



REPUBLIC OF GHANA

ICT INFRASTRUCTURE FRAMEWORK 2018-2047



National Development Planning Commission

ICT INFRASTRUCTURE FRAMEWORK

of the

GHANA INFRASTRUCTURE PLAN

2018-2047

The Ghana Infrastructure Plan is a
companion document of the
40-Year National Development Plan (2018-2057)

It draws substantially from the National Spatial Development
Framework (2015-2035) as a critical complement to
infrastructure delivery through the efficient use of land and the
planning of human settlements, including public transport

ACKNOWLEDGEMENTS

As a long-term document, the Ghana Infrastructure Plan (GIP) is a framework, or a master plan, for the preparation of medium-term and annual infrastructure plans by successive governments up to 2047, 10 years before the completion of its “mother” document, the *40-Year National Development Plan*. It was prepared with the support of many individuals and institutions. The vision and commitment of both the previous and current leadership of the Commission, particularly chairmen P.V. Obeng, Prof. Kwesi Botchwey, Prof. Stephen Adei, Prof. George Gyan-Baffour, and Dr. Nii Moi Thompson, proved highly valuable from the start to the completion of the GIP.

We wish to express our profound gratitude to the members of the Commission, especially the Energy as well as Infrastructure, Spatial Planning and Human Settlements thematic committees, who rigorously reviewed the plan and provided insightful comments for its preparation and finalisation.

We also acknowledge the team of specialists made up of government experts and consultants, led by Ing. Charles K. Boakye, who brought their vast experience to the preparation of the plan. Special appreciation goes to the Ministries, Departments and Agencies (MDAs) for providing the necessary data for the Plan and participating at every stage in its preparation and completion.

Last but not least, the staff of the Commission deserve special commendation for burning the proverbial midnight oil to ensure that the contents of the plan conformed to the development aspirations of Ghanaians as outlined in the 40-Year National Development Plan, officially known as “Ghana Rising: Long-term National Development Plan of Ghana (2018-2057).

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The GIP has been translated into the following frameworks:

1. Energy Infrastructure Framework
2. Transport Infrastructure Framework
3. Water Infrastructure Framework
4. Human Settlements and Housing Infrastructure Framework
5. Social, Civic and Commercial Infrastructure Framework
6. ICT Infrastructure Framework
7. Institutional Development Framework
8. Results Framework
9. Financing Framework

ICT INFRASTRUCTURE FRAMEWORK

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LIST OF ACRONYMNS AND ABREVIATIONS

BOT	Business Processing Outsourcing
CICs	Community Information Centres
GIFEC	Ghana Investment Fund for Electronic Communications
GSS	Ghana Statistical Service
ICT	Information and Communications Technology
ICT4AD	ICT Policy for Accelerated Development
IoT	Internet of Things
MESTI	Ministry of Environment, Science, Technology and Innovation
NCA	National Communications Agency
RFID	Radio Frequency Identification
SPV	Special Purpose Vehicle
STI	Science, Technology and Innovation
TIA	Tertiary Institutions Access
ITU	International Telecommunication Union

HIGHLIGHTS

Accelerating the digital revolution

ICT

- Ghana's Internet penetration per population as at March, 2017 was 27.8%, which is low as compared 77.8% in Kenya and 57.3% in Morocco, and 96.3% in Norway and 91.6% in United Kingdom. It is expected that this will be increased to 99% by 2047.
- Ghana has made strides in international and local fibre optic connectivity through connection to five international submarine fibre optic cables.
- In spite of the improvement in fibre optic networks, broadband internet access still remains low, thus fibre optic cables will be extended to remote areas, schools and health facilities and other public areas.
- ICT facilities to be created in each region include ICT parks, Incubators, digital data centres, community information centres, etc.

- Smart city innovations will be employed in major cities in the country, beginning with the upgrading of the national capital into a smart city.
- Public places like transport terminals, trains and buses and recreational centres will be connected to broadband internet services so that while on the move, people can have internet access. This can also contribute to job creation and income generation.
- The ongoing E-Transform Ghana Project will provide the necessary ICT infrastructure for effective, efficient and transparent e-government and economic system.

- A major action plan in the NSDF was to translate the framework into an online GIS database. This system will be periodically updated with new images and dimensions with time/date data to inform policymaking and analyses
- Database infrastructure and institutions must be established for the collection, analysis and reporting of annual ICT statistics for the socio-economic development of the country.

- The National Cyber Security Policy and the National Interoperability Framework, among others, that have been developed, will be implemented.



Chapter 1.0 Information and Communications Technology

1.1 Introduction

Ghana is one of the pioneers in national information and communications technology (ICT) reforms in Africa. In 1994, the country became the first on the continent to liberalise the telecommunication sector to encourage competition. Since the 2000s, Ghana has been active in developing ICT policies and strategies to promote socio-economic development.

Following the development of the 2003 ICT Policy for Accelerated Development (ICT4AD), other national policies such as the National Telecommunication Policy (2005) and the National Cyber Security Policy and Strategy (2016) have been developed. In addition, some sector specific policies and strategies, including the ICT in Education Policy (2008) and the E-Health Strategy (2010), have also been developed.

In recent years, Ghana's ICT sector has seen appreciable improvements in mobile and internet penetration, international and inland fibre optic connectivity as well as ICT parks and incubators. However, the country is yet to fully exploit the opportunities offered by these resources, especially for intensive use for e-government, e-business, e-commerce, e-health, e-education, e-research, etc. As the country seeks to become a high-income economy by 2057, there is the need for an ICT infrastructure and policy plan to help achieve this long-term socio-economic goal.

1.1.1 Goal and Objective

The overarching goal of the ICT Infrastructure and Policy Plan is to “build a 21st century digital infrastructure to drive economic growth, improve governance, enhance competitiveness, and support social development, while positioning Ghana to play a leading role in the development and export of technology globally”.

The objective is to “ensure that all public and private organisations as well as citizens have access to quality ICT infrastructure and services regardless of location and status”.

