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PERCEPTIONS OF SECONDARY LEVEL STUDENTS ABOUT THE UNITED NATIONS (UN) AND THE UN PERMANENT MEMBER STATES

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Abstract: *The purpose of this study is to determine perceptions of secondary level students concerning the United Nations (UN) and the UN permanent member states (the US, Russia, China, England and France). The semi-structured interview form that is prepared for this purpose is conducted with 204 12th grade students in 10 secondary schools fit for purpose. Qualitative method is adopted in order to realize the aims. Application results are evaluated in computer environment and a descriptive analysis is made. As to the analysis results, 22,2% of the students that expressed an opinion on the UN perceive the UN as an institution operating in line with its primary objectives and 31,3% define it as an unnecessary, quasi-institution. It is observed that the sample has put emphasis on the US's power, Russia's natural riches, China's population, England's imperialism and France's cities. After being interpreted, the determined findings are brought to a conclusion and suggestions are made.*

Key words: *United Nations (UN), The UN permanent members, Instruction of countries' geography.*

INTRODUCTION

The United Nations and the UN permanent member countries (the US, Russia, China, England, France) are among the references that secondary level students often come across in geography textbooks. As a matter of fact, they study the following conceptions in their textbooks: the UN in Geography 12 textbook (Gultepe etc, 2008: 178); the US in Geography 9, 11, 12 textbooks (Oruc etc, 2009: 184) (Gultepe etc, 2009: 41, 51, 59, 149, 158, 162, 197, 219, 235) (Gultepe etc, 2008: 5, 11, 94, 149, 178, 179, 205); Russia in Geography 11, 12 textbooks (Gultepe etc, 2009: 64, 149, 219, 228) (Gultepe etc, 2008: 94, 163, 165, 178, 183); China in Geography 11, 12 textbooks (Gultepe etc, 2009: 34, 59, 70, 140, 149, 199, 204, 210) (Gultepe etc, 2008: 6-8, 27, 41, 49, 50, 94, 149, 170-174, 178, 195); England in Geography 11 textbook (Gultepe etc, 2009: 45, 59, 175-178, 235); and France in Geography 11, 12 textbooks (Gultepe etc, 2009: 35, 45, 59, 219, 227) (Gultepe etc, 2008: 10, 94, 182, 198-199).

The United Nations was founded on 24 October 1945. The US president Roosevelt, England's prime minister Churchill and Soviet Russia's prime minister Stalin laid the foundations (Ozey, 2010:372), (Akengin, 2010:169). Its purpose is to maintain international peace and security (Article 1/1), to develop friendly relations among nations based on peoples' equality (Article 1/2), to help nations work together to solve international economic, social, cultural and humanitarian problems (Article 1/3), to be a centre for harmonizing the actions of nations to

achieve these goals (Article 1/4). Its headquarters is in the US's New York City. It is directed by this headquarters. The number of the member countries is 192. Switzerland hasn't joined the UN in order to keep its neutrality (Ozey, 2010: 374). The Security Council, one of the organs of the UN consists of fifteen member countries. 5 of these members are permanent whereas 10 are non-permanent. Each member of the General Assembly shall have one vote (Article 18/1). Although the UN bestows equal rights to vote and be represented to all the member states, five permanent charter members (the US, Russia, China, England and France) have the veto right. If one of these permanent member countries objects to a decision, this decision cannot be performed (Akengin and Demircioglu, 2006: 252) (Gultepe etc, 2008: 178). The other ten non-permanent countries are elected for a two-years period. The geographical balance is taken as a basis in elections. Being one of the charter members, Turkey was elected as a non-permanent member for a two-years period in the year 2009.

The income of the organization consists of the dues paid by the member states. The contribution rate of the member countries is proportional to their ability to pay. For example, 22% of the budget of the year 2005 was met by the US, 19.47% by Japan, 8.66% by Germany, 6.13% by England, 6.03% by France, 4.89% by Italy, 2.81% by Canada, 2.52% by Spain, 2.05% by China and 1.88% by Mexico (UNIC- United Nations Information Centers)

The studies of the organization are conducted and published in English, French, Spanish, Russian, Chinese, and Arabic (Article 111).

The UN and the UN permanent member states are among the conceptions that the secondary level students study in textbooks and come across in their everyday lives. The fact that there are not much study about the perception of these conceptions is one of the reasons that necessitates this research.

The purpose of this study is to determine perceptions of secondary level students concerning the UN and the permanent member states and to compare the reasons and results of this situation. A semi-structured interview form is prepared for this purpose and answers to the following questions are sought.

1. Do the secondary level students perceive the UN as an organization operating in line with its primary objectives?
2. Do the secondary level students regard the UN as an effective and necessary organization in maintaining world peace?
3. Do the secondary level students think that the UN is controlled by certain member states?
4. Do the secondary level students think that the member states are active in the UN?
5. Are the secondary level students of the opinion that the UN helps needy countries?
6. Do the secondary level students think that the permanent member states are qualified to act in line with the requirements in the world?
7. Do the secondary level students appreciate or criticize the permanent members of the UN? Why?
8. On which conceptions do the views of the secondary level students about the UN permanent member states focus?
9. Do the secondary level students receive Turkey's membership of the UN favorably? Why?
10. Which permanent member state of the UN is most mentioned by the secondary level students with respect to its relationship with Turkey? Why?

METHOD

Model

This study adopts qualitative method to obtain in-depth data (Yıldırım and Simsek, 2005; Balcı, 2004; Karasar, 2003; Kus, 2003). The reason why this model is preferred is that it provides oppurtunity to obtain more elaborate data from the secondary level students about the UN and the permanent member states.

Participants

The participants of the study consist of 204 12th grade students studying in 10 secondary schools in Istanbul (Besiktas Anatolian, Mustafa Saffet Anatolian, Haci Sabanci Anatolian, Cagri Bey Anatolian, Huseyin Avni Sozen Anatolian, Cagaloglu Anatolian, Hayrullah Kefeoglu Anatolian, Kadikoy Anatolian, Atasehir and Capa Anatolian High Schools) in spring term of the 2008-2009 academic year (Table 1).

Table1: Sample distribution according to the schools (frequency: f and its percentage:%)

	f	***%***
Besiktas Anatolian High School	*21*	*10.3*
Mustafa Saffet Anatolian High School	*20*	*9.8*
Haci Sabanci Anatolian High School	*19*	*9.3*
Cagrı Bey Anatolian High School	*22*	*10.8*
Huseyin Avni Sozen Anatolian High School	*21*	*10.3*
Cagaloglu Anatolian High School	*20*	*9.8*
Hayrullah Kefoglu Anatolian High School	*22*	*10.8*
Kadikoy Anatolian High School	*19*	*9.3*
Atasehir High School	*19*	*9.3*
Capa Anatolian High School	*21*	*10.3*
Total	***204***	***100***

DATA ACCUMULATION AND ITS ANALYSIS

A semi-structured interview form is used in this study in order to gather data. Expert opinion is received about its preparation and application.

In the study, the sample is asked to specify his/her gender and geography grade and answer 6 open-ended questions titled United Nations (UN), the US, Russia, China, England, France.

The UN and the permanent member states are among the notions that the secondary level sample students come across in everyday life as well as in geography lessons.

The information the sample wrote concerning these notions that they had learned in their lessons and come across in everyday life is put down in the relevant tables much the same. Their statements are not altered. Although the repetitions are avoided as far as possible, they are reflected much the same on the the frequency lists in the tables.

The semi-structured interview form had been conducted approximately two weeks before the schools were closed. The results of the application are evaluated in computer environment and a descriptive analysis is made.

FINDINGS AND INTERPRETATION

62,3% of the secondary level 12th grade sample students, 204 people in total that have participated in our study are males whereas 37,7% are females. Geography grade-point average of 80,4% of these students is above 70.

The number of views that the sample expressed about the United Nations (UN) is less than the number of views about the UN permanent member states. While 99 views in total in 10 different categories are expressed on the UN concept, 2128 views in total in 189 different categories are expressed on the permanent member states of the UN. 451 views in 41 different categories concerning Russia, 412 views in 33 different categories concerning China, 459 views in 38 different categories concerning England, 418 views in 41 different categories concerning France were written (Table 2).

Table 2: The number and proportions of the views on the United Nations (UN)

	The views'			
	Category number	***Category percentage (%)***	***Number***	***Percentage (%)***
UN	*11*	*5.5*	*99*	*4.4*
The USA	*36*	*18.0*	*388*	*17.4*
Russia	*41*	*20.5*	*451*	*20.3*
China	*33*	*16.5*	*412*	*18.5*
England	*38*	*19.0*	*459*	*20.6*
France	*41*	*20.5*	*418*	*18.8*
Total	***200***	*100.0*	***2227***	*100.0*

When statements of the sample students about the UN, The US, Russia, China, England and France are analysed, it is observed that the students emphasized UN's existence, the US's power, China's population, England's imperialism and France's cities.

The United Nations (UN)

48.5% of the sample gave 99 answers in total in 11 different categories to the open-ended questions about the United Nations (UN). The rest 51.5% of the sample could not answer the question or left it blank.

When the answers are classified; the rate of those who think the UN is unnecessary, unsuccessful and good for nothing is very high. So much so that, this rate corresponds to 31.3% of the whole answers. The sample's statements concerning this are as follows: *"One of the unnecessary organizations. An unnecessary community. It is for show only. An organization that is good for nothing. So called united nations. An organization that has lost its significance. Doesn't have much function. Doesn't carry on a business properly. A different dimension of double standard. An organization that has deviated from its aim. A biased institution".*

It is observed that the participants' views on the UN's establishment, its aim and operation constitute 22,2% of the whole views. They stated those views as follows: *"An organization that balances political relations and maintains world peace. Sort of a nations assembly. Its aim is to gather all the nations under a single roof in worldwide peace. It aims at increasing collaboration among countries. Helping nations that are in a squeeze and objecting to war are among its duties".*

12,1% of the sample stated that the UN is under the US's control and it is the US's plaything. Those statements can be summarized as follows: *"An organization in which the US has always a say. A community under the US's control. They are responsible for world peace, but they became plaything in the hands of the US. It was established upon the US's demand. An organization that the US presides. The US is the centre of the UN. A union that was established by the US in order to control the states in the world".*

The statements made by the students concerning the UN-Turkey relations (12,1%) indicate that they think Turkey is a member, but does not have a say. That's why there are even those who think that Turkey should cancel its membership. The sample's statements regarding this matter can be ordered as follows: *"Turkey is in the UN. We are a member of this organization. We are a so-called member, because we have never been influential although we do whatever they demand. It is one of the elements that restricts Turkey's freedom. We must definitely cancel our membership."*

The sample made such references about the UN as culture, civilization, military organization, economic union and relief organization (6.1%). Moreover, names of the UN secretary-generals are repeated at the rate of 3%. Apart from that, there are also such assertions as that the UN was established to help Christians and it is actually crusading (2%), that it defends the rights of only one member (2%), that it is a murderer (2%) and that it does not have military power (1%) (Table 3).

Table 3: Sample's views concerning the United Nations (UN)

	f	*%*
One of the unnecessary organizations. Unnecessary. An unnecessary community. Fabrication of the foreign people. Fabricated nations. Made up, nonsensical united states. It is nonfunctional. An organization that is good for nothing and a supporter of Israel and the US. So-called saviors. So-called united nations. A lie. An unnecessary organization where necktied men come and try to maintain peace. It comes to nothing. Futile. Useless. It goes for little. An organization that has lost its significance. Doesn't have much function. Cannot carry on a business properly. A different dimension of double standard. A community of no use. It has obviously been unsuccessful. An organization that was established to help people but it has deviated from its aim. A biased institution. A union taking care of interests of imperialism. Fake empire.	*31*	*31.3*
An organization that balances political relations and maintains world peace. Conditionally an effective, good union, power. Its aim is to gather all the nations under a single roof in worldwide peace. It aims at increasing collaboration among countries. Cooperation among nations. Helping nations that are in a squeeze and objecting to war are among its duties. A union in which international problems are negotiated. It has the mission to help nations work together in dire straits. It collaborates with UNICEF and IMF. It contributes to world peace. An organization founded for the sake of peace. It was established to maintain worldwide peace. Its aim is unity and solidarity. It was established in 1948 to bring about peace. It was established to maintain worldwide peace after the second world war. An international organization founded after the second world war to bring about peace. It solves international problems. It was established after the San Francisco Conference. Continuation of the league of nations.	*22*	*22.2*
An organization in which the US has always a say. A community under the US's control. Responsible for world peace but they also became plaything in the hands of the US. Its function is to gather around the US. It was established upon the US's demand. The US is the centre of the UN. An organization that the US presides. An organization that is under the influence of the US. Under the US's influence, the US does what it wants. Recently, the US is the country that is violating human rights which is a contradiction. The US is a country that carries out genocide in the place to which it brings peace. A union that was established by the US in order to control the states in the world. We have seen what happened in Iraq and Palestine. They do not even publish a notice to North Korea that is threatening the world with its chemical weapons. A union that condemns a war-criminal state 'only' after ninety days and says it has to put an an end to that.	*19*	*19.2*
Turkey also became a member of the UN in 1952. We are a member. Turkey is a member. Turkey is in the UN. We are a member of this organization. A foundation that we are a member of. There are very few states that are not members of it. We are so-called a member, but we have never been influential although we do whatever they demand. It is one of the elements that restricts Turkey's liberty. We must definitely cancel our membership. A union of which developed states of the world are permanent members	*12*	*12.1*

whereas we are a non-permanent member.		
The most powerful civilization of the world. A powerful civilization. A civilization that has a global economy. An organization that is developed in military terms. A union that includes soldiers of states that cannot pay credits of the funds. Like a relief organization. Helps African countries. An institution established with the aim of helping.	*6*	*6.1*
Its secretary general is Ban Ki-moon. Kofi Annan was the former one.	*3*	*3.0*
A group in which the member states defend each other's rights. A group whose members try to get on with each other.	*2*	*2.0*
It was established with the aim of helping Christians. Crusade.	*2*	*2.0*
An establishment which does not have much military power and whose decisions are disregarded by Iran.	*1*	*1.0*
The United Nations is the official name of a bloody-minded murderer as well.	*1*	*1.0*
Total	***99***	***100***

The United States of America (the USA)

388 views in total in 36 different categories concerning the USA are expressed. The sample's prominent emphasis concerning the US is that it is a developed country in terms of power, industry, technology, army and economy. 31,2% of the views the students expressed about the US are related to the preceding points. The statements they made are exactly as follows: *"The greatest and most powerful state of the world. Developed in terms of economy. The country that holds the world economy in its hands. The boss and giant of the world. The only superpower. It is ruling the world. Developed in terms of industry, technology and military power."*

The second most prominent statement the sample made (12,1%) is about the US's being imperialist, colonialist and capitalist. They expressed the following opinions about that: *"The capital of imperialism. It takes the bread out of people's mouth and feeds on cake and champagne itself. The father of exploitation and colonialism. It is known to be a colonizer. It has become a superpower by exploiting. It is exploiting powerless and defenceless countries. The center of capitalism. Supporter and spreader of capitalism."*

The third most prominent emphasis the students made is about Obama the president. These statements correspond to the 10,1% of the whole views expressed on the US. The following statements are about Obama's characteristics emphasized by the sample: *"He is the first black president of the USA, first negro president. As he is a newly president, we don't know what he will do in the future. We congratulate Obama. We love Obama the president. We hope that what he has said will not fall on deaf ears. Obama is in Turkey. Obama cannot change the USA's destructive policy either."* Only the names of the former presidents Abraham Lincoln (0,5%) and Clinton (0,3%) are written. No views on those presidents are expressed. But the following statement is made about Bush (0,3%): *"When he was the president, Bush was trying to make war."*

The forth most prominent conception the students emphasized is war (5,7%). The following remarks are made about the USA. *"The US is infamous for its massacres and wars. It is a supporter of war. A warrior. Its policy is to wage a war with the aim of having oil reservoirs. It is the military police of the world. It has carried out an attack on Iraq. It said that it would leave Iraq and it did. But this time it is in Afghanistan."*

The rate of those who wrote that the capital of the USA is Washington corresponds to the 4,9% of the whole views. The rate of those having emphasized the concept of liberty is 4,1%. They have passed the following remarks about this: *"It has got a free environment. Highly liberal. The place I want to live in. The only country that embraces every kind of people."*

The rate of those who made the following statements about the USA is 3,6%: *"It is divided into states. It is ruled by provincial system. It has stars on its flag that represent its states."* The rate of those who underlined natural riches of the US is 3,1%. They expressed their opinions on these riches in that way: *"It has rich oil reservoirs. It is rich in underground and overground sources. It has a natural beauty."*

The rate of those who mentioned cultural characteristics of the USA is 2,8%. The prominent statements about this are as follows: *"A cultural capital. It has a cultural diversity. It does not have a single race or culture. It has a short history and has a mixture of races. The feeling of patriotism doesn't exist in this country."*

The following points concerning education are reported: *"Developed in education. It gets the most brain drain. It provides equality of oppurtunity in education. It is a cradle of civilization which provides high education and living standards. It contains best universities of the world."* This rate corresponds to 2,6% of the whole views.

The subsequent ideas are put forward about money and bank: *"The place where money is hidden. The fact that it is constantly minting is worth-stressing. Most of the banks in the world belong to the US. Most important finance centers are located in this country. Nevertheless, it has been highly affected by the economic crisis. It is the greatest trade center."* The rate of these ideas is 2,3%.

The sample has also ideas about such concepts as place names (2,3%), the Statue of Liberty (1,3%), Christopher Columbus (1,3%), nuclear weapon (1%), obesity (1%), American Indian (1%), gambling house (1%) and Israel (0,8%).

There are the following remarks as well: cinema (0,5%), big surface area (0,3%), basketball (0,8%), it will begin to decline (0,8%), it is an ally and enemy of Turkey (0,8%), Christianity is widespread (0,5%), it is a loathed country (0,5%), it is a terrorist state (0,5%) and it is located between two oceans (0,3%).

In addition, ideas about the following conceptions were put forward: *"drugs"* (0,3%), *"traditional families are common"* (0,3%), *"most commonly used means of transport is airplane because there are too many deserts and badlands in the country"* (0,3%), "*they didn't make a deal for global warming"* (0,3%), *"more than one local time is used"* (0,3%), *"the twin towers incident"* (0,3%), *"American football"* (0,3%) (Table 4).

Table 4: The sample's views concerning the US

	f	*%*
The greatest and most powerful state of the world. A powerful state. The world's most wealthy state. Developed in economy. The boss and giant of the world. The only superpower. It is ruling the world. Most powerful state of the world. Not only the most powerful one among the other countries but also the most ruthless country. Egoist. Strong and strengthening. The unique superpower. A country that interferes in internal affairs of other countries and that tries to be global. The country that holds the world economy in its hands. Boss of the world. The giant of the world. A state that is ruling the world. Developed in terms of industry, technology and military power. All branches of industry is well-developed. The industry isn't accumulated in one area. It is the center of technology, developed in tecnology, the most advanced technology is here, pioneering country in space research. Highly developed in space technology. Developed. Most developed. It has got a developed industry and economy. Developed in tourism. Powerful in army. Developed in weapon and energy. It ranks first in military and economic terms. It has the strongest military armada. Although it had less military power than Yugoslavia's army, it became a superpower.	*121*	*31.2*
Imperialist. The capital of imperialism. The father of colonialism and imperialism. The world's imperial power (Uncle Tom). The nest of imperialism. It takes the bread out of people's mouth and feeds on cake and champagne itself. Colonizer. Colonial empire in the world. It exploits many countries. The US provides petrol via exploiting foreign countries. The USA is known to be a colonizer. It has got the most out of imperialism. Trouble maker that exploits various countries (Turkey from 1940s on). It became a superpower by exploitation. A state that seems to be trying to maintain peace. It became a superpower by exploitation in the name of bringing peace. It exploits powerless and defenceless countries. Capitalist, supporter and spreader of capitalism. The center of capitalism. The capital of capitalism. Capitalism, money and power.	*47*	*12.1*
Barack Hussein Obama is the first black president of the USA, first negro president, we don't know what he will do in the future since he is a newly president. We congratulate Obama. We love Obama the president. Long live Obama. We hope that what he has said will not fall on deaf ears. Obama is in Turkey. Hello Obama! You brought peace. Obama cannot change	*39*	*10.1*

destructive policy of the US either.		
It is infamous for massacres and wars. Warrior, pioneering country in cold war etc. Its policy is to wage a war with the aim of having oil reservoir. It has fought wars with the Middle East countries. It has been the military police of the world approximately for 100 years. It tries to get rid of the antipathy it got after it waged war on Iraq by the sympathy it gained through Obama. It has carried out an attack on Iraq. It said that it would leave Iraq and it did. But this time it is in Afghanistan. It is the country that creates trouble among states. Lives of a good deal of people are ruined because of US's interests.	*22*	*5.7*
Its capital city is Washington	*19*	*4.9*
There exists quite a liberal atmosphere. Highly liberal. So-called liberty. Focus of anger. One of the countries where people can live independently. Country of oppurtunities. People are deceived that it is a country of freedom. They say they are best to protect human rights. But I don't think so. It is the place where I want to live. I want to live in California. Living standards are high. It has developed living standards. It has a complicated social structure. Very complicated, contains people of all the nations. The only country that embraces every kind of people.	*16*	*4.1*
It is divided in states. It is ruled by provincial system. A lot of provinces exist. Consisting of states. It has stars on its flag that represent those states. It is a federation that consists of 52 memberstates. There are 52 stars on its flag. Each of them represents a state.	*14*	*3.6*
It has rich oil reservoir. It is a very wealthy state. One of the most wealthy states. Rich in underground and overground sources. Search for market and raw material emerged after the Industrial Revolution. Wealthy people and unemployed people that migrated from the West Europe after manpower was no longer needed, established this country. A country that is fond of raw material. It has a rich natural beauty.	*12*	*3.1*
It is the capital of culture. It has cultural diversity. It does not have a single race or culture. It has a short history and a mixture of races. It applies cultural imperialism. It has cultural diversity as well as cultural regeneration. Morality has collapsed. The feeling of patriotism does not exist. It is trying to rule the world although it doesn't have a real history. Being a country of 200 years, it cannot compete with Turkey's long history.	*11*	*2.8*
Developed in education. It gets the most brain drain. It provides equality of opportunity in education. It is a cradle of civilization which provides high education and living standards. Heart of the world. But level of education goes through the floor. It contains best universities of the world. One has to pass SAT in order to enter university here.	*10*	*2.6*
The place where money is hidden. The fact that it is constantly minting is worth-stressing. Most of the banks in the world belong to the US. Most important finance centers are located in this country. Nevertheless, it has been highly affected by the economic crisis. Stock exchange. It is the greatest trade center.	*9*	*2.3*
Place names; Alaska, New York, California, Miami, Hawaii, Michigan,	*9*	*2.3*
The Statue of Liberty	*5*	*1.3*
Christopher Columbus explored. It was founded by the Europeans that migrated to the American continent, after Christopher Columbus explored it.	*5*	*1.3*
They manufacture nuclear weapon and bomb. They have nuclear weapons.	*4*	*1.0*
They are obese patients. The country in which a high level of obesity is observed. 80% are fat. They are butterballs.	*4*	*1.0*
First there were Indians. They slaughtered Indians. They didn't treat black citizens as human	*4*	*1.0*

beings until 50 years ago.		
Gambling house (Las Vegas, night, poker, Daniel Negreanu).	*4*	*1.0*
Abraham Lincoln, Clinton and Bush (Bush was trying to make war).	*4*	*1.0*
It is Israel's main ally. It backs Israel up. It takes helping Israel's plans as its duty and occupies Middle East at every oppurtunity.	*3*	*0.8*
One of the countries that will collapse very soon. Although it seems to be the superpower of the world for the time being, what will happen in the future is uncertain. It might begin to collapse. The world power that is thought to be indestructible but that is beginning to collapse.	*3*	*0.8*
It is declared to be Turkey's ally by every current government. It has always stabbed us in the back. Manipulative ally. It is even the country that has the president of the Turkish Republic elected.	*3*	*0.8*
Basketball (NBA, Hidayet Turkoglu, Mehmet Okur)	*3*	*0.8*
Christianity is widespread. Christianity is probably the most popular religion.	*2*	*0.5*
I hate this country. It is a country in which there are all kinds of immorality, deception and ignominy.	*2*	*0.5*
The greatest terrorist state of the world.	*2*	*0.5*
It is a country that you have to like, if you like cinema. Holywood.	*2*	*0.5*
It has a big surface area.	*1*	*0.3*
Geographical position: located between two oceans	*1*	*0.3*
Use of drugs are widespread.	*1*	*0.3*
Traditional families are widespread.	*1*	*0.3*
Most commonly used means of transport is airplane because there are too many deserts and badlands in the country.	*1*	*0.3*
They didn't make a deal for global warming.	*1*	*0.3*
More than one local time is used.	*1*	*0.3*
The twin towers incident	*1*	*0.3*
American football	*1*	*0.3*
Total	***388***	***100***

Russia

The sample has expressed 451 views in total in 41 different categories. Most repeated views of those are as follows: *"It has rich natural sources. It is rich in underground sources. One of the greatest natural gas producers"* (14.2%). The following statements succeed this with a rate of 13.7%: "*It has a cold climate. Glacial climate is dominant in some parts of the country (Siberia etc). A paragon of beauty covered in glaciers. Very*

cold." The rate of those who put forward the following statements about its surface area is 8.2%: *"It has the largest surface area in the world. It has got a huge piece of land. The largest country."* The rate of those who referred to its developed, powerful technology and to the fact that its capital city is Moscow is quite high as well (8.2%).

The sample passed the following remarks about Turkish-Russian relations: *"It is Turkey's biggest rival in politics. It was a nuisance forTurkey because of its policy to break south into the warmer climates. It has been Turkey's enemy so many times. It has fought many wars with Turkey. It is among the countries that first recognized Turkey as a state. A great majority of the people travel to Turkey in summer to take a holiday. The country that provides more than half of Turkey's need for natural gas" (5.8%).*

The observations made concerning Russia's history are as follows: *"From principality into czardom. After the czardom collapsed, the Soviet Union was established. New countries came into existence after dissolution of the USSR. The country that is founded after dissolution of the Soviet Union. It tries to protect its reputation and regain its power" (5.8%).*

The prominent concept about the relations between Russia and The USA is rivalry (5.1%). Commonly expressed ideas are as follows: *"It is the US's rival. It is an opponent of the US. One of the rare states that the US fears. One of the most powerful states in the world after the USA."*

They made the following explanation about Russia's regime: *"It is the founder of the communist regime. Still a socialist"* (4.7%).

The sample put an emphasis on the beauty of its women (83.5%) and its famous vodka (3.5%). In addition, they suggested that *"It has adopted a policy to move south into the warmer climates"* (2.9%) and that it has a small population despite the large surface area because of severe climate conditions (2%). It is underlined that its people are *"blonde, white-skinned and cold"* (1.1%).

The rate of those who submitted that *"It is a state that has nuclear weapons and is pioneering in weapon manufacture"* is 1.1%. The sample gave information about the political leaders Lenin (1.1%), Stalin (0.7%), Putin (1.1%) and Medvedev (0.2%) as well.

The samle expressed opinions on Russian literature, art and architecture (0.9%), problems of people of different ethnical groups that live in the country (0.9%), nuclear power stations (0.9%), the Petersburg city (0.9%), sport activities (0.9%), economic activity (0.9%), economic crisis (0.7%) and its being a popular country (0.9%). Moreover, they made explanations about mafia (0.7%), poker (0.2%), Roman Abramovich (0.2%), White Russia (0.2%), Red Square (0.2%), Red Army Choir (0.2%), Eurovision (0.2%), its language (0.4%), religion (0.2%), flag (0.2%), that Russia is active in Georgia (0.2%), that it has land in Europe and Asia (0.2%), that people in the country suffer from class division (0.2%), and that it is difficult to set up a home and have a child in Russia (0.2%) (Table 6).

Table 5: The sample's views concerning Russia

	f	***%***
It has rich natural sources. It is rich in underground sources and raw materials. Today one of the greatest natural gas producers of the world. It has coal deposits and natural gas wells.	*64*	*14.2*
It has a cold climate. Glacial climate is dominant in some parts of the country (Siberia etc). A paragon of beauty covered in glaciers. A country where the temperature is very low. A great part is always covered in snow. Cold. Very cold. Very very cold! Wearing coat is a must. There must be definitely antifreeze in cars.	*62*	*13.7*
The largest surface area of the world. It has got a huge piece of land. The largest country. A very large country. Quite a large country.	*37*	*8.2*
It is a developed country. Very powerful in military terms. It is the most powerful state of the world. The greatest power in the world according to me. Developed in technology. It has got a powerful technology and army. The most powerful country of Asia. It has a great military power. It has a very big army.	*37*	*8.2*

The capital city is Moscow.	*29*	*6.4*
It is our greatest rival in political area. It was a nuisance for Turkey because of its policy to move south toward the warmer climates. It has fought many wars with our country throughout history. The country that was among the allied powers and that left the Ottoman Empire in a difficult situation in the second world war. It is among the first countries that recognized Turkey as a state. The country that provided military vehicle for Turkey. It has been our enemy so many times. Seemingly an ally. I like that country. It seems to be a friend to me.	*26*	*5.8*
The country for which Turkey is the most favourite holiday destination. Tourists of the country flock into the Mediterranean every summer. A great majority travel to Turkey in summer to take a holiday. Every summer, a large number of its citizens travel to our country for holiday.		
An important trade place for Turkey. It has developed economic relations with Turkey. Turkey is dependant on its energy, since it is rich in natural gas. The country that provides more than half of Turkey's need for natural gas.		
It had a long way from principality to czardom, from there to communism regime. Lastly they attained republic as the right way. Formerly, it was a czardom, then it was the USSR. After the czardom collapsed, the Soviet Union was established. It is a socialist state. It supports the idea of panslavism. It founded socialist republics in the Balkans with the policy of panslavism. Countries such as Kazakhstan, Georgia and Ukraine are its colonies. Capitalist system has been adopted after dissolution of the Soviet Union. Once upon a time, it was the Soviet Union. Imperialist country in other words. The place where Russia is established after dissolution of the USSR. I hope it will create a bipolar world again, although it begin to decline after the Soviets. It has experienced an irregular political life. They have imperial dreams for 400 years. New countries emerged after dissolution of the USSR. The country that is established after the Soviet Russia dissolved in 1991. It was no longer different from the USA after the Soviets dissolved. Although it has lost power since then, it began to grow stronger. They have never been a superpower after the Soviets. It nationalized the banks that were not formerly in possession of the state. It is trying to protect its reputation and regain its former power. One of the four giants of the world.	*26*	*5.8*
It is in a rivalry with the USA. (Unfortunately!) the only power against the US. Anti-american. It is an opponent of the US. A country that can compete with the US. The arch rival of the US. It is the rival of the US. It is trying to be a rival to the US. A country that can be a rival to the US. It is the second superpower after the USA. One of the rare countries that the US fears. It is thought to be threatening for the US. In addition, the US destroyed its energy policy by surrendering Alaska. The US's main enemy. It sent the first astronout to the space during the cold war. Russia is one of the most powerful states after the US. A power that can stand up to the US alone.	*23*	*5.1*
It is the founder of the communist regime. It reminds me of the communist revolution that took place in the country. One of the countries that was most affected by socialism. Still socialist. They are communists. The place of former communism. Socialism.	*21*	*4.7*
It has beautiful women. I am jealous of its girls since they are very beautiful. Russian girls are renown worldwide. Taking the physical characteristics into account, there are lots of beautiful citizens in the country. People are generally defined as blonde and blue-eyed.	*16*	*3.5*
The country's most well-known alcoholic drink is vodka. It is famous for whiskey as well. Drinking all day long.	*16*	*3.5*
They have the policy to move toward the warmer climates. They are always trying to realize megali idea (moving south toward the warmer climates).	*13*	*2.9*

Its population is around 160 million. The severe climate conditions are influential in the low population. It has the largest surface area. Therefore population density is low. It has a Turkish population.	*9*	*2.0*
Blonde, white-skinned people. Everbody is blonde due to the climate i guess. People are cold as well. But still they are nice people.	*5*	*1.1*
It is a pioneering state in terms of weapon production. A country that has nuclear weapons. It has a powerful armament.	*5*	*1.1*
Lenin.	*5*	*1.1*
Putin.	*5*	*1.1*
According to me, literature's all noteworthy authors are from Russia, I am much obliged. Russian literature. A very artistic country. Its architecture is very nice.	*4*	*0.9*
It has problems with the various ethnical groups living in the country. The murderer of the Crimean Turks. It has assimilated Azerbaijanis and other Turkish states for many years. Turkish states became independent in 1980s.	*4*	*0.9*
There are a lot of nuclear power stations. They caused the Chernobyl disaster. They increased the rate of cancer in the Black Sea Region.	*4*	*0.9*
Petersburg.	*4*	*0.9*
I like Russia. One should visit. If only I could go and see it. I wish to see Moscow.	*4*	*0.9*
Sport (People were dazzled by the football it played in European Championship. Semi-finalist of the last European Championship. Arshavin. Fatih Tekke plays for Zenit. Figure skating.)	*4*	*0.9*
Agriculture has a big share in economy. Developed in the field of forestry. Forests cover 1.4% of the country.	*4*	*0.9*
It has been seriously affected by the economic crisis. Its economy is not good now. The country which will come to an end in the following centuries in my opinion.	*3*	*0.7*
Stalin.	*3*	*0.7*
Mafia	*3*	*0.7*
Its language is Russian. They speak fast.	*2*	*0.4*
It caused Georgia to be negatively influenced in moral and material terms.	*1*	*0.2*
Apart from Turkey, it is the only country that has land in Eurasia.	*1*	*0.2*
It has a great class division.	*1*	*0.2*
It is difficult to set up a home and have a child. There are laws to encourage that.	*1*	*0.2*
Poker	*1*	*0.2*
It has a very rich citizen called Roman Abramovich, he is a future world leader candidate.	*1*	*0.2*
White Russia	*1*	*0.2*
Red Square	*1*	*0.2*

Red Army Choir	*1*	*0.2*
Eurovision	*1*	*0.2*
Orthodox Christians	*1*	*0.2*
The country's flag is made up of blue, red and white (with horizontal lines)	*1*	*0.2*
Medvedev is the president.	*1*	*0.2*
Total	***451***	***100***

China

412 views in total in 33 different categories about China are expressed. The most repeated one among these views (41,7%) is about China's crowded population. The views that succeed this idea with a rate of 15,5% are about the labour superfluity, cheap and poor quality production. The following ideas are put forward regarding this issue: *"There is a great deal of manpower. A country that manufactures everything of poor quality with cheap labourer. They produce commodities of poor quality and cheap toys. They threaten human health. They manufacture broken toys and poor-quality goods."*

Another thing the sample underlined is about China's economic power (11,2%). The statements made about this point are as follows: *"Superpower of the future. Third giant of the world. It seems that it will shake the world with its industry. It has recently left its mark on the world in the fields of trade and industry. It has surrounded the world with its products."*

The views on China's regime correspond to 6,1% of the whole views expressed about China. The following remarks concerning this come to the forefront: *"A socialist country. A communist state. Dictatorship."*

The rate of the statements on its capital city (2,9%), its short and slant-eyed people (2,9%) and Great Wall of China (2,7%) is quite high.

