AN ASSESSMENT OF LITERACY LEVEL OF POLICY MAKERS IN THE UTILISATION OF SCIENCE, TECHNOLOGY AND INNOVATION INDICATORS IN POLICY MAKING PROCESS IN NIGERIA

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INTRODUCTION TO ASTII

Background: The African Science Technology and Innovation Indicators (ASTII) Initiative is a programme within the African Science and Technology Consolidated Plan of Action (CPA). The CPA was adopted in 2005 by the African Ministerial Council on Science and Technology (AMCOST) as a framework for science, technology and innovation (STI) to respond to the socio-economic challenges facing the continent.

The ASTII Initiative aims at supporting evidence-based policy that addresses Africa's development challenges in the context of STI, with the overall goal being to contribute to improving the quality of STI policies at national, regional and continental level by strengthening Africa's capacity to develop and use STI indicators.

Investment in Science Technology and Innovation (STI) is seen by African countries as an essential element in responding to Africa's socio-economic development needs and challenges. Various platforms held at national, regional and continental level have echoed the need for committed investment to STI. Notable among these is the Addis Ababa Declaration on Science, Technology and Scientific Research for Development made at the African Union (AU) Summit in January 2007 in which Heads of State and Government committed to promote and support research and innovation activities and the development of the requisite human and institutional capacities.

The first phase of ASTII was implemented in 19 AU member states from 2007 to 2010. Participating countries conducted Research and Development (R&D) and Innovation surveys, the outcomes of which are captured in the African Innovation Outlook (AIO) 2010. The AIO-2010 is the first in a series, intended to provide information about STI activities and the state of STI in African countries. The second edition of the Outlook (AIO-II) has been produced in 2014 covering national surveys from 21 AU member States. Other ASTII Series publications include policy briefs on various topical issues concerning STI indicators. The availability and usage of the African Innovation Outlook series is expected to generate debate, which will enrich the process of collecting better quality data and improve understanding of policy processes in Africa. The debate is expected to contribute to African solutions to African problems and influence the work on STI indicators.

ASTII Research Papers: The broader objective of ASTII Research Papers is to stimulate and support the development of case studies on STI processes in the Member States of the African Union (AU), and to make use of R&D and Innovation core indicators that NEPAD made available to the public. The case studies are intended to contribute to informing policy on the uptake of research and innovation results into national development agendas. The ASTII data being collected by countries provides an opportunity for studies to analyse the data and provide policy recommendations on development of STI in Africa. It is hoped that these case studies will stimulate the development of training programmes on strategies, approaches, and uses of STI indicators as part of the policy process. These training programmes will support the measurement and evaluation of domestic STI capabilities in the African Union. Also, focusing on a strong understanding of the importance of collecting and making use of STI indicators, training modules will build a critical mass of graduate students, researchers, and junior-to-mid-level policy makers. Measurement of STI indicators alone

is not adequate to drive national development; they must be effectively utilized in policy-making to achieve its goals.

Following a competitive research call process by the NEPAD Planning and Coordinating Agency (NPCA) in 2012 with generous support of the Government of Sweden, four research papers were commissioned focusing on the following areas: STI Policy Reviews; Sector specific studies on STI indicators; and Studies to propose a framework for measuring STI indicators to reflect the African context. The National Centre for Technology Management (NACETEM) of Nigeria conducted this study which provides an assessment of evidence of literacy level of policy makers in the utilization of STI indicators in the policy-making process in Nigeria. It is edited by Fred Gault, Claes Brundenius and Luke Mumba.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

The Project Management team is obligated to the NEPAD Planning and Coordinating Agency for the immeasurable support given throughout the process of the project. Definitely, the project would not have been successful without the support of the Agency and the funding from the Swedish Government. The visionary leadership provided by Prof. Luke Mumba, the Coordinator, NEPAD/ASTII programme contributed immensely to the successful completion of this project and this is well appreciated. We also acknowledge the committed and dedicated assistance demonstrated by Lukovi Seke, Research Assistant NEPAD/ASTII, as well as the reviewers of the draft report.

The entire management and staff of the National Centre for Technology Management (NACETEM) are also appreciated for the support given throughout the project by making resources available from time to time. The project leader, Dr. Willie Siyanbola, demonstrated an unparalleled leadership throughout the study. The field workers that collected the data, all NACETEM staff, exhibited a high level of commitment to ensure the impressive response rate. We also acknowledge the roles played by Ololade Adewole and Joseph Ikem in data entry and the editorial team led by Isaac Oluyi.

Lastly, this project would not have been successful without the support of policy makers from both the executive and legislative arms of government in Nigeria. We are indeed grateful to the Directors, Deputy Directors and all the respondents who attended to our questionnaire in the different ministries and parastatals. Words cannot also express our sincere appreciation to legislators at the state and federal levels for taking time out of their busy schedules to grant us interview and fill the questionnaires. We are indeed grateful!

EXECUTIVE SUMMARY

Introduction

This report presents the results of the assessment of literacy level of policy makers in the utilisation of STI indicators in policy making process in Nigeria. The project was undertaken by the National Centre for Technology Management (NACETEM), an agency of the Federal Ministry of Science and Technology saddled with the responsibility of policy research in science, technology and innovation in Nigeria.

NACETEM undertook the project after winning a competitive research grant from the NEPAD Science Technology and Innovation Hub (NSTIH) of the NEPAD Agency. The competitive process saw NACETEM emerge as one of the four winners in Africa to receive the grant funded by the Swedish Government. This summary presents the background, methodology and key outcomes of the project.

Background

NACETEM, an Agency of Nigeria's Federal Ministry of Science and Technology, won a Swedish Government grant from the NEPAD Planning and Coordinating Agency (NPCA) to undertake this study with the aim of assessing the literacy level of policy makers in the utilisation of science, technology and innovation (STI) indicators in policy making process in Nigeria.

NACETEM is Nigeria's government Agency responsible for managing the nation's National Innovation System (NIS) through policy research and capacity building in STI management. NACETEM has built strong competences in recent years having completed about 20 policy research projects since 2005. Notably, NACETEM now has strong collaborations with reputable global institutions such as NPCA, INASP, World Bank (STEPB), among others.

For instance, NACETEM is the implementing Agency for the Science, Technology and Innovation indicators project of NEPAD which consists of two main surveys: the research and development (R&D) and Innovation surveys. The R&D survey measures the R&D activities in Nigeria's government and higher education sectors while the innovation survey assesses the innovativeness of Nigeria's business enterprises in the manufacturing and service sectors. NACETEM has since 2007 conducted two rounds of the surveys.

Also, in 2009, NACETEM won a research grant from the International Network for the Availability of Scientific Publications (INASP), UK to undertake a study to evaluate the source and quality of science and technology (S&T) knowledge available to Nigerian policy makers with the aim of determining its impact on decision and policy making process in the country. The policy makers include members of the National Assembly, researchers and senior staff of the Ministry of Science and Technology and parastatals. The study was implemented as a case study for African countries. The project was completed in 2011. As a follow-up to this, INASP awarded

NACETEM the right to host an international conference on Evidence-Informed Policy Making to disseminate the findings and discuss issues on availability and utilisation of scientific information for policymaking. The conference was supported by Parliamentary Office of Science and Technology (POST), House of Commons, UK and the Wellcome Trust, UK.

Based on these experiences, NACETEM initiated the current project to assess the literacy level and utilisation of STI indicators by legislators and Ministry officials in policymaking process. The three specific objectives of the study are to:

i. Assess the literacy level of policy-makers on STI indicators;

ii. Examine the utilisation of STI indicators in policy process; and

iii. Assess the factors influencing utilisation of STI indicators in policy process.

Methodology

The study made use of both primary and secondary data sources. In undertaking the study, we captured S&T activities in cognate S&T Ministries, those Ministries whose activities are dependent on the utilisation of scientific information. These, in addition to S&T Ministries, include Agriculture, Health, Education and Trade and Investment. Hence, STI indicators were not restricted to core indicators outlined in the OECD's Frascati and Oslo Manuals as reported in the African Innovation Outlook 2010but also sub-sectoral indicators with direct relevance in the sampled Ministries.

Nigeria operates a federal system of government with a Federal Capital Territory (FCT) and 36 States structured along six geo-political zones. In order to enhance national spread and representativeness of the data, data was collected from policy makers from the FCT and one state selected from each of the geo-political zones. The states selected are those with active S&T structure such as a full-fledged Ministry dedicated to S&T. The states are Lagos (South West), Enugu (South East), Bayelsa (South South), Kano (North West), Niger (North Central) and Bauchi (North East). However, due to the security challenges situation arising from the Boko Haram insurgency, the North East was excluded from the survey.

The sampling frame was drawn from the policy makers who are the primary users of STI indicators. These are found generally in two arms of government: Legislature and the Executive. Policy makers sampled in the Executive included Permanent Secretaries and Senior officials at the Directorate levels in Ministries and selected parastatals. In the legislative arm, Committee members of the National and State Assemblies which have oversight responsibilities on the activities of the five Ministries were sampled. Since Nigeria operates a bi-cameral legislature at the Federal level, members at both the Senate and House of Representatives were sampled in this study. Other respondents sampled in the legislative arm of government included the Clerk of each Committee, researchers at the National Institute for Legislative Studies, and the Librarian at the National Assembly Library.

In the FCT and the five states, data was collected from the respondents in the legislative and senior officials at the selected Ministries and parastatals through a set of structured questionnaires. This was supported by interviews for the Chairmen or Deputies of Committees at the National and State Assemblies.

A total of two hundred and sixty-five (265) respondents were sampled with the breakdown as follows:

i. Ministry of Science and Technology (Federal and States): 7 respondents made up of the Permanent Secretary and six Directors/Deputy Directors;

ii. Other Ministries (Federal and States): 4 respondents each made up of the Permanent Secretary and three Directors/Deputy Directors;

iii. Legislative Committees (National and State Assemblies): 4 respondents each comprising Chairmen/ Deputy chairmen, Clerk and two members; and

iv. Others: 5 officials of the National Assembly Library and National Assembly Institute for Policy Studies.

The study encountered two major obstacles. One was the Boko Haram insurgency in the Northern part of the country as earlier discussed which particularly led to the exclusion of the North East geopolitical zone from the study. The second was the recess embarked upon by members of the National and State Assemblies which affected the response rate especially in the National Assembly and also affected the duration of the project implementation.

Key Results

The general information of the respondents shows that majority are male with about 85% in the Ministries and 86% in the Legislature. This is a typical representation of the sex distribution of policy makers in Nigeria, especially within the legislative arm. Only about 7% of the 469 members of the National Assembly are female. Also, majority of the respondents fall within the age groups 50-59 years in the Ministries and 40 – 49 in the Legislature. Majority of the respondents in the Ministries had Master degree as the highest educational qualification while Bachelor/HND was the highest educational qualification among legislators. About 7.5% of respondents in the Ministries and 1.8% among the legislators hold doctorate degree.

The study investigated three objectives namely awareness; utilisation and factors influencing the utilisation of STI Indicators among policy makers in Nigeria. On awareness, generally, the policy makers claimed a high level of knowledge of STI indicators. About 72% of legislators and 82% of policy makers at the Ministries claimed to have good knowledge of indicators. However, questions on level of awareness of specific sectoral indicators yielded a lower level of knowledge of these indicators. For example, about 44% of legislators had a clear understanding of sub-sectoral indicators relating to the Ministries they are overseeing. A similar proportion of respondents in the Ministries have such knowledge.

On utilisation of the indicators, though majority of the policy makers in both the legislative (98%) and executive (95%) arms of government claimed a high level of utilisation of these indicators, however, the frequency of use shows more of an occasional, ad-hoc utilisation rather than regular institutional use. This was depicted by about 50% of policy makers in the Ministries and 53% of parliamentarians.

The most utilised sub-sectoral indicators among policy makers in the Ministries are infant and maternal mortality ratio (Health), Number of enrolment and graduates in STVE (Education), Public agricultural R&D expenditures as a percentage of agricultural GDP (Agriculture), Gross Domestic Expenditure on R&D (GERD) (Science and Technology) and FDI per capita (Trade and Investment). Among the legislators, the pattern was the same except among members belonging to the Education and Trade and Investment Committees which ranked numbers of teachers in ST&E disciplines and Manufacturing Value Added as the most utilised indicators respectively. Workshops and seminars and the internet were the most important sources of the indicators

among both the legislators and Ministry officials while public opinion and legislative motion/resolutions among legislators were the least important sources among legislators. Among the policy makers in the Ministries, public opinion polls and town-hall meetings were the least important sources.

Interestingly, institutional databases and repositories from international institutions were the most consulted by policy makers at the Ministries of Health (WHO and UNICEF), Agriculture (NEPAD, FAO and IFPRI), Science and Technology (UNESCO, NEPAD, UNDP) and Trade and Investment (UNIDO, UNCTAD) while Ministry database was the most important for policy makers at the Ministry of Education. Other important databases for STI Indicators include National Bureau of Statistics (Health and Education), research institutes (Agriculture and Trade and Investment) and NACETEM (S&T). Among legislators, sources from Ministries and agencies of government constituted the most important databases of sourcing STI indicators. This was followed by international agencies (Health and Education) and National Bureau of Statistics (Science and Technology and Trade and Investment).

Utilisation of scientific information such as indicators in policymaking process is predicated on several factors which can be classified broadly into the nature, medium of information and the capacity and lifestyle of the user. The greatest obstacle to the utilisation of indicators among both the legislators and Senior Ministry officials was insufficient information on challenges facing S&T in Nigeria. This was followed by inaccessibility to information on S&T (legislators) and obsoleteness of information (Ministry officials).

Conclusion

Policy makers both at the national and state levels play a critical role in STI policy making process. The successful implementation of any development agenda is predicated on formulation and implementation of sound policies. The global best practice is to employ scientific evidences in formulation of policies. One of such is STI Indicators, developed to measure and manage the technological progress of the country. To transit from research to development, policy makers must understand and be equipped to effectively deploy the indicators. This study is therefore based on the need to assess and examine the level of awareness and literacy of STI indicators among policy-makers in Nigeria in order to enhance evidence-based policy making process.

The primary respondents are policy makers at the Ministry of Science and Technology as well as cognate Ministries of Agriculture, Education, Health, and Trade and Investment. Others include legislators in Committees with oversight function on the Ministries.

The general conclusion is that while the policy makers claimed a high knowledge of the indicators, their utilisation is at best, ad-hoc and not institutionalised. We observed that international and Ministry sources are the most important sources for the indicators. Also, agencies like the National Bureau of Statistics play an important role in provision of these indicators. Workshops and Seminars are the most important medium of acquiring knowledge about the indicators. The policy makers rated insufficient and inaccessibility to information on STI indicators as the biggest challenges facing their utilisation of these indicators.

Recommendations

Based on the above, we therefore recommend that government should encourage the Legislators and Senior Ministry Officials to explore and make use of variety of sources for relevant information needed to enhance the quality S&T information gathering for policy and law making in Nigeria.

Regular organisation of training and capacity building programmes for law and policy makers in the understanding and practical utilisation of relevant and appropriate indicators in the policy making process should be embarked on for awareness creation.

Strengthening the existing interactions and broader collaboration among the actors in STI policy making process will increase awareness and utilisation of other STI indicators other than those of sectoral concerns.

THE RESEARCH TEAM

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N.B: The project team were supported by several field officers and data handlers.