18.2 Priority Focused Areas

The ICT Infrastructure and Policy Plan is anchored on the following priority areas:

- Telecommunication infrastructure
- ICT facilities
- National digital and e-government infrastructure
- Geographic information system database
- ICT infrastructure financing
- Areas for ICT policy updates
- Areas for ICT laws updates

1.2.1 Telecommunication Infrastructure

Broadband Infrastructure

Broadband access has increasingly become very significant for economic growth of nations. According to the World Bank, in middle-income countries such as Ghana, a 10 percent increase in broadband penetration leads to a 1.38 percent increase in economic growth¹. Telecommunication infrastructure forms the fundamental backbone for broadband penetration in any country. According to the Internet World Statistics², Ghana's internet penetration per population as at March 2017 was 27.8 percent. This rate is below that of leading countries in Africa, such as Kenya (77.8 %), Mauritius (62.7 %), and Morocco (57.3 %). Ghana's penetration rate is also way below that of international leaders such as Norway (96.3%), Netherlands (95.5%), and United Kingdom (91.6%). As Ghana seeks to become a high-income nation, there is the need to do more to catch up with not only our African neighbours, but global leaders in ICT as well.

Required Actions:

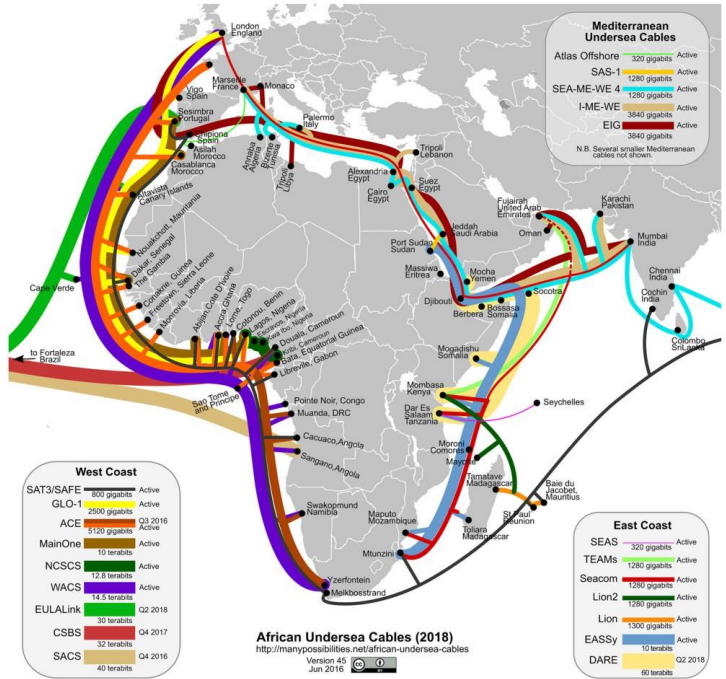
- Ensure that all households and citizens have access to broadband services;
- Ensure that Ghana has the highest internet penetration in Africa;
- Ensure that Ghana becomes the leader in broadband development in Africa; and
- Ensure that Ghana achieves internet and broadband penetration rates comparable to that of leading economies in the world.

¹ World Bank ICT 4 Development Report 2009
² <http://www.internetworldstats.com/stats1.htm>

Fibre Optic Infrastructure

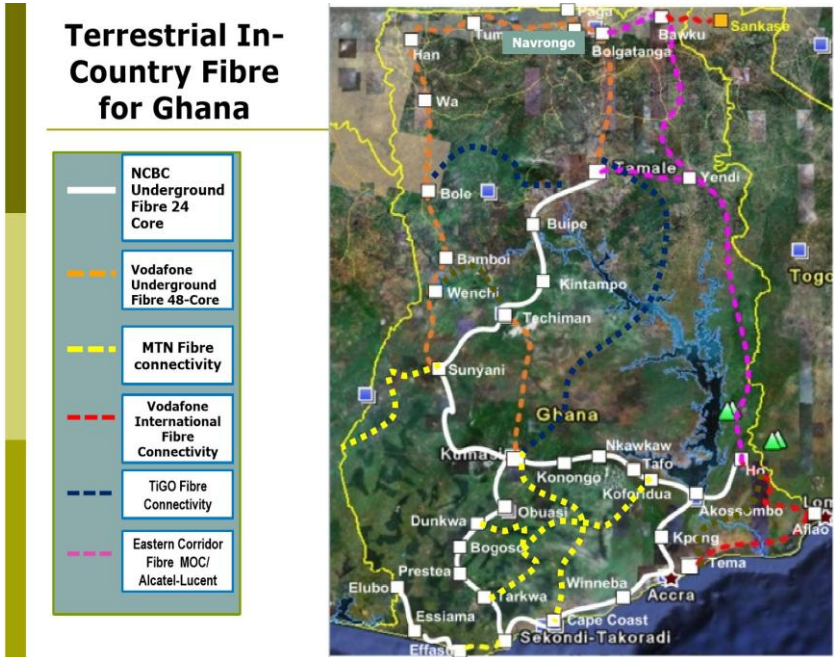
In recent years, Ghana has advanced in international and local fibre optic connectivity. The country is now connected to five international submarine fibre optic cables as shown in Figure 1.1.

Figure 1.1: African Undersea Cables (2018 Project)³



Inland fibre optic network connectivity has also improved as shown in Figure 1.2.

Figure 1.2: Terrestrial In-Country Fibre for Ghana



Source: Ministry of Communication

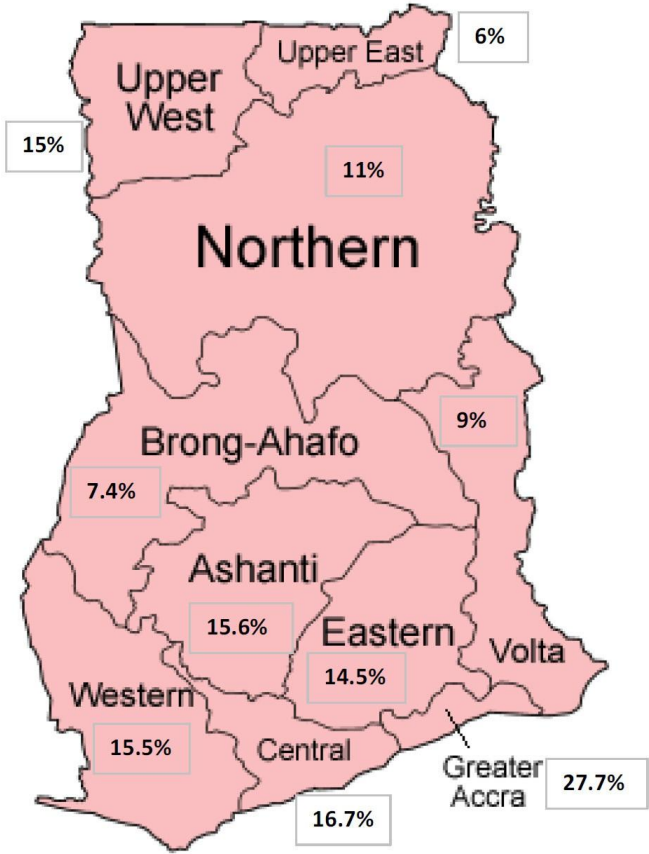
³ <http://manypossibilities.net/african-undersea-cables>

