

# Application of GIS in Improving Tax Revenue from the Informal Sector in Bayelsa State, Nigeria

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**Abstract-** A pre-requisite to an effective tax administration is knowing who the taxpayers are, where they are located and whether they are active or inactive. Knowledge on the spatial distribution of informal sector businesses and tax compliance status is integral in improving informal sector tax assessment and efficient collection of taxes. This study aims to create spatial and attribute database of informal sector businesses as a strategy for an efficient revenue collection from the informal sector. The study adopted the procedure of locational data acquisition by GPS and a procedure of the combination of GIS/Remote sensing for the capture, store, retrieve, update, query, analyze, display and output of informal business locations. The GPS and combination of GIS/Remote sensing procedures showed remarkable capture and graphical display of the spatial distribution of businesses in the study area with records of 1805, 2929 and 2559 of businesses in designated zones of one, two & three respectively. The study also adopted a survey research design technique in conducting investigation into the affirmation from existing literature that the informal sector participants are not willing to pay tax and cannot be lured to become formal even with incentives. The primary source of data was used and questionnaires were distributed. The number of questionnaire completed was 7293 which is sum of all three designated zones and constituting 100% response rate. The results were presented as percentages and charts. It was revealed that; tax compliance in the study area is very low as business owners are not willing to register their businesses despite majority of business owners have operated their businesses for more than 11 years. It was also revealed that majority of respondents affirmed they have never paid taxes whereas survey records show all business owners in the study area have knowledge of tax payment as they have been informed through the media, friends/colleagues and by the Board of Internal Revenue Service (BIRS).

**Index Terms-** Global Positioning system (GPS), Geographic Information System (GIS), Remote sensing, Informal sector

## I. INTRODUCTION

The fall in the price of crude oil in the international market is sending economic and political shocks around the world. The hardest hit are countries whose economies depend largely on oil for appreciable percentage of their foreign exchange earnings. According to experts, crude oil accounts for a greater chunk of Nigerian foreign exchange receipts. Agbaeze et al (2014), reported that crude oil receipts account for about 80 percent of

total government revenue accruable to the federation account and 95 percent of foreign exchange earnings - thus making Nigeria one of the most oil dependent economies in the world.

This serious decline in the price of oil globally has led to a decrease in fund available for the distribution to the various states and local government to attain the level of development envisioned by vision 2020. Therefore, the need for state and local government to generate adequate revenue for internal sources has become a matter of extreme urgency and importance. This need underscores the eagerness on the part of the state and local governments to look for new sources of revenue or to become aggressive and innovative in the mode of collecting revenue from existing sources. One source is to have a strong tax regime that conveniently generates revenue. Adesoji and Chike (2013) states that revenue generated for development projects like construction of accessible roads, building of public schools, health care centres, construction of bridges are generated from taxes, obtained from the states, national and international governments. However like in most sub-sahara African countries, the public revenue in Nigeria remains weak and the tax burden appear to be unevenly distributed (Araujo-Bonjean and Chambes 2003). As stated earlier, part of the problem is the over dependence on oil revenue by the Nigerian economy owing to the utter neglect of the traditional tax revenue which has never assumed a strong role on the country's management of fiscal policy.

One sector that presents hope of generating extra income to make up for the deficit in tax revenues, is the informal sector. According to Joshi et al (2014) as cited in Schneider et al (2010) and Schneider Klinglmar (2004), that with respect to revenue, the informal sector forms a large and, in many countries, growing share of GDP, and thus represents a potentially significant source of tax revenue for cash-strapped governments. The Nigeria vast informal sector is estimated to contribute up to 65% of current Gross National Product (Vanguard 2010). Though taxing the booming informal sector presents hope for the economy, but yet it is not without its problem. As These studies suggest that informal firms start out and live out their lives informal, they avoid taxes and regulations, and they do not trade with the formal sector. It is difficult to lure them into becoming formal, even with subsidies.

In Nigeria, the public revenue collection challenge has been largely conceptualized within the tax reform initiatives of the prior to 1992 period and from 1992 to date period. Prior to 1992 the Nigerian tax system was marked by narrow band, low yield, high rates and incoherent administrators (James, 2013). There was thus need for reform. Furthermore, from 1992 to date, a

number of reforms has been effected and the tax becoming more vibrant. Notably among these includes:

- ❖ Elimination of some taxes: these includes the cattle tax, poll tax, excess profit tax (1991), capital transfer tax (1996), and sales tax (1993) (James, 2013).
- ❖ Introduction of new rates in respect of company taxation, a small business rate of 20% was introduced from 1992 to date (James, 2013).
- ❖ Introduction of new taxes: these includes value added taxes (1993), education tax (1993) (James, 2013)
- ❖ Administrative reforms of FIRS (2004).
- ❖ Review of National tax policy such as taxation and federalism, tax incentives and disincentives, and tax administration.
- ❖ Introduction of presumptive tax (2011).

These reforms are regarded as a sure way of raising internally generated revenue (IGR) for the various governments vital for accelerating the pace of development (James, 2013). Thus they are seen as catalyst of growth and according to Gideon and Aloius (2013), they sought to revamp and strengthen revenue administration, enhance voluntary compliance, expand the tax base and address corruption induced revenue leakage.

Underneath the pile of tax reforms was the need to bringing the informal sector into the tax net. For example, the Federal Inland Revenue Service in 2013, began moves to fast track the implementation of the presumptive tax regime for the informal sector (Punch, 2013). The move according to the acting Chairman, FIRS, Alhaji Kabir Mashi, is part of efforts aimed at improving easy access to the tax system for the large pool of eligible tax payers in the informal sector.

However, in spite of the barrage of reforms targeted at bringing the informal sector into the tax net, the government has not succeeded in bringing this critical sector under official purview.

In Bayelsa State tax administrators are faced with the challenge of coping with an unorganized pattern and clashes of interest in tax collection from the informal sector, resulting in very low tax compliant rate. The adverse effects is the low turnover of internally generated revenue. To a large extent, the total collectables from all MDA's involved with collection of taxes to the central purse is indeed poor.