LIST OF ABBREVIATIONS AND ACRONYMS

AIO	African Innovation Outlook
ASTII	African Science, Technology and Innovation Indicators
BRICS	Brazil, Russia, India, China and South Africa
DG/CEO	Director-General/Chief Executive Officer
ETF	Education Trust Fund
FAO	Food and Agriculture Organization
FCT	Federal Capacity Territory
FDI	Foreign Direct Investment
FGN	Federal Government of Nigeria
FMST	Federal Ministry of Science and Technology
GERD	Gross Domestic Expenditure on R&D
GDP	Gross Domestic Product
HND	Higher National Diploma
IFPRI	International Food Policy Research Institute
INASP	International Network for the Availability of Scientific Publications
KII	Key In-depth Interview
NACETEM	National Centre for Technology Management
NASS	National Assembly
NBS	National Bureau of Statistics
ND	National Diploma
NEPAD	New Partnership for Africa's Development
NPCA	NEPAD Planning and Coordinating Agency
NSTIH	NEPAD Science, Technology and Innovation Hub
NIS	National Innovation System
NRIF	National Research and Innovation Fund
OECD	Organisation for Economic Cooperation and Development
PGD	Post Graduate Diploma
PhD	Doctor of Philosophy

PS	Permanent Secretary
R&D	Research and Development
RI	Research Institutes
SETI	Science, Engineering, Technology and Innovation System
SPSS	Statistical Package for Social Sciences
SSCE	Senior Secondary Certificate Examination
S&T	Science and Technology
ST&E	Science Technology and Education
STI	Science, Technology and Innovation
STVE	Science Technical and Vocational Education
UNESCO	United Nations Educational Scientific and Cultural Organization
UIS	UNESCO Institute of Statistics
UNU	United Nations University
US	United States

CHAPTER ONE:

INTRODUCTION

1.1 Science, Technology and Innovation and Development

Advances in scientific and technological knowledge made possible the significant reduction of poverty and improvement in the quality of life in both developed and developing countries throughout the 20thcentury and beyond. In the future, the ability of countries to access, select, comprehend, adapt and use scientific and technological knowledge will increasingly be the determinant of material well-being and quality of life. Thus, knowledge, a product of science and scientific enterprise, is one of the critical resources that Africa should apply to drive her development aspirations. Access to new knowledge and technology can help developing countries leverage on the benefits of globalisation of technology (Archibugi and Pietrobelli, 2002). Given the vital importance of the growth and application of new knowledge to this evolutionary process, it is equally an indisputable fact that the interplay between knowledge and its application in development process produces different results for societies at different levels of development with varied policy consequences (Metcalfe and Ramlogan, 2005).

Today, reaping benefits from science and technology depends on a number of factors including investment in human resources training and development; the demand for knowledge by the private sector; public policies that provide the appropriate enabling environment for strong knowledge institutions; and the level and quality of the information and communication technologies systems that permit the flow and dissemination of knowledge and information. When the policies and institutions oriented around these four factors are present and performance is high both within and between them in a given country, significant progress can be made in responding to problems associated with poverty and stimulating economic growth.

Modern Science and Technology is undoubtedly the principal engine driving the world industrial and socio-economic development and indeed, the key to competitiveness in the global market. Science and Technology, rather than bring about a convergence of income in nations as expected, has led even more to greater income divergence in countries at a multidimensional level. It has divided countries by creating a wide separation between the advanced OECD countries and others. For instance, there is the fast followers (mostly East Asia countries like South Korea, Singapore, Hong Kong); the emerging economies whose economies have also grown at a fast rate in the last decade (BRICS), and then the lagging latecomers (largely, sub-Sahara Africa), and the least developed countries (Oyelaran-Oyeyinka, 2006) . Therefore, to be an effective partner in the emerging global market, a country must master the necessary tools of industrial production and socio-political development which are based almost on the critical roles of its Science, Engineering, Technology and Innovation system (SETI) (Akpokodje, 2010) . The examples of emerging industrialised economies such

as China, Brazil, South Korea, Taiwan, Singapore, etc. demonstrate that high scientific and technical input and emphasis on a nation's educational system are critical to the transformation of the nation's economy and optimal utilisation of the natural resources.

As a result, policy makers have suspected a close link between economic growth and productive investments in S&T, and now mounting evidence and findings have helped to establish a correlation between innovation and growth. Economic development is primarily dependent on the adoption and creation of technological innovation (Dollar and Kraay, 2001; Saviotti and Pyka, 2004; Niosi, 2010). However, one of the acknowledged paradoxes of the Nigeria economic system/development is the fact that as a nation richly endowed with abundant natural resources, the country is also among the poorest countries. There is no doubting the fact that the lack of scientific, technical and vocational orientation and content in Nigeria education and low investment in R&D had often limited the achievement of the growth potential of the Nigerian economy. Therefore, to effectively utilise S&T and enjoy the accompanying benefits for sustainable development, there is need to properly measure the existing science, technology and innovation (STI) capacities and capabilities in order to deploy it efficiently in the formulation of national STI policy.

1.2 Role of STI Indicators in National Development

STI indicators are metrics used to measure development in scientific, technological and innovation activities of a country. Current sets of STI indicators consist of five accepted dimensions. These are research and development (R&D); human resources; patents; innovation; and Technology Balance of Payments (TBP) (Lugones and Suarez, 2010),which are crucial for monitoring any nation's scientific and technological development. They are useful for formulating, adjusting and implementing STI policies. Therefore, measurement and utilisation of STI is fundamental for the formulation of national innovation strategies. Indicators can be used to monitor global technological trends, conduct foresight exercises and determine specific areas of investment. An example is the target of a ratio of R&D spending to GDP of 1% for African countries. It becomes immediately evident that indicators of the number of people engaged in research at the present time are needed to suggest how many will be required if the target is to be achieved. That raises questions about the production of researchers by universities, and their mobility within the system and across its boundaries through immigration and emigration. As part of gathering the data to construct the indicators, best practices may be found in the organisations being surveyed which can be shared across the system. At the end, the target may not have been achieved, but the functioning of the system may have been improved. This is an important outcome of a benchmarking exercise.

For indicators to be used effectively, they must be embedded in the policy process, and that requires interaction among policy makers, statisticians and other key stakeholders. For example, policy makers must be able to formulate objectives such as the need to feed more people with domestically grown food and programmes to move the economy and the society towards the national developmental goals. These could include genetic research leading to more robust breeds of plants and animals, or new breeds, the development of vaccines and of better diagnostic tests for food safety. Statisticians, on the other hand, can then formulate survey questions which provide information on the state of these programmes (e.g. funding, number of researchers involved), of their outcomes (e.g. number of new plant breeds) and their impacts (e.g. increase in quantity of food delivered to market). For the process to work there has to be discussion of the policy questions to be raised, leading to the formulation of survey questions, which, if answered well, will provide the information needed. The process of interaction and co-operation allows each group to do what it does best, policy analysis and development on one hand, and survey questionnaire development and analysis on the other hand. These are quite different skills that must be harnessed if the resources available to generate indicators are to be effectively deployed.

STI indicators can provide answers to sensitive national questions such as: How does R&D affect innovation and growth (by sector; region); How large should the federal research budget be and how should incremental amount of money be allocated; What impact does federal research spending have on social well-being, and over what period of time; and whether regional or local R&D funding create jobs in the region or locally?

1.2.1 Present Efforts in S&T Development: The influence of STI indicator, Triple Helix and NIS frameworks as Basis for Future Outlook

In Nigeria, the rationale for embarking on 2010 Science, Technology and Innovation policy review exercise made it obvious that previous efforts at STI policy development and formulation are still incapable of resolving most of the challenges facing STI system in Nigeria. This is exemplified by the various weaknesses and constraints facing the national S&T system as reflected from the country's STI indicator project and R&D status assessment (See, NACETEM, 2011b).

For instance, in the area of infrastructure/institutions' building, the apparent decline in the quality of education exemplified by the inadequate development of infrastructure in Nigeria's educational systems has resulted in the limited exposure of students, at all levels, to science and technology and to meaningful and instructive skills and industrial practice. This is due to the inadequate emphasis on the courses and curricula available on how to resolve the challenges of development which tend to pose serious challenges and weaken the links between education and the technological needs of Nigeria (Ewa, 2012). This is attested to by the lowest position of Nigerian Universities among their peers in the world. For instance, the 2012 University ranking placed University of Ibadan at 38th,Obafemi Awolowo University at 49th, and University of Lagos at 52nd positions among the top 100 Universities in Africa. In 2013, the positions of few of these Universities changed slightly as can be seen from the table 1 below.

Table 1.1: World Rankings of some Nigerian Universities

Top 100 in Africa		Top 5 000 in the world	
2012	**2013**	**2012**	**2013**
UNIBEN (22)	OAU (8)	UNIBEN (1 639)	OAU (1 926)
UNAAB (35)	UI (24)	UNAAB (2 266)	UI (2 183)
UI (38)	UNILAG (25)	UI (2 515)	UNILAG (2 933)
UNN (44)	UNN (31)	UNN (3 228)	UNN (3 539)
OAU (49)	UNAAB (45)	OAU (3 263)	UNILORIN (4 088)
UNILAG (52)	UNIBEN (69)	UNILAG (3 486)	UNAAB (4 125)
ABU (55)	ABU (74)	ABU (3 512)	ABU (4 624)
UNILORIN (63)	UNILORIN (81)	UNILORIN (4 302)	UNIBEN (4 699)
UNIJOS (88)			

Source: Webometrics, 2012 & 2013.

The implication of this is that the country needs to embark on transformative educational policy agenda that will improve the activities of these universities in order to enhance their international competitiveness (Olaopa et al, 2012). For instance, it has been argued that Universities and RIs play a key role in national innovation systems. Beyond their mission to educate, they account for substantial shares of total R&D spending and also perform most of the basic research carried out in different countries (Bamiro et al, 2008; Ewa, 2012). This is especially so in middle income countries.; For example, the share of universities and RIs in total basic research is close to 100 percent for China, 90 percent for Mexico and 80 percent for the Russian Federation (WIPO, 2011). Thus, there is need to focus on the production of world class scientists, engineers and technologists by re-visiting Admission ratio, change of Education Trust Fund (ETF) to Tertiary Education Trust Fund (TETF) to focus more on R&D in tertiary education including training more academics to PhD level, and establishment of more Universities of S&T (NACETEM, 2011a; Siyanbola, 2012).

The above is critically important in view of the fact that in terms of the availability of R&D personnel and researchers as a percentage of R&D personnel, Nigeria is still lagging behind. This is glaring if this is compared with the number of researchers per million inhabitants in relation to her population and comparatively with other African countries like South Africa, Senegal, Gabon and Cameroon. This suggests that the university should enhance its role of capacity building to produce and train more scientists and engineers needed to drive sustainable development. This is particularly important in the areas of entrepreneurial skills with focus on market-driven research (Siyanbola et al., 2011 cited in Ewa, 2012).

Table 1.2: R&D Researchers and Personnel (Head Count)

Country	R&D Personnel	Researchers	Researchers as a % R&D Personnel	Population in Million	Research Personnel /Million Inhabitants	Researchers /Million Inhabitants
Cameroon	5 600	4 562	81.5	18.660	300	244
Gabon	834	527	63.2	1.422	586	371
Ghana	2 115	636	30.1	22.871	92	28
Kenya	6 799	3 794	55.8	37.755	180	100
Malawi	2 884	733	25.4	14.846	194	49
Mali	2 414	877	36.3	12.409	195	71
Mozambique	2 082	522	25.1	21.869	95	24
Nigeria	32 802	17 624	53.7	147.722	222	119
Senegal	10 207	7 859	77.0	11.893	858	661
South Africa	59 344	40 084	67.5	49.173	1 207	815
Tanzania	3 593	2 755	76.7	41.276	87	67
Uganda	1 768	785	44.4	30.638	58	26
Zambia	2 219	612	27.6	12.314	180	50

Source: African Innovation Outlook, 2010

The realisation of this fact and the need for investment in the enterprise of knowledge generation, building and developing the required and needed human capacity for managing governmental businesses for development and conduct of basic research is responsible for the establishment of Universities and Colleges of Education in Nigeria since 1948 and up to date (Ekundayo and Ajayi, 2009).

Nigeria, like several other countries in Africa and South America, does not only have poor S&T capacities and human resources, but also invests only a small fraction of her annual budget on S&T development (Olaopa et al, 2011). This situation has over the years been a major barrier to socio-economic development of the country (NACETEM, 2011a). For instance, the proportion of expenditure spending on science and technology expressed as a percentage of GDP for African countries like Nigeria, Kenya and Ghana with countries like Korea, Japan, USA and Europe is comparatively low (See table1.3 below). The implication of this is that there will be low idea generation, which will lead to low investment and low human capacity development (Olaopa et al, 2011).

Consequently, Nigeria was not ranked among the top 72 countries in research and development expenditures as it spends less than US$100 million on R&D (World Bank, 2011). As regards innovation, Nigeria is ranked 88 out of 110 countries (MINAM, 2009). This is unlike the leading countries of the world, US, China, South Korea, and some African countries such as South Africa, Ghana and Egypt, for instance, who have set up specific funding mechanisms to power R&D in various research institutions for enhanced basic and applied research, R&D capabilities and outputs and national economic development (See also, NACETEM, 2011a).

In fact, as revealed by the R&D survey, Nigeria is yet to have a specific funding mechanism for R&D activities in the country. According to the report, Nigeria accounts for only 0.01% of global expenditure on R&D; the country's Global Competitiveness Index ranking is 94 (out of 134 nations sampled) and has no university in the world's top 500. These figures are relatively insignificant when compared with the R&D expenditure profiles of the advanced countries of America, Europe and some parts of Asia (NACETEM, 2011a). Today, South Africa is ranked No 45 in the Global Competitive Index and has 0.8% of the world's top 500 universities – the only entrée from Africa (NACETEM, 2011b). On the basis of the findings of the survey, Nigeria needs to invest more of its GDP in R&D for serious economic impact. As a result of this, the new STI policy in Nigeria (FMST, 2012) established a structure, National Research and Innovation Fund (NRIF), to provide reliable and sustainable funding for R&D and Innovation activities in the country. The policy also gives new opportunities to Venture Capitalists which is embedded in the NRIF and available for entrepreneurs.

The Gross Domestic Expenditure on R&D for Selected African Countries and Gross Domestic Expenditure on R&D (GERD) as a Percentage of GDP are shown below.

Table 1.3: Gross Domestic Expenditure on R&D for Selected African Countries

Country	Year	GERD million PPP$	GERD per capita PPP$	GERD as % of GDP
Gabon	2008	78.7	58.3	0.47
Ghana	2007	120.1	5.0	0.38
Kenya	2007	277.8	7.4	0.48
Malawi	2007	180.1	12.9	1.70
Mali+	2007	37.4	3.0	0.28
Mozambique*++	2007	42.9	2.0	0.25

Country	Year	GERD million PPP$	GERD per capita PPP$	GERD as % of GDP
Nigeria*+	2007	583.2	3.9	0.20
Senegal	2008	99.0	8.0	0.48
South Africa	2007	4 976.6	102.4	1.05
Tanzania	2007	234.6	5.8	0.48
Uganda+	2007	359.8	11.6	1.10
Zambia	2008	55.3	4.6	0.37

Source: ASTII R&D Surveys PPP data from UNDP (2010); population and GDP data from ADB (2010)

* Data do not include the business enterprise sector

+ Data do not include private non-profit institution/organisation

++ Data do not include the higher education sector

With regards to the sources of fund for R&D, Table 1.5 shows that government is the major source of expenditure. This requires a change from this funding pattern to other areas including the private non-profit organisations, international donor/development partners, Diasporas, among others. Besides, the business sector should also be encouraged to fund research in the research institutes.