Figure 1.2 shows the coverage of inland fibre optic networks as at the year 2016. The latest achievement was the completion of the Eastern Corridor Fibre Optic Network to connect Ho to Bawku with a link from Yendi to Tamale. This network is expected to connect over 120 rural communities and provide ducts for extension.

Internet Penetration

Notwithstanding the significant improvement in international and inland fibre optic networks, broadband internet access across the country remains low. According to 2017 International Telecommunication Union (ITU) figures, only 17.1% of Ghanaians use the Internet⁴. In addition, there are wide variations in regional access to the internet as shown in Figure 1.3.

Figure 1.3: Internet Penetration in Ghana by Region (2013)⁵



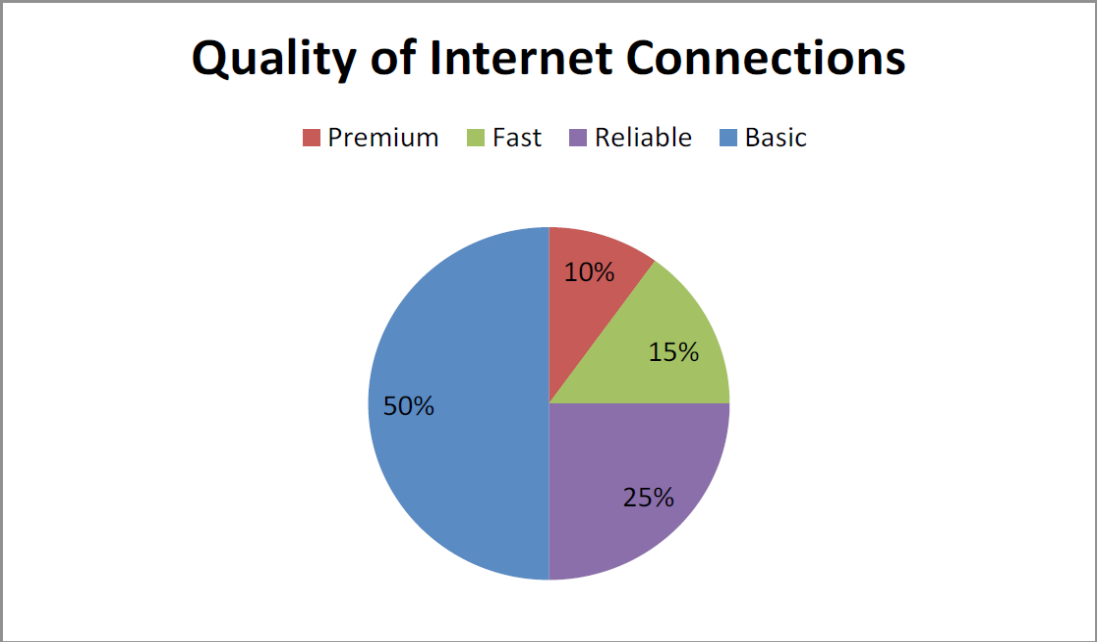
Source: USAID Report for Ministry of Communications and GIFEC, 2013

Also, as shown in Figure 1.4, bandwidth capacity remains low while the usage has largely been for news and social media and less for economic purposes.

⁴ <https://www.oecd.org/aidfortrade/casestories/casestories-2017/CS-03-A4AI- Affordable-Internet-in-Ghana.pdf>

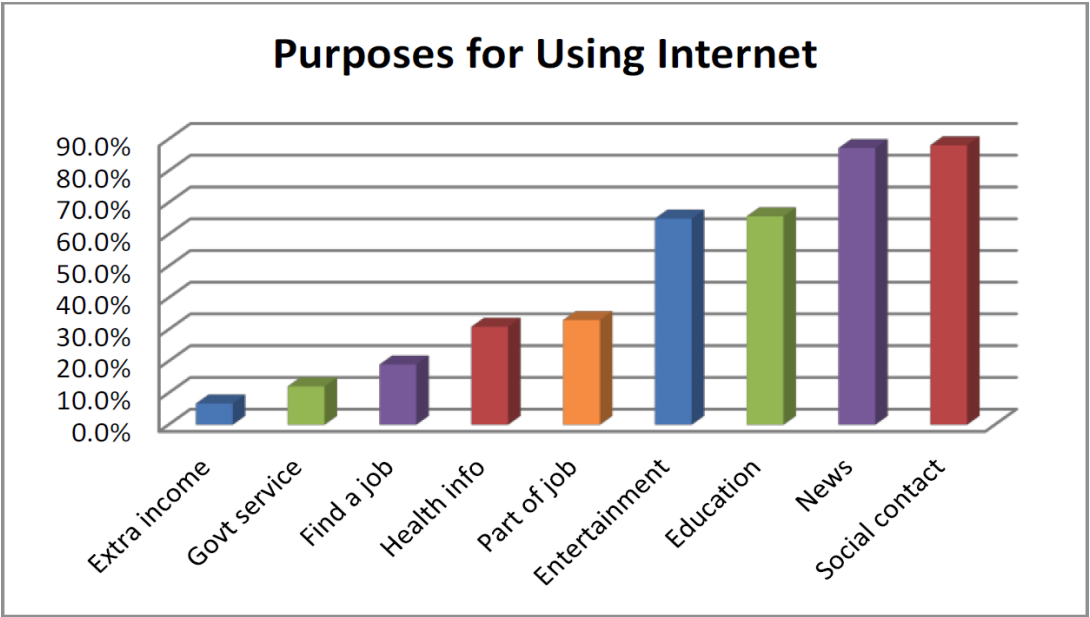
⁵ USAID 2013, Digital divide in Ghana: Analysis and recommendations, Report for the Ghana Ministry of Communications and Ghana Investment Fund for Electronic Communications (GIFEC)

