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RESEARCH ARTICLE

GIS IN GEOPOLITICS OF OIL IN THE WORLD

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ABSTRACT

This paper entitled with GIS based decision support system and data base for contribution towards sustainability of future earth related to Geopolitics of oil in the world. With the help of GIS we are analysis or mapping the over exploited area of oil resources, oil sites of the world, oil pollution, oil spill and marine environment, geopolitics over oil resources, political instability etc. These types of maps will help to us for the planning or the sustainable use of these resources and we predict a better future for the earth. This study provides us the global view of oil geopolitics and its impact on our environment. GIS plays a very important role for the identification of those sites which are more exploited or vulnerable and it's also very helpful for the sustainable conservation of our present oil resources in the world. This study is also deals with the oil production, consumption and reserves in the world and we also describes how the GIS plays a very important role for the oil sustainability in the world.

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INTRODUCTION

Geographic Information Systems (GIS) are powerful computer-based tools used to enter, maintain, store, distribute, and analyze geospatial data. GIS and associated spatial analyses deal with the quantitative location of features and their associated attributes. GIS have been implemented across a broad range of research, science, business, and government applications. GIS are particularly effective for managing natural resources. As the development of oil and gas resources expands in the world, so does the need for spatial data and spatial awareness of development impacts. GIS can be utilized to document and examine the potential and observed effects of oil and gas development on all impacted resources including: water, wildlife, cultural/historic, habitat, air quality, socioeconomic, vegetation etc. Furthermore, GIS provides a tool for oil and gas operators to effectively and efficiently manage development for the protection of resources and optimal production. GIS is the best decision support system for the contribution towards sustainability of the future earth because it provides the solutions for the problems by mapping. With the help of GIS we are analysis or mapping the over exploited area, oil spill and marine environment, geopolitics over oil resources, political instability. These types of maps will help to us for the planning or the sustainable use of these resources and we can predict a better future for the earth. Geographic information systems (GIS) can significantly contribute to correct interpretation of the slick signatures visible on synthetic aperture radar (SAR) images. Initially GIS

is proven to be an excellent management tool for resource assessment, oil spill response, oil production and consumption, oil sites, planning and damage assessment. GIS approach to a problem of oil spill mapping and oil geopolitics includes integration of the geographical, remote sensing, oil & gas production/infrastructure data and slick signatures, detected by SAR, in GIS. Compiled from data of several sources including nautical maps, geo databases, ground truth and remote sensing data, GIS allows retrieval of key information, i.e. predict locations, reveal offshore/onshore sources, estimate intensity of oil pollution estimation of political instability and geopolitics over the oil resources. SAR and GIS technologies can significantly improve identification or even classification of oil resources allowing making the final product - oil exploitation, oil distribution, oil and political stability maps.

Aim and Objective

1. To assess the role of GIS for the identification of oil production consumption and reserves in the world.
2. To analysis the geopolitics over the oil in major oil producing countries.
3. To identify the relationship between oil, climate and Geopolitics.

Research methodologies

Research design and methodology consists of collecting data both from secondary as well as primary sources. But in my research the data will be collected by the secondary sources like world energy yearbook, UNDP reports, etc. data will be analyzed with the help of Arc view in forms of map. And some

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tables are also describes with the help of the world energy scenario.

GIS database and GIS decision support system

The inventory resulted in a geographic information system (GIS) database containing numerous layers of geographic data gathered from various agencies including the world Geological Survey (WSGS), Energy Information Administration (EIA), BLM, and To study of lands within a GIS framework, the inventory managers developed three specific data layers. The federal lands layer shows onshore federal mineral (oil and gas) ownership including federal lands and minerals from all surface managing agencies. The oil and gas resources layer was generated from data from the WSGS National Oil and Gas Assessment. Included in this layer is EIA data on the nation’s proved oil and gas reserves growth estimates. The inventory assembled and processed this data into a form useful for further analysis. The third data layer in the inventory shows the access constraints (oil and gas land closures, lease stipulations, and drilling permit conditions of approval), which were obtained from the surface management agencies. The lease stipulations, as defined by the various land-use plans, are numerous, complicated, and overlapping. To simplify the spatial analysis, each unique stipulation was placed into one of nine access categories in a hierarchy ranging from most (no leasing) to least (leasing with standard terms) constrained.