The rate of those who made the following comparison between China and the US is 1,9%: *"It is powerful enough to overcome the US with its manpower and dollar."*

The rate of those who mentioned rice, China's one of the prime nutrients is 1,7%. The other significant characteristics that the sample laid stress on are food culture (1,7%), culture and civilization (1,5%), Beijing Olympic Games (1,5%) and its large surface area (1,2%).

The students claimed that *"China affects Turkey's economy negatively with cheap and poor-quality stuff"* (1%). The rate of those who regard Chinese as the language of the future is 1%.

The sample also passed remarks on characteristics of stockbreeding in China (0,7%), its being a Far East country (0,7%) and inadequacy of education and health facilities (0,5%).

One of the participants of our study made the following statements: *They are very hardworking and well-disciplined* (0,2%). *The national flag of the country is red* (0,2%). *The country of imitation* (0,2%). *I am a fan of their system* (0,2%). *The country that is aware of the fact that it is manipulated* (0,2%). *Cotton production is widespread* (0,2%). *Taoism* (0,2%). *One of the former presidents committed suicide* (0,2%). *Silk road* (0,2%). *It is quite influential in global warming* (0,2%). *They have such thought systems as Ctao and Funk Shui that acquired worldwide fame* (0,2%). *I don't like Chinese people, they all look the same* (0,2%). *Beijing massacre* (0,2%). *The mount Everest is located in this country* (0,2%). *Its air is polluted* (0,2%)" (Table 6).

Table 6: The sample's views concerning China

	f	*%*
It is the most crowded country in the world. The country that experience population explosion. Ant nest. It is forbidden to make more than a baby, since it has a large population. They have adopted certain policies in order to decrease the population. A family can only have one child. They are obliged to have only one child. According to an assumption, the world would be destroyed if the Chinese jumped all at once. The world's orbit would change if they all jumped simultaneously.	*172*	*41.7*
There is a great deal of manpower. A lot of manpower, cheap production. It manufactures everything at a zero-cost with cheap labourers. The country that can manufacture cheap products by exploitation and ecocide. It is related that labourers live on $40 in a month. There is a cheap production in textile and toy industries. Their products are very lousy. They manufacture every stuff of poor-quality. They threaten human health. They manufacture broken toys and poor-quality goods. The country that has reduced the quality by the products it has manufactured in recent years.	*64*	*15.5*
Superpower of the future. Powerful country of the future. A great power with its distinct route. Third giant of the world. It is becoming a dominant country day by day. It seems that it will shake the world with its industry. The center of technology. Developed in industry. It has recently left its mark on the world in trade and industry. Developed in economy. Its products have surrounded the world. The goods it manufactures at zero-cost is a big threat to the global economy. It has an important role in the world market. It is an influential state in the world market. A developed country in terms of economy. It turned the global economy upside-down. It has a significant role in theworld economy. An economically developed country. Its economy grows even in times of economic crisis. Its market is growing day by day. It has turned the market upside-down. It is a closed book.	*46*	*11.2*
Its regime is socialism. A communist state. Dictatorship. It made great progress through communism. The country had a culture revolution during Mao's time and destroyed most of the cultural and historical artifacts. It has a nonsensical regime called Red Republic similar to socialism. Nowadays the state is capitalist. It is pro-Russian. Doesn't like the US.	*25*	*6.1*
Its capital city is Beijing.	*12*	*2.9*
Short, slant-eyed people. Slant-eyed, small people. Small, slant-eyed Asians. They all look the same. They are all the same. Apart from Yao Ming, all its people are of one-meter high.	*12*	*2.9*
The country where the Great Wall of China is located. It contains such an historical construction as the Great Wall of China. The Great Wall of China constructed to be protected from the Turks is the only man-made structure visible from space.	*11*	*2.7*
One of the greatest rival of the US. It is able to overcome the US with its manpower and dollar if it likes. The China-Russia-Iran cooperation is emerging as an alternative power to the US. Dollar reserves of the country are much more than that of the US. It challenges the USA with its large population.	*8*	*1.9*
There is too much production and consumption of rice. It ranks number one in rice production.	*7*	*1.7*
They have an interesting food culture. I don't like eating habits of the Chinese. Horrible creatures. They eat dogs which is disgusting. They eat all kinds of insects as well. They eat sushi, a Chinese food. Rotating dining tables.	*7*	*1.7*
Chinese civilization is civilization of the future. It has a deep-rooted civilization. One of the most deep-rooted nations. They have a developed culture.	*6*	*1.5*
Last Olympic Games took place in this country. Beijing Olypmpics.	*6*	*1.5*

It has a very large surface area. A country that has a huge geographical area.	*5*	*1.2*
It affects Turkey's economy negatively with cheap and poor-quality stuff. They threaten our economy. They caused Turkey's economy to collapse because of cheap Chinese commodities. They turned our national economy upside-down.	*4*	*1.0*
Chinese is regarded to be the language of the future. It is difficult to learn because of its interesting alphabet. 11 languages are spoken in China.	*4*	*1.0*
Stockbreeding is developed. The country in which sheep and goat farming in on the first rank. It has agricultural economy as well.	*3*	*0.7*
It is a Far East country.	*3*	*0.7*
Its people lead a dog's life because of social, and monetary problems. Education and health facilities are insufficient.	*2*	*0.5*
They are very hardworking and well-disciplined.	*1*	*0.2*
The national flag is red.	*1*	*0.2*
The country of imitations.	*1*	*0.2*
I am a fan of their systems.	*1*	*0.2*
The country that is aware of the fact that it is manipulated.	*1*	*0.2*
Cotton production is widespread.	*1*	*0.2*
Taoism	*1*	*0.2*
The former president has recently committed suicide.	*1*	*0.2*
Silk road	*1*	*0.2*
It is quite influential in global warming.	*1*	*0.2*
They have such thought systems as Ctao and Funk Shui that acquired worldwide fame.	*1*	*0.2*
I don't like Chinese.	*1*	*0.2*
Beijing massacre	*1*	*0.2*
The Mount Everest is located in this country.	*1*	*0.2*
Its air is polluted	*1*	*0.2*
Total	***412***	***100***

England (The United Kingdom)

The sample wrote 459 views in total in 38 different categories about England. 12,4% of those suggested that *"England is an imperialist state."* 11,1% of the views are about the fact that *"It is one of the most powerful states of the world."* There are also views related to football (10,5%) and Industrial Revolution (%8,7).

The statements made about the fact that it is an island country and London is the capital city corresponds to 74%

of the statements written about England.

The rate of the views on the personal characteristics of the English is 5%. They put forward these ideas: *"Its people are successful and cold-blooded. They lead a modern life. They are fair-skinned, colored-eyed and tall*." The rate of those who mentioned its queen is 3,9%. The rate of those who referred to its political and historical relations with the USA and Israel is 3,3%. Related to this point, the following ideas were put forward: *"The USA's father. The power behind it. The US's brain and commander. It works for the benefit of Israel."* 2,8% of the sample highlight that England is actually ruling the world and it pursues a hideous policy. 2,8% put emphasis on the climate conditions and 2,4% mentioned universality of the English language.

The most important point the sample laid stress on is about its *"low population growth rate and high rate of active, elderly population"* (21,2%). 2% of the sample stated that it is one of the most influential leader country of Europe. Another 2% wrote the following statements: *"It has a high quality eduation. A developed country preferred for the preceding reason. The country that contains most popular universities of the world."*

Other conceptions mentioned are as follows: inventer of the steam engine (1,5%), cradle of democracy (1,1%), value of its currency (0,7%), deficient in oil(0,7%), rich in bituminous coal deposits (0,7%), developed in industry whose foundation was laid by cotton weaving (0,7%).

0,4% put emphasis on the fact that the prime meridian passes through Greenwich, that modern methods are used in agriculture, that it has very good writers and that it is one of the countries they wish to visit.

The sample also made the following statements: *"It is not on good terms with Turkey. It has problems concerning autonomy with Scotland. A country that is idiosyncratic and that tries to conserve its culture. It is the former superpower. Any individual freedom is not respected. German has wanted to occupy it for many times but have not been able to do. It is developed in marine transportation. Fishing industry is developed thanks to ocean currents. It has so many cliffs. A wealthy country in respect of trade. It is a mountainous and rough country"* (0,2%).

There are also some concepts to which the sample referred without any explanation or comment. They are as follows: London Eye (0,9%), Tower of London (0,2%), the Clock Tower (0,4%), Big Ben (0,7%), Tony Blair (0,4%), red double-decker buses (0,4%), Oxford (0,4%), Ireland (0,2%), Scotland (0,2%), Arsenal (0,2%), Manchester (0,2%), Galya (0,2%), Elizabeth (0,2%), Gordon Brown (0,2%), John Terry (0,2%), Harrods (0,2%), Lloyd George (0,2%), Madame Tussauds (0,2%), Museum of Great Britain (0,2%), wax museum (0,2%), Westminster (0,2%) (Table 7).

Table 7: The sample's views concerning England

	f	*%*
An imperialist state. Imperialist. Colonial empire. Colonizer. Master of imperialism. It was formerly a large colonial empire. Continuation of an empire built upon colonies. A country that exploits Muslims. It is under the protection of Canada, the USA, Australia, New Zeland and South Africa. It meets its raw material need through exploitation. The country that gets most of the raw material from abroad. It is known to be "the empire on which the sun never sets" because it is imperialist. It is called "the country on which the sun never sets."	*57*	*12.4*
One of the most powerful states of the world. Its economy is quite developed. The center of economy. It is a developed country in every aspect. It has high living standards and welfare level. Per capita income is considerable.	*51*	*11.1*
Sports (Cradle of football. Ancestors of football. Main country of football. It is among the most successful countries in football. Arsenal, Chelsea, Liverpool, Manchester United, Everton are among the most popular football clubs. Tuncay Sanlı plays for Middlesbrough. They possess the most watched football league of the world. Premier league. Champions league. This country is the finalist with its champion. Its hooligans)	*48*	*10.5*
England laid the foundations of the Industrial Revolution. It is the place where industrialization began. The first country of indutrial revolution. Industrial country. Industrial Revolution.	*40*	*8.7*

Its capital city is London.	*34*	*7.4*
It is an island country. It is not affected by problems since it is an island. The country that possesses the most beautiful island of the world. One of the most important states of Europe that is not involved in wars, because it doesn't have any land connection. A country that cannot be easily occupied, because it is an island country. It plays an important role because of its strategic position.	*34*	*7.4*
A country full of cold-blooded people. A country consisting of cold people. People lead modern lives there. Spectacled men. They are successful and cold. Clever and cold. People are priggish yet pretty at the same time. White-skinned, colored-eyed, tall people. They are bad people. They don't give up their traditions. They are bigots. They can do anything for their interests. The country of vain Anglo-Saxons.	*23*	*5.0*
The country where the queen lives. It has managed to maintain kingdom. It has a symbolic queen. Her authority is almost non-existing. It has idiosyncratic queens.	*18*	*3.9*
The US's father. It is the seemingly weakest link in the USA-Israel-England triangle though it is very powerful. One of the closest ally of the US. The hidden power behind the US. The US's brain and commander. The US's arm. The USA's partner in Europe. Or rather its slave. The USA's servant. It works for the benefit of Israel.	*15*	*3.3*
The country that is ruling the world in real sense, I think. The country that controls the world. Its conspirations have drawn my attention. It has a great role in world wars. Diplomacy. The world's most cunning politicians. They govern the world through politics. Diplomatic. Nowadays they don't reveal themselves in foreign policy. It carries out an insidious policy unlike the US.	*13*	*2.8*
It rains most of the year. A country in which it rains too much. A rainy country. It has always a gloomy atmosphere. There is always the possibility of raining.	*13*	*2.8*
Its language is English. English language. The country that is influential in the world through its language. It has spread its language and culture everywhere. English is the world language. They possess the language that people try hard to learn.	*11*	*2.4*
It has a low population growth rate. It has low birth rate. It has a large active and elderly population. The children population is small.	*10*	*2.2*
The greatest nation of Europe. Still the leader country of Europe. The first influential country in Europe. The spokesman of Europe and of interests. Sort of the capital of Europe.	*9*	*2.0*
It has a high quality education. A developed country preferred for this reason. It can be said that it contains most popular universities of the world.	*9*	*2.0*
Steam engines were first used in this country. Steam engines are invented.	*7*	*1.5*
One of the countries that was first democratized. They combined democracy and monarchy.	*5*	*1.1*
They have considerable bituminous coal deposits. They are rich in coal deposits.	*3*	*0.7*
A country that is not rich in oil.	*3*	*0.7*
The foundation of industry was laid by cotton weaving.	*3*	*0.7*
British pound is valuable. But euro will catch up with it in a short period of time.	*3*	*0.7*
The Greenwich meridian passes through this country.	*2*	*0.4*

One of the countries I wish to travel around.	*2*	*0.4*
It has very good writers.	*2*	*0.4*
It has modern agricultural method. Agricultural output is considerable.	*2*	*0.4*
One cannot say that it is on good terms with Turkey.	*1*	*0.2*
It has problems concerning autonomy with Scotland.	*1*	*0.2*
Trying to preserve its culture	*1*	*0.2*
An idiosyncratic country.	*1*	*0.2*
It is a former superpower.	*1*	*0.2*
Any individual freedom is not respected.	*1*	*0.2*
German has wanted to occupy it for many times but have not been able to do.	*1*	*0.2*
It is developed in marine transportation.	*1*	*0.2*
Fishing industry is developed thanks to ocean currents.	*1*	*0.2*
A wealthy country in terms of trade.	*1*	*0.2*
It has so many cliffs and fjords.	*1*	*0.2*
It is a mountainous, rough country.	*1*	*0.2*
Concepts mentioned: (Ireland, Scotland, Arsenal, Manchester, Oxford (2), Big Ben (3), Galya, Elizabeth, Gordon Brown, Tony Blair (2), John Terry, Harrods, Lloyd George, red double-decker buses (2), Madame Tussauds, Museum of Great Britain, London eye (4), the Clock Tower (2), Tower of London, Wax Museum, Westminster	*30*	*6.5*
Total	***45***	***100***

France

The secondary school student sample expressed 418 views in 41 different categories about France. The rate of those who mentioned cities of France is 15,3%. The most repeated of these views is Paris's being the capital city. The rate of those who referred to the relations between Turkey and Russia is 10,3%. The most underlined statements are as follows: *"They don't allow Turkey to join the EU. A country that doesn't like Turks much. The only country that admits it doesn't want Turkey to join the EU. The president Sarkozy is an opponent of Turkey and doesn't want us to join the European Union. The country that supports the idea of so-called Armenian Genocide."* The following kind of statements constitute 7,7% of the whole views of the sample: *"It is one of the most developed countries of Europe."* The Eiffel Tower (6,2%) is the most mentioned construction among other historical and touristic structures in the country. They referred to the following concepts as well: Arc de Triomphe (0,5%), the Louvre Museum (0,5%), the River Seine (0,5%), the Avenue des Champs-Élysées (0,5%), castle (0,2%).

5,5% of the views are about sports. The most important name that the sample highlighted is Sarkozy (5%). The following names succeeds him: Carla Bruni (1%), Napoleon (0,5%) and De Goule (0,2%).

4,8% put forward an idea about nationalism. The rate of those that made explanations about personal characteristics of the French (4,5%), its tourism (4,5%), its language (4,5%) and its fame in fashion (4,5%) is

considerably high as well.

The rate of those who made the following statements is 2,9%: *"It has got colonies. It is an imperialist state. It has colonized a good many countries. It has pursued a colonial policy."* 2,6% said that the population growth rate is low and the elderly population rate is high, therefore they pursue a policy to increase population. The rate of those that wrote about its being the EU member and the center of culture and art is 2,4%.

The sample put emphasis on France's popular wine (2,2%) and perfume (1%). They also underlined that "it is the country of love" (1,4%).

1,2% referred to the Sorbonne University, its success in education and the French cuisine. Its religion (1%), its wars with England (0,7%) and its achievements in literature (0,7%) are some other points that the sample emphasized.

The statements the sample made about its geographical position, neighbours, flag and cheese types correspond to 0,5%. The following subjects are mentioned at a rate of 0,2%: principle of secularism in the constitutional law, the Dover Strait, its automotive companies, symbol of the country, its cinema, textile products, trade, rich coal deposits, underground means of transport, its involving various races, not being open to change and its being the first country with which the Ottoman Empire signed capitulations (Table 8).

Table 8: The sample's views concerning France

	f	*%*
Its cities (the capital city Paris (52), Marseille (8) ve Lyon (4))	*64*	*15.3*
Its relations with Turkey (They don't allow Turkey to join the EU. Chief opponent of Turkey. The only country that admits it doesn't want Turkey to join the EU. It does everything in its power to prevent Turkey from joining the EU. Enemy of the Turks. They don't want us to join the EU. The president Sarkozy is an opponent Turkey and doesn't want us to join the European Union. The country that supports the idea of so-called Armenian Genocide. They approve the so-called Armenian Genocide. I don't like France because of its Armenian Genocide resolution. The French Senate passed the so-called Armenian Genocide resolution. They recognized the so-called Armenian Genocide. The country that accuses Turkey of slaughtering Armenians and slaughterer of Algerians itself. It does't recognize the Algerian Genocide which is a contradiction. They sold us out. It was our opponent in the first World War. We are not on good terms with them because of the support it provides for the terrorist organization. Throughout the history, it has been on our side in accordance with its interests. A large number of Turks work in this country. A country in which there are lots of Turkish workers.)	*43*	*10.3*
A developed country. One of the most developed country of the world. It is among the most developed countries of the world. It is developed in industry and technology.	*32*	*7.7*
The Eiffel Tower	*26*	*6.2*
Sports (Developed in football. A football country. A preferred place by those who want to improve in that area. Football is good. Its football team is quite good. It is very popular in football. Lyon has been champion for 8 years. Marseille will put an end to its sovereignty. Lyon is the only football team that became champion 7 times on end. Lyon hegemony. I like Henry and Zidane. Zidane is very famous. Domenech is the football coach of the France national team. Its most popular football players are Del Piero, Zidane, Juninho, Mamauda, Trezeguet and Tony Parker.	*23*	*5.5*
Sarkozy	*21*	*5.0*
The country where the idea of nationalism was born. The pioneering country of nationalism. The movement of nationalism was born here. The country in which the term nationalism is exaggerated. Their national feelings are quite strong. Nationalism. The country in which the French Revolution took place. The French Revolution took place in 1789. The French	*20*	*4.8*

Revolution started here.		
On the characteristics of its people (sophisticated, kind, famous for their courtesy, noble and funny. They are very romantic. They are not noble-hearted and proud. In addition, they are inglorious liars. We don't like them. They are tricksters. I don't like them. Almost all the French people I know are arrogant. A country whose people are egoistical. The narcist society. It consists of big-headed people. They are not clean. People were dirty and wigged in the past. They invented perfume and wig since they were dirty.)	*19*	*4.5*
Tourism is developed. The most developed country of the world in tourism. One of the places that lots of tourists visit in a year. A country that attracts a large number tourists. It is a popular place for tourists. There are lots of places worth seeing. One of the most beautiful countries. A country that has natural and historical beauties. A place worth living in. Very historical place. The country I wish to see.	*19*	*4.5*
It has colonies. An imperialist state. It has colonized so many countries. It has pursued a colonial policy. They managed to colonize South Africa as well. The colonial power of the past. Nobody will forget what it has done in Algeria. The country that slaughtered Algerians. A street named "Algerian street" in Istanbul was exchanged into "French street" because Algeria was a colony of France.	*16*	*3.8*
Its language is French. They are devoted to their language. When you are in France, they don't speak English even if they know it. They give answer in their own language to the people that ask questions in a foreign language. But they have a nice language. They protect their language. They are devoted to their language. The pronunciations in this language are very nice. Their language is awful. I don't like this language.	*15*	*3.6*
Certain words: (Arc De Triomphe (2), the Louvre Museum (2), Napoleon (2), the River Seine (2) the Avenue des Champs-Élysées (2), castle, De Goule, Treaty of Paris)	*13*	*3.1*
The center of fashion. It is famous for fashion shows. It has a great role in fashion. Significant in terms of fashion. Fashion's capital. Brands and models emerge from this country.	*13*	*3.1*
It pursues a policy to increase population. It has a high life expectancy. The number of children is small. The elderly population is large.	*11*	*2.6*
It is a member of the EU. It is one of the charter members of the EU. It has a strong political influence on the EU. One of the powerful countries of Europe. It has always had a say in global politics.	*10*	*2.4*
Europe's culture and art center. The center of many cultural activities. A country that is devoted to its own culture. Culture has a significant role. Civilization. It gives importance to art. They are in an advanced level in art and culture. The capital of many branches of art. They protect their culture quite well.	*10*	*2.4*
It is famous for wine production. Bordeaux wine is renown worldwide.	*9*	*2.2*
The country of lovers. The country of love. The city of love. Romantic. Romanticism	*6*	*1.4*
They are very successful in education. One of the countries in which I want to study. The Sorbonne University.	*5*	*1.2*
The French cuisine is famous. Food culture is developed. Its food is renown worldwide.	*5*	*1.2*
Carla Bruni	*4*	*1.0*
Its religion is Christianity. They are a protector of Catholicism. Christianity is widespread, but there are Muslims as well. The rate of the Muslims is 10%.	*4*	*1.0*

Perfume	*4*	*1.0*
There occurred wars between France and England. It has fought many wars with England for a long period. When England was excommunicated, it supported the pope. In addition, it fought with Germany over the Alsas-Loren coal deposits.	*3*	*0.7*
The country of good literature. It has made good progress in the field of literature. The place preferred by Turkish poets.	*3*	*0.7*
It has a coast on the Atlantic ocean. Neighbour of Spain and Belgium.	*2*	*0.5*
Its flag is red, white and blue (vertical lines).	*2*	*0.5*
It is famous for different types of cheese. You can eat a different type of cheese every day for a year.	*2*	*0.5*
Last year, cars were burned in the suburbs. Communists that burn their own cars.	*2*	*0.5*
It has the principle of secularism in its constitutional law.	*1*	*0.2*
The country that involves various races.	*1*	*0.2*
It is not a country open to change.	*1*	*0.2*
There is the Dover Strait between England and France.	*1*	*0.2*
It is the first country with which the Ottoman Empire signed capitulations.	*1*	*0.2*
Renault, Citroen and Peugeot are leading automative companies.	*1*	*0.2*
The rooster is a national symbol of France, as roosters don't compromise their nobility even if they are in a pit.	*1*	*0.2*
Famous for its cinema: Truffaut, Godard.	*1*	*0.2*
They became famous for their textile products.	*1*	*0.2*
Developed in terms of trade.	*1*	*0.2*
Underground systems and means of transport are developed.	*1*	*0.2*
They have rich coal deposits.	*1*	*0.2*
Total	***418***	***100***

DISCUSSION, CONCLUSION AND SUGGESTIONS

Discussion

There are sufficient information about the United Nations (UN) and the UN permanent members in the geography textbooks of the 9th, 10th and 12th grades. This information is completely unbiased. It consists of objective statements. This situation points out to the fact that all the views the sample expressed in the semi-

structured interview form belong to the sample and that the sample expressed opinions with its free will.

No study has been discovered about the UN and the UN permenant members in secondary schools. This study is unique in that sense. It is expected to make a contribution to present studies.

Conclusion

The following results are obtained from the findings acquired in this study which tries to determine the perceptions of the 12th grade secondary level students about the United Nations (UN) and the UN permanent member states:

The sample expressed 2227 views in total in 200 different categories about the UN and the UN permanent member states. Only 4,4% of those views are about the UN. The number of the views expressed about the UN permanent members is approximately 22,5 times more than the views expressed about the UN. Most commented UN permanent member states are England (20,6%) and Russia (20,3%). France (18,8%), China (18,5%) and the US (17,4%) succeed them.

31,3% of the students that put forward ideas on the UN regard it as an institution that does not operate in line with its main objectives. Concerning this, they passed the following remarks: unnecessary, only for show, nonfunctional, an organization that has deviated from its aim and has lost its significance, a so-called organization that applies double standard and that does not have much function. But 22,2% define the UN as an influential, necessary organization that opposes wars and tries to establish peace. They even describe it as a council of countries that gathers all the countries under a single roof.

19,2% of the sample that expressed opinions on the UN think that the UN is under the USA's control and guidance.

12,1% of the sample's views on the UN is related to Turkey. Those views are as follows: Turkey is a member of the UN, but its membership is only for show. Therefore, it should cancel its membership.

6,1% of those that expressed views described the UN as a civilization, military organization, economic union and relief foundation. 3% defined it as an institution that defends the rights of the member states.

Student opinions focused on some concepts about the UN permanent member states. For example, more than half of the student views on China are about the concept of population. The number of this kind of concepts on which more than half of the sample focused is three for the US, six for Russia, England and France.

412 views in total in 33 different categories are expressed about China. 57,2% of those are about China's population (41,7%) and excessive manpower (15,5%).

388 views in 36 different categories are expressed about the US. 53,4% are about its president Obama (10,1%), its being powerful (31,2%) and imperialist (12,1%).

The sample expressed 451 views in 41 different categories about Russia. 56,5% are about Russia's natural sources (14,2%), climate (13,7%), development level (8,2%), surface area (8,2%), capital city (8,2%) and its relations with Turkey (5,8%).

459 views in total in 38 different categories were expressed on England. 57,5% of those views are about England's colonies (12,4%), power (11,1%), football (10,5), Industrial Revolution (8,7%), city of London (7,4%) and about its being an island country (7,4%).

418 views in total in 41 different categories are expressed on France. 50% of these views are about the cities of France (15,3%), its relations with Turkey (10,3%), its development level (7,7%), the Eiffel Tower (6,2%), its sports activities (5,5%) and Sarkozy (5%).

Most commented permanent member state due to its relations with Turkey is France. Russia succeeds it. The rate of those who made references to Turkey's relations with the US, China and England is rather low.

10,3% of those that made reference to France mentioned Turkey-France relations as well. It is emphasized that France does not want Turkey to join the EU and it is a country that supports the idea of "so-called Armenian Genocide.".

5,8% of the students that expressed views on Russia talked about Turkey-Russia relations. They also made reference to the points that Turkey fought wars with Russia because of its desire to move south toward warmer climates, that its people travel to Turkey to take a holiday in summer and that it sells natural gas to Turkey.

2,3% of the views on the US are related to the relations between the US and Turkey. References made about the US are as follows: the US is declared an ally of Turkey by every current government, it is an allied nation that is motivated solely by self-interest, it has stabbed Turkey in the back and exploited it.

1% of the sample that expressed an idea concerning China put forward that Turkey's economy is affected negatively by cheap and poor-quality goods manufactured by China.

Only 0,2% of those who expressed an opinion on England put forward that Turkey is not on good terms with England.

Most mentioned leader of the UN and the UN member states is Obama. The sample referred to Obama 39 times. Sarkozy (21 times) and Mao (11 times) succeed him. The number of the sample that referred to Lenin (5 times), Putin (5 times), Stalin (3 times), Ban Ki Moon (2 times), Bush (2 times), Tony Blair(2 times), Napoleon (2 times), Kofi Annan (1 time), Abraham Lincoln (1 time), Clinton (1 time), Medvedev (1 time), Elizabeth (1 time), Gordon Brown (1 time) ve John Terry (1 time) is much less.

The sample emphasized that the US, Russia, England and France exploit other states whereas China exploits its own people.

The sample paid attention to talk about the capital cities. Most repeated city is Paris. London (34), Moscow (29), Washington (19) and Beijing (12) succeed it.

The countries the sample found successful in education are the USA (10 people), England (9 people) and France (5 people) respectively. Whereas only two students put forward that the education system in China is not good, no explanation was made about the education system of Russia.

Sport activity is one of the most important elements to which the sample drew attention. Almost all the views related to this are about football. England (48 people) and France (23 people) take the lead in this order. The sample's interest in sport activities in the USA (4 people) and Russia (4 people) is less.

The sample regards China's population as a power. In addition to this, they put forward that China follows certain policies to decrease population. On the other hand, it is suggested that England and France follow policies to increase population due to the large elderly population.

Suggestions

Relying on the study results, it can be claimed that schools and textbooks are not sufficient in education. As a matter of fact, there is adequate information about the UN and the UN permanent members. However, it is observed that the sample put emphasis on different characteristics of the UN and the member states. This situation indicates that various extracurricular, social activities and especially communication instruments and the like are quite effective. Therefore, we should find the right way of using extracurricular elements properly and make suggestions to the executives.