Figure 1.4: Quality level of Internet Connections (2013)⁶



Source: USAID Report for Ministry of Communications and GIFEC, 2013

Figure 1.5: Purposes for Internet Use in Ghana⁷



Source: USAID Report for Ministry of Communications and GIFEC, 2013

Required Actions:

- i. Extend fibre optic cables to all rural, remote, and underserved areas;
- ii. Extend fibre optic cables to all schools;
- iii. Extend fibre optic cables to all health facilities;
- iv. Extend fibre optic cables to all public places;
- v. Extend fibre optic cables to all buildings and homes; and
- vi. Provide necessary infrastructure to achieve last mile fibre optic connectivity to remove digital divide.

⁶ USAID 2013, Digital divide in Ghana: Analysis and recommendations, Report for the Ghana Ministry of Communications and Ghana Investment Fund for Electronic Communications (GIFEC)

Wireless Infrastructure

Ghana’s telecommunication sector is dominated by wireless connectivity. According to the National Telecommunication Agency’s (NCA) statistics for December 2016⁷, subscriptions for mobile telephones stood at 136.34% while that of fixed lines was 0.90%. Nevertheless, there are a number of challenges with wireless infrastructure and services, including, mobile subscription being largely for voice and less for data; some locations in the county experience poor quality service; lack of order and bureaucracy for siting mobile telecommunication masts; limited use of advanced wireless technologies such as radio frequency identification (RFID) and Internet of Things (IoT) for data capturing and communication.

Required Actions:

- i. Use incentives to ensure universal mobile access delivery throughout the country;
- ii. Encourage use of data services to promote mobile business and commerce;
- iii. Develop a comprehensive policy to streamline telecommunication mast siting and co-sharing; and
- iv. Promote the use of embedded RFID and IoTs for direct data capturing and communication.

1.2.2 ICT Facilities

ICT facilities such as innovation parks, incubators and community information centres (CICs) have become important resources for socio-economic development in digital economies.

ICT Parks

The development of science and technology parks has become an important national strategy for technological innovation and job creation. These ICT parks house clusters of technology companies and provide synergies for both local and global companies to promote a vibrant industry for software, hardware and communication devices. In 2016, the construction of Ghana’s first ICT Park began in the Tema Free Zone Enclave. The layout design is shown as follows.

⁷ <http://www.nca.org.gh/assets/Uploads/Voice-Statistics-December-2016.pdf>

Figure 1.6: Design Layout for the Ghana Cyber City Project



Source: Ministry of Communications

When completed, the park is expected to generate revenue and employment. More of such parks are needed in other parts of the country to help promote a vibrant ICT industry to manufacture ICT products and provide services for local consumption and export.

Required Actions:

- i. Establish one ICT park in each regional capital
- ii. Establish one special purpose ICT innovation Park to collaborate with KNUST to promote local manufacturing of computer, mobile, and network devices.

ICT Incubators

ICT incubators, including mobile hubs (mHubs) and mobile laboratories (mLabs), help to nurture start-ups and young entrepreneurs to develop innovative ideas in concrete products and services. These incubators provide office spaces, utilities, internet facilities, shared resource centres, training etc., and help establish networks of entrepreneurs, industry professionals, trainers and investors to promote ICT development, innovation and job creation. Ghana as a country, however, is yet to take full advantage of ICT incubators. The few ICT incubators in the country are: Meltwater Entrepreneurial School of Technology (MEST) with private and foreign ownership, Ghana Multimedia Incubation Centre (GMIC) and KNUST Business incubator.

Required Actions:

- i. Establish one ICT incubator in each ICT Park created;
- ii. Establish at least one ICT incubator in each regional capital; and
- iii. Get each University or Polytechnic offering Computer Science, IT or Information Systems programme to establish at least one ICT incubator on campus.
- iv. Coding to be introduced at all educational institution to induce critical thinking.

Business Processing Outsourcing

Business Processing Outsourcing (BPO) has increasingly become a significant socio-economic sector, especially in emerging economies such as India and South Africa. It is estimated that as at 2013, South Africa's BPO sector was generating over USD 1.5 billion and 54,000 direct jobs while that of Morocco was also generating about USD 1 billion and over 60,000 jobs⁸.

In 2016, the Accra Digital Data Centre, established through a renovation of 12 old warehouses of the Public Works Department, was completed and inaugurated to provide BPO services. The centre is expected to provide digital jobs and thereby help to generate revenue as well as reduce unemployment.

⁸ McKinsey Global Institute (2013), Lions go digital: The Internet's transformative potential in Africa

Figure 1.7: Accra Digital Centre



Source: Ministry of Communications

Given the potential role of BPOs for revenue generation and job creation, there is the need to establish more of such centres in various parts of the country.

Required Action:

- i. Establish at least one BPO centre in each regional and district capital for job creation and revenue generation.
- ii. Educational technology programmes to be establish at all training institutions.
- iii. Training the trainer schemes to be encouraged.

Community Information Centres

Over the years, the Ministry of Communication, through its implementation agency, GIFEC, has established many CICs. By 2016, over 120 CICs with Internet access had been established in various rural, underserved and remote communities as well in some government institutions. Despite the growing number of CICs in various underserved communities, access to fast Internet services remains a challenge for most of them. It is therefore important to extend fibre optic networks and broadband Internet services to such areas.

Required Actions:

- i. Ensure all underserved communities and

- ii. institutions have CICs; Extend fibre optic connectivity to all CICs; and
- iii. Provide broadband Internet access to all CICs.