Table 1.4: Sources of R&D Funding in Nigeria

Sources of R&D Funding	University	Research Institute	% of Total
	Million (Naira)	Million (Naira)	
Business	72.8	-	0.2
Government	28 092.0	16 090.2	96.4
Higher Education	1.2	36.3	0.1
Private Non-Profit Institutions	791.6	0	1.7
Funds from Abroad	467.5	7.1	1.0
Others (Donations & Request)	292.4	1.5	0.6

Source: NACETEM, 2010a

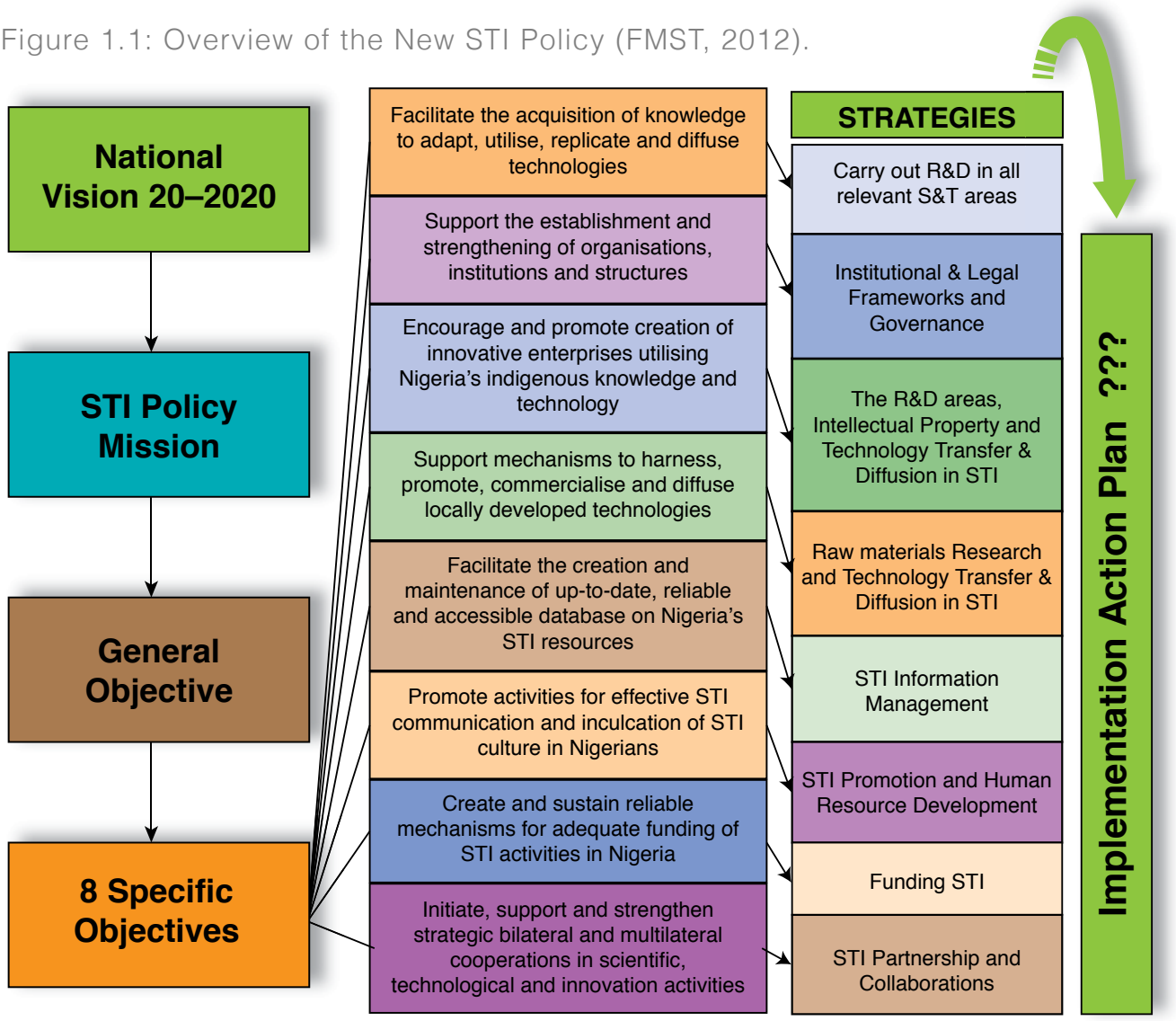
All the above and the R&D statistics point to the fact that the performance of economies depends on broader investment in knowledge production and related activities within the STI system.

Most especially and very critical to the development of S&T is effective networking and collaboration among the various stakeholders with regards to the implementation of their respective role within the system. How best this could be achieved formed the frameworks of the triple Helix (See Leydesdorff (2000); Etzkowitz and Leydesdorff, (1997)) and National System of Innovation as recently put into perspective by Siyanbola (2012) GIA model of STI governance and administration.

However, in Nigeria, as can be deciphered from the little impacts which past efforts at STI development have had on its economy, the result is not unconnected with much emphasis on functional differentiation rather

than integration as well as inadequate collaborative efforts among the various stakeholders that comprise the science and innovation system of the country (Siyanbola et al., 2013). This is a great departure from all the available theses of innovation frameworks. The realisation of this fact and against the governmental vision which drives the passion for science and technology-led development underscored the need for a definitive and prescriptive National STI policy to define the vision, goals, objectives and priorities for investment in STI (Siyanbola et al., 2013) as suggested by the country's various STI indicators . It is against this background that the development of the New National Science, Technology and Innovation Policy was initiated in order 'to develop and build a strong STI capability and capacity needed to actualise the Vision 20:2020 Economic Transformation Blueprint (Nigeria Vision 20:2020 document) of the country and evolve a comprehensive and modern economy by the year 2020, among others (New National STI Policy, 2012). The overview of the new STI policy is shown in Figure 1.1.

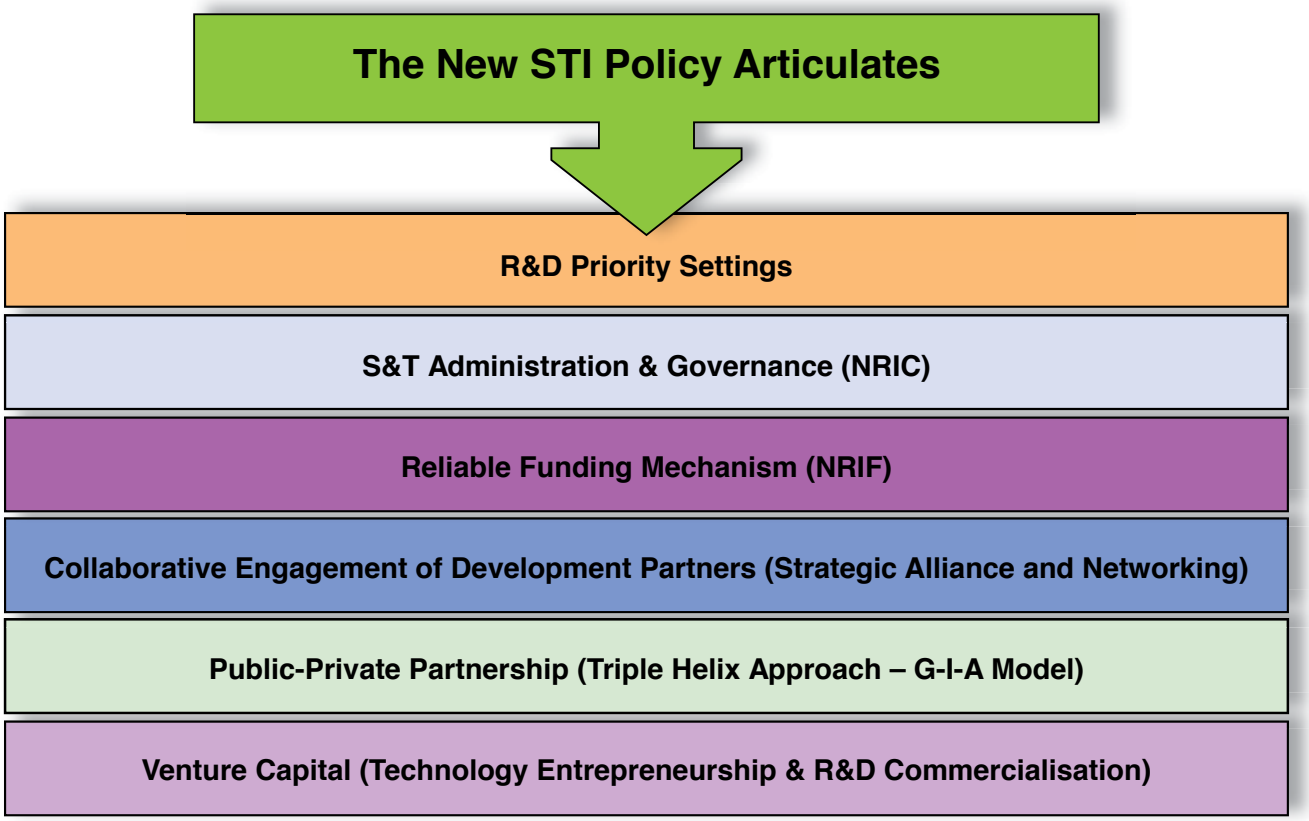
Figure 1.1: Overview of the New STI Policy (FMST, 2012).



In the context of the above and with heavy reliance on different innovation models and report of the STI indicator project, the new National Science, Technology and Innovation Policy was crafted and adopted. Specifically, taking cue from the developed countries of the world, the country adopted an all-inclusive

participatory approach and explored a thorough and holistic method to incorporate "innovation" in the revised S&T policy (Siyanbola, et al, 2013). This is with a view to enabling the policy to have wide range implications for technology advancement of the country in the next decade. The highlight of the new policy is diagrammatically depicted in Fig. 1.2.

Figure 1.2: Highlight of the New STI Policy (FMST, 2012).



1.3 Statement of the Problem

There is consensus of opinion among researchers and policy makers that STI is pivotal to development. The role of science and technology (S&T) as an engine of development has been globally recognised (NEPAD OST, 2006; Chataway et al., 2009; NACETEM, 2010). Application of S&T increases the efficiency of production systems and enhances industrial competitiveness (Ilori, 2002). In fact, Prusak (1996) posited that what gives a nation competitive edge is what it knows, how it uses it and how fast it can learn new things. To successfully benefit from the strategic role of S&T and develop it, formulation of effective STI policy is critically required. This in turn (STI Policy development) requires proper understanding and strategic deployment of indices (STI indicators) in policy making process. STI indicators are metrics used in assessing scientific and technological performance of a country. They are deployed in national planning and in formulating, evaluating and reviewing STI policies. The realisation of this has led to the development of STI indicators by countries to measure different activities such as research and development, innovation, human resource, patent etc. as well as their deployment in policy making for the desired effect on economic development.

However, in spite of their critical role and importance, the absence of relevant STI statistics and how to utilise them in the design and implementation of STI policies in developing countries, particularly Nigeria, is often a major obstacle. Central to this is the understanding of policy-makers of the key STI indicators concepts. Without clear understanding, adoption and effective use of the indicators will be impossible. How then could sustainable development be assured and guaranteed in the context of a globalising market economy and what role could science, technology and Innovation (STI) indicators and policy play in stabilising and sustaining such development? What are the priorities of the policy makers in understanding and deploying STI indicators in designing and implementing STI to support the attainment of the national development agenda of Nigeria? These, therefore call for the need to examine, among others, the level of awareness and literacy of STI indicators among policy-makers in Nigeria so as to enhance evidence-based policy making process. This is critically important in order to remove guess work from governance, planning and policy development.

1.4 Objectives of the Study

The overall objective of the study is to examine the literacy level of policy-makers in Nigeria on STI indicators and assess the utilisation of these indicators in policy-making process.

The specific objectives are to:

- assess the literacy level of policy-makers on STI indicators;
- examine the extent of use of STI indicators in policy process; and
- identify the factors influencing utilisation of STI indicators in policy process.

1.5 Significance of the Study

Measurement of STI indicators alone is not adequate to drive national development; they must be effectively utilised in policy-making process to achieve its goals (Gault, 2010, Siyanbola, 2013). Undertaking this study among Parliamentarians at the national and state levels will enhance the capacity of policy-makers in the formulation of better informed policy necessary to fast-track sustainable S&T development across the nation. The outcome of the study will serve as a framework for other African countries on how to transit from STI indicators to evidence-informed policy making. The project has a great potential to engender sustainable national growth because NACETEM, being a policy research agency on STI management in Nigeria, is well-positioned to advise the Federal Government of Nigeria on STI policy issues.

CHAPTER TWO:

METHODOLOGY FOR THE STUDY

2.1 Introduction

The study made use of both primary and secondary data sources. The sampling frame was drawn from the primary users of STI indicators data such as the S&T Committees of the National and States' Assemblies and policy makers at the Federal Ministry of Science & Technology (FMST) and other cognate Ministries. For this purpose, a set of structured questionnaires was designed and administered to the respondents. This was supported by key in-depth interviews (KII) for the National Assembly and selected State Assemblies members. This enabled us to obtain first-hand information needed for the successful outcome of the project.

2.2 Scope of the Survey

Table 2.1: List of the six geopolitical zones of Nigeria and the states

ZONES	STATES
North Central	Benue, Federal Capital Territory (FCT), Kogi, Kwara, Nassarawa, Niger, Plateau
North East	Adamawa, Bauchi, Borno, Gombe, Taraba, Yobe
North West	Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, Zamfara
South East	Abia, Anambra, Ebonyi, Enugu, Imo
South South	Akwalbom, Bayelsa, Cross River, Delta, Edo, Rivers
South West	Ekiti, Lagos, Ogun, Ondo, Osun, Oyo

Science, Technology and Innovation (STI) indicators in respect to this study refers to indicator in the field of Science and Technology, Health, Agriculture, Education and Trade & investment.

2.3 System of Government in Nigeria

Nigeria is a Federal Republic composed of 36 States, and a Capital Territory, with an elected President and a Bi-cameral Legislature. It operates the presidential system of government with three distinct but complementary arms namely the Executive, the Legislature and the Judiciary, each acting as a check on the other two (EFRN, 2004). Executive power is exercised by the federal or state government. Legislative power is vested in both the two chambers of the legislature, the House of Representatives and the Senate. Together the two chambers make up the law-making body in Nigeria called the National Assembly. The seventh session of the National

Assembly which was inaugurated in 2011 has only 26 women federal parliamentarians. This figure represents 6.4 per cent of the total number of federal legislators. There are 469 members of the National Assembly; the Senate has 109 members, while there are 360 legislators in the Federal House of Representatives. Seven of the women serving in the National Assembly were elected into the Senate, while 19 of them are in the House of Representative. Of these number, only seven female Senators (7.63 per cent) and 19 Reps (5.28 per cent) were elected in 2011 as opposed to nine senators and 25 Reps that sailed through in 2007. Out of those elected in 2007, only three female senators and 11 Reps were re-elected in 2011.

2.3.1 National and State Assemblies

Data for all legislators both in the national and state assemblies from all the six geopolitical \zones of Nigeria were included in the study. Since the study was aimed at assessing the literacy level of policy makers in the utilisation of STI indicators in policy making process in Nigeria, data from the six zones of the country were therefore included; hence there were no exclusion criteria. Each zone consists of a cluster of 5-7 states, including the Federal Capital Territory (FCT). The zones and their constituent states are displayed in Table 2.1.

The target groups comprised the National and State Assemblies Committees on Science and Technology, Education, Trade and Investment, Agriculture and Health. The Librarian of the National Assembly Library and Director of the National Institute for Legislative Studies were also sampled.

2.3.2 Federal and State Ministries

The Permanent Secretary (PS) as well as the Directors and Deputy Directors of five ministries were targeted for sampling. These ministries were:

i. Science & Technology

ii. Health

iii. Education

iv. Agriculture

v. Trade and Investment

A total of two hundred and sixty-five (265) respondents were sampled. From the Federal level twenty-three (23) respondents, seven (7) respondents (Permanent Secretary and six (6) directors/deputy directors in STI or related departments) each from FMST were sampled and at the selected cognate ministries; Agriculture, Health, Education and Trade and Investment, four (4) respondents each (Permanent Secretary and three (3) directors/deputy directors were also sampled (23). At the selected states' level, four (4) respondents (Permanent Secretary and three (3) directors/deputy directors were selected from the five (5) ministries same as the ministries selected at the federal level which gives a total of eighty (80).

From the National Assembly and states' assemblies, four (4) respondents (Chairmen/Deputy chairmen, clerk and two members) each from Committee on Science and Technology and from selected cognate committees: Agriculture, Health, Education and Trade and Investment. From five selected states' assemblies a total of hundred (100) respondents were sampled while at the National Assembly (Senate 20, House of Rep. 20). In total, 40 policy makers were purposively selected.

The information/data obtained so far has been transcribed / analysed and hereby reported using Statistical Package for Social Sciences (SPSS) and other statistical tools. In addition to this technical report, findings and policy recommendations from the study will be disseminated through published monographs and stakeholders' workshop.

2.4 Data Analysis

Data Analysis was prefaced by questionnaire editing and cleaning. This was done at two levels: On-the-spot field and office editing. Data was checked manually for errors; and coding of questionnaires was done before data entry. Epidata 3.1 was used for data entry while Statistical Package for Social Sciences (SPSS) version 15.0 was used to conduct statistical analysis. Descriptive statistical procedures were used in analysing the data.

2.5 Data Quality Assurance

In this survey, a high level of quality was assured through training of enumerators and pilot testing of the questionnaire. A three-day training was undertaken by the enumerators to discuss the details of the survey. This was done to ensure that they understand the study and its objectives. The questionnaire was pre-tested to determine its content validity. In addition, pre-testing of the questionnaire also enhanced field officers understanding, clarity and flow of questions. This helped to reduce interviewees' challenges associated with understanding of the questions. Minor changes to questionnaires were made appropriately before carrying out the main survey.

2.6 Challenges Encountered

The major obstacle encountered in the course of the study was the social unrest/conflict in the North East zone of the country which comprises six states, namely: Adamawa, Bauchi, Borno, Gombe, Taraba, Yobe. This geopolitical zone was therefore excluded from the study since the lives of the field workers cannot be guaranteed during the course of fieldwork. The second challenge encountered, although not a serious one, was that in the state and national assemblies, delays occurred during data collection as the legislators went on recess (holiday). This challenge was however surmounted as we continued data collection after resumption from the recess. This obviously affected the project implementation period.

