IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399. Volume 7, Issue 4 (Nov. - Dec. 2013), PP 14-20
www.iosrjournals.org

Optimization of Nigerian Satellites and Geo-Spatial Intelligence on National Security.

Aderoju Olaide. M[1], Onuoha Hilda. U[2], Ibrahim Mustapha [3].
[1, 2]*Dept of Strategic Space Application National Space Research and Development Agency*
[3]*Dept of Mission Planning, IT &Data Mgt. National Space Research and Development Agency*

Abstract: *Nigeria as a nation is experiencing a tremor in its National security based on the indiscriminate bombings and killings in the country which is attributed to religious, political and/ or ethnic fight. The United States defense has used geospatial intelligence to manage its national security in the past years and it has yielded by the cracking down of the big terrorist and terrorist organization in the world. This was achieved by its massive investment and commitment in its space programs. In bid to emulate the US, this study aimed to promote geospatial intelligence amongst the Nigerian Security Agencies towards achieving a stable National Security. Also, the study identified the relevant agencies to collaborate with the security agencies to promote synergy towards a stable national security in Nigeria; and provides a framework for improving and managing National Security using geospatial intelligence approach. The approach employed was a combination of satellite imagery, imagery intelligence and geospatial information with the help of ICT to tackle the identified sectors that makes up national security (micro (internal), macro (regional) and strategic (world at large)). The incorporation of geospatial intelligence in the micro, macro and strategic security sectors will strengthen our National Security provided there is synergy, commitment and information sharing among relevant agencies.*
Key Words: *National Security, Terrorist, Geospatial intelligence, Agencies, Images.*

I. Introduction

US mapping and charting efforts remained relatively unchanged until World War I, when aerial photography became a major contributor to battlefield intelligence. Using stereo viewers, photo interpreters reviewed thousands of images. Many of these were of the same target at different angles and times; giving rise to what became modern imagery analysis and mapmaking. With the advent of the Second World War aviation, field surveys began giving way to photogrammetry, photo interpretation, and geodesy. During wartime, it became increasingly possible to compile maps with minimal field work.

The United States' NIMA Act of 1996 establishing the National Imagery and Mapping Agency and the subsequent amended language in the 2003 Defense Authorization Act as codified in the U.S. Code, governs the mission of the National Geospatial-Intelligence Agency (NGA) and offers a definition of Geospatial Intelligence. This de jure definition of **Geospatial Intelligence** as found in U.S. Code Title 10, §467, as it relates to NGA as the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the earth. Geospatial intelligence consists of imagery, imagery intelligence, and geospatial information.

Nigeria as a nation is experiencing a tremor in its National Security based on the indiscriminate bombings and killings in the country which is attributed to religious, political and/ or ethnic fight. In bid to emulate the United States and other world powers, Nigeria has invested heavily in Space science and technology in order to exploit space science and technology. With the launch of the NigeriaSat-2, NigeriaSat-X and NigComSat-1R satellites, Nigeria tend to promote geospatial intelligence to solve its National security issues.
Furthermore Geospatial Intelligence, or the frequently used term GEOINT, is an intelligence discipline comprising the exploitation and analysis of geospatial data and information to describe, assess, and visually depict physical features (both natural and constructed) and geographically referenced activities on the Earth. Geospatial Intelligence data sources include imagery and mapping data, whether collected by commercial satellite, government satellite, aircraft (such as Unmanned Aerial Vehicles [UAV] or reconnaissance aircraft), or by other means, such as maps and commercial databases, census information, GPS waypoints, utility schematics, or any discrete data that have locations on earth. Geospatial Intelligence is a field of knowledge, a process, and a profession. As knowledge, it is information integrated in a coherent space-time context that supports descriptions, explanations, or forecasts of human activities with which decision makers take action. As a process, it is the means by which data and information are collected, manipulated, geospatially reasoned, and disseminated to decision-makers (Bacastow and Bellafiore, 2009).

