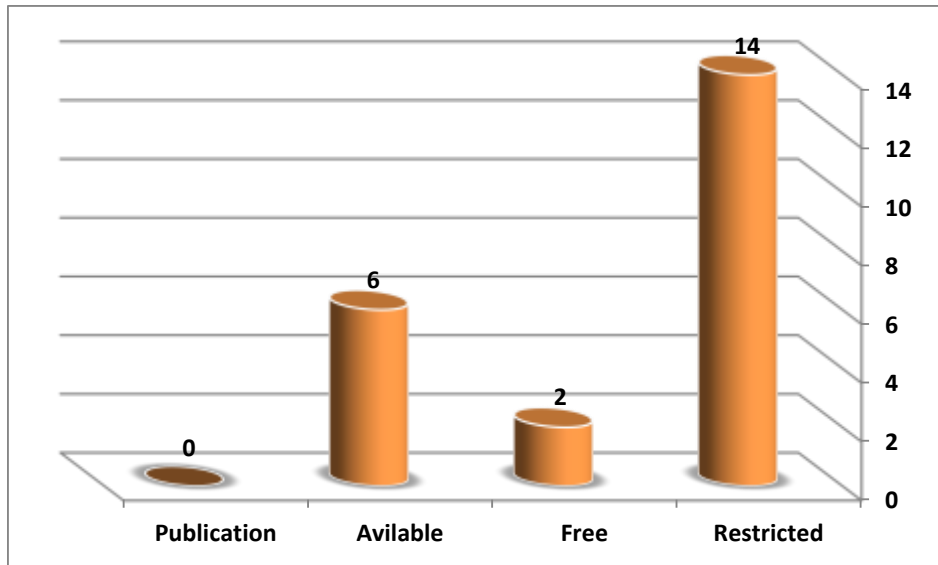
40. What kind of maps / spatial data does your Organization have for environmental risk analysis/ management?

Topics	Frequency	%
Natural Hazard	6	21.43%
Pobulation	12	42.86%
Land degredation	5	17.86%
Health disaster	4	14.29%
None	1	3.57%



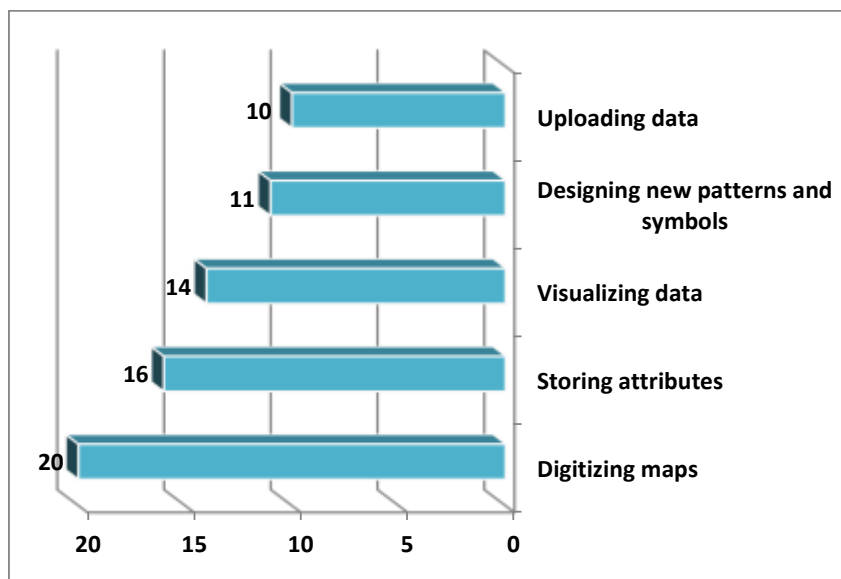
41. Is the data used by your Organization restricted, or free and available for use and/or publication?

Topics	Frequency	%
Restricted	14	70.00%
Free	2	10.00%
Avilable	6	30.00%
Publicatiorn	0	0.00%

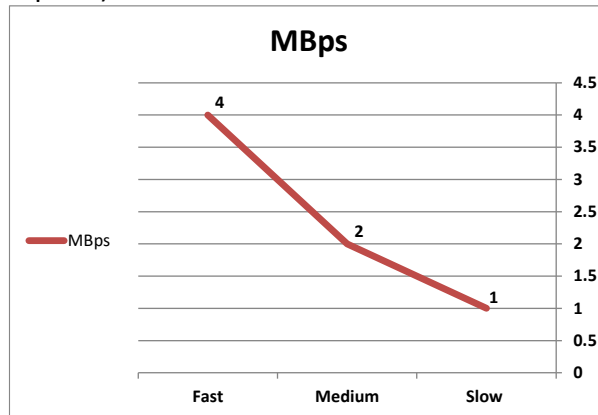


42. Which functionalities does your Organization expect from emGeo?

Topics	Frequency	%
Digitizing maps	20	28.17%
Storing attributes	16	22.54%
Visualizing data	14	19.72%
Designing new patterns and symbols	11	15.49%
Uploading data	10	14.08%