The nine categories can be further combined into three groups: (1) inaccessible, (2) available restrictions beyond standard lease terms, and (3) available under standard lease terms. Using Arc GIS, the three data layers—federal lands, oil and gas resources, and access constraints—were compiled. From the resulting coverage, extracting the land access categorization enabled the creation of statistical tables and charts showing the federal land acreages in each of the access categories. The compilers were able to do a similar extraction and create tables and charts of the oil and gas resource volumes under each of the access categories. The team looked at whether each drilling permit’s conditions of approval had a negative effect on access. To extrapolate the random sample to the larger study areas, the team used a numeric method to produce a random scatter of 40-acre parcels. This method helped quantify the access effect on conditions of approval. The final results were adjusted accordingly.

Geopolitics and oil

The term "Geopolitics" was coined at the beginning of the twentieth century by Rudolf Kjellén, a Swedish political scientist, who was inspired by the German geographer Friedrich Ratzel. Ratzel published *Politische Geographie* (political geography) in 1897. Geopolitics is the study of the effects of geography (both human and physical) on international politics and international relations. Geopolitics is

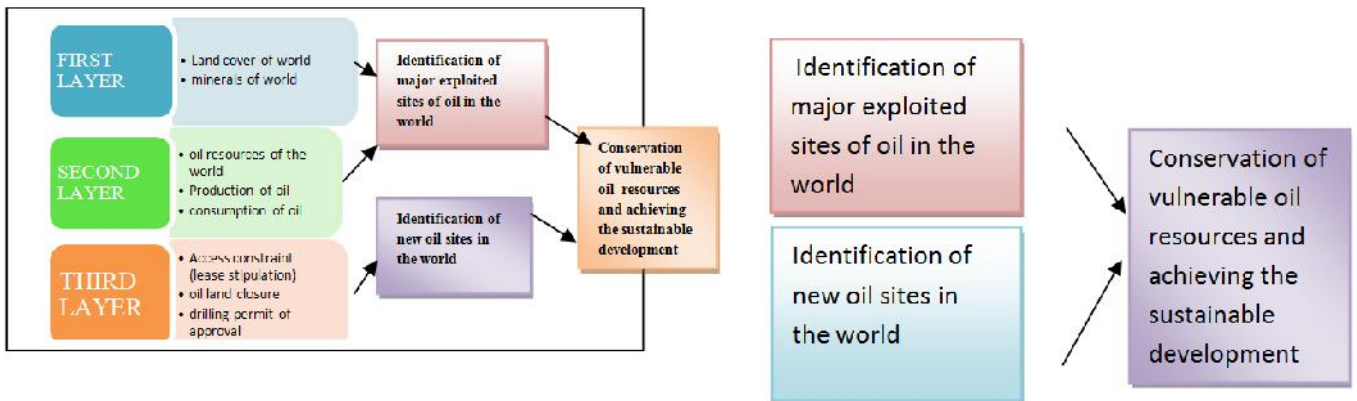


Fig. 1. GIS multi criteria and overlay analysis for the identification of most vulnerable site of oil in the world