CHAPTER THREE:

RESULTS AND DISCUSSIONS - THE LEGISLATURE

3.1 Information from Secondary Data Sources

In order to be able to situate these analyses and discussions into an appropriate context, it is imperative that a brief overview of the legislative process in the country is reported. Nigeria operates a Federal system of government with a central government in the Federal Capital Territory and thirty six states. At the centre, the federal government operates a bi-cameral legislature named the Senate and the House of Representative. However, a unicameral legislature is operated at the state level, which is referred to as the State House of Assembly.

3.2 The National Assembly of Nigeria

The National Assembly of the Federal Republic of Nigeria is a bicameral legislature established under section 4 of the Nigerian 1999 Constitution. It consists of a 109-member Senate and a 360-member House of Representatives. The term of the National Assembly is 4-years.

The Senate is the upper house of the National Assembly of Nigeria. It consists of 109 senators: the 36 states are each divided into 3 senatorial districts each electing one senator; and one seat in a single-seat constituency (the federal capital, Abuja). Hence, each of the 36 states has an equal number of three senators while the Federal Capital has one member in the senate. The President of the Senate is the presiding officer, whose chief function is to guide and regulate the proceedings in the Senate. The Senate is chaired by the President of the Nigerian Senate.

The House of Representatives of Nigeria is the lower house of the country's bicameral National Assembly. The House of Representatives has a total of 360 members who are elected from the 36 states and the Federal Capital Territory. The membership of the House of Representative from each state is determined by the population of the state. Hence, a state with a high population has more members in the House. The Speaker of the Nigerian House of Representatives is the presiding officer of the house. At any joint session of the Assembly, the President of the Senate presides and in his absence the Speaker of the House presides.

The current 7th National Assembly (2011-2015) was inaugurated on 6th June, 2011. Out of the 109 Senators of the Senate, 36 were re-elected while 73 were elected for the first time. Out of the 360 members of the House of Representatives, 100 were re-elected while 260 were elected for the first time. The National Assembly, like the other organs of the Nigerian government, is located in the Federal Capital territory Abuja.

At the state level, there is a unicameral legislative system. Each state has a House of Assembly where Legislative/policy making power is vested. Specifically, both the National Assembly and States' Assemblies have broad oversight functions over the affairs of the Federal and state governments.

3.2.1 Functions of the National Assembly

The primary responsibility of the National Assembly is to formulate policies and make laws for the conduct of the affairs of government. It also has broad oversight functions and is empowered to establish committees of its members to scrutinise bills and the conduct of government functions.

The Senate has the unique power to impeach judges and other high officials of the executive. This power is, however, subject to prior request by the President. The Senate also confirms the President's nomination of senior diplomats, members of the federal cabinet, federal judicial appointments and independent federal commissions.

Before any bill may become law, it must be agreed to by both the House and the Senate, and receive the President's assent. Should the President refuse assent to the bill, the Assembly may overrule the veto by passing the bill into law through the vote of two-thirds of members of both chambers.

3.3 Information from Primary data sources

This chapter presents the key outcomes of the national and state assemblies' surveys. The main information reported includes the socio-demographic characteristics of the lawmakers, awareness of STI indicators, utilisation of STI indicators in law-making process, among others. The results for the national and state assemblies were analysed and reported as one. The same procedure was applied to the analysis of the policy makers in federal and state ministries reported in Chapter Four.

3.3.1 Socio-demographic Analysis of the Parliamentarians

This section displays the general information on the respondents at both the national and state assemblies. The information includes gender, age, educational qualification and the field of study of the legislators.

a. Gender Distribution of the Respondents

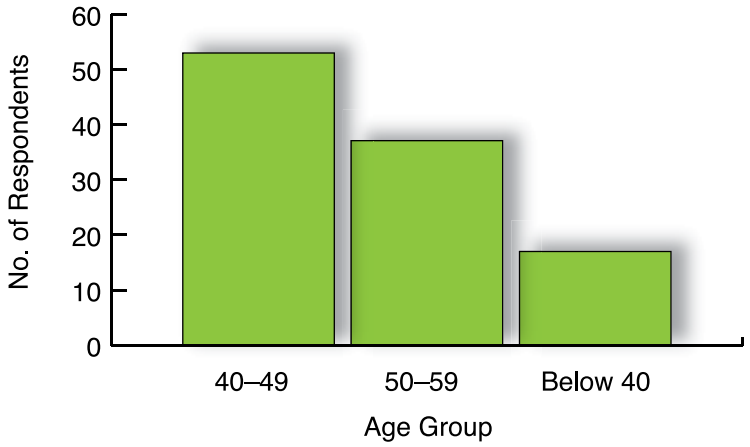
Figure 3.1: Gender Distribution of the Respondents

Information on gender distribution of legislators in Nigeria is described in figure 3.1. It reveals a male-dominated chamber with female legislators accounting for only 14% of our sample. Our sample reflects the gender state of legislators in Nigeria. For example at the National Assembly, only about 6.4% of the entire 469 members are females (NBS, 2011). Among the states, the situation was not any different. About 5.5% of legislators in states are women. However, some state house of assembly in Nigeria (such as Osun State) does not even have a

single female member. The imbalance in gender structure of membership in the legislature is not peculiar to Nigeria but common in most African countries. We note, for instance, that about 8% of legislators in Kenya are females (Barkan and Martiangi, 2013). There are improvements in some countries due to special constitutional provisions made for women representation (Uganda) or proportional representation (South Africa, Mozambique) (Barkan and Martiangi, 2013). This observation is most likely to have some policy implications with impact on the quality and direction of debates especially relating issues of women not only in Nigeria but in Africa.

b. Age Distribution of the Respondents

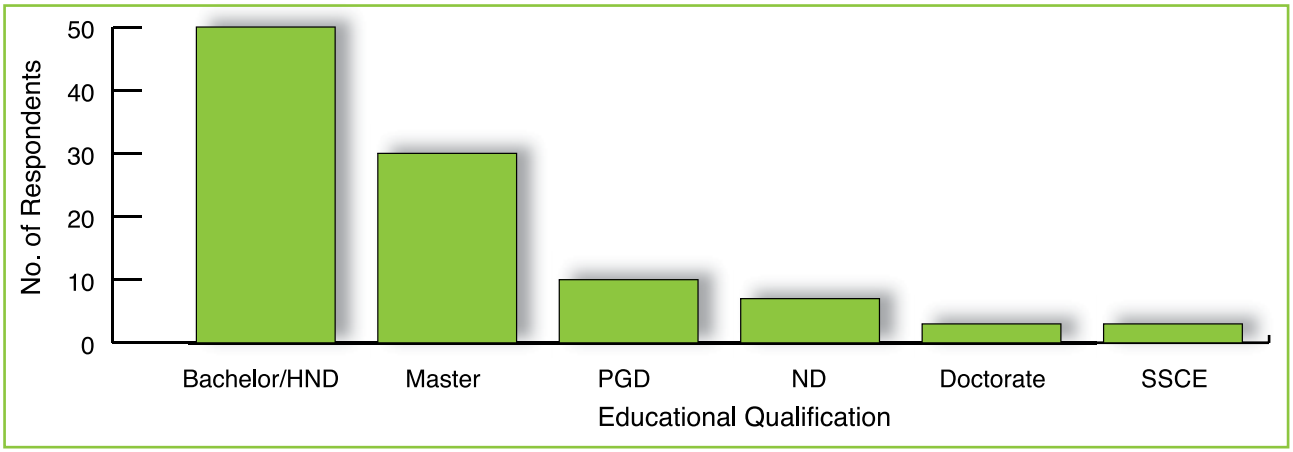
Figure 3.2: Age Distribution of the Respondents



The age distribution of the legislators from the national and state assemblies in figure 3.2 shows that the majority (53%) belong to the age group 40-49 years, while those between about 17% fall below the age 40. This is similar to situation in other African countries. In Kenya for example, though the average age of parliamentarians in the tenth parliament was about 50 years, the highest proportion of 37.1% is in the age range of 40 to 49 (Barkan and Matiangi, 2010). The higher middle age range in Nigeria may be attributed to the constitutional requirement for becoming a legislator in Nigeria which requires a person aspiring to become a Senator to have attained an age of 35 years while that of the House of Representatives is a minimum of 30 years (FRN, 1999). In advanced economies, such as the United States, the average of legislators is higher. For example in the 112th Congress of the United States, the average age of Members of the House was 56.7 years while that of the Senators was 62.2 years. The higher average age in the US, as in the case with most established democracies may be attributed to low rate of turnover among legislators. In Nigeria, there is a high turnover among legislators, which has been described as one of the highest in the world (NASS, 2012). Incumbent legislators typically lose their seats by failing to be re-nominated by their parties, rather than through defeat at the polls. In 2007, about 20% of legislators retained their seats from the preceding legislature. When surveyed in 2009, two-third of members was serving their first term (Lewis, 2011).

c. Educational Qualification of the Respondents

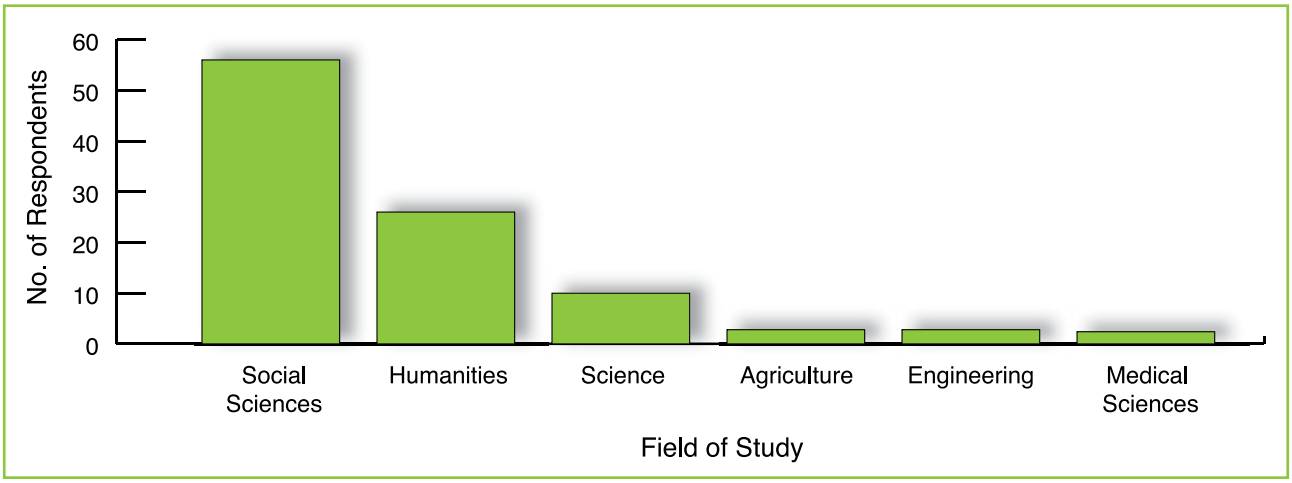
Figure 3.3: Educational Qualification of the Respondents



The educational qualifications of legislators, both at the National and State assemblies are of paramount importance to the formulation of policies in the country as it helps in mainstreaming sustainable STI strategies into the domain of public policies. Figure 3.3 reveals that bachelors/HND is the highest educational qualification of majority of the legislators followed by Master's Degree. About 50% of the legislators had Bachelor's degree while about 30% holds Master degree. This shows that the legislators possess the required capability to undertake their legislative activities. Given the significant number of bachelor's and postgraduate degrees holders among the committee members, this portrays parliamentarians with the capacity to assess, understand, analyse and utilise STI indicators information and be able to contribute meaningfully to debates and the policy formulation process. This number of legislators with university education is higher in Nigeria than in most African countries. For example, findings from the African Legislatures Project, a comparative study of the legislature in 17 African Countries supported by DFID, Heinreich, Böll Foundation, USAID, the University of Cape Town and the World Bank reveal that legislators with university education in Nigeria surpasses that of Uganda, Ghana, South Africa, Kenya, Tanzania among others (Barkan, et. al, 2013).

d. Field of Study of Respondents

Figure 3.4: Field of Study of Respondents



The analysis in Figure 3.4 displays the field of study (area of specialisation) of the parliamentarians both at the national and State Assemblies. The figure shows that majority of them (56%) had their educational background in the social sciences. Slightly one-fourth of them were from the humanities field of study and one-tenth from the sciences. Respondents from the medical sciences, agricultural sciences and engineering field of study had few representations; less than one-tenth of the whole. This was observed at both the national and state assemblies when the analysis was disaggregated.

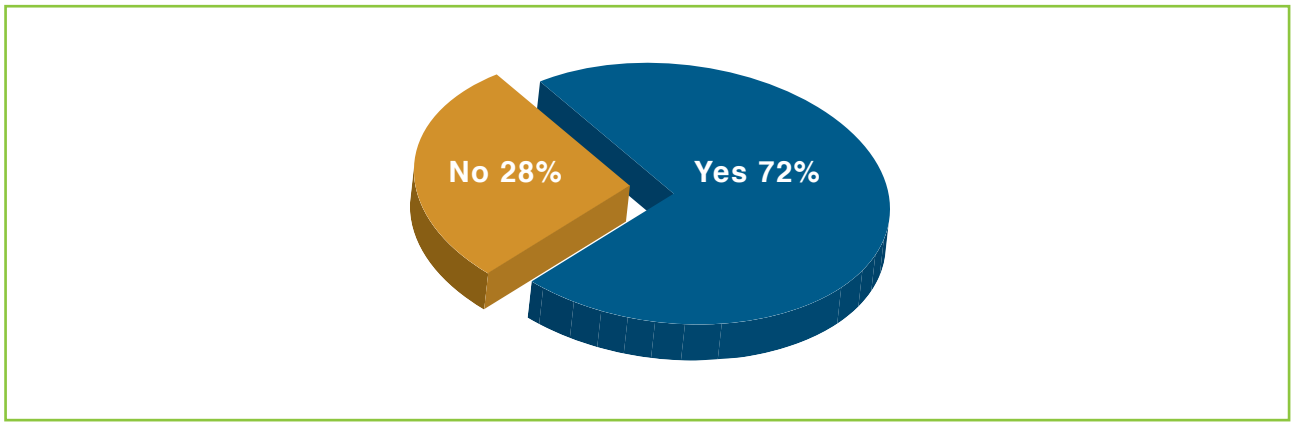
3.3.2 Awareness of STI Indicators among Lawmakers in Nigeria

In the developed world, appropriate science, technology and innovation policy derived from evidence-based activities through sound knowledge of existing relevant indicators serve as the critical driving force for their rapid industrialisation and national development. Many developing countries have adopted a similar development trend through various scientific and technological intervention efforts exemplified by substantial investments in R&D and a robust STI policy framework designed based on available scientific and technological indicators/ evidences. This is against the background that the poverty gap between developed and poor nations is largely a technological gap. It is however not surprising that the categorisation of nations into “advanced” and “developing” is based on their scientific and technological development (Godfred, 2007).

e. Awareness of Indicators by Lawmakers

In order to test and confirm the knowledge of our policy makers in Nigeria with regard to their level of awareness of STI indicators with a view to determining their ability to deploy the indicators in policy making process. The responses of Nigeria’s legislators are shown in Figure 3.5 below.

Figure 3.5: Awareness of indicators by Policy makers



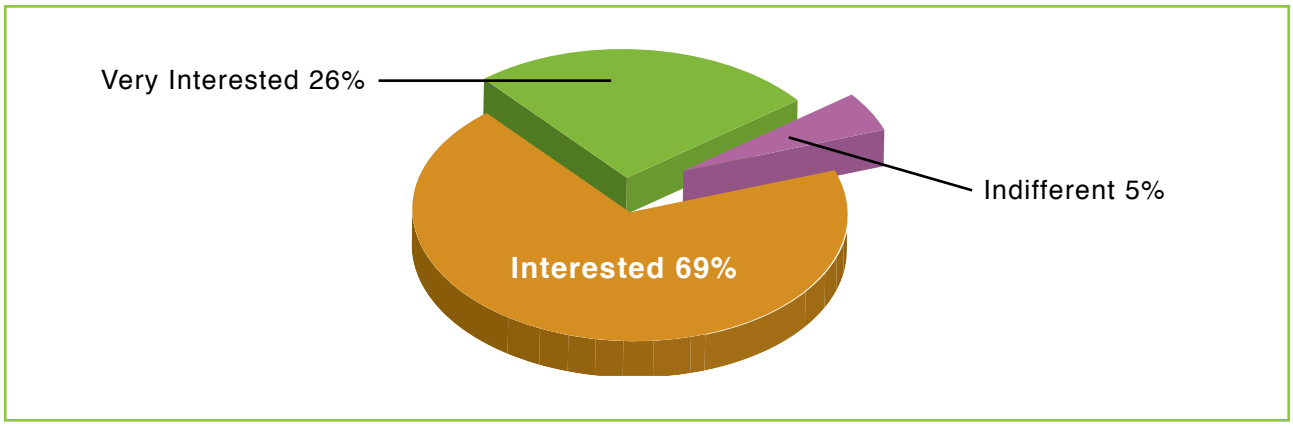
As discussed earlier, one of the key functions of the legislature is to make laws and perform oversight functions of the government activities. Among the respondents, 72% claimed awareness of STI indicators. Majority of the responses from the Key In-depth Interview (KII) also revealed a high level of awareness.