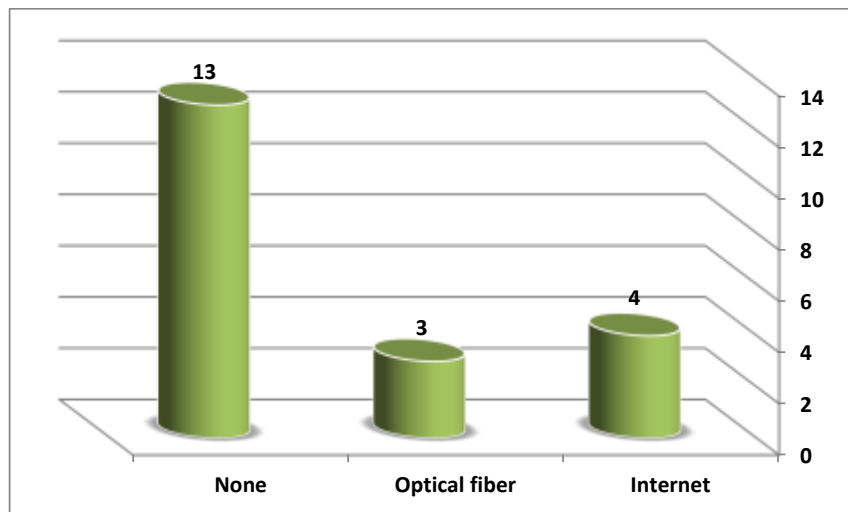


43. Does your Organization have a fast / medium or slow Internet connection? (if possible, specify upload/download speed)?



44. Does your Organization have any mechanism for data sharing? Describe it if any.

Topics	Frequency	%
Internet	4	20.00%
Optical fiber	3	15.00%
None	13	65.00%



4.2.2. Taiz University

The questionnaire results

After returning from Sweden to Yemen, the working group participating in the Lund University meeting from 28 February to 1 March met with the non-participating team in Yemen and conveyed to it what was discussed and agreed upon at the Swedish Lund university meeting. Then, the team shared the job of carrying out the questionnaire in Taiz governorate and the surrounding areas.

The team began working on translating the questionnaire into Arabic and then printing it. The team then shared the field survey tasks for the targeted government and non-government bodies, especially in three governorates (Taiz, Ibb and Aden). The team identified the work to be done within three weeks. In The first week the team would have to translate the questionnaire, print it and distribute it to the different parties. The second week was set up to collect the questionnaire from the target groups and study the problems they faced during the questionnaire execution to suggest some possible solutions. The third week was set up to analyze it and then translate it into English and then write the report and send it to the competent committee in the project at Lund university.

During the working period, the team faced some difficulties and found unexpected facts directly related to the questionnaire, the most important of which were the following:

- the city of Taiz was a hotbed of street fighting resulted in the closure of some offices located in the area of armed clashes, which led to the slow pace of work and stopped it for a whole week until things returned to normal.
- Field visits showed that all the target parties do not have any paper or digital data, and all the infrastructure, appliances, laboratories, electricity and buildings were destroyed, some of them partially, while others were completely destroyed.
- Most of the administrative and technical personnel are not present in these institutions because of the circumstances of the war, which made some institutions use staff who are not experienced in information management and systems.
- Most respondents were unable to fill in the questionnaire due to the absence of awareness of the environment as a whole, as well as GIS & RS due to war and displacement and the relocation of institutions from the clash zone to safer areas within the city.
- Some authorities attributed the lack of availability of remote sensing and geographic information systems personnel to the centralization of decisions related to the central government in the capital Sana'a and that thus, all the data and information they need about the environment reach them from the central government.
- Some of the target groups considered that the financial and legal aspects is beyond the lack of availability of laboratories, software, infrastructure for remote sensing and

geographic information systems, and they lacking government support and private sector participation in supporting this type of knowledge.

- Some institutions related to the environment have administrative and technical staff specialized in the field of environment, but they do not know the technology of remote sensing and geographic information systems because the staff available don't know about that they don't keep up-to-date with the environmental programs and keep up with science and technology related to it.
- Some research and scientific institutions do not have the technology of remote sensing and GIS in their research or teaching as some universities have shown that there is no systematic course in these techniques within their different faculties; And in the field of scientific research it is indicated that researchers develop themselves personally or they make use of Experiences in remote sensing and GIS in some areas of their research.
- The field visits and interviews with employees in the various institutions revealed the consensus of the need for training, training and readiness to train some employees within their institutions to keep abreast of modern technologies.
- It is indicated there is an urgent need for descriptive geographical and special information and data during wartime or post-war periods, especially since most of the data available in some institutions were destroyed in whole or in part as well as the migration and exodus of remote sensing and GIS specialists.