There are no proper documentation on taxes collected by all MDA's. Where there is, the MDA's remits whatsoever that is deemed fit to the BIRS. In most cases the collection ministry or agency does not remit at all. Remittances are not consistent, due to the fact that the MDA's commissioned agent(s) are directly engaged by the ministry or agencies without knowledge of the office of the Attorney General or Board of Internal revenue, therefore breach of contract are considered "as non-payment by the tax payer".

There are also too many unknown persons engaged in the collection of taxes in the state. The monies collected are direct to the individuals by cash which makes it impossible and difficult to know how much was actually remitted by the tax-payer.

Due to the continuum in the unaccounted collection, there have been clash of collection, because it is juicy in nature, thus in most cases resulting in double taxation. For example an individual business premise may pay same fee with different

name to sanitation authority, local government council, trade and investment ministry etc. The fact still remains that the remittances are intricate to the central purse. Therefore the internally generated revenue continues to dwindle.

Further observations have shown that most business owners bribe tax collectors to evade tax payment. There are reports of unauthorized discounts by tax collectors, arbitrary fixation of taxes, individuals and business owners avoiding tax payment by closing shops when tax collectors are sighted and individuals commissioning themselves as tax collectors for personal gains. There are also reports some taxpayers in certain areas do not pay tax as tax collectors avoid such areas due to physical attacks on them.

In order to restore sanity to the unorganised pattern of revenue collection and low tax turnover the state government recently adopted treasury single account system. This means all public revenue accruable to the state government made payable by tax payers will be paid to the state IGR account. The government believes the treasury single account system will be able to check corruption, block revenue leakages and improve the revenue base of the state. Furthermore, poor database and comprehensive strategic means of collection of revenues is yet to be instituted, thus most of the problems with revenue collection still persist.

To address this problem, the Bayelsa State Board of Internal Revenue in conjunction with the Bayelsa State Geographic Information System Agency and in collaboration with our research team embarked on a series of reforms aim to promote efficiency in tax enforcement and compliance, one of which is the development and maintenance of an updated taxpayers database.

The preparation of a tax roll or master list of taxpayers is integral in tax administration. A pre-requisite to an effective tax administration is knowing who the taxpayer are, where they are located and whether they are active or inactive.

Therefore to realize maximum yield from the informal sector, tax collection and management has to be properly administered. Proper administration here involves ensuring adequate geographical coverage in the discovery of informal sector businesses, identification of each business, comprehensive collection of revenue, proper management and constant updating of the database. Considering the magnitude of spatial data to be acquired and processed alongside its associated data calls for putting in place a spatial information system that is amenable to constant updating and flexibility.

However, for informal sector taxation to be properly administered, having a comprehensive, accurate, timely, and easily accessible reservoir of geographic or spatial data (along with their associated attribute data), is indispensable. This is because informal sector taxation is largely a spatial activity that can best be captured and managed using remote sensing/GIS.

For a system to be seen as suitable, that is, effective and efficient, it must have the capacity and capability of being used easily and accurately capture, edit, store, retrieve, update, query, manipulate, analyze, display and output informal economy location data in various formats, and it has to do all this objectively and at a cheaper and faster rate.

There is a strong case for improving the indigenous revenue base of tax authorities. However, the problem is how to raise

revenue from this sector in an efficient and effective manner such that it will win the trust and confidence of the citizens that pay the tax. The aim of this paper is to explore the potential of Geographic Information System (GIS) for improving the revenue base of Bayelsa state through modern approach to the administration of informal sector taxation.

The specific objectives of the paper are to:

1. Determine the geographic location of all businesses and their attribute in the study area.
2. Develop a data base for effective revenue collection from all businesses in the study area.
3. Ascertain the tax payer's perception on their decision to remain informal and their willingness to pay tax.

## II. LITERATURE REVIEW

Many countries have continued to introduce reforms in order to foster voluntary compliance and improve the conditions necessary for effective and efficient tax collection. The reforms which are geared towards enhancing the tax administration systems also points to the pressing need in many developing countries to widen the tax base to formalize much of the informal sector, which according to Di John (2008), makes up about 60-70% of the GDP in the poorest countries.

Going through the existing literature, one would observe that simplifying registration and reducing tax burdens for individuals and firms is one means through which developing countries have introduced reforms to their tax legislation to encourage compliance. Increasing evidence suggest that offering greater access to registration does encourage entrepreneurs to formalize (Oviedo, 2009). For instance, USAID (2005) reports that after Montenegro reformed its registration process, it recorded an increase in the number of registered firms from 6001 in 1991 to 21, 724 in 2003. Colombia provides another example where business service centres were created within the premises of the local chamber of commerce in six Colombia municipalities, with the goal of ensuring business registration is "one step, one day, one place, with one interaction, one prerequisite, and at a minimum cost" (Oviedo, 2009).

Closely related to the foregoing, is an evaluation conducted by Cardenas and Rojo (2007) as cited in Oviedo (2009), reporting that the introduction of centres increased registrations by 5.2 percent. While the existing statistical evidence suggests that reducing time and cost required for firm registration can contribute to increases in the number of formally registered firms, the magnitude of the corresponding effects is still subject to controversy (Guillermo et al., 2007). For instance, evidence comes from a field experiment carried out in Sri Lanka by De Mel, McKenzie, and Woodruff (2013) as cited in Rafael et al (2014), reported that information about the registration process and even eventual reimbursement of direct costs of registration had no effect on formality.

Targeted educational campaign is another means employed by many countries to formalize the informal sector. By means of tax payer education and tax payer service, citizens can be informed and educated about the tax system and can be assisted in their attempt to comply with the tax system. Efforts in this direction have been conducted by Song and Yarbrough (1978) in

a study of people's knowledge about the objectives of a planned tax system in the USA. They found that the respondents who had most tax knowledge also received the highest scores on questions related to tax moral. A study by Roberts et al (1994) found that specific tax knowledge had impacts on tax attitudes. Chaudry and Munir (2010) analyzed the determinants of low tax revenues in Pakistan and concluded that an increase literacy rate results in increase of collected tax revenues. However, contrasting studies have shown that there is no positive correlation between tax education and tax compliance. Mohd and Wan (2013), while studying the role of religiosity between tax education and tax knowledge towards tax compliance, of working adults pursuing MBA program in one of Malaysian public university, found out that there is no significant relationship between awareness on tax education and tax compliance. Analysis was carried out using the Pearson correlation technique.