3.3.3 Level of Interest on STI Indicators

The parliamentarians were also asked to estimate their level of interest on issues that has to do with STI indicators. The responses presented in Figure 3.6 shows that majority of them 95% are very interested/

interested while only 5% are indifferent in the use of STI indicators for policymaking. This depicts that most of the respondents are actually interested in STI indicators matter.

Figure 3.6: Level of interest on STI Indicators



3.4 Knowledge of Policy makers on STI indicators

To further test the knowledge of legislators on the awareness of STI indicators, specific questions relating to their understanding of sectoral STI indicators relating to their activities were asked. The result of the question which asked the legislators for the meaning of STI indicators is presented in Table 3.1.

Table 3.1: Knowledge of Policy makers on STI Indicators

Knowledge on Key Indicators*	N	Percentages (%)
Indicators used to measure Scientific and Technological development	48	44.0
Indicators used to measure economic development	29	26.6
Indicators used to measure social development	17	15.6
Indicators used to measure political transformation	15	13.8
Total	**109**	**100**

*Multiple responses

Results in Table 3.1 show that about 44% of the respondents understand the meaning of STI indicators by choosing the definition that they are used to measure scientific and technological progress of a nation. However, further analyses show that majority of the legislators (52%) did not have the right understanding of STI indicators.

One of the quotes from the interviewers, when asked if they have heard anything about STI (Science, Technology and Innovation) Indicator:

> *"Yes, these are avenue(s) through which the Government or other agencies focus on the various changes in the agricultural sector e.g. Farming, land use, fertilizer and crop production."*
> ***- Member, House committee on Agriculture***

3.5 Knowledge of Output Indicators

In order to ascertain their level of understanding and knowledge of STI indicators, issues of patent and Research and Development (R&D) intensity were posed to the legislators. They were asked questions that tested their knowledge of specific indicators notably patent and R&D intensity. As shown in Table 3.2, majority (71%) of the respondents had a proper understanding of R&D intensity, 52% said it means the level of R&D activities in Nigeria is low and approximately 19% responded that it means that the amount of GDP devoted to R&D in Nigeria is 0.2%. Only few of the respondents chose a wrong response to the question on R&D intensity.

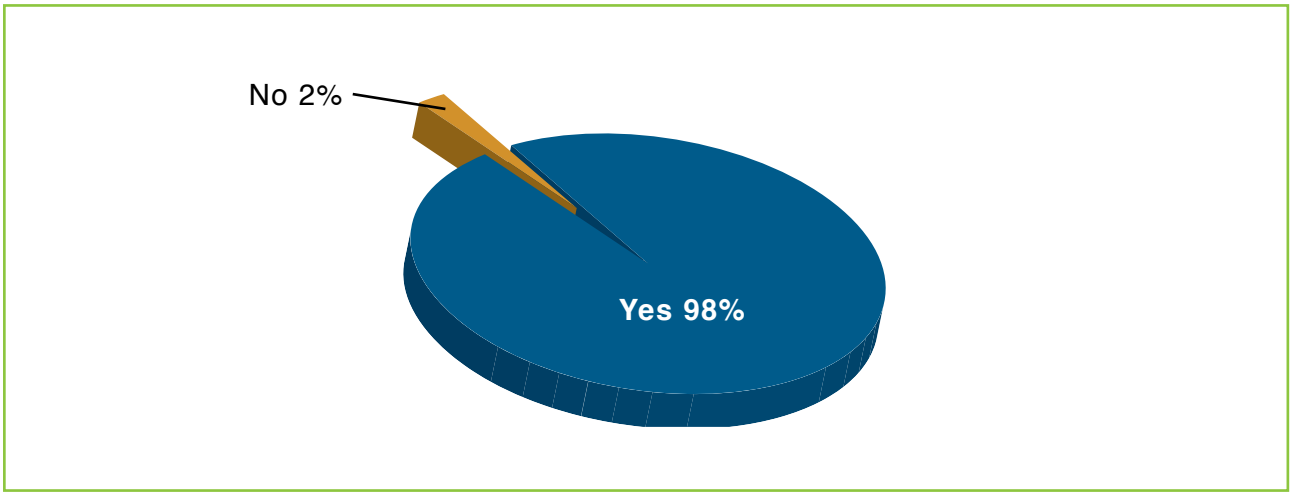
Knowledge of patent was also used to establish their level of understanding of STI indicators (see table 3.2). The result in table 3.2 depicts that majority of the parliamentarians (70.9%) have a good knowledge of what a patent is while very few of them were not quite knowledgeable about the indicator. This may not be too surprising as majority of the legislators have university education with about 30% having postgraduate degrees.

Table 3.2: Knowledge of Output Indicator (GERD) by the National and State Assemblies

What is the implication that Nigeria has R&D Intensity of 0.2?	**Percentage (%)**
It shows that the level of R&D activities in Nigeria is low	52.1
It shows that with minimum effort Nigeria can become global R&D player by year 2020	20.8
It means that the amount of GDP devoted to R&D in Nigeria is 0.2%	18.8
It shows that the level of R&D activities in Nigeria is high	6.2
It means that Nigeria belongs to a group of scientifically and technologically developed economy	2.1
Which of this is true about Patent?	
Inventions protected by law	70.9
R&D product/process that leads to wealth creation when exploited	12.7
R&D outcomes lacking applicability	9.1
Number of patients admitted in the hospital	7.3

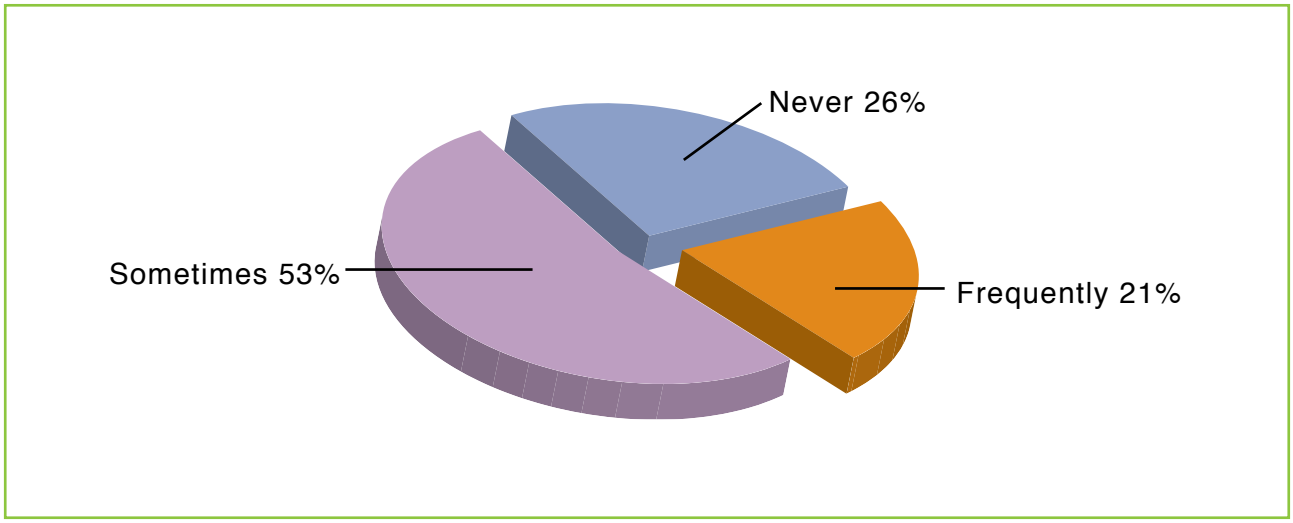
3.5.1 Utilisation of STI Indicators in Policy Making Process

Figure 3.7: Use of Empirical Data for Policy Making Process



In order to ascertain the level of utilisation of empirical data in law making process, legislators were asked to state whether they utilise the indicators as well as their level of use. Figure 3.7 shows the proportion of the respondents who used empirical data in the law-making process i.e. from policy conception/development to policy implementation. The figure reveals that the majority of the respondents (98%) use empirical data in law making process especially in oversight functions. To further corroborate the use of STI indicators among the respondents, the question on utilisation was also posed to the legislators during the KII and the major response was that STI indicators are important but not generally applied presently.

Figure 3.8: Frequency of Use of STI Indicators in the Parliamentary Activities



In order to ascertain the level of utilisation of STI indicators by the various committees surveyed, the study investigated the frequency of use in legislative activities. The result shows that only 21% of the legislators utilised the indicators frequently. The majority, about 53%, used the indicators occasionally while about 26%

did not use them. This shows that despite the utilisation of the indicators, majority of them do not use them frequently, but only on an ad-hoc basis.

3.5.2 The Extent of Use of Specific Indicators in the Policymaking Process

There are various indicators that lawmakers use in law making process (Table 3.3). This study sampled opinions of legislators from health, education, agriculture, science and technology and trade Committees with regards to specific indicators used in law-making processes. Analysis of responses from the education committee shows that numbers of teachers in ST&E disciplines was the most utilised indicator while total spending on STVE and the number of enrolment and graduates in STVE were the least utilised.

Table 3.3: The proportions of respondents that Use Specific Indicators in the Policymaking Process

INDICATORS	Percentages (%)
Health	
Doctor-patient ratio	18.8
Infant and Maternal mortality ratio	18.8
Per capital total expenditure on health	18.8
Health labour-force (in millions)	12.5
Population using improved sanitation facility	9.4
Density of Physician (Per 10,000 population)	9.4
Per capital total expenditure on health at average exchange rate	6.2
Crude death rate (per 100,000 population)	6.2
Education	
Numbers of teachers in ST&E disciplines	50.0
Gross Domestic Expenditure on R&D	25.0
Total spending on STVE	12.5
Number of enrolment &graduates in STVE	12.5
Agriculture	
Public agricultural R&D expenditures as a percentage of agricultural GDP	44.4
Numbers of laying hens	44.4
Public agricultural research staff per million agricultural labourers	11.1
Science &Technology	
Gross Domestic Expenditure on R&D	28.2
R&D intensity	23.1
Researchers per million	20.5
Number of Scientific publications	15.4
Number of patent generated	12.8

INDICATORS	Percentages (%)
Trade	
Manufacturing Value Added	23.5
Foreign Direct Investment (FDI)	17.6
Innovation propensity	17.6
Royalty and technical payments abroad	11.8
Manufactured exports per capita	11.8
Industrial intensity	11.8
Export Quality	5.9

Among legislators in health committee, doctor-patient ratio, infant and maternal mortality ratio and per capital total expenditure on health are the most utilised indicators used by about 19% of the legislators while Crude death rate (per 100,000 populations) is the least (6.2%).

In the analysis of indicators used by the agriculture committee, the study shows that the most utilised indicators are public agricultural R&D expenditures as a percentage of agricultural GDP and numbers of laying hens respectively as attested by about 44% of the members in the agriculture committee. About 11.1% of the respondents in the committee used public agricultural research staff per million agricultural labourers.

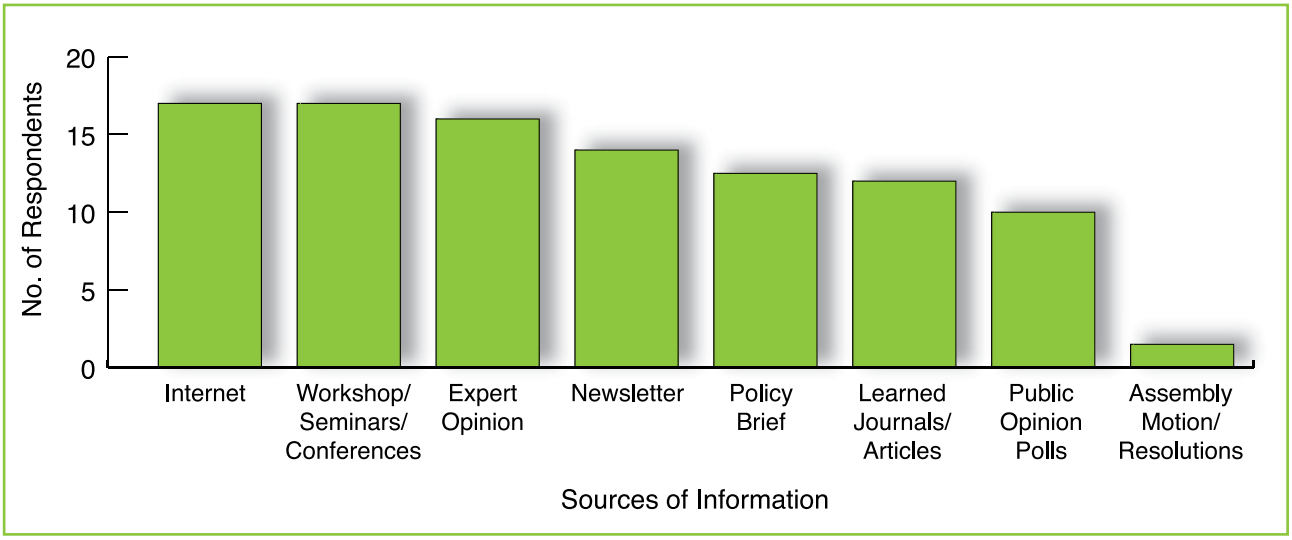
Analysis of the opinions of lawmakers from the S&T committee shows that Gross Domestic Expenditure on R&D is the most utilised indicator followed by R&D intensity. These are used by about 28% and 23% of legislators in S&T committees respectively. Meanwhile, few number of respondents in the committee utilised number of scientific publication (15.4%) and number of patents (12.8%) in law-making process respectively.

Among the legislators in the committee of trade, manufacturing value added is the most utilised indicator as attested to by 24% of the legislators while export quality was the least, used by about 6%. Other important indicators are foreign direct investment (FDI) and innovation propensity each used by about 12% of the legislators.

3.6 Sources of STI Indicators Information for Law-making Process

Lawmakers in both the national and state assemblies consult many sources of information on STI in their law-making activities. Figure 3.9 illustrates many of these sources.

Figure 3.9: Sources of STI Indicators Information for Law-making Process



Our analysis reveals that Internet, workshop/seminars/conferences and expert opinions are the most important sources of information for legislators as attested by about 17%. KII among the legislators also corroborated the use of expert opinions (consultants) in sourcing for information. However, learned journals were not an important source of information for legislators. Only 12% of the legislators chose learned journals as the source of indicators. Public opinion is the least source of information for lawmakers as attested by about 9% of the legislators.

3.7 Organisational Sources of STI Indicators

There are various organisations and institutions that provide repositories for indicators for legislators and policy makers. Some of these organisations include ministries/department/agencies, university-based research Institute, National Bureau of Statistics and International agencies.

Table 3.4: Organisational Sources of STI Indicators

Sources of information	Percentage (%)
Health	
Ministries/Department/Agencies	20.0
International agencies	17.1
University-based research Institute	14.3
Research Institutes/agency	14.3
Professional groups	14.3
Federal ministry of health	8.6
Consulting Firm	5.7
Health websites	2.9
National Bureau of Statistics	2.9

Sources of information	Percentage (%)
Education	
Ministries/Department/Agencies	16.7
Federal ministry of education	16.7
International agencies	16.7
Consulting Firm	11.1
National education research and development centre	11.1
National Bureau of Statistics	11.1
Research Institutes/agency	5.6
Workshops/seminar/conferences	5.6
University-based research Institute	5.6
Agriculture	
Ministries/Department/Agencies	20.4
Workshops/seminar/conferences	18.4
International agencies	14.2
Research Institutes/agency	12.2
University-based research Institute	10.2
National Bureau of Statistics	10.2
Consulting Firm	8.2
FMST	6.1
Science and Technology	
Ministries/Department/Agencies	18.2
National Bureau of Statistics	14.8
Research Institutes/agency	13.6
University-based research Institute	12.5
International agencies	11.3
FMST	8.0
Workshops/seminar/conferences	8.0
NACETEM	6.8
Consulting Firm	6.8
Trade	
Ministries/Department/Agencies	36.8
International agencies	15.8
University-based research Institute	10.5
Federal ministry of trade & investment	10.5
National Bureau of Statistics	10.5
Research institutes/agency	10.5
Relevant organisations	5.3

In the health committee, many of the lawmakers (20.0%) consult ministries/ department/agencies of the government while 17.1% of the committee members consult International agencies such as WHO and UNICEF as sources of their information on STI indicators. This is closely followed by the university-based research institute (14.3%), research institutes/agency (14.3%); professional organisations (14.3%) and Federal Ministry of Health (8.6%). Few of them use information from consulting firms (5.7), National Bureau of Statistics (2.9%) and health websites for policy formulation.