And those surveyed are as in the following table:

	Organization name	Number of Staff
1	Al-Hikma University /Taiz	60
2	General Authority of Land Survey& Urban Planning/Taiz	179
3	Improvement Cleaning Fund /Taiz	2400
4	Agricultural Research &Extension Authority/Taiz	Not indicated
5	Taiz Information Center	19
6	Estidama Foundation for The Conservation of Nature /Aden	Not indicated
7	Department of Geography Aden University	15
8	Environment Protection Authority /Aden	14
9	Ibb University	500

- The first question was about: How does the Organization perform Environmental Management?

The answer ranged from the concerned authorities as follows:

- There is no management

- Through urban plans, sweeping the streets and removing waste from the streets of the city.
 - Studying and surveying natural resources and knowing the human damage that leads to the deterioration of natural resources.
 - There is no management.
 - According to a clear strategy aimed to protecting the human and protecting natural resources to ensure their safety and sustainability.
 - Setting plans and setting goals and policies.
 - It is not indicated.
- The second question was about: How does the Organization undertake/run Environmental Risk Management Programme(s)?

The answer varied as follows:

- Training as much as possible
 - According to programs prepared by the Environment Department
 - Through security and safety
 - Studies of endemic, rare and endangered species are carried out according to the nature conservation division.
 - There is no answer
 - Government offices
 - Open source sites
 - Purchase of satellite imagery data
 - Google Earth
 - Not indicated.
- The third question was about: In which areas of Environmental Analysis/Management does your Organization act (select from the list below)?

The answer was different among the target bodies as shown in Table 3 at the end of the report.

The fourth question: What types of topics and practical works on environmental management should be discussed in this course?

The answer was different among the target parties, some of them expressed interest in some aspects and neglected other aspects as shown in Table 4 at the end of the report.

However, there are two areas covered by the questionnaire that added some points of interest to them and are not mentioned in the questionnaire. The Agricultural Research

Authority requested the addition of the subject of environmental monitoring programs, while the General Authority for the Protection of the Environment - Aden requested the addition of two topics, disaster risk management and the management of nature resources.

- The fifth question was about: What kind of topics relevant to Geographical Information Systems (GIS), Remote Sensing (RS) and Spatial Data Infrastructures (SDI) do you think are more relevant for the course development?

The answer was different among them as shown in Table 5 at the end of the report. Agriculture research authority asked for the addition of the one topic, which is Risk Management.

- The sixth question was: Which type of indicators related to Environmental Management does your Organization use?

The answer ranged from those studied was as follows:

- Not indicated.
- Through reports from the field of work and hygiene monitors.
- Knowing the dangers that threaten the protection of the environment, such as grazing, and improving them.
- The percentage of achievement in the general plan of the institution and the institutional commitment to the environmental issues and its communication with the community groups, local bodies and external bodies to achieve satisfactory results.
- Commitment to environmental monitoring program.
- The seven question was about: Do you use GIS in your daily work? If yes, what type of processes use? (Digitizing maps, Risk assessment, site selection etc.)?

Most respondents answered “yes”. but two answered “no”. The answer ranged from those who said yes, as follows:

- Digitizing maps.
- Site selection, data collection, storage and data processing.
- Collection, storage and processing data, and site selection for risk assessment.
- The eighth question was: Do you do use Remote Sensing in your daily work. If yes, If yes, with which types of RS data (optical / multi spectral / SAR / thermal, etc.)? And with which type of processing (image classification, change detection, map production, etc.)? What is the last update of each entry?

Most of the answers were “yes”, and the answer to those who said yes varied as follows:

- Google and Google Earth.
 - Data collection, use of databases and knowledge of land area.
 - Data collection, database completion, road drawing and building drawings.
- The ninth question was: What GIS and Remote Sensing software do you use? Please include versions if available.

The responses varied among the studied bodies as follows:

- There is no program.
- Network Maps and Neighborhood blocks maps.
- Not indicated.
- ArcMap, Kododelling map, erdas, twinsPAN, DivaGIS
- Erdas, ArcGIS, Google earth, QGTS
- ArcGIS, Erdas

The tenth question was: Do you use other GIS and Remote Sensing software as intermediate?

- If yes describe them into more details.

The answer varied as follows:

- No.
- Yes, via Internet and Google Earth.
- Not indicated.
- Yes, modeling and sampling on topographic maps and area selection.