To further simplify and encourage voluntary compliance, many countries have adopted the self-assessment system as a solution. Self Assessment System (SAS) has become the key administrative approach for both personal and corporate taxation in developed countries including; U.S.A, U.K and Australia, where it has had relative success. This approach emphasizes both the taxpayer's responsibility to report their income and the need for them to determine their own liability. In accordance with the implementation of Self Assessment System (SAS) in most African countries, there is expected to be a positive impact on the control of corruption, in order to reduce the opportunities for negotiations between taxpayers and tax officials and also streamline procedures (Rahman 2009). On the contrary, Kweden (2011), observed as cited in Martini (2014), that the effective implementation of Self Assessment System (SAS) in Africa has several challenges, including coping with complex laws and regulations which make compliance more difficult, inconsistent and unpredictable, lack proper verification mechanism and limited enforcement of the law as well as lack of appropriate mechanism for reviewing/appealing decisions. Another challenge related to implementation of SAS in many developing countries is the issue of taxpaying performance. Under SAS, taxpayers are required to discuss taxable income honestly, compute tax payable correctly, file tax return form and pay tax on a timely manner. Therefore under SAS, the responsibility to tax liability is on the taxpayers. Thus, taxpayers must have sufficient tax knowledge in order to assess their tax liability correctly and to file tax return forms on time. However, the concern here is whether the taxpayer would handle their tax matters appropriately. This is important because for the implementation of SAS to be successful, taxpayers must possess a good understanding of the tax laws. Note, even in the developed country, such as, Australia and the United Kingdom (U.K), the implementation of SAS was overwhelmed with various problem and criticisms at the beginning (Lai & Choong 2001). Paddock & Oates (2003) and as cited in Lai & Choong (2001) stated that the Australian Treasurer had to announce a major review of SAS based on concerns raised by the Australian taxpayers on the tax system; and it took almost a decade for SAS to make a difference in Australia. Earlier, Inglis (2002) as cited in Lai and Chong (2009) had the opinion that SAS is not working properly in Australia as the frequent changes in tax laws make it difficult for tax specialist and tax assessors to comprehend, let alone anyone else. Whilst, in the

U.K, a report by the U.K Her Majesty Revenue and Customs (HMRC), the department targeted to increase the percentage of individuals who file their self-assessment returns on time to at least 93% percent over a ten (10) year period to the year 2007-2008, observe they could not achieve the stated target. This phenomenon indicated that the performance of taxpayers had not achieved the satisfactory level and required further improvement.

For SAS to be effective and to reduce the risk of underassessment, auditing procedure have to be improved and followed through in cases of suspected tax evasion. Tax audit procedures conducted, however, may increase the tax revenue base and stamp out the incidence of tax evasion. Findings from a study carried out by Adediran et al (2013), showed that tax audit and investigation can lead to an increase in Government Revenue to a great extent and also serves as motivating factors to taxpayers in fulfilling their tax obligations. Their conclusions were drawn by, analyzing data collected from staff of the federal Inland Revenue Service and Edo State Board of Internal Revenue in Nigeria. In another study conducted by Muktar et al (2015), in Gabonimo, Somaliland, established a statically significant correlation between tax audit and investigation and thus conclude that tax audit and investigation can lead to an increase in tax revenue. A majority of respondents (54.8%) in this study supported the assertion that tax audit and investigation can serve as motivating factors to taxpayers in fulfilling their tax obligations. These findings are supported by Ojo (1996), who concluded that the major aim of tax audit and investigation is not to manage the taxpayer but a focus on generating revenue and hence greater compliance whenever the auditing and investigations are done. However, on the contrary, Erard and Feinstein (1998) are of the view that tax audit and investigation can result in considerable compliance cost to both non-complaint taxpayers and as well as honest taxpayers.

Related to the above, Arthur et al (2011), states that individuals and businesses change their behaviour in response to tax policies. Furthermore, according to them, individuals and businesses change the composition of their income, location of their income, the timing of their income, and the volume of their income in order to minimize the effect of tax codes on their well-being. For example, comprehensive audits by the complex U.S Federal income tax code, imposes additional taxpayer burden of at least \$3.9 billion annually (Arthur et al, 2011). This cost according to them, includes, time spent by taxpayers in collecting records, organizing files, leading through the tax code to determine exactly what their tax liability is and the purchase of products and services. The complexity tax is particularly problematic because it creates all of negative incentives of a high tax burden, but nets the Government no additional revenue.

The introduction of self-enforcement taxes such as the VAT is also intended to increase compliance, since it increase incentives to belong to the formal sector. VAT has become a main source of revenue for many developing countries. Some African countries such as Benin Republic, Sengal, Togo and Nigeria have introduced VAT. Evidence suggest that in these countries, VAT has become an important contributor to total Government Revenue. Ajakaiye (2000) and Shalizi et al (1998) as cited in Izedonmi and Okunbor (2014) stated that in 1982 VAT accounted for about 30% of total tax revenue in cote d'Ivoire, Kenya and Senegal.

Tait (1989) as cited in Izedonmi and Okunbor (2014) showed that VAT has been in effect in Ecuador and Mexico since at least 1973 and by 1983 accounted for 12.35% and 19.7% of total Government Revenues in these countries respectively. Indonesia introduced VAT in 1983 and by 1988; the ratio of VAT revenue to GDP had risen to 4.5% (Bogetic and Hassan, 1993). In spite of these recorded success, VAT still face serious challenges in most countries, such challenges includes; Resistance against VAT registration, low level of tax awareness, weak audit and enforcement capacity of the tax authority, render goods and services without tax invoice etc. These challenges tend to have a negative effect on tax revenue. For examples the Nation Newspaper (2015), reported that experts in the taxation sector in Nigeria, during a Joint Tax Board (JTB) meeting in Abuja were quick to align with the acting chairman Federal Inland Revenue Service(FIRS), Mr. Babatunde Fowler, that there are many stones left unturned as far as the country's current tax administration process are concerned. They argued that the administration of the Value Added Tax (VAT) is greatly hindered by many factors ranging from inadequate coverage of VATable persons to non-remittance of VAT deductions. Tax revenue loss in this aspect can only be imagined. Izedonmi and Okunbor (2014), suggest further that the Federal Inland Revenue Service (FIRS) lacks logistics support for effective administration of VAT.

