University of Nairobi

School of Engineering

APPLICATION OF WEB-GIS IN MAPPING OLDER PERSONS

CASH TRANSFER (OPCT)

CASE STUDY: LANGATA CONSTITUENCY, KENYA

BY

John Muita Wairiuko

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Declaration

I, John Muita Wairiuko, hereby declare that this project is my original work. To the best of my knowledge, the work presented here has not been presented for a degree in any other Institution of Higher Learning.

JOHN MUITA WAIRIUKO   …….………….   …………………

Name of student   Signature   Date

This project has been submitted for examination with my approval as university supervisor.

DR. F. N. KARANJA   ……………….   …………………

Name of supervisor   Signature   Date

Dedication

To my children, George Luke Wairiuko, Trevor Ndichu and Lysette Wanjiru.

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Abstract

This study focused on the developments of a web-based GIS portal for the Older Persons Cash Transfer (OPCT) programme. OPCT is welfare improvement programme that is targeted toward the elderly poor with the aim of alleviating old age poverty among the beneficiaries. The programme has been under implementation in Kenya since year 2007. The overall objectives of the study was to develop a web-based GIS system that will help OPCT programme management to map the programme to enhance transparency, accountability, accessibility, and availability. The study area was Langata constituency with approximately 650 enrolled beneficiaries. Programme data was acquired from the Programmes Office at the Department of Gender in the former Ministry of Gender, Children and Social Development. Data provided was mainly programme attribute data that included; Beneficiaries Enrolment data, No. of Beneficiaries by County and OPCT Payment Points. This data was mainly used to establish the format of the data collected and maintained by the programme. Geographic point data for beneficiaries and pay points was generated using Google Maps and an Internet-based geocoding tool. County boundaries data was extracted from shapefiles obtained from secondary sources. The datasets were imported on to Google Fusion Tables for analysis and visualisation. HyperText Markup Language (HTML) and Cascading Style Sheets (CSS) were used to create a Front-end User Interface. Google Maps JavaScript Application Programming Interface (API) was used to embed maps visualised in Fusion Tables on to the web pages. The final output was a web-based GIS portal that displayed