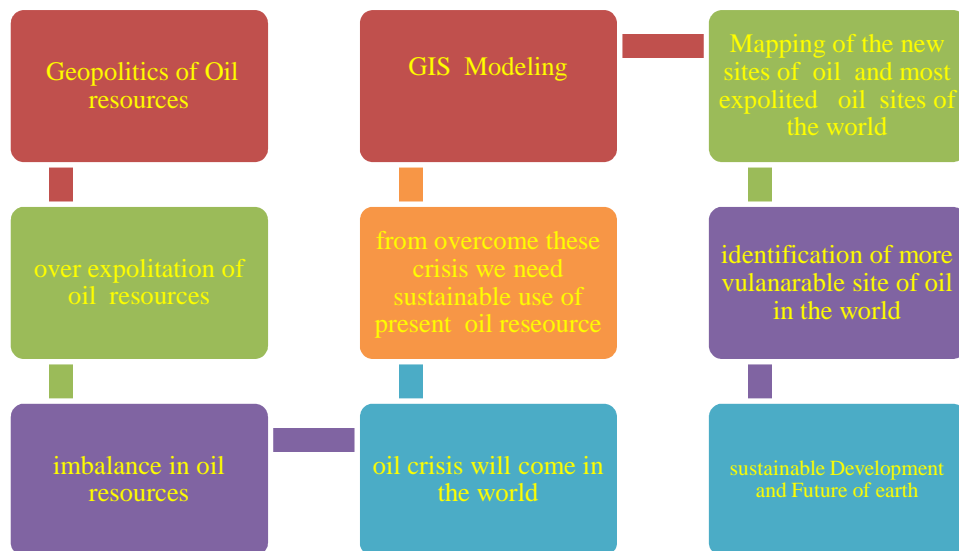
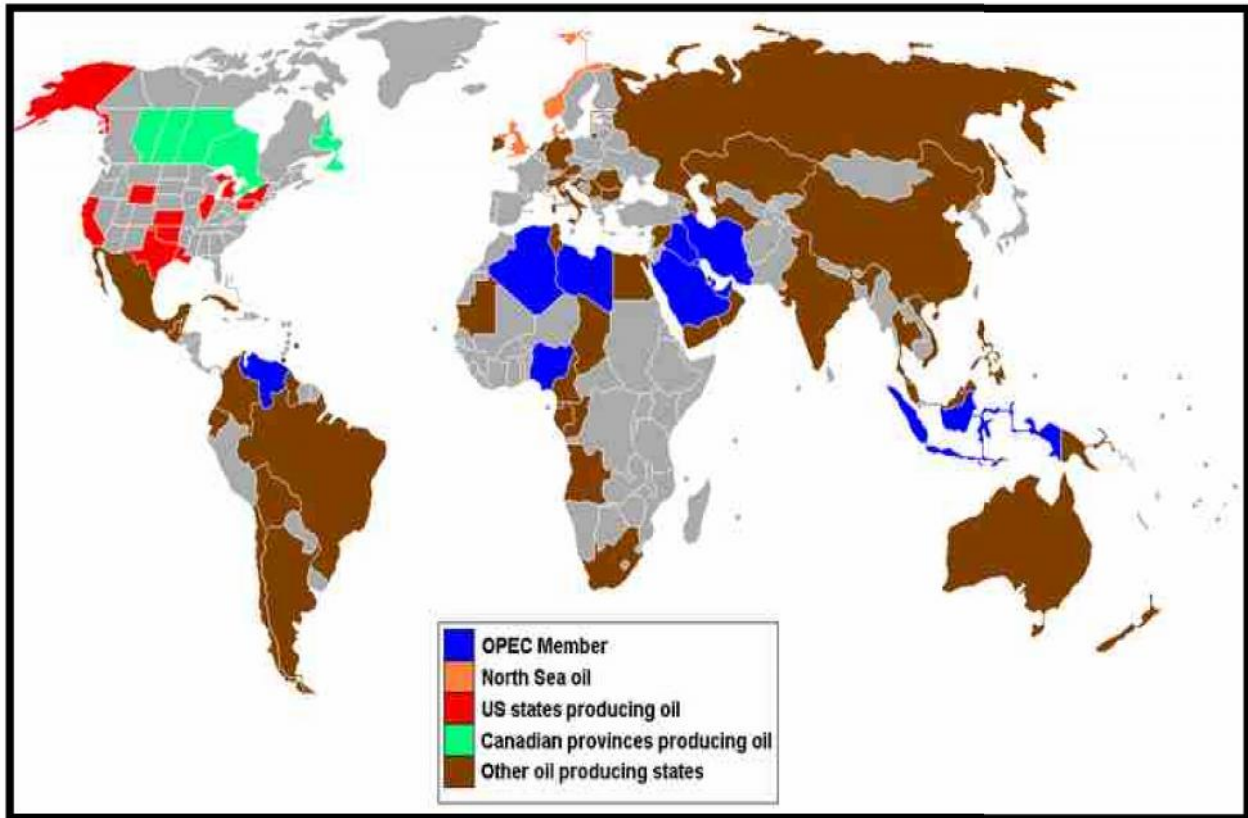