Another worldwide tax administration reform is the trend towards the creation of semi-autonomous revenue authorities. A review of the international experience reveals that the record of semi-autonomous revenue authorities in improving tax effort in combating corruption is mixed. Moreover, even in many countries that has shown some degree of success with the model, there is some evidence that gains in revenue performance tends to be eroded after some time. For instance, tax effort has started to falter in Peru since 1997 (Manasan, 2003). Likewise, similar observations were made in Argentina (Since 1995), Colombia (since 1994), Venezuela (since 1997) and Rwanda (2001). In all these countries with the exception of Peru, the deterioration in tax effort was such that tax effort settled at a level that was just the same or even lower than the pre-reform level. Related to this, Taliercio (2001), after assessing the experience of Mexico, Peru and Venezuela, concludes that semi-autonomous RA's have been less sustainable than expected. This occurs as their autonomous features are undermined, if not eliminated.

Another measure that has been implemented in several countries with the aim of improving tax revenue is the introduction of Unique Tax Identification Number (U-TIN) for individuals and companies. According to Ayodeji (2014), the basic idea of U-TIN is to provide harmonized and coordinated taxpayer Identification system that is based on computerized system and easily accessible to all relevant stakeholders' perspective. He stated further that U-TIN program would generate proper linkages within tax authorities and yield cooperation and information dissemination about taxpayer, thus lead to better compliance by taxpayers. This is supported by Jocet (2014), who inferred that the U-TIN does not only expedite the processing of information about the taxpayer but also fosters compliance, consciousness and increases revenue.

This statement is as a result of the double increase in the number of tax filers in 1986, the implementation date of the U-

TIN in the Philippines in 1992. It was further observed the number continued to increase between 1992 and 1997. Related to this, Egugwu and Agbaji (2014), carried out a study to access the application of Unique Taxpayer identification Number (U-TIN) on internally generated revenue (IGR) in Kogi state Nigeria. After analysis of data they were able to reveal that the internally generated revenue (IGR) before the introduction of U-TIN within 2003-2007, was not significant. After the introduction of U-TIN within 2008-2012 a tremendous increase of internally generated revenue was witnessed. More evidence reveal, implementation of U-TIN can cause expanding of the tax base and bringing the informal economy into the formal one. For example, according to OECD economic surveys (2001), the Russian Ministry of Finance conducted several projects to expand the tax base and increase the efficiency of tax collection. Thus, in 1998 they introduced the requirement for tax identification number (TIN), with the aim of expanding the tax base by bringing informal economy into the formal one. The results showed that the number of TIN issued reached more than 14 million as of June 2000, compared with 5 million in 1998.

In similar vein, the Argentina authorities announced an important tax administration reform package on June 17, 2003, aimed at combating tax evasion and improving voluntary tax compliance (IMF, 2003). Part of this strategy is to improve information sharing between the Federal and Provincial governments through the wider adoption of the Federal tax identification number by the provinces.

However, while many countries have already adopted this unique tax identification number, findings disclose that targets have not always been met. According to Ifueko (2012), while accessing the financial performance of FIRS Nigeria, stated these setbacks may be partly as a result of challenges in the movement to bank collection automation. These problems according to him are posed by collecting banks, the Central Bank of Nigeria, and general systemic challenges and they include; non availability of Taxpayer Identification Number of some taxpayers and wrong posting caused by Taxpayer Identification Number. Also, while the majority of countries in Africa have adopted this unique tax identification number, the process of assigning such number is still very slow and bureaucratic in most of them. For instance, Mr. Oduba Oduba, the National Project Manager, Taxpayers Identification Number, Nigerian, during an interview with the Punch Newspaper (2014), stated different reasons for the non-participation of some states in the TIN Project in Nigeria. According to him, Lagos State is concerned about how to integrate the TIN into their existing system. For Enugu and Ebonyi State, there are various levels of procedure to get approval. Whereas, there is an ongoing challenge between Lagos and Ogun State concerning the issue of where the residents should pay their tax. Further to this, Mr. Oduba Oduba agreed that part of the problem for the slow assigning of the TIN is the unwillingness of individuals to register.

Other factors affecting the effective implementation of TIN in most developing countries is the unwillingness of certain class of taxpayers in paying tax. For example, Fjeldsted (2013) identified that small and relatively few medium sized and large enterprises account for the majority of tax revenue in many developing countries. In Tanzania, for instance with a population of more than 45million people, the number of taxpayers

registered in the TIN System was about 400,000 in 2008 (Fjeldsted and Heggsted 2011). In November, 2010, less than 400 large taxpayers contributed about 80 percent of total domestic revenue collection. The revenue base generally excludes the large number of small and micro enterprises, as well as many professionals, tents. Furthermore, the political and economic elite generally do not pay taxes. In the same vein, Patrick and Michael (2013), reported that in 19 Francophone Sub-Saharan African countries, it is a big challenge in stopping the customs department and other government offices in using other identification numbers rather than using TIN.

In addition, the integrity of the taxpayers identification number (TIN) is in doubt. According to Kloeden (2011), there are instances multiple TINs have been issued to the same taxpayers. This is common in most developing countries and arises from the fact that there is lack of information sharing mechanism (Kenyon, 2007). In Morocco, for example, companies receive different identification numbers from the Social Security, tax authorities and companies registrar, making it impossible to trace their activities (Kenyon, 2007).

