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Abstract- Geographic Information System (GIS) is a computing system to capture, store, manipulate, analyze, manage, and represent all types of geographical data. GIS systems are used in cartography, so that the simplest explanation of GIS was merging of cartography and database. There is almost no human activity related to a geographical territory, and the whole planet, which could not be improved by using an optimized GIS system. GIS allows efficient prediction and managing of resources to protect the environment. GIS technology provides public safety and the ability to manage and analyze large amounts of information. In the Republic of Srpska, as well as the whole country there are still a large number of mines from the Civil War (1992-1995). This paper describes the application of GIS and mapping the mine suspected areas, and the ability to facilitate consideration of the surface displacement due to severe flooding which occurred in the Republic of Serbian and region on May 2014, taking into account that the largest concentration of mines from the war was just through the length of the flooded river, which is the risk and responsibility to the Republic of Serbian and the states that border.

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I. INTRODUCTION

Geographic information system (GIS) is a computer system designed to capture, store, manipulate, analyze, manage, and present all types of geographic data. The acronym GIS is sometimes used for geographic information science or study of geospatial information related to academic discipline or career working with geographic information systems and a major domains within the wider academic discipline of geoinformatics. [1] The simplest explanation is that GIS is the merging of cartography and GIS database technologies. GIS systems are used in cartography, remote sensing, surveying, management utilities, photogrammetry, geography, urban planning, management of emergencies, navigation and localized search engines. GIS applications are tools that allow the user to make interactive queries (user request), analyze spatial information, edit data, maps, and presents the results of all these operations. Geographic information science is the science which are basically geographic concepts, applications and systems, studied and

validated at various universities. [2] In this paper we show the use and application of GIS in mapping mine suspected areas on the territory of the Republic of Srpska.

II. ABOUT THE GEOGRAPHIC INFORMATION SYSTEM

For the application of GIS it is necessary a map which displays the data. Site map should be of the highest quality, and for the quality map it is believed that is the map which is exact placed in the exact geographical coordinates. Coordinate Reference System (CRS) can be explained as a coordinate system that is associated with the Earth with geodetic date [2]. CRS can be geodetic coordinate system where the positions are defined by geographic longitude and latitude. In the most cases, is using of the projected coordinate system where the coordinates are transferred to the plane using the Map projections. Within one country can be a number of different coordinate systems (NGO, MG17, GK6, UTM34) in use. [3] In the Republic of Serbian WGS84 -UTM zone 34 coordinate reference system is using. [4] The definition of the geographic coordinate system is practically reduced to definition of the two mathematical models. The first is a mathematical model of the Earth's sphere or its part that we are trying to represent by mapping. This mathematical model (with particular reference point on the sphere) in geo-science and so. space industry is called a date. Given that the main task in creating maps is that the image of a terrain with curved surfaces set on the plane, it is not enough just to have a model of the Earth. The second mathematical model that is directly responsible for this "setting on the plane" is called projection. There is a huge number of dates and projections in use. Practically every country in the world has its own date and projection, and some of the country have several dozen. Traditional GIS packages are programs that work with maps in vector format. In addition, they have the above-mentioned geographic coordinate system through which the position of certain objects on the map associated with their actual position. This feature of GIS system is called georeferencing and is the essence of the GIS idea. Without georeferencing, GIS systems would be kept to a regular (electronic)