Fig. 2. Geopolitics of oil and GIS best decision modeling, Geopolitics of oil



Map 1. Oil sites of the world

a method of foreign policy analysis which seeks to understand, explain, and predict international political behaviour primarily in terms of geographical variables. Typical geographical variables are the physical location, size, climate, topography, demography, natural resources, and technological advances of the state being evaluated. Traditionally, the term has applied primarily to the impact of geography on politics, but its usage has evolved over the past century to encompass wider connotations. Geopolitics traditionally studies the links between political power and geographic space, and examines strategic prescriptions based on the relative importance of land power and sea power in world history. The geopolitical tradition had some consistent concerns with geopolitical correlations of power in world politics, the identification of international core areas, and the relationships between naval and terrestrial capabilities. Rapid development of the human society over the last two centuries was based on the excessive and uncontrollable use of fossil, non-renewable energy resources. As modern society developed, the need for energy has grown bigger, while the reserves of the non-renewable energy resources have lessened. That is why, nowadays, it is not possible to solve the majority of the global problems without involving energy issues, whether the climate changes are concerned, new world economic crisis or current geopolitical conflicts. Among energy resources, in the modern world, due to their enormous importance as energy resources and raw materials in industry, oil and natural gas have been and still are, geopolitically, the most important 'goods'. Despite all efforts to develop alternative energy sources and to use energy rationally, the position of oil as an energy resource is not severely shaken. Oil reflects the division of the world economic and political power.

OIL: RESERVES, PRODUCTION AND CONSUMPTION

One of the greatest challenges regarding energy that the world is facing today is production and consumption coordination. We have moved from the world in which energy production matched the biggest countries consumption, towards the world in which energy offer is not nearly enough to satisfy global demand. Inconsistency of supply and demand of the fundamental energy resources influences the global balance change among world leading economic and political powers. The fact that we do not have enough energy does not mean that supply and demand of energy resources decreases, but that there is not enough energy to satisfy rapidly growing needs in the world. Currently, in the overall world balance (consumption), fossil fuels participate with 80%, with dominant participation of oil and natural gas of 57% [BP, 2011]. Even before the modern ways of exploitation appeared, oil was used in medicine, for lightning, as weapon and for other purposes by ancient civilizations in the Middle East and in America. This source of energy is now used for getting more refined sorts of energy (for example, for electrical energy), as raw material in industry, as fuel in traffic, agriculture and other. Today, oil is not extensively exploited only in Western Africa, north China, east Siberia, on the east coast of Latin America, the Arctic and Antarctic area. Modern oil industry dates from the middle of the 21st century, when the first oil wells were drilled in Romania and the USA (Pennsylvania). Along with industry development, urbanization process and higher life standard, the need for this energy resource was also growing. Up until the end of the 20th century, the most developed countries in the world had the highest demand growth, and then countries with rapid economic development