From the above it is obvious reforms are difficult in making the informal sector formal. Therefore, the big question is, Why don't informal firms become formal?. According to La Porta and Shleifer (2014), Informal firms almost never become formal. Earlier corroborated report by La Porta and Shleifer (2008), observe that an average surveyed informal firm will be in business for nearly a decade without attempting to become formal. Also in the same report and consistent with this observation, they asserted that only 2 percent of informal firms sell their output to large firms (versus 14 percent of firms in the Enterprise Survey). Another observation is the evidence on the effects of microcredit, which shows that such credit helps informal entrepreneurs a bit, but almost never jump-starts significant growth or transforms them into formal businesses (Karlán and Zinman 2011). Most compelling observation on the informal sector reluctance to become formal is made by La Porta and Shleifer (2014), after reviewing literature from Marx, Stoker, and Suri (2013) on the emerging image of slums as domains of permanent informality rather than hubs of transition between agriculture and the formal sector. They concluded by reporting that the studies suggest informal firms start out and live out their lives informal, they avoid taxes and regulations, and they do not trade with the formal sector. It is difficult to lure them into becoming formal, even with subsidies. Far from being reservoirs of entrepreneurial energy, they are swamps of backwardness.

In all the literature above, there is a general agreement on the need to improve tax compliance by broadening the tax net, thus making it imperative to developing comprehensive taxpayer database of both individuals and firm, through the adoption and implementation of a variety of reforms. However, none of the reforms mentioned the potential of GIS for enhancing tax compliance in the informal economy. Ayeni (2003) defines GIS as a computerised database management system for the capture, storage, retrieval, analysis and display of special data. This tool has the capacity to inter-relate data sets and assist in their analysis as well as in the presentation of the results (Ajala, 2000)

### III. RESEARCH METHODOLOGY

#### Data

Our research team worked with the Bayelsa State Geographical Information System Agency (BGIS), which patterned and subdivided Yenagoa into eleven (II) administrative zones. Our research is based on 3 of these zones with high density of businesses and comprising of seven (7) communities. Below is a list of the zones and their codes.

1. Amarata zone (AM01)
2. Ekeki/Okaka/Yenezue-epie/Kpansia zone (KEO2)
3. Yenezue-gene/Bioglobolo zone (BY03)

Thus, the above 3 zones served as the case study for our research.

#### Population Sample Size of The Study

The population consist of owners/entrepreneurs of small and medium scale enterprise. This consist of 1805 small and medium scale enterprise dealers in zone 1, 2929 dealers in zone 2 and 2559 in zone 3.

The population sample of the study involved total population sampling of the owners of small and medium scale enterprises. The sampling technique employed is the purposive sampling technique.

#### Sources of Data

The study utilized both primary and secondary data; the primary source been through field work (Yenagoa City) by use of GPS to acquire coordinate positions and also by questionnaire administration. While the secondary data involved the use of enhanced satellite imagery of Yenagoa (2013), automated data (zone data) acquired from the database of the Bayelsa State Geographic Information System(BGIS), text books, journals, internet, conference and seminar proceedings.

#### Method of Data Collection

The peculiarity of the informal sector and lack of reliable data on the sector necessitated some level of innovation to improve the prospect of participation. Methods or strategies used are as follows;

1. Field Work: This method was based on respect, trust and persuasion. With the help of friends and colleagues who are familiar with respondents and persistent persuasion from the media by the government, it

enabled respondents feel more confident about participation in the project without fear that they would suffer sanctions. Respondents were made to understand that the aim is to see how government can encourage them/improve the situation.

2. Confidentiality: Finally, strong confidentiality agreement or parameters such assurances from the government to respondents that their participation would in any way compromise them and their enterprise.

#### Data Analysis

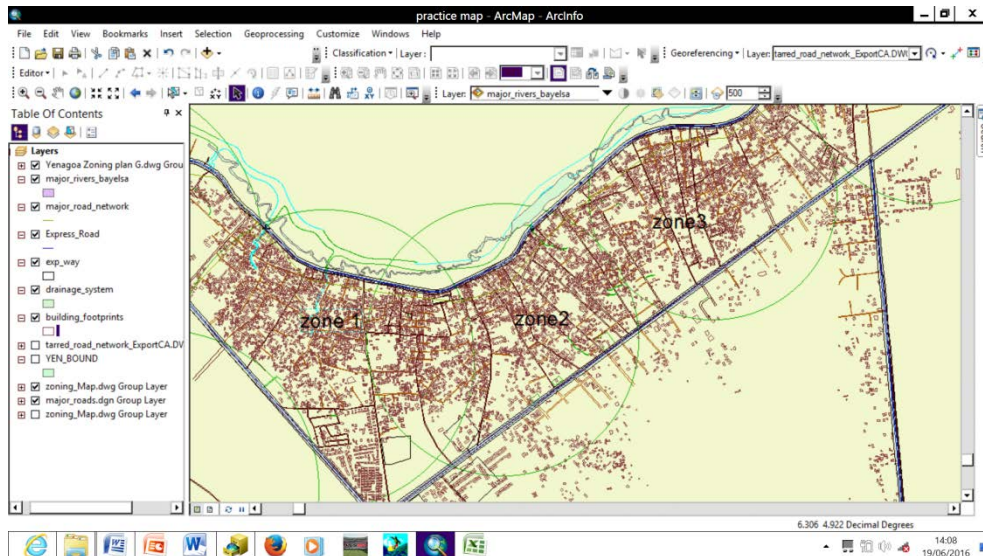
Determining the Geographical location of Businesses and their attributes in the study are.

Firstly, we conducted a spatial survey of all businesses in the study area. Given the high density of businesses and haphazard pattern of business location in the study area, a zoning plan data drawn and represented by concentric circle in AutoCAD dwg file format was developed by BGIS for a more detail data collection in the most efficient manner. The zoning data overlaid on a base map was printed out and used as hard copy plan by the various enumeration team to serve as a guide for data collection. See figure 1 below.

Global Positioning System (GPS) device was use to take coordinates of the various locations of the businesses in the study area.

These Coordinators were later uploaded into Microsoft-Excel Programme. A georeferenced satellite image with a resolution of 0.5m dated 2013 obtained from GeoEye and used in representing the study area. This satellite image was mosaic and assigned spatial reference to make it geometrically correct, so that measurements taken on the image would represent ground situation. The prepared excel format of coordinates was uploaded to ArcView 10 environment where the coordinates were converted to point features, displayed and overlaid on the satellite image. See figure 2 below.

During field work, we recorded a number of attributes date (type of business and business activity, address and other geographic markers, biometric data of business owner etc.). These informations are recorded in the questionnaires issued out to respondents.