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BIOCHEMICAL EFFECTS OF NITRITE ON METHEMOGLOBIN AND PLASMA NITRITE CONCENTRATION IN THREE TROPICAL FRESHWATER FISHES

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Abstract: *The 96h LC_{50} (Median Lethal concentration) of nitrite to African catfish (Clarias gariepinus), Nile Tilapia (Oreochromis niloticus), and African River pike (Hepsetus odoe) under similar water quality condition were 7.00 ± 0.9, 16.00 ± 2.10 and 14.03 ± 8.1 mg NO_2 – N/L (Mean ± S.E.) respectively (pH 7.1-8.4; temperature 24°C). During 24 h sublethal exposure to nitrite, methemoglobin concentrations in the blood of all three species generally increased with increasing nitrite concentrations. African catfish and Nile Tilapia concentrated nitrite in their blood above environmental levels than African River pike at all nitrite concentrations tested. African River pike did not develop elevated methemoglobin concentrations until NO_2 – N concentrations reached 48.6 mg/L, and plasma nitrite concentrations in African River pike were never observed higher than environmental concentrations. This finding indicates that differences in resistance to nitrite among species may be partially due to a differential ability of some species to prevent the concentration of nitrite in the plasma.*

Keywords: *Biochemical effects, Nitrite, Toxicology, Methemoglobin, Plasma, Tropical freshwater fishes.*

INTRODUCTION

Nitrite (NO_2) is a naturally occurring anion in fresh and saline waters. Nitrite is intermediate in oxidation state between ammonium ions and nitrate, and its concentration in certain oxygenated waters is typically less than .0.005 mg/L. Under circumstances, however, concentrations of nitrite may be sufficiently high to alter haemoglobin and thus be toxic to aquatic organisms. Changes in acidity can in the presence of large amount of ammonium ion inhibit nitrate formation and cause accumulation of nitrite. Nitrite is present at unusually high concentrations under some natural conditions. For example, Mccoy (1972) and Infante *et al.* (1979) reported accumulation of nitrite in aquatic environment especially in lakes mixing during stratification. Certain human activities increased the amount of nitrite in aquatic ecosystems. High nitrite concentrations can be expected in the effluents from industries producing metals, dyes, and celluloids. Sewage effluents can contain high amounts of nitrite (Anthonisen *et al.* 1976). Nitrite can also be produced in quantity by some types of aquaculture or coastal aquaculture wastes (Lioa and Mayo 1974; FAO 1996). Nitrite enters the fish through the gills and passed into the circulatory system (Perrone and Meade 1977; Palachek and Tomasso 1984). The best known effect of nitrite is the conversion of haemoglobin to methemoglobin, a derivative is incapable of binding and transporting

oxygen. (Wedemeyer and Yasutake 1978). In effect, fish with elevated levels of methemoglobin may suffer from anoxia (Palachek and Tomasso 1984). From the blood plasma, nitrite diffuses into red blood cells where it oxidizes the iron in haemoglobin to ferric (3^+) oxidation state. Haemoglobin that is changed in this way is called methemoglobin or ferrihaemoglobin (Kiese; 1974), which lacks the capacity to bind oxygen reversibly (Bodansky, 1951). As nitrite raises the fraction of methemoglobin in the blood, it reduces the total oxygen carrying capacity of the blood (Cameron, 1971). A visible symptom of high methemoglobin levels is a brown colour in the blood or gills.

Environmental nitrite can be toxic to many species (Russo and Thurston, 1997). Nitrite may reach toxic concentration in recirculating systems where ammonia, the major nitrogenous waste product of fishes is converted first to nitrite, and then to less toxic nitrate. Concentrations of nitrite can also increase toxic levels in streams receiving effluent from waste-water treatment plants due to an imbalance in the nitrification process (FAO, 1996).

The literature suggests that the toxicity of nitrite varies greatly among fish species. For example, the 96-h median lethal concentrations (Lc_{50}) range from 0.2 mg nitrite – nitrogen (NO_2-N) L for rainbow trout (Salmo gairdneri, to 140 mg NO_2-N/L for largemouth bass Micropterus Salmoids) Palachek and Tomasso; 1984). These differences are probably attributable to the different water quality characteristics that exist at the individual research facilities and to genetically based differences in nitrite susceptibility among species. Toxicity depends on environmental pH, alkalinity, calcium and chloride concentration (Perrone and Meads 1977; Russo and Thurston, 1977; Palachek and Tomasso, 1984). Limited information is available on comparison of different species of fishes under similar water quality conditions and their differences in resistance to toxin. Changes in acidity can in the presence of large amounts of the ammonium ion inhibit nitrate formation and cause accumulation of nitrite methemoglobin; concentration were determined spectrophotometerically (Evelyn and Malloy; 1938) after blood sample were lysed, and centrifuged to remove turbidity.

MATERIALS AND METHODS

African River Pike (*Hepsetus odoe*) Bloc and Tilapia were obtained from the Cross River, Calabar, Cross River State, Nigeria. African Catfish were acquired from African Regional Aquaculture Centre Hatchery in Port Harcourt. All fish were acclimatized for 2 weeks prior to testing in 200-L plastic tank supplied by bore hole water (temperature 23^oC; pH 7.2 hardness 310 mg/L as $CaCO_3$ dissolved oxygen > 6.0 mg/L; chloride 22 mg/L; NO_2-N < 0.01 mg/L) at a flow rate of seven turn overs per hour. Fish were fed a commercial fish food (40% protein) *ad libitum* every 48 hours, feeding was discontinued 24 hours prior to transferring fish into experimental aquaria. All tests were conducted in 30-L glass aquaria placed in a 23^oC water bath. Test water came from the same source as holding water and was constantly aerated to maintain dissolved oxygen levels near saturation. Fish were placed in experimental aquaria and acclimatized for 24 hour prior to adding reagent grade sodium nitrite. Water characteristics for LC_{50}'s were measured in randomly selected aquaria every 24 hour throughout the tests water quality for methemoglobin and plasma nitrite. Determinations were measured at 0 and 24 hour in all aquaria (Table1).

Twenty four; 48,-72 and 96h LC_{50} concentrations were determined for African catfish and African River Pike using 10 fish per aquarium, 5 fish were used in the tests on tilapia. Nitrite concentrations were increased from aquarium to aquarium by a geometric progression factor of 1.6 in a series of five aquaria per species (from 2.7 to 28.7 mg NO2-N/L to *African River Pike* for LC_{50} determinations. The sixth aquarium in each series served as a nitrite free (control). Dead fish were removed every 24 hours and weighed to the nearest 0.1 g. Because nitrite tolerance may vary with size (Russo *et al;* 1974; Smith and Williams, 1974; Perrone and Meade 1977, Palachek and Tomasso, 1984). In the younger stages testing was conducted using individuals of approximately the same weight (African catfish 3.0 ± 0.1 g; tilapia 3.4 ± 0.2 g; *African River Pike* 2.8 ± 0.01g (mean ± SE). Median lethal concentrations were estimated using the method of Thompson (1947). Each LC_{50} series was repeated three times for each species. Methemoglobin and plasma nitrite concentrations were determined using live fish per aquarium exposed to nitrite concentrations ranging from 1.5 to 194.9 mg/L (geometric progression factor = 2). After 24 hours of exposure, fish were weighed. The caudal peduncle was severed and blood was collected into capillary tubes from the haemal arch.

Methemoglobin concentrations were determined spectrophotometerically (Evelyn and Malloy; 1938) and blood samples were lysed and centrifuged to remove turbidity. Total haemoglobin was determined according to

Hainuni (1958). In the determination of methemoglobin at least 10 African catfish or *African River Pike* from each concentration of nitrite were sampled with the exception of the 24.4 mg NO_2-N/L concentration for African catfish where 5 fish were used. Five tilapias were used from each nitrite concentration for analysis. Average fish weights used in methemoglobin analysis were 12.66 ± 0.3 g for African catfish. 13.2 ± 0.2 g for tilapia and 13.6 ± 1.0 g for *African River Pike.* Plasma nitrite levels were determined by a modification of the azo-dye method for water analysis (USEPA 1974).

Fish blood was removed as before into heparinized capillary tubes which were centrifuged and broken at the plasma – cell interface. Plasma (20 UL) was transferred to spectrophotometer tubes containing 3 ml of deionized water and 0.2 ml of azo dye agent. After 10 minutes, absorbance at 540 mm was determined in an internal assay control, 20 of fish plasma with a known amount of nitrite added to it were similarly assayed. In addition, randomly selected assays were spiked with known amounts of nitrite at low, intermediate and high levels after the initial determination of plasma nitrite. In all cases, nitrite concentrations determined were 95 – 106% of the expected value. The number of fish sampled for plasma nitrite analysis varied from 8 to 13 African catfish or *African River Pike* and 5 tilapia for each environmental nitrite concentration. Average weights of fish used in plasma nitrite analysis were as follows: African catfish, 10.6±0.2 g tilapia, 12.7±1.0 g and *African River Pike* 9.1 ± 0.5 g.

Analysis of variance followed by a student Newman – keuls Multiple Range Test (Woolf, 1968) was employed to test for differences among species. An $\alpha = 0.05$ was established at the levels for significance in all tests.

RESULTS AND DISCUSSION

Median lethal concentrations (Fig.1) were significantly different among all three species tested under similar water quality conditions after 96 hours of exposure. African catfish were the least resistant to nitrite of the species tested with 96 hours LC_{50} value of 7.1 ± 1.9 mg N-N/L. Tilapia showed intermediate tolerance for nitrite compared with the other two species with a 96h LC_{50} of 16.2 ± 2.3 mg NO_2-N/L. *African River Pike* had a 96h LC_{50} of 140.2 ± 0.1 mg NO_2-N/L. In a similar study under the same experimental conditions, Fathead Minnows (*Pimpephales promellas*) weighing 3.1 g had a 96h LC_{50} of 43.1 ± 2.7 mg NO_2-N/L (Palachek and Tomasso; 1984). The values reported here for *African River Pike* are higher than those reported for any other fresh water fish species (Russo and Thurston; 1977).

The 24 hours dose – response studies showed that methemoglobin levels increased as environmental nitrite levels increased with the exception of the *African River Pike* whose methemoglobin levels did not increase until nitrite concentrations reached 48.7 mg/L. The African catfish were most susceptible and had the highest methemoglobin levels compared with the other species. African catfish exposed to 12.2 and 24.4 mg NO_2-N/L had methemoglobin levels of 84.5 ± 4.6 and 95.3 ± 2.55 % of total haemoglobin, respectively. Several African catfish from 12.2 and 24.4 mg NO_2 –N/L remained motionless on the bottom of the aquaria and had methemoglobin levels of 100 %. Perrone and Meade (1977) have suggested that it is possible for fish in good physical condition with high stores of glycogen to obtain the majority of their required energy from anaerobic glycolysis.

Also, fish can decrease oxygen requirements by reduced activity and could meet the lowered demand through oxygen dissolved in the plasma allowing them to tolerate high methemoglobin levels for long periods of time (Fox; 1954). Methemoglobin levels in tilapia (69.5 ± 6.5 %) after 24 hour exposure to 12.2 mg NO_2-N/L also increased with increasing nitrite concentrations and were consistently intermediate to the African catfish and *African River Pike* levels.

African River Pike exposed to 97.4 and 194.9 mg NO_2-N/L showed levels of only 38.4 ± 4.4 and 47.6 ± 3.2 % methemoglobin respectively. Two difficulties were experienced at obtaining methmemoglobin values for *African River Pike*. First, some blood samples became turbid after the ion of neutral sodium cyanide reagent and remained so after centrifugation. Secondly, *African River Pike* were difficult to bleed because of a tendency for the blood to clot at a much faster rate than the blood of the other two species. Furthermore, blood appeared to clot even more quickly at the higher levels of nitrite exposure. Therefore, *African River Pike* with lower methemoglobin levels may have been *preferentially* sampled, and the reported methemoglobin values for exposure to the higher nitrite concentrations may be artificially low.

The ability of *African River Pike* to survive and to maintain low blood methemoglobin levels during exposure to extremely high levels of nitrite was unexpected particularly since several reports indicate that fish actively concentrate nitrite in their blood (Bath and Eddy 1980, Mead and Perrone 1980). Rainbow trout may concentrate nitrite as much as 60 times more than environmental concentrations (Margiocco *et al.* 1983). These results indicate that African catfish and tilapia concentrate nitrite in the plasma as do rainbow trout. African catfish and tilapia exposed to 24.4 mg NO_2-N/L for 24 hours had levels of 76.7 ± 5.0 and 61.3 ± 7.9 mg plasma nitrite respectively.

Tilapia consistently concentrated nitrite to a lesser extent than did the African catfish. Plasma nitrite levels in *African River Pike* did not differ from control levels until environmental concentration reached 48.7 mg NO_2 - N/L and above. A relationship between plasma nitrite concentrations and the number of lamellar chloride cells has been established in rainbow trout (Krous *et al;* 1982). Variations among species in the numbers and differential selectivity of chloride cells to nitrite could account for a potion of the differences in nitrite toxicity among species. It is apparent that methemoglobin and plasma nitrite levels follow similar trend for each species and appear to be correlated as has been reported in nitrite exposed rainbow trout (Eddy *et al.* 1983). The finding that *African River Pike* exclude nitrite from their plasma raises a question concerning the primary toxic mechanism of nitrite. Low plasma nitrite concentrations and the corresponding low methemoglobin levels in *African River Pike* at higher (97.4, 149.9 mg/L) environmental nitrite exposures support the suggestion, as made by other investigators (Smith and Williams 1974; Brown and Mcleay 1975; Crawford ad Allen 1977), that some toxic mechanism other than methemoglobin is associated with death.

Methemoglobinemia may be a major mechanism in fish that concentrate nitrite in their plasma such as African catfish and tilapia. But *African River Pike* may succumb to another toxic mechanism. One mechanism that may affect species at extreme environmental concentrations (194.9 mg/L) could be gill damage. Gill hypertrophy, hyper plasma and lamellar separation were noted in Steelhead trout (*Salmo gairdneri*) after a 3 – week exposure to 0.06 mg NO_2-N/L (Wedemeyer and Yasutake 1978). A second mechanism that may affect a species in concentration of nitrite is the organ as suggested by Margiocco *et al.* (1983).

Another possibility that must be considered in species differences is the tolerance to different methemoglobin levels which may cause mortality depending on species difference in oxygen demand that results from metabolic activity, dominant behaviour (Perrone and Meade 1977), and sensitivity to environmental oxygen concentrations (Bower *et al*. 1983; Tomasso *et al;* 1981). The results of this investigation confirm that toxicity of nitrite varies considerably among species tested under similar water quality conditions as suggested by Mccoy (1972) and Russo and Thurston (1977). The data also indicate that these differences are related to the extent to which nitrite is concentrated in the plasma, and the associated blood methemoglobin levels. Therefore, African catfish have a lower resistance to nitrite than Tilapia or *African River Pike* which has the greatest resistance of environmental nitrite as well as the lowest methemoglobin levels due to lower plasma nitrite concentrations. The lower plasma nitrite levels may be indicative of a more selective chloride uptake cell located in the gills, resulting in exclusion of nitrite.

Table 1: Water quality characteristics in test aquaria during nitrite toxicity tests range

(mean or mean ± SE) Number of tanks sampled is given in parentheses

Character	24 h	48 h	72 h	96 h
pH[a]	7.6 - 8.0 (88)	7.6 - 8.0 (32)	7.7 - 8.0 (25)	7.7 - 8.1 (20)
DO (mg/L)[b]	7.8 ± 0.1 (61)	8.1 ± 0.1 (36)	8.1 ± 0.0 (24)	8.1 ± 0.0 (25)
Temperature (C)[b]	23 (42)	23 (20)	23 (20)	23 (20)
Alkalinity as $CaC0_3$ (mg/L)[c]	222.7 ± 5.0 (24)	203.6 ± 4.5 (29)	181.2 ± 5.9 (20)	165.6 ± 3.9 (27)
Hardness as $CaC0_3$ (mg/L)[c]	2.54.8 ±3.5 (37)	2.34.5 ±4.4 (19)	217.7 ± 4.6 (21)	202.4 ±3.6 (27)
Nitrite (% nominal)[d]	101.6 ± 1.0	99.7 ± 1.1	102.0 ± 2.3	101.6 ± 1.2

	(79)	(40)	(22)	(20)

a pH meter

b. dissolved oxygen/temperature meter

c. Hach chemical Company (1973)

d. Azo-dye method (USEPA 1974)

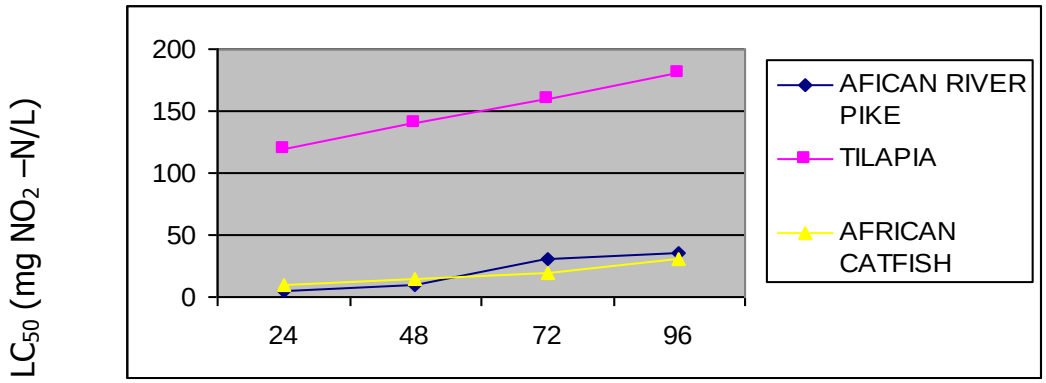

Fig.1: Median concentrations (LC_{50}) of Nitrite for three fish species (Mean± S.E.), *Clarias gariepinus, (African cat fish), Tilapia (Orecromis niloticus) and African River Pike (Hepesetus odoe)*

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KNOWLEDGE-BASED ECONOMY VERSUS TRADITIONAL ECONOMY: COMPETITION OR INTEGRATION

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Abstract: *The research paper handles the knowledge-based economy's concept and its aspects which distinguish it from the traditional economy. The paper focuses mainly on the most important essential changes in the work of the new economy's mechanism and its momentum. The paper aims to analyze and measure the economic value of information as a source of the world economy after transformation from the industrial revolution to the information revolution. In addition, the paper shows certain measuring indicators of the information. The unique characteristics distinguishing information are represented in the economic value increase of its components as a result of long series of its treatment processes. The measuring analysis process is conducted through treating information based on cost and value. It is necessary as well to handle the reversal relation between them according to an economic viewpoint. The paper has adopted a descriptive analytical technique and the revenue-cost technique to analyze the information economic value. The paper is divided into six parts and finally it draws some recommendations.*

Key-words: *economic value- knowledge-based – traditional economy- cost and benefit.*

INTRODUCTION

Information occupies a distinguished position in the world economy after the economic ideas focused on natural resources and traditional productive engine of the world economy. The economic development revolves around them, especially after the emergence of the industrial revolution. The rapid technological advancement and the emergence of information and communication technologies that led to diminish time and distance (the gap of time and space) among the world's various continents and countries. Therefore, the growth and development of the information importance is sustained under a fully transparent economy. This adds an new economic resource to the traditional resources, i.e. information (Hany Attia Mohi-Eldin,2008).

Peter F. Drucker has used the term knowledge economy and knowledge society in chapter 12 of its book entitled "The Age of Discontinuity" Various terms are often used to ascertain different aspects of the knowledge economy such as information

economy society, the digital economy, the new economy network, knowledge economy and information revolution. The United Nations estimates that the knowledge economies account for about 7% of world GDP and growing at 10% annually. It should be noted that 50% of productivity growth in the European Union is considered as a direct result of the use and production of information and communication technology (The World Bank, 2005). The human community development track is always related to the human knowledge development. Over the whole history of humanity, each community has enjoyed a certain level of knowledge and science. Therefore, the development stages of those communities were comprehensively a reflection of knowledge development. Therefore, the knowledge concept is not something new, but generally the new thing about is the size of its impact on current economic, social and cultural rights, and on the modern man's lifestyle. The world had witnessed during the last quarter of the twentieth century, the greatest change in human history. That is, the third transformation after the emergence of agriculture and industry. This transformation is embodied in the highly developed revolution of science and technology. Nowadays constitute the peak of the information and communication technology revolution. Information and knowledge have become an essential resource of the economic resources. They have rather become the new strategic resource in the economic life which supplements the natural resources and the emergence of what is called as the "knowledge economy". Thus, science and knowledge have currently become the key elements (factors) of production in society. The current age is known as post-industrial era, where the production of knowledge, investment, consumption and circulation are considered as the main sources of growth and sustainable development. Today, the real wealth of nations dwells mainly in their people's minds followed by the material wealth dwells inside the earth or on its surface. The main feature of this knowledge-based economy is that the practical applications are based on the theory in contrary to the previous stage in which theory precedes application. Today, the scientific researches have become continuously successive like gold mines in inventions, discoveries and new scientific fields. However, they are inexhaustible, and its profitability and investment feasibility have become an undoubted issue (Jeremy Rifkin, 2003).

The paper is based on the main characteristics that distinguish the knowledge-based economy from the traditional economy. It handles the transformation of the work of the new economy mechanism and its momentum. It refers to certain measuring indicators of the information society. It attempts to measure the information economic value through its implementation as one of the capital terms according to the economic concept. Since it is considered as an economic resource on the one hand which tangibly or intangibly leads to revenue. On the other hand, it is considered as a cost spent to obtain economic resources such as having an industrial environment or a commodity to be used in economic activities. However the measurement process, in terms of cost, leads to the measurement of the so-called cost of acquisition and possession of economic resources for information and then to the measurement of information accumulation. The study has adopted the descriptive analytical technique and the cost-revenue technique to analyze and measure the information economic value.

The paper is divided into six parts. The first part deals with the resources of the new economy, while the second part handles the main driving forces in light of the knowledge economy. The third part identifies the main characteristics of the knowledge economy compared to the traditional economy. The fourth part deals with the analysis and attempt to measure the information economic value. The fifth part refers to some measuring indicators of the information society. Finally, the sixth part presents the most important models proposed to measure the information value. Finally, the paper draws some suggestions.

FIRST: NEW ECONOMY RESOURCES

Each economic system has got its own distinguished resources on which it is based according to its mechanisms and laws. The content of information society is based on triple aspects: data, information and knowledge rules (Zaid bin Mohamed Al-Ramany, 2008). At the beginning, it is remarkable that the modern information resources should be handled according to a pure information viewpoint prior to the analysis of its content under the contemporary information system. Data are formats mentioned in the English dictionaries or they are verified things act as a basis of measuring, calculation or induction processes (Nassen T R. 2001). They are multi-format information that could be handled or sent by digital tools and technologies. It is seems clear that the data concept means that they are the raw and primary resource for information environment. They are the direct inputs that feed the knowledge system with numbers or symbolic features which do not refer apparently to an exact concept. They lack treatment provided by the mathematical or statistical models which clarify the entwined relation among their components. Treatment classifies data, puts them in a knowledgeable course and establishes the dwelt relations between them and other data or previous information. Thus, a new concept or meaning is revealed which the user could consume in his daily activity. Information is a unit or group of data which goes through a

series or stage of information treatment stages to induce meanings in a form of mathematical format or text. It provides the user a chance use such information in forming a new conception or paving the way for treating other forthcoming data.

SECOND: THE MAIN DRIVING FORCES IN LIGHT OF THE KNOWLEDGE ECONOMY

There is a range of key driving forces that led to change the rules of trade and competitiveness in a knowledge economy. Globalization, where markets have become Globalized. Markets and products have become more global. Besides the growing revolution of Information / Knowledge Intensity - efficient production relies on information and; over 70 per cent of workers in developed economies are information workers; many factory workers use their heads more than their hands. In addition, the spread of Computer networking that bring information "ever nearer". Computer networks and the internet help make the world as one village. As a result, the need to develop goods and services increase constantly, and become bought and sold through electronic networks. A matter which requires knowledge of the new technology applications which is necessary to meet economic demand (Jean-Eric Aubert and Reiffers, Jean-Louis, 2003). These forces have contributed to the expansion of international production through the liberalization of policies and eliminate borders between countries. This gives room to all kinds of foreign direct investments and the various arrangements of capitalism. The rapid technological change and lower costs of transport and communications have facilitated the economical integration between geographically dispersed parts and transportation of products across the world in search of efficiency. Finally, the increased competition has forced companies to discover new ways to increase efficiency, including the use of new markets and the relocation of certain production activities to reduce costs.

THIRD: KNOWLEDGE ECONOMY FEATURES VERSUS TRADITIONAL ECONOMY

If the economy means traditionally the science of rarity; resources rarity versus multiple and unlimited needs, the knowledge economy in light of digital technology is an economy of abundance. This is attributed to the fact that knowledge cannot be consumed or exhausted. However, it is self-breed consumption, through the transfer to other knowledge. Thanks to digital technology, the marginal cost of any subsequent version of the initial version, which are often very expensive to diminish gradually become closer to zero. This is what creates abundance in production so that the principle of abundance is the most striking feature of the knowledge economy. The knowledge economy can be defined as an economy in which knowledge production, distribution and use, constitute the main engine of the process of sustainable growth, wealth creation and employment opportunities in all areas. Knowledge constitutes a major source of the wealth of sophisticated and well-being of society. One of the main characteristics of the knowledge economy is the continued and increased expansion of employment in science and technology in all fields of economy. In addition to its effective role as a critical factor in the production process, its great impact on experiences, learning ability, organization and innovation in the economic system. Knowledge has replaced capital and became the main source of growth. It enhances the competitive advantage of companies within the economic system. The following are the main features of the knowledge economy compared to the traditional economy:

FIRST: THE CONCEPT OF VALUE ACCORDING TO THE KNOWLEDGE ECONOMY

the traditional economy based on the binary value of use and the commodity exchange value. The knowledge economy adds two new values. The first value one represents the information and knowledge value whenever it is possible to measure the information quantity and estimate its revenue. In such a case, knowledge has become a main factor of the production factors and a mere additional factor to increase its efficiency as it was under the traditional economy. The second one is the symbolic value, such as the value of science and the values of civilization and national identity. In contrast to the value of material assets such as land, real estate and movables which are relatively stable, and retain a fundamental portion of its value even whenever it is not exploited (land value usually increases over time). The knowledge assets lose their value if not used, as they can lose their value promptly whenever more advanced and sophisticated knowledge technology emerge. The acceleration of knowledge production, and obsolescence and the erosion of its value force the investor to seek and achieve the maximum return within the possible shortest time. This is attributed to the fear of the emergence of competing product based on more advanced knowledge that may underestimate the value of his product. Therefore, the knowledge-based

commodity producers firstly exaggerate the prices of their commodities in an inappropriate way to their production cost such as prices of computers and mobile phones or digital cameras when they are firstly produced (Nabil Ali, Nadia Hegazy, 2005).

SECOND: PROPERTY CONCEPT ACCORDING TO THE KNOWLEDGE-BASED ECONOMY

it is characterized by unlimited unrestricted –multiple property because of the disconnection between the former landlord and what he had previously possessed. Whenever a person sells the knowledge product, he practically remains the owner of its dwelt knowledge. In addition, the knowledge –product buyer practically possesses its dwelt knowledge. Therefore, the knowledge economy is transformed into abundance economy due to knowledge sharing in contrast to property under the traditional economy where property is exclusive. Whenever a person sells something he is no longer its landlord. In contrast to the material property, there are difficulties to determine, authorize and protect the intellectual property, particularly the information-industry products. Therefore, the question of intellectual property protection is one of the most important tasks which the World Trade Organization seeks to achieve and over-generalize. The World Trade Organization has approved the treaty of "commercial aspects of the intellectual property" "TRIPS" and joined it a treaty which determine disputes solutions. The treaty is based on Berin chart "related to the intellectual property". However, it is inadequate due to challenges raised by communications and information technology, particularly the internet network. Today, there are efforts seeking modern techniques to adapt special nature of the knowledge-based product. (Kinitsy, Ohmy, 2006).

THIRD: THE RELATIONSHIP BETWEEN DEMAND AND SUPPLY ACCORDING TO THE KNOWLEDGE ECONOMY

It is known that demand is determined by supply in the traditional economy, as the society needs exceed its productivity. According to the knowledge economy, supply creates demand. This means that the productive capacity of society has exceeded its needs. Supply has become the larger in terms of quantity, better in terms of quality and more enriched in terms of diversity, due to the high-technology development (especially digital and network). The transition occurs from quantity to quality stage. It could be said that the economy is no longer interested in addressing the rarity issue. However, it has become related to the question of abundance. This attributed to the fact that knowledge has become one of the new production factors. In contrast to the traditional factors of production, they do not face the problem of depletion because they are characterized by continued growth. While the economic resources depleted because of their consumption, the knowledge resources increase due to the increase of their consumption rate (Peter Drucker,2001).

FOURTH: THE COST CONCEPT UNDER THE KNOWLEDGE ECONOMY

According to the knowledge economy, high cost is fixed to produce the first version product of the knowledge product. However, the marginal cost used to reproduce the additional versions is usually very lower or close to zero. This new feature reduces the importance of , even eliminate, the concept of "optimal size" of production. It has become possible to produce any later size based on the commodity's first edition which is based on highly-intensive knowledge. This attributed to the production diminished cost to the minimum rate. This phenomenon, that is, high fixed cost associated with very low marginal cost, stimulates the tendency to market monopoly. It leads the companies to strengthen their knowledge capital in order to be distinguished in the market. This explains the uniqueness of the limited number of companies in the field of knowledge-intensive products and increasing merger cases. This phenomenon encourages companies to sufficiently sells the product first version and freely distributes the additional versions later in the case of association with the service requested by the consumer when a great number of the mobile phone companies in the world intend to provide a free device for those who buy the phone line.

Thus, the knowledge assets are dissimilar to the material asset since they are exhausted when used and they are cloning with minimum marginal cost approaches zero. The economy is divided into different sectors, some of which produce material

goods, such as food, cars, and clothing etc.. These goods subject to the behavior of well- known law of diminishing returns, where returns increase to a certain level, after which they start to diminish. There are other sectors which produce highly-intensive and technology services and goods. In such sectors the primary cost (investment and fixed) aims to develop a high programmed and digital knowledge. However, the additional cloning production cost is very low. Thus, returns increase as profitability highly and reversely soars up in accordance with production increase. These goods subject to the behavior of increasing returns law (Emirates Center for Strategic Studies and Research, 2004).

FIFTH: THE KNOWLEDGE ECONOMY IS AN ECONOMY OF THE INTANGIBLES

The traditional economy is characterized by assembling the property and material capital, in contrast to the knowledge economy which is the economy of neither weight nor size. Therefore, it could be said that it is the economy of the intangibles which is primarily based on the knowledge capital and oriented towards minimization and the replacement of material content by information. The data indicate that about 90% of the capital market value for some highly-intensive knowledge companies such as Microsoft and America Online, SAP is represented in the moral assets. It is clear that the future in light of the knowledge economy is for the companies "graceful", where the value is measured by ideas, rather than assets and material assets (Arab Human Development Report, 2003).

Sixth: The knowledge economy is an economy of acceleration: The traditional economy represents the relatively slow economy as it relies on the traditional train, car, plane and mail. The knowledge economy is the economy of high-speed movement. It depends on satellite-based and e-mail, the Internet and other modern means of communication and transportation. This speed helps exceed the barrier of space and time. The e-commerce is one of the most prominent manifestations of this in the new economy. Therefore, it could be said that "The Economics of speed to replace the economies of scale" in the new market of competition (Najm Aboud, 2005). The company‘s success to enter the market before others enables it to set prices and get high profit margins. However, maintaining the first-place competition for a few months just means so much for the company. The more speed the good is available at the market, the longer the period of its survival at the market is. This allows the company to recover its investment and make money quickly and achieve an adequate profit before the good becomes obsolete.