Some of the sources of STI used by the education committee are national education research and development centre, workshops/seminar/conferences, UNESCO, etc. Many of the respondents in the committee also make use of Ministries/Department/Agencies of the government (16.7%), Federal Ministry of Education (16.7%) and International agencies (16.7%). The committee also use National Bureau of Statistics (11.1%), national education research and development centre (11.1%), consulting firm (11.1%) for sources of information on STI indicators. Very few of them in the committee make us of university-based research institute (5.6%), research institutes/agency (5.6%) and workshops/ seminar/conferences (5.6%) as shown in Table 3.4.

Analysis of sources of information on STI indicators from the policy makers in the agriculture committee is shown in Table 3.4. It reveals that the committee utilises more information from the Ministries/Department/ Agencies of the government (20.4%), workshops/ seminar/conferences (18.4%) as well as International agencies (14.2%). In addition to these sources of information, they also make use of research institutes/ agency (12.2%), university-based research institute (10.2%), National Bureau of Statistics (10.2%). However, few of them (8.2%) use consulting firm and FMST (6.1%) as sources of information on STI indicators.

In the same light, this study also reveals that majority of the respondents in science and technology committee make use of Ministries/Department/Agencies of the government (18.2%), research institutes/agency (13.6%), university-based research institute (12.5%), FMST (8.0%) and workshops/seminar/conferences (8.0%). Meanwhile, many of them do not usually consult NACETEM (6.8%), consulting firms (6.8%), NEPAD (5.7%), UNIDO (4.5%) and PARP (1.1%) as sources of information on STI indicators

With regards to the members of committee in the trade ministry, the study shows that the, majority of respondents (36.8%) use Ministries/Department/Agencies of the government, followed by University –based research institute (10.5%), Federal ministry of trade and investment (10.5%), National Bureau of Statistics (10.5%), UNIDO (10.5%) and research institutes/agency (10.5%) as sources for their information on STI indicators. Very few of them consult UNCTAD (5.3%) and relevant organisations (5.3%) as sources of information on STI indicators. These analyses are shown in table 4.

3.8 Collaborations between legislative committees and organisational sources of STI Indicators

In order to effectively fulfil their mandate, legislators rely on collaborations with several agencies of government. Table 3.5 shows that about 30% of the legislators collaborate with various organisations to obtain policy advice which will enable them to effectively discharge their duties. The least form of collaboration is in the presentation of private bills. About 6% of legislators collaborated with organisations on developing and enacting private bills.

Table 3.5: Nature of Collaborations between legislative committees and organisational sources of STI Indicators

Forms of Collaborations	Percentage (%)
Policy Advice	29.0
Workshop	25.2
Training	20.6
Public Bill	19.1
Private Bill	6.1

3.9 Factors Influencing the Utilisation of STI Indicators

3.9.1 Obstacles to Accessing STI Indicators

Nigeria is bedevilled with lack of quality and current data especially those related to STI. Most countries lack institutions to produce these and where they exist, lack the capability. The few dataset found in international databases are in most cases inaccurate and obsolete, hence do not represent the facts on ground in most developing countries especially, sub-Sahara Africa.

Table 3.6: Obstacles to Accessing STI Indicators

	OBSTACLES TO ACCESSING INDICATORS	A	B	C
		Never an Obstacle (%)	Sometimes an Obstacle (%)	Usually an Obstacle (%)
A	Uncertainty of the integrity of the source of information	15.1	49.3	35.6
B	Unavailability of relevant information	46.9	28.1	25.0
C	Insufficient information on S&T challenges	20.4	29.5	50.0
D	Obsoleteness of information	29.7	32.4	37.8
E	Busy schedule of legislators	28.2	46.2	25.6
F	Lack of clarity of information	34.2	37.1	28.6
G	Scanty information	24.3	48.6	27.0
H	Technicality of the source of information	41.0	28.2	30.7
I	Inaccessibility of information	24.4	34.1	41.5

Utilisation of scientific information such as indicators in law-making process is predicated on several factors which can be classified broadly into the nature, medium of information and the capacity and lifestyle of the user. The major obstacles to legislators' utilisation of STI indicators are listed in Table 3.6. The biggest obstacle is the insufficiency of information on S&T challenges (50.0%). This may come in the form of medium and nature of producing these indicators. This is followed by inaccessibility of information (41.5%); obsoleteness of information (37.8%), uncertainty of the integrity of the source of information (35.6%) and the technicality

of information (30.7%). These are major challenges associated with the utilisation of indicators by legislators in Nigeria. One would also have expected the busy lifestyle of the legislators to constitute a major obstacle. However, this was not so. This suggests that despite their busy schedules, most legislators would still find a way to utilise these indicators if they are accessible, up-to-date, sufficient and friendly. Technicality of information was also not an obstacle to STI indicators utilisation. This suggests that the first concern of legislators is inaccessibility of STI indicators.

3.10 Suggestions for Removing the Obstacles

The most common suggestions on how to remove the challenges associated with the utilisation of STI Indicators are capacity building (27.3%) and increase of accessibility of scientific information (27.3%).

Table 3.7: Suggestions for removing the obstacles

Opinions (N = 66)	Percentage (%)
Improved capacity building	27.3
Provision of scientific information	27.3
Implementation/articulation of policies	13.6
Institutional strengthening and improved funding	9.1
Collaboration among all the stakeholders	7.6
Development and improved accessibility of STI database management	6.1
Innovative efforts	4.5
Improved research infrastructure	4.5

Legislators need closer interaction with policy research institutes for capacity building in the use of STI Indicators in policymaking process. Platforms such as Experts Forum initiated by NACETEM in 2006 should be undertaken more regularly to strengthen the capacity of legislators. Also, considering the busy schedule of legislators, these indicators can be made available in short and reader-friendly briefs which should be made more accessible to the policy makers on a regular basis.

CHAPTER FOUR:

RESULTS AND DISCUSSIONS - FEDERAL AND STATE MINISTRIES

4.1 The Executive

The Federal Executive Council or cabinet is headed by the president. He is elected by the people and he is both the chief of staff and head of government. The executive branch is divided into federal ministries, headed by a minister appointed by the President, who must include at least one member of each of the 36 states in his cabinet. The President's appointments are confirmed by the Senate. Each ministry also has a Permanent Secretary, who is a senior civil servant. A minister may be assisted by one or more ministers of State.

The ministries are responsible for various parastatals (government-owned corporations) such as universities (Education), the National Broadcasting Commission (Information) and the Nigerian National Petroleum Corp (Petroleum). Other parastatals are the responsibility of the Office of the Presidency, such as the Independent National Electoral Commission, the Economic and Financial Crimes Commission and the Federal Civil Service Commission.

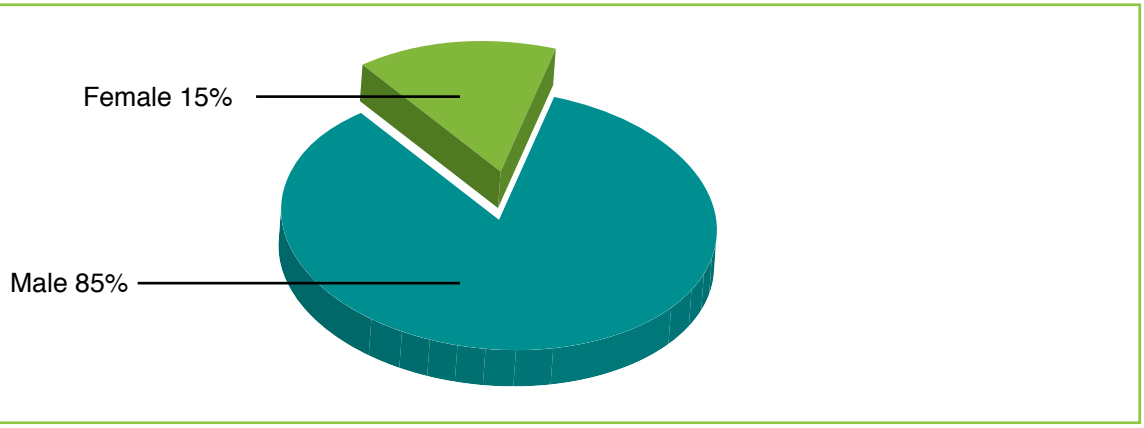
The Executive Branch of the Government of Nigeria has 19 Federal Ministries, each responsible for providing different aspect of government services. The ministries are staffed by career civil servants, but are headed by a politically appointed Minister, who reports to the President. Each ministry has a Minister who is appointed by the President, subject to approval by the Senate. Each ministry also has a Permanent Secretary, who is a senior civil servant. The Minister is responsible for policy formulation and the Permanent Secretary is responsible for the implementation of policy. In some cases, a Federal minister is responsible for more than one ministry, and may be assisted by one or more Ministers of State. The existing ministries in Nigeria are Agriculture & Water Resources, Aviation, Commerce and Industry, Defence, Education, Energy (Gas, Petroleum and Power), Environment, Federal Capital Territory, Finance, Foreign Affairs, Health, Information & Communications, Interior, Justice, Labour, Mines and Steel Development, Niger Delta, Police Affairs, Police Formation and Command, Science & Technology, Transportation, Tourism, Culture & National Orientation, Youth Development, Women Affairs, Works, Housing & Urban Development and Ministry of National Planning.

This chapter therefore presents the key findings from the respondents from both the State and Federal ministries. The main information reported include the socio-demographic characteristics of the policy makers, awareness of STI indicators among policy makers, utilisation of STI indicators in policy making process for effective policy formulation and implementation.

4.2 Socio-demographic Characteristics of the Respondents

4.2.1 Sex Distribution of Respondents

Figure 4.1: Sex Distribution of Respondents



The charts reveal the general information of the respondents in terms of sex, age, education qualification and rank. Economic growth is more effective in reducing poverty in societies that have higher levels of gender equality. In figure 4.1, majority of the respondents were males (85%) and females (15%). This could be a clear indication of under representation of women in the ministries. Meanwhile, balanced gender distribution may contribute to a more fruitful discussion about the necessary conditions, procedures and conventions on policies that could lead to more egalitarian institutions, and encourage equal participation of men and women in the society. Furthermore, a balanced gender distribution at the ministries and other government parastatals will ensure that all government's efforts consider and address the experiences, needs, and priorities of men and women at all stages. It will also assist government development outcomes benefit women and men equally. The present imbalance however, could represent a significant obstacle to promoting gender-responsive sustainable development. The age distribution shows that 76% of the respondents' age belongs to 50–59 years while 22.1% falls within 40–49 years; as shown in Figure 4.2. Looking at figure 4.3, the educational qualification of the respondents, exactly half of the respondents possessed Master degree, 33.3% had Bachelor/Higher National Diploma, 8.8% had Doctorate degree while 5.9% possessed Postgraduate Diploma.

Figure 4.2: Educational Qualification of Respondents

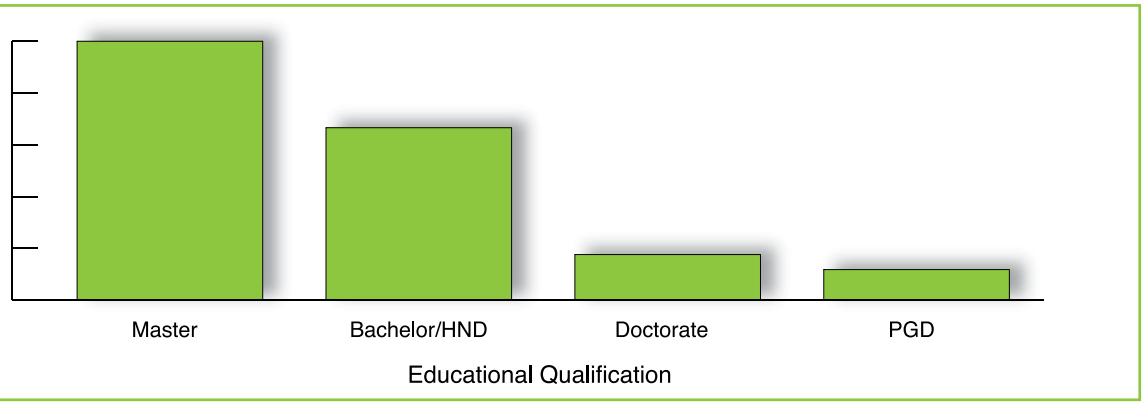


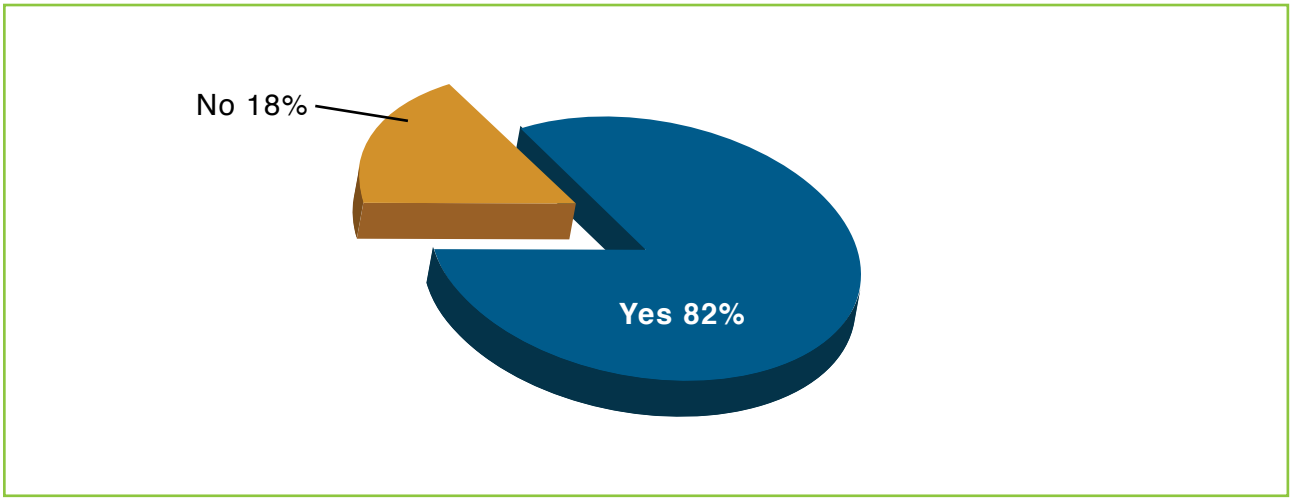
Table 4.1: Number of years spent as a Civil servant and in Directorate cadre

Number of years spent in Civil Service	Frequency	Percentage (%)
Less than 10 years	5	4.9
11–20 years	48	47.0
21–25 years	22	21.6
More than 25 years	27	26.5
Number of years spent in Directorate cadre		
Less than 1 year	13	14.6
1–4 years	31	39.6
5–8 years	15	24.0
More than 8 years	19	21.9

Table 4.1 presents the distribution of respondents from government departments. From the table, majority of the respondents have been working as civil servants for about 11–15 years and this accounts for 47% of the total respondents. 27% of the polled respondents have been working for over 25 years contributing to national growth of the country while 21.6% have spent between 21 and 25 years in service. The number of respondents working for 16–20 years and less than 11 years are very few as shown in the Table 4.1. Considering the number of years spent in Directorate cadre, more than one-third (39.6%) of the respondents have been directors for 1–4 years, 24% have been directors for 5–8 years. Over 20% of the respondents constitute the highest serving directors in the various ministries, agencies and department of government establishment while 14.6% have been directors for less than a year. Analysis in this table shows that most of the civil servants in the various ministries would have requisite knowledge of policy formulation based on the number of years they have spent in their various positions. It is also expected that they would understand some of the indicators used in their various ministries.