Geospatial intelligence analysis has been light-heartedly defined by Bacastow in 2010 as “seeing what everybody has seen and thinking what nobody has thought.” Geospatial reasoning creates the objective connection between a geospatial problem representation and geospatial evidence. Here one set of activities,

information foraging, focuses around finding information while another set of activities, sense making, focuses on giving meaning to the information. The activities of foraging and sense making in geospatial analysis have been incorporated in the Structured Geospatial Analytic Method (Bridges, 2010). In February 2011, the Secure World Foundation stated that "In the US, they employ the ISEBOX (Integrated Socio-Cultural Environment for Behaviour Observation Exploitation) a geospatial threat- forecasting application to monitor and predict human behaviour, enabling the military to fuse together the data at its disposal and make better decisions faster".
Geo-spatial Intelligence is a layering of multiple sources, including imagery, imagery intelligence, and geospatial information. No one source can do it all. The final product is intelligence that can answer questions such as:

- Where am I?
- What are the natural and man-made structures?
- What does the area look like now? What might it look like after an event?
- What do we need to prepare for?
- Where are our allies? Where are our enemies? Where might they move?

Layers of Geo-spatial Intelligence

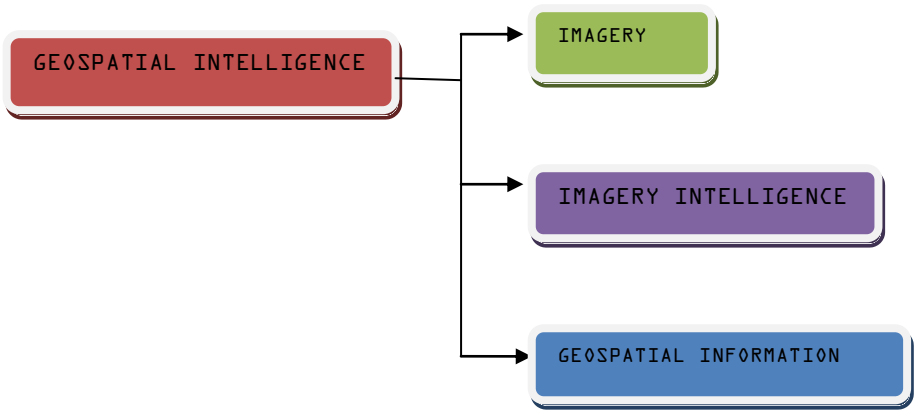


Fig. 1.0: Geospatial Intelligence Layers

1.1 Definition of Terms

- Imagery (IM) - a likeness of any natural or man-made feature, as well as its location.
- Imagery Intelligence (IMINT) - information derived through interpreting imagery.
- Geospatial Information (GI) - information that identifies a natural or constructed feature on earth by its geographic location and other characteristics.

1.2 Understanding National Security

The term **National security** should ideally be defined as the ability of the Nation State to successfully pursue her national interests, being able to protect the core values of the State and be able to maintain same through victory in case of a war (Orok, 2000). It should view individual, national and international security from a holistic perspective as there are interplays between all three. The contending branches that make National Security are as follows;

- **Military security** which involves the interplay of offensive and defensive capabilities of the National Armed forces to defend the State and prevent coup de etats or carry out same, depending on the ruling elites definition of self interest.
- **Political security**, this involves the organizational stability, systems and ideology that gives the Nation State her legitimacy.
- **Economic security**, which covers access of the State to resources and finance to provide welfare and sustain State power.
- **Societal security**, this covers the guarantee within acceptable limits of the expression of each indigenous culture, language, religion, custom and ethnic identity of each nationality.

- **Environmental security**, this entails the maintenance of the local and surrounding biosphere from harm or contamination so as to support the Nigerian populace.

