



University of Nairobi

School of Engineering

DEVELOPMENT OF A WEB BASED SPATIAL INFORMATION SYSTEM FOR NON-GOVERNMENTAL ORGANIZATIONS IN NAIROBI COUNTY

BY

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F56/88421/2016

A project report submitted in partial fulfillment of the requirements for the Degree of Master of Science in Geographic Information Systems, in the department of Geospatial and Space Technology of the University of Nairobi

May 2019

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Declaration

I, Jackline Rateng', hereby declare that this project proposal is my original work. To the best of my knowledge, the work presented here has not been presented for a proposal in any other university.

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Dedication

I would like to dedicate this project to Mark Karimi Maina for his love and support throughout the project.

Acknowledgement

I would like to acknowledge God for his provisions throughout this Masters programme; Prof. G.C. Mulaku, for his assistance, guidance and patience during the preparation of this project report and my parents and siblings for their unyielding support.

Abstract

When the Non – Governmental Organisations (NGO) sector in Kenya was started there were no quality standards in the sector that would allow distinguishing independent and active NGOs working with human rights and social development issues from those being used as fronts for funding terrorism, money laundering or promotion of regime change/civil unrest through propaganda or otherwise.

Over the recent past, Governments across all continents have begun perceiving NGOs as a threat to political, economic and social control over their countries. This shift can be attributed to the kind of foreign policy pursued by former US president George W. Bush through interventions in Iraq and Afghanistan that resulted in regime changes. Currently, the Kenyan government is suspicious of NGOs as it is unable to monitor their source of funding, whether they are active or not and spheres of influence/activities within their areas of operation.

The objective of this project was to create a Geodatabase of NGO's as well as a web based application for querying, interaction, visualisation and submission of reports for analysis of their socio-economic impact.

A customised version of the GIS Development Life Cycle by Alesheikh et al (2002) was used as the baseline methodology to develop the Web GIS system. The reason for using this particular model is that it has been tried and tested over time and has been successful in the implementation of Web GIS projects.

A fully functioning web portal and a geodatabase of NGOs was to be realised upon completion of this project. This web portal and geodatabase can be used by the government and security officials to query the existence of a particular NGO, area of operation and economic impact from the uploaded reports. It can also be used to monitor the activities of NGOs by ensuring that they only carry out the activities that they were registered to do and in the registered location. In addition, the web portal may also be used by the general citizenry to understand the activities of NGOs, thus promoting trust between them and the people they intend to serve. Apart from enhancing trust, when the citizens are aware of the NGOs based in their localities they will be able to participate in volunteer work and in the identification of genuine NGOs from dubious ones that are being used as fronts for promoting undesirable agenda.

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1 .CHAPTER 1: INTRODUCTION

1.0 Background

There are thousands of Non-Governmental Organisations (NGOs) in Kenya, nine thousand Seven hundred and twenty-eight (9,728) registered NGOs to be precise but only seven thousand two hundred and fifty-eight (7,258) that are active (Daily Nation Kenya, 2015). In addition, seventy-seven thousand two hundred and ninety-five (77,295) people, majority being Kenyans have been employed by NGOs. In the 2013/2014 financial year alone one thousand eight hundred (1800) NGOs were registered most of them dealing in health, education and services, with the majority being located in Nairobi County (13.4%) and the least (0.7%) in Lamu County. (Daily Nation Kenya,2015).

When the NGO sector in Kenya was started there were no quality standards in the sector that would allow distinguishing independent and active NGOs working with human rights and social development issues from those being used as fronts for funding terrorism, money laundering and promotion of regime change/civil unrest through propaganda or otherwise. Further, there were no measures put in place to encourage NGOs accountability, making them a channel for misappropriation, counterfeiting and contraband, some even being unable to explain the sources of their funds. For example, in 2017, five hundred (500) NGOs in Kenya were de-registered for being unable to explain the source of their funding (Daily Nation Kenya, 2015). Moreover, there is lack of public information about these organisations which has resulted in increased distrust and indifference towards NGOs among citizens.

By mapping NGOs in Kenya, this project hopes to provide a platform that will enable identification of all NGOs registered within a specified geographic location and their mandate thus increasing transparency.

■ Problem Statement

Currently, the government is suspicious of NGOs as it is unable to monitor their location, source of funding, whether they are active or not and spheres of influence/activities within their areas of operation. This suspicion has led to increased regulation hampering the activities of NGOs in the country.

Apart from security related reasons, the citizens wishing to volunteer in NGOs as well as the donors may wish to find out information about the existence of an NGO and its project activities within a particular region. Currently, this is only possible by contacting the NGOs directly.

The project aims to increase the much needed transparency that will enable re-establishment of trust among the Government, NGOs and citizens. This can be achieved through creating a Geodatabase of NGOs and a web based application for querying, interaction, visualization and submission of reports for analysis of their socio-economic impact. Similarly, the project will enable identification of dubious NGOs that have been set up as fronts for other purposes.

■ Objectives

The objective of this project was to create a Geodatabase of NGOs as well as a web based application for querying, interaction, visualisation and submission of reports for analysis of their socio-economic impact.

The specific objectives were:

- i. To create a Geodatabase of NGOs
- ii. To create a web based application for querying, interaction, visualisation of spatial and attribute information about NGOs.

■ Justification for the Study

The NGOs web portal and geodatabase can be used by the government and security officials to query the existence of a particular NGO, its location, area of operation and economic impact from the uploaded reports. It can also be used to monitor the activities of NGOs by ensuring that they only carry out the activities that they were registered to do and in the registered location.

It will also be used by the general citizenry to understand the activities of NGOs promoting trust between them and the people they intend to serve. Apart from enhancing trust, when the citizens

are aware of the NGOs based in their localities they will be able to participate in volunteer work and in the identification of genuine NGOs from dubious ones that are being used as fronts for promoting undesirable agenda.

The developed geodatabase and geoportal of NGOs could also be integrated with the PISCES (Personal Identification Secure Comparison and Evaluation System), a border control database system largely based on biometrics, and National Registration Bureau (NRB) systems for registration of foreigners entering the country as employees/volunteers of NGOs and to monitor the activities of foreign nationals and establishing whether work permits have been issued for all the foreign employees.

Document Organization

This report has been organized into five chapters. The first chapter is the introduction and deals with the background to the study, the objectives and justification for carrying out the research. The second chapter covers the literature review which looks at research that have been done in the area of NGO mapping, the third chapter gives an overview of the methodologies that were used in the research and the data sources. Chapter four discusses the results that have been obtained while chapter five gives the conclusions and recommendations.

2 CHAPTER 2: LITERATURE REVIEW

■ About NGOs

There are as many definitions of Civil Society Organisations (CSO's) and Non – Governmental Organization (NGO's) as the people who attempt to define them. According to Wanjiru (2015), there is no single right definition; however, common themes run through most definitions. The following definitions will be adopted for the purposes of this project:

A Non – Governmental Organization refers to an association, society, foundation, charitable trust, non-profit corporation, or other juridical person that is not regarded under the particular legal system as part of the governmental sector and that is not operated for profit, if any profits are earned, they are not and cannot be distributed as such. It normally does not include trade unions, political parties, profit distributing cooperatives, or churches, which are usually regulated under separate legislation (World bank, 1997).

The London School of Economics and Political Science (LSE,2001) defines civil societies as a sphere of institutions, organizations and individuals located among the family, the state, and the market, in which people associate voluntarily to advance a common interest. It includes but is not limited to various forms of NGOs, trade unions, political parties, cooperatives and churches.

In the recent past, governments across all continents have begun perceiving NGOs as a threat to their political, economic and social control over their countries. Katja Drinhausen and Günter Schucher from the German Institute for Global and Area Studies (Drinhausen *et al*, 2010) explain the shift as attributable to the kind of foreign policy pursued by former US president George W. Bush through interventions in Iraq and Afghanistan that resulted in regime changes. The West's solidarity with the colour of revolutions in Georgia, Ukraine, Central Asia and the Middle East all led to government's justification of resistance to external democracy. These incidences have led to the shrinking of the NGOs space in countries and an emergence of mistrust between the government and the NGOs. To put it in perspective, CIVICUS, a global organization for citizen participation highlighted ninety six (96) significant restrictions on the rights of NGOs between June 2014 and May 2015. These restrictions are not only present in

Russia, Turkey, India and China but in over sixty (60) countries, with the core concern being, cutting the flow of money to domestic organizations or placing the flow of money under state control.

In many countries, national security and especially the war on terror are used to ban democratic organizations. A good example is in Egypt where on 30th May 2017, their President, Abdel Fattah el-Sisi , signed into effect a law that restricts the operations of more than forty seven thousand NGOs (Najjar,2017). This general suspicion is so extreme that the country has become a military dictatorship. Ethiopia is also another country where several NGOs have been closed down by the state or forced to leave (Dupuy *et al* 2015).

■ NGOs in Kenya

Civil societies in Kenya, of which NGOs are a part, have their origins in African communal traditions and values, early Christian missionaries and British colonization during the 19th century (Chemnetich, 2009). In the early African tradition and value system, a number of families had organized themselves into sub-units and units that would appoint elders who would be responsible for leading the community and defending the old and the vulnerable members. This tradition was augmented by educational and social welfare institutions that were established by Christian missionaries in the 19th century and finally as welfare associations that were used by Africans to advocate for rights and express dissatisfaction with colonial government rule and treatment. Such organizations included: Kavirondo Taxpayers Welfare Association, East African Association, Taita Hills Association and Ukambani members Association (Jilo, 2009). The post-independence government continued to further popularize the self-help spirit, commonly referred to as harambee.

From the above explanation it is apparent that civil society organizations are vital to the core existence and sustainability of the Kenyan Society. Under the Kenyan Government, they have continued to complement the work of the government, provide services and advocate for reforms and democracy.

In Kenya, the NGO Coordination Board, which is the body responsible for registration and deregistration of NGOs, was in 2015 taken to court over deregistration of the Kenya Human Rights Commission (KHRC) (Nation, 2015). On 15th August 2017, NGO Coordination Board, through a press statement, announced the deregistration of five hundred NGOs, which came a week after the 8th August elections.

NGOs in Kenya have in various occasions successfully contained and managed crises in the country. A good example is the Kenya Red Cross which during the 2013 Westgate terror attack mobilized funds, through the “we are one campaign”, which were used to pay for medical bills for the victims of those attacked as well as provide psychological counseling to those affected. The Red Cross has also been known to come through during natural disasters like floods and drought and other humanitarian emergencies. Another good example is Women Fighting Aids in Kenya (WOFAK) which was established by women who were HIV positive. It mainly deals with health, orphans and vulnerable children, economic empowerment and advocacy in HIV related issues.

Technology Aspect

The project will make use of the technological foundations provided by the web 2.0 to present information regarding NGOs. With the advent of the internet and the web 2.0, interactive websites have become the standard for web development (O’Riley, 2004). GIS technology has taken advantage of this opportunity to produce dynamic interactive web-maps that allow for zoom, pan and search functions with high cartographic standards. Previously, most digital information was confined for use on PCs. Such information could not be shared by other organizations. GIS analysts would access data from powerful PCs that were often connected to a file server and specialized software was required to view or manipulate the data, narrowing the audience that could benefit from the information.

In the 1990s people began posting static maps and other geographic maps on HTML pages. However, peoples soon realized the potential for interactive maps and it was a game changer (Plewe, 1997). The early, dynamically drawn web maps experienced challenges with speed and scalability especially during simultaneous user access, but as web mapping matured, the concept

of tiling map images from pre-generated caches was adopted. Tiling of images involves pre-drawing all possible map extents at reasonable sets of scales, and after caching, serving out the images as a tiled mosaic. This way each tiled map request is satisfied exponentially faster than it would take to serve the map dynamically, allowing the server to accommodate hundreds of simultaneous users (MacWright *et al*, 2010). Notable examples of where tiling has been used include Google maps and OpenStreetMaps.

The foundation technologies enabling web 2.0 are Asynchronous JavaScript and XML (AJAX), RSS, Eclipse, Microsoft Silverlight and Adobe Flash. Most applications on the Web 2.0 are based on the decentralized download methodology in which each downloader of content is also a server, sharing the workload and making heavily demanded content more accessible. A good example being Bit Torrent (Rouse, 2015).

Web GIS Development Methodologies

Unlike conventional software systems, methodologies for web GIS have not been around for a long time and are mostly project specific (Ananda *et al*, 2016). Web GIS began gaining widespread popularity in the mid-2000s and is now slightly over a decade old. The technologies supporting these systems have been rapidly evolving with widespread adoption of open source tools and standards in their development. A few authors have published methodologies that could be used in Web GIS development. These methodologies are presented in Table 2.1.

Table 2.1: An overview of the strengths and weaknesses of Web GIS methodologies (Adopted from Ananda *et al* 2016)

Table

Methodology	Overview	Strengths/Weaknesses
Web GIS Development Cycle (Alesheikh, 2002)	A hybrid approach adapted from the waterfall model and the classical Software Development Lifecycle (SDLC). Development is split into 8 successive phases in the following order;	Suitable for the novice developer as it offers a simplified step by step approach. However the methodology is not practical for large projects and it does

	requirements analysis, conceptual design, hardware & software survey, database design & construction, acquisition of GIS hardware & software, web GIS system integration, application development and web GIS use and maintenance	not put any emphasis on user involvement and testing which are critical components during the development of such systems.
Rapid GIS Development (Cavaco <i>et al</i> , 2010)	Based on Rapid Application Development methodology. Supports the rapid development of database-centric GIS applications. It is more of an implementation framework than a methodology.	Based on Rapid Application Development methodology. Supports the rapid development of database-centric GIS applications. It is more of an implementation framework than a methodology.
Web GIS Navigational Development Techniques	This process integrates models from Navigational Development Techniques (NDT) methodology with models from the Organizational Semiotic technique. Consists of Requirements engineering, conceptual design, navigational design, abstract interface design and implementation. Relies on formal model definitions to represent geographical concepts.	Supports the rapid development of web GIS applications. Furthermore during the requirements engineering, it introduces the use of the Organizational Semiotics to define requirements.

Web GIS development methodologies are still being developed as the number of such projects increases. The methodologies still require adequate testing on a broad range of projects. This is not entirely possible as GIS projects are quite costly and organizations may not be willing to risk adopting processes that are not proven.

■ Case Studies

Within the vast literature of NGOs, the case study approach is the norm (Bebbington, 2004), such that works provide in-depth, often single organization accounts of NGO structure, history, organizational culture, business enterprises, local communities and NGO effectiveness in on-the-ground projects. Generally, not much attention has been paid to analyzing the geographies of NGO activities in the national and subnational levels including distribution in relation to poverty levels and amount of funding that a particular NGO can access, or even just to enable one draw general conclusions from emerging trends and patterns. The following case studies have been selected as this project will attempt to carry out a similar exercise in Nairobi, Kenya.