**Figure 1. Zoning plan overlaid on base map of Yenagoa.**

**Creation of Database**

The non-spatial or attribute data was entered into Arcgis 10 in an organized form to create the database. Attribute table was created in Arcgis10 when the map document containing the shapefile of business locations in the table of contents is chosen. This is achieved by clicking properties from the context menu. From the layer properties dialog box click on fields tab. To begin adding fields to the table, right click on the shapefile in table of contents and choose open “Attribute Table” from the context menu. Click on the “Options” button in the table frame and choose add field.

Attribute data such as Type of business, Business Activity, Address, Name, Sex, Marital Status, State of Origin, Home Town, Data of Birth, L.G.A etc. where entered into the attribute table.

After entering the attribute data into the GIS Environment (Arcgis10) the spatial and the non-spatial data were linked from the expected database aiding the database query aimed at determining the owner of business, type of business, home town, date of birth, the location and condition of prospective business owner etc.

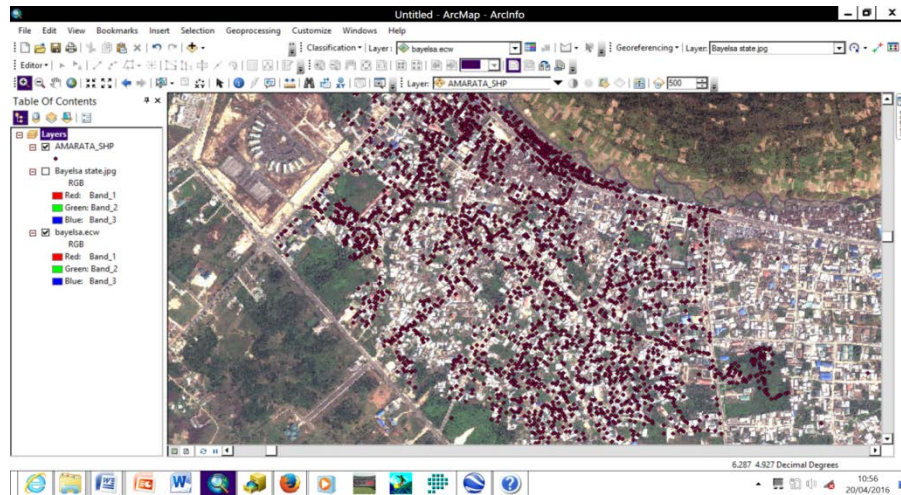
In analysing tax payers compliance statue of each business in the study area, the Microsoft Excel Software is used. Data was presented in tabular, graphical, and narrative forms. In analysing the data, descriptive statistical tools such as bar graphs and pie charts were used complemented with percentages.

**IV. DISCUSSION OF RESULTS AND FINDINGS**

Table 1 below shows the distribution of business premises as they vary from one zone to another. There are 1805 business premises in zone 1, 2929 SME's in zone 2 and 2559 in zone 3. Figure 1 below shows the spatial distribution of business premises in all three zones.

**Table 1.**

| Zone   | Total Number of SME's |
|--------|-----------------------|
| Zone 1 | 1805                  |
| Zone 2 | 2929                  |
| Zone 3 | 2559                  |



**Figure 2. Spatial distribution of business premises in parts of zone one and point features overlaid on image of study area**  
**Source: Own compilation from survey research (2015)**

Based on La Porta and Shleifer(2014) report, where they emphasize from existing studies that informal firms start out and live out their lives informal, they avoid taxes and regulations, they do not trade with the formal sector and it is difficult to lure them into becoming formal, even with subsidies. This shows that despite every other odd most informal sector participants will want to remain informal and therefore can only be coaxed by government to integrate them into the formal sector. However, integration can only be done when the taxpayers are known and there locations are also known of which GIS becomes a veritable tool. Therefore our research in this section will look at behavioural perspective of the informal sector participants. These include issues to do with voluntary and involuntary informal sector participation and as well as not to be tax compliant (which looks at the decision to become or remain informal and the decision not to pay tax). Here, lost revenue is pinpointed and seen as short comings in the existing revenue assessment and collection method resulting from informal sector participants attitude towards tax payment in the study area. Thus, survey was conducted with the purpose of obtaining informal sector participants views on taxation. The survey was indented to obtain information with a view to establishing decisions to remain in the informal sector and the decision on never to pay tax. Data was therefore collected through a questionnaire administered to people owning businesses in the study area within Yenagoa in Bayelsa State. In other words, our research in this section presents, analyses and interprets the study findings in line with the third research objective. Thus we looked at years of business operation by participants, level of tax compliant and ascertaining the level of tax payment awareness through the medium of hearing about tax.

### **Years of Business Operation**

Table 2 – 4 and Figure 2 – 4 below shows that majority of respondents have operated their businesses between 11 and 15 years. In zone one, 635 representing 35% of total respondents have been operating their businesses between 11 and 15 years. In zone two, 896 representing 31% of total respondents have been operating their businesses between 11 and 15 years, while in zone three, 832 representing 33% have operated their businesses

between 11 and 15 years. This shows that most of the business owners have attained a favourable curve experience, taking their excellent competencies and skills into consideration; otherwise they should be out of business by now. This shows that business owners are old timers and ought to know the importance of tax compliance. Thus, from a tax point of view they are not just prepared to pay. There continual operation in the informal sector indicates a voluntary decision to be there.