General knowledge and skills of your organization employees on GIS and RS.

- no knowledge
- low
- medium

Twelve question was: Do you have any program / willingness to improve the competence attending distance courses?

There was a difference in the responses of the participants in the questionnaire as follows:

- Yes.
 - Yes, and encouragement financially and administratively.
 - General programs.
 - Preparing databases for the center and linking them with other entities, publishing data on the internet and telephone applications.
 - Not indicated.
 - ArcView.
-
- The twelfth question was about would you like your staff will attend distance courses on GIS and RS to improve their competence?

The answer was “yes” to all the respondents.

5. Summary/ Conclusion and Recommendation

Field visits showed that all the target parties do not have any paper or digital data, and all the infrastructure, appliances, laboratories, electricity and buildings were destroyed, some of them partially, while others were completely destroyed.

In Iran the situation is somehow different and the data is available in many cases but still there is a problem in accessing/ using the spatial / descriptive datasets.

Most of the administrative and technical personnel are not present in these institutions in Yemen because of the circumstances of the war, which made some institutions use staff who are not experienced in information management and systems.

Most respondents were unable to fill in the questionnaire due to the absence of awareness of the environment as a whole, as well as GIS & RS due to war and displacement and the relocation of institutions from the clash zone to safer areas within the city.

Some authorities attributed the lack of availability of remote sensing and geographic information systems personnel to the centralization of decisions related to the central government in the capital Sana'a and that thus, all the data and information they need about the environment reach them from the central government.

Some of the target groups considered that the financial and legal aspects is beyond the lack of availability of laboratories, software, infrastructure for remote sensing and geographic information systems, and they lacking government support and private sector participation in supporting this type of knowledge.

Some institutions related to the environment have administrative and technical staff specialized in the field of environment, but they do not know the technology of remote sensing and geographic information systems because the staff available don't know about that they don't keep up-to-date with the environmental programs and keep up with science and technology related to it.

Some research and scientific institutions do not have the technology of remote sensing and GIS in their research or teaching as some universities have shown that there is no systematic course in these techniques within their different faculties; And in the field of scientific research it is indicated that researchers develop themselves personally or they make use of Experiences in remote sensing and GIS in some areas of their research.

The field visits and interviews with employees in the various institutions revealed the consensus of the need for training, training and readiness to train some employees within their

institutions to keep abreast of modern technologies.

It is indicated there is an urgent need for descriptive geographical and spacial information and data during wartime or post-war periods, especially since most of the data available in some institutions were destroyed in whole or in part as well as the migration and exodus of remote sensing and GIS specialists.

The Regional Water Authority: related information is collected by some stations and observation wells. They analyze data to create maps and monitor the water table drop down. They are responsible for control the groundwater pumping and issuing the permit for digging new wells. They are also managing the surface water bodies and establish a new dam and use them. However, the lack of knowledge and instruments in some cases make problems to make proper desicions.

The Environmental Protection office: Protecting actions are mostly carried out by field studies. Protecting actions are based on continuously monitoring, analyses, and evaluations. Actions are carried out by field studies, and sometimes by satellite images. Accordingly, decisions, management and protection activities plans are developed. Nevertheless, due to the recent flood happend in the region, most of the infrastructures damaged and/ or broken. Also, due to the disaster happened in the region, the lack of desicion making and disaster management is noticeable.

The Agricultural Jihad Organization: They are responsible for monitoring agricultural fields and crop yield estimation, agricultural field diseases detection and protection, and agricultural planning and management. They distribute pesticides for crops and fertilizer to increase the crop yield. They are also monitoring soil erosion and soil ecological conditions. There are a number of problems in this area which the most challenging issue is the lack of knowledge as well as the enough and accurat instruments for the field measurements.

The Forest, Range and Watershed Organization mostly use field observation and sometimes satellite images to environmental management. Main EM activities are the followings: monitoring the soil erosion and soil ecological conditions, rational use of land resources, monitoring land degradation and ranges. Due to the same circumstances, the need for an SDI is crucial.

All the organizations interviewed did not have any specific programs for environmental risk management and did not undertake an Environmental Risk Management program. Therefore, there is a general issue to develop a program based on an SDI as well as a geoportal as an infrastructure for data sharing. Also, the lack of knowledge in undrestanding modells and DSS is another main challenge which needs a skill improvement in this area.

They use GIS and satellite images to perform Environmental Management. ArcGIS is the popular GIS software, and they use ENVI and ILWISS to visualization and processing of the satellite images.

They do not use data sharing, and most of them did not have any information about SDI. They are very keen to attend distance courses.