2.5.1 Karamoja NGO Mapping Report, UGANDA

The report on the Karamoja NGO Mapping was prepared, on behalf of the Karamoja Development Partners Group (KDPG), on 1st November 2016 with the support of the USAID through the Karamoja Resilience support Unit (KRSU). The main objective of the exercise was to support strengthened co-ordination and dialogue between civil societies and other stakeholders in the Karamoja region in a bid to improve analysis, collaborative learning and evidence based decision making.

The methodology used involved distributing an excel based data collection tool electronically to NGOS within the Karamoja region. The data entry form was completed and the responses electronically returned to KRSU by 92 % of all the NGOs that were contacted. The mapping done was based on the responses from the fifty four (54) NGOs out of the fifty nine (59) that had been identified and contacted. These NGOs included International, National and Faith based organisations within the Karamoja region.

From the exercise, it was possible to identify the major sources of funding, the distribution of the funds across the sectors being supported by the NGOS - with the main foci being basic service

delivery and food security, the active projects being carried out by NGOs and their duration, and the distribution of projects across the districts.

Some of the findings from the exercise were:

- There are 142 active projects in Karamoja being implemented by the 54 NGOs which responded to the survey. The project durations for the various initiatives range from 1 month up to 8 years; funding ranges from \$10,000 up to \$55 million.

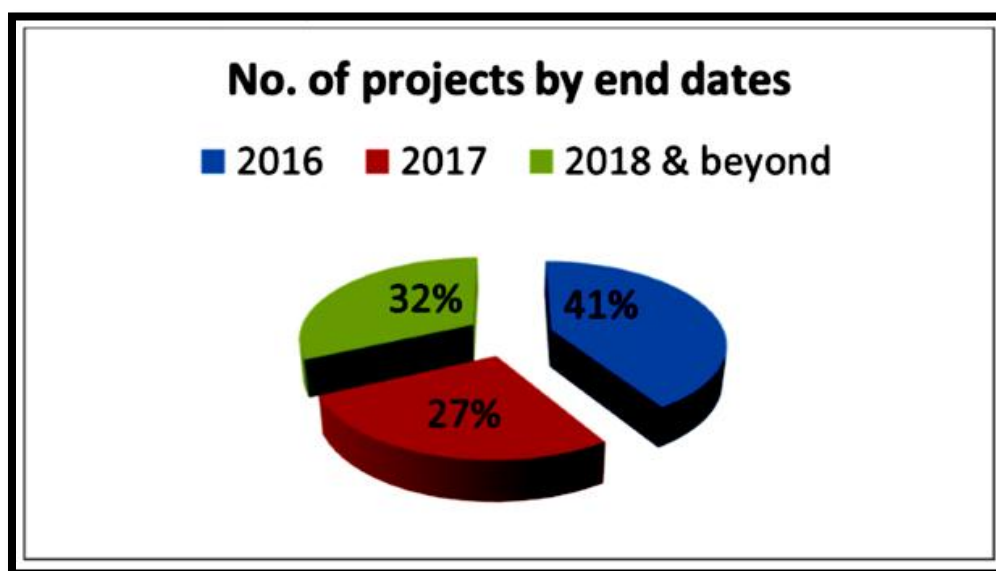


Figure 2.1: Number of projects by end dates in Karamoja

- About 41% of currently active projects will end in 2016, and 27% of projects will continue through 2017. A further 32% of projects go beyond 2018.

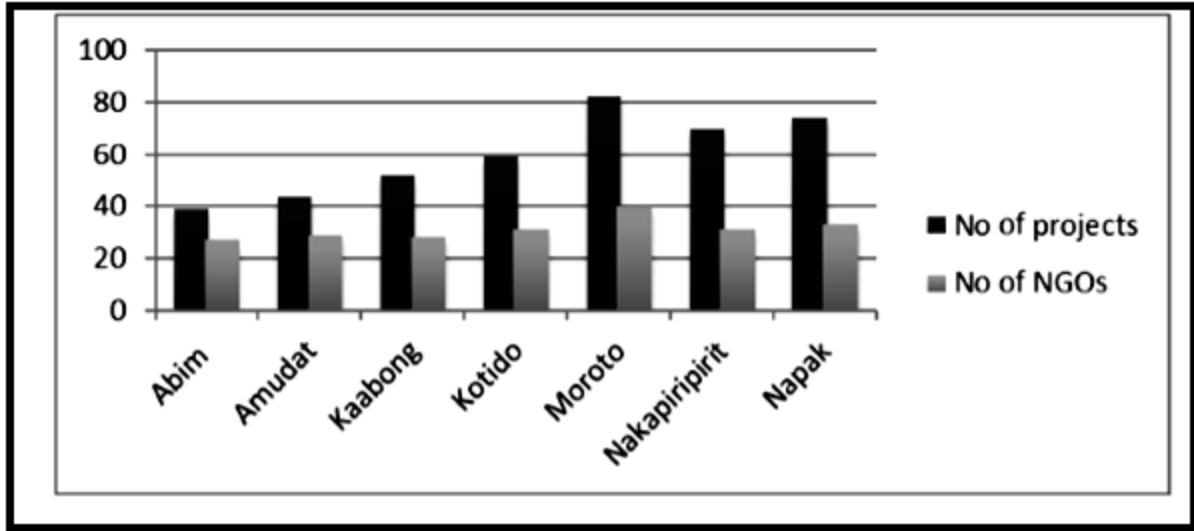


Figure 2.2: Distribution of projects across various districts in the Karamoja region

- The distribution of projects across the various districts is relatively uniform with most of the districts except in Moroto where there are many implementing partners and more active projects and in Abim where there are less than half the number of projects in Moroto.

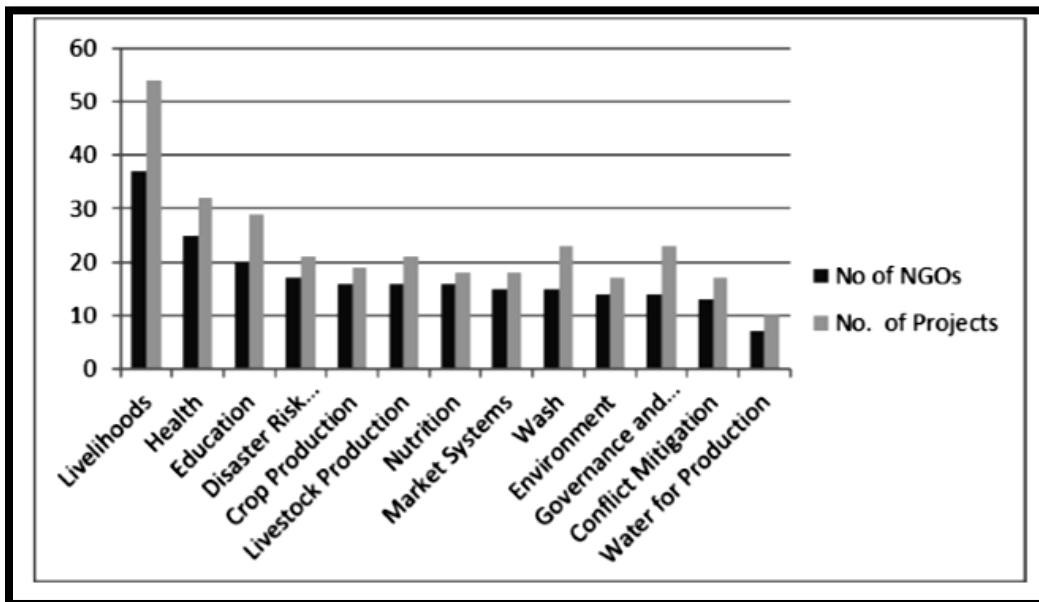


Figure 2.3: NGOs participation in various sectors in the Karamoja region

- Most NGOs support multiple sectors and a few partners specialize in specific sectors. Overall the distribution of partner's effort in the various sectors is balanced except for the livelihoods sector; where close to 70% of the actors are actively engaged.

2.5.2 Mapping the UK NGO Development Sector

The report on Changes in Expenditure, Income and Income Sources for Development NGOs based in the UK was first published in October 2017. The aim of the exercise was to understand better how the development of the NGO sector in the UK works and how it collaborates with overseas partnerships and networks. The exercise was also important for understanding what supports the sector in the UK and how that support is changing. The NGO sector in the UK has grown rapidly since the 1980s but it is highly unequal in terms of its allocation of resources and geographical distribution.

To construct the database, 898 development NGOs were selected after 1500 charities were screened (hereafter NGOs) from the membership lists of BOND, Scotland's International Development Alliance; South West and South Wales International Development Network; The South Yorkshire International Development Network, the Foundation for Social Improvement and Small Charities Coalition; from grantees of DFID and Comic Relief; from Hub Cymru Africa; from organisations declaring their interests in ODA and famine relief on the Charity Commission website; from a previous research project into conservation NGOs. For the selected organisations, financial data was obtained from three sources. Basic income and expenditure were available for download from the Charity Commission, the Office of the Scottish Charity Regulator and from the organisations themselves.

Some of the findings of the exercise were:

- The total charitable spending was about £68bn of which £53bn was for charities whose remit is only within the UK. Only £2.9 billion was spent entirely overseas.
- Establishment of NGOs has increased rapidly since the 1980s with the largest number of annual establishment in 2003, 2007 and 2009.

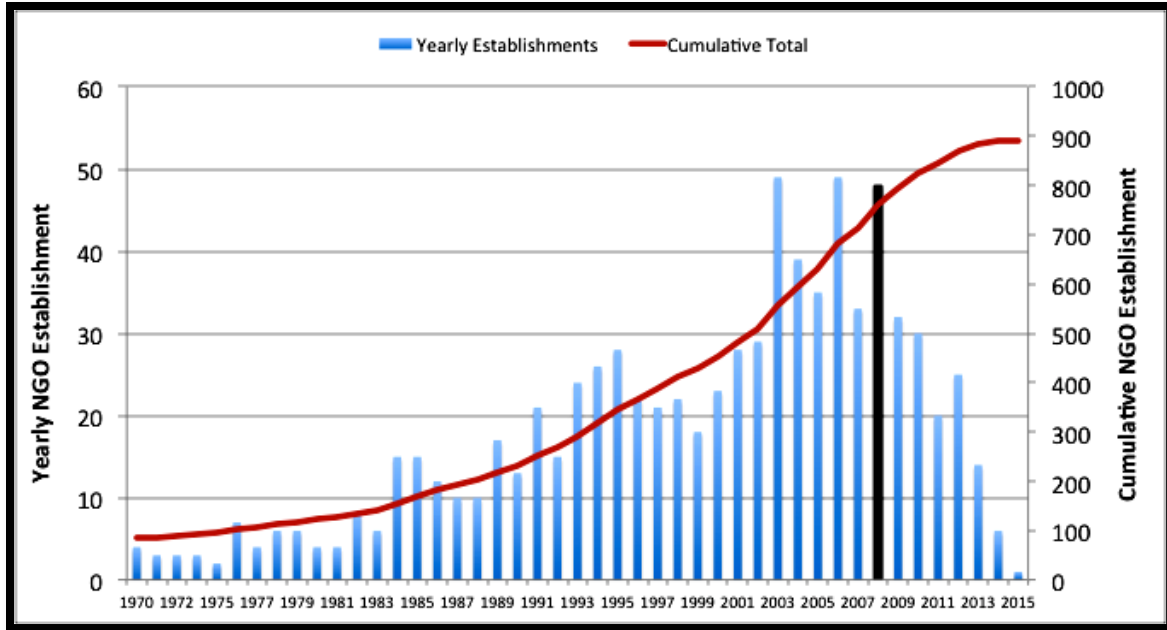
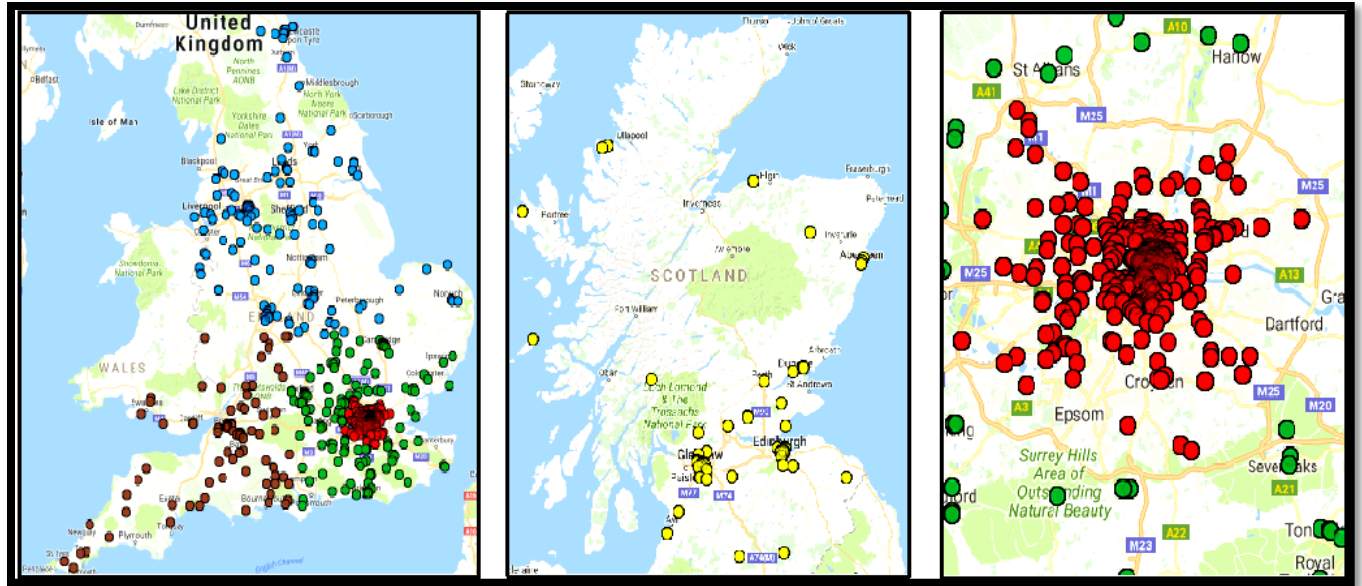


Figure 2.4: NGOs annual and cumulative establishment in the United Kingdom

- Income and expenditure by development NGOs has increased since 2004 across all class sizes in England and Wales, and in Scotland since at least 2009.
- London dominates the development NGO scene. Most of the largest organisations are found there and by far the most money is spent by organisations headquartered there. (See Figure 2.5):



Key:

	Annual Budget
● (Red)	> £3,000,000.00
● (Green)	£1,500,000.00 - £3,000,000.00
● (Blue)	£500,000.00 - £1,500,000.00
● (Orange)	£100,000.00 - £500,000.00
● (Yellow)	< £100,000.00

Figure 2.5: Distribution of NGOs in the United Kingdom

- The public is the most important source of revenue for development NGOs, providing 40% of revenues. This has increased in real terms over the last 5 years, but decreased marginally in relative importance as the sector has diversified.
- Growth in public income is not rivalrous, i.e. organisations do not seem to be fighting for the same pound. Instead they are seeking and creating new sources. It is likely that growth in public income derives from high net-worth individuals.
- Corporate donations generally account for little more than 5% of income, and have not increased except for the largest NGOs (Dan Brockington *et al*, October 2017).