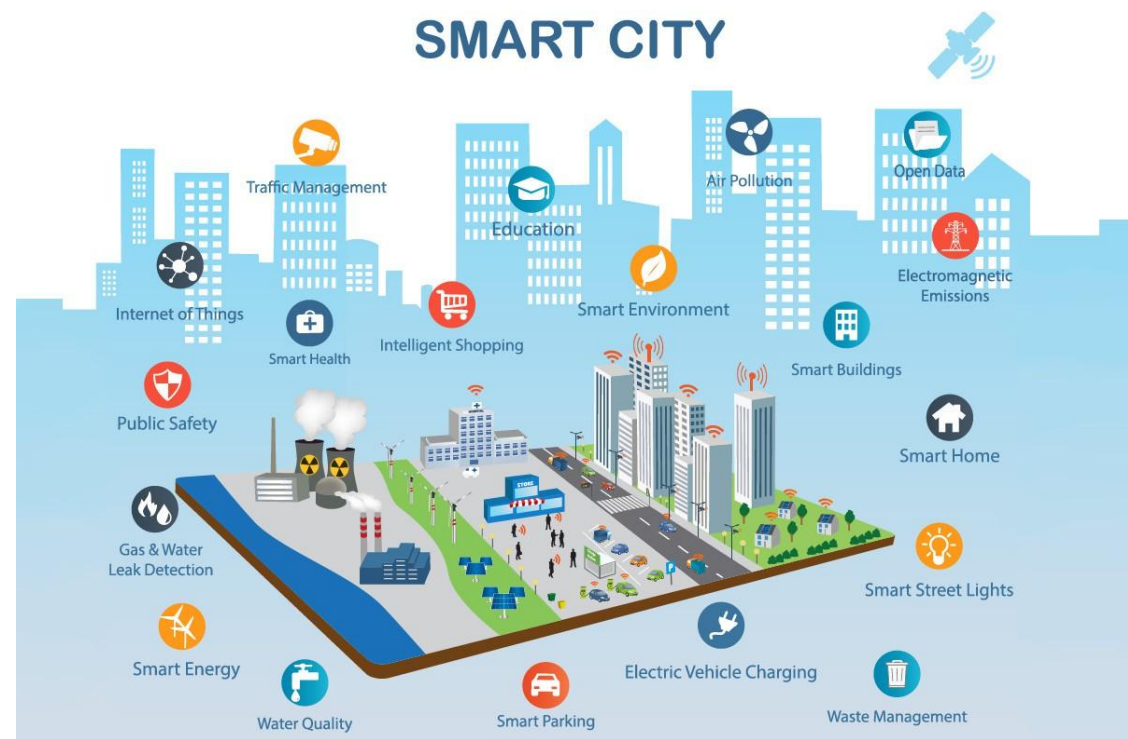
Smart Cities

Smart cities are ICT-based urban development innovations that depend critically on Internet of Things (IoT)s. Smart city innovation uses digital technology to plan, design and monitor occurrences in urban areas. Because of their usefulness, smart cities are becoming popular in advanced economies as the preferred strategy for sustainable urban planning, development and management⁹. Unfortunately, Ghana is yet to take advantage of the smart city innovation. Some of the problems in our cities can be solved through smart city innovation, such as water pipe bursts, cabling cuts, traffic congestion, fire outbreaks, defective vehicles on roads and streets, building without permits, managing street lights, detecting and managing potholes, crime monitoring etc.

Figure 1.8 shows a conceptual model of a smart city with various components and requirements.

⁹ United Nations E-Government Survey 2016: E-Government in Support of Sustainable Development

Figure 1.8: Smart City Concept



Source: Google Images

Required Actions:

- Develop national policies and guidelines for smart city development;
- Upgrade the national capital into a smart city; and
- Upgrade all regional capitals into smart cities.

ICT in Public Places

ICT facilities in public places are almost non-existent in Ghana. Beyond the community information centres, which are largely sited at rural and underserved communities, most public places such as transport terminals, recreational centres, schools, hospitals and libraries do not have Internet facilities. As Ghana seeks to achieve high-income status, it is important that such places are connected to the Internet for use, especially by people on the move.

Required Actions:

Connect the various public places to broadband Internet services:

Transport terminals:

- Airports,
- Seaports,
- Train Stations,

- River Ports,
- Bus Terminals, etc.

Inside transport access:

- Trains,
- Buses,
- Airplanes,
- Boats,
- Ships, etc.

Recreational centres:

- Stadia,
- Tourist Sites,
- Theatres,
- Public Parks, etc.
- Community centres;
- Educational Facilities;
- Correctional Facilities;
- Health Facilities;
- Libraries, etc.

Once such places are connected, Internet cafes, public kiosks and business centres can be setup to provide commercial services to generate revenue and employment.

1.2.3 National Digital and E-Government Infrastructure

The ongoing E-Transform Ghana Project being funded by the World Bank¹⁰, is expected to provide the necessary ICT infrastructure for an effective, efficient and transparent e-government and economic system. The project, which began in 2014 with a 2019 deadline, is expected to cover several areas, including:

- National Identification System
- E-Government Portal
- National Data Centre
- E-Payment Gateway
- Public Key Infrastructure
- Open Data Repository
- E-Parliament System
- E-Immigration System
- E-Procurement System
- E-Justice System
- Digitisation of Paper Records
- Integrated E-Health System
- Educational Portal
- E-Services
- Tertiary Institutions Access (TIA) System
- Innovation Incubators
- Enterprise Architecture and Interoperability Framework etc.

The project is in various stages of finalisation and will be completed by the deadline.

Required Action:

Complete the e-transform project and all related components by the 2019 deadline.

1.2.4 Geographic Information System Database

Location infrastructure in Ghana remains problematic because reliable online infrastructure and services for identifying places, buildings and facilities such as houses, streets, roads, installations, etc., are very limited. Available maps are also largely paper-based and therefore do not support online and mobile access.