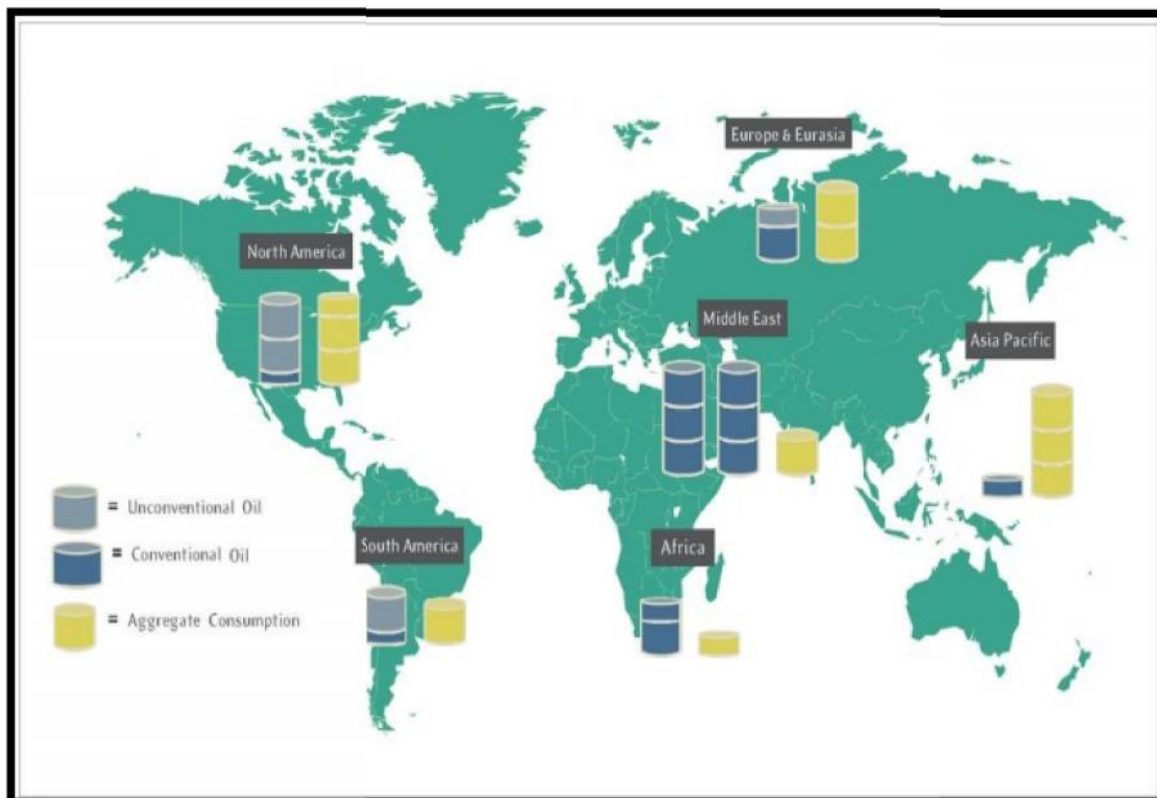
appeared on the global market as buyers. Those countries were China, India, Brazil and others. The USA was the world's leading oil producer until 'the first oil shock'. In the USA, 70% of oil production goes for traffic. According to the data from 2010 [BP, 2011], the USA is the third producer (after Russia and Saudi Arabia) and by far the biggest consumer of oil in the world (21.1% of the world consumption). According to the data from 2010, dependence of some countries on oil import is different. The USA, for example, satisfies 48% of its demand for oil by import, China 47%, Europe 82%, while in Japan, the entire oil demand is satisfied by import. Only 45% of the countries in the world are raw oil exporters, while more than 140 countries are forced to import either oil or oil products. This table shows the world oil production, Reserves and consumption in 2008. This table shows that the OPEC countries are more prominent in the production and consumption of oil major countries are, Saudi Arabia, Iran, Russia, U.S, Asia Pacific Region, Africa and South America.

China will intensify its researches in the next few decades, as an answer to the geopolitical games related to the oil and gas deposits. Namely, in China, there is all present fear from the growing American hegemony on the Middle East, around the Caspian basin, in Middle Asia and in the countries of Northern Africa; as well as from dominant control of the important oil transport sea routes, especially in the Hormuz and the Malacca straits. These two maritime straits are important for the transport of oil from Iran, Saudi Arabia, Kuwait, Iraq, the Caspian basin, the African area and others. This map is prepared by the Arc GIS 3.1 which gives us a broader view of the most vulnerable site in the world and we are also identify the which area's oil resource in abundance and which area's resources are vulnerable as a results we makes some policies and plans for the conservation of our present resources which are very helpful for the sustainable development of human beings. Remote sensing and GIS are playing a very important role for the detection and prediction of any phenomena which gives effect on our present resource.