3 CHAPTER 3: MATERIALS AND METHODS

Area of Study

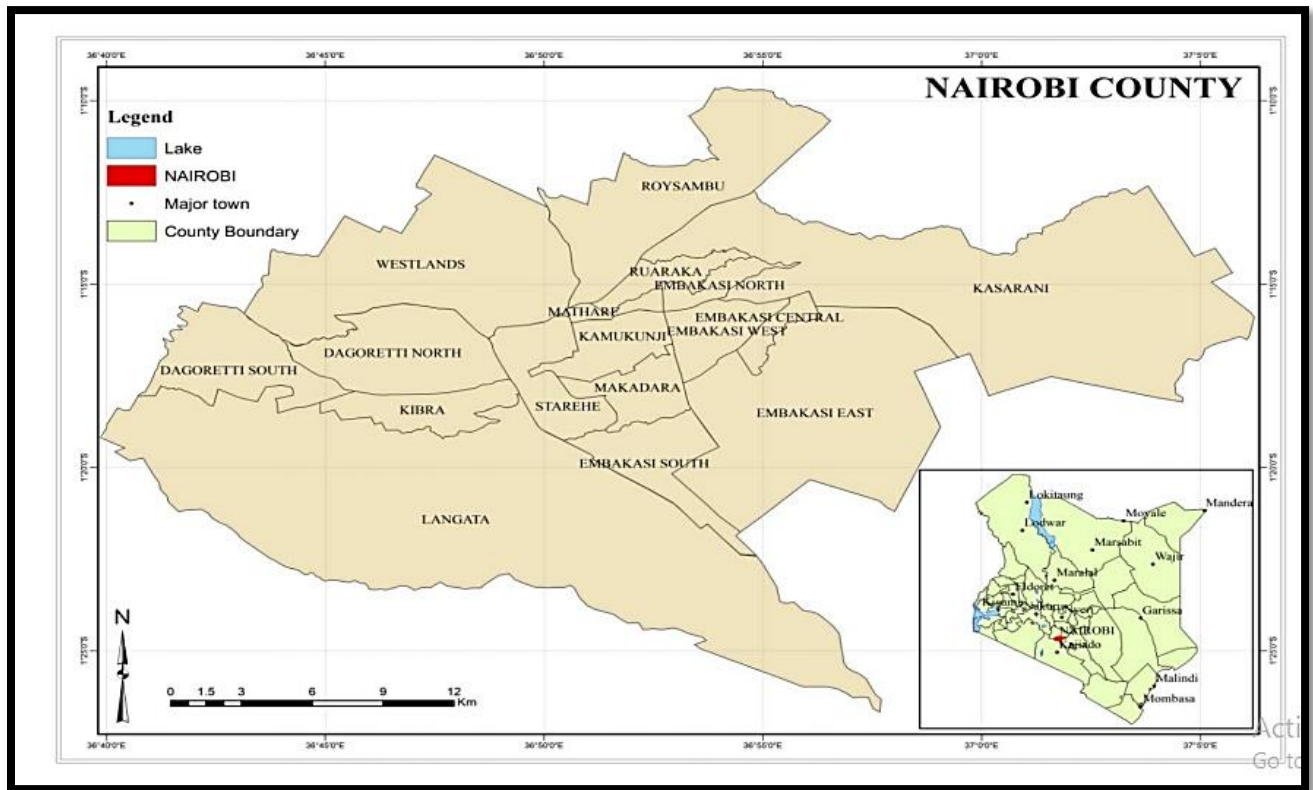


Figure 3.1: Map of Nairobi

The area of study is Nairobi County. Nairobi County is the capital city of Kenya and lies at a latitude of between -1.28333° – 1.2921° South and longitude of 36.8219° - 36.81667° East. It covers an area of 696 km², at an average elevation of 1795m above sea level, and has a population of about three million people (United Nations, 2009). This area was selected because being the capital, many NGOs are headquartered here.

Materials

The materials for the study included the following:

3.2.1 Data

Table 3.1: Data Sources

DATA	SOURCE
Registered NGOs and their corresponding attributes	NGO Coordination Board NGOs websites

Administrative Boundaries Map for Nairobi County	Survey of Kenya
Open Street Map Base Map	https://www.openstreetmap.org
Google Maps	https://www.google.com/maps

3.2.2 Tools

The tools that were used included the following:

- Hardware – Personal computer.
- Software-Open geo suite. Open geo suite has a robust and flexible architecture that enables reliable management and publication of geospatial data. It consists of : PostGIS, QGIS, Geoserver, Open layers and Apache Tomcat is used as the application server. Additionally, django, css and bootstrap will be used in styling the web page.

Methodology

3.3.1 Summary of Methodology

The architecture that was used for the project was the three tier client-server architecture in which the map server is the server; the database is also part of the server side. The client will be the browser. Additionally, the user interface is the presentation tier, the Map Server as the application/business logic tier and Desktop GIS the data tier.

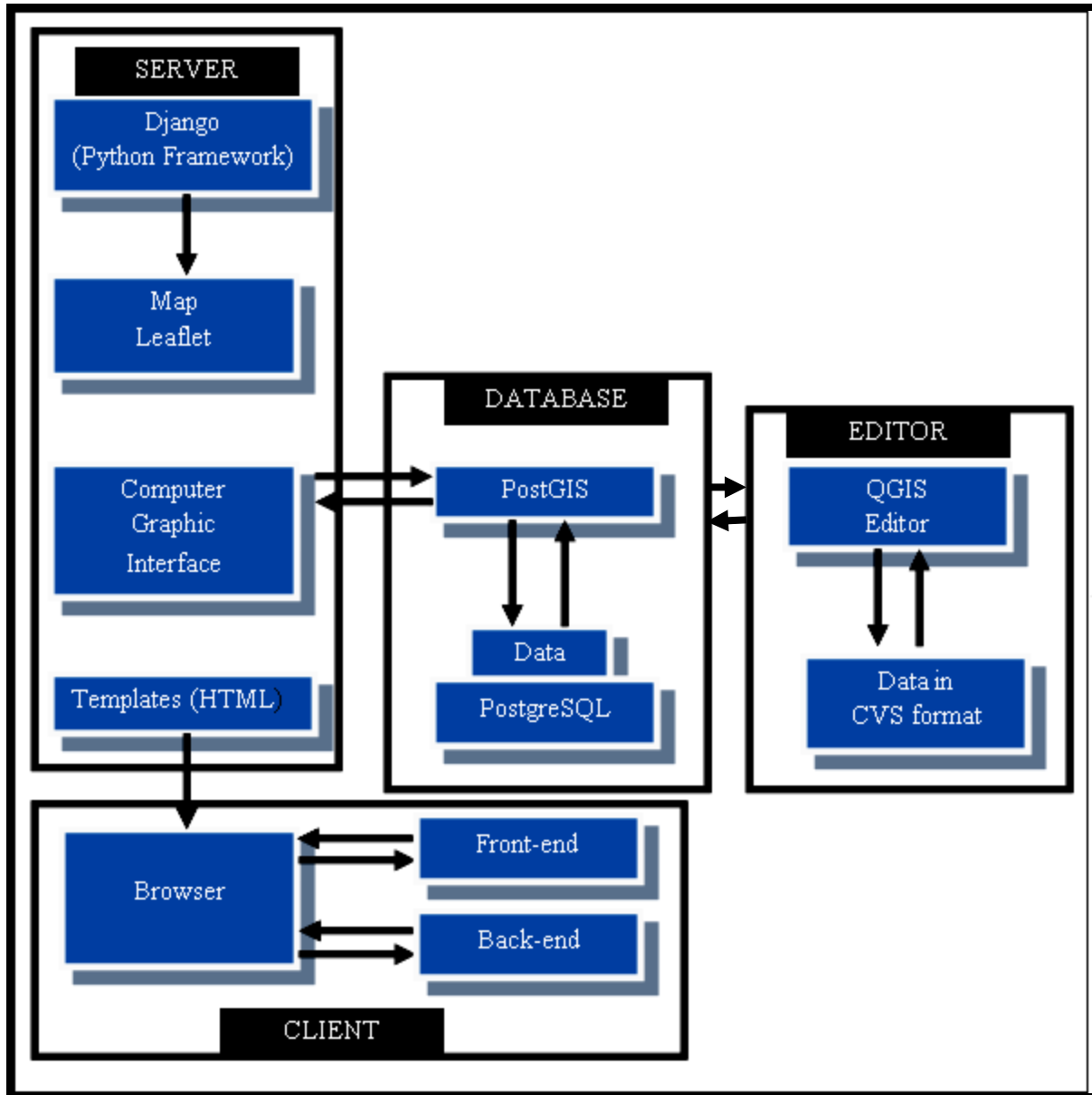


Figure 3.2: Three tier client/server architecture

The solution consists of the following functional parts:

- i. **A spatial database** that can provide random access to large data sets, query processing and provides for spatial relationships. Post GIS an extension of Postgresql has been used to create and maintain the spatial database of the NGOs in Nairobi County.
- ii. **A desktop software:** QGIS provides editing and visualisation of data in the database. This enabled data management, quality control and reporting.

- iii. **A cartographic map renderer:** GEOJSON map leaflet was used to serve data from the spatial database, apply styling rules and output map images. It also reacts to web requests through open layers, to generate geographical objects dynamically will be the server side software.
- iv. **An application server: Django** provided a programming framework where other applications can run.

3.3.2 Database Design

The GIS database design involved:

- The survey and analysis of user needs
- Inventory and evaluation of data sources
- Development of a conceptual database design

This survey and analysis of user needs provided fundamental information for the design of a shared system. In the creation of a geo - database for NGOs various users of the database were identified. These included: The NGOs themselves, Government Institutions, Donors, Affiliate Organisations and the General Public.

The survey was carried out through interviews and aimed at addressing the user views of interest to each institution. The expected views of each user are as outlined in Table 3.2.

Table 3.2: Summary of user views as per requirement

No.	USER	VIEWS
1	NGOs	<ul style="list-style-type: none"> • Projects currently being carried out to avoid duplication or provide opportunities for partnering • Location of the projects to enable appropriate distribution of services • Other NGOs carrying out similar activities • Showcase achievements • Status of current projects: This could be obtained by looking at the start and end dates of the projects.
2	Government	<ul style="list-style-type: none"> • Names and locations of NGOs • Distribution of the NGOs

	Institutions/Regulators	<ul style="list-style-type: none"> • Donors and affiliate organisations of the NGOs • Budgets of the NGOs • Assets owned by the NGOs • Ongoing projects and their status • Previously completed projects • Total number of NGOs per sector
3	Donors	<ul style="list-style-type: none"> • NGOs in specific locations • Projects carried out and their duration • Budgets of the projects • The status of ongoing projects
4	Affiliate Organisations/Partners	<ul style="list-style-type: none"> • The projects name and location • The duration of a project • The NGO carrying out a particular project • Donor funding the project • The status of ongoing projects • The beneficiaries of the project
5	Public	<ul style="list-style-type: none"> • NGO's names and locations • Ongoing projects and their current status

a) External Model

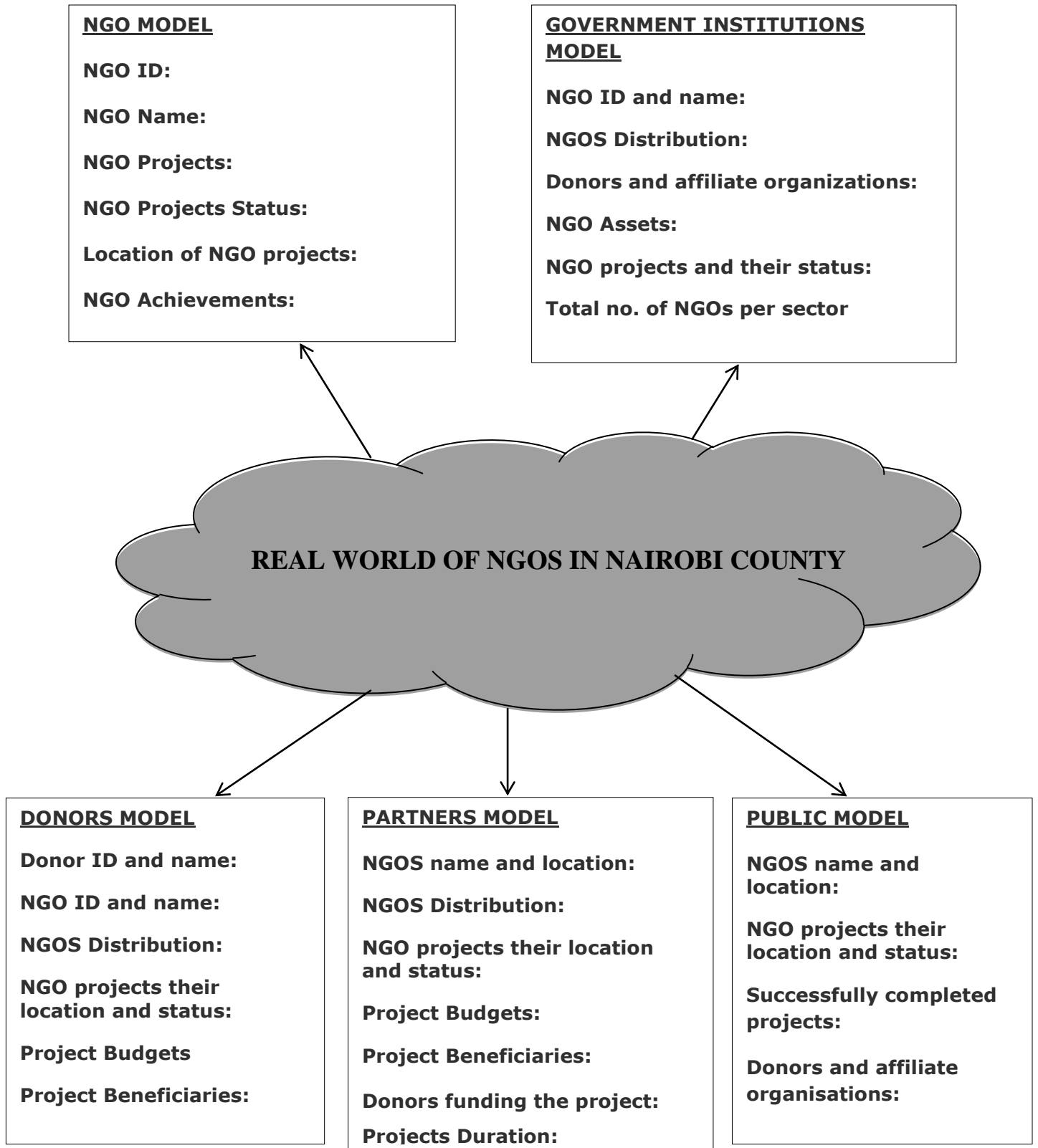


Figure 3.3: Database external model

b) Conceptual Model

The conceptual model is essentially an entity relationship diagram meant to capture the relationships among entities in a database. The relationships can be one to one (1:1), one to many (1: N) or many to many (N: N).