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map, not much more useful than their "paper ancestors." [4] If we use the whole maps, all of data on the map (coordinates, date created, projection, with maps etc.), are later used in the process of georeferencing. Given that the geographical data in a GIS are geographically oriented and defined by geographic coordinates, it is necessary to present a data by thematic layers. [5] In addition to geo-referencing, as well as in any other information system, the most important feature of GIS systems are, of course a database. The ability of GIS to manage a database, to complement and to searches database by using vector maps, objects on that maps or simply based on the given coordinates is actually a basic measure of its functionality. In order to be able to use geographic information system it is necessary to ensure appropriate software- (a) commercial: Autodesk (MapGuide), Cadcorp, Intergraph (GeoMedia, GeoMedia Professional, GeoMedia WebMap, ERDAS IMAGINE, ESRI (ArcView 3.x, ArcGIS, ArcSDE, ArcIMS, ArcWeb) Idris, MapPoint, etc., and (b) non-commercial: GRASS, MapServer, Chameleon, GeoNetwork opensource, GeoTools, gvSIG, ILWIS, JUMP GIS, OpenLayers, PostGIS, Quantum GIS TerraView etc ... [6]

III. THE APPLICATION OF GIS IN PROTECTION OF ENVIRONMENTAL IN THE EXTREME SITUATIONS

There is almost no human activity that is linked to some territory, and even the entire planet, that could not be improved by using optimized GIS system. [5] GIS is a computer technology that connects geographic data with other types of data in order to create analytical framework for understanding and visualize spatial relationships. GIS enables efficient forecasting and management resources before, during and after the crisis. [7] The geographical information is a key component of any information system that is designed to support social or environmental analysis or decision-making. GIS is a computer technology that is often defined as an integrated set of tools and methodologies for collecting, storing, editing, integration, analysis and visualization of spatial referenced data. [8] In the geographic area all the social and ecological processes are occurring. From this implies that the location is the main dimensions for reviewing all of environmental and social factors. GIS linking geographic informations with other types of data in order to create analytical framework for understanding and visualizing spatial relationships. Using GIS everyone can share information and computer-generated maps in one place. GIS provides a mechanism for centralization and visualization of critical information in emergencies. GIS allows the user to combine data sets. GIS technology provides public safety and the ability to manage and analyze large amounts of information. Data can be stored in a geographic database and can be used to

visualize spatial relationships and analyze trends to track a phenomenon. Computer-generated maps can be shared over a network or the Internet with multiple agencies to coordinate efforts in order to increase the funds. Operation of overlapping layers on the map allows analysts to calculate new values for places based on multiple attributes or layers of data to identify and display the locations that meet certain criteria. GIS is used for monitoring, surveillance, data collection, management in the field, more efficient data analysis, policy analysis and planning, rapid sharing of information. [7] GIS uses detailed digital maps, satellite images and computer models to determine where it is necessary to react. Application of GIS allows quantify and summarize data in a simple way. Spatial analysis involves three basic steps: preparation of an appropriate model, its proper visualization and analysis of data from a simple map to statistical models. To do this all you need is a lot of information immediately in the real world. Analysis and modeling (events, actions, reactions) depend on the positioning of the exact coordinates in the real world. Geospatial technology can be used for designing and managing database systems, systems for monitoring, controlling and reporting the performance of spatial queries, data compression, visualization and analysis, data modeling, map production, dissemination of information needs. [7]

IV. APPLICATION OF GIS IN MAPPING A MINE SUSPECTED AREAS IN THE REPUBLIC OF SRPSKA

As a result of the civil war (1992-1995), Bosnia and Herzegovina is still one of the most mine-contaminated countries in South-Eastern Europe, taking into account that a large number of unexploded ordnance deployed in the surrounding rural areas. By the end of the conflict in 1995, nearly 600601 people were killed as a result of explosive remnants of war remaining. Nearly 20 years after the war in Bosnia and Herzegovina, over 200,000 mines and other ordnance are still located throughout the country. Equally it is a number of potential victims. Mines are still distributed to as many as 1340 km². A large investigation of minefields was done. In doing so, their expertise gave the soldiers who had taken part in setting up mines. So they could fence dangerous areas to prohibit access to the population. Then began a systematic search of minefields and mine clearance. There are different methods of detection mines- robots, rats, bees (which can learn to recognize the scent of explosives), or even genetically modified plants. Manual search is still the most responsible way of clearance. Mine often consist of plastic so metal detectors do not help much. Over the minefield drives digging machine, and so triggers an explosion of mines laid in its territory. The using of GIS mapping in mine suspected areas provides: efficient