4.3 Awareness of STI Indicators among Policy Makers in the Ministries

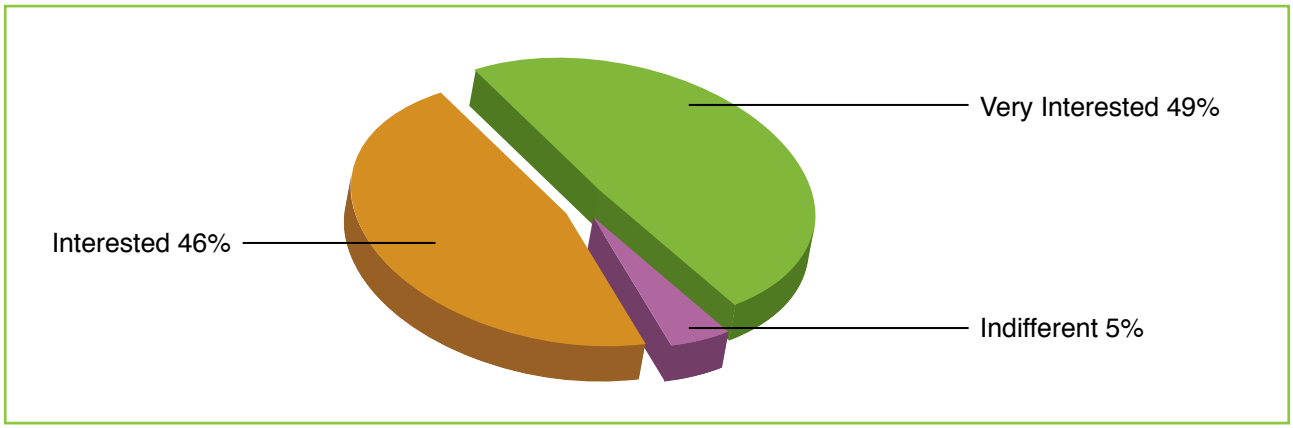
Figure 4.3: Awareness of STI Indicators among Policy Makers



There is a strong relationship between awareness of STI indicators and knowledge of its usage. It is expected that those that are aware are more likely to use the indicators in policy making process. Out of the total respondents selected for this study, 82% of them claimed to be aware of STI indicators while only 18% of the respondents were not aware of the indicators. This large number of respondents that are aware could increase the use of STI indicators at the ministry since they constitute the pool of civil servants that would use STI indicators in policy making process in the future.

4.4 Level of Interest of Policy Makers in STI Indicators

Figure 4.4: Level of interest of Policy Makers in STI Indicators



Given the high level of awareness of STI indicators among the respondents, it is not surprising therefore that majority of them are interested in STI indicators. Analysis in Figure 4.5 depicts the level of interest of the policy makers in STI indicators. As can be seen from the figure, most of the policy makers in the Nigerian ministries are interested in STI indicators. About 95% respondents are interested while only 5% are indifferent about STI indicators. Again, this is a good indicator that many of the policy makers are likely to use these indicators in their official engagements.

4.5 Knowledge of Policy Makers on STI Indicators

To further examine their knowledge on the awareness of STI indicators, specific questions relating to each Ministry were asked. Table 4.2 shows the respondents' opinions about their level of knowledge on STI indicators in relation to overall development.

Table 4.2: Knowledge of Policy Makers on STI Indicators

Knowledge on key indicators	N	Percentage (%)
Indicators used to measure Scientific and Technological development	92	44.0
Indicators used to measure economic development	64	30.6
Indicators used to measure social development	37	17.7
Indicators used to measure political transformation	16	7.7

Analysis presented in table 4.2 reveals that the knowledge of STI indicators among the respondents in the ministries is different from that of the committee members at both the national and state assemblies. As shown in table 4.2, majority of the respondents (90%) from the various ministries have the knowledge of STI indicators and their relevance to the overall national development. These analyses have shown that the policy makers have demonstrated high level of knowledge of STI indicators.

The assumption with the next analysis is that if the policy makers become more knowledgeable about STI indicators and its associated issues, they will, in turn, become more aware of its importance and its impacts in policy making process and, thus, be more motivated to use them in evidence-based policy making. In order to explore further the investigation on the knowledge of the policy makers on STI indicators, understanding of issues of R&D intensity and patent were also examined among the policy makers at the federal and state ministries. Analysis in table 4.3 reveals that the respondents have high knowledge of specific indicators of their respective ministries. In other words, majority of these policy makers in the ministries/agencies, departments of the government understand the implications of Nigeria having 0.2% "R&D intensity" and "patent".

4.6 Knowledge of Specific STI Indicators in the Federal and State Ministries

Table 4.3: Knowledge of Specific STI Indicators in the Federal and State Ministries

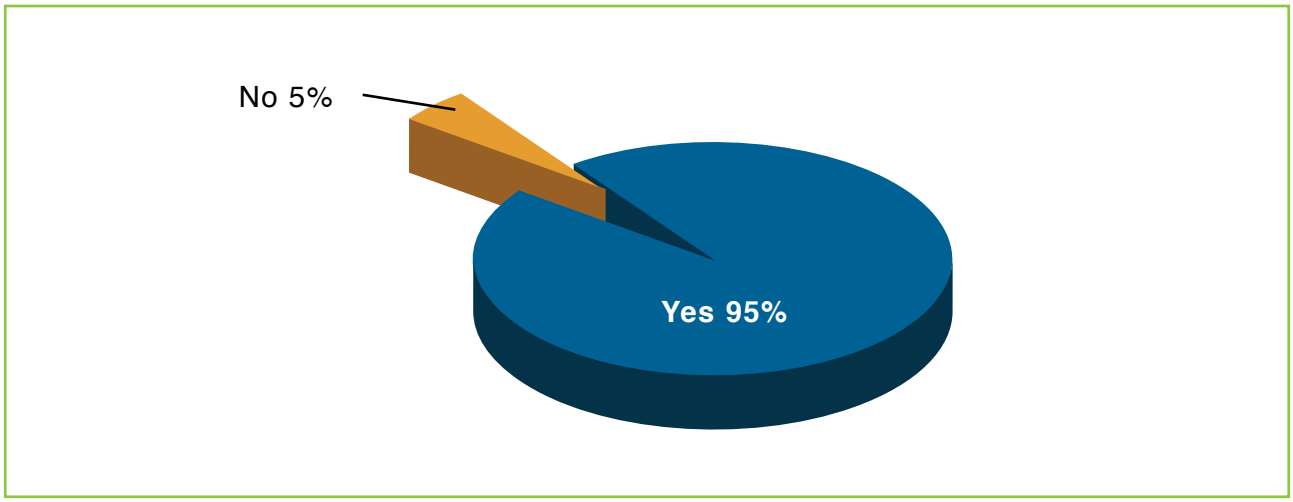
MINISTRY	N	Percentage (%)
What is the implication that Nigeria has R&D Intensity of 0.2?		
It means that the amount of GDP devoted to R&D in Nigeria is 0.2%	29	96.0
It shows that with minimum effort Nigeria can become global R&D player by year 2020	4	4.0
Which of this is true about Patent?		
Inventions protected by law	77	67.5
R&D product/process that leads to wealth creation when exploited	22	19.3
Number of patients admitted in the hospital	8	7.0
R&D outcomes lacking applicability	7	6.1

4.7 Utilisation of STI Indicators in Policy Making Process

The idea that policy formulation should be based on best research evidence might appear to be self-evident. But experiences have shown that there are a number of issues inherent in the concept of "evidence-based policymaking", most especially among the policy makers in Nigeria. Information on Figure 4.6 presents the analysis on how important or useful empirical data is for policy-making process. 95% of the Ministries affirm the importance of empirical data for policy making process while the remaining 5% does not consider it useful for policy making process. From this analysis, it could be implied that that majority of the respondents in the ministries understand the importance of using empirical data useful in policy-making process. It is indicative to say that programme, practice, or policy coming from these ministries would be grounded in the best available research evidence and informed by experiential evidence from the field and relevant contextual evidence. However, whether this is actually the case in reality among the policy makers remain to be seen.

4.8 Use of Empirical Data in Policy-making Process

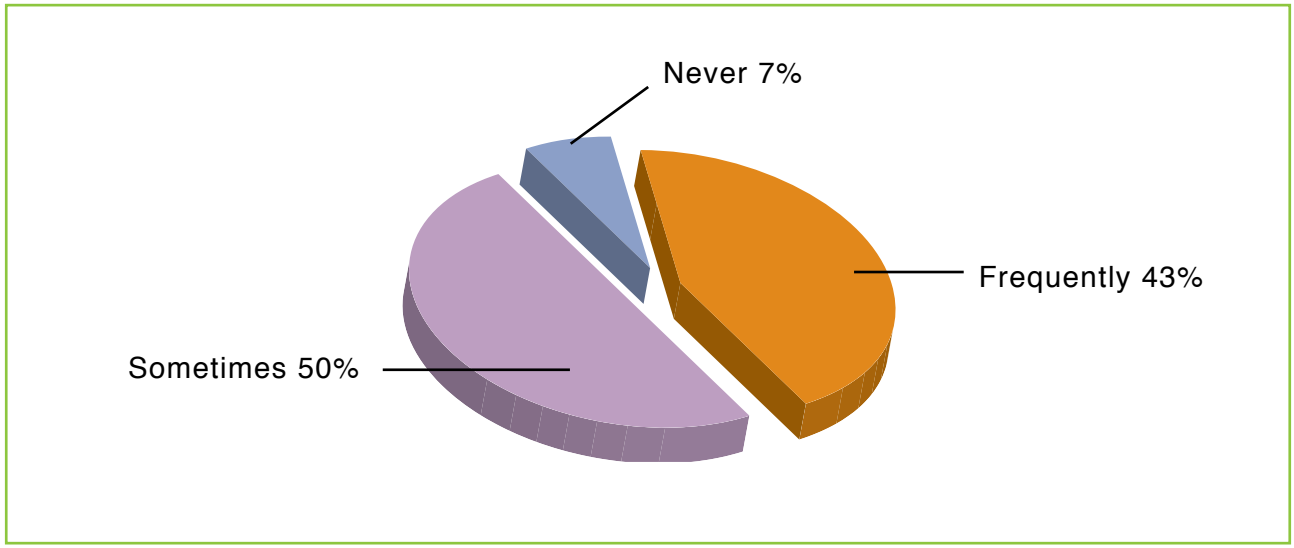
Figure 4.5: Use of empirical data in policy-making process



4.9 Frequency of Use of STI Indicators

The frequency of use of STI indicators in official activities by the ministry officials was also investigated as shown in figure 4.7. The analysis shows that half of the respondents (50%) sometimes use STI indicators while 43% frequently use indicators in official activities. Only 7% of the respondents never use indicators in official activities. Going by the information that majority of the policy makers use empirical data in policy formulation, it is expected that the frequency of use of STI indicators will be very high. Unfortunately, this is not the case. It is imperative therefore that there is the need to increase the frequency of use of STI indicators among the policy makers.

Figure 4.6: Frequency of Use of STI Indicators



4.10 The Use of STI Indicators in Policymaking Process among the Committees

This study also sought for responses from the permanent secretaries, directors and deputy-directors of the ministry of science and technology as well as those from cognate ministries such as from health, education, agriculture, trade with regards to their specific indicators used in their official duties. Table 4.4 presents the analysis on the indicators of the various ministries in policy making process. The information in the table shows that the officials of ministry of health majorly use infant and maternal mortality ratio indicator (21.1%). The next set of indicators used are doctor-patient ratio (18.3%), crude death rate (per 100,000 population) (14.1%), population using improved sanitation facility (12.7%) and per capital total expenditure on health and density of physician (per 10,000 population) accounts for 11.3%. Other indicators are health labour-force (in millions) (4.2%) and per capital total expenditure on health at average exchange rate (7.0%). The analysis indicates that virtually all the indicators were used in the official duties of the ministry staff.

This study further shows the analysis of the usage of indicators by the officials of ministry of education. This study shows that number of enrolment and graduates in STVE and numbers of teachers in ST&E disciplines is the most commonly used indicators (31.0%) in the ministry while total spending on STVE with 26.2% of the respondents is the next indicator frequently used. Other indicators used are number of scientific publications and researchers per million constituting 9.5% and 2.4% respectively (see Table 4.4).

The officials of the ministry of agriculture were also sampled for the study. Analysis of the indicators used shows that public agricultural R&D expenditures as a percentage of agricultural GDP (40.0%) and number of laying hens (35.0%) are the two most frequently used indicators. Public agricultural research staff per million agricultural labourers (10.0%), gross national production of poultry-meat (10.0%) and Nigeria share of world trade in cassava (5.0%) is the least used indicators by the officials of the ministry in their various activities.

With respect to the ministry of science and technology, GERD (25.0%), this is followed by R&D intensity (23.7%) while about 1 out of 5 respondents makes use of number of patents as one of the STI indicators in the ministry. Other indicators include number of researchers, researchers per million and R&D outputs consisting 15.8%, 13.2% and 1.3% of the respondents respectively. This analysis indicates that GERD is the most frequently used while R&D outputs is the least frequently used indicator in official activities of the ministry of science and technology.

In the analysis of the indicators used by the ministry of trade, FDI per capita (25.5%), manufacturing value added (17.0%) and manufactured exports (14.9%) are the most frequently used indicators. Meanwhile, export quality and industrial intensity (12.8%), high tech products as percentage of manufactured products (8.5%), innovation propensity (6.4%) and royalty and technical payments abroad (2.1%) are the least used indicators by the officials of the ministry. In all, most of the officials in the committees showed that they make use of some array of specific indicators during their official duties. The choice of these indicators reflects that many of them are used in policy making process as shown by the spread of frequency distributions of the usage among the respondents.

Table 4.4: The Use of STI Indicators in Policymaking Process among the Committees

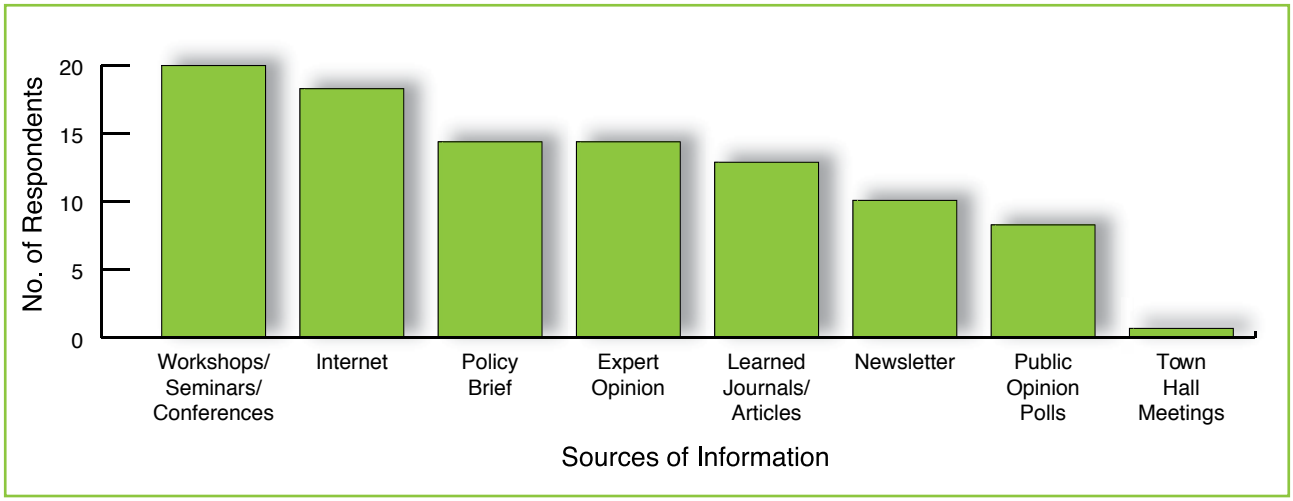
INDICATORS	
Health	**Percentage (%)**
Infant and Maternal mortality ratio	21.1
Doctor-patient ratio	18.3
Crude death rate (per 100,000 population)	14.1
Population using improved sanitation facility	12.7
Density of Physician (Per 10,000 population)	11.3
Per capital total expenditure on health	11.3
Per capital total expenditure on health at average exchange rate	7.0
Health labour-force (in millions)	4.2
Education	**Percentage (%)**
Number of enrolment & graduates in STVE	36.4
Number of enrolment & graduates in STVE	31.0
Numbers of teachers in ST&E disciplines	31.0
Total spending on STVE	26.2
Number of Scientific publications	9.5
Researchers per million	2.4
Agriculture	**Percentage (%)**
Public agricultural R&D expenditures as a percentage of agricultural GDP	40.0
Number of laying hens	35.0
Gross national production of poultry meat	10.0
Public agricultural research staff per million agricultural labourers	10.0
Nigeria share of world trade in cassava	5.0
Science &Technology	**Percentage (%)**
Gross Domestic Expenditure on R&D (GERD)	25.0
R&D intensity	23.7
Number of patents	21.1
Number of researchers	15.8
Researchers per million	13.2
R&D outputs	1.3
Trade	**Percentage (%)**
FDI per capita	25.5
Manufacturing value added	17.0
Manufactured exports	14.9
Export Quality	12.8
Industrial intensity	12.8
High tech products as percentage of manufactured products	8.5
Innovation propensity	6.4
Royalty and technical payments abroad	2.1

4.11 Sources of STI indicators information for Policies Formulation

This report takes the view that evidence-based policy should be based on systematic evidence (both the hard and soft evidence). Meanwhile, what is referred to as evidence varies. It could be expert knowledge; published research; existing research; stakeholder consultations; previous policy evaluations; the Internet; outcomes from consultations; output from economic and statistical modelling (Cabinet Office, 1999). From the foregoing, the breadth of evidence is therefore wide and dynamic (Shaxson, 2005). Figure 8 shows the various sources of information consulted for policy formulation at the Federal and State levels. At the federal level, the most common sources of information consulted for policy formulation are the Internet, policy brief, learned journals/articles and workshop/seminars/conferences as they account for 16.3% each of the total sources of information; this is followed by expert opinion and newsletters with 11.6% each of the total respondents. Other sources include public opinion polls and town hall meetings with 9.3% and 2.3% respectively. The town hall meeting is not a usual source of information at the federal ministries.