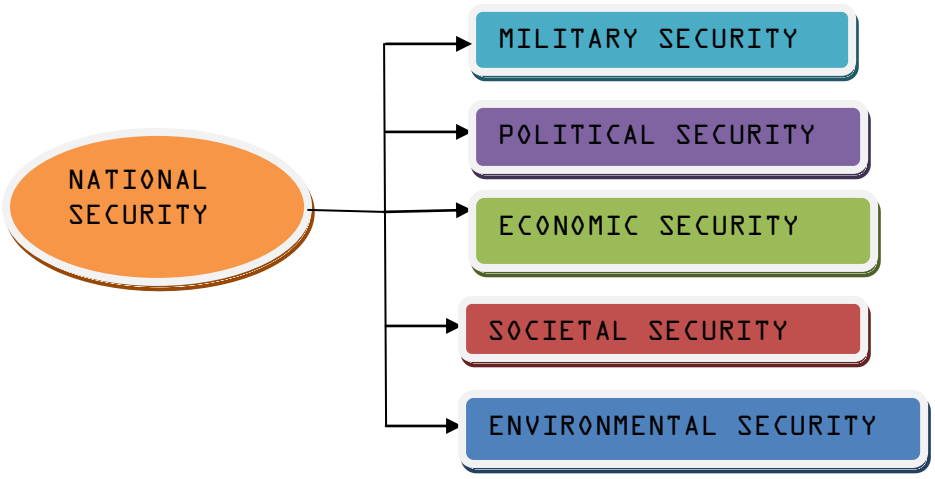


Fig. 2.0: Branches of National Security

Aim

The aim is to promote geo-spatial intelligence among the Nigerian Security Agencies using Nigerian satellites, and collaboration between National Space Research and Development Agency (NASRDA) and relevant Security Agencies for proper management of National Security in Nigeria.

II. Significance of the Study

There is need for the adoption of Geo-spatial intelligence to tackle our national security problems. With the recent political and religious crisis in Nigeria which has lead to loss of life and property, through indiscriminate bombings and other forms of killings. It is high time the Nigerian security agencies understood the need to explore space technology in its defense for criminal and terrorist activities. The security agencies must respond fast by exploring the most recent way of managing national security which is Geo-spatial intelligence. The essence of Geo-spatial Intelligence is to combine satellite imagery, ICT, and on ground surveys reports to cut down on field- based work in other to give the Nigerian Security Agencies precise decision to make, so that National Security issues can be well improved and managed. This will make findings less expensive, fast and more precise.

III. Challenges of National Security in Nigeria

Some of the major security problems currently confronting the nation have been identified to include: political and electioneering conflicts, socio-economic agitations, ethno-religious crises, ethnic militias, boundary disputes, cultism, criminality and organized crimes. These problems individually and collectively constitute threats to the peace, security and development of the country. Invariably, they have implications for the continuity and survival of the nation's nascent democracy (Abdulsalami, 2007).

For the better part of the forty-four years of Nigeria as a nation, the country was under military administration resulting from military takeover of the democratic and constitutional structures of the state. The military takeovers are security breaches resulting from a wide range of reasons, sometimes a culmination of a number of security and political developments. The security, political and sometimes socio-economic developments are security concerns that were not addressed or managed by the existing state structure at the time. Apart from military coups there are other security issues that have challenged, and indeed, rattled the democratic political system. Among them, is civil or organized rebellion resulting from a number of socio-political developments including ethnic disagreements and national resource contentions (Abdulsalami, 2007). The Nigerian civil war is an example of such security breakdown resulting from failure to manage ethnic and social problems. Recent international debates have also raised the need to see security in the broader sense as the struggle to secure the most basic necessities of life: food, fuel, medicine and shelter. This broader human security is important for the attainment of physical and national security and overall peace and development as social unrests arising from the absence of such basic human security can indeed lead to security problems and conflicts.

In recent times, especially during the present democratic dispensation, traits of similar intolerant and ruthless contest for political office have manifested. In addition, the use of illegal arms and weapons by political party contestants and their supporters has assumed very alarming dimension. There have been several ethno-religious conflicts in the history of Nigeria, but in recent times, these problems appear to be escalating at an intolerable scale. Ethnic and the foregoing problems and criminal activities individually and collectively create insecurity and breach of the peace that are likely to or indeed affect legitimate social and economic activities in the country. These problems also have the very damaging consequence of giving the signal to the rest of the international community that Nigeria is not a safe and secure place and as such not suitable for economic investment and activities. This is particularly important in view of the efforts being made to create the desired atmosphere to attract foreign investment.

Beyond the effects of security concerns on the economic fortunes of the country, the nature of the security challenges facing the country also have implications for the country's political system.

IV. Nigerian Satellites and National Security

Effective use of space programs can improve national security. A number of factors have made space more important for national security. These factors arise from the changing international security environment, where there is greater risk and competition; the evolving nature of warfare, where informational advantage and asymmetric attacks are increasingly important; and with the rapid pace of technological change, that makes military or intelligence services from space much easier to acquire (James, 2007).

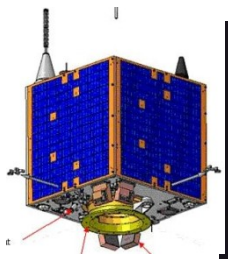
Consequently, many nations observed the benefits satellites provided for military operations and began to acquire or develop their own satellites. Countries are turning to space for national security for three principle reasons:

- The political prestige and international influence space activities bring;
- The technological capabilities that space programs create or reinforce;
- The informational advantage space assets and services can bring to military and security operations and to strategic planning for security.