FOURTH: THE ECONOMIC VALUE OF INFORMATION

The emergence of the concept of commodification of information, and its employment in the production of economic value added, has resulted in the need to create accurate standards and constants to measure the information content by a quantitative standard fit to be accredited as the basis of economic evaluations of movement within the economic structure of the informational / digital market (Ziad bin Mohammed Romany, 2010). Generally there are three basic criteria to determine the things value, namely quantity, kind and the factor of time. Meanwhile the other factors are used to form secondary criteria or they are associated with others to judge the value factor. Before determining the value of information, the meaning of the word ‘value’ should be determined. In light of the abstract economic concept, the single information value equals a specific sum of money currency. However, according to the military criterion, its value is determined based on its contribution quantity to end the battle against an enemy that tries to harm the national security system. The more complicated the information role in human activity is including the socio-economic and cultural aspects, the larger the criteria difficulties size on which the value determination process is based in line of entwined and overlapped factors (Cramer, 1997). There are several options to estimate value including Cost-Effectiveness Analyses or Cost-Benefit Analyses. Whereas the former is used to select the optimal way to accomplish a specific end such as providing systematic protection for an information system, the latter analyzes the benefits of cost as compared to the investments that provide various abilities. In spite of the attempt to find an easy and clear method to determine the absolute value of single information, it should be admitted that value is closely related to its content which obtains its material from the nature of using that value besides the activities that the rivals could practice through it. For further clarification, some information forms such as trade secrets are of paramount importance for the bodies which possess them. This is attributed to the important opportunity which they provide for that body’s members to establish products or practice better businesses and commercial activities than those bodies that lack such information. Such information will lose its value whenever it spreads for all and the public. The same thing is applied to the intellectual capital such as applied programmes or intellectual

production which is based on the principle of intellectual protection. On the other hand, there are other types of information such as advertisement and political ideas whose value increase with further spread and manage to break through all angles of the environment in which they are launched. Such information will lose its value whenever it spreads and its value will be obtained from its effect on actions such as purchasing encouragement and election and voting decisions. On a third hand, information content could have an absolute value regardless of its usage circles and user's nature. Information could be invaluable for an organization or one of the society's members. However, that information could have no value for another organization or an individual lives in another environment. In other words, it could be said that user has a value model to deal with single information which differs from the model that others adopt in dealing with the same piece of information in light of the developments surrounding it. In this concern, Cramer, 1997 suggests four essential bases to determine the value. Each basis proposes a self-evident approach to guess the value which each piece of information possesses. These bases are Development Basis, Operation Basis, Market Basis and Collection Basis. Generally, there is a different group of controlling factors which affect the information value. The information value emerges from the user's identity, its usage, its effect nature on others and the nature of its resulted in effects. An attempt to guess the value of each piece of information in each of these models will show a different group of results. They are based on the perspective nature of each piece of information. The following simplified format describes the value equation for each piece of information:

Value Basis= Function (Information identity, user's identity, user's end, other activities and actions, expected results of its usage)

For example, X possesses a package of high-value applied programmes. This programmes package constitutes high value for the rival body Y which works in the same field and may exploit it in analyzing the applied programmes codes. Then it will employ it in one of its products or may deeply understand it by designing and developing the programme. On the contrary, that invaluable information has no value for the body which does not possess important knowledge to produce programmes. However, it may have paramount important value for the information pirates who aim to establish knowledge for rival institutions and companies to obtain huge sums.

FIFTH: SOME INDICATORS MEASURING THE INFORMATION SOCIETY

The information society criteria are indicators which predict the society's entry or transformation into the information society. Such criteria have deserved a lot of arguments which raised several questions. Are they attributed to technology, technology spending or technology spread in the information society? Can spread measured by spending on the information technology or by the quantity and range of the introduced information? These indicators aim to measure the extent of progress in a certain country by using indicators related to the measurement of information technology accessibility provided the availability of primary conditions particularly those related to human development. Indicators should not be considered as a constant group which does not change over time. Some of them could be useless in the future or lose its value with the change of the indicators objectives of the information society. Some (WPIIS) believe that the information society indicators change according to four entwined stages, namely readiness and intensity of usage, effect of using that technology and finally the outcome of that technology in relation to development. These stages are as follows:

- Readiness indicators represent the main requirements to support the building of the information society. They measure the society's readiness extent to transfer and benefit from the information technology.
- Usage-intensity indicators show the extent and aim of using that technology in different sectors such as business, education or others.
- Usage-effect indicators are mainly related to organizing changes of (e.g. business and government). Such changes describe human investments and capital as a knowledge basis. They describe as well the new methods used in organizing work; production; invention; research and development for competitiveness in the future at the world level (Nor El-Din Sheikh Abied, 2004).
- Technology outcome indicators are related to the social effect and level. They show the social homogeneity degree, employment at the work market and level of productivity and competitiveness.

A study conducted by Hend Olwy 2006 howed some indicators related to measuring the information society. According to their significance and order the findings are: establishing the information culture; establishing information national policy; information infrastructure, communication infrastructure; information contribution to the rate of gross national income; internet users in scientific research; number of computers and other indicators.

SIXTH: MODELS SUGGESTED TO MEASURE INFORMATION

The unique characteristics distinguished information and the new information environment constitute an obstacle when handling the information value according to economic criteria or standards. Undoubtedly, information is currently the golden key for the economic activities. They have become an important source for institutions and companies. Some believe "the organization which revolves around things deliberation and the capital has totally changed into managing the economic wheel based on information" (Ducker, 1992). Although information is distinguished from other economic resources by its own characteristics, advantages and high economic value, it still has no fixed official value in the financial and economic budget of the state. This contradicts to transforming and fixing the computers and their programmes in the form of capital in the financial and economic budgets. In fact, computers and their programmes are but mechanisms and treatments for information from different aspects. However, the real economic return dwells in information per se. information provides suitable atmosphere and great ability to direct services, making proper decisions, improving performance efficiency, achieving competitive accomplishments and it could be sold directly as an independent commodity (Marijke, V., 1998). Clearly, the value determination process of the economic information still lacks great negligence and defect in spite of the effective role which the information play in the contemporary economic model. The important basis for information cost and value in a certain information system represented in the stored information in the system medium and not in the computer equipments or its programmes. Therefore, the information systems try to focus on supporting and reinforcing the information value (the new commodity) more than giving attention to the systems and technology (production equipments). They are considered as its helping and serving tools. However, there is no unanimity on how to measure the information value. It has really only a notional value not as a quantity measured by the quantitative measurement tools (Wang and Strong, 1996). The information economic measurement process entails measuring the information getting cost and measuring the information value as an economic resource which achieves tangible benefit to elevate the institutions economic value. The information getting cost could be measured through applying some of the following concepts: direct cost which includes data getting cost, and the indirect cost which includes factory cost (resources exhaustion + installments of turning off the ready programmes) and operation process cost in order to transform data into information such as ready programmes cost and human resources cost used in data operation process (wages). The measuring process of the above-mentioned cost terms depends on the accounting system mechanism used to determine spending cost to get the information through several methods according to accounting concepts. Among them are cost versus benefit concept, efficient input to analyze cost components, or the activity-based system. The measuring process of the information value as an economic resource is based on two approaches. The first is the behavioral approach related to the effective information quantity in realizing the benefited person and how he obtains information through suitable communication channels. The second is the financial and quantitative approach based on economic bases according to the following theory (Daniel Moody, 1999). The resource possession is the basis for benefits inflow and hence the benefits from the resource over the origin's lifetime before its total extinction. Can the possession concept be related to the information resources as an economic resource? It is necessary to indicate that the possession concept should be related to property rights concept. Thus, the possession element can be exploited in possessing the resource and hence getting benefited from it in any way. The raised question is "is a lasting or inconstant resource?" An example of inconstant information is the political news which affects the economic situation. There is a term-deferred continued benefit such as invention potency which represents productive information monopoly. However, this sort becomes extinct with the appearance of a better sort. In both sorts, the information value is measured through the effect based on the implementation process under the information reality. Some may question the extinction of that resource as the other resources under the general frame of the economic theory. This means the end of its benefit regardless of the property element. Some may indicate that the lasting economic resource could last indefinitely with the increase of the information resource value due to the accumulated experience that works on the continuity of that resource and the increase of its value. Therefore, how can a resource become extinct when it increases according to the economic concept? For clarification an accounting view, the resource possession cost will represent its value as an origin. Therefore, the extinction (erosion) equals the amount of the annual cost discount when applying the principle of revenues-spending equality and based on the assuming age.

The accounting zero estimation of the economic resource's record value means restoring the money spent to obtain that resource and its transformation into a real-record extinct possession which economically increases as an added value. Therefore, the resource's added value is considered as a resource possession without adding costs. In addition, the freely added value concept resembles to a great extent the special treatment for a shop popularity which appears without a possession process due to the spread of the consumer's knowledge of one of the products. This grants the shop special trust which does not result from a purchasing process of that popularity resembles the purchasing of the trade marks and so on. Thus, the shop popularity is transformed into an economic resource emerges as a secondary product in the project-establishment process. This resource is lasting as long as the institution or the project still achieves success in attracting more consumers based on preserving such popularity (Verrijn, Sturat, A. & Hesse, W., 2001). The information value measurement as an economic resource according to the previous concept is applicable in the cases of merging and separation of the institutions through the value difference. Suppose that two major corporations agreed to merge in one great economic institution, the landlord-share determination process in the new corporation will be based on the capital besides the difference resulted from the higher-information possession of one corporation over the other based on their market-values.

CONCLUSION

It could be said that the economic dilemma is currently based on the information abundance not the rare traditional resources. This is because the knowledge effect has become the crucial element in all aspects of the economic activity. Knowledge has become the main basis for any social or economic growth. Therefore, the world has changed from searching for or colliding for the rare resources sources to searching for and colliding for controlling as much as a great amount of knowledge sources. The competitive advantage which is based on size abundance and market-wide spread retreats to give room for those advantages based on elasticity and speed. Institutions, which have become highly capable of properly meeting the demand on an exact time, are the qualified institutions to occupy the leading rank of the digital economy. Therefore, the structures based on leadership, control and decision-making processes continually get narrower field with the increasing dependence on the technologies and means of the knowledge economy. To accomplish an information-characterized society, the primary conditions should be available. They most importantly include among others human resources development, interest of research development and benefit from the experience of advanced countries in the knowledge and information fields. The measurement of information society penetration is necessary to determine development in a certain country. A matter which entails a sound statistical system and database that can show the measurement indicators. They are usually main indicators related to the socio-economic system of the state. A matter which entails the adoption of effective policies to obtain, assimilate and transfer information. These components support each other in paving the way for drawing a comprehensive strategy aims to meet the knowledge gap.

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STRUCTURAL INTERPRETATION OF REMOTELY SENSED DATA SETS, ITS HYDROGEOLOGICAL IMPLICATION OVER ILE-IFE AND ENVIRONS

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Abstract: *Lineaments are mapable linear surface features, which presumably reflect subsurface phenomena. The study demonstrates the use of ALOS imagery for lineament mapping for geological application. The image was enhanced and used for lineaments extraction through on-screen digitising. The extracted lineaments were evaluated against the published geological map for the study area using GIS overlay operation. Statistical analyses were carried to determine lengths, densities and intersections of the lineaments. The results show that the interpreted lineaments from ALOS imagery and ancillary data closely correlate with the faults shown on the published geological map (in 1974) of the study area.*

Key words: *Lineament, Hydrogeology, Mapping, Remote Sensing, Information Extraction, Image Enhancement, Statistical Analysis, Multispectral Image*

INTRODUCTION

Image interpretation for identification of geological structures used to be performed using field campaign, aerial photographs and the first generation imageries. A major challenge is that most of the conventional geological surveying techniques are not able to cover a wide region of the Earth's surface. To map geological features for hydrogeological application, environmental disasters study, geotechnical investigation, etc., geological researchers must be able to conduct simultaneous measurements over broad areas of surface or subsurface of the Earth (Marghany *et al*., 2009).

In recent times, a number of sophisticated remote sensing systems exist, and many more are being launched, thereby making processing, interpretation and mapping of geological lineament easier and with minimal costs. Moderate spatial resolution optical sensors such as Landsat and ASTER have been used extensively for lineament analysis (Rana, 1998; Semere and Ghebreab, 2006; Meijerink, 2007; Sander, 2007). Studies have been carried out in remote regions of the world using optical remotely sensed data to enhance geological knowledge and revise existing geological maps. For example, Kann and Glenn (2006) mapped a remote area of northern Pakistan using ASTER imagery and discovered two active strike-slip faults that were previously unmapped. Also, Carla et al., (2008) used ASTER, RADARSAT and Landsat images together with a Digital Elevation Model to study a regional system of multiple aquifers and created a lineament map of the Quito aquifer system in Ecuador.

A major challenge in Ile-Ife and environs of Osun state, Nigeria, is large population density, resulting in pressure on the natural, social and economic resources. With particular reference to water, demand is moving towards outweighing available surface water resources. There is now an urgent need to abstract all available water resources, including subsurface water for domestic and industrial consumption.

A potential, but least exploited source of potable water in the area is underground water resources. This has been due to dearth of information on aquifer locations. Understanding and mapping of geological formation including lineament is one of the ways by which localized aquifer can be analysed for groundwater prospecting.

The study explored the applicability of remote sensing data (ALOS image data) in the structural geological study in Ile-Ife and environs. This objective was achieved by mapping the structural lineaments using ALOS image data; evaluating the structural lineaments extracted against published geological map and Landsat ETM+ image data; using statistical analysis to determine lineaments length, density and intersection; and producing an updated structural map useable for hydrogeological investigation and engineering infrastructural development of the study area.

Description of the Study area

The study area covers Ile-Ife and it's environ. The entire area occupies about 1000km^2 of land. It lies within latitudes 7°14' 25" N and 7° 30' 22"N and longitudes of 4° 14' 42" E and 4° 32' 43'' E (Figure 1). The geology of the area as reviewed by Rahman (1976), includes migmatite, granite gneiss and schist pegmatite (Figure 2). Other rock types include charnokite, porphyritic granite and schist epidiorite.

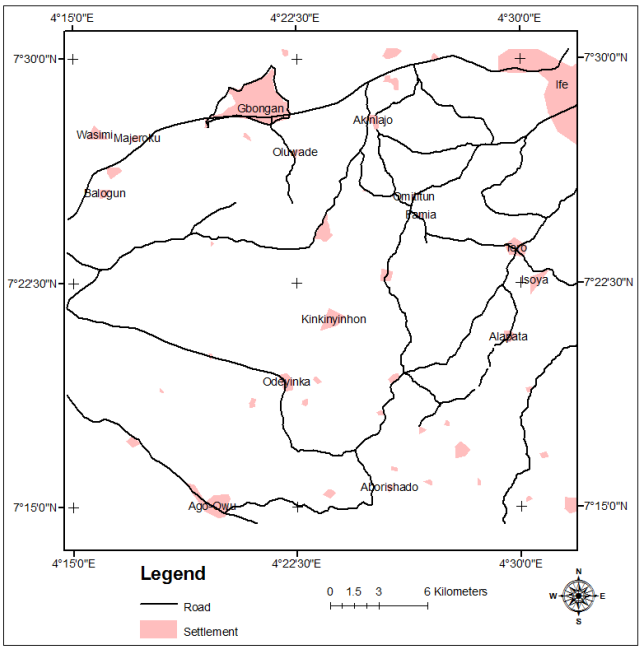

Figure 1: The Study Area

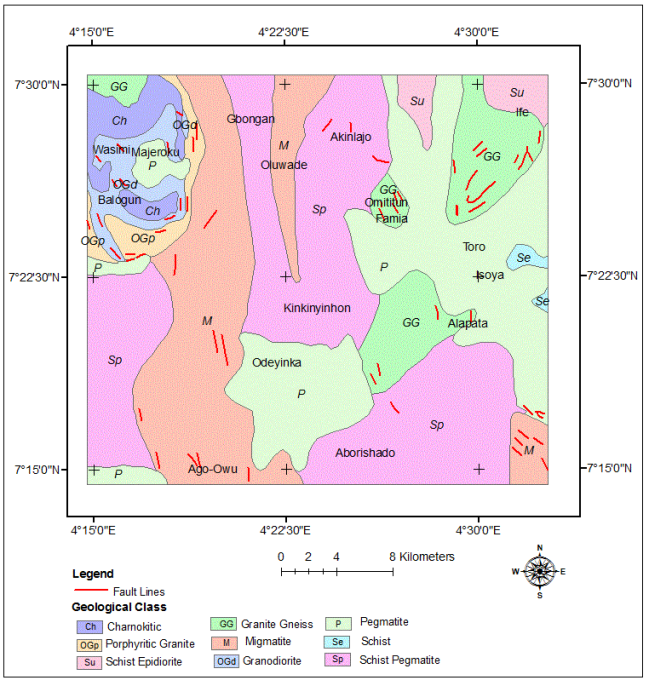

Figure 2: Geological map of the Study Area (Digitised from geological map of Nigeria – IWO Sheet 60 at scale 1:250,000)

DATA AND METHODS

Data

The datasets used include subsets of Advanced Land Observing Satellite (ALOS) imagery, published geological map of Nigeria (IWO Sheet 60 at scale 1:250,000), Landsat 7 ETM+ image and ASTER DEM data. The ALOS image, captured by the sensor's Advanced Visible and Near Infrared Radiometer type 2 (AVNIR-2) instrument is of 10m spatial resolution in channels 1(0.42 – 0.50 µm), 2 (0.52 – 0.60 µm), 3 (0.61 – 0.69 µm) and 4 (0.76 – 0.89 µm). The image was donated to RECTAS by Japan Aerospace Exploration Agency (JAXA). The Landsat 7 Enhanced Thematic Mapper Plus (ETM+) of 03 January 2002, was downloaded free from the Global Land Cover Facility homepage (http://glcf.umiacs.umd.edu/index.shtml). The spatial resolution is 30m for the reflective bands. These are band1 (0.45 - 0.52 µm), band2 (0.52 - 0.60 µm), band3 (0.63 - 0.69 µm), band4 (0.76 - 0.90 µm), band5 (1.55 - 1.75 µm) and band7 (2.08 - 2.35 µm). The spatial resolution of panchromatic (band8) and thermal infrared (band6 (10.4 - 12.5 µm)) bands are 14.25m and 56m respectively. The approximate scene size is 170 × 183 km. ASTER DEM data was downloaded from NASA's Land Processes Distributed Active Archive Center (LP DAAC). The data is in GeoTIFF format with geographic lat/long coordinates and a 1 arc-second (approximately 30 m) grid. It is referenced to the WGS84/EGM96 geoid, and has estimated accuracies of 20 m at 95 % confidence for vertical data and 30 m at 95 % confidence for horizontal data.

METHODOLOGY

Geological Structural investigation such as lineament mapping is normally undertaken based on geomorphological features such as aligned ridges and valleys, displacement of ridge lines, scarp faces and river passages, straight drainage channel segments, pronounced breaks in crystalline rock masses and aligned surface depression (Koch and Mather 1997, Hung et al. 2005).

The first step of the methodology is the selection of initial input data for lineament extraction. A Digital image processing for the extraction of linear features involving contrast stretching, Image enhancement, Principal Component Analysis (PCA) were carried out on the satellite data using ENVI 4.7 software. Colour composite of bands 1, 2 and 3 of ALOS and The Landsat 7 Enhanced Thematic Mapper Plus (ETM+) images bands were made. A convolution filtering algorithm involving Directional Gradient-Sobel filters was applied on the enhanced Images in N-S, E-W, NE-SW and NW-SE directions to increase frequency and contrast of the images. Table 1 shows the directional filters in its four principal directions. A shaded relief image was derived using ASTER DEM data. The enhanced images were overlaid on the shaded relief image with transparency set to 50 % in ArcGIS 9.3 software environment. Using on-screen manual digitizing, the lineaments were extracted from the images (Figure 4 and 5).Table 2 shows the summary statistics of the extracted lineaments.

Table 1: Sobel filters in four main directions applied in this study

N - S			**NE - SW**			**E - W**			**NW - SE**		
-1	0	1	-2	-1	0	-1	-2	-1	0	1	2
-2	0	2	-1	0	1	0	0	0	-1	0	1
-1	0	1	0	1	2	1	2	1	-2	-1	0

Table 2: Summary statistics of lineaments derived from ALOS image

Count	632
Minimum	76.72
Maximum	1072.53
Sum	201298.61
Mean:	318.51
Standard Deviation	151.71

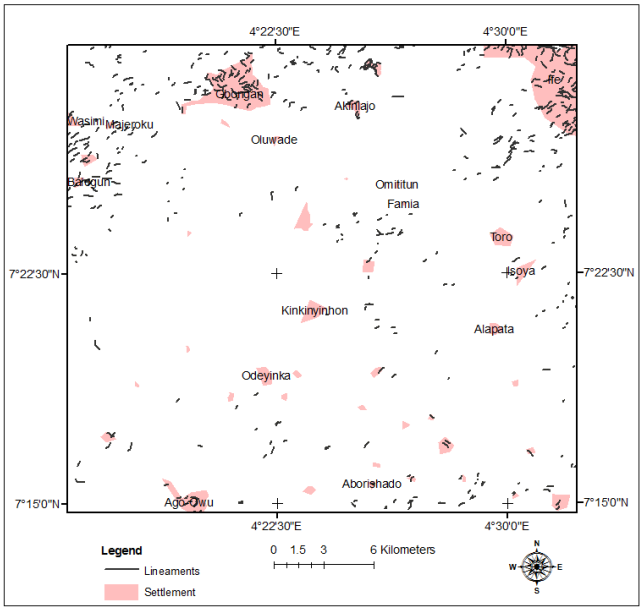

Figure 3: Lineaments extracted from ALOS image

Structural lineaments were also extracted from Landsat ETM+ multispectral datasets. A common feature of multispectral image such as Landsat is that different bands of the data usually appear similar because of high correlation between them. To enhance the visual interpretability and reduce the number of bands for digital image analyses, image transformation techniques such as Principal and Canonical transformations are usually employed to reduce such redundancy and correlation between bands of multispectral data (Lillesand et al., 2004).

Principal Component Analysis (PCA) is often used to reduce the dimensionality (number of bands) in the data and compress information contained in the original image to few bands (components). The analysis, using statistical methods, maximizes the amount of information (variances) from the original data into the least number of new components. For the six bands of Landsat ETM+ data, for example, the first three principal components contain over 90% of the bands. It is simpler and more efficient to interpret and analysed the three bands when they are combined either visually or digitally.

PCA was applied to the six bands (1-5 and 7) of Landsat ETM image to compress the information in three bands. Linear features were manually delineated by visual interpretation of the false colour composite of the first three principal components (Figure 3). Table 3 shows the image statistics of the principal components (PCs) within the study area. This table show the anomaly of the Eigenvalues decreasing variance in successive principal components. The first principal component contains 87.108% of the total variance. The first three components contain 96.5% percent of the total variance within the whole volume of data of six bands.

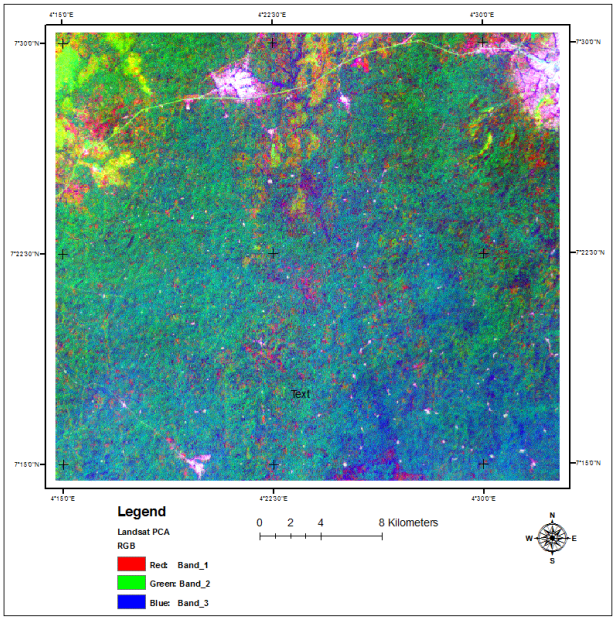

Figure 4: False colour composite of PCA 1 (Red), 2 (Green), and 3 (Blue).

Table 3: Eigen vectors and Eigen values of the Principal Component Analysis of the Landsat ETM data

Eigenvector	ETM1	ETM2	ETM3	ETM4	ETM5	ETM6	Eigenvalue	Eigenvalue (%)
PCA 1	0.065	0.108	0.259	-0.118	0.665	0.679	180.735	87.108
PCA 2	0.071	0.020	0.225	-0.818	-0.474	0.226	13.641	6.574
PCA 3	0.315	0.319	0.697	0.441	-0.339	0.062	5.846	2.818
PCA 4	0.390	0.134	0.259	-0.339	0.457	-0.663	3.192	1.538
PCA 5	0.821	0.095	-0.512	0.048	-0.100	0.207	2.543	1.226
PCA 6	-0.258	0.927	-0.259	-0.076	-0.006	-0.031	1.527	0.736

A convolution filtering algorithm involving Directional Gradient-Sobel filters was applied on the False Colour Composite image of the PCA bands in N-S, E-W, NE-SW and NW-SE directions to increase frequency and contrast in the image. The images were overlaid on the shaded relief image with transparency set to 50 % in ArcGIS 9.3 software environment. Using on-screen manual digitizing, the linear features (lineaments) were extracted from the images.

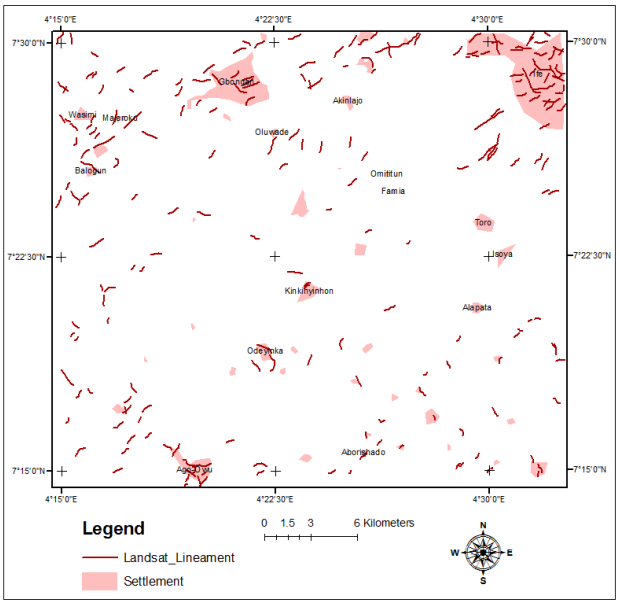

Figure 5: Lineament extracted from Landsat ETM+ image

The structural lineaments extracted from ALOS and Landsat ETM+ images were evaluated against the published geological map by intersection operation using overlay technique that determines where the extracted lineaments and the fault lines merged. Before the operation, a buffer zone of 250m was assigned to the extracted lineaments. This corresponds to the published geological map's scale in which 1mm on the map represent 250m on the ground. Table 4 shows the typical statistical the breakdown of the relationship between the lineaments delineated from ALOS image and the published fault line map.

Table 4: Length and ratio of the matching lineaments for the Study Area

Total lineament length (m)	201298.61
Total fault length (m)	58248.02
Total matching length (m)	20605.52
Matching length/Fault length (%)	35.38

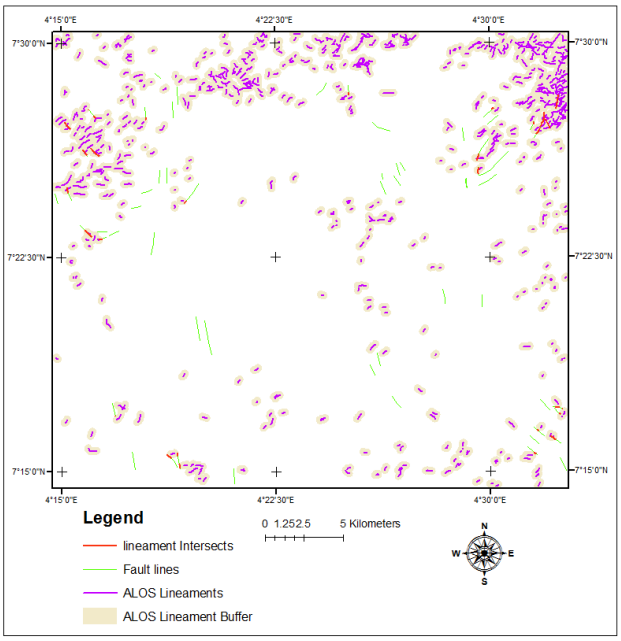

Figure 6: Matching line segments of ALOS lineaments and fault lines

A total of 238 and 44 matching lineaments representing 39% and 21% for lineaments extracted from ALOS and Landsat imageries respectively were observed (Figures 6 and 7).

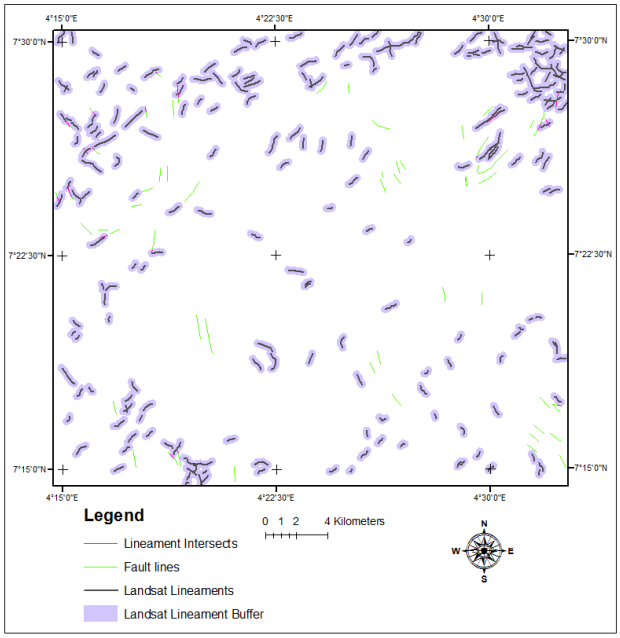

Figure 7: Matching line segments of Landsat ETM+ lineaments and fault lines

Using statistical analysis, lineament lengths, density and intersection were determined. The lineament lengths were plotted in Grapher 4 Excel spread sheet to generate rose diagram. The Rose diagrams were constructed by applying the Bin size command of the editing manager of Grapher 4 software. The rose diagrams show the prominent lineaments trends in N-S and NE-SW directions for ALOS lineaments while those of Landsat ETM+ image are mainly in N-S direction (Figures 8 and 9). These figures show the directional frequency of the detected lineaments over the area of study. It was interpreted as a statistical means of representing the anisotropy of the fractured environment, as well as the fissure development tendency on a regional.