management of mine suspected areas, better protection, interactive access and manage (query, update, delete, add, connect) with databases, statistical data analysis, presentation of digital maps (maps on display computer screen and printing), viewing of multimedia data (establishing links between data on a map and photos or analysis and modification of existing data), display and printing of reports, etc. [3]. GIS can be combined with other systems which is another justification of using GIS application systems. Although geographic information system offers rich opportunities in the manipulation of input data, processing and generating output data, it has certain drawbacks, both in 3D modeling and in the visualization of data. On the other hand, object-oriented software packages that are designed for modeling and visualization showing those deficiencies that constitute the major advantages of GIS. Using the coupling of these two systems is achieved by effective use of modern planning techniques. [3]

a) *Mapping the movements of mine suspected areas due to heavy flooding in the Republic of Srpska and region*

As already mentioned, a large number of mines left over from the civil war are still located on the territory of the Republic of Serbian and BiH. The highest concentration of mine suspected areas is along the border rivers, as well as the inter-entity boundary line and the state border. Due to the severe flooding which occurred in Bosnia, Croatia and Serbia on the May 2014, there was a possible displacement of mines, which were carried by the flooded river. United Nations Development Programme (UNDP) and the Mine Action Centre (MAC) emphasize that the record floods which occurred in the Balkans may increase the risk of mines in Bosnia and Herzegovina. UNDP since 1996, is actively working with the authorities in cleaning, recording and marking minefields. So far cleared over 26 960 km² of mine contaminated areas, however, nearly two-thirds of 1230 km² was covered by floods and over 2000 landslides was activated. According to the Mine Action Centre BiH, there is more than 100,000 mines. Floods triggered mine and stolen signs which were labeled dangerous areas. Some of the recorded cases of explosion of mines that are shifted by floods have occurred in the area of Brcko District in the north of the country; Srebrenica and Bratunac. Also, the mine threat is largely present in the river basins of Bosnia, prevent, Ustora and cranks. In Bijeljina, reported finding mines in six locations in the city and suburbs. Thus, after the withdrawal of water at three points in the Prijedor area located explosives devices. According to the BHMAK's, whose teams have also arrived in places that were affected by the weather woes, mine is the most vulnerable area of Doboj, Maglaj, lead, and the Bosanska Posavina, Tuzla and Una-Sana Canton. Flow Mine is possible Sava and Danube to Romania and

even Bulgaria. Experts claim that the mine could stop by the turbines of hydroelectric power plants.

V. CONCLUSION

In order to manage natural resources in a sustainable manner it is required accurate and timely information to make action to changes in field on time. For this reason, it is necessary to establish a system that will integrate all relevant data to achieve the stated goal. In a word it should formed a system that would be able to simply search database as well as the ability to display informacija through colors and symbols. To achieve the above requirements imposed by the simple answer, and it is the application of GIS in mapping mine suspected areas, for better monitoring, visualization, planning demining activities as well as easier and faster updates. On the basis of creating layers, in GIS it is possible to make a layered representation of data (which are stored in shape files). Figure 1 shows the territory of the Republic of Srpska divided by municipalities with mine suspected areas. Here are added two shape files, one of which represents a mine suspected area (highlighted in red) and the other municipalities of Republic of Srpska (shown in pink color). In this section of two shape files, it is presented the RS territory affected by mines. On the detail of the R = 1: 250 000 shown is part of the territory of the municipality of Doboj, which is the most damaged in the floods in May 2014 with a topographical map as a base. The mine suspected area is marked, and it is assumed that the water is shifted mine. Here, using GIS can track, update and manage mine suspected areas on the territory of RS. The said territory is shown and mapped in ArcGIS.

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ATTACHMENTS

Figure 1 : Overview map of municipalities with mine suspected areas in the Republic of Srpska, shown in GIS