The results of the Requirement Analysis Questionnaire show that the academic institutions perform their management by conducting courses and researches while the governmental institutions have different framework and methodology to perform their environmental management. The most areas of environmental management applications are land use planning, land contamination, Sustainable development, Environmental Monitoring and water pollution.

Most of the academic institutions and governmental agencies often use GIS and Remote sensing Techniques for environmental management but they used these Techniques for simple processes such as digitizing maps and map production.

Results show that Water pollution, Prevention of pollution, land cover monitoring and urban planning, Air pollution / Dust storms, Coastal management were among the most important topics to be included and discussed in any future courses.

GIS for spatial analysis in environmental management, Map Visualization for environmental management, GIS and RS for data acquisition and storage, RS for monitoring the environment and land cover change were found to be the most relevant topics for the course development in GIS, RS and SDI.

Most of the institutions have huge amount of spatial data such as Aerial photography, satellite images, thematic maps, but they lack the ability to manage this data and have no mechanism for sharing.

In conclusion it must be said that in addition to the activities that have taken place in the fields of SDI, GIS, and RS that are mentioned in the answers, the respondents mentioned a lot of difficulties and problems related to these areas in the local level and thus in the whole country. Besides from some parts in which their organizations have been involved and are working in, there are many other areas that work is needed to be done but the required materials are not available. Some organizations also faced the lack of experts in these fields and also complained about the low level of education of their staff members. Gathering data is also an issue for many organizations which is linked to the shortage of equipment.

Overall three general issues can be concluded from this questionnaire:

- Lack of sufficient and proper equipment and facilities (not being able to use GIS in all sectors and areas and collect the required information)
- Lack of a comprehensive and professional education system (we don't have many GIS specialists with high skills) and the fact that they don't have enough time to go for a complete program due to an overload job responsibility!
- Failure to utilize the full capacity of GIS (the most recent example is the wide-spread flood which involved a large part of the country and according to the Head of the

National Disaster Management Organization would have been less destructive if we used GIS with its full capacity)

- In some cases, there is a so called a local SDI implemented but there is no specific method for assessment and check if it is in the right direction or not?
- Groundwater vulnerability assessment to pollution is considered as one of the main challenges due to the traditional methods and also overdrown of water.

Recommendations:

1. All the institutions and organizations that have been surveyed reported the need to improve their environmental management by using GIS and RS techniques for data analysis and management and learn more about SDI-T.
2. There is a need to improve the quality of education and by including GIS and RS techniques in B.A and M.A programs.
3. Improving the quality of education and teaching by providing online learning programs.
4. Establishing Geoportal for environmental management spatial data.
5. Due to some limitations for using commertial softwares, the willingness for the open source software is increasing rapidly.

Annex I

Questionnaire

EMME project Description:

The main aim of our project is to build capacity, using spatial methods, for better environmental management in the Middle East (ME). Detailed objectives of the project are:

- Developing innovative and blended courses in Spatial Data Infrastructures and Technologies (SDI-T) for environmental management: The developed courses will be offered by partner universities as short courses to the environmental management authorities in ME. They will also be used as complementary courses in the master programs.
- Training of trainers: Faculty members at the partner universities will be trained on how to teach the developed courses. The ability of local teachers to teach and update these courses guarantees lifelong learning and continuation of the education and usage of the courses.
- Implementing GeoNetC program in Yemen and Iran: The master program will be implemented in Yemen and 3 more Iranian universities.
- Improving quality in education and teaching: Online learning techniques/tools have revolutionized the pedagogic world. ME partners will be equipped with e-learning and open network learning (ONL) tools. This makes it possible to offer standard SDI-T courses as well as the specialized courses developed in this project, online. Online programs/courses provide stakeholder employees under geographical or professional constraints to start a university program, with the possibility to learn more about SDI-T and its applications in environmental management, and so get new competencies.
- emGeo development: A web-based geoportal for environmental management spatial data (emGeo) will be developed and implemented. The aim is to make environmental spatial data widely available for stakeholders in the ME to be able to use it for a better environmental planning and decision-making. The geoportal can be further developed to satisfy additional requirements of the stakeholders in the future.
- Dissemination of the outcomes: Environmental management authorities, at policy-making, planning, and operational levels, will become aware of the advantages and applications of SDI-T in environmental management to support the development and use of SDI-T in their countries. They will also get possibilities to gain required skills to be able to use SDI-T in planning and decision-making for environmental management.
- Developing HEIs within society: The links between HEI, governments, and companies are not well established in Iran and Yemen, especially when it comes to environmental management and SDI-T. As a result, students may not find adequate jobs after graduation. One aim of this project is thus to strengthen these links making stakeholders aware of the technologies they need to use and the educated group of graduates that can be employed to support these technologies.