Table 1. Oil Production, Consumption and Reserve in the world

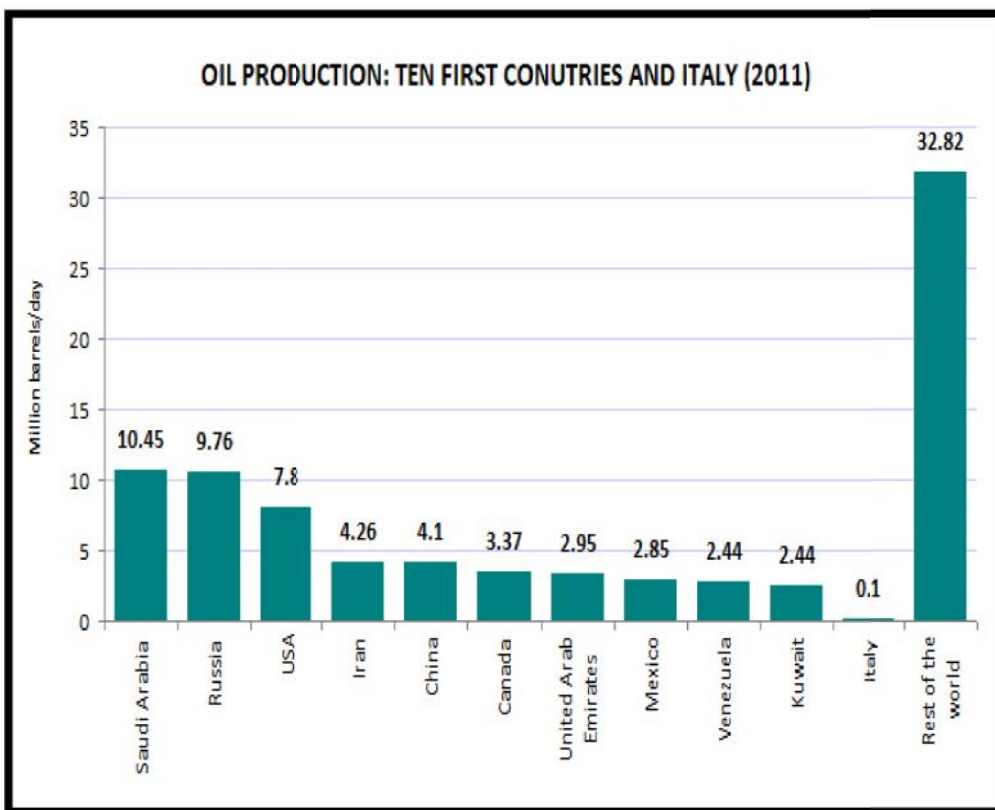
Country	Oil production . in %	Country	Oil consumption . In %	Country	Oil reserve in%
Saudi Arabia	12.9	USA	21.1	Saudi Arabia	19.1
Russia	12.0	China	10.6	Venezuela	15.3
USA	8.7	Japan	5.0	Iran	9.9
Iran	5.2	India	3.9	Iraq	8.3
China	7.1	Russia	3.7	Kuwait	7.3
Canada	4.2	Saudi Arabia	3.1	UAE	7.1
Mexico	3.7	Brazil	2.9	Russia	5.6
UAE	3.3	Germany	2.9	Libya	3.4
Kuwait	3.1	South korea	2.6	Kazakhstan	2.9
Venezuela	3.1	Canada	2.5	Nigeria	2.7

Source :- BP statistical year book 2010



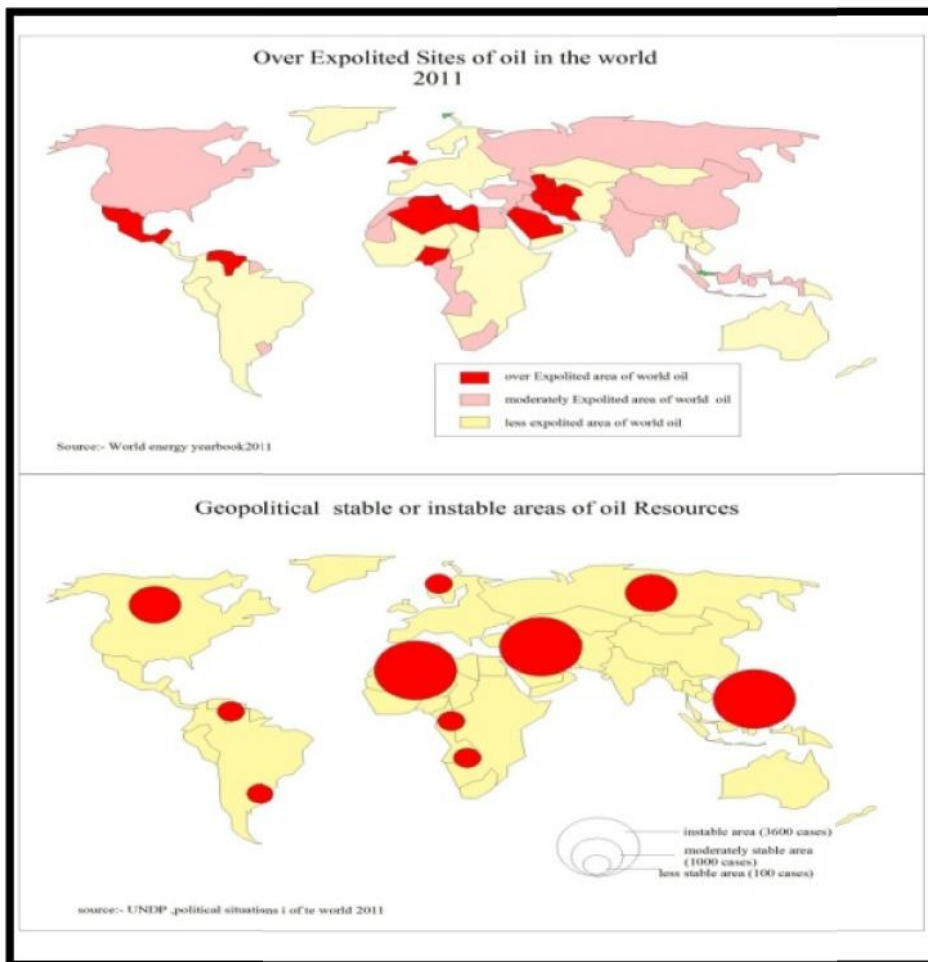
Source:-EIA, IEO2009, TableA2: BP, BPStactical review of world energy 2009