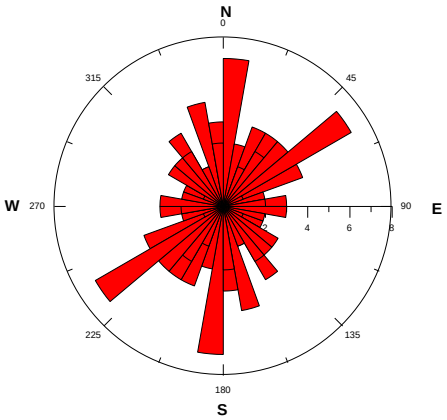

Figure 8: Rose diagram showing the direction of lineaments derived from ALOS image

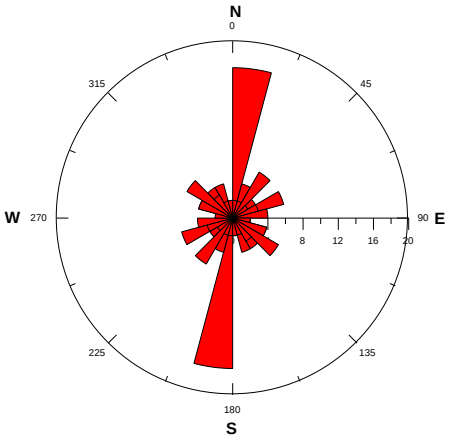

Figure 9: Rose diagram showing the direction of lineaments derived from Landsat ETM+ image

The lineament density (frequency of lineaments per unit area) was calculated for lineaments derived from ALOS image. This was accomplished by gridding study area into cells of equal dimension, counting the number of lineaments occurring in each cell and recording the frequencies in ASCII file for the centre of corresponding unit area. The resultant text file containing X, Y and Z values (Easting, Northing and frequency, respectively) was imported to ArcGIS 9.3 environment for preparing density (contour) map of the area. The contours were derived by interpolating the lineament frequencies over the study area using Kriging algorithm (Figures 10). Figure 10 shows lineament density variation between 2 and 91 in numbers. The lineament density is an indicator for the degree of rock fracturing which is a prerequisite for development of hollow passages over an area. Generally, the area around the central, northern parts of the study area has a relatively high density value (>15) while the southeastern parts of the study area are covered by density values (<10). According to Edet et al., 1998, the zones of relatively high lineament density are identified as zones of high degree of rock fracturing which are prerequisite for groundwater conduit development in an area

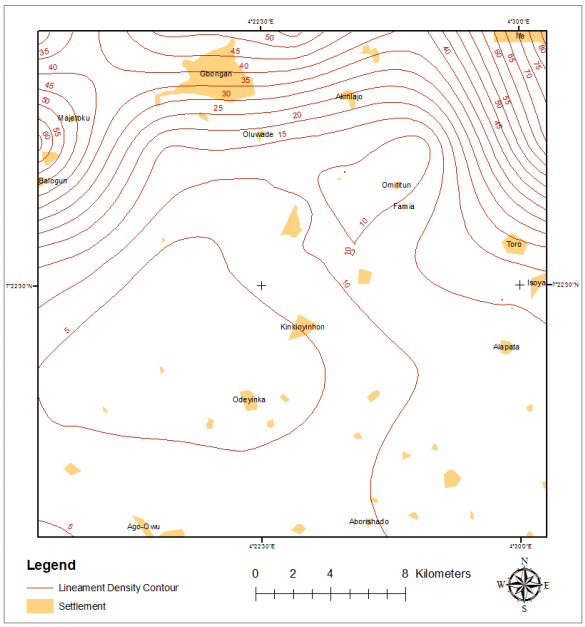

Figure 10: Contour map showing lineament density in the study area.

Lineament intersection density (Figure 11) analysis was performed following the same procedure described above for density map. The total numbers of lineament intersection variation is amount to 80.The purpose of using intersection density map is to estimate the areas of diverse lineament orientations. The density of lineaments intersection is produced by counting the number of lineament intersections per unit area. Final map showing the density of the

lineament intersections were derived following similar procedure described above for lineament density analysis. Figure 11 revealed the hidden subsurface tectonic configuration in form of linear features intersection/cross cutting geological structures that are diagnostics of deep seated fracture/ fault medium. A comparison of Figure 11 with Figure 10-Lineament density map, shows that the area underlain by high density are characterized by relatively high lineament intersection value. The zones of high lineament intersection over the study area are feasible zones for groundwater potential development in the study area.

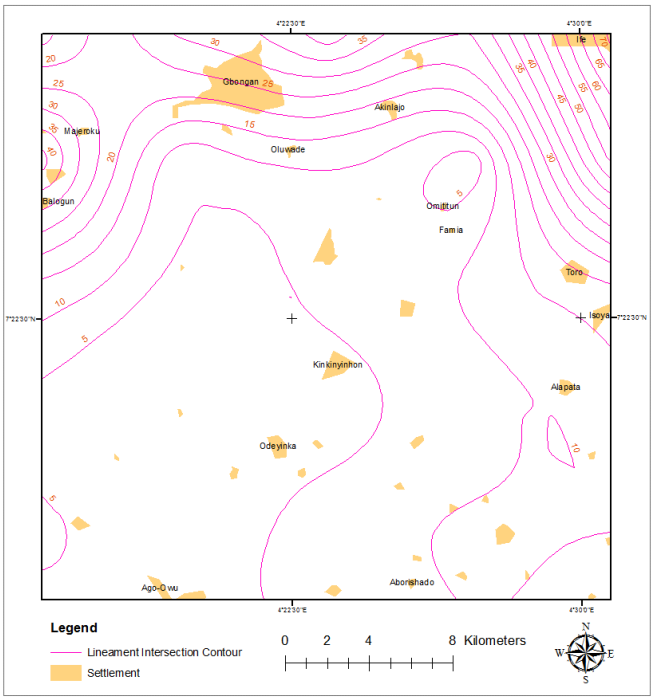

Figure 11: Contour map showing lineament intersection density in the study area.

An updated structural (lineament) map was prepared by updating the published fault map with the lineaments derived from ALOS image. The extracted lineaments were overlaid on the geological formations digitized from analogue published fault map. Analysis of the distribution of the structural lineaments shows that Schist Pegmatite has about 25% of the lineaments, followed by Pegmatite with 20%. Porphyritic Granite has the list numbers of lineament with 1% of the total lineaments in the study area (see Table 5)

Table 5: Distribution of lineaments per Geological Units.

Geological Units	Number of Lineaments	%
Charnokitic	33	5
Granite Gneiss	117	17
Migmatite	85	12
Granodiorite	63	9
Porphyritic Granite	9	1
Pegmatite	137	20
Schist	5	1
schist Pegmatite	171	25
Schist Epidiorite	73	11
TOTAL	**693**	**100**

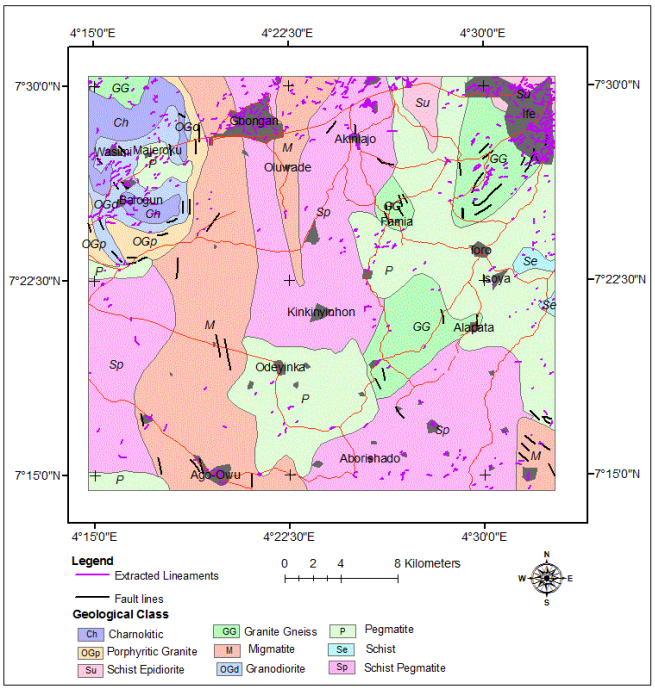

Figure 12: Updated structural map of the study area

CONCLUSIONS

The study was carried out to explore the applicability of ALOS image data in structural geological study with particular emphasis on hydrogeological application. Appreciable numbers of geological linea features were detected on the image data as compared to Landsat ETM+ data and published fault map. This is attributable to the better spatial resolution of ALOS image (10m) compare to 30m resolution of Landsat ETM+ and the small scale of the published fault map (1:250,000). However, the image lack spectral depth of imageries such as Landsat ETM+ that can be used to discriminate the complex objects of the terrain for effective classification and mapping.

Comparing the lineament extracted from ALOS image with the fault lines digitized from the published geological map, the result shows that the remote sensing approach produced more lineaments (Table 5). However, the matching ratio between the extracted lineaments and the published fault map (about 35%) is low. Possible reasons for this could be ascribed to the coarseness of the fault lines on the published geological map (due to small scale of 1:250,000); and because the study area is composed of dense vegetation which obscures the reflectance of the bedrock deformation on the imagery.

The rose diagram, lineament density and lineament intersection maps derived from the analyzed lineaments show the structural disposition of the bedrock. The prominent lineaments trend development in the area of study is in N-S and NE-SW directions for ALOS lineaments while those of Landsat ETM+ image are mainly in N-S direction. The lineament density map generally shows that area around the central, northern parts of the study area has a relatively high density value (>15) while the southeastern parts of the study area are covered by density values (<10). The zones of relatively high lineament density are diagnostic as zones of high degree of rock fracturing which are prerequisite for groundwater conduit development in an area.The lineament intersection map revealed the hidden subsurface tectonic configuration in form of linear features intersection/cross cutting geological structures that are diagnostics of deep seated fracture/ fault medium. A comparison of Figures 11 and 10 shows that the areas underlain by high density are characterized by relatively high lineament intersection value. The zones of high lineament intersection over the study area are feasible zones for groundwater potential development in the study area.

Lineament intersection map revealed the hidden subsurface tectonic configuration in form of linear features intersection/cross cutting geological structures that are diagnostics of deep seated fracture/ fault medium. A comparison of Figure 11 with Figure 10- Lineament density map, shows that the area underlain by high density are characterized by relatively high lineament intersection value. The zones of high lineament intersection over the study area are feasible zones for groundwater potential development in the study area.

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CAPSICUM ASSAMICUM SP. NOV. (SOLANACEAE), FROM ASSAM, NORTHEASTERN INDIA

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Abstract: *Capsicum assamicum is illustrated and described as a new species, with a note on its 'internal transcribed spacer' based molecular phylogeny and differential proteomic analysis. It is closely related to C. frutescencs and C. chinense, but can be distinguished by its profusely branched habitat, yellow green corolla, pale blue anther, orange red and sub-conical to conical fruits with rough, uneven, dented skin, and anatomical details of the stem.*

Keywords: *Solanaceae, Capsicum, North East India*

INTRODUCTION

There are about 20 species of *Capsicum* in the world, of which only five have been domesticated (Bosland & Votova 2000). By 1542, three varieties of chile peppers were recognized to be growing in India (Purseglove 1968), but today, numerous landraces of chile pepper differing in shape, size, color, and heat level can be found in India.

During the course of an ethnofloristic study (2008-2009) on the members of *Capsicum* (Solanaceae) growing in northeastern India, the authors collected a specimen growing wild, from the Tezpur area (157m) of the Assam region. The specimen appeared distinct from other species collected and described so far with refreshing aroma, and is spicy with green foliage, as are other species in the region. The plant as a whole is known in the region as, 'Borbih Jolokia'and it is being used by the local people as a substitute of chili spice in food or eaten raw along with the staple food. Because of its refreshing aroma, palatability and medicinal properties, local people use it for pickle preparation, flavoring curries and for home remedies of ailments like gastritis, arthritis and chronic indigestion problems.

After consultation of the herbarium at Central National Herbarium, Howrah (CAL) and relevant literature (Hooker 1885, Kurz 1887, Kanjilal *et al.* 1940, Haridason & Rao 1987), we found it to resemble *Capsicum frutescencs* with

respect to red to orange red fruit, multicellular epidermal hairs, parenchymatous cortex, presence of endodermis, stele in the form of a continuous ring surrounding the parenchymatous pith etc., and the presence of a calyx constriction, multiple flowers per node, and pendent flower position, however, placed this specimen in the species *Capsicum chinense*. This specimen differs from other species of *Capsicum* with respect to its habit, leaves, flower and fruit morphology and anatomical details of the stem as outlined below. In view of the above characters, the authors concluded that the plant concerned is a separate entity although allied to *C. frutescencs and C. chinense.* Hence, it is described and illustrated here as a new species.

MATERIAL AND METHODS

The specimen was collected from Tezpur area (157 m) of Assam in northeastern India and the information about its local use was gathered on the basis of interviews with local people. The collected specimen was dissected, illustrated, studied, and compared with the classical morphological characters described in relevant floristic literature (Hooker 1885, Kurz 1887, Kanjilal *et al*. 1940, Haridason & Rao 1987), as well as herbarium specimens at CAL. Stem anatomy were studied following the anatomical procedure used for other members of family *Solanaceae* (Cristina *et al.,* 2006). For phylogenetic analysis, the related sequences were retrieved and aligned by ClustalW alignment programme. Sequences were truncated to the length of shortest sequence in the alignment data before constructing the tree. A maximum parsimony tree was reconstructed showing phylogenetic relationship between *Capsicum assamicum* accessions and other related reference species of *Capsicum* using alignment data of concatenated ITS1-5.8S-ITS2 sequences (668 bases) with 1000 bootstrap replicates using tree construction software MEGA version 3.1 (Kumar *et al.,* 2004). Voucher specimens of the taxon are lodged at the Herbarium of Defence Research Laboratory (DRDO), Tezpur, Assam (DRLT, unregistered herbarium acronym), India and was also sent to the Herbarium of Botanical Survey of India, Eastern Circle, Shillong (BSI), India.

Description of the New Species

***Capsicum assamicum* Jubilee Purkayastha & L. Singh sp. nov., Fig.1 A-G**

C. assamicum affinis, folia opposita, ovatis ad ovato-lanceolatis, pallide virides, subtus, apice acutae, subacute, aut brevi acuminate, basi attenuates, marginibus integris, sed fluctuo, crinkled ad maturitatem; floribus pendant, calycis gamosepalous, adsiduus, corolla epipetalous, antherae pallide caeruleo, basifixed, filamenta pilosa fusa, monocarpellary, ovarium ellipsoid, trilocular, stigmatibus diffundet; fructus tricarpellary, sub-conica ad conicam, nam rhoncus rubent ubi matura, aspera cutis dented differt.

Type: India, Assam, Tezpur (157 m), 25-05-2008, Purkayastha & Singh, DRLT 12 (BSI, holotype; DRLT and BSI, isotypes).

Profusely branched shrub, reaching a height of 45-150 cm. The form is bushy and sometimes little slender, behaves as a semi-perennial if grown under optimal condition. Basal stem up to 1-4 cm girth; stem and larger branches of mature plants woody, young plant moderately soft and weak; bark green with dark green pigmentation at nodes, older stem grayish. Leaves opposite, ovate to ovate-lanceolate, green, pale green below, apex acute-subacute or shortly acuminate, base attenuate, margins entire but undulate, variable in size, 10-14x5.5-7.5 cm, crinkled at maturity; venation reticulate, unicostate. Petiole concave above, up to 1cm long. Flowers complete, 2-2.5cm long, pendant, 2-3 flowers per node, pedicel 1.5cm long, calyx 3mm, gamosepalous, persistant, corolla 8 mm, yellow green; stamens 4mm long, epipetalous, anthers pale blue, basifixed, filaments fleshy hairy; monocarpellary, pistil 6mm long, ovary ellipsoid, trilocular, style 3 mm, thickish, stigma diffuse; fruit tricarpellary with central placentation, 6-8 cm in length, sub-conical to conical, orange-red when ripe, skin rough and dented; seeds 19-34, light brown, slightly wrinkled, seeds and placenta extremely biting and pungent.

Distribution, habitat and phenology

Very rare and endemic to Assam and Northeast India and known only from localized parts (Fig. 2) including Bangladesh border. It is restricted to seasonally moist soil with shade where water clogging doesn't occur. Flowers in August-September, fruits in October-November.

Etymology

The specific epithet *assamicum* is given in honour of its first occurrence report from Assam, Northeast India.

Similar Species

Capsicum assaimicum is most similar to *C. frutescens* and *C. chinense* but can be distinguished morphologically and anatomically as summarized in Table 1 and Fig. 3 & 4.

Notes on molecular phylogeny

The internal transcribed spacer (ITS) evolves relatively quickly and can be useful in determining interspecies (Jorgensen & Cluster, 1988) and sometimes intra-species relationships (Baura *et al.*, 1992). Phylogenetic analysis was conducted using ITS sequences (concatenated ITS1, 5.8S, and ITS2) with the aim of evaluating relationships among different accessions of *C. assamicum* and its position with respect to the closely related species of *C. frutescens* and *C. chinense* (Fig. 5). Related sequences were retrieved from the database (http://www.ncbi.nlm.nih.gov) and aligned by ClustalW software. The phylogenetic trees were reconstructed after truncating the sequences to the length of the shortest sequence in a given alignment data, by performing a maximum parsimony analysis using tree construction software MEGA version 3.1. The topology of the tree constructed using the complete ITS sequence clearly indicated that the different accessions of *C. assamicum* could be resolved discretely in the form of a tightly clustering clade, from the two related species of *C. frutescens* and *C. chinense* (Fig. 5). Further, a unique 13 base deletion was observed in all the representative accessions of *C. assamicum*, making it distinct from all other members within the genus and beyond.

Notes on differential proteomics

Differential proteomic analysis of this new species (*C. assamicum*) including 2-DE, image analysis, and protein identification based on MALDI-TOF, was carried out with total cell extracts from fruit tissues of *C. assamicum, C. frutescens*, and *C. chinense.* This analysis revealed 22 differential protein spots which appeared only in *C. assamicum* but not in *C. frutescens*, and *C. chinense.*

CONCLUSION

At the morphological level, the accessions of *C. assamicum* plants with profusely branched habitat, green stem and leaf colour, larger leaves (10-14 x 5.5-7.5 cm), only 2 pedicels / axil, yellow green corolla, pale blue anthers, presence of annular constriction below calyx, sub-conical or conical large fruits with uneven dented surface, light

brown larger seeds, smaller flower pedicel (1.5-1.7 cm), and longer anthers; differ from those found in *C. frutescens* with upright dichotomous habitat, light green stem and leaf colour, smaller leaves (4-12 x 1-4.5 cm), 1-3 pedicels / axil, greenish white or yellowish white corolla, blue / violet or yellow anthers, absence of annular constriction below calyx, elongated- slender- smaller- fruits with smooth surface, cream or yellow smaller seeds, larger flower pedicel (2-3 cm), and smaller anthers (Fig. 1&3,Table 1). *C. assamicum* also differs from *C. chinense* in that the latter shows slender declining habitat, pale green or greenish stem and leaf colour, smaller leaves (5-14 X 3-8 cm), 1-2 pedicels / axil, greenish white / purple white or greenish purple corolla, greenish anthers, short and obtuse smaller fruits with smooth surface, straw colour seeds, and smaller anthers. The accessions of *C. assamicum* also exhibited a steler organization distinct from *C. chinense* (Fig. 4).

Amplification of the ITS region produced an ~750 bp fragment in all cases, which is in agreement with the previous studies with other species of *Capsicum* (Ryzhova *et al*., 2002). All of the accessions of *C. assamicum* had a deletion of 13 bp in 5.8S rDNA region. Despite some minor incongruence, in general the pattern of relationships derived from ITS1, 5.8S rDNA, and ITS2 sequence data were in good agreement.

The sequencing and phylogenetic analysis of the different accessions of *C. assamicum* using ITS sequence clearly indicates early delineation of this unique group of plant in the evolution of genus *Capsicum*. Our results further indicate a divergent evolution after speciation of *C. assamicum* as it is homogenous in ITS sequences but distinct from the other two related species of *C. frutescens* and *C. chinense*. Even if this speciation is result of a hybridization event, it seems so have occurred in ancient time and concerted evolution appears to have homogenized the ITS sequences.

If the observed deletion in our study is the result of multiple copies of the ITS-rDNA region within a single genome; it would be counterintuitive to believe that such variation is restricted only to the accessions of *C. assamicum* and not observed in sequences from *C. frutescens* or *C. chinense*.

All the morphological, anatomical and ITS based and proteomic note presented here were effective in discriminating *C. assamicum, C. frutescens* and *C. chinense*. These differentiating characteristics support the recognition of *Capsicum assamicum* as distinct species within the genus *Capsicum*.

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Legends for figures

Figure 1. A-G. Morphological structures of *Capsicum assamicum*. A. a flowering and fruiting twig. B. single flower. C. pistil. D. anthers. E. corolla opened with stamens. F. calyx. G. fruit.

Figure 2. Geographical distribution of *Capsicum assamicum* sp. nov. in North Eastern India.

Figure 3. Comparative macromorphology of *Capsicum assamicum, C. frutescens and C. chinense.* a. Young twig with leaves. b. flowers. c. corolla with anthers. d. carpels. e. fruits. f. fruit surface image. g. LS fruit. h. TS fruit.

Figure 4. Cross section of stem showing comparative anatomy of *C. assamicum*, *C. frutescens*, and *C. chinense*. The lower panel is enlarged section of the whole stem cross section shown in the upper panel. Scale bar = 1mm.

Figure 5. Maximum Parsimony trees showing phylogenetic relationship between *C. assamicum* accessions and other related reference species of *Capsicum* based on the ITS1-5.8S-ITS2 sequence (668 bases) analysis. Bootstrap values above 30 are given at the nodes. This is a rooted tree reconstructed with 1000 bootstrap replicates using tree construction software MEGA version 3.1.

Table 1: Morphological and anatomical differences between *C. assamicum* with related species of *C. frutescens* and *C. chinense*.

Character	***Capsicum frutescens***	***Capsicum chinense***	***Capsicum assamicum***
Morphology			
General habitat	Upright, dichotomous	Slender, declining	Profusely branched
Plant height	100 – 150 cm	50 – 200 cm	45 – 150 cm
Stem color	Greenish-light gray	Greenish	Green
Leaf color	Light green	Pale to medium green	Green
Leaf length	4 – 12 cm	5 – 14 cm	10 – 14 cm
Leaf width	1 – 4.5 cm	3 – 8 cm	5.5 – 7.5 cm
Pedicels / axil	1 – 3	1 – 2	2
Corolla color	Greenish white or yellowish white	Greenish white, milky white or purple	Yellow green
Anther color	Blue, violet or yellow	Greenish	Pale blue
Annular constriction	Not present	Present below calyx in mature fruits	Present below calyx
Fruit color at maturity	Red-red orange	Red	Orange red
Fruit shape	Elongated, slender	Mostly short and obtuse	Sub-conical to conical
Fruit length	1.5 – 5.5 cm	1.5 – 5.0 cm	5.9 – 8.5 cm
Fruit width at shoulder	0.5 – 1.2 cm	0.5 – 2.0 cm	2.5 – 3.0 cm
Fruit weight	1.2 – 2.5 g	2.8 – 6.5 g	5.5 – 9.0 cm
Fruit surface	Smooth	Smooth, sometimes little uneven	Rough, uneven, dented
Seed color	Cream to yellow	Straw coloured	Light brown

Weight of fresh seeds (1000)	3.0 – 3.5 gm	8.0 – 8.2 gm	6.0 – 8.0 gm
Seeds/fruit	12 – 30	15 – 25	19 – 34
Flower Pedicel	2 – 3 cm	1.0 – 1.5cm	1.5 – 1.7 cm
Anther	3.0 – 3.5mm	2.5 – 3.0 mm	4.0 – 5.0 mm
Anatomy			
Stem outline	Angular	Angular	Rounded
Cuticle	Absent	Absent	Present
Epidermal hair	Multicellular hair, less	Absent	Multicellular hair, many
Cortex	Parenchymatous / collenchymatous	Collenchymatous	Parenchymatous
Tannin cells	Absent in cortex	Present in cortex	Present in cortex
Endodermis	Present and prominent	Present	Present
Pericycle	Sclerenchymatous patches	Discontinuous ring above vascular bundles	Parenchymatous with patches of schlerenchyma
Stele	Continuous ring surrounding pith	Surrounding pith with internal or intraxylary phloem	Continuous ring surrounding pith
Pith	Large Parenchymatous	Parenchymatous with sclerenchymatous cells	Large, parenchymatous with intercellular spaces

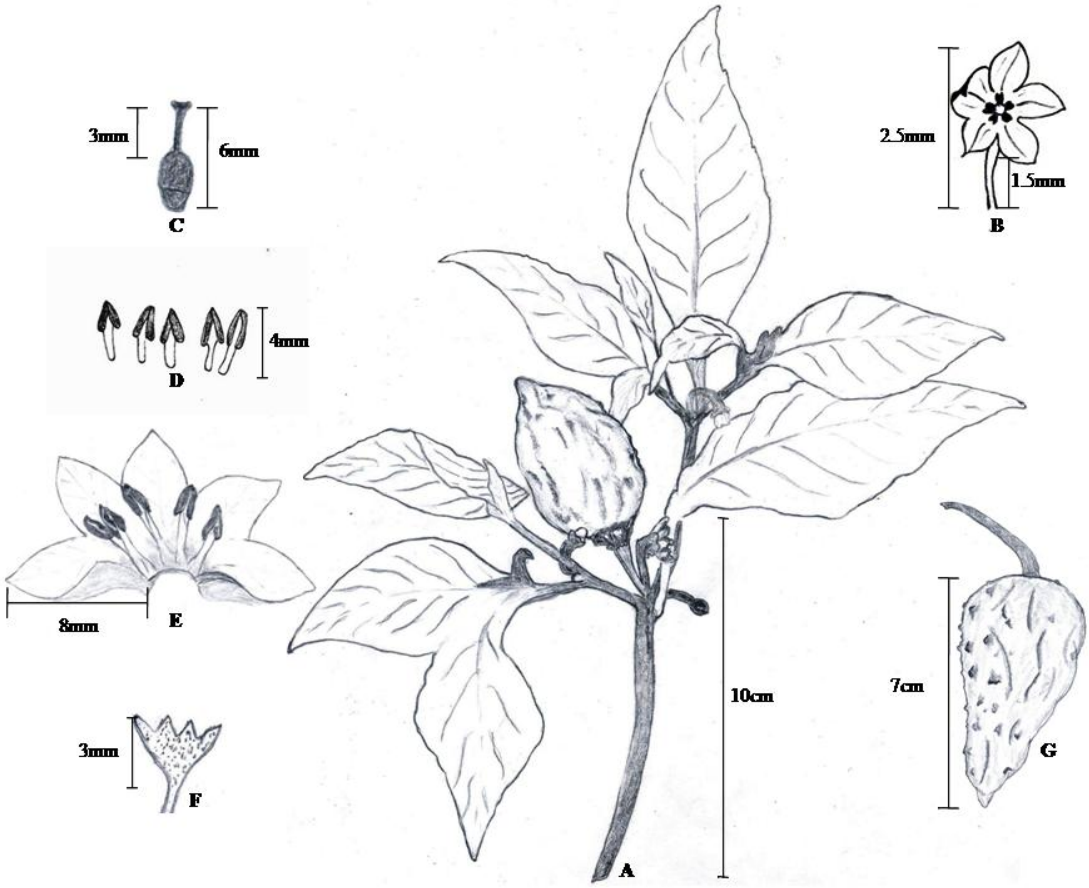
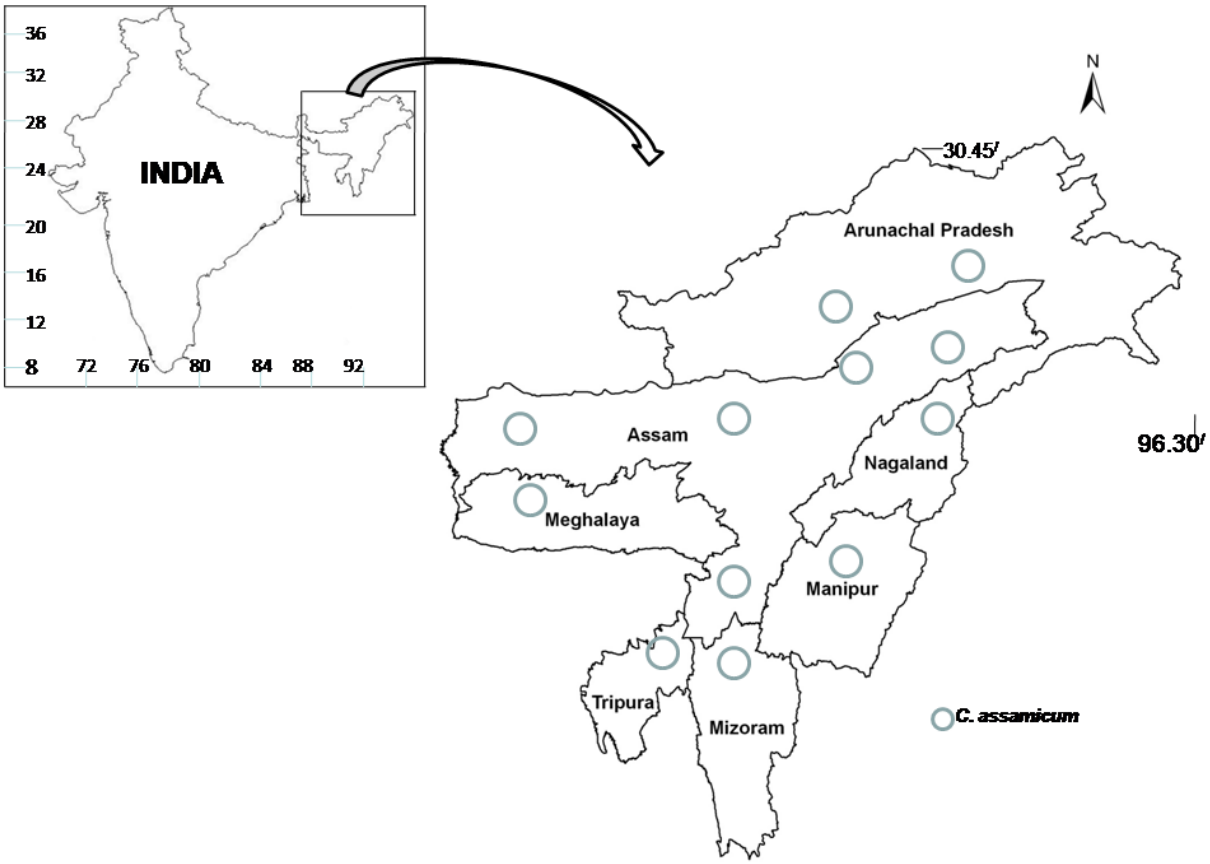


Figure 1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Mizoram
C. assamicum

Figure 2


C. chinense
C. frutescens
C. assamicum
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Figure 3

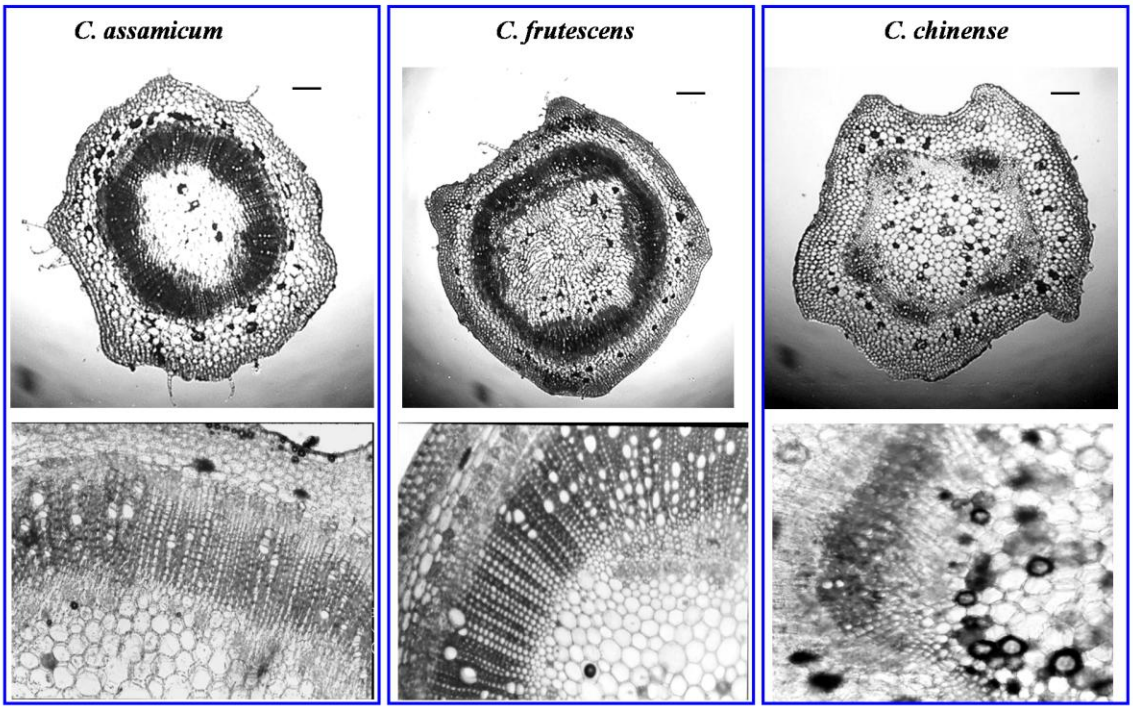
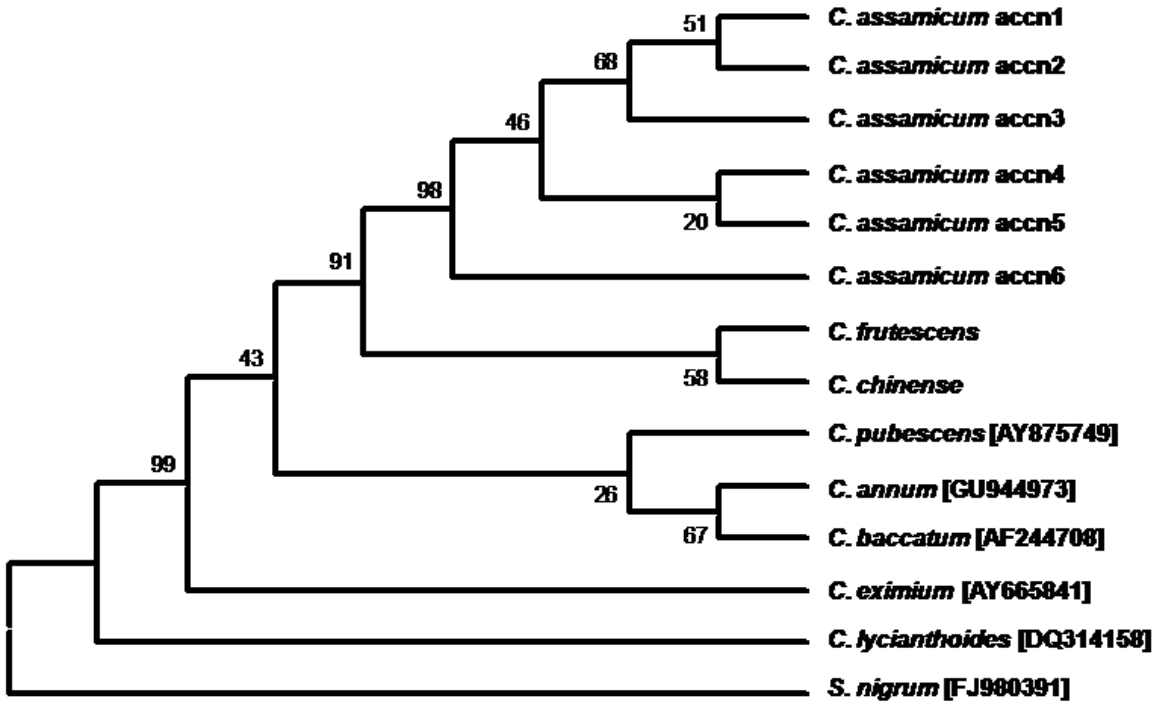


Figure 4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C. assamicum accn2
C. assamicum accn3
C. assamicum accn4
C. assamicum accn5
C. assamicum accn6
C. frutescens
C. chinense
C. pubescens [AY875749]
C. annum [GU944973]
C. baccatum [AF244708]
C. eximium [AY665841]
C. lycianthoides [DQ314158]
S. nigrum [FJ980391]

Figure 5

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SATELLITE NETWORKS ENGINEERING EDUCATION IN NIGERIA: CHALLENGES AND OPPORTUNITIES

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Abstract: *With the uptake and growth in Space and Satellite technology in developing countries like Nigeria in recent years, there is a urgent need for skilled manpower for design, development, operation and maintenance of the sophisticated satellite networks. Currently, there is a shortage of accredited engineering faculties in Nigerian higher institutions to cater for this need. This is further hampered by the high cost of teaching and research facilities to support the training of highly skilled manpower required for the satellite communications sector. This paper examines some of the present challenges facing the provision of qualitative satellite technology education within Nigerian higher institutions. Our analyses of the prevailing situations within the academic sector reveal some unique opportunities for advancement of manpower development for the satellite communication sector. Finally, we proffer some viable and innovative solutions to overcome the most of the existing bottlenecks.*

Key words*: Satellite Communication network education, satellite communication network laboratory, satellite network curriculum, space research and training equipment.*

INTRODUCTION

As the world continue to experience unending expansion of Telecommunications usage, the exploration of every means to achieve global swift communication is becoming more pertinent than ever. Satellite communication is one of the oldest means of entrenching communication in the globe. Advent of internet has brought about voice, data and video communications over the satellite. Mobile communication is also supported and fostered by satellite (NASA). Thus, the study of satellite networking is a most to teach course in Telecommunications engineering. To introduce such a new field into any academic institution takes courage, negotiation skills, office and laboratory space, human and capital resources and a team effort.