WP 2. Information collection and need analysis for course development in Qazvin province

QUESTIONNAIRE 1

Organization name:

Date:

Other Notes:

- 1, How does the Organization perform Environmental Management?
2. How does the Organization undertake/run Environmental Risk Management Programme(s)?
3. In which areas of Environmental Analysis/Management does your Organization act (select from the list below)? Rank each of them according to their importance to your country.

Rank	Application areas
	Land use planning. Please specify.....
	Air/atmospheric emissions or emission of air pollutants. Please specify.....
	Other type of Pollution. Please specify:
	Land contamination. Please specify
	Environmental Monitoring. Please specify
	Sustainable development. Please specify:
	Industrial risks. Please specify
	Public health. Please specify

	Waste management. Please specify.....
	Other areas. Please specify

4. What types of topics and practical works on environmental management should be discussed in this course?

Mark	Offered topics
	Environmental performance
	Prevention of pollution
	Environmental policy
	Forests health
	Soil salinization
	Land cover monitoring
	Ecosystem monitoring
	Air pollution
	Water pollution
	Sand winds
	Dunes movements
	Urban planning
	Agriculture and/or forestry evolution
	Other topics

5. What kind of topics relevant to Geographical Information Systems (GIS), Remote Sensing (RS) and Spatial Data Infrastructures (SDI) do you think are more relevant for the course development?

Mark	Offered topics
	RS for soil degradation
	RS for monitoring the environment and land cover change
	Hotspot analysis
	Natural disaster risk assessment with spatial analysis methods and techniques
	GIS and RS for data acquisition and storage
	SDI for data sharing
	GIS for spatial analysis in environmental management
	Map Visualization for environmental management
	Spatial data metadata and provision requirements
	General information on free spatial resources and other types of open source data
	Other topics

6. Which type of indicators related to Environmental Management does your Organization use?

7. Do you use GIS in your daily work?

	No
*	Yes.

If yes, in which type of processes? (Digitizing maps, risk assessment, site selection, map production, spatial data storage, etc.)

8. Do you use Remote Sensing data in your daily work?

	No
	Yes.

If yes, with which types of RS data (optical / multispectral / SAR / thermal, etc.)? And with which type of processing (image classification, change detection, map production, etc.)? What is the last update of each entry?

9. What GIS and Remote Sensing software do you use? Please include versions if available.

10. Do you use other GIS and Remote Sensing software as intermediate?

If yes describe them into more details.

11. General knowledge and skills of your organization employees on GIS and RS?

Average knowledge	Number of persons	% of staff involved in Environmental Monitoring (average)
Nothing	—	
Low	—	
Medium	—	
High	—	
Very high	—	

12. Do you have any program / willingness to improve the competence attending distance courses?

13. Would you like your staff to attend distance courses on GIS and RS to improve their competence?

No
Yes.

WP 2. emGeo (environmental management Geoportal) need analysis

As a web-based geoportal, emGeo will be used to facilitate the sharing of environmental related spatial data between organizations, both nationally and internationally. The aim is to make environmental spatial data widely available for stakeholders in the ME to be able to use it for better environmental planning and decision-making. The portal will also have a web GIS tool that can be used for data collection and storage. In this way, organizations can collect and share the information they need for environmental management, using a web-based and easy-to-use system. The web GIS will also provide them with basic spatial analysis tools needed to support planning and decision-making. The availability of such a system (emGeo) not only helps stakeholders to organize and manage the spatial data they need, but will also be a smooth introduction to the use of SDI-T in general, and GIS in particular, for daily activities, planning, and decision-making. emGeo will be developed based on open source solutions, as well as existing Internet GIS tools available to 1) make the maximum use of available resources, and 2) reduce the development/software/engine costs. Copyright issues will be carefully considered.

QUESTIONNAIRE 2

45. What types of spatial data do you use/or collect and update in your Organization?
46. What are the data sources that your Organization uses to get GIS/ RS data?
47. How does your Organization get the RS data it uses? (Download, buy, etc.)
48. What issues does your Organization face when downloading RS data?
49. What types of base maps/ spatial data does your Organization have? (Types, scale range, information content, metadata availability).
50. What kind of maps/ spatial data does your Organization have for environmental management? If possible, indicate if each entry is updated information or not.