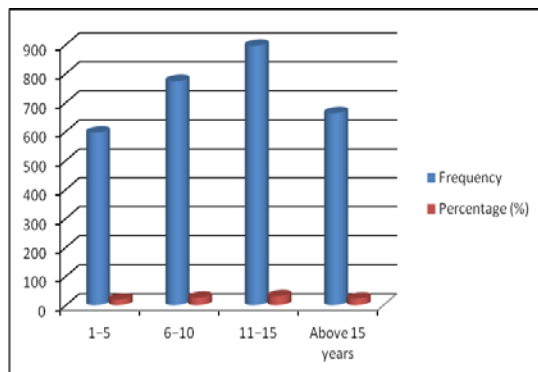


Zone 1

**Table 2**

| Years          | Frequency | Percentage (%) |
|----------------|-----------|----------------|
| 1-5            | 310       | 17             |
| 6-10           | 550       | 31             |
| 11-15          | 634       | 35             |
| Above 15 years | 311       | 17             |
| Total          | 1805      | 100            |

**Figure 3**



Source: Own compilation from survey research (2015)

**Table 3**

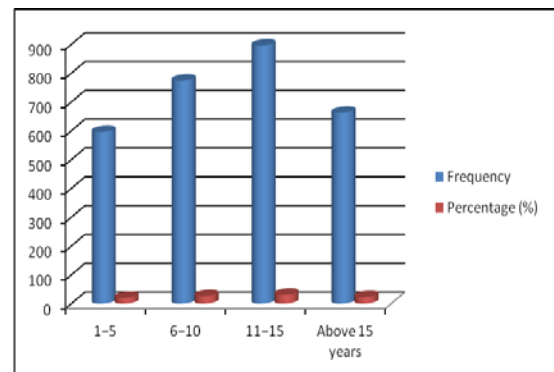
| Years          | Frequency | Percentage (%) |
|----------------|-----------|----------------|
| 1-5            | 596       | 20             |
| 6-10           | 774       | 26             |
| 11-15          | 896       | 31             |
| Above 15 years | 663       | 23             |
| Total          | 2929      | 100            |

Source: Own compilation from survey research (2015)

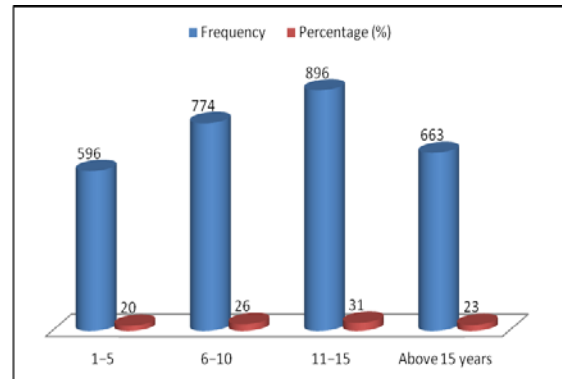
**Table 4**

| Years          | Frequency | Percentage (%) |
|----------------|-----------|----------------|
| 1-5            | 441       | 17             |
| 6-10           | 793       | 31             |
| 11-15          | 832       | 33             |
| Above 15 years | 493       | 19             |
| Total          | 2559      | 100            |

Source: Own compilation from survey research (2015)



**Figure 4**



**Figure 5**

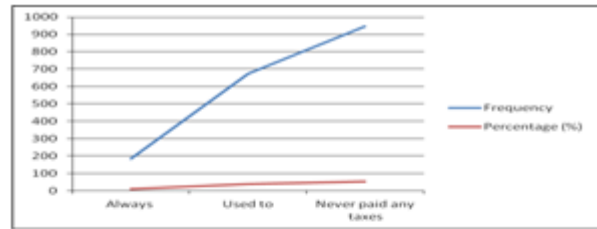
**V. LEVEL OF TAX COMPLIANCE**

Table 5 – 7 and Figure 5 – 7 shows that majority of the respondents in the three zones said they have never paid any tax in their business. In zone one, 947 representing 53% of total respondent are recorded as never paid any taxes, while in zone two there are 1319 representing 45% of total respondents who said their businesses have never paid taxes and 1228 representing 48% of total respondent in zone three said they have never paid any tax. This is the problem with the informal sector as reported by La Porta and Shleifer (2014), who suggested the informal sector start and live out informal and are never willing to pay tax. This also confirms that the tax non-compliance rate is very high in the study area. However, the recorded, 183 representing 10% of total respondent of always paying tax in zone one, the 439 representing 15% of total respondent are recorded as always paying tax in zone two, and the 589 representing 23% of total respondent recorded as always paying tax in zone three respectively are discovered to be either registered with the Bayelsa State Board of Internal Revenue or the Federal Inland Revenue Service.

**Zone 1  
 Table 5**

| Responses      | Always | Used to | Never paid any taxes | Total |
|----------------|--------|---------|----------------------|-------|
| Frequency      | 183    | 675     | 947                  | 1805  |
| Percentage (%) | 10     | 37      | 53                   | 100   |

Source: Own compilation from survey research (2015)

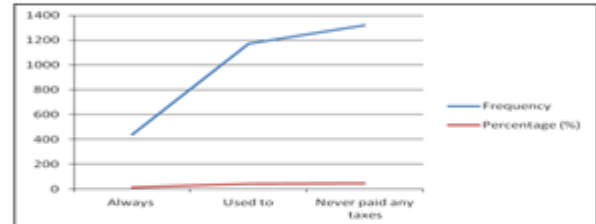


**Figure 6**

**Zone 2  
 Table 6**

| Responses      | Always | Used to | Never paid any taxes | Total |
|----------------|--------|---------|----------------------|-------|
| Frequency      | 439    | 1171    | 1319                 | 2929  |
| Percentage (%) | 15     | 40      | 45                   | 100   |

Source: Own compilation from survey research (2015)

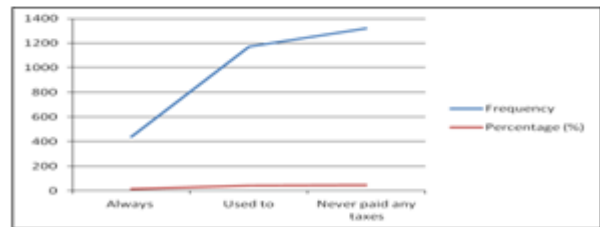


**Figure 7**

**Zone 3  
 Table 7**

| Responses      | Always | Used to | Never paid any taxes | Total |
|----------------|--------|---------|----------------------|-------|
| Frequency      | 589    | 742     | 1228                 | 2559  |
| Percentage (%) | 23     | 29      | 48                   | 100   |

Source: Own compilation from survey research (2015)



**Figure 8**

**Medium of Hearing about Tax**

It was detected that 49%, 55% and 62% of tax payers in zone one, zone two and zone three respectively heard about tax through the media( electronic and print). While 45%, 39% and 33% of tax payers in zone one, zone two and zone three respectively heard about tax though friends and colleagues. Also, 6%, 6%, and 5% of respondent in zone one, zone two and zone three respectively heard about tax through the Bayelsa State Board of Internal Revenue. Whereas in all three zones there is zero record of respondent who have not heard about tax. This indicate that all tax payers are aware of there obligation to pay tax but are not just willing to pay.