Nigeria as the giant of Africa launched the NigeriaSat-2, NigeriaSat-X (earth Observation satellites) and NigComSat-1R (a communication satellite) in to the space orbit in August and December 2011 respectively which will serve as a boost to our National security if well explored. Nigeria Sat-2 was launched in August, 2011. It is high resolution satellite spatial resolutions of 2.5 m panchromatic and 5m multispectral and with area coverage (swath width) 600 by 600km with the ability to rapidly produce accurate mapping to updates the existing information and acquiring new mapping information. It is has the Red, Green, Blue and Near –infrared band. The Nigeria Sat-2 allows for infrastructure mapping, settlement classification, development of urban green spaces, service provision maps, and access control mechanisms regional planning, security, environmental and disaster management.

NigeriaSat-X was launched in August, 2011 alongside NigeriaSat-1. It was designed and built by Nigerian Engineers in the UK. It is a medium resolution satellite with a resolution of 22m multispectral. . It is has the Red, Green and Near –infrared band with a swath width of 700km. NigComSat-1R is a replacement satellite for NigComSat-1 Satellite. It is a critical ICT backbone infrastructure to drive the National ICT revolution in providing revenue diversification for the Nation and offering cost effective solution and affordable access to meet Nigeria's telecommunications, broadcast, aviation, maritime, defense and security needs. The satellite has over 15 years life-span and was designed to meet the needs of telecommunications, maritime, defense, broadcast media in Africa and parts of Europe and Asia. It has 28 active transponders, and quad band of Ku, Ka, C-Band and L-Band. The combination of these three satellites (NigeriaSat-2, NigeriaSat-X and NigComSat-1R) would help Nigeria achieve a great deal in improving and managing its national Security.

NigeriaSat-2 Satellite



NigeriaSat-X Satellite

NigcomSat-1R Satellite

Fig. 3.0: Images of Nigerian Satellites in Space

V. Approach of Attaining National Security through Geo-spatial Intelligence

To establish sound intelligence and national security policies, one must look thoroughly and eliminate all nuances that are considered inimical to the country. The advent of carrying out such policies must be done in the following sequence, namely: **micro security, macro security**, and **strategic security** (Max, 2001).

a) **Micro Security** deals with the internal security of which our country is currently mired in a state of obfuscation. To curb or control these internal security problems, our country requires commitment from security personnel and financial mobilization to strengthen all the security agencies. The National Security Agency (NSA) must have clear and achievable objectives on how to keep this country safe. The objectives as envisaged by NSA must be articulated to the National Intelligence Agency (NIA), State Security Service (SSS), Nigeria Police Force (NPF), and Nigeria Immigration Service (NIS), Nigeria Customs Service (NCS), National Drug Law Enforcement Agency (NDLEA), and Ministry of Internal Affairs (MIA). The defense Intelligence Agency (DIA) should coordinate the efforts of the Directorate of Military Intelligence (DMI), Directorate of Naval Intelligence Agency (DNIA), and the Directorate of Airforce Intelligence (DAI). Any and all information gathered that may be considered a threat to the stability of our country, be it from afar or within, must be shared with NSA for passage to the proper agency authorized to checkmate such insurgency. Micro Security starts with the stabilization of internal security. When our citizens' rights to safety from all kinds of manmade threats are reduced considerably, the government will inherit an increase in foreign investments. Examples of Micro security are crime mapping and monitoring, surveillance cameras (UAV and CCTV) and many more.

b) The next level of security as described earlier is the **Macro Security**. Macro is the complete security and understanding of the regional communities (ECOWAS community). Gen. Yakubu Gowon (rtd.) recorded two great achievements during his tenure as the Head of State of Nigeria. The first was the way he handled the Civil War and kept this country together. The second is the creation of the Economic Community of West African States (ECOWAS). The leaders of these nations must be persuaded by any means necessary to follow our ideology of free trade, fairness, and, above all, peace and internal stability.

c) **Strategic Security** is the final aspect of National Security, which I termed strategic, extends beyond the ECOWAS nations. This extends throughout Africa and worldwide. Nigeria was at its best during the administration of the late Gen. Muritala Muhammad (may he rest in peace). He envisaged a strategic scope that broadened our National Security, and indisputably empowered our operational capabilities.