51. What kind of maps / spatial data does your Organization have for environmental risk analysis/ management?

52. Is the data used by your Organization restricted, or free and available for use and/or publication?

53. Which functionalities does your Organization expect from emGeo?

	Digitizing maps
	Storing attributes
	Visualizing data
	Designing new patterns and symbols
	Uploading data
	Other functionalities

54. Does your Organization have a fast / medium or slow Internet connection? (if possible, specify upload/download speed)

measure (Mbps)	Speed
	<input type="checkbox"/> Slow * <input type="checkbox"/> Medium <input type="checkbox"/> Fast

55. Does your Organization have any mechanism for data sharing? Describe it if any.

Annex II

Organizations Interviewed

Iran

University of Tehran as the National Coordinator

Forests, Range and Watershed management Organization

Objectives:

FRWO is a state agency responsible for natural resources management that comprises of four departments and six independent bureaus as well as a high council and a natural resources guard, with 32 natural resources administrations or General Directorates at provincial level. These four departments are as follows:

- 1- Forestry Department
- 2- Conservation and Land Affairs Department
- 3- Watershed Management, Range & Desert Affairs Department
- 4- Planning, Management and Resources Development Department

Vision

Conservation, restoration, sustainable development and exploitation of forests, rangelands, wooded lands, coastal areas and soil and water conservation based on sustainable development approach and through integrated watershed management.

Mission

- Formulation of policies and strategies for natural resources and integrated watershed management as well as implementation of development programs for natural resources and watershed management within the goals of sustainable development.
- Conservation, protection and sustainable utilization of forests, rangelands, deserts and watershed basins throughout the country.
 - Determination and delineation of public and private lands to secure the state sovereignty over national property.
- Study the watersheds throughout the country aimed at planning and formulating integrated plans and implementation of natural resources and watershed management projects.
- Development of timber cropping and man-made forests and rangelands and restoration of degraded forests and rangelands, with emphasis on genetic resources and biodiversity conservation.
- Improvement of efficiency of executive activities through optimum planning and monitoring.

- Optimization of production and exploitation systems of natural resources and watershed management, using indigenous knowledge.
- Mobilization of public participation of individuals and legal entities in natural resources and watershed management activities.
- Formulation, commissioning and updating of natural resources and watershed management communication system aimed at boosting public awareness and developing a culture that respects natural resources.
- Development of management and human resources aimed at enhancing organizational productivity and effectiveness.

Tehran Disaster Mitigation and Management Organization TDMMO

Tehran Disaster Mitigation and Management Organization (TDMMO) is a non-beneficiary organization affiliated to Tehran Municipality. It has legal entity and financial independence and carries out its duties under legal documents approved by Tehran City Council. It is located at Tehran and from the establishment; it operates with no time limitation. TDMMO operates within legal and geographical boundaries of Tehran.

The president of TDMMO is appointed by Tehran Mayor. Strategic planning and long- term programs of the TDMMO will be reviewed and approved by the Board of Trustee.

Tehran Mayor is head of The Board of Trustee and the other 4 members are as follows:

- One of the members of Tehran City Council (appointed by this Council)
- TDMMO president (as the secretary of the Board of Trustee)
- Two experts (suggested by Tehran Mayor and approved by Tehran City Council)

Objectives:

1. To improve level of security and safety and to reduce risks at Tehran by doing related coordination, review, research, training programs and executive measures prior to occurrence of disasters for mitigation and preparedness for emergency response.
2. To perform measures and necessary coordination for increasing efficiency of disaster management system in Tehran and in related organizations at the time of occurrence of disasters for implementation of rescue and relief operations and also decrease of damages and human and property losses.
3. To perform measures and necessary coordination for increasing efficiency of disaster management system in Tehran and in related organizations after occurrence of disasters for prevention of damages, human casualties and financial losses.
4. To monitor and direct reconstruction efforts and recovery activities following occurrence of disasters within framework of national rules and regulations and also governmental and nongovernmental (community- based) aids.

Department of Environment

Objectives:

The realization of the fifth article of the Constitution of the Islamic Republic of Iran in order to protect the environment and guarantee the proper and continuous enjoyment of the environment in such a way that while preserving the balance of biological relations leads to sustainable development and improvement, quality of human development.

Organization's basic duties:

Protecting the natural ecosystems of the country and restoring the adverse effects of the past on the environment
Prevention and Prevention of Environmental Damage and Pollution
Assess the environmentally tolerant capacity for sustainable and sustainable use of environmental resources
Continuous monitoring of the exploitation of environmental resources

Active exposure to critical environmental environments involves contaminants exceeding the permeability of the environment

Review, study and research in order to achieve or obtain recognition in the following areas:

- Pollution and environmental degrading agents in the field of water, air, soil, waste, pesticides, chemical fertilizers, sound and so on.
- How to deploy the development and development phenomena of the country such as industrial units, power plants, dams, agricultural and human settlements, human settlements and the like.
- Use of environmentally friendly technology
- Areas that have unique ecological characteristics and determine their limits
Specific and rare species of endangered species of plants and animals and their habitats and ecological relationships and their distribution
- Regional environmental issues using the cooperation of neighboring countries and international cooperation
- Provision and development of environmental standards and standards in the following areas:
 - Air includes free air, drainage limits, classification of sources and contaminating water, and changing and destroying river paths and destroying wetlands and the ecological transformation of lakes and seas
 - Soil resources that contain pollutants and soil erosion
- The noise includes the limit and the spatial, temporal and temporal criteria
Solid and solid waste includes collecting, transporting, disposing or transforming and recycling waste materials from rural, urban, mineral, agricultural, etc. in different parts of the country.