Map 2. Global Reserves and Aggregate Consumption by Region 2009-2030



Source:- world energy year book 2009

Fig. 3.Oil production in the ten first countries in 2011



Map 3. Geopolitics, oil and its over exploitation in the world

Geopolitics of oil and climate change

The humans and environment are strong interconnected; hence environment influence human activity, but in the same time, human activity can create harm to the environment. The human society became dominant because of developing skills regarding energy production and use; and the activity which hurts a lot the environment is connected with energy. The energy production causes irreversible harm to the environment. Carbon and other greenhouse gases' rising concentration level in the atmosphere, due to fossil fuels burning for energy generation, influence the temperature patterns; and an increase of more than 2 degrees Celsius could have serious impacts globally, including the extinction on many plant and animal species, or even the collapse of the entire ecosystems (Bales and Duke 2008). Climate change would in the same time bring security risks; if the planet warms by 1.3 degrees By 2040, there will be "heightened internal and cross-border tensions caused by large-scale. Migrations; conflict sparked by resource scarcity increased disease proliferation and some Geopolitical reordering" (Bales and Duke 2008 *The Age of Consequences* 2007). Today every man can easily see that almost everything is influenced by the oil. The problem of oil is more and more politicized; oil and the secure access to it are aspects which are present on The top of all states' agenda. The problem of oil is more pressing, and it has become so, because of the fluctuation of oil prices. Starting in early 2000 oil price registered a constant rising, until summer of 2008, and since then the peculiarity of oil market was price fluctuation; this is a great problem because it can hit hard interests of the state (it can influence the balance of payments of importing states through rising expenditures for oil imports). Governments in nearly all the large consuming nations are preoccupied by energy security aspects like at no time since the oil crises of the 1970s (Victor and Yueh 2010).

Yet important shifts are taking place in global energy system (Victor and Yueh 2010): one regards the changing of energy consumption countries, most of the future growth on oil demand will come from emerging economies, especially from China and India; the other concern regards the environmental impact of energy use, especial carbon dioxide emissions. Unfortunately, man and society always pay attention to pressing problems, leaving other problems – which could be more important – unresolved, thinking they will never become pressing enough in order to impose strong hand decision. Oil is one of the most pressing problems on states' agenda, and for some states oil policy almost equates foreign policy (be they oil importing, or oil exporting countries). Climate change is recognized to be a certain fact, but this aspect is not so pressing; this is due to the fact that present situation is this: for modern society oil is a key-element, which sustains its present way of development, and oil is an extremely important asset because it is the essential element in today's transportation system, sustaining the movement of wealth and people, and being and extremely important ingredient in a lot of products which dominate modern lifestyle: 90% of the goods in one store implies the using of oil in one way or another (Giddens 2009). economies, very hungry for oil; but continuing the same path – of using oil more and more in industry, energy production, and transportation – will not only create greater pressure on remaining oil resources, even wars for access to it, but this trend could bring great havoc to whole humanity,

through climate changes which will affect both, rich, and especially poor countries. And all these things take place in a situation where since 1901 until 2000 world oil production had risen over 180 times (Mali_a 2009: 297). And doesn't matter which measures and steps are taken in the field of energy efficiency, the pursuing of clean energy, and alternatives oil in transportation, energy, and industry, oil will continue to be a very critical element in the stability of world economy, and regional and international security (Morse, 2009:).