Developing a suitable curriculum for satellite Communication Networks has to address all the following topics:

- Module prerequisites

- Laboratory facilities
- Computer and software capabilities
- Complementary courses from Telecommunications and Computer systems
- Final year projects
- Postgraduate courses
- Library and other reference sources

To cope with afore mentioned challenges it would become apparent that satellite research and teaching group has to be established in the Department of Electrical, Electronic, Computer and Communication Engineering at various universities in Nigeria. For this group to be viable and remain growing, programs in satellite networks engineering, links and cooperation have to be established with the following role-players:

- Other educational institutions working in this field (in Nigeria and abroad)
- Research institutions such as NASRDA, NigComSat etc.
- Network Operators such as GTZ
- System, sub-system and component manufacturers and suppliers; including suppliers of computer software
- Government regulatory agency for engineering practice (COREN)
- Professional societies such as IEEE, NASA,SPIE and OSA
- Research support organizations such as ETF, PTDF.

As a result of limited trained satellite networks professionals in industry as well as the academic environment in Nigeria, universities are faced with a serious bootstrapping exercise: The required satellite network engineers cannot be trained because we lack adequate teaching staff in this field, this lack resulting to a great extent from too few PhD students in the field aside human resource shortages in the academia this is the consequence of Nigeria not being/able to launch her first Communication Satellite until May 14, 2007 when NigComSat-1 was successfully launched from the Xichang Satellite Launch Center (-XSLC) in China (5 en.wikipedia.org). The satellite was designed for several purposes that are possible of giving Nigerian and beyond services like; Community Tele-centre, Telepresence, internet and multimedia, broadcasting and Telecommunications (NigComSat). On November 11, 2008, NigComSat-1 failed in orbit after running out of power due to an anomaly in its solar array.

High cost of satellite network teaching equipment (instrumentation, components, training/educational "kits" and simulation software) has further aggravated the challenges. The high cost of equipment according to (Donwa, 2006) has three components: (a.) The high cost of importing equipment from abroad, (b.) The weak and weakening Naira and (c.) Inadequate research funding.

Despite these restrictive factors, there are also certain strengths in the satellite Communication Engineering among which include:

- The relative low cost of skilled labour in Nigeria (especially engineers)
- The excellent quality of engineers and postgraduate students (broadminded)
- Government incentives for exportation and importation for satellite communication and allied equipment.

- The experience of some of the high-tech companies in Nigeria
- The good relationships amongst role Players

By exploiting these strengths, Nigeria can become the satellite network engineering focal point for West Africa and even attract strong franchise in the ICT markets for exporting knowledge, skills and equipment (hardware and software) to other parts of the world.

Satellite Network Engineering Curriculum Development

After many years of teaching introductory courses in computer networks and communication at the undergraduate level at universities and polytechnics in Nigeria, the emphasis is gradually being shifted from mere computer networks (or local Area network -LAN) to wide area networks (WAN) and even terrestrial networks feasible mostly with aid of satellite networks. The recent postgraduate courses in communication engineering in some universities (ABU Zaria, FUT, Minna, University of Ilorin etc) have also been enhanced by introducing satellite Network related courses [FUTM and UniIorin] Example of such courses includes:

- Satellite Communications for postgraduate students in communication engineering.
- Communication networks theory and design for postgraduate students in Electrical engineering (communication engineering option).
- Communication engineering policy and standards for postgraduate students in communication engineering
- Data communication and networking for undergraduate students in electrical and electronics engineering

The first introductory course in satellite networks should teach basic topics/concepts such as satellite communication principles, types of satellites (LEO, MEO and GEO); satellite services; fixed, mobile and broadcasting satellite services (FSS, MSS and BSS); characteristics of satellite networks; propagation delay, propagation loss and power limitation ,orbit space and bandwidth limit, IP over satellite networks, ATM over satellite networks ; Satellite internetworking with terrestrial networks, satellite orbits and networking concept.

Such introductory courses could be built on principles courses such as Data communication and networks, history of satellite, digital communication systems, telecommunications science, and mathematics.

For the undergraduate course, the curriculum should cover a number of laboratory experiments and computer simulations, to teach;

- Network architecture for computer science students at undergraduate level
- satellite communication links
- Receiver and satellite emulator
- Microwave 2.4Ghz operation satellite trainer
- Tele-command and telemetry
- Satellite signaling

These should be properly enhanced also by making readily available to the students standard reference materials in form of Textbooks, Journals, e.t.c such as;

- Journal publications from professional institutes (e.g. IEEE, SPIE, OSA)
- Industry Journals (e.g NASA)
- Manufacturer magazines
- Information guides from suppliers of systems
- Satellite networking –Principle and protocols text books
- Aeronautics and astronautics fundamentals etc

The rapid progression in the field of satellite networking is no doubt creating a fast change and increase in the sophistication of the equipment available for satellite communication. The change is as result of satellite ability to network wide and dispersed locations and its applications to military, remote sensing aeronautics and astronautics exploration to mention a few (Kokkinos et al. and Nishida et al.). New measuring and laboratory equipment appear in the market at an increasing rate. This creates a high per unit cost and even higher Naira cost for Nigerian universities. In a research laboratory for postgraduate course it is sufficient for a start to equip laboratories with one or two pieces of expensive measuring instruments such as spectrum analyzers, receiver and satellite emulator etc that can give state-of-art trend in satellite communication. However, such equipment needs to be supported with manufacturers detail training kits. This is because the training kits do have the advantage of well-prepared training manuals that accompany the kits. For training large groups of undergraduate students (160 or more), it is however essential to have numerous training "stations", standard laboratories to be operated 24-hours every day These laboratories should be equipped with entrance and exit control as well as surveillance equipment, so that they can be used any time of the day or night.

POST GRADUATE STUDIES AND RESEARCH

Master's degree studies in Nigerian universities require at least four compulsory semester modules as well as a comprehensive research project and dissertation; or seven modules and a mini-research project (called a course-work Master's degree). During these mini blocks specific problems are discussed, extensive laboratory work (including simulations) are done and a thesis is written at the end of the session. Most of the satellite Network engineering postgraduate modules are presented in this way. These modules prepare the students for the final research project for the Master's degree or beyond. The PhD degree in engineering is based on research only (in most cases). For both the Master's and PhD degrees expensive laboratory equipment and/or computer simulation software are essential. Educational institutions have some impairment to cater for such advanced research.

Support through centers of expertise/excellence (such as those sponsored by Telecommunication companies could ease the situation) this problem can be overcome with;

- Support by research funding organizations such as the STEP-B
- Support/sponsorship from Industry
- Research co-operation with universities and research establishments in China, America, Europe, Asia, Far East and other countries that are already in the business of satellite networks.

Advanced postgraduate studies (PhD) in Nigerian universities have been viewed as something destined for academics for many years and of no real value for engineers in Industry. Through Industry-based research at Master's and PhD level, the universities can gradually change this view and the number of PhD students could progressively increase. Short corroborative visits by lecturers to industry from renowned research universities are also essential for fostering academic cum industries collaboration for common goal.

Staff (lecturer) Recruitment, Training and Retention

The short history of satellite Network education in Nigeria universities and the small scale at which it happens, the source of academics in this field is very limited. This circumstance has necessitated the Nigeria government to establish satellite research agency called NATIONAL SPACE RESEARCH AND DEVELOPMENT AGENCY in May, 1999. If one combines the needs of the Industry for satellite Network engineers and the salary difference between the Industry and the academic institutions, it is clear that only a small number of dedicated educationists will join and stay with universities. Young graduates frequently join the university to use the opportunity for "full-time" postgraduate studies up to PhD level. Thereafter they leave the university for better Remuneration, practical experience, entrepreneurial opportunities and interesting work environments. Combinations of these, fused with the week naira and the current high levels of crime in Nigeria, cause many young engineers to leave the country. The challenge that faces Nigeria universities is to come up with creative plans and programmes to create as many opportunities as possible for lecturers to:

- Exercise their educational (teaching) skills and desires

- Be active in research environment; including conference participation and research visits
- Practice their engineering skills through consultancy so as to stay in touch with real engineering projects and earn extra income
- Participate in research and teaching exchange programmes with universities abroad
- Develop their innovative and entrepreneurial skills through patenting and product development

Academic institutions frequently face stiff competition from the Industry (and recently even government departments, parastatals and local governments) for the services of young engineers. Because of petite and fixed salary scales at universities for academics, there is very little room for matching offers made to these lecturers. Academic institutions however should also carry out this process of "head-hunting", as most universities do not have a bursary scheme for attracting scholars into university studies with the aim of becoming lecturers. Better cooperative programmes for staff development between universities and the Industry have to be developed.

Opportunities in Satellite Network Engineering for Universities in Nigeria

The challenge is to change the weaknesses and threats facing Nigerian universities (as listed above) into strengths and opportunities. Our proposals can be summarized as follows:

(i) Closer cooperation amongst educational institutions, equipment suppliers and network operators

(ii) Improved opportunities for internships abroad

(iii) Opportunities for innovation and entrepreneurship in developing educational satellite network equipment (for the local market, but more so for the export market).

To evaluate the benefits of any such cooperation, we have to consider what each participant can offer and require:

Universities

Offer - Expert knowledge on the state of the art research from all over the world; student projects (undergraduate and postgraduate); Continuing Professional Development (CPD)

Require -Access to state of the art equipment and instruments; participation in real world problems; training equipment.

Equipment suppliers

Offer – Subsidised equipment; information on equipment and instrumentation developments; internships for students and lecturers

Require – Equipment sales; product promotion and evaluation; product research

Network operators

Offer – Access to state of the art installations; internships; consultancy possibilities

Require – Good and well prepared human resources; access to technology forecasting; specialist consulting.

By combining the efforts of these three groups, funding from others (such as the STEP-B, government support programmes and venture capitalists) can be influenced. This can even lead to new initiatives for import replacement and export ventures (especially in educational training equipment and software). A project on developing satellite Networking Training kits for educational institutions in Nigeria, the rest of Africa and abroad, can be started from within the Local content Technology system at any of chosen University in Nigeria and the research projectile at the Innovation Hub (operated by National Space Research Institute – NASRDA). The imminent introduction of CPD for all registered professional engineers (with CoREN) will require a certain

number of hours per year of course attendance. These courses will take the form of refresher courses, as well the introduction to new technologies, products and systems. Universities will play a major role in presenting some of these courses. It should be the opinion of the authors that organisations will benefit from two types of CPD courses:

- Discipline and field specific courses that deal with the latest trends in the satellite technology
- Overview courses for managers and engineers working in related (but not the same) field
- Security, discoveries in satellite network trends

These courses can even be presented as in-house courses and may include laboratory experiments and techniques. This will limit the costs, promote satellite networks research, and provide jobs for satellite network engineers and advice government appropriately in formulating satellite policy.

CONCLUSION

The wide spread usage and bandwidth capabilities of satellite communication networks for voice, data and video communications make them essential components of the Information Super Highway. The training of engineers for the design and management of satellite networks is a challenge for especially Nigeria universities with their unique problems- for example Nigeria lost a satellite in 2003 without any Nigerian satellite engineer being able to give convincing account of the lost. These are consequence of the high cost of imported measuring and training equipment, the lack of outstanding postgraduate programme in satellite communication and the difficulties in recruiting and retaining suitably qualified lecturers. We have suggested innovative solutions to address these problems which can actually create opportunities for developing products (hardware and software), skills and services for the export market. These solutions could also assist the universities in obtaining funding for the purchase of expensive measuring equipment.

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HIGHWAY ROUTE DESIGN THROUGH THE USE OF GIS AND MULTI-CRITERIA ANALYSIS: A CASE STUDY OF ISTANBUL

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Abstract: *Highway route layout design is a very complex issue, requiring considerable time and effort from city planners. In this paper, a highway layout is designed for Istanbul using the GIS-multicriteria analysis technique. Several maps illustrating land use and land cover are used to define the routes and locations of proposed highways. Special attention is paid to environmental considerations, and each map layer is assigned a value. Vector maps are converted to raster maps, and the raster calculator tool in the ArcGIS 9.3 software is used to calculate the value of each pixel for the resulting map. Possible routes are defined for highway construction and the possibilities are evaluated to find the scenario that is most favorable with respect to environmental considerations. As a conclusion, there are only a few suitable places to construct a bridge on the Bosporus and a highway cannot be constructed in Istanbul without destroying forests or agricultural areas. This work emphasizes that GIS is a very useful tool for transportation applications and as in all GIS-related applications, accuracy of data is very important.*

Keywords: *Highway route, GIS, Multi-criteria analysis, Istanbul.*

INTRODUCTION

The state of transportation system of a country is an important factor that can have a large impact on the future of that county. There is a direct relation between the efficiency of the transportation system of a metropolitan field or city and its economic and social wealth (Tanga and Waters, 2005). The transportation system affects the level of economic activities and development in the long run while also providing mobility to both the people and supplies in a city (Banister, 2002). With this in mind, the analysis and planning of city transportation systems is very significant, as it contributes to the productive transportation of people and products and affects social development (Black, 2003). Countries in the EU have in turn accepted the importance of a regular, sustainable, and integrated transportation system.

Investments in transportation have reached very high levels and have played an important role in the habitation of cities and the development styles of residence areas. Because of the contribution to the economy of their surrounding area, as well as the impact on the local environment, traffic and road safety, institutions dealing with the planning and managing of transportation have begun to consider the establishment of transportation systems as one of the most important issues today. The length and density of a highway transportation network can have many positive contributions to the economic life of a city, but at the same time can have negative effects as well, such as air pollution, pollution of natural drainage systems, noise pollution, and an increase in energy

consumption (Ulengin et al. 2010; Cavallin et al., 1994). It is clear that with an increase in the number of vehicles on a highway, environmental conditions will soon degrade.

One reason for the occurrence of traffic accidents is the insufficiency of roads and the accompanying increase of vehicle density on the roads. Traffic accidents are considered a growing problem that threatens the public health in developing countries. According to estimated figures 1.3 million accidents occur each year in EU nations, resulting in a total of 40,000 deaths (CEC, 2001).

Turkey is situated at the border of Asia and Europe, and its economic and social structure contains aspects of both cultures (Işıldar, 2006). The transportation network in Turkey was not developed in a premeditated manner, due primarily to political factors. A master plan for the development of a transportation system in any one city or across the country, taking into account the many different perspectives, has not been prepared at present. Despite all of these shortcomings, 92% of supplies and 95% of people in Turkey are transported via the highway system (Ulengin et al. 2010).

Although the number of vehicles per person in Turkey has recently undergone a rapid increase, only 795,552 vehicles participated in traffic in 2007. There is not a parallel relationship between the population increase and the number of vehicles on the road; the number of vehicles is increasing much more rapidly. The population increase between 1995 and 2007 was approximately 15%, while the increase in the number of vehicles was nearly 75%. In that same period of time, there was a 167.98% increase in traffic accidents and a 30.45% increase in traffic related injuries. In contrast, the number of deaths decreased by 42.39%. The cost of traffic accidents in 2007 in Turkey was approximately 1.1 billion TL, excluding the related health expenses and loss of work power (TUIK, 2007).

The preparation of comprehensive transportation plans and the design of motorways are complex activities that require the efforts of many experts and executives. Even with the combined efforts of selected executives, planners, analyzers and sensible citizens, the preparation of a transportation plan can take months (Nyerges et al. 1997). A successful plan of transportation makes public transportation more attractive to people and prevents them from using private vehicles. Such a decrease in private vehicles is of great importance from an environmental aspect, especially for governments that signed the Kyoto protocol and aim to decrease the distribution of greenhouse gases into the atmosphere (Woudsma, 2003). Many academic studies have shown that public participation has provided new points of view to city and transportation planning (Nyerges, 1995; Moore, 1997; Kikukawa et al., 1999).

A multi-criteria analysis is a general term that refers to techniques used to obtain the most suitable solution to a problem by making a series of choices from different data (Arentze and Timmermans, 2000). Multi-criteria analysis and highway design are automatic procedures that involve many evaluation steps and take into account the relevant geometric, environmental, societal, and geotechnical factors. Moreover, this approach is flexible and can include criteria for adjusting, evaluating and measuring stability from an environmental perspective.

With the development of computer technology, GIS has become one of the most widely used techniques for the planning and analysis of transportation. GIS is commonly used in a number of applications including the preparation of land use maps, the analysis and preparation of transportation maps, and the management of natural resources (Tanga and Waters, 2005). GIS is of invaluable importance in the preparation and revision of low cost transportation planning, in testing the results of transportation models and in the selection of routes (Bielli et al. 2006).

To conduct more comprehensive analyses in GIS applications, data transfer between parts is necessary, and many parts are often included in one topic during analyses (Demirel, 2002). Generally, three different GIS models can be used for application of transportation: 1) field models, 2) discrete models, 3) network models (Goodchild, 1998). Among these, a network model is the most frequently used; as many applications require only the network model to properly describe the data (Thill, 2000). A network data model is commonly used in the description of both linear and two-dimensional objects that are topographically relevant on the same surface (Demirel, 2002).

Apart from these studies, additional research was done to determine the most consistent methods within multimodal transit systems (Battista et al. 1995; Lozano and Storchi, 2001). Fernandez et al. (1994) aimed to find the shortest paths among bimodal networks. Modesti and Sciomachen (1998) developed a utility to determine the shortest path in an urban multimodal transportation network. Miller and Storm (1996) developed a modal transfer arc to reveal changes in models. Theriault et al. (1996) developed a modeling and simulation procedure to find the most suitable route by using a database and GIS software, simulating the travel time. This procedure was developed to find the best route in topographic road networks.

One primary objective in most technologies that use Geographic Information Systems is the integration of "routing" models. Boulmakoul et al. (2000) developed formulations to find pathways in fuzzy networks, and the

Fuzzy Spatial Network Solver offers generic algorithmic solutions for these kinds of problems. Li and Kurt (2000) developed the GIS-TIPDSS model (with the name arising from the design of a transit route planning system), which was based on an input module, a transit route module, and an output module.

The aim of this study is to determine the most suitable route for the construction of a new highway in Istanbul by exposing the potentials and functions of GIS using automatic route determination.

Study Area

Istanbul is the largest city in Turkey, with a population of 12,697,164 (TUIK, 2009), which, after London and Moscow, is the largest city in Europe. Istanbul is the cultural and financial capital of Turkey and is considered a megacity with 39 districts. With the Bosphorus defining the borders of Asia and Europe, Istanbul has an important geopolitical position, uniquely belonging to two different continents (Figure 1).

Istanbul lies in the northwest of Turkey, in the Marmara Region. With an area of *6220* km^2, Istanbul has a transitional climate that has features of the oceanic climate in the Black Sea Region, the terrestrial climate found in the Balkans and the Mediterranean climate on the shorelines of Marmara Sea.

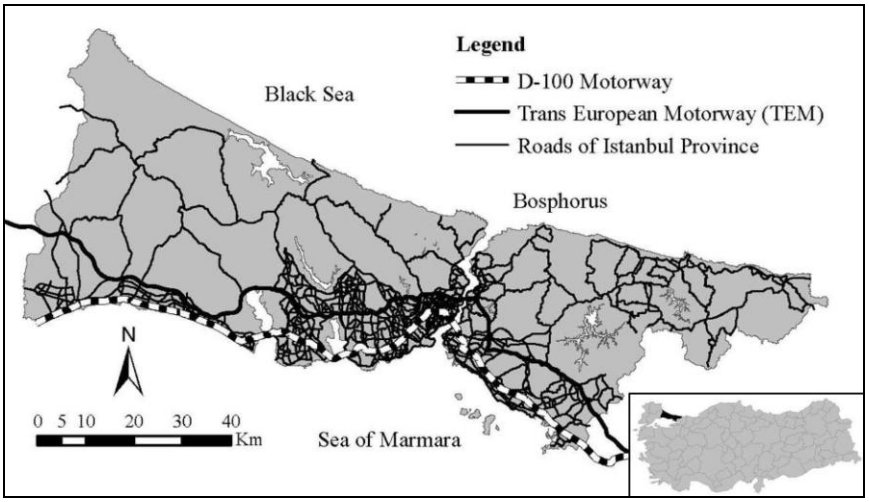

Figure 1: Map of Istanbul Province

The Province of Istanbul has undergone a rapid population increase that began in the 20th century as a result of economic development. The province was uninhabited until the 1950's, but open places have since begun to fill with newly constructed houses and slums. This urbanization has occurred primarily in locations close to main roads. The main reason for the rapid increase in population has been emigration from other places. In 1950, Istanbul had a population of 1,166,477, which increased to 1,882,092 in 1960, 3,019,032 in 1970 and 4,741,890 in 1980. The rapid economic developments in the period after 1980 resulted in an increase in emigration into the city, and the population increased to 7,309,190 in 1990 and 10,072,447 in 2000. According to the results of the address-based population register, the population of Istanbul in 2008 was 12,697,164 (TUIK, 2009; Statistics for Istanbul, 2000, p. 264). Today, nearly two thirds of the population of Istanbul lives in the European region, while the remaining third inhabit the Anatolian region.

The most popular transportation system in Istanbul is the highway system. Buses are used for public transportation, making up for the deficiency in rail travel. With the large presence of private vehicles and other means of transit transportation, the density of vehicles on the highways is very high. The large density increases the travel time on roads, causes economic losses, and, most importantly, leads to an increase in the number of traffic accidents that in turn result in losses of life and property.

Approximately 107,346 traffic accidents occurred before the end of July in 2000, causing 167 deaths and 6,536 injuries in Istanbul. According to statistical results in 2000, 10.3% of the accidents in Turkey took place in Istanbul, with 7.9% of traffic-related accidents occurring in Istanbul. The aim of this study is to determine the most desirable route of an additional road so that its long-discussed construction will decrease the number of vehicles on the existing roads and accordingly the number of accidents.

DATA

For the determination of road routes, it is necessary that the tools and methods be comprehensive and includes every type of information that is needed to achieve the predetermined aims. The determination of road routes is a subject that is influenced by many factors and significantly affects city life. Thanks to today's technology, the use of digital data in this type of planning study makes it possible to easily integrate sets of data from different sources, and data can be easily transformed into various formats (Sadekl et al. 2000). Therefore, data used in this study were either taken from the relevant institution digitally or transformed from a paper document into a digital format.

Because this study deals with the design of a third highway within the borders of Istanbul, a digital map that shows the borders of the Province of Istanbul has been obtained from the Istanbul Metropolitan Municipality with the land use map of Istanbul. This map includes information regarding forests, farming lands, residential areas, existing roads, rivers and lakes. Moreover, during the digitizing, a table of features was created with information about each layer for the construction of various maps relevant to this study. For instance, locations of forests and farmlands were separated into categories, and protected areas were described as "fields that will never be touched".

The coordinate system of digital data obtained from the Istanbul Metropolitan Municipality is GCS_European_1950, so the coordinate system of GCS_European_1950 was used on digitized maps and "Zone_35N," within which Istanbul is situated, was chosen as the zone; for accurate analysis, it is essential that data are produced using the same coordinate system. Collected digital data layers are province borders, existing roads, land use, land cover, existing residential areas, and lakes and rivers. By analyzing these maps in the same ArcMap environment, the most suitable road routes were determined.

METHODOLOGY

As mentioned previously, a significant volume of data was used in this study. While using these data, a specific criterion was formed for each layer, and a multi-criteria analysis was performed. In the formation of map layers, more environmental values were considered, and an effort was made for an environmental analysis by giving values to the features of maps according to these criteria.

Fertility Map of Soils of Istanbul

A paper map displaying land types in Istanbul, obtained from the Ministry of Agriculture, was digitized. A different value was given for each soil group in the map according to their degree of productivity; high-fertility lands took low values, as they are more suitable for farming, while low-fertility lands were assigned high values, as they are more expendable and therefore more suitable for the construction of roads (Figure 2).

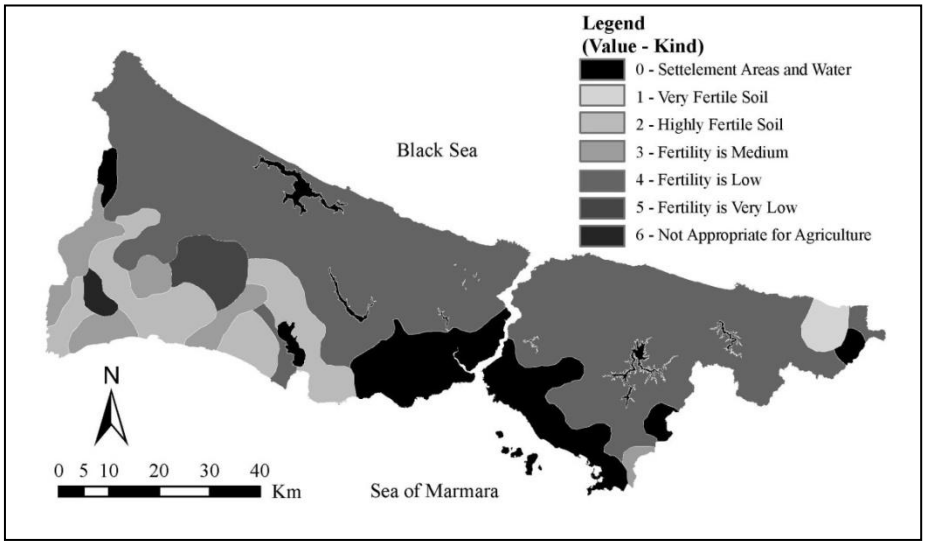

Figure 2: Classification of soils of Istanbul according to fertility.

Geology Map

A geologic map of Istanbul obtained from the General Directorate of Mineral Research and Exploration was digitized. A different value was given for each surface rock layers according to the degree of hardness. The layers with a high degree of rigidity were assigned higher values because hard grounds provide more convenient conditions (Figure 3).

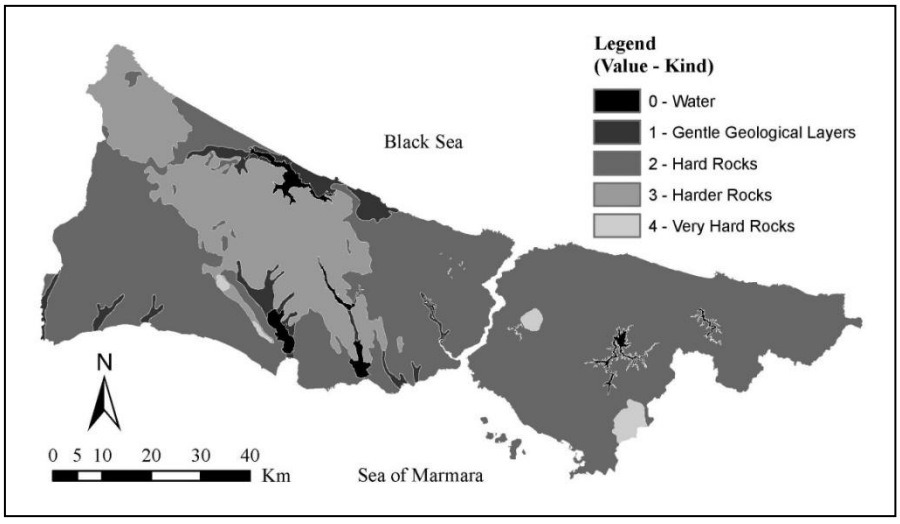

Figure 3: Classification of rocks in Istanbul, according to hardness.