National Security under democracy encompasses the stability and adequate internal security (Micro Security), then extended to Macro Security (Concentric regions), before finally embracing Strategic Security. They are all dependent of one another. If there is a breach in any of these factors, thus national security cannot be achieved.

Sectors of National Security

Fig. 4.0: National Security Sectors

Combining Geo-spatial Intelligence and National Security

Incorporating Geospatial Intelligence into Nigerian National Security will go a long way in protecting life and property, and most importantly maintaining the peace and internal stability of the Nation. The methodology framework is as shown below;

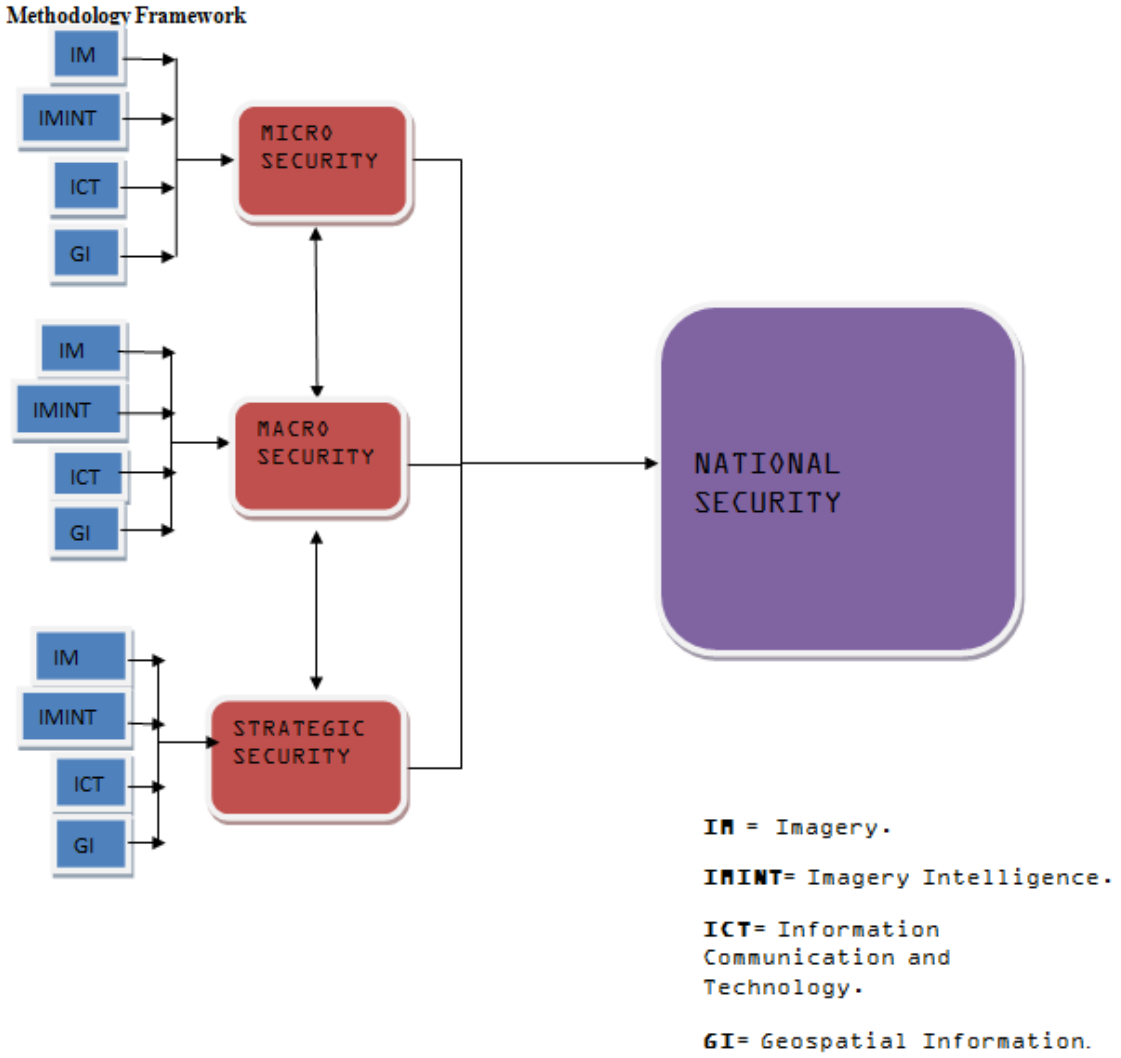


Fig. 5.0: Geo-spatial Intelligence and National Security Proposed Framework

In the above frame work, **GEOINT = IM + IMNT + ICT + GI.**
Geospatial Intelligence as a combination of imagery (IM), Imagery Intelligence (IMINT), Information Communication and Technology (ICT), and Geospatial Information (GI). It is very important to consider Geo-spatial Intelligence (GEOINT) in each of the factors of the National Security because they strongly depend on one another.