- Pesticides and chemical fertilizers including the residual limit in the environment, disposal or exclusion and spatial, temporal, type, quantitative and qualitative prohibitions
 - Vegetation and wildlife pollution of oil, heavy metals, agricultural toxins, human wastewater and ... in marine environments (water, sediment, aquatic)
 - Environmental education to promote and raise the level of knowledge and environmental perception of individuals to create interest, sense of responsibility and public participation in the protection of the environment in cooperation with educational and research centers and mass media, NGOs and the use of All facilities in the country and internationally
 - Evaluation and monitoring in order to ensure the application and performance of environmental standards and standards.
 - Establishment of a museum and exhibition to collect and display specimens and species of plants and wild animals, justifying their educational and research aspects and taxidermy wild animals for use in exhibitions and museums.
 - Establishment of development and extension of scientific and applied environmental education centers in order to provide and train the required human resources of the country's environment in coordination with the Ministry of Culture and Higher Education and other relevant authorities.
 - Study of marine eco-biology and marine pollution and coastal wetlands
 - Study and evaluation of quantitative and qualitative status of biodiversity and genetic resources of the country
- Development of regional, national and international research and research projects in the field of environmental issues
- Economic valuation of natural resources and environmental costs of development
- Study and context for sustainable development

Ministry of Energy

The main responsibilities of the Ministry can be highlighted as follows:

- Production, supply distribution of electricity to all subscribers (Industry, home users, commercials, agriculture, public and others)
- Store, extract, transfer, refinement, and distribution of water to all subscribers (Industry, home users, commercials, agriculture, public and others)
- Collect, transfer and refinement of wastewater (Urban and Rural)
- Study, design and implement of Renewable Energy Projects (Wind, Solar and Geothermal)
- Public duties (Environment protection, HSE, Public education)
- By the use of GIS and RS technologies, the status of electricity distribution network in urban and rural areas can be monitored (operation and events, Subscribers, power meter locations, and so on) and finally in development of networks and power distribution in urban and rural areas can be optimized.
- In water domain, dam site selections as well as the distribution are the main application with utilizing GIS and RS, agriculture irrigation networks site selection and urban and rural irrigation are other necessary applications in this area.
- Another major challenge and necessity is the site selection of wastewater treatment plant that needs experts and proper knowledge in this field.

Bu-Ali Sina University

In Hamedan, four organizations have been interviewed.

- The Regional Water Authority of Hamedan,
- The Environmental Protection office of Hamedan,
- The Agricultural Jihad Organization of Hamedan and
- The Forest, Range and Watershed Organization of Hamedan.

Imam Khomeini International University

- The Qazvin Municipality Department of Urban Planning and Architecture
- Qazvin Province Roads and Urban Development Administration
- Information and Communication Technology Organization - Municipality of District 2 – GIS sector
- Management and Planning Organization
- Department of Environment
- Forests, Range and Watershed Management Organization
- Qazvin Municipality Department of Planning, Research and Development
- Nahid Fallah – GIS researchist

Yemen

Sana'a University

- Geography department, Sana'a University
- Earth and Environmental Science, Sana'a University
- Faculty of Agriculture, Sana'a University.
- Water and Environmental Centre (WEC), Sana'a University.
- Yemen remote sensing and GIS center.
- Environmental Protection Authority (EPA)
- Public Work for Development (PWD)
- Social Fund Development (SFD)
- Ministry of Agriculture and Irrigation (MAI)
- Ministry of Fishery
- General Authority for Land survey and Urban Planning
- Yemen Telecom
- Emergency Unit of General Authority for Rural Water Supply Projects (EUGARWSP)
- Civil Aviation and Meteorology Authority (CAMA)
- Public Electricity Company (PEC)

- Central Statistical Organization (CSO)
- Authority of Water and Sanitation.
- General Authority for Agricultural Research and Extension.
- Enhancing and Cleaning Fund
- Ministry of Electricity and Energy.

Taiz University

- Al-Hikma University /Taiz
- General Authority of Land Survey& Urban Planning/Taiz
- Improvement Cleaning Fund /Taiz
- Agricultural Research &Extension Authority/Taiz
- Taiz Information Center
- Estidama Foundation for The Conservation of Nature /Aden
- Department of Geography Aden University
- Environment Protection Authority /Aden
- Ibb University