NGO DATABASE CONCEPTUAL DESIGN

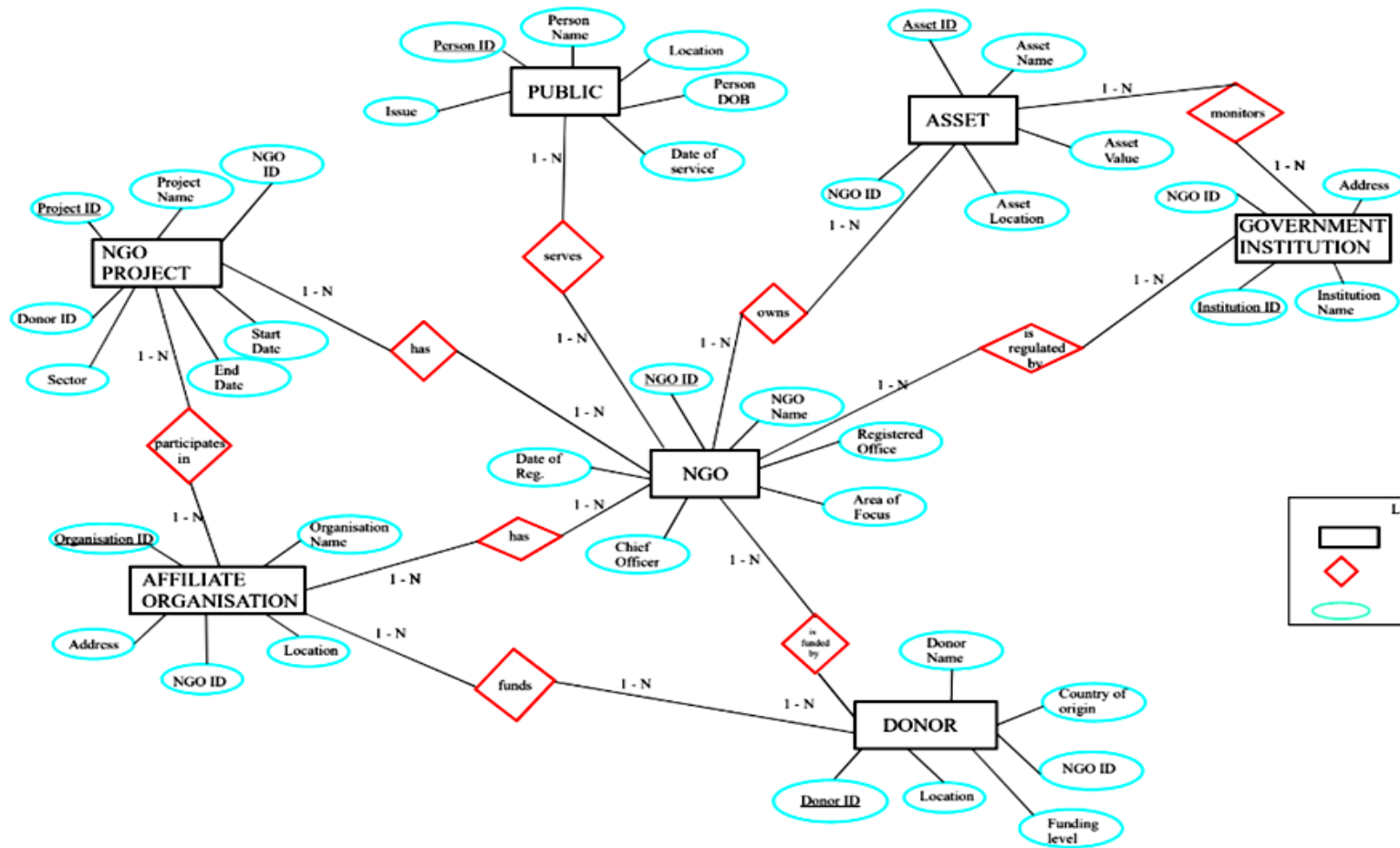


Figure 3.4: Database conceptual model

c) NGO Database Logical Model

Relation 1: NGOS

<u>NGO ID</u>	Name	Date of Registration	Registered Office	Chief Officer	Area of Focus
---------------	------	----------------------	-------------------	---------------	---------------

Relation 2: DONORS

<u>Donor ID.</u>	Donor Name	NGO ID	Country of Origin	Location	Funding Level
------------------	------------	--------	-------------------	----------	---------------

Relation 3: AFFILIATE ORGANISATIONS

<u>Organization ID.</u>	Organization Name.	NGO ID	Address	Location
-------------------------	--------------------	--------	---------	----------

Relation 4: NGO PROJECTS

<u>Project ID</u>	NGO ID	Donor ID	Project Name	Sector	Start Date	End Date
-------------------	--------	----------	--------------	--------	------------	----------

Relation 5: PUBLIC

<u>Person ID.</u>	Person Name	Date of Service	Person DOB	Location	Issue
-------------------	-------------	-----------------	------------	----------	-------

Relation 6: ASSETS

<u>Assets ID.</u>	Asset Name	NGO ID	Asset Value	Location
-------------------	------------	--------	-------------	----------

Relation 7: GOVERNMENT INSTITUTIONS

<u>Institution ID</u>	Institution Name	NGO ID	NGO Address
-----------------------	------------------	--------	-------------

3.3.3 Database Implementation

The database implementation of the logical model was done on postgresql. Postgresql was the database of choice because:

1. It is open source and has a wide community of users
2. It is capable of handling spatial data through spatial extensions
3. It supports a wide variety of languages and allows for atomicity, consistency, Isolation and durability.

Some tables that were present in the design phase were dropped during the implementation phase. This is because of inability to obtain the information required to populate these tables during the data collection. NGOs appeared reluctant to divulge information relating to their finances, financial expenditure, investments and assets.

The public table was also dropped because the web application was not accessible to the public where people could login and provide their biodata information before downloading content. For this reason, it also was not populated.

During data collection, it was also discovered that most affiliate organisations happened to be the donors or government institutions that the NGOS were partnering with. This made the affiliate organisation table redundant and so it was dropped.

The total number of tables that were used in creating the database were therefore five and not the expected seven that were present in the design phase.

4 CHAPTER 4: RESULTS AND DISCUSSION

PostGIS Database

PostgreSQL was installed together with the relevant extensions (plpgsql, postgis and postgis_topology). PgAdmin3 was also installed which provides a graphical interface for interacting with the postgres database. A database NGO was created. This is illustrated in figure 4.1

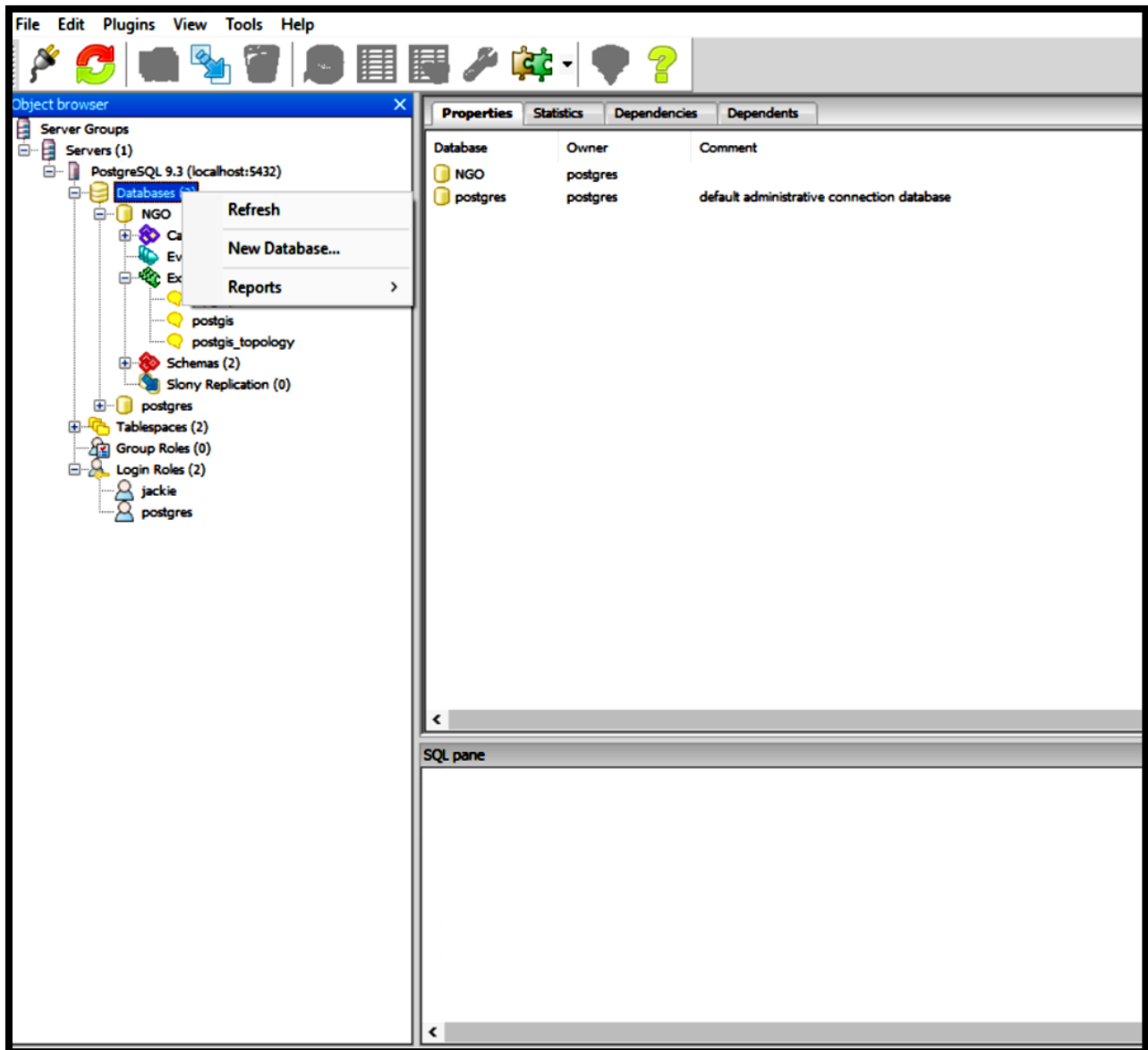


Figure 4.1: PgAdmin: PostGIS database

Querying PostGis Tables using SQL

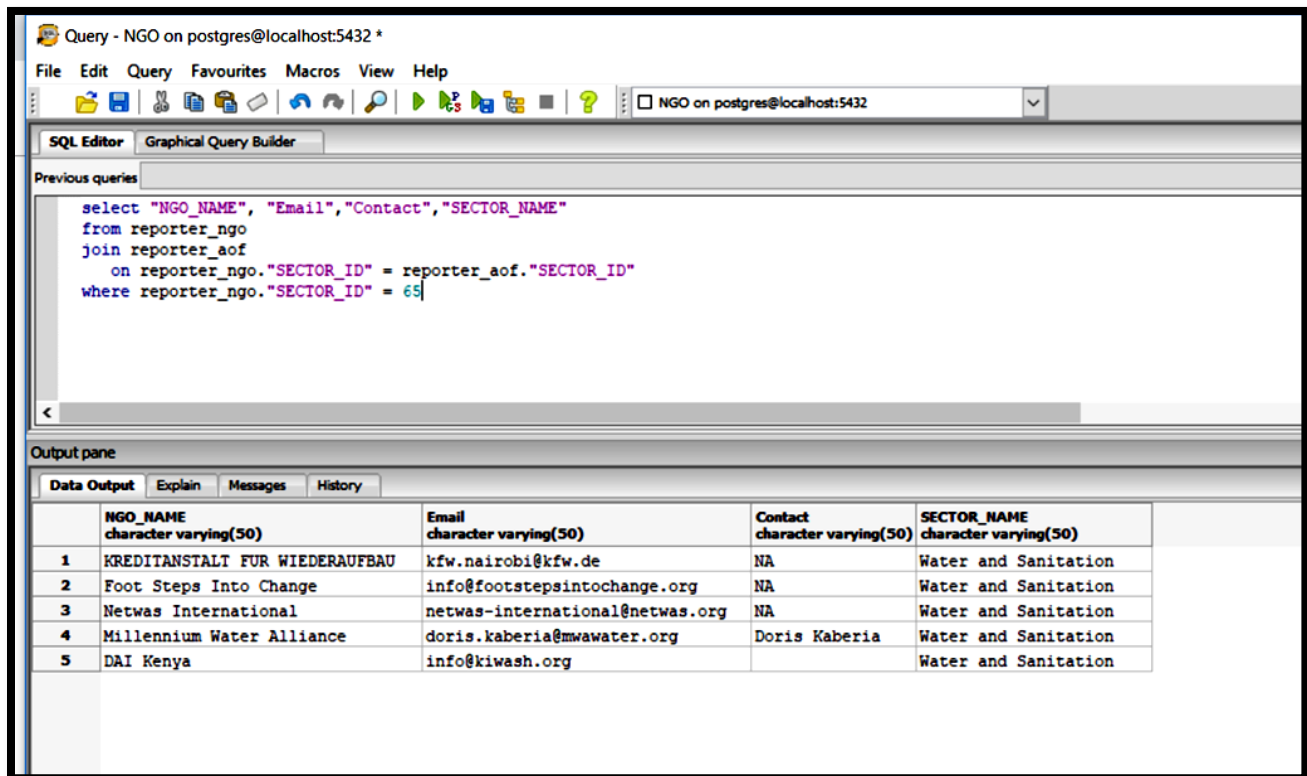
The tables that were created on the database were linked using foreign keys which are the primary keys in the respective tables. The primary keys allow for generation of data from multiple tables. Some examples of useful queries are shown below:

4.2.1 Performing an outer join

Retrieving NGO name, email, contact sector name from tables NGO and Area of Focus

```
SELECT "NGO_NAME", "Email", "Contact", "SECTOR_NAME"  
FROM reporter_ngo  
JOIN reporter_aof  
on reporter_ngo."SECTOR_ID" = reporter_aof."SECTOR_ID"  
WHERE reporter_ngo."SECTOR_ID" = 65
```

The result is shown in figure 4.2



The screenshot shows a PostgreSQL SQL Editor window titled "Query - NGO on postgres@localhost:5432 *". The SQL Editor pane contains the following query:

```
select "NGO_NAME", "Email", "Contact", "SECTOR_NAME"  
from reporter_ngo  
join reporter_aof  
on reporter_ngo."SECTOR_ID" = reporter_aof."SECTOR_ID"  
where reporter_ngo."SECTOR_ID" = 65
```

The Output pane shows the results of the query in a table format:

	NGO_NAME character varying(50)	Email character varying(50)	Contact character varying(50)	SECTOR_NAME character varying(50)
1	KREDITANSTALT FUR WIEDERAUFBAU	kfw.nairobi@kfw.de	NA	Water and Sanitation
2	Foot Steps Into Change	info@footstepsintochange.org	NA	Water and Sanitation
3	Netwas International	netwas-international@netwas.org	NA	Water and Sanitation
4	Millennium Water Alliance	doris.kaberia@mwawater.org	Doris Kaberia	Water and Sanitation
5	DAI Kenya	info@kiwash.org		Water and Sanitation

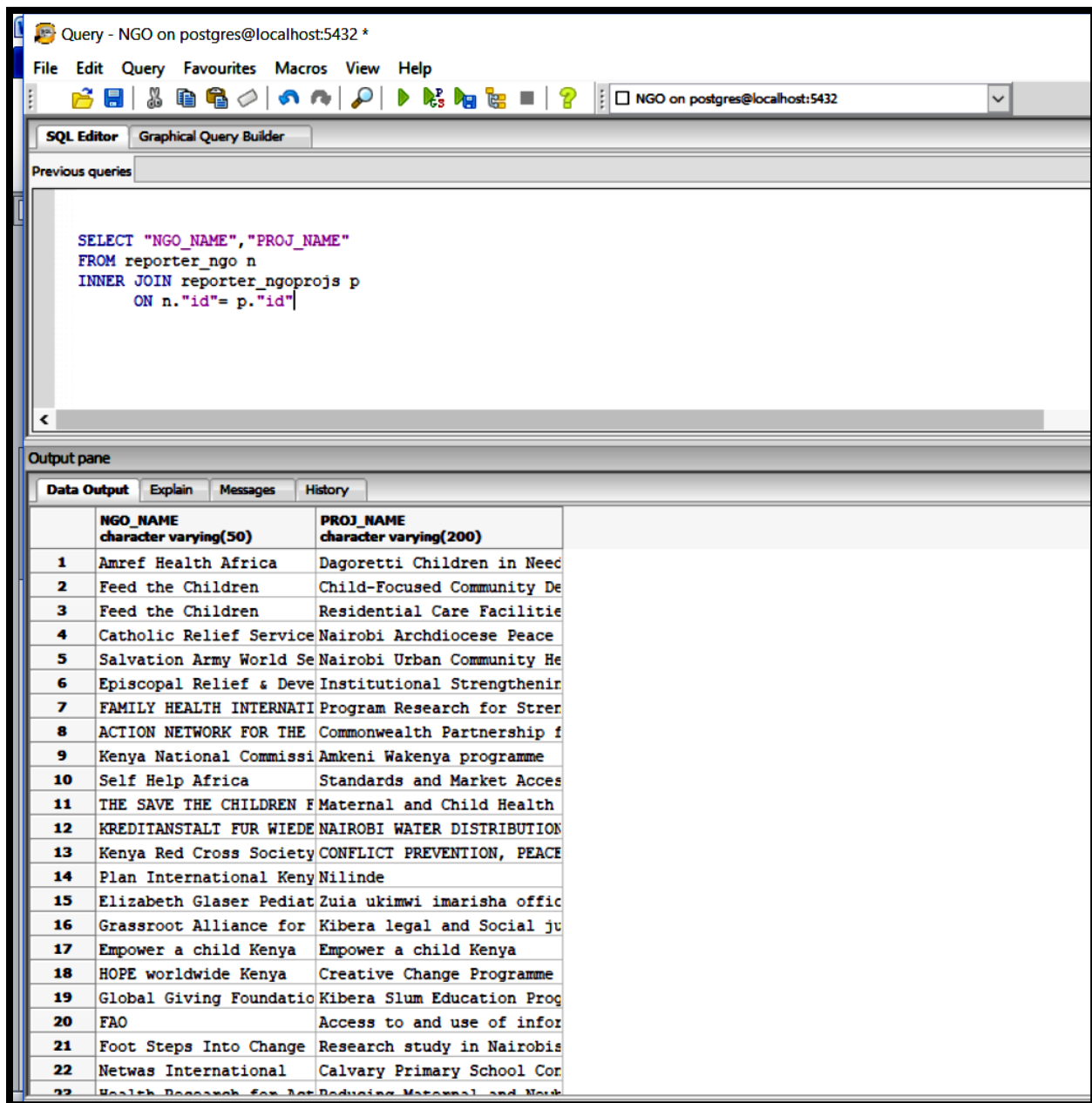
Figure 4.2: Result of performing an outer join

4.2.2 Performing an inner join between two tables

Querying the Ngo name and Project name in the projects and NGOs database

```
SELECT "NGO_NAME","PROJ_NAME"  
FROM reporter_ngo n  
INNER JOIN reporter_ngoprojs p  
ON n."id"= p."id"
```

The result is shown in figure 4.3



The screenshot shows a PostgreSQL query editor window titled "Query - NGO on postgres@localhost:5432 *". The query editor contains the following SQL query:

```
SELECT "NGO_NAME","PROJ_NAME"  
FROM reporter_ngo n  
INNER JOIN reporter_ngoprojs p  
ON n."id"= p."id"
```

The output pane shows the results of the query in a table with the following columns: NGO_NAME (character varying(50)) and PROJ_NAME (character varying(200)). The results are as follows:

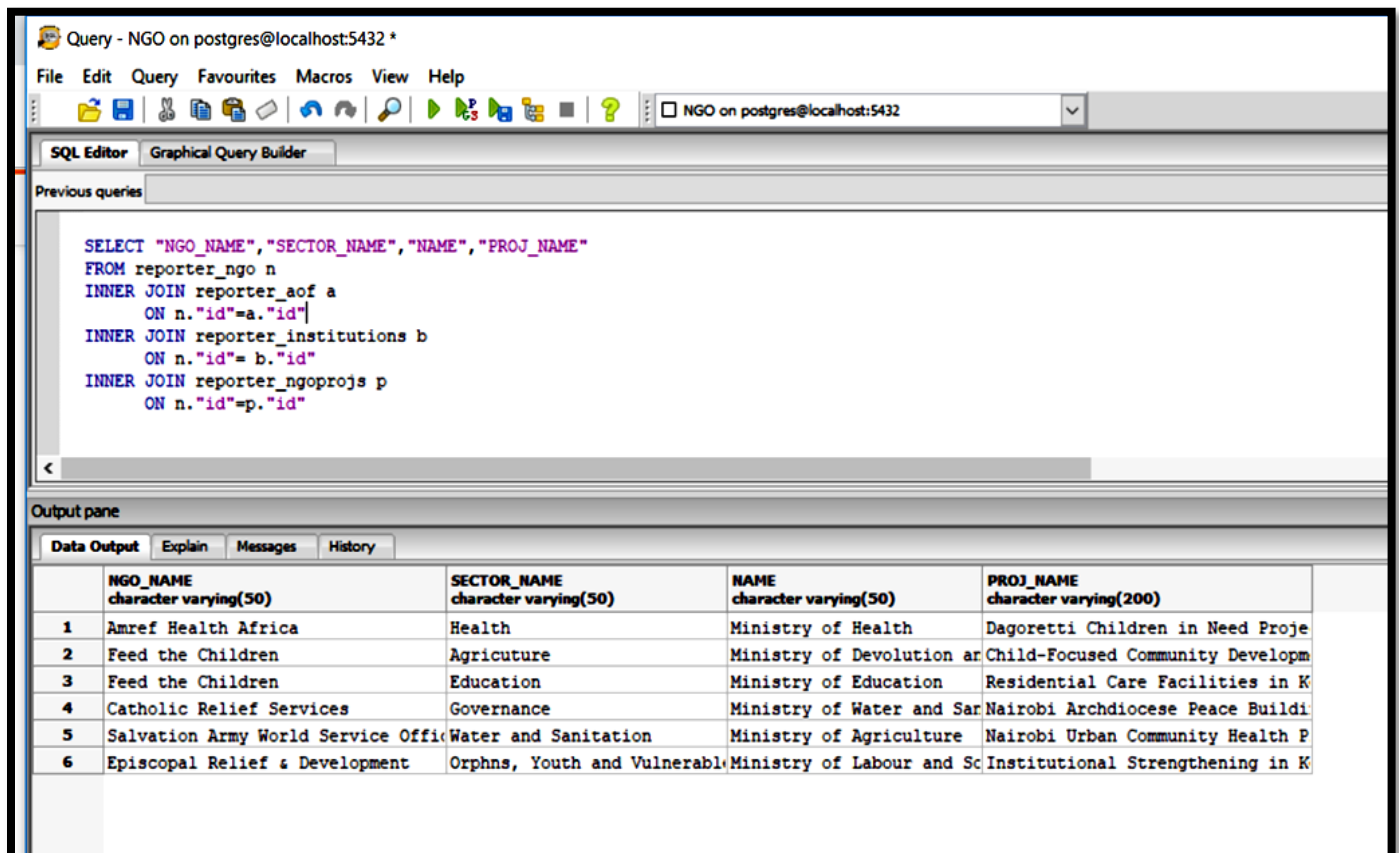
	NGO_NAME character varying(50)	PROJ_NAME character varying(200)
1	Amref Health Africa	Dagoretti Children in Need
2	Feed the Children	Child-Focused Community De
3	Feed the Children	Residential Care Facilitie
4	Catholic Relief Service	Nairobi Archdiocese Peace
5	Salvation Army World Se	Nairobi Urban Community He
6	Episcopal Relief & Deve	Institutional Strengthenin
7	FAMILY HEALTH INTERNATI	Program Research for Strer
8	ACTION NETWORK FOR THE	Commonwealth Partnership f
9	Kenya National Commissi	Amkeni Wakenya programme
10	Self Help Africa	Standards and Market Acces
11	THE SAVE THE CHILDREN F	Maternal and Child Health
12	KREDITANSTALT FUR WIEDE	NAIROBI WATER DISTRIBUTION
13	Kenya Red Cross Society	CONFLICT PREVENTIION, PEACE
14	Plan International Kenya	Nilinde
15	Elizabeth Glaser Pediat	Zuia ukimwi imarisha offic
16	Grassroot Alliance for	Kibera legal and Social ju
17	Empower a child Kenya	Empower a child Kenya
18	HOPE worldwide Kenya	Creative Change Programme
19	Global Giving Foundatio	Kibera Slum Education Prog
20	FAO	Access to and use of infor
21	Foot Steps Into Change	Research study in Nairobi
22	Netwas International	Calvary Primary School Cor
23	Health Research for Act	Reducing Maternal and Newb

Figure 4.3: Result of performing an inner join on two tables

4.2.3 Performing an inner join on three tables

```
SELECT "NGO_NAME","SECTOR_NAME","NAME","PROJ_NAME"  
FROM reporter_ngo n  
INNER JOIN reporter_aof a  
  ON n."id"=a."id"  
INNER JOIN reporter_institutions b  
  ON n."id"= b."id"  
INNER JOIN reporter_ngoprojs p  
  ON n."id"=p."id"
```

The result is shown in figure 4.4



The screenshot shows a SQL query editor window titled "Query - NGO on postgres@localhost:5432 *". The query text is as follows:

```
SELECT "NGO_NAME","SECTOR_NAME","NAME","PROJ_NAME"  
FROM reporter_ngo n  
INNER JOIN reporter_aof a  
  ON n."id"=a."id"  
INNER JOIN reporter_institutions b  
  ON n."id"= b."id"  
INNER JOIN reporter_ngoprojs p  
  ON n."id"=p."id"
```

The output pane shows the following table:

	NGO_NAME character varying(50)	SECTOR_NAME character varying(50)	NAME character varying(50)	PROJ_NAME character varying(200)
1	Amref Health Africa	Health	Ministry of Health	Dagoretti Children in Need Proje
2	Feed the Children	Agricuture	Ministry of Devolution ar	Child-Focused Community Developm
3	Feed the Children	Education	Ministry of Education	Residential Care Facilities in K
4	Catholic Relief Services	Governance	Ministry of Water and Sar	Nairobi Archdiocese Peace Buildi
5	Salvation Army World Service Offi	Water and Sanitation	Ministry of Agriculture	Nairobi Urban Community Health P
6	Episcopal Relief & Development	Orphns, Youth and Vulnerabl	Ministry of Labour and Sc	Institutional Strengthening in K

Figure 4.4: Result of performing an inner join on three tables

Connecting the Database to the Map Editor

The database name, username and password were used to connect the map editor to the postgis database. This provides a more accurate interface for editing spatial data being used in the application. It also ensures the standardized editing of maps to be rendered at the front end.