**Zone 1**  
**Table 8**

| Medium                     | Frequency | Percentage |
|----------------------------|-----------|------------|
| Media, Electronics & print | 864       | 49         |
| Friend/colleague           | 820       | 45         |
| Brochure                   | 0         | 0          |
| BIRS                       | 121       | 6          |
| Not heard                  | 0         | 0          |
| Total                      | 1805      | 100        |

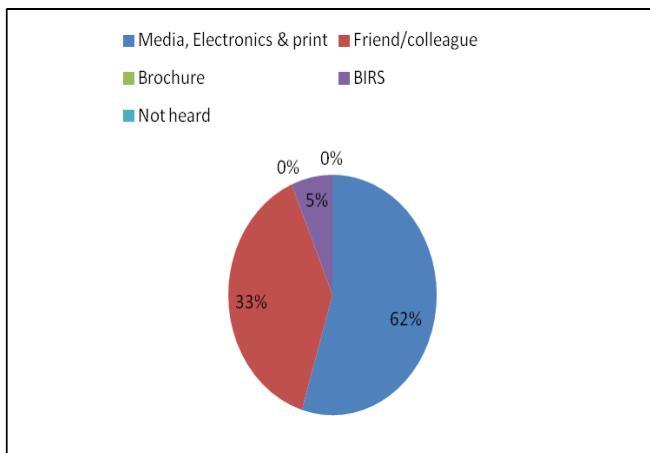
Source: Own compilation from survey research (2015)

**Zone 2**  
**Table 9**

| Medium                     | Frequency | Percentage |
|----------------------------|-----------|------------|
| Media, Electronics & print | 1603      | 55         |
| Friend/colleague           | 1139      | 39         |
| Brochure                   | 0         | 0          |
| BIRS                       | 187       | 6          |
| Not heard                  | 0         | 0          |
| Total                      | 2929      | 100        |

Source: Own compilation from survey research (2015)

Zone 3

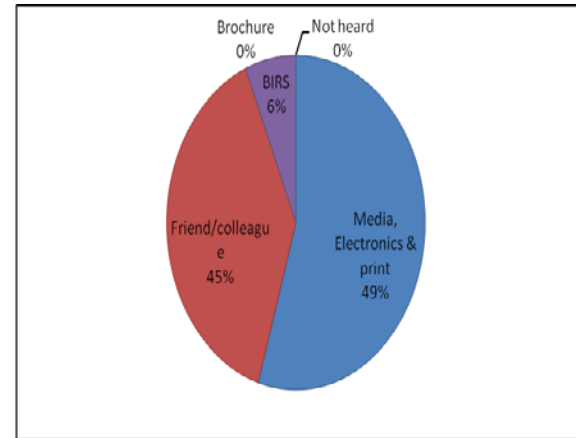


**Figure 9**

**Table 10**

| Medium                     | Frequency | Percentage |
|----------------------------|-----------|------------|
| Media, Electronics & print | 1579      | 62         |
| Friend/colleague           | 840       | 33         |
| Brochure                   | 0         | 0          |
| BIRS                       | 140       | 5          |
| Not heard                  | 0         | 0          |
| Total                      | 2559      | 100        |

Source: Own compilation from survey research (2015)



**Figure 10**

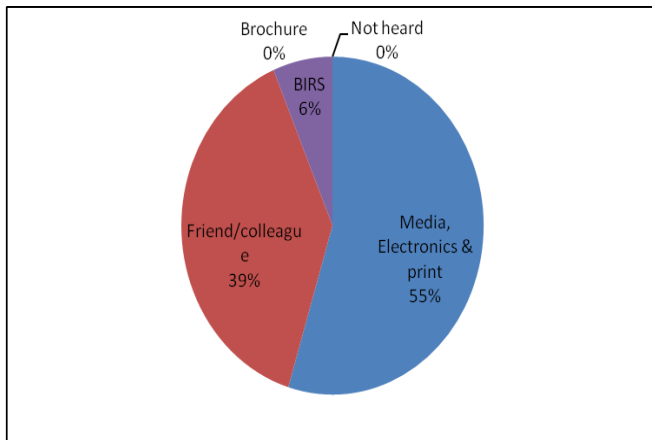
## VI. CONCLUSION

There are many obstacles to overcome when strategizing to tax the informal sector. But as this paper shows, some progress can be made. We provide records of 1805 businesses that existed in zone one, 2929 businesses in zone two and 2559 businesses in zone three during the year 2015 using procedure of locational data acquisition by GPS and a procedure of the combination of GIS/Remote Sensing for a graphic data display, associated data database creation and queries. Some new knowledge/insights are gained with respect to the number and profile of businesses in the study area, leading to three main conclusion.

- The first conclusion from the results is that GPS is seen to be amenable to meeting the challenge faced in bringing the informal sector into the tax net. This is made possible based on the method of data acquisition in the form of acquiring XY coordinates of the location of all businesses in the study area. As represented in the study taxpaying entities are captured and their locations known. However, equally important is the adoption of zoning in the study which resulted in a more detail, effective and efficient attribute data collection. This is confirmed by the capture without exemption of all businesses in the study area.
- The second conclusion is that the use of GIS infrastructure has been perceived as a viable strategy to enhance government decision in the process of informal sector regularization. This is confirmed by the capability of the GIS to create an attribute database by entering the attribute data in an organised form and linking the attribute data and spatial data from the expected database and performing queries. For example query on ownership name, age, sex, etc. of businesses can be carried out.
- The third conclusion is that the informal sector participants are perceived to be tax and regulation avoiders. It is also believed they remain in the informal sector voluntarily and it is difficult to lure

them into the formal sector even with subsidies. This is confirmed in the result as majority of the respondents have operated their businesses for more than eleven years and majority of such businesses are discovered to have never paid any form of tax despite been aware of tax payment through the media(electronic and paper), through colleague/friends and also through the BIRS. This shows the state is losing a lot revenue as most of these businesses were not captured in the tax net.

**Figure 11**



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