Regarding Russia, a low price of oil has immediate and strong impact on its domestic, and foreign policies. When price of oil is high, Moscow can easily play pipeline politics, using gas deliveries with political ends; when oil price is low, Russian state strongly needs to receive currency from its gas exports, reducing its capacity to use gas delivery as a political weapon. Another state which has an assertive policy, and which can create trouble on regional scale, with global consequences, is Iran. As oil price is high, Iran has money to sustain subversive activities in Arab Sunni countries, and can influence the direction taken by Middle East peace process. If Iran has lower revenues, then the flow of petrodollars to terrorists would be reduced, and the adamant policy of Tehran could swift to a more moderate one. Taking account of this situation, on short run, the main global consumers could establish and consolidate the connections with oil producing countries from Gulf, Central Asia, and Africa, forging an exchange concentrated on arms and military assistance for oil – a peculiarity of oil trade in the second part of 20-th century. The intensification of state's actions could become very present, rising even more the risks of militarization of oil trade, bringing the possibility of tensions and escalations, culminating in wars among the most powerful nations, through proxy allies. Present society is very dependent on oil, and security of oil supplies is a national security matter; security of oil supplies is a pressing problem not only because old supply reserves are depleting quickly, but because investors are not very open to risk in developing new supplies, in a very volatile global economical and political environment. There are massive risks (economical, as well as political) in developing new projects for oil supply, especially if they involve the transfer of oil over many national borders, facing a myriad of political uncertainties.

Table 2. World carbon dioxide emission 1990-2010

Country	Carbon emission from oil use in 1990%	Carbon emission from oil use in 2010 %
United states	44	44
Canada	48	48
Mexico	77	62
Oecd Europe	45	48
Oecd asia	59	46
Japan	65	50
Australia	38	33
Russia	33	23
China	32	26
India	15	16
Middle east	28	26
Africa	57	52
Central & south America	70	58
Non -OECD -Europe	46	43
Non -OECD Asia	76	70
TOTAL WORLD	42	39

Source :- UNDP report on Environmental pollution 1990-2010

To the scarcity and constant reduction of the quantity of non-renewable energy resources – which has brought, and will continue to bring tensions among nations – we need to add the carbon emissions generated by their burning; and both these things signal us that we must reorient to those energy sources which are renewable – but which have disadvantages regarding fluctuations in energy production (water, Sun, wind, geothermal) – and to unlimited energy resources, which work more constantly (nuclear power, and hydrogen). Not only that the reduction – and possibly elimination – of fossil fuel energy resources will bring a type of society which embraces sustainable development, and which is not so greedy in using natural resources to sustain its activity, but the importance of the resource – oil – which already has generated bloody wars would fade, creating the possibility of reducing military expenditure which would have been made in order to secure and maintain access to it in different places of the Earth. The money saved in this situation could be used in developing green energy projects in great energy consumers, and in developing countries, too, helping whole humanity to live in a better and cleaner world.

Conclusion

GIS best decision support system and data base are provides a vital statistics for the preservation and conservation of oil resources in the world. GIS techniques are utilized for the mapping of those areas which are more vulnerable or exploited and this will helps to make policies and plan for the sustainable use of oil resources. At present time population grows at a very faster rate as a results the number of vehicles increases four times more than population which leads to the large emission of carbon dioxide in the atmosphere. This leads environmental pollution at a large scale. Rapid development of the human society over the last two centuries was based on the excessive and uncontrollable use of fossil, non-renewable energy resources. As modern society developed, the need for energy has grown bigger, while the reserves of the non-renewable energy resources have lessened.

That is why, nowadays, it is not possible to solve the majority of the global problems without involving energy issues, whether the climate changes are concerned, new world economic crisis or current geopolitical conflicts. Among energy resources, in the modern world, due to their enormous importance as energy resources and raw materials in industry, oil and natural gas have been and still are, geopolitically, the most important 'goods'. Despite all efforts to develop alternative energy sources and to use energy rationally, the position of oil as an energy resource is not severely shaken. Oil reflects the division of the world economic and political power. Disposal of oil wells determines political and economic position of a country, as well as its inner stability or instability and perspective for development. Oil also dictates the position of particular countries in international trade on the global market, and that position depends on the fact whether or not the country is an importer or exporter of oil. For economic, but also military reasons, each country tries to provide sufficient oil supplies; therefore, steady supply of oil has become an important part of security politics of every country. And oil became a valuable resource which needs more conservation or a sustainable use which are benefited for the future of earth.

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