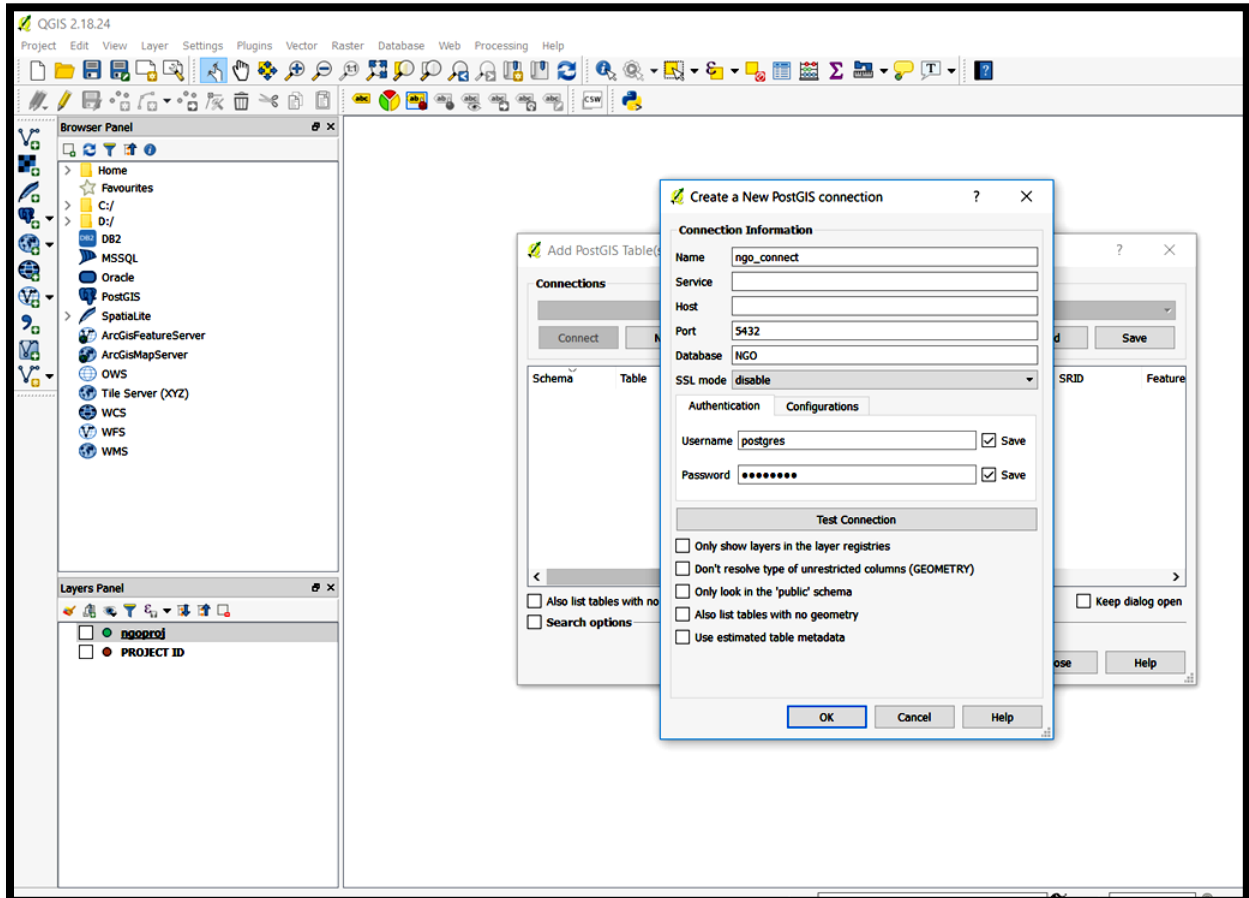


Figure 4.5: Setting up a virtual environment

Querying from the map editor

It is possible for the analyst to query the database from the map editor in order to carry out some analysis on the datasets.

```
SELECT "NGO_NAME","Email","Contact","geom","SECTOR_NAME"  
FROM reporter_ngo  
JOIN reporter_aof  
ON reporter_ngo. "SSECTOR_ID" = reporter_aof. "SECTOR_ID"  
WHERE reporter_ngo. "SECTOR_ID" = 63
```

The results are as shown in Figure 4.6

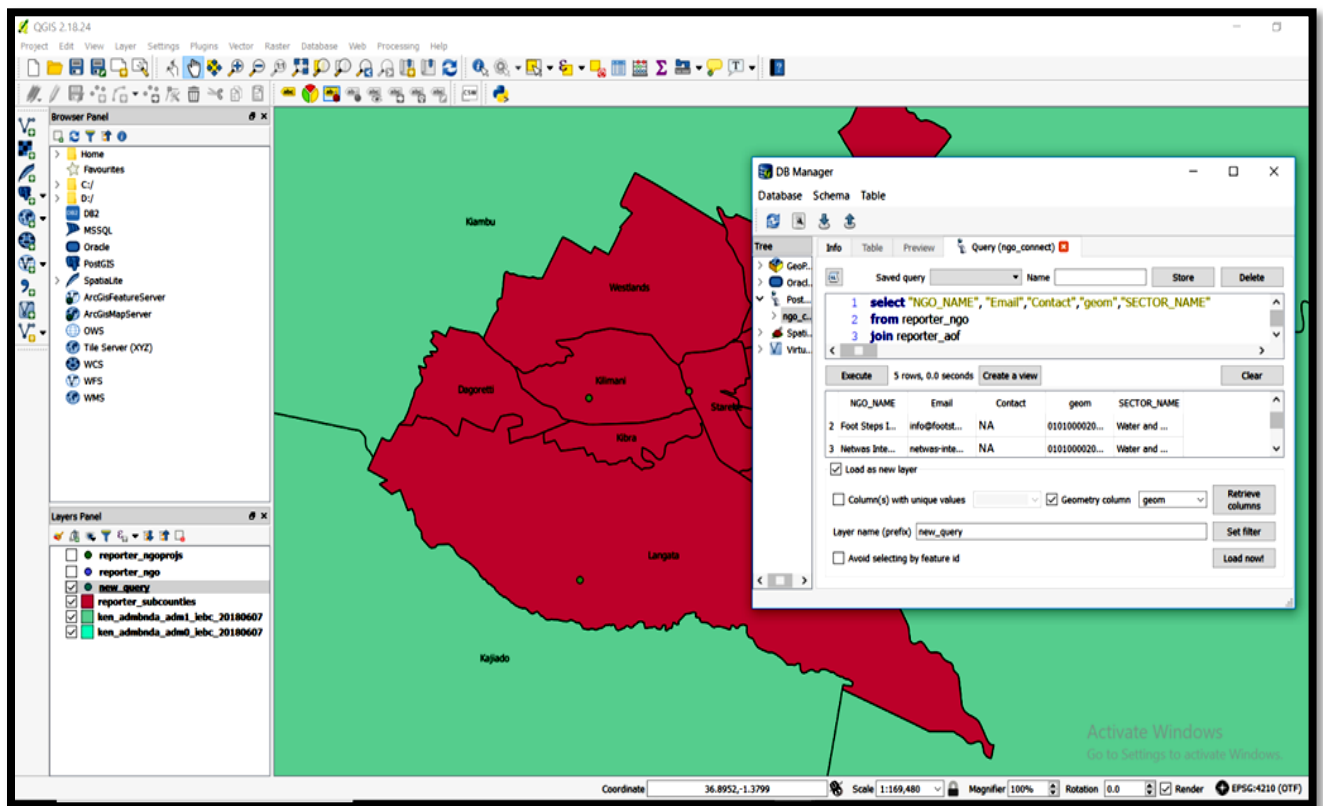


Figure 4.6: Result of querying database using the map editor

Setting Up a Virtual Environment

Windows power shell was used to install python version 3.7, django version 2.1.1 was installed in the life in gis virtual environment from which the development was done. The use of a virtual environment enables the installation and use of various libraries without affecting the other programs installed in the computer. The django leaflet 0.24 was also used to enable the quick display of maps from the mapserver. OSGEO was installed as it contains libraries such as the Geospatial Data Access Libraries (GDAL) which provide a spatial environment during development. Psycpg2 version 2.7.5, an adapter that enables the programme to interact with the postgres database was also installed. Refer to Figure 4.7.



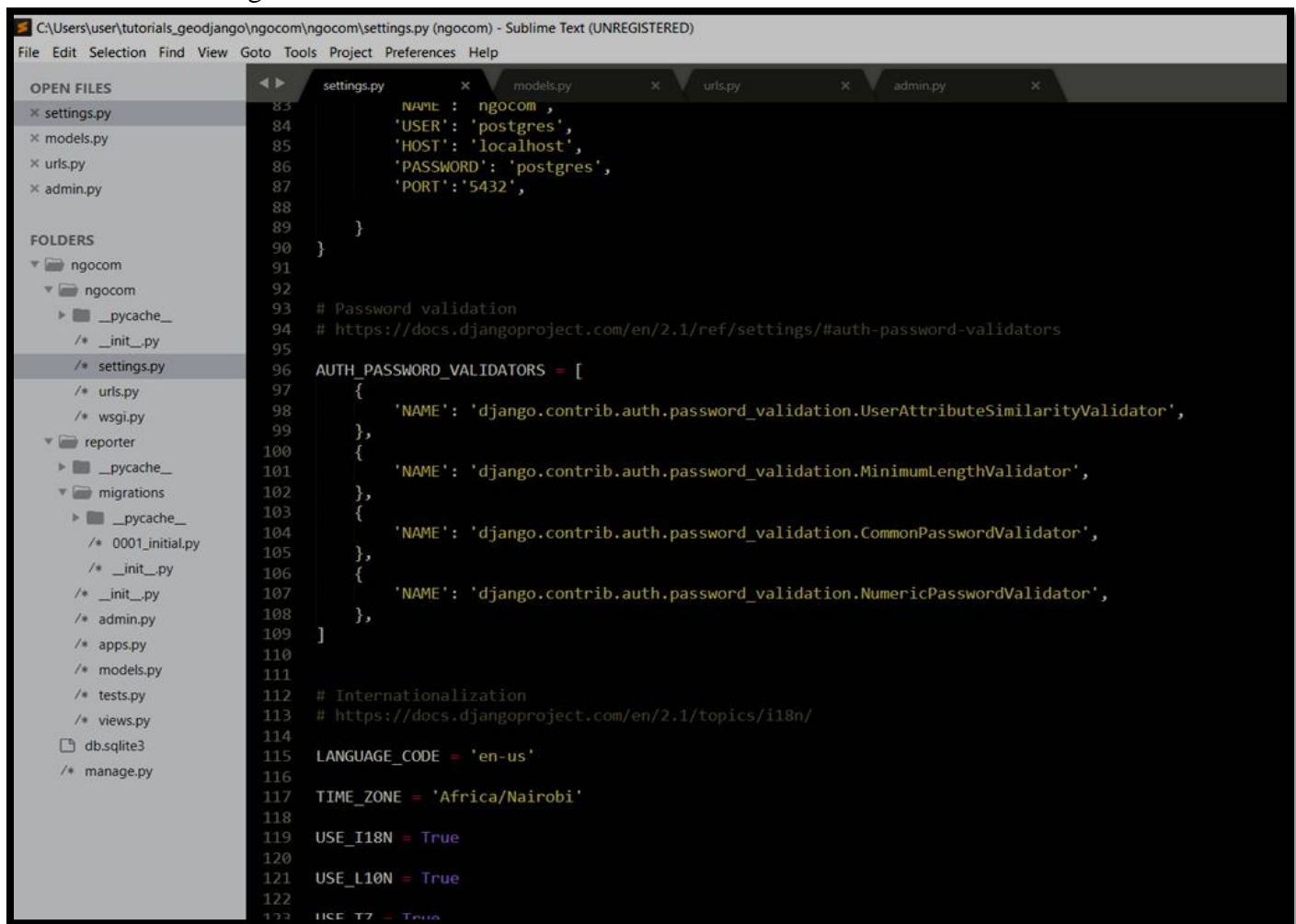
```
Windows PowerShell
(lifeingis) PS C:\users\user\tutorials_geodjango\ngocom> pip freeze
Django==2.1.1
django-geojson==2.11.0
django-leaflet==0.24.0
psycpg2==2.7.5
pytz==2018.5
six==1.11.0
(lifeingis) PS C:\users\user\tutorials_geodjango\ngocom>
(lifeingis) PS C:\users\user\tutorials_geodjango\ngocom>
```

Figure 4.7: Setting up a virtual environment

Setting Up the Development Dependencies

Sublime text was used as the text editor of choice. This is because it is simple to use and makes it easy to navigate from one display to another. It also easily provides a visual of which folder one is working from on the left pane. Sublime Text is a cross-platform, fast text editor that provides clever auto completion features.

Setting the dependencies involved ensuring that the settings to the database are correct to enable connection between the application and the database. It also involved installing several libraries that would be necessary for example for importing and exporting data into and out of the database. Various bootstrap and CSS files that enable the rendering of templates were also available. Refer to figure 4.8



```
C:\Users\user\tutorials_geodjango\ngocom\ngocom\settings.py (ngocom) - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help

OPEN FILES
x settings.py
x models.py
x urls.py
x admin.py

FOLDERS
v ngocom
  v ngocom
    p _pycache_
    /* _init_.py
    /* settings.py
    /* urls.py
    /* wsgi.py
  v reporter
    p _pycache_
  v migrations
    p _pycache_
    /* 0001_initial.py
    /* _init_.py
    /* _init_.py
    /* admin.py
    /* apps.py
    /* models.py
    /* tests.py
    /* views.py
  db.sqlite3
  /* manage.py

83     NAME : ngocom ,
84     'USER': 'postgres',
85     'HOST': 'localhost',
86     'PASSWORD': 'postgres',
87     'PORT': '5432',
88
89     }
90 }
91
92
93 # Password validation
94 # https://docs.djangoproject.com/en/2.1/ref/settings/#auth-password-validators
95
96 AUTH_PASSWORD_VALIDATORS = [
97     {
98         'NAME': 'django.contrib.auth.password_validation.UserAttributeSimilarityValidator',
99     },
100    {
101        'NAME': 'django.contrib.auth.password_validation.MinimumLengthValidator',
102    },
103    {
104        'NAME': 'django.contrib.auth.password_validation.CommonPasswordValidator',
105    },
106    {
107        'NAME': 'django.contrib.auth.password_validation.NumericPasswordValidator',
108    },
109 ]
110
111
112 # Internationalization
113 # https://docs.djangoproject.com/en/2.1/topics/i18n/
114
115 LANGUAGE_CODE = 'en-us'
116
117 TIME_ZONE = 'Africa/Nairobi'
118
119 USE_I18N = True
120
121 USE_L10N = True
122
123 USE_TZ = True
```

Figure 4.8: Configuring the application

Programming the Back-end

The django admin is the back end of the ngoecom system. It allows for direct interaction with the database. To access it one has to create a super user and password in the windows PowerShell. It allows for creation of additional groups and users. Upon login one accesses the page as shown in figure 4.9 below:

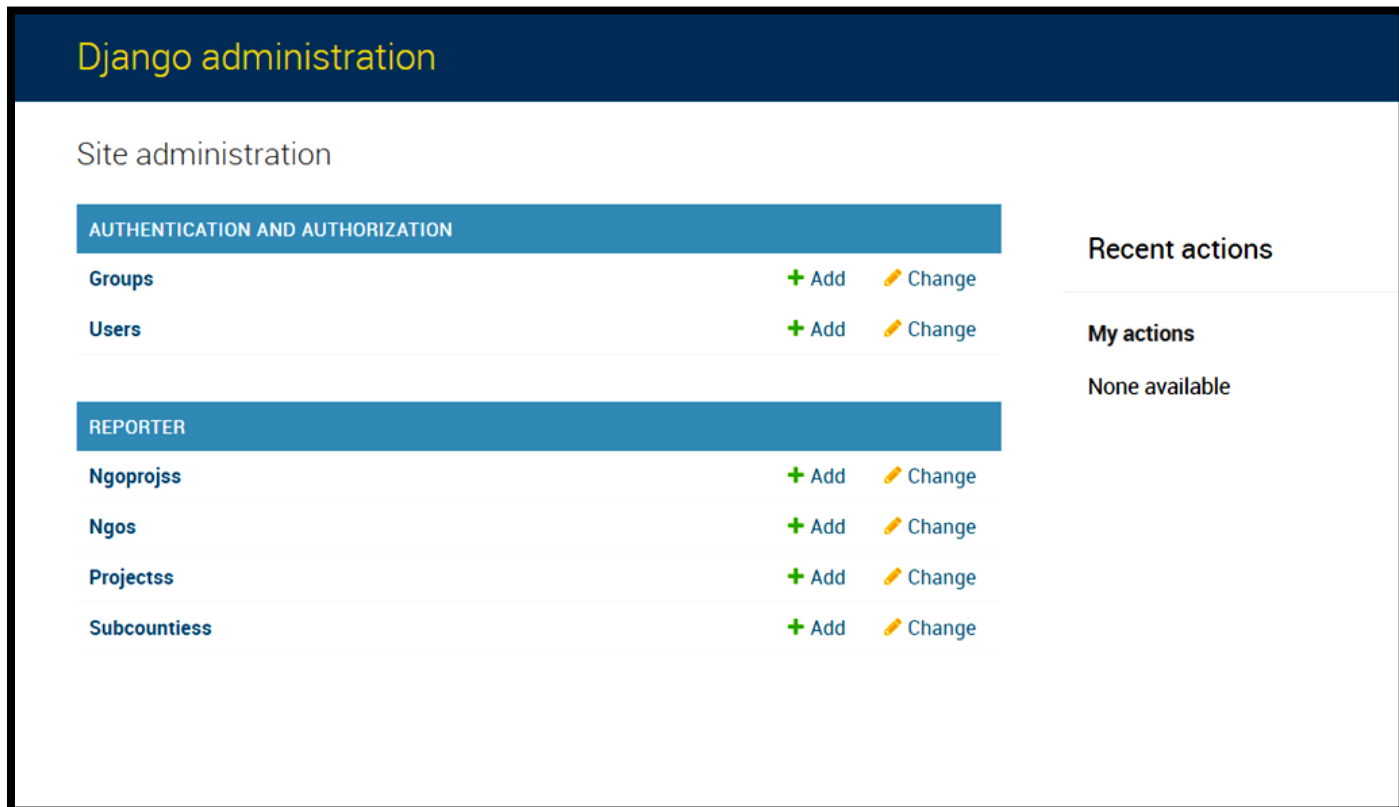
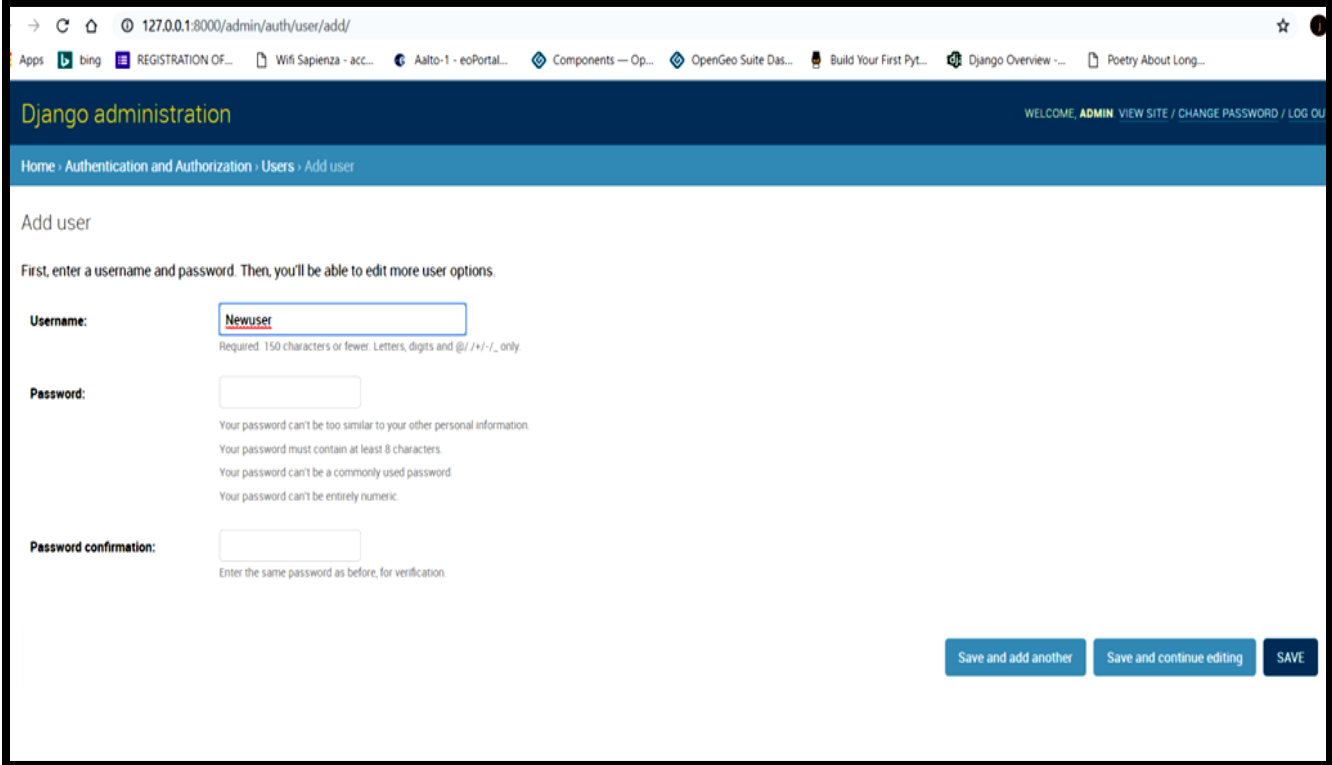


Figure 4.9: Django administration interface

The application is known as reporter and it has several models that have been listed under it.

Permissions and authorizations

The backend allows us to set username and passwords along with their access .It also allows us to group a number of users and give them the same level of permissions. Permissions may include: Read only, read and edit and read and create. Refer to Figure 4.10.



The screenshot shows the Django administration interface for adding a user. The browser address bar displays `127.0.0.1:8000/admin/auth/user/add/`. The page title is "Django administration" and the user is logged in as "ADMIN". The breadcrumb trail is "Home > Authentication and Authorization > Users > Add user".

The main content area is titled "Add user" and includes the instruction: "First, enter a username and password. Then, you'll be able to edit more user options."

The form contains three fields:

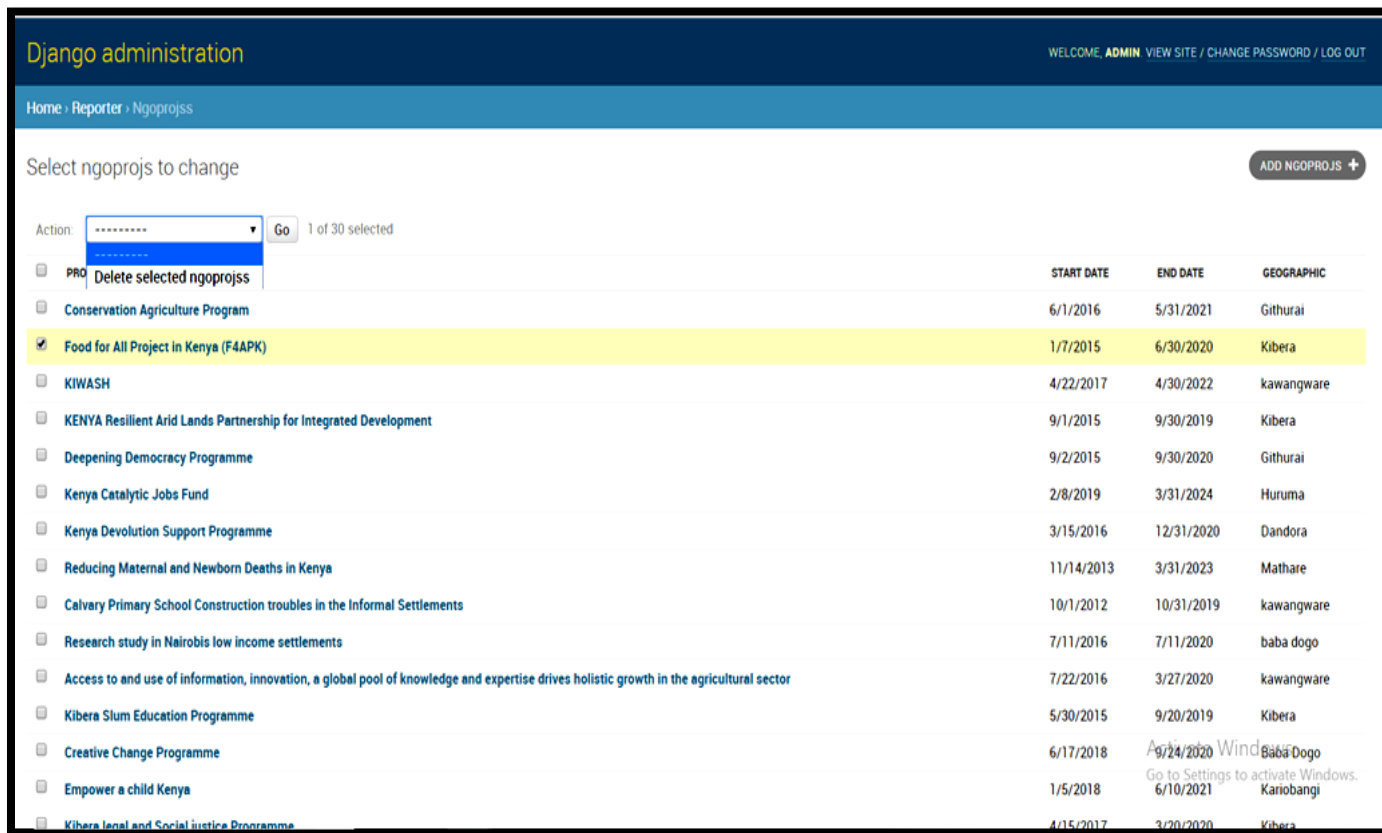
- Username:** A text input field containing "Newuser". Below it, a red error message reads: "Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only".
- Password:** A text input field. Below it, four error messages are listed: "Your password can't be too similar to your other personal information.", "Your password must contain at least 8 characters.", "Your password can't be a commonly used password.", and "Your password can't be entirely numeric."
- Password confirmation:** A text input field. Below it, an error message reads: "Enter the same password as before, for verification."

At the bottom right of the form, there are three buttons: "Save and add another", "Save and continue editing", and "SAVE".

Figure 4.10: Setting up permissions and authorizations

Add/Delete entries in database

The administration section provides a graphical interface to the database where we can add or delete records directly. Refer to Figure 4.11.



The screenshot shows the Django administration interface for the 'Ngoprojss' model. The page title is 'Django administration' and the user is logged in as 'ADMIN'. The breadcrumb trail is 'Home > Reporter > Ngoprojss'. The main heading is 'Select ngoprojs to change'. There is an 'ADD NGOPROJS +' button in the top right. Below the heading, there is an 'Action:' dropdown menu with a 'Go' button and a counter '1 of 30 selected'. The dropdown menu is open, showing 'Delete selected ngoprojs' as the selected option. Below this is a table of projects with columns for 'PROJ', 'START DATE', 'END DATE', and 'GEOGRAPHIC'. The 'Food for All Project in Kenya (F4APK)' row is highlighted in yellow and has a checked checkbox. Other rows include 'Conservation Agriculture Program', 'KIWASH', 'KENYA Resilient Arid Lands Partnership for Integrated Development', 'Deepening Democracy Programme', 'Kenya Catalytic Jobs Fund', 'Kenya Devolution Support Programme', 'Reducing Maternal and Newborn Deaths in Kenya', 'Calvary Primary School Construction troubles in the Informal Settlements', 'Research study in Nairobis low income settlements', 'Access to and use of information, innovation, a global pool of knowledge and expertise drives holistic growth in the agricultural sector', 'Kibera Slum Education Programme', 'Creative Change Programme', 'Empower a child Kenya', and 'Kibera Legal and Social Justice Programme'. A Windows watermark is visible in the bottom right corner of the screenshot.

PROJ	START DATE	END DATE	GEOGRAPHIC
<input type="checkbox"/> Conservation Agriculture Program	6/1/2016	5/31/2021	Githurai
<input checked="" type="checkbox"/> Food for All Project in Kenya (F4APK)	1/7/2015	6/30/2020	Kibera
<input type="checkbox"/> KIWASH	4/22/2017	4/30/2022	kawangware
<input type="checkbox"/> KENYA Resilient Arid Lands Partnership for Integrated Development	9/1/2015	9/30/2019	Kibera
<input type="checkbox"/> Deepening Democracy Programme	9/2/2015	9/30/2020	Githurai
<input type="checkbox"/> Kenya Catalytic Jobs Fund	2/8/2019	3/31/2024	Huruma
<input type="checkbox"/> Kenya Devolution Support Programme	3/15/2016	12/31/2020	Dandora
<input type="checkbox"/> Reducing Maternal and Newborn Deaths in Kenya	11/14/2013	3/31/2023	Mathare
<input type="checkbox"/> Calvary Primary School Construction troubles in the Informal Settlements	10/1/2012	10/31/2019	kawangware
<input type="checkbox"/> Research study in Nairobis low income settlements	7/11/2016	7/11/2020	baba dogo
<input type="checkbox"/> Access to and use of information, innovation, a global pool of knowledge and expertise drives holistic growth in the agricultural sector	7/22/2016	3/27/2020	kawangware
<input type="checkbox"/> Kibera Slum Education Programme	5/30/2015	9/20/2019	Kibera
<input type="checkbox"/> Creative Change Programme	6/17/2018	9/24/2020	Baba-Dogo
<input type="checkbox"/> Empower a child Kenya	1/5/2018	6/10/2021	Kariobangi
<input type="checkbox"/> Kibera Legal and Social Justice Programme	4/15/2017	3/20/2020	Kibera

Figure 4.11: Deleting entries from database

Data entry through the map interface

The administrator section also allows us to add records to the database through the map leaflet. The map is interactive and allows us to add, edit, and delete points. It also allows for zooming into and out of the map. Refer to Figure 4.12.