Map of Residential Areas

A land use map displaying water bodies, residential areas, and others areas (Figure 4) was obtained. Water bodies are available in all maps used in this study, and they were identified as "forbidden fields" and accordingly assigned a value of 0. Regardless of the population density, all residential areas were also assigned a value of 0 and assumed to be areas that cannot host highways. Highways are large roads, 40-50 meters in width, and it is not possible for them to pass through inner parts of residential areas. In addition, the noise associated with highway traffic would considerably disturb those who live in the neighborhood.

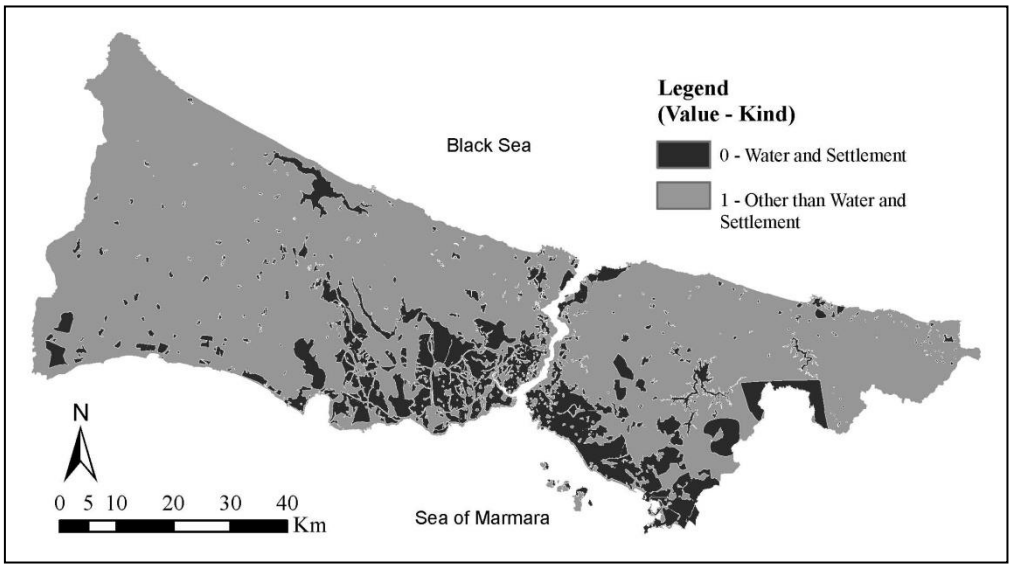

Figure 4: Settlement Areas of Istanbul

Map of Protected Areas

The map below shows different types of protected areas in Istanbul. Values are assigned to the protected areas on the map according to the numerical system that the Istanbul Metropolitan Municipality's Planning Management uses. Although archeological sites and protected areas are absolute protection areas, in the open-air museum that is Istanbul, we are not able to take every protected area into account. Otherwise there would be no place left to build a highway. Archeological sites and natural protection areas are located near the Bosphorus, and in order to construct a bridge that connects the two continents, some portion of the protected areas must be sacrificed. Aside from the protected areas near the Bosphorus, the sacrifice of protected areas for the sake of highway construction can be avoided. Archeological sites and natural protection fields were regarded as the most important of the protected field and were assigned a value of 1. Historical places were the next important and were assigned a value of 2. The other fields were considered suitable places for road construction in terms of land use (Figure 5).

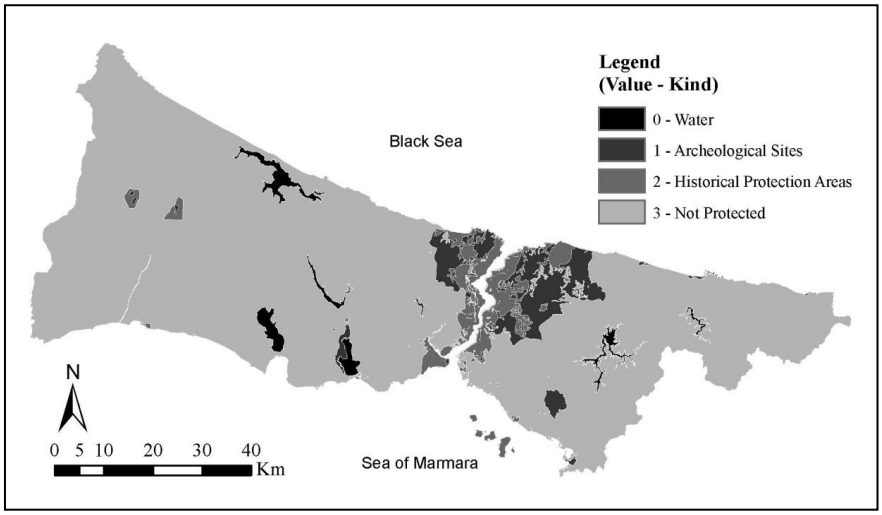

Figure 5: Protection Areas of Istanbul.

Forest Map

The map of forests shows water surfaces and forest fields. As mentioned previously, water surfaces were given the value of "0", and these fields were excluded from the possible fields over which highways could pass. Although all forest fields were handled as primary protection areas in this study, the northern area of Istanbul, which is covered with forests, was considered an area in which highways could be built with considerable forest destruction. This is especially true in the Anatolian region. Hence, these forest fields were described as fields that should be protected but were assigned the lowest values. Forestation areas follow the forest areas in terms of value and received a value of five. Some areas were removed from the status of forests by the municipality, although they had previously been assigned forest status. These fields are described as suitable fields for road construction, receiving a value of eight. The remaining lands of Istanbul were seen as the most suitable places in terms of road construction and assigned a value of 4 on this map (Figure 6).

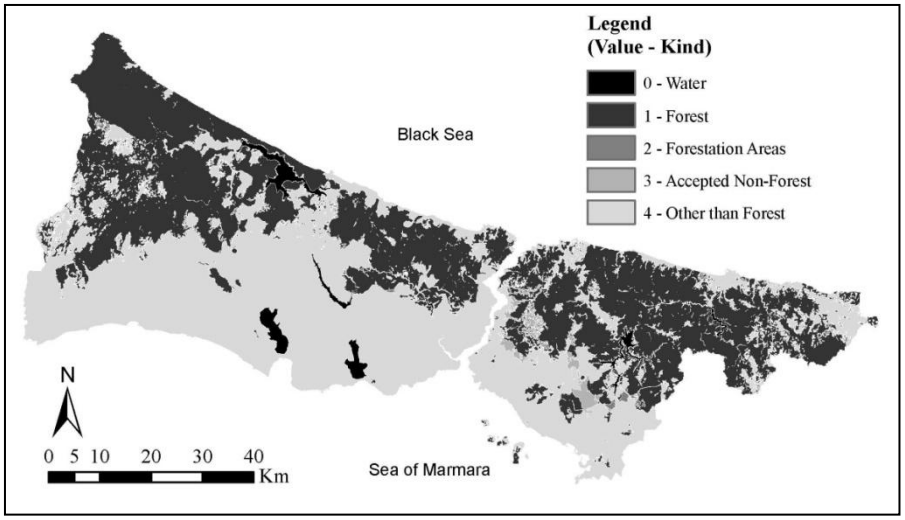

Figure 6: Forest Areas of Istanbul.

Agriculture Map

The agricultural map is composed of farmlands. Farmlands are also considered lands that must be protected, just as forestlands. However, after examining the regions, including provinces adjacent to the Province of Istanbul and considering the general farming conditions of Turkey, we concluded that farm lands are a slightly more important than forests fields. Farmlands are shown as the most valuable fields on this map and assigned a value of 1, the lowest value assigned to agriculture related lands. Natural and rural fields follow farmlands and were assigned a value of 2. The other fields on the map were described as the most suitable locations for highways to be located and assigned a value of 3 (Figure 7).

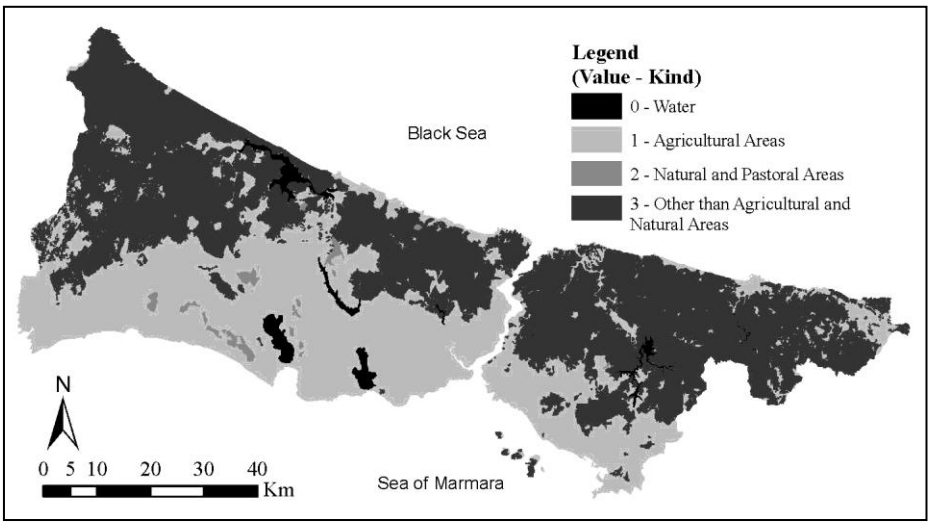

Figure 7: Agricultural Areas of Istanbul

Slope Map

The slope map is produced by ISKI and shown by a DEM, with 1 m resolution, provides some of the most important information in this study. This DEM is first categorized according to percentile values of slope, transformed into the raster format, and then a map is created, in which new values were given according to the reclassification. In this study, the fields with an inclination between 0-5% are assigned the highest value of 9, while the fields with an inclination higher than 30% are assigned the lowest value (Sadekl et al., 2000).

ANALYSIS

After map creation, each map was assigned a value of weight. These weights may be different for different studies, according to their aim. As environmental values are the primary considerations in our study, protected fields and forest maps were assigned the highest value, while the map of inclination was assigned the lowest value, because current technology allows for road construction on all types of land topography (Table 1).

Table 1: Criteria for route determination

Map	Classes	Class Value	Calculation Value (*)
Protected Areas	Archeological Sites	1	0,7
	Historical Protection Areas	2	0,7
	Not Protected	3	0,7
Forests	Forest	1	0,6
	Forestation Areas	2	0,6
	Accepted Non-Forest	3	0,6
	Other than Forest	4	0,6
Agricultural Areas	Agricultural Areas	1	0,5
	Natural and Pastoral Areas	2	0,5
	Other than Agricultural and Natural Areas	3	0,5
Geology	Gentle Rock	1	0,4
	Hard Rock	2	0,4
	Harder Rock	3	0,4
	Very Hard Rock	4	0,4
Settlement	Settlement Areas and Water	0	0,3
	Other than Water and Settlement	1	0,3
Soil Type	Very Fertile Soil	1	0,3
	Highly Fertile Soil	2	0,3
	Fertility is Medium	3	0,3
	Fertility is Low	4	0,3
	Fertility is Very Low	5	0,3
	Not Suitable for Agriculture	6	0,3
Slope	0%	7	0,2
	0-5%	6	0,2
	5-8%	5	0,2
	8-12%	4	0,2
	12-20%	3	0,2
	20-30%	2	0,2
	More than 30%	1	0,2

After the formation of value tables giving the criteria for route selection work to determine the most suitable fields for the construction of highways using “the raster calculator” feature in ArcGIS 9.3 software was started. The class values created for maps were multiplied by the values of maps producing new maps, which were multiplied by each other, and the ones with the highest values were considered the most suitable fields for the highway route. The fields with a value of 0 were considered areas unsuitable for highway construction (Figure 8).

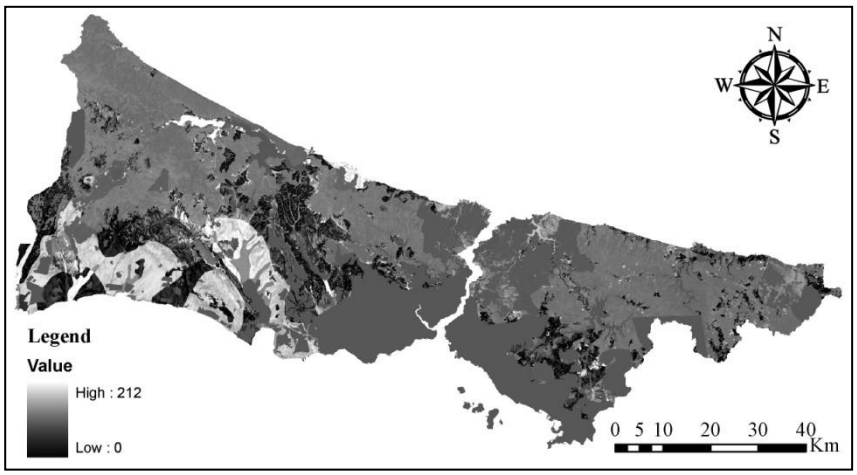

Figure 8: Unclassified Result Map of the Raster Calculation Operation.

RESULTS

The map formed through the cellular calculation was again classified, and an attempt to determine the fields over which highways could pass was made. The resulting map had 25 different classes, with the 25th class identifying the most suitable fields for highway construction and the first class the least suitable.

As the highway will connect the western and eastern parts of Istanbul, suitable construction areas are found by beginning at the 25th class and proceeding numerically downward, and the pixels that display the most suitable areas are expected to connect in the east-west direction. Indeed, when we reached analysis of the 15th class, a set of pixels are being seen connecting in such a way (Figure 9).

As seen from the map, the black pixels, referring to suitable places for highway construction, are more heavily accumulated in the European part of Istanbul. This is because most of the farmlands in Istanbul are situated in the European part, while the Anatolian part is dominated by residential areas, protected areas and forests. Because farmlands are assigned higher values in terms of highway construction, the farmlands situated in the southern European part of Istanbul constitute the most suitable places for highway construction. Apart from this, forestlands in north Istanbul, both in the European and Anatolian section, are also suitable for highway construction.

As the Bosporus is completely full of residential places, only two places were determined suitable for building a bridge. The southernmost location was chosen. The two locations, indicated as possible routes on the map, were also considered to be suitable locations for a bridge construction.

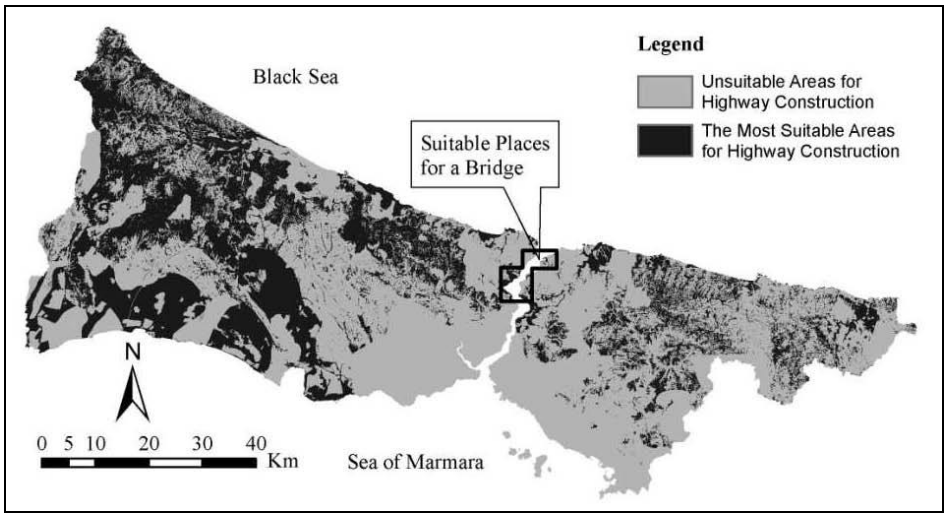

Figure 9: Reclassified Result Map.

Possible Highway Routes

After the suitable places for highway construction were calculated analytically, two different routes were determined. In the determination of these routes, other features of the province of Istanbul were considered in addition to pixel values, as explained below.

The first route, shown in Figure 10, is the most suitable route according to calculation results. While determining this route, we considered that the highway should be close to the residential places in the Anatolian region. The proximity to the residential places will increase the highway usage and thus lighten the traffic on the TEM and D-100 motorways. We assume that a new bridge across the Bosporus will be constructed simultaneously with the highway, as the two existing bridges cannot bear the burden of additional traffic. Furthermore, the route of the highway is far away from other bridges.

An additional advantage of this highway route is that less forest fields were used in the European part than for other routes. As mentioned previously, forestlands are considered more valuable than farmlands in this study. In addition, this route was closer to the TEM road in the western part of the city, providing a valuable connection.

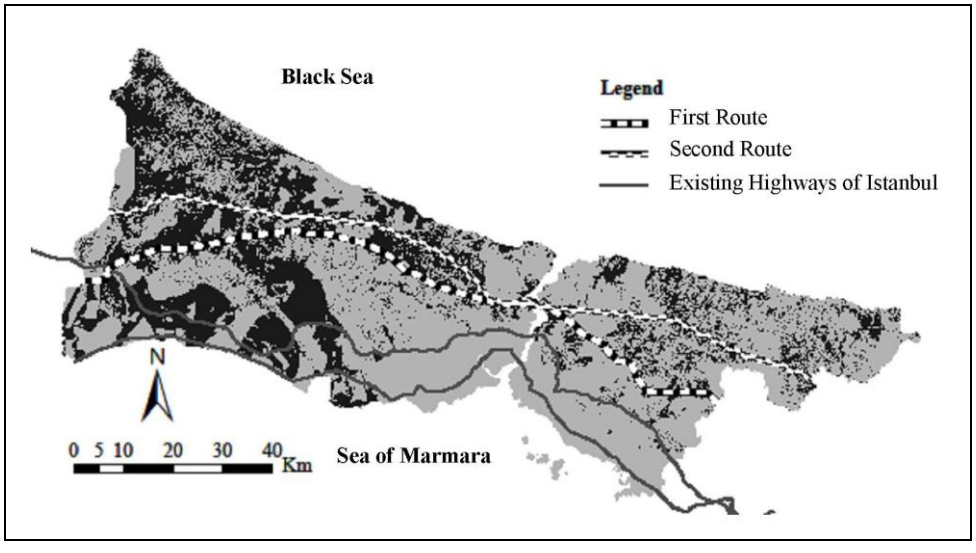

Figure 10: The First and Second Route

The second possible route determined for highway construction (Figure 10) more closely follows the logic of engineering, rather than environmental factors. The construction of this road would cause the destruction of more forest fields, but it almost never passes over farming fields. However, one important advantage of this route is that it is quite flat and much shorter than the other alternative and thus has a lower cost. This can be a very

important advantage, as road construction is very costly but in this study cost was not a parameter to be considered specially.

CONCLUSIONS

This research illustrates the important advantages of Geographic Information Technologies in people's lives and city life. It is seen that with GIT, it is possible to execute a very complex procedure in a much shorter time and with perhaps more accuracy compared to what experts from different disciplines can do under normal conditions.

As in all research that uses Geographic Information Technology, the accuracy and quality of data are very important in the studies of road design. The scale of maps should be as large as possible, giving as much detail as possible. Also, accuracy is one of the most important aspects in this kind of study. In a metropolis where residential areas have grown very rapidly, such as Istanbul, using updated maps that show residential areas is very important in order to reach correct results. In this study, residential places are considered as fields over which highways can never pass.

During the construction of motorways, routes should be chosen that are less harmful to the environment. As long as it is possible, the balance of nature should not be spoiled. If this is not possible, the least harmful alternative should be chosen. Moreover, the fields across which roads should not pass should also be off limits for residential construction, as such development would result in the destruction of forests and agricultural areas.

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INTERPRETATION OF THE HISTORIC SITE, AGORIN IN BADAGRY, SOUTHWESTERN, NIGERIA USING GEOPHYSICAL METHODS

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Abstract: *The use of non-invasive geophysical methods in archaeological studies is gaining prominence both in terms of technique and application.The purpose of this study is to locate possible buried artifacts as well as characterizing the shallow subsurface geology using magnetometry and electrical resistivity techniques. Magnetometry survey lines were aligned and measured along North-South direction while the Electrical resistivity survey was conducted along N-S as well as E-W directions. Measurements involving magnetic and vertical electrical soundings (VES) were taken along seven traverses. A total of 150 magnetic stations at spacing of 5m and 9 vertical soundings were established covering the entire study area.The results were presented as magnetic profiles,contour maps and geoelectric sections at various depths.The magnetic signatures indicate area with high magnetic dipole values possibly due to buried anomalous structures.Correlation of the VES results with available borehole log shows at least three geoelectric layers which corresponds to topsoil,sand,clayey sand and clay.The combination of the two methods in terms of possible depths of burial of the causative body shows good agreement. Consequently, the survey results revealed that integrated geophysical techniques are useful tools to obtaining detailed information concerning the subsurface and gaining a more holistic understanding of archaeological sites prior to excavation.*

Keywords*: Magnetometry, Magnetic anomalies ,Artifacts, Vertical electrical sounding, Geoelectric section.*

INTRODUCTION

The ancient city of Badagry is located in southwestern part of Nigerian border with Benin Republic. It is located precisely between latitude 6.5^{o}N of the Equator and longitude 3.25^{o}E of the Greenwich Meridian. It is bounded on the west by Porto Novo and Weme; on the north by Ilogbo,Ipokia; on the south by the Osa lagoon and the Atlantic ocean and on the east by the Awori settlements of Ojo and Lagos (Akran,2001). As a result of its strategic location, Badagry became a cultural transition zone at a time in its history. In the sixteenth century, it was transformed into a trading outlet for the export of slaves from West Africa into Europe and its environs**.**

Archaeological studies on the Quaternary geology of Badagry coastline revealed the accumulation of buried pottery-bearing mounds which have been linked to deposits created as a results of boiling salt from sea water in the area (Allsworth and Wesler,1997).Badagry, as one of the ancient cities has maintained its program to preserve, interpret diverse aspects of cultural heritage through the collection of artifacts and relics of human slavery among others.To show-case this project,it has been playing host to tourists from different parts of the world.

A variety of approaches to archaeological survey are occasionally used in order to reflects the essence of investigations. In recent times, emphasis has been placed on an integration of geophysical methods. These techniques have proven to be very promising for the location of buried archaeological targets. Notable researchers who have used standard geophysical techniques as an aid to archaeological excavations includes (Gaber et al.,1999,Carr,1982.,Young,1986,Tite,1972.,Chouker,2001).The success of these methods is based on the contrast in physical properties between the target and the surrounding substrate.

In accordance with the purpose of study, magnetic method was chosen for its quick, efficient data capturing capabilities and the good response it gives to buried structures which showed a good magnetic contrast to the surrounding soil. It was first used in the 1950s (Belshe,1957, Aitken etal.,1958) and has since become the backbone of archaeological prospection.

Electrical resistivity has proven to be very promising for the exploration of buried archaeological targets (Gaber et al., 1999; Chouker,2001). It is reputed for the strong and clear signal response it gives over archaeological features (Karavul et al.,2010). It cannot only map with great success archaeological areas but also delineate the plane of buried archaeological structures in various cases (Sarris,1992;Tsokas et al., 1994).

In view of the afore-mentioned, a preliminary survey using integrated geophysical methods was embarked upon with the hope of not only locating the buried artifacts but also enhance the diagnostic possibility of archaeological surveys.

Geological Characteristics of the Study Area

The studied area Fig.1 is found within the Nigerian sector of the Dahomey basin.The geology has no basement outcrop.The basin extends almost from Accra in Ghana, through the Republic of Togo and Benin to Nigeria where it is separated from the Niger- Delta basin by Okitipupa ridge (Ondo state) at the Hinge of the Benin flank. The stratigraphy of the Dahomey Basin has been discussed with various works and several classification schemes have been proposed by (Jones and Hockey,1964;Omatosola and Adegoke,1981;Coker et al.,1983;Billman,1992;Elueze and Nton 2004).The stratigraphy sequence includes : Abeokuta Group,Imo Group,Ilaro formation,Benin Formation,Coaster plain sands and Recent alluvium. The bottom of the sedimentary basin consists of unfossilferous sandstones and gravels weathered from the underlying Precambrian basement. On top of this are marine shale, sandstones, and limestones of Albian to Santonian ages.

The surface geology is made up of the Benin formation (Miocene to Recent) and the recent littoral alluvial deposits. The Benin formation which consists of thick bodies of yellowish (ferruginous) and white sands, rest comformably on Ilaro Formation (Jones and Hockey, 1964).

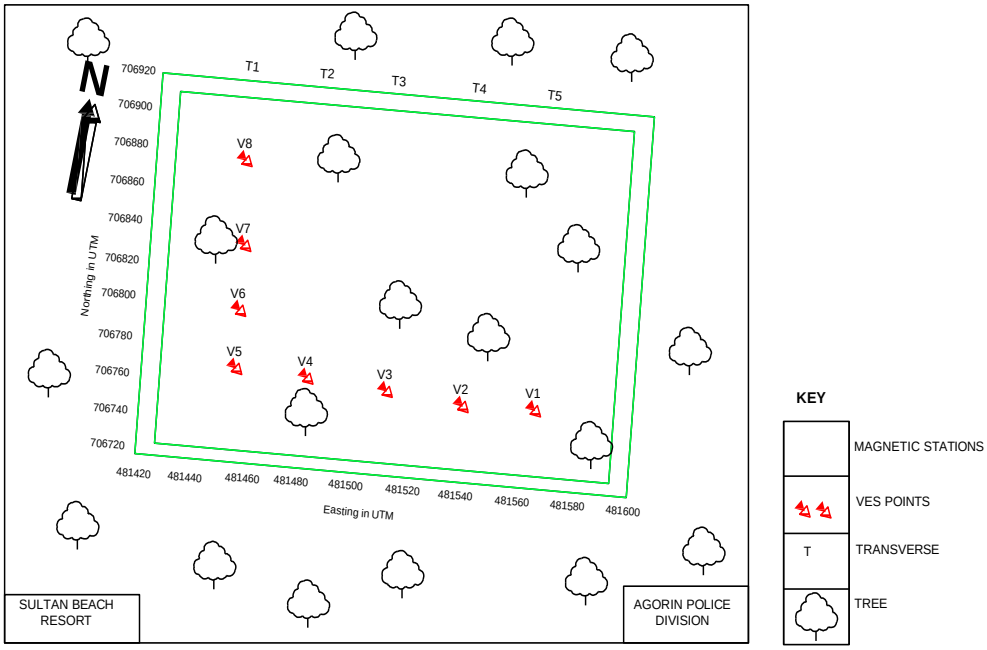


Figure 1: Location map of the Study Area

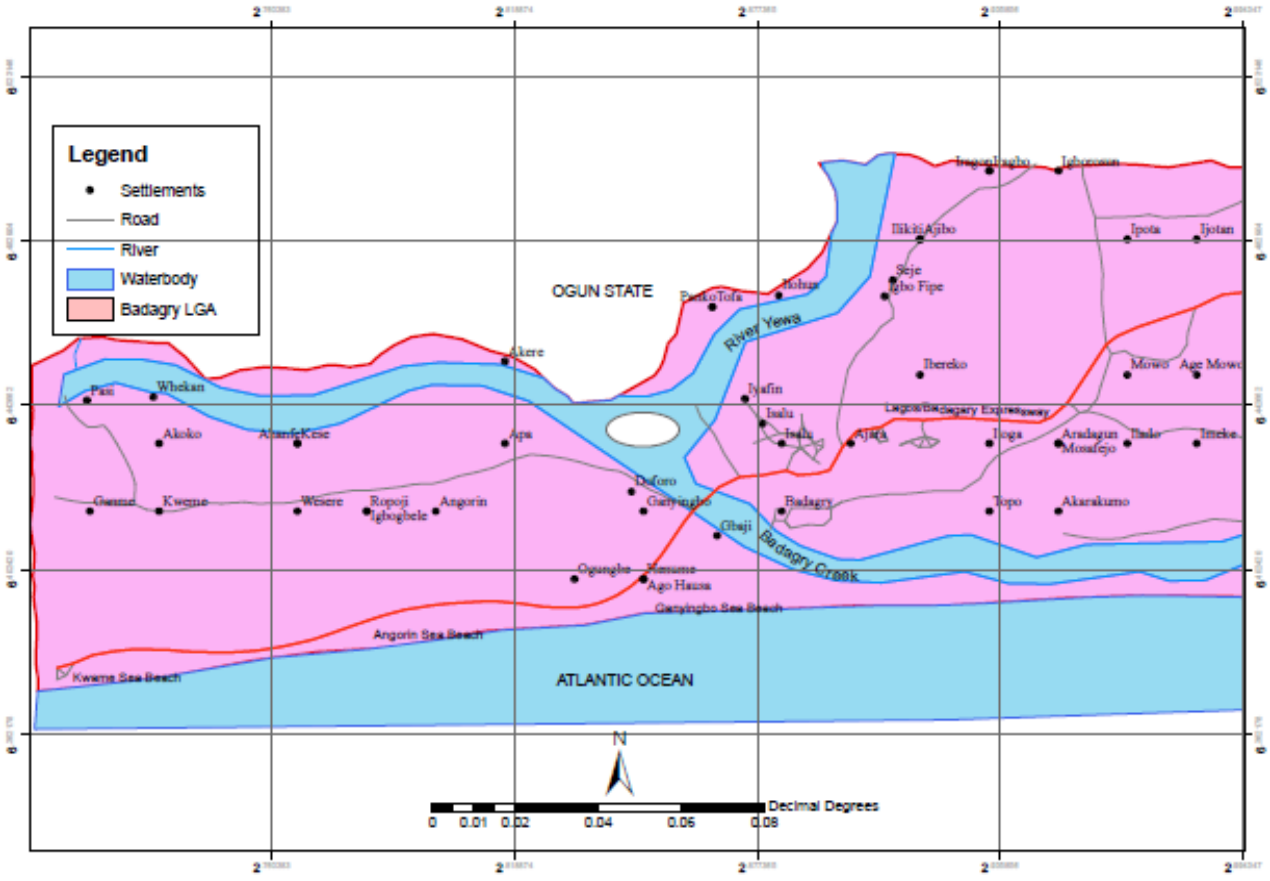


Figure 2: Map of Badagry Local Government showing the study area

BASIC THEORY

The theoretical basis of the magnetic method is to a first approximation the same as the gravity method. The main differences between the two techniques is that in the magnetic method, the total magnetic field (x, y and z components) is measured, whereas in the gravity method commonly only the z-component is measured. In addition, the magnetic properties of rocks can vary by several orders of magnitude, while the densities of rocks usually only vary by a few percent.

The theory behind the applied magnetic method can be explained by a magnetic dipole in which the basic elements can be seen in a simple bar magnetic . The bar magnetic consists of two poles (dipolar), a positive north-seeking pole and a negative south-seeking pole, and these poles always exist as pairs. These two poles produce a magnetic field called the magnetic field intensity (**H**). If a magnetizable body (e.g., iron or magnetite) is placed in an external magnetic field (e.g., the earth's magnetic field), it will become magnetized and produce a secondary magnetic field, determined by the material's magnetic polarization (**M**).

For low external magnetic fields (e.g., the earth's), the degree in which the body is magnetized is determined by its magnetic susceptibility, k, and is defined as

$$M = kH. \qquad (1)$$

Magnetic susceptibility is a non-dimensional quantity and is the fundamental physical property used in the magnetic method. The measurement of the total magnetic field, (which includes the external magnetic field and the magnetization) is called the magnetic induction (B) and is written as

$$B = \mu_{\circ} (1 + k)H \qquad (2)$$

where, $\mu_{\circ}$ is the magnetic permeability of free space. The units of B are tesla, which is generally too large a number for applied magnetic work, so gammas (10^{-9} teslas) are more commonly used. Also, note that B is a vector quantity and in most magnetic work today, the amplitude of B is measured and it is called the total magnetic field.