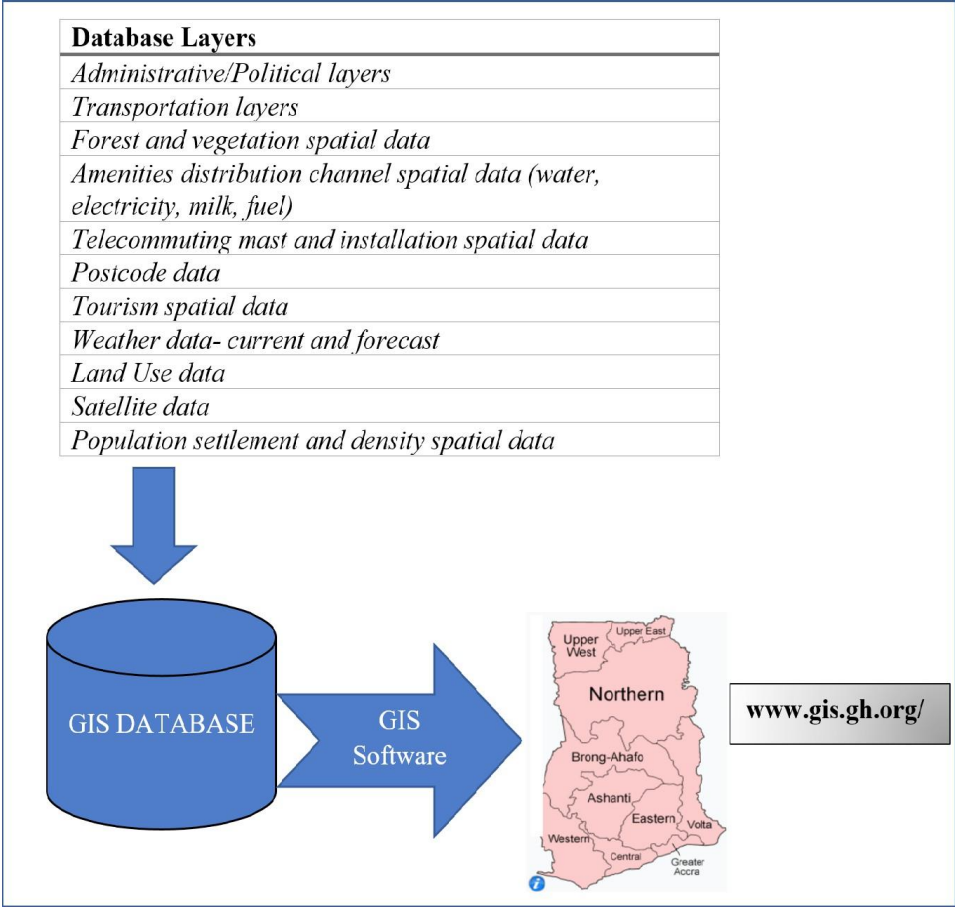
In 2015, the National Spatial Development Framework was developed. The related action plan is to translate the framework into an online GIS database with the details in Table 1.1.

Table 1.1: GIS Database Layers

Layers	Attributes	Feature Types	Comments
Administrative Coverage	Code, name, location, feature, representation, last updated date	Regions, districts, towns, villages etc.	Nested design—towns and villages are in districts, which themselves are in regions.
Political Coverage	Code, name, location, feature, representation, last updated date	Regions, constituencies, polling stations and sub-stations etc.	Nested design—polling station in electoral area, which is in a constituency and constituency in a region.
Buildings	Code, name, location, feature, current owner, representation, last updated date	Residential, commercial, state etc.	Owner linked to national identification database. Has a transaction table that contains changes in ownership over time.
Transportation Network	Code, name, type, segments, representation, date of last update	Street, road, railway, waterway, airway etc.	Include both current and existing plans. Capture and update data on density, speed and delays.
Cable Network	Code, name, type, segments, representation, last updated date	Fibre, telephone, television, electricity etc.	Map out and capture data on cable networks for analysis and updates
Pipe Network	Code, name, type, segments, representation, last updated date	Water, oil, irrigation, drainage, sewerage, milk etc.	Capture and update data on paths, flow, blockage etc.
River Network	Code, name, type, segments, representation, last updated date	Streams, tributaries, major rivers, floods etc.	Monitor the flow direction of rivers and any barrier impeding flow. Analyse upstream and downstream activities.
Land Use	Code, location, last updated date	Farming, settlement, mining, recreation, tourism, irrigation	Use satellites and GPS capture and update land use data.
Spatial Coverage	Code, name, type, density, representation, last updated date	Population data, vegetation coverage, weather coverage, disease coverage, soil type coverage, etc.	Use remote sensing and digital genesis innovation to capture and update special coverage data.

¹⁰ <http://projects.worldbank.org/P144140/gh-ettransformghana?lang=en&tab=o> verview , <http://nita.gov.gh/eGhana-Project>

Figure 1.9: High level GIS Database Design Framework



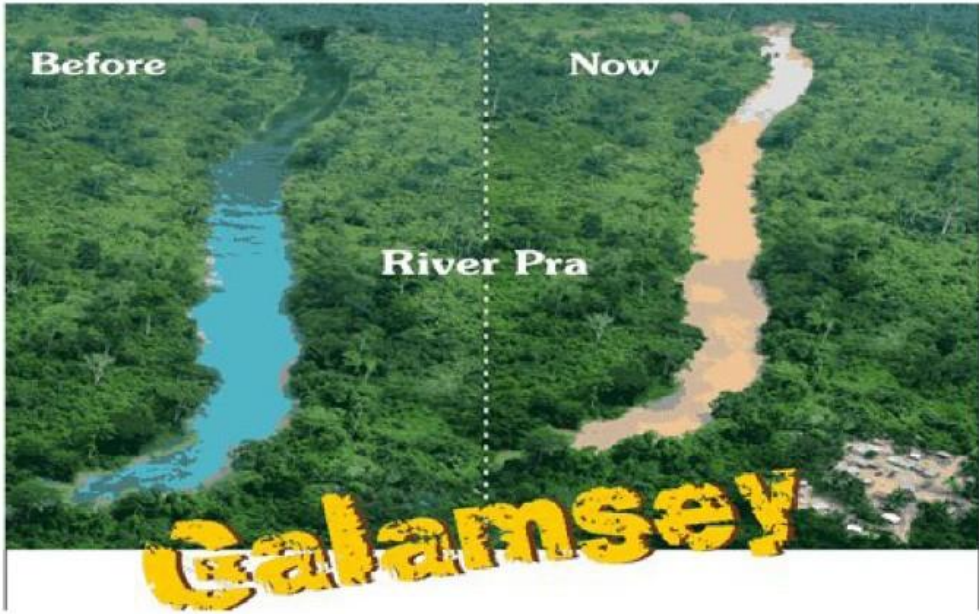
Source: Author's construct

Figure 1.9 presents a high level architecture for mapping the GIS database to online access via a dig- ital map of Ghana through a designated web address.

Given the dynamic nature of spatial data, the GIS database is expected to capture and store space and time-based data to provide opportunities for trend and time series analysis. Thus, feature attributes and their representations will be periodically updated with new images and dimensions with date/time data to show changes and trends, to inform policymaking and analysis.

For example, the GIS database should be able to provide reference of the state of the Ankobra river at a given historical time and its status given the intensive pollution from “*galamsey*” activities by 2016 as shown in Figure 1.10.

Figure 1.10: Comparative Aerial Photograph of River Ankobra between two time periods



Source: Ghana News Agency, 2016

Required Actions:

- i. Develop and implement the online GIS design; and
- ii. Develop and implement the GIS online application.

National ICT Survey Database

In modern times, national surveys have been extended to provide statistics on ICT infrastructure, access, usage and economic contribution. With feedback from national surveys, a country can monitor and evaluate trends and usage of ICT by citizens as well as private and public-sector organisations. Such statistics also provide feedback on ICT investments as well as scientific data for measuring progress and benchmarking with regional and international standards.

An annual ICT survey is yet to be fully established in Ghana as an essential and regular activity to provide the necessary statistics for ICT performance measurement and comparison with other countries and global trends. The 2010 population census by the Ghana Statistical Service (GSS) provided some data on household ownership of desktop and laptop computers as well as internet access by gender, age and geographical location.

However, given the limited scope of the indicators used and outdated nature of the results it is difficult to use them for monitoring and evaluation.

Generally, the absence of annual survey data makes it difficult to measure ICT contribution to employment and GDP¹¹. Given the growing importance of national ICT survey data therefore, it is imperative to establish the necessary database infrastructure and institutions for the collection, analysis and reporting of annual ICT statistics for

the socio-economic development of the country.

Required Actions:

- i. Establish comprehensive ICT indicators in line with international standards;
- ii. Institutionalise publication of annual ICT survey report; and
- iii. Deploy a national database infrastructure for ICT survey data.

11 <http://www.mofep.gov.gh/?q=news/210610>

1.2.5 ICT Infrastructure Financing

ICT infrastructure provision requires huge capital expenditure for initial setup and maintenance. The global trend for alternative funding besides government sources include: Public Private Partnership (PPP), Loans, Private Equity (PE) and Universal Service Fund (USF). Among these sources, PPP remains the most popular option. However, to ensure maximum government ownership, it is important that PPP and PE arrangements incorporate Build Operate and Transfer (BOT) arrangements so that ownership can be transferred to the government after expiration of the agreement period. Another variation of the PPP agreement is buy build and operate, which can be used for assets that have become obsolete and therefore need capital injection for rejuvenation.

In 2004, Ghana established a universal service fund, which is managed by the Ghana Investment Fund for Electronic Communications (GIFEC) as the implementation agency of the Ministry of Communications to provide financial resources for ICT infrastructure and services to remote and rural communities. By 2014, GIFEC had funded several projects.

Apart from direct funding, GIFEC has also used PPP arrangements to fund some projects. In line with its mandate, GIFEC funding has been limited to underserved and remote communities and organisations. For example, its school ICT projects have focused mainly on basic, secondary, technical, and some colleges of education. Universities and Research Institutions that require more intensive fibre optic and broadband connectivity are yet to benefit immensely from such projects. Thus, the need for alternative sources of funding continues.

In most developing countries, Public Private Partnerships (PPP) arrangements in the form of build, operate and transfer (BOT)/special purpose vehicle (SPV) continues to be the preferred option for financing national ICT infrastructure requirements.

Required Action:

Develop and implement a comprehensive Public Private Partnership policy and guidelines for ICT

infrastructure financing.

1.2.6 Areas for ICT Policy Updates

Several ICT related policies and laws have been developed in the country over the years. The 2003 ICT for Accelerated Development (ICT4AD) Policy was the first of its kind. The tables below show the various policies with their publication years at the national and sectoral levels.

Table 1.2: National ICT Policies

Year	Title
2003	ICT for Accelerated Development (ICT4AD) Policy (2003)
2005	National Telecommunication Policy (2005)
2015	National Cyber Security Policy and Strategy (2016)

Source: Author's construct

Table 1.3: Sectoral ICT Policies and Strategies

Year	Title	Sector
2008	ICT in Education Policy (2008)	Education
2010	National E-Health Strategy	Health
2016	Interconnect Clearing House Policy, 2016	Telecommunication

Source: Author's construct

While the National Cyber Security Policy and Strategy as well as the Interconnect Clearing House Policy are recent and thus reflect current trends in ICT, the other policies such as ICT4AD are obsolete and must be revised to meet current trends.

Required Actions:

- Implement the National Cyber Security Policy;
- Implement the National Interoperability Framework;
- Implement the National Enterprise Architecture;
- Review, update and add to existing ICT policies and strategies to meet modern trends taking into account the policy pillars below; and
- Develop related sectoral policies to direct ICT transformation at the MDA and MMDA levels.

The following policy pillars (as depicted in Table 1.4) have been defined to ensure that Ghana emerges as a technologically advanced country, with digital governance systems, digital societies and a digital economy.

Table 1.4: Policy Pillars

No.	Policy Pillar	Description
1	E-Personal Identification	Establish a comprehensive single, unified and multi-purpose e-identity for citizens and foreign residents.
2	E-Property Identification	Develop a comprehensive online accessible database of landed and movable properties such as vehicles, houses and lands to help reduce conflicts on ownership and transfers.
2	E-Location System	Develop a comprehensive online GIS system to support physical delivery, place location, courier and security (police and fire) service access.
4	E-Government	Use ICT to e-transform public sector operations and process to make the government more transparent, accountable and open to citizens.
5	Cashless Economy	Advance existing online, mobile and card-based payment systems to transition the economy from a cash-based to a cashless economy by gradually reducing the use of physical money and cheques.
6	E-Commerce	Promote online buying and selling by easing current constraints in online transactions and promote online sales of made in Ghana goods.
7	Digital Inclusive Society	Ensure that every citizen regardless of location or status has electronic access to government information and services through mobile and internet channels.
8	E-Employment	Use the opportunities provided by ICT to create job opportunities for the unemployed and the underemployed and provide ready access to information for job seekers.
9	E-Voting	Transition Ghana's democracy into a reliable and secured electronic voting platform to avoid violence and risks associated with elections.
10	E-Education	Promote the use of ICT resources at all levels of academic and professional education and ensure that all schools and have adequate ICT skills and resources.
11	E-Health	Use ICT to extend health services to the doorstep of all citizens and general health information for research to prevent diseases and epidemics.
12	ICT Industry	Promote the ICT sector to move from mere support to development of hardware and software products and improve training and professionalism.
13	E-Capability	Ensure the adequacy and availability of highly skilled professionals in software development, hardware manufacturing and data analytics.
14	E-Agriculture	Use ICT to provide the necessary information for the agricultural sector and ensure that farmers have readily available information about crops, pricing and storage right from their farms.
15	E-Research	Use modern ICTs such as big data, analytics and internet of things to collect and analyse national data on epidemiology, mortality, employment/unemployment, to inform the strategic direction of the country as well as connect various research teams to create knowledge for the development of Ghana economy.
16	ICT for Rural Development	Extend CIC to all rural communities and develop local information portals as well as connect them to the national and sector portals.
17	Legal and Regulatory Framework	Ensure that the right laws are developed and regularly updated to be abreast with advancements in the ICT sector.
18	Sectoral strategies and frameworks	Ensure that MDA and MMDAs develop sectoral ICT strategies in line with the national ICT policy.