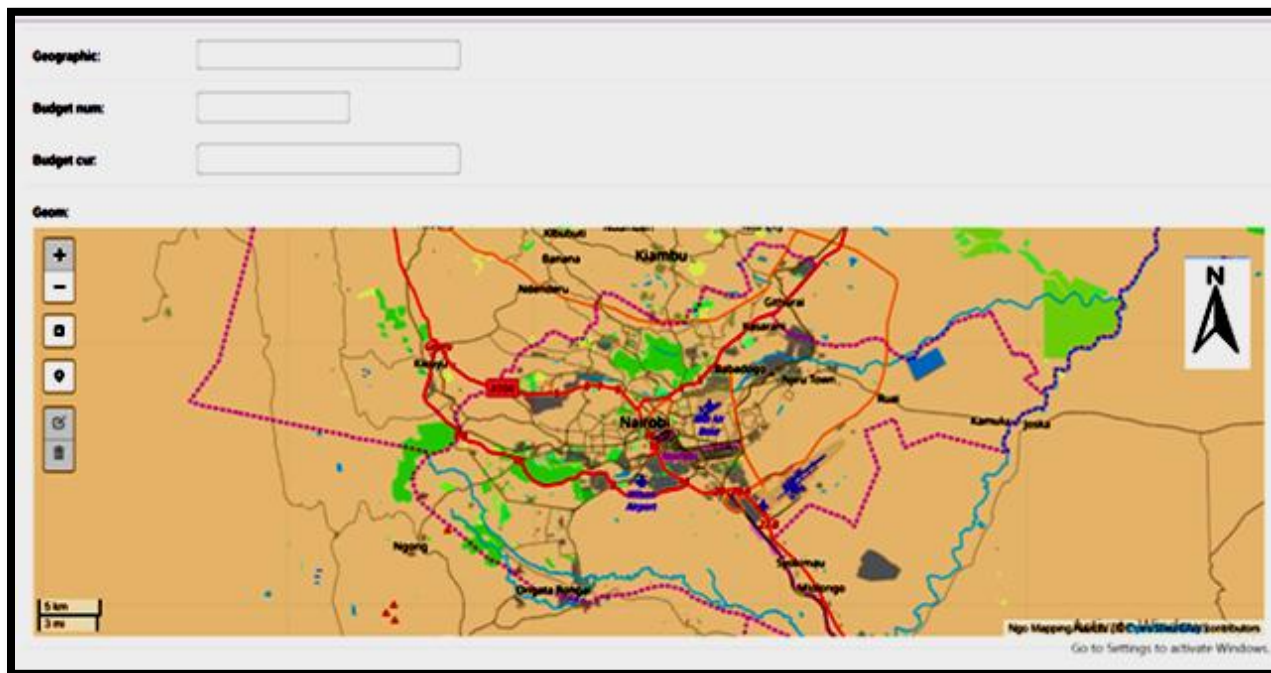


Figure 4.12: Data entry through the map interface

The Front-end

The front end allows for display of the database information to the users. It shows a number of layers that can be turned on and off depending on what the user wishes to see. It also has a navigation par that helps navigate to different pages in the portal. The leaflet also has the zoom in / zoom out and reset functionality enabled. Refer to Figure 4.13



Figure 4.13: Map showing our data

Popups

The front end allows for pop-ups on mouse click that provide additional information relating to an NGO or project. The pop up in the diagram below shows us the location of the FAO headquarters. Refer to Figure 4.14

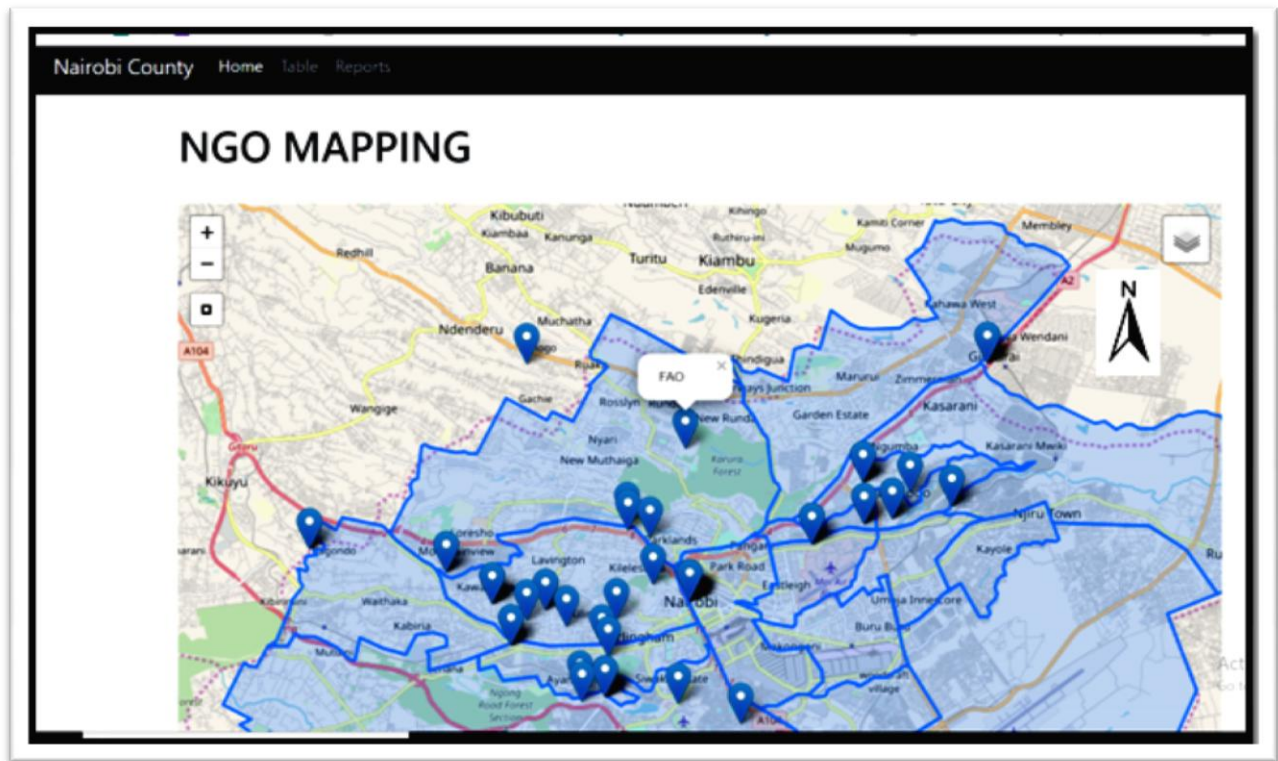


Figure 4-14: Pop-up showing selected entry

Discussion

The entire process that is the life cycle of the project from data collection to the final rendering of the data on a web portal was faced with unique challenges at every phase of the process such as incomplete information during the data collection phase; software configuration to windows environment during the installation and development phases; database implementation due to insufficient information and application hosting due to bureaucracies and service provider restrictions. The WebGIS consists of various useful GIS tools for spatial data visualizations and analysis. The use of an effective database management system allows for efficient storage, querying and retrieval of geospatial data. The adopted approach and its implementation using postgresSQL, postGIS, django, leaflet maps to develop a GIS application provides public data sharing services. It shares the information and geospatial datasets allowing users with limited GIS knowledge to access the information relating to NGOs, their projects and locations. The GIS and various open source web technologies can be efficiently combined as a mechanism to share spatial information openly, freely and easily.

5 CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The objectives of this project were:

- i. To create a Geodatabase of NGOs
- ii. To create a web based application for querying, interaction, visualisation of spatial and attribute information about NGOs.

These have been achieved and it is concluded that:

- Data from NGOs was successfully collected, and mapped on a GIS web platform that allows for viewing of specific location based datasets by allowing one to switch on and off layers. Pop ups appear on mouse click to provide more information about a specific point or area within our region of interest
- The application also provides a backend with additional functionality for adding points manually to the database along with the possibility of adding an entire comma separated value (csv) file through the map editor (QGIS). Queries can also be run on the map editor to extract information from the database.

5.2 Recommendations

From the study, it is recommended that:

- A more comprehensive geodatabase of NGOs in Kenya should be established.
- More research should therefore be made in the area of NGO operation in Kenya. This will enable a better understanding of the NGO activities, source of funds and assets in order to establish genuine NGOs from illegitimate ones.

REFERENCES

- Alesheikh, A., Helali, H. and Behroz, H. (2002) *Web GIS: Technologies and Its Applications*. Symposium on Geospatial Theory, Processing and Applications, Vol. 15, Ottawa, 2012
- Ananda F, David K. and Moses N. (2016) *Towards a new methodology for web GIS development* International Journal of Software Engineering & Applications (IJSEA), Vol.7, No.4, July 2016
- Bebbington A. (2004) *Progress in Human Geography: NGOs and uneven development: geographies of development intervention*.
- Brockington D. and Banks N., October 2017, *Changes in Expenditure, Income and Income Sources for Development NGOs based in the UK* <https://mappingdevelopmentngos.wordpress.com/> [accessed on August 21, 2018]
- Cavaco R., Rui S., Mário A., Miguel C. (2010) *Rapid GIS Development: a mode Portugal: International Conference on Geographic Information Science -based approach focused on interoperability*.
- Chemnetich M. (2009) *Discourses on Civil Society in Kenya-The prospects of civil society driven change in Kenya* 3: 20-31.
- Daily Nation Kenya (2015) (KHRC vs NGO Coordination board 495 of 2015): October 15 2015.
- Drinhausen K. and Günter S. GIGA Focus Latin America, 9, online: <www.giga-hamburg.de/giga-focus/lateinamerika>.
- Dupuy K., Ron J. and Prakash A. (2015), *Who Survived? Ethiopia Regulatory Crackdown on Foreign-Funded NGOs*, in Review of International Political Economy
- Jillo R. A. (2009) *NGO Law in Kenya* The International Journal of Not-for-Profit Law Volume 11, Issue 4, August 2009
- Julia P. *Middle East Research and information Projects* 2017 at www.merip.org/mer/mer214/ngos-dilemmas [accessed on 10 March 2018]
- Kamau N., *civil-society-condemns-attempted-raid-and-deregistration-of-human-rights-organisations* 18 August 2017 <https://www.civicus.org/index.php/media-resources/media-releases/2918-kenya-civil-society-condemns-attempted-raid-and-deregistration-of-human-rights-organisations>[accessed on 12 March 2018]
- Karamoja Resilience Support Unit (KRSU) *Karamoja NGO Mapping Report*, November 2016, Karamoja Resilience Support Unit (KRSU)

- Kristina A. (2016) *Civil Society Under Pressure* 4. January 2016 at <https://ke.boell.org/2016/01/04/civil-society-under-pressure>[accessed 8 March 2018]
- MacWright T., and E. van Zummeren (2010), *The Hitchhacker's Guide To Tiled Maps* www.liedman.net/tiled-maps
- Mas'ó J., K.P., Julia, N (2010): *Open GIS Web Map Tile Service Implementation Standards*. Open Geospatial Consortium Specification.
- Najjar F. (2017), *Why is Egypt's new NGO law controversial?* Aljazeera 31/05/2017 [accessed on August 23,2018]
- O'Reilly T. (2004) O'Reilly Media, <https://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html?page=5> [accessed on August 23, 2018]
- Peters, Ina (2011), *The Belo Monte Dam: Prime Example of a Successful Civil Society in Brazil*
- Plewe B. (1997) *GIS Online: Information Retrieval, Mapping, and the Internet* Santa Fe, USA: Wordpress, First Edition.
- Rousse M. (2015), *Web 2.0* <https://whatis.techtarget.com/definition/Web-20-or-Web-2> [accessed on March 10,2018]
- Samuel K., Eunice K. *NGOs received Sh6b funds from unknown sources-* report 15 September 2015 at www.nation.co.ke/news/NGOs-receive-funds-unknown-sources/1056-2871462-gka0bz/index.html [accesses on 8 March 2018]
- The London School of Economics and Political Science (LSE), *How to Measure Civil Society*, 2001, <http://fathom./se.ac.uk/features/122552> [accessed on March 10, 2018]
- Wanjiru G. *Role of civil society in implementing constitution- the struggle-continues* October 24, 2015 at www.katibainstitute.org/role-of-civil-society-in-implementing-constitution-the-struggle-continues-by-by-wanjiru-gikonyo [accessed on March 10,2018]
- Wischermann, J. (2013), *civil societies supporting authoritarian regimes. The case study Vietnam*, in: *Political quarterly* , special issue, 47, 324-347.
- World Bank, (1997) *Handbook on Good Practices for Laws Relating to NGOs*, The International Center for Not-for-Profit Law.

APPENDIX

APPENDIX 1: NGO QUESTIONNAIRE

1. Basic data

Name of the NGO

Address

Physical Address

Registration Number

What is the Main Sector of operation of this NGO (tick one only):

1	Education	
2	Health	
3	Governance	
4	Youth and women empowerment	
5	Water and sanitation	

Ownership Status Description of NGO (tick one only):

- 1. International NGO.....
- 2. National NGO.....
- 3. Community based NGO.....

Which year was this NGO first registered in Kenya? Year _____
(If not Registered, write 00)

2. Projects:

Titles of the projects	Location of the projects	Budget	Start date	End date	Status	Source of funding	Beneficiaries

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3. Affiliate Organisations/Partners

	Name of Organisation	Country of Origin

4. Main Sources of Funding. Also indicating the levels of contribution on a scale where the highest contributor is (1) to lowest.

Source of Funding	Tick	Level
Government (central & states)		
Foreign agencies		
Individual Donations		
Other NGOs		
Charities		
Corporations		
Internal Sources		
Parent NGO		
Others		

If 'Others' please specify

5. Employees / Volunteers

Item	Male	Female
a. Number of workers – National staff		
b. Number of workers – International staff		
Total number of workers (a+b)		

6. Organisation's Assets

	Asset Description	Asset value

7. Annual report (tick one)

Yes

No