COLLABORATION FRAME WORK

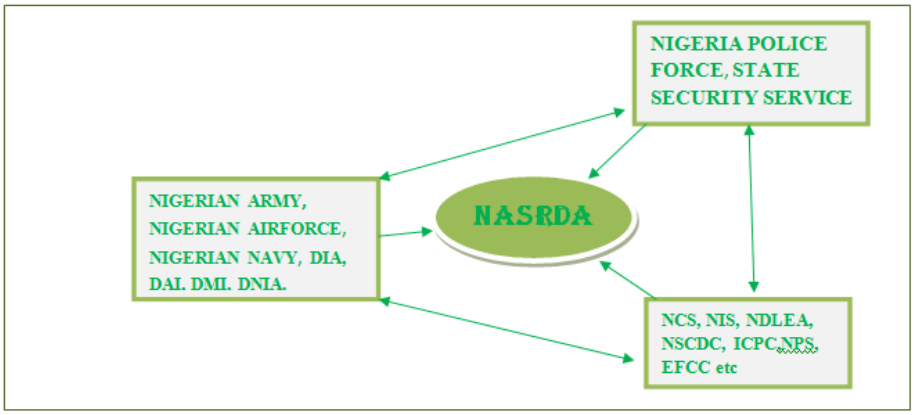


Fig. 5.1: Collaboration framework of security agencies and NASRDA

The figure 5.1 is emphasizing on promoting synergy amongst all the security agencies and most especially collaborations with the space agency NASRDA on acquisition and consultation on geospatial based information.

Benefits of Geo-spatial Intelligence to National Security in Nigeria

Geo-spatial intelligence involves the using satellites and space services for national security and it provides several important benefits as follows;

- Space services are a force multiplier for conventional forces, as they improve capabilities and performance.
- Space services can significantly expand intelligence collection and analysis for assessing threats and providing warnings.
- Nations can, of course, conduct military operations, collect intelligence, and plan their security and strategic functions without access to space assets and services, but those that make use of space will have an advantage over their adversaries and competitors.
- Finally, space programs are an element of national power and they increase prestige and provide technological prowess that can expand a nation's influence and leadership on the international stage.

VI. Conclusion

Geo-spatial intelligence basically depends on space power in order to exploit space forces to support national security strategy and achieve national security objectives. However, space power is an effort not to dominate space but to better integrate space operations and assets into nations security planning and activities by developing alternative technologies such as, high-altitude Unmanned Aerial Vehicles and mini-satellites.

Nigeria as a country with lots of security challenges should ensure that she explores her space programs in order to develop a good geo-spatial intelligence unit in all her security agencies. Also to ensure synergy and information sharing between security agencies by tasking the Nigerian satellites for their operations in order to improve national security and to finally demonstrate to the world her return to great power status in Africa.

References

[1]. Abdulsalami A. The Challenges of Security in Nigeria, NEWSWATCH Magazine, February 21, 2005.
[2]. Bacastow, T S. (2010). The Learner's Guide to Geospatial Analysis. Dutton eEducation Institute, Penn State University.
[3]. Bacastow, T.S. and Bellafiore, D.J. (2009). Redefining geospatial intelligence. American Intelligence Journal. Pp 38-40.
[4]. Bridges, D.M. (2010). A Structured Geospatial Analytic Method and Pedagogy for the Intelligence Community. International Association of Law Enforcement Intelligence Analysts (IALEIA) Journal. 19 (1).
[5]. Max G. (2001) National Security Intelligence in Nigeria under Democracy. New Jersey, USA. maxgbanite@hotmail.com
[6]. Orok E. (2000). The Nigerian State and National Security. www.nigerdeltacongress.com/narticles.
[7]. Secure World Foundation. Geospatial Intelligence for Security, Energy and Environment. February 11, 2011
[8]. Codes.lp.findlaw.com/uscode/10/I/22/IV/467