Similarly, at the state level, 1 out of 5 respondents depends on workshop/seminars/ conferences as the major source of information; this is followed by the Internet (18.3%) while expert opinion and policy brief account for 14.4% of the total sources of information. Other sources include learned journals/articles (12.9%), newsletter (10.1%), public opinion polls (8.3%), town-hall meetings (0.7%). This analysis shows that workshop/seminars/ conferences is the major source of information while town-hall meetings is the least common source of information both at the federal and state levels. Other sources like the Internet and policy brief are also very important in that they provide the policy makers with the necessary information needed for policy formation frequently. These analyses have a lot of implications for policy making in the country. This could mean that online communication platforms and policy brief are veritable tools that researchers can use in getting the outcome of their R&D to the policy makers at the federal level in Nigeria. Meanwhile, the situation is different at the state level where workshop/seminars/conferences, online communication platforms and policy brief are ways by which evidence can be passed across to the policy makers in general.

Figure 4.7: Sources of information on STI indicators



Many factors come into play in policy-making process. Different levels of policy-makers source for evidence in different ways for policy formulation. A critical aspect of policy making is the understanding of what constitutes

evidence. Without doubt, the sources of such information matter a lot. As a result of this, this study also examines the sources of information among the selected committees in the ministry/departments/agencies of the government. Table 4.5 analysis in the table shows that about 1 out of 5 respondents from the ministry of health got information about indicators from the National Bureau of Statistics. This is closely followed by the WHO which accounts for 16.9% of the total sources of information on the indicators while UNICEF and research institutes/agency account for 15.6% each. Other sources include University-based research Institute (9.1%) while the National Assembly and NGOs account for only 1.3% each of the total sources of information on indicators in the ministry of health.

The ministry of education cooperates with other organisations to obtain information on indicators. From the analysis of the officials in the ministry, the major sources of information on indicators are federal ministry of education and National Bureau of Statistics as they both account for 22.7% and 19.7% of the total respondents respectively. The ministry also sources for information on indicators from university-based research institutes (18.2%) and research institutes/agencies (16.7%). Other organisations/agencies include consulting firm (10.6%), NEPAD (9.1%); National Assembly is the least source of information on indicators.

The analysis of the sources of information on indicators in the ministry of agriculture shows that the research institutes/agencies are the most common organisation contacted for information (18.0%). National Bureau of Statistics and university-based research institute account for 16.9% each of the total sources of information. This is followed by the federal ministry of agriculture (15.7%) while FAO accounts for 11.2% of the total sources of information. Other relevant organisations that act as a source of information on indicators are FAO (11.4%), NEPAD (10.1%), National assembly (5.6%), Consulting Firm (4.5%) and IFPRI (1.1%).

In the ministry of Science and Technology, NACETEM is one of the most consulted agencies for information on indicators. It accounts for 15.1% of the total sources of information available to the ministry of science and technology. This is followed by departments and units under the ministry (12.9%) and university-based research institute (11.5%). Other sources of information on indicators include other ministries/departments/agencies, research institutes/agencies, workshops/seminars/conferences, UNESCO, National Bureau of Statistics, NEPAD and UNDP.

While analysing the sources of information on indicators in the ministry of trade, information in Table 4.5 shows that the research institutes/agency is the major source of information on indicators (19.0%). It was also revealed that the National Bureau of Statistics, UNIDO, consulting firm and university-based research institutes are also major sources of information as they account for 17.7%, 16.5% 11.4% and 18.2% of the total sources of information respectively. Other sources of information include UNCTAD (7.6%), relevant MDAs (5.1%), National Assembly (3.8%) and Federal Ministry of Trade (3.8%) Analysis of the sources of information among these committees shows that information sources among the committees differ greatly. Strategies on getting evidence-based information to them about indicators and its usage in policy making process should be committee-specific.

Table 4.5: Sources of Information on STI Indicators

Sources of Information	
Health	**Percentage (%)**
National Bureau of Statistics	20.8
Federal ministry of health	19.5
WHO	16.9
Research Institutes/agency	15.6
UNICEF	15.6
University-based research Institute	9.1
National Assembly	1.3
NGO'S	1.3
Education	**Percentage (%)**
Federal ministry of education	22.7
National bureau of statistics	19.7
University-based research institute	18.2
Research institutes/agency	16.7
Consulting firm	10.6
NEPAD	9.1
National Assembly	3.0
Agriculture	**Percentage (%)**
Research Institutes/agency	18.0
National Bureau of Statistics	16.9
University-based research Institute	16.9
Federal ministry of agriculture	15.7
FAO	11.2
NEPAD	10.1
Consulting Firm	4.5
National assembly	5.6
IFPRI	1.1
Science and Technology	**Percentage (%)**
NACETEM	15.1
FMST	12.9
University-based research institute	11.5
Ministries/departments/agency	10.1
Research institutes/agency	10.1
Workshops/seminar/conferences	10.1
UNESCO	9.4
National bureau of statistics	8.6
NEPAD	6.5
Consulting firm	4.3
UNDP	1.4

Sources of Information	
Trade	**Percentage (%)**
Research institutes/agency	19.0
National bureau of statistics	17.7
UNIDO	16.5
Consulting firm	11.4
University-based research institute	11.4
UNCTAD	7.6
Relevant MDAs	5.1
Federal ministry of health	3.8
National Assembly	3.8
Trade & industry associations	2.5
Newspaper	1.3

4.12 Factors Influencing the Utilisation of STI Indicators

Table 4.6: Obstacles Encountered in Accessing Information on STI Indicators

	OBSTACLES TO ACCESSING INDICATORS	A	B	C
		Never an Obstacle (%)	Sometimes an Obstacle (%)	Usually an Obstacle (%)
A	Integrity of the source of information	26.2	53.6	20.3
B	Unsure of the correctness of the information	31.3	41.0	27.7
C	Available information is not relevant to needs	41.6	40.3	18.2
D	Insufficient information on science/technological challenges facing my country/region	16.2	30.1	53.8
E	Information is out of date	26.6	30.4	43.0
F	Busy schedule	39.7	35.2	25.0
G	Information is not clear	26.6	45.6	27.9
H	Information is too scanty	30.6	31.8	37.7
I	Language is too technical	47.1	38.8	14.1
J	Inaccessibility of information	19.3	45.5	35.2

How to approach the utilisation of STI indicators in the policy formulation process and management in Nigeria seems to be a challenging subject because the process of evidence-based policy formulation in Nigeria is marred with a lot of obstacles. It is not surprising therefore that many expectations regarding the contribution of STI indicators to the development of sustainable STI policy have not been fulfilled. According to Table 4.6, the greatest obstacle to utilisation of STI Indicators by policy makers in the ministries was insufficient information (53.8%) while technicality of information (47.1%) was not considered as an obstacle. This shows that policy makers in ministries have the capability to interpret and understand STI indicators in policymaking

process if they sufficiently address the developmental and prevailing challenges in the country. The challenge, however, is the insufficiency of available information. Similarly, other big obstacles are outdated information (43.0%), inaccessibility (35.2%) and scanty information (37.7%) on indicators. The integrity of the information is also considered as an obstacle as reported by 23.5 % of the total respondents. It could be inferred from these analyses that with accessible, sufficient and complete information on indicators, Nigerian policy makers have the capability to utilise STI Indicators for national development. The onus therefore is on the appropriate agencies of the government to facilitate access to this information for utilisation by the policy makers.

Table 4.7: Suggestions on how to Remove Obstacles Encountered in Assessing Information on STI Indicators

WAYS TO REMOVE OBSTACLES (N = 91)	Percentage (%)
Capacity building	34.1
Accessibility to information/database	29.6
Collaboration between industry and research institutions	12.1
Government policies and laws	8.8
Provision of infrastructure	7.7
Organisations access to the Internet	2.2
Proper planning of programmes	2.2
Regular research/survey	2.2
Personal contact/effort	1.1

Several solutions were proposed on how to remove these obstacles (see Table 4.7). The predominant suggestions among policy makers were capacity building and facilitating access to relevant information and databases on STI Indicators. This suggests that policy makers need to be trained on how to utilise these indicators in policymaking process. It was also suggested that STI databases should be developed and made accessible to policy makers. This can be done through online access like those of international organisations such as OECD, World Bank, UNESCO, etc. It can also be made accessible through regular print medium such as POST NOTE, a policy brief of UK Parliamentary of Science and Technology. Workshops, seminars and conferences can also serve as a means of capacity building and information dissemination on STI indicators.

CHAPTER FIVE:

SUMMARY AND CONCLUSIONS

5.1 Major Findings of the Study

Legislators in the Assemblies and Senior Ministry Officials play critical roles in STI policy making process and put special efforts at getting the required information that will add to the process and quality of policy making. The trend in most developed economies is to engage in systematic and evidence-based policy dialogue and processes as means for improving policy formulation and practice (INASP, 2012). This has led to the development of STI indicators to measure different activities such as research and development, innovation, human resource, patent etc. in order to formulate appropriate STI policy. Hence, this study evaluated the literacy level of Legislators in selected committees of the Assemblies as well as Senior Officials in selected Ministries with the aim of determining the impact of STI indicators on policy making process in Nigeria. This was done through sets of structured questionnaires designed and administered to the respondents. This was supported by oral interviews for selected Legislators in S&T-related committees. The analysis combined empirical data and oral interviews, comparing the S&T-related committee members and senior Ministry Officials, drawing out practical conclusions. With respect to the first objective of the study, the univariate analyses results suggest that all findings from this study include information on:

Table 5.1: Major findings

S/N	Socio-demographic parameters	Legislators	Senior Ministry Officials
1	Gender	The imbalance in gender structure of the legislator is most likely to have some policy implications with impact on the quality and direction of debates on S&T and other issues;	Among the senior ministry officials, despite the gender imbalance, the officials are aware of STI indicators while only few did not have the awareness.
2	Educational qualification	Majority of the legislators have the requisite educational background for enhancing the quality of debates and the policy formulation process on issues in S&T area discussed in the Assembly;	Similarly, majority of the senior ministry officials have the requisite educational background for enhancing the quality of information and the policy formulation process on S&T issues in their respective Ministries;
3	Awareness	Majority of the legislators are aware of STI indicators and more specifically those related with the Committees which they belong;	Majority of the senior ministry officials are aware of STI indicators and they are more knowledgeable on those related with their specific Ministries;

S/N	Socio-demographic parameters	Legislators	Senior Ministry Officials
4	Indicator Literacy	Among the five (5) Committees sampled in the National Assembly, only two (2) committees (trade and industry, and Sciences) have full knowledge of specific indicators of their committees while others (health, agriculture and education) committee members lack knowledge of indicators relating to their sectors;	Majority of the respondents from the various ministries have the knowledge of specific indicators and their relevance to overall national development in their respective ministries.
5	Relevance of Empirical data for policy making	In the Assembly, majority of the legislators sometimes use empirical data for policy making process;	Majority of the senior ministry officials find empirical data useful for policy-making process with a little more than half of them sometimes using indicators.
6	Frequency of Use of Indicators	All the legislators sampled use many of the indicators frequently, although with preferences in the various committees with the exception of Science and Technology which do not have any preference for any particular indicator;	Ministry officials use many of the indicators frequently and also with preferences for some more than the others.
7	Sources of information	Majority of the legislators consult many sources of information on STI for policy making with little preference for public opinion poll and motion/resolution	At the Ministry level, the most common sources of information consulted for policy formulation on S&T are the Internet, policy brief, learned journals/articles, and workshop/seminars/conferences
8	Sources of STI information	The legislators in their different committees source for their information on STI indicators majorly from their related/ supervising Ministries, Departments and Agencies, and international development partners/agencies;	The senior ministry officials source for their information on STI-related indicators majorly from the National Bureau of Statistics, their related/supervising Ministries, Departments and Agencies, and international development partners/ agencies;
9	Obstacles to the use of STI indicators	In the Assembly, the major obstacles to legislators' utilisation of STI Indicators is inaccessibility of information;	On the contrary, the greatest obstacle to utilisation of STI Indicators by senior officials in the Ministries is insufficient information.
10	Action plan to remove barriers	Capacity building and accessibility of scientific information are the main solution to the challenges associated with the inability of the legislators to understand and utilise STI Indicators in policy making process in their various committees.	Capacity building and facilitating access to relevant information and databases on STI Indicators are the main solution to the challenges associated with the inability of the ministry officials to understand and utilise STI Indicators in policy making process in the various ministry.

5.2 Recommendation and Conclusion

Until recently, formulating reliable and effective Science, Technology and Innovation (STI) policy had remained a difficult task for Nigerian law and policy makers. This can be deciphered from the inability of previous S&T policy documents to solve the various developmental challenges facing the country. Although the recently approved STI policy (FMST, 2012) has been able to resolve some of the problems associated with S&T policy design, the level of awareness and ability to utilise available data, otherwise known as STI indicators, in policy

formulation process among the Nigerian law and policy makers still need to be further strengthened. The detrimental effect of this on overall national development obviously requires serious research effort in order to proffer effective and reliable solutions. These indicators are only valuable and have positive effect on economic development (Gault, 2010) if they are effectively deployed in policy making processes. However, a major challenge in most of the developing countries such as Nigeria is in transiting from research to policy (Nath, 2011). Central to this is the understanding of law by policy makers of the key STI indicators which surprisingly is very low in Nigeria. This therefore necessitated the need to assess and examine the level of awareness and literacy of STI indicators among law and policy makers in Nigeria in order to enhance evidence-based policy making process.

This study fills this gap by providing a multi-layered analysis of the level of awareness and literacy of STI indicators among the primary users of STI indicators data including the Legislators of the Assemblies, Federal Ministry of Science and Technology, cognate Ministries (Health, Education, Agriculture, and Trade and Investment) and other senior government officials engaged in S&T policy making process in Nigeria. Based on these findings, the study confirmed the need to increase the level of awareness of, and create incentive and mechanism for law and policy makers to utilise STI indicators in order to remove bureaucratic and systemic issues impeding evidence-based policy processes in the field of science, technology and innovation in Nigeria. It also shed light on the available sources of information on STI indicators, law and policy makers' willingness and impediment to effectively utilise the indicators in debate and policy-making process. The study also examined the factors affecting the adoption and use of STI indicators as well as how to enhance the capacity of law and policy-makers in the formation of better informed policy necessary to fast-track sustainable S&T development across the nation. The study concluded by suggesting further critical areas of research with respect to strengthening the capabilities of Nigerian law and policy makers in the STI policy making process in the country.

5.3 Recommendations

Government should encourage the Legislators and Senior Ministry Officials to explore and make use of variety of sources for relevant information needed to enhance the quality S&T information gathering for policy and law making in Nigeria.

There is need to also strengthen the existing interactions and broaden collaboration among the actors in STI policy making process in order to increase awareness and utilisation of other STI indicators other than those of sectoral concerns.

Efforts should be made to create awareness about STI indicators by regular organising training and capacity building programmes for law and policy makers in the understanding and practical utilisation of relevant and appropriate indicators in the policy making process.

5.4 Further Areas of Research

Several issues came up from this study which could be explored further. Some of these issues include:

i. The influence of Post graduate degree (particularly PhD) on the quality of debate in the National Assembly in Nigeria;

ii. Periodic training of all policy makers at all levels on key STI and other indicators from other ministries;

iii. In-depth analysis of factors affecting utilisation of STI and other indicators in policy making process in Nigeria;

iv. Ways of better facilitating interactions between and among the ministry officials and Policy makers.

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