Source: Author's construct

1.2.7 ICT Laws

Since 2005, some ICT laws have been passed to support legitimate use of the technology as shown in Table 1.5. However, most of the laws are not up-to-date given the year of passage and current developments.

Table 1.5: ICT Related Laws

Year	Laws
2005	Copyright Law (2005)
2008	Electronic Transactions Act, 2008 (Act 772)
2008	National Information Technology Act
2008	Electronic Communications Act, 2008 (Act 775)
2012	Data Protection Act, 2012 (Act 843)

Source: Author's construct

Required Action:

Review, update and extend available ICT Laws

In line with the long-term National Development Plan, the ICT plan period is from 2018 to 2047. The following action plan is proposed for the period.

Table 1.6: Long-term Action Plan

STRATEGIC GOAL	INDICATOR	2018-2021	2022-2025	2026-2029	2030-2033	2034-2037	2038-2041	2042-2045	2046-2049*
1. TELECOMMUNICATION INFRASTRUCTURE									
Ensure that all households have access to broadband services	Achieve over 90% broadband penetration for households								
Ensure that all citizens have access to broadband services	Achieve over 95% broadband penetration for citizens								
Make Ghana become the leader of internet penetration in Africa	Become the leader in internet penetration in Africa								
Make Ghana become the leader of broadband penetration in Africa	Become the leader in broadband penetration in Africa								
Make Ghana achieve an internet penetration rate comparable to that of world leaders	Catch up with world leaders in broadband penetration								
Fibre Optic Connectivity									
Fibre optic connectivity in all rural, remote and underserved areas	% Of communities with fibre optic connectivity								
Fibre optic connectivity in all schools	% Of schools with fibre optic connectivity								
Fibre optic connectivity in all health facilities	% Of health facilities with fibre connectivity								
Fibre optic connectivity in all public places	% Public places with fibre optic connectivity								
Fibre optic cables in buildings and homes	% Of buildings and homes with fibre optic connectivity								
Provide necessary infrastructure to achieve last mile fibre optic connectivity for all	% Of national fibre optic connectivity								
Wireless Connectivity									
Achieve universal access to mobile services									
Develop clear policy on telecom mast siting and co-location									
Promote intensive use of wireless technologies such as RFID and IoTs for data capture and communication									
2. ICT FACILITIES									
ICT Parks									
Establish one ICT park in each regional capital	% Of regional capitals with ICT parks								
Establish one Innovation Park in KNUST to locally produce ICT devices and accessories	One park for local devices and accessories production established								
ICT Incubators									
Establish an ICT incubator in each ICT Park created									
Establish at least one ICT incubator in each regional capital									
Each University and Polytechnic to establish an ICT incubator									
Business Processing Outsourcing (BPO)									
Establish at least one BPO centre in each region									
Community Information Centre (CIC)									
Ensure all underserved communities and institutions have CICs									
Extend fibre optic connectivity to all CICs									
Provide broadband internet access to all CICs									
Smart Cities									
Upgrade Accra into a smart city	Accra made a smart city								
Upgrade all regional capitals into smart cities	Number of regional capitals that are made smart cities								
Define policies and standards for smart city development	Policies and guidelines defined								
ICT In Public Places									
Provide broadband in transport terminals									
Provide in-transport broadband services									

STRATEGIC GOAL	INDICATOR	2018-2021	2022-2025	2026-2029	2030-2033	2034-2037	2038-2041	2042-2045	2046-2049*
Provide broadband in tourist/recreational centres									
Provide broadband in all CICs									
Provide broadband in all schools									
Provide broadband in all prisons									
Provide broadband in all hospitals									
Provide broadband in all libraries									
3. E-TRANSFORM GHANA PROJECT									
Complete e-transform Ghana project by 2019 project deadline	E-transform project components completed by 2019								
4. GIS DATABASE									
Develop and implement the GIS physical database design	GIS physical database design implemented								
Develop and implement the online application for the GIS database	Online application for GIS database implemented								
Complete the E-Transform Ghana Project by 2019	% of components completed by 2019								
5. ICT INFRASTRUCTURE FINANCING									
Develop and implement a policy on ICT infrastructure financing	Policy developed								
Review and revise ICT policy on infrastructure financing	Policy reviewed and revised								
6. ICT POLICIES, STRATEGIES AND LAWS									
Implement the Cyber Security Policy and Strategy	Strategy implemented								
Develop ICT policies/strategies for sectors without such	Policy/strategy developed								
Review and revise ICT4AD Policy every 5 years	Policy reviewed and revised								
Review and revise Telecommunication Policy every 5 years	Policy reviewed and revised								
Review and revise ICT in Education Policy every 5 years	Policy reviewed and revised								
Review and revise National E-Health Strategy every 5 years	Strategy reviewed and revised								
Review and revise Copyright Act every 5 years	Act reviewed and revised								
Review and revise Electronic Transaction Act every 5 years	Act reviewed and revised								
Review and revise Information and Communication Technology Act every 5 years	Act reviewed and revised								
Review and revise Electronic Transactions Act every 5 years	Act reviewed and revised								

Source: Author's construct