Electrical resistivity is measured by passing or injecting current into the ground through two electrodes and observing the resulting potential through two other electrodes.The apparent resistivity of the subsurface which is a function of resistivity variations at depth can be used to investigate surface structure. It is based on measuring of the resistivity 'ρ' of subsurface by passing a known electric current into the ground and measuring the potential difference between two points. The technique is based on the validity of Ohm's law for linear conduction which is represented as,

$$R = \frac{\Delta V}{I} \qquad (3)$$

The fundamental physical law used in the resistivity surveys is the Ohm's law that governs the flow of current in the ground. The equation for Ohm's law in vector form for current flow in a continuous medium is given by:

$$J = \sigma E \qquad (4)$$

Where σ is the conductivity of the medium, J is the current density and E is the electric field Intensity. Since what is measured is the electric field potential, then the above can be modified as:

$$E = -\nabla\varphi \qquad (5)$$

Combining equations above, we get

$$J = -\sigma\nabla\varphi \qquad (6)$$

METHODOLOGY

Magnetometry

Based on the surface geologic features an area of $150 \times 80\ m^2$ was surveyed. The instrument used for the magnetic survey was the Geometrics Proton precession Magnetometer G 856 Model with a resolution of 1nT. A base station was set up about a few meter from the survey area where the magnetometer records the magnetic readings at a time interval of thirty minutes using a looping technique. Reoccupation of the base station remove the diurnal variation effects of the earth's magnetic field from the survey measurements. Measurements were taken along five traverses with line spacing of 20m. Each of the 150m long traverse has station spacing of 5m determined using a plastic measuring tape.Three magnetometer readings were taken at each station and averaged. The coordinates of the beginning and end points of each line were recorded by GPS.

Electrical resistivity

The electrical resistivity measurements were carried out using vertical electrical sounding technique. Two traverses were established in the field of study for data acquisition. A total number of nine(9) VES points employing the Schlumberger array with PASI resistivity meter was occupied. Electrode spread (AB) varied from 2m to a maximum of 300m.The location was fixed using the GPS as in the magnetic survey. The electrodes are positioned symmetrically along a straight line with the current electrode on the outside and potential electrode on the inside. These electrodes are driven into the ground to make good contact. The current electrode spacing were expanded over a range of values for measurements in the field.

Data processing

The magnetic data was processed by inspection of the raw data for spikes ,instrument noise or any other irregularities in the data. We used Microsoft Excel spreadsheet for data reduction. After performing diurnal variations correction and IGRF corrections the data were imported into a grid file to the WinGlink software. By approximating the regional field to a second order polynomial surface, a residual magnetic map was obtained. Also, a high pass filtering techniques was applied to further enhance the magnetic anomalies.

The processing of the Electrical resistivity field data was by both qualitative and quantitative approaches. We plotted the apparent resistivity against electrode separation(AB/2) on a log-log sheet. The observed field data inverted the Winresist software. The computer inverted resistivity curves are shown in fig.4(a-f). Automatic iterative interpretation, following the main ideas of (Zohdy,1989) was employed in the selection of layer parameters. Layer parameters are consequently modified in iterative manner until subsequent iteration yields no improvement on the root mean square (RMS) error. The resulting layer parameters are then given geologic interpretation.

RESULTS AND DISCUSSION

The magnetic results were presented in the form of anomaly profiles fig.3(a-g) and magnetic contour maps generated using Microsoft Excel and WinGLink. The depths to top of the anomalous structure were estimated using Peter's half slope method table1. The total field intensity of the local magnetic field map is shown in fig.5a.It shows the variation of the total intensity of the magnetic field and the areal extent of the anomalies.

The generated residual map in which magnetic survey lines were indicated by cross sign is as shown in fig.5b. The residual magnetic map gives magnetic dipole values which vary from about – 8nT to 18nT.The plots fig.3(a-g) show magnetic anomaly responses relative to station spacing with variations in shape and amplitude. The observed magnetic contrast is due to the heterogeneity in the subsurface geology. A well pronounced anomaly is observed along traverse one positive values of 16 -18nT.

The subsurface concentration of the magnetic dipoles along traverse one could suggests the presence of fragmented potteries which are buried at depths in the range 7.2-16.4m as presented in table 1.These supposed buried anomaly were located at the western part of the study area. Little or no magnetic response was observed on the other traverses signifying no buried structure. The enhanced magnetic anomalies due to the high pass filtering technique further indicates the likelihood of locating the anomaly in this zone. The downward continuation applied to the total magnetic map, gives an estimated average depth to magnetic anomaly features to be about 13.26m.Interestingly,this depth agrees perfectly with the estimated depths using Peter's half slope method.

The results of Vertical electrical soundings were presented as geoelectrical sections along profiles AA' and BB' figs.8a and b. Geoelectric section along AA' consists of four sounding points VES (1-4) which runs along E-W direction and has a maximum of four geoelectric layers. The layers delineated with the use of borehole log were topsoil (sand plus pebbles) , sand and sandy clay and clay. The upper layer (resistivity 422.5 - 2274.6 ohm-m, thickness 0.7-1.2m) is the topsoil and composed of mixture sand with pebbles. The second geologic unit is representative of sand with layer thickness 0.3- 4.1m and resistivity in the range of 759.8 and 2274.6 ohm-m. The

third identified layer is made up of sand (resistivity 420.3 and 1619.5 Ohm-m, thickness 4.8 – 17.5 m). The fourth subsoil stratum symptomatic of sandy clay (resistivity 103.4-177.7 ohm-m). Its thickness could not be ascertained because the current terminated within this zone.

Geoelectric section along BB' is aligned in a N-S direction fig.8b. It consists of five sounding points VES (5 - 9).The first layer has resistivity values ranging from 710.5-1581.7 ohm-m which corresponds to the topsoil of unconsolidated sediments and have thickness ranging from 0.6 – 2.4 m. The second subsoil stratum denotes sand resistivity 396.7-1283.7 ohm-m, thickness 1.6-11.2m.The next layer composed of alternating sequence of alluvium horizons marked with resistivity ranges of 51 – 387ohm-m and thickness from 1.9 – 28.1m**.** The fourth geoelectric layer has resistivity value range of 68.8 – 2364.7 ohm-m. The thicknesses in VES 5, 6, 7 and 9 could not be determined because the current terminated within this zone while the thickness in VES8 is 16.1 m. The fifth layer denotes sand with resistivity value of 355.9 ohm–m. Its thickness could not be ascertained because the current terminated within this zone.

Since this profile was conducted along the magnetic survey line 1, the sudden drop in resistivity values in the third layer for VES 8 gives an indication of the presence of an electrically conductive structure presumed to be clay which contrast markedly with the surrounding formation. Thus confirming the presence of the buried artifacts (potteries).

CONCLUSION AND RECOMMENDATION

We have deployed magnetic and electrical resistivity methods to detect the buried potteries as well as delineate the subsurface geological substrata. The magnetic survey displayed probable buried anomalous structures as evidenced from their magnetic dipole values. The resistivity results has characterized the subsurface into different layers. The estimated depths of burial from both methods show good agreement. Although the causes of the anomaly was suggested or speculated upon, only excavations can clearly confirm the nature of the anomaly. Moreso, the methods employed may not have recorded excellent results, we recommend that further investigation should be carried out deploying other geophysical methods .For further studies we hope to deploy Electromagnetic and Induced Polarization methods for the thickness variations and quality of the potteries artifact.

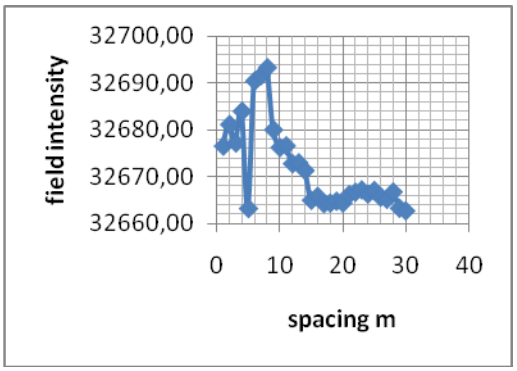


Fig.3a: Total mag.field profile along Tr. 1

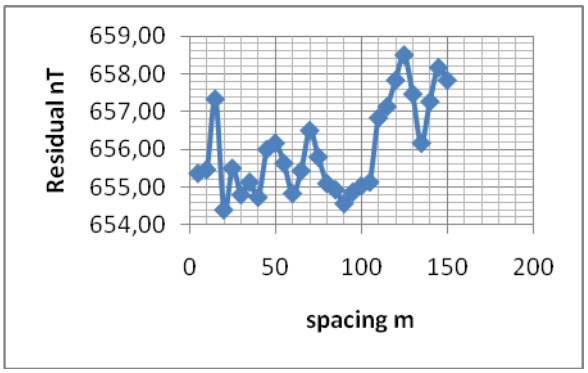


Fig.3b: Residual mag. profile along Tr. 1

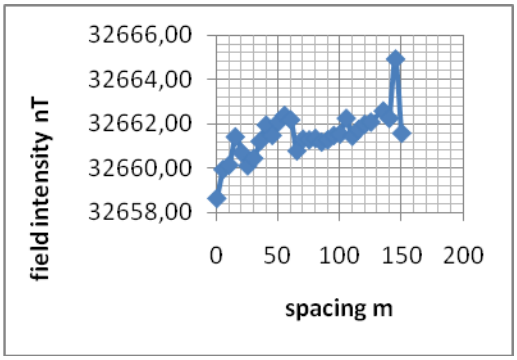


Fig.3c: Total mag.field profile along Tr.2

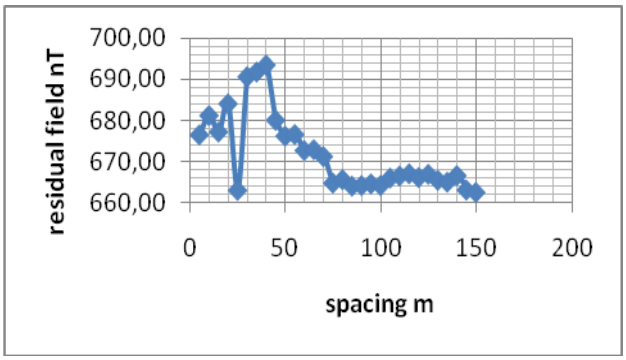


Fig.3c: Residual mag. profile along Tr. 2

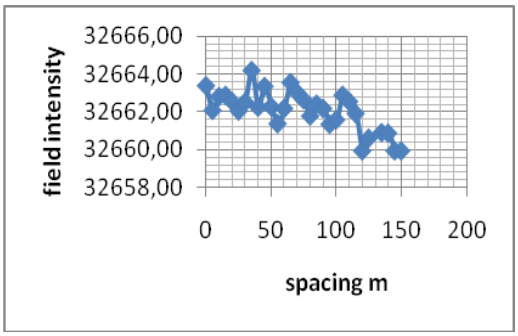


Fig.3d: Total mag.field profile along Tr. 3

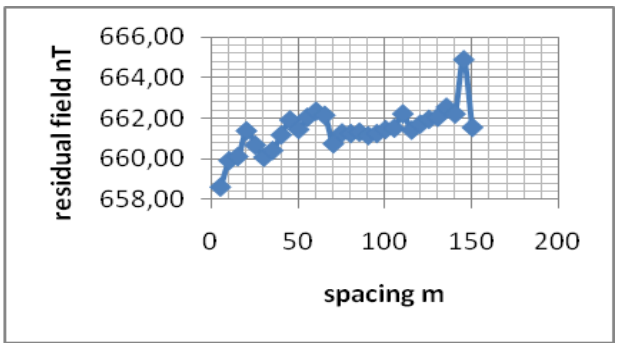


Fig.3e: Residual mag. profile along Tr. 3

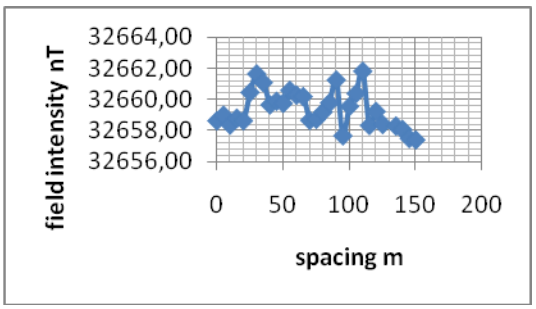


Fig.3f: Total mag.field profile along Tr.4

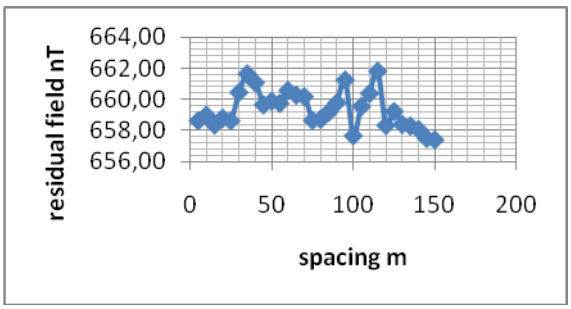
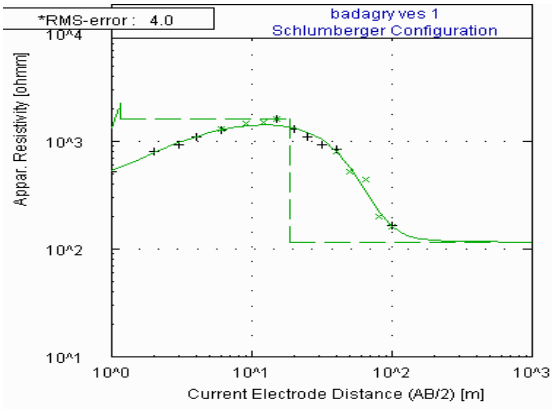
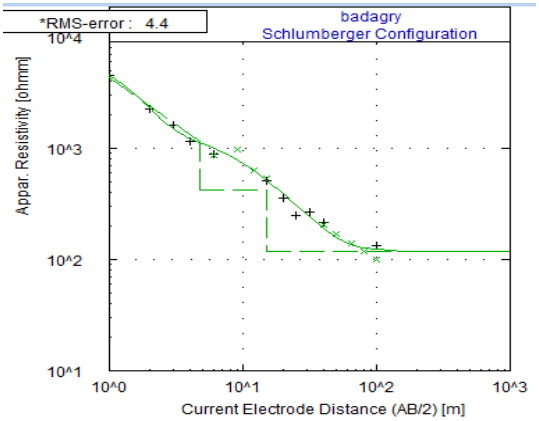


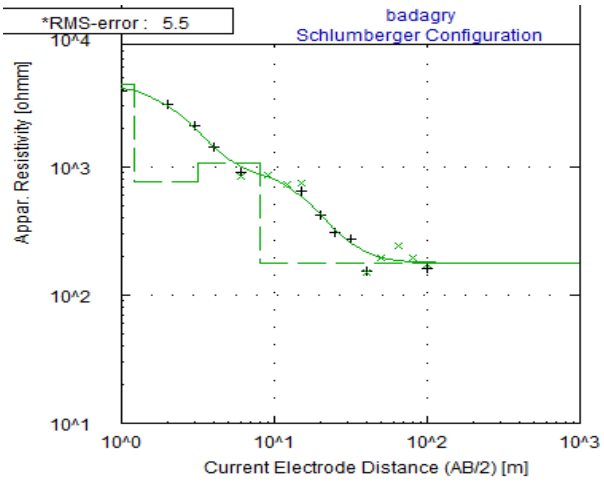
Fig.3g: Residual mag. profile along Tr.4



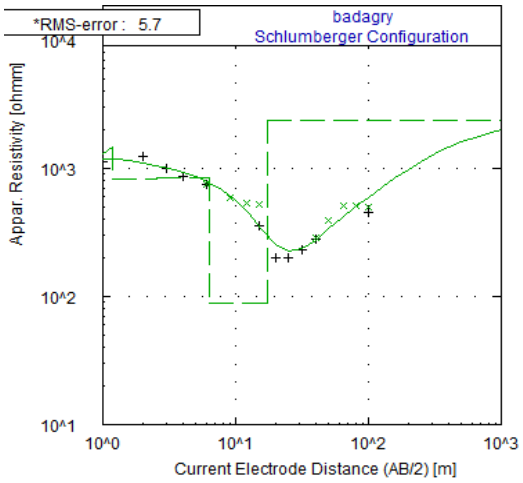
(a) Curve type for ves 1



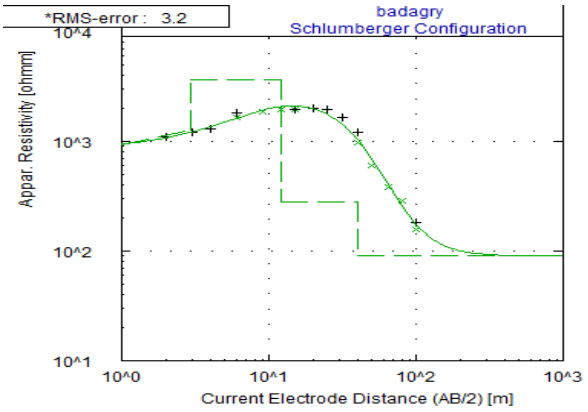
(b) curve type for ves 2



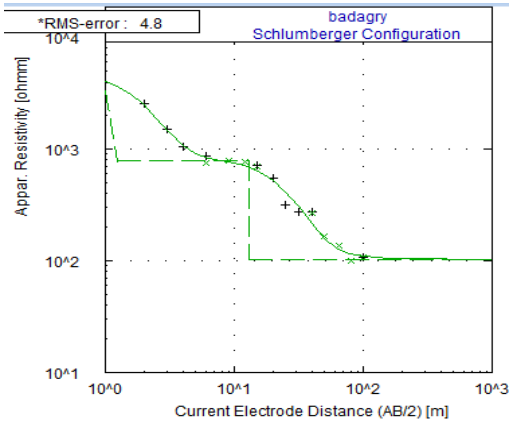
(c) curve type for ves 3



(d) curve type for ves 4



(e) curve type for ves 5



(f) curve type for ves 6

Fig. 4: Computer iterated resistivity curves for some VES points

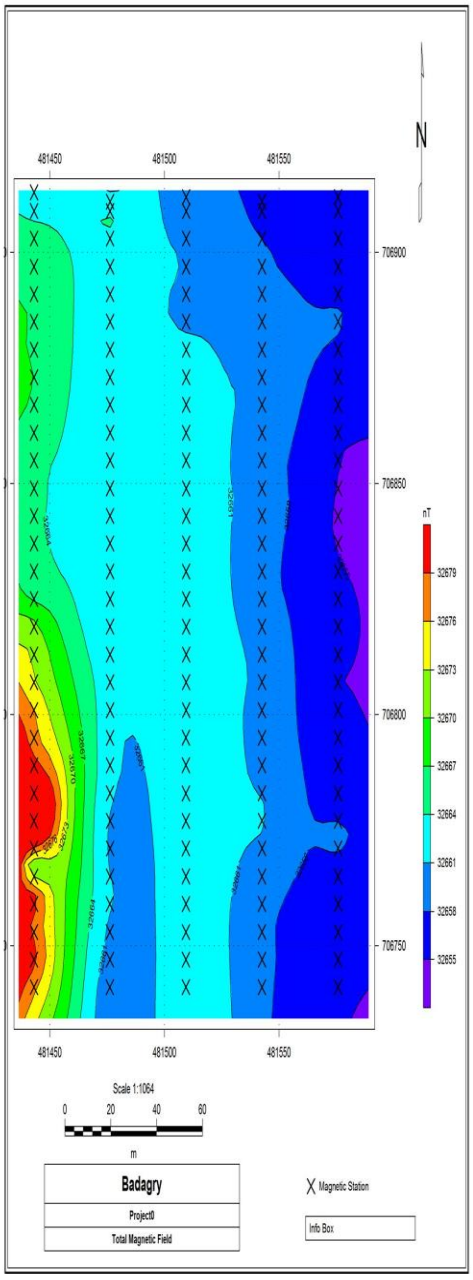


Fig.5a: Total field Magnetic intensity map, countour interval is 3nT

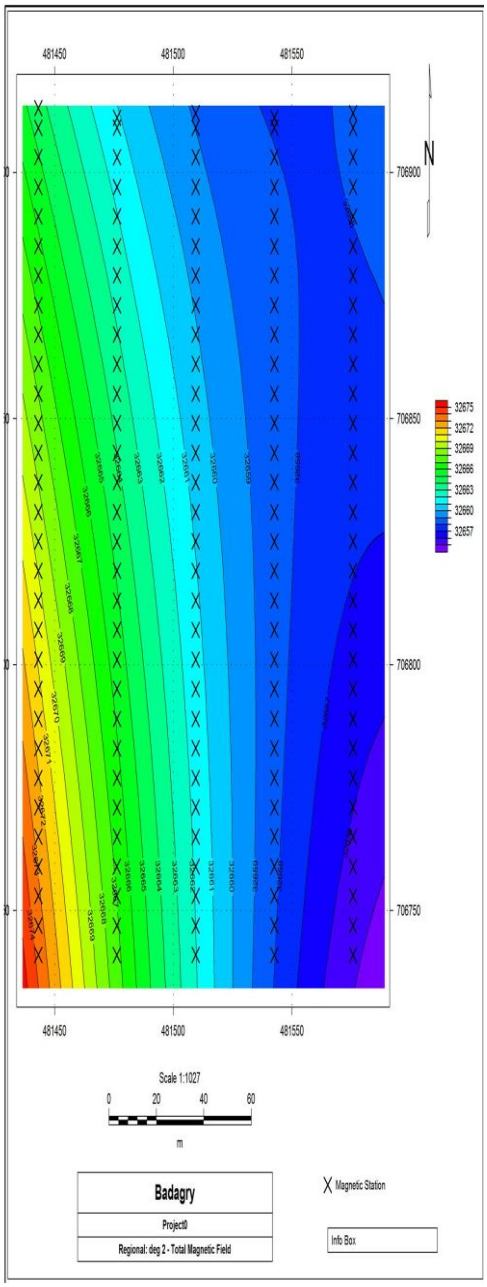


Fig.5b: Regional Magnetic anomaly map contoured at 1nT

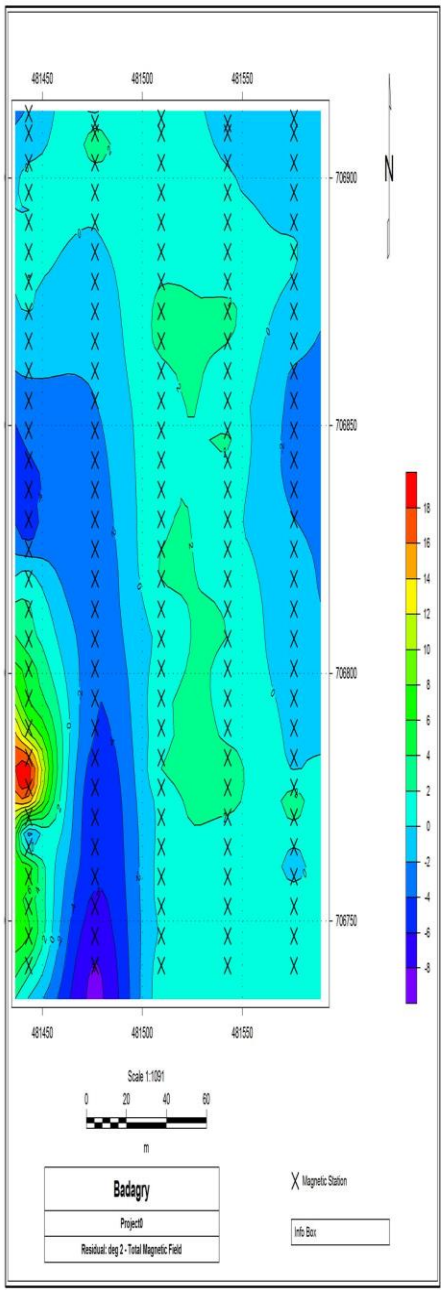


Fig.6a: Residual magnetic anomaly map contoured at 2nT map

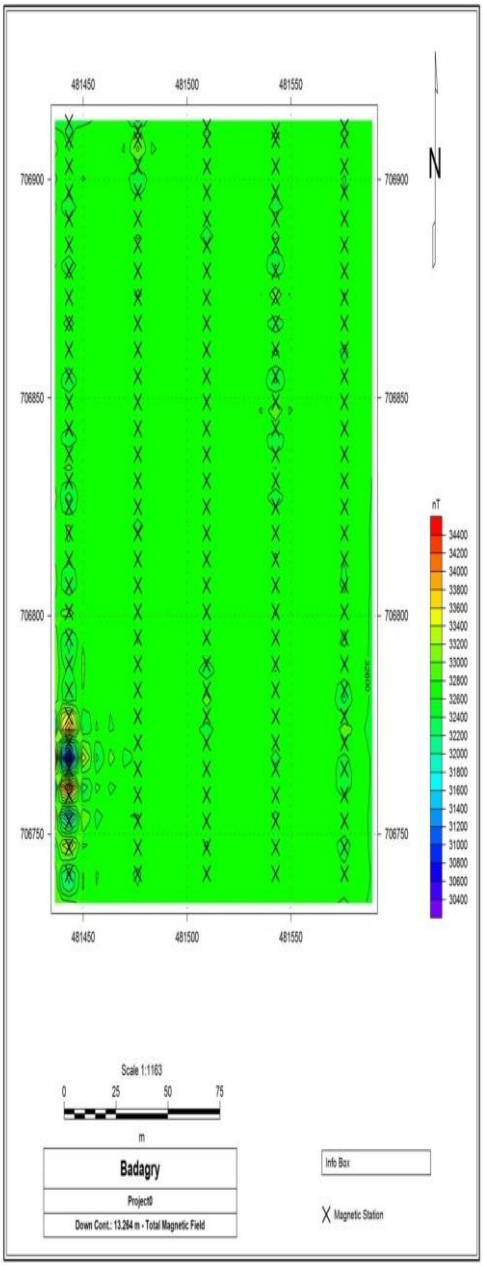


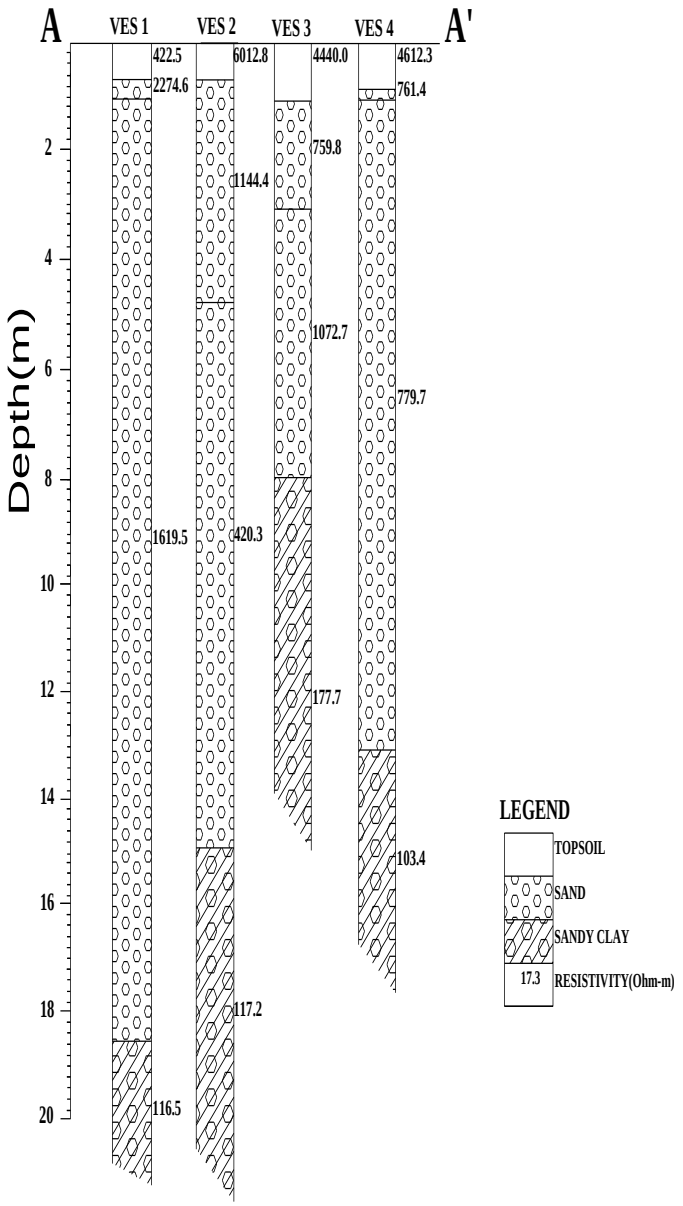
Fig.6b: Downward continuation magnetic

Table 1: Depth, Extent and Nature of the Magnetic Anomaly

Depth to top of Anomalous Structure (m)	Range(m)	Nature of Anomaly
12.3	4 - 16	+
7.2	16 – 20	+
9.2	20 – 28	-
16.4	28 – 42	+
8.1	136 - 144	+

Table 2: True Resistivity values and Layer Depths

VES NO	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5	D_1	D_2	D_3	D_4
1	422.5	2274.6	1619.5	116.5		0.7	1.1	18.6	
2	6012.8	1144.4	420.3	117.2		0.3	4.8	14.9	
3	4440.0	759.8	1072.7	177.7		1.2	3.2	8.0	
4	4612.3	761.4	779.7	103.4		0.9	1.2	13.0	
5	1199.0	815.8	88.1	2364.7		0.9	2.3	13.2	
6	911.0	1283.7	278.1	89.9		0.9	2.9	31.0	
7	1187.5	655.9	103.2	201.5		0.6	6.3	15.9	
8	1581.7	970.4	387.8	68.8	355.9	0.9	2.7	11.4	27.5
9	710.5	396.7	51.0			2.4	9.9		



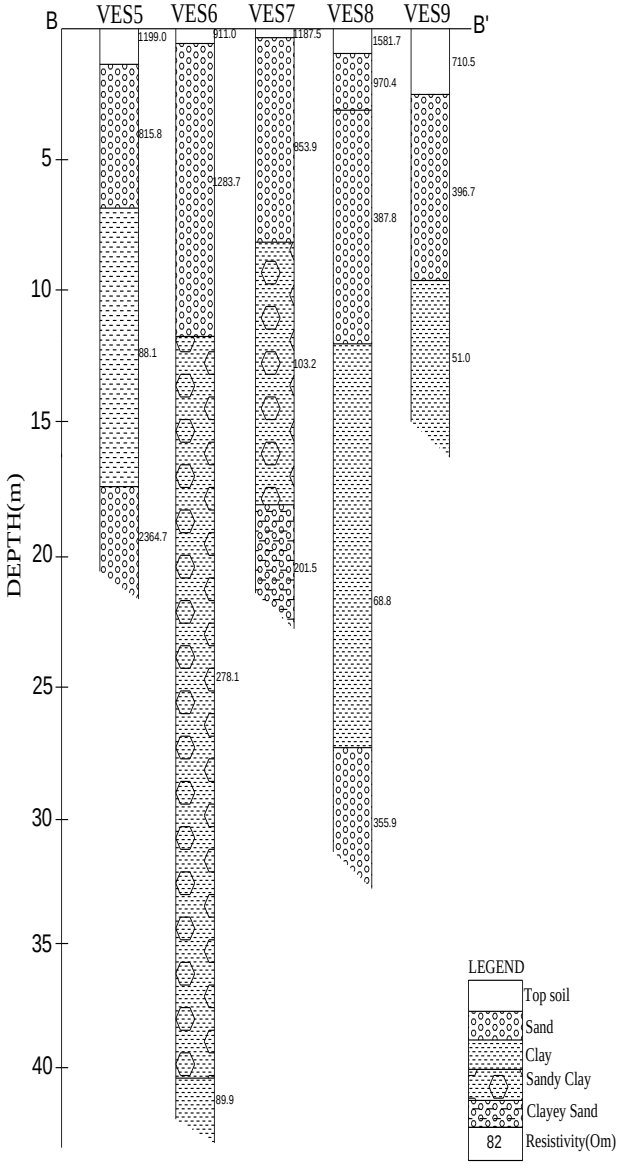


Fig.8a. *Geoelectric Section along AA'*

Fig.8b. *Geoelectric Section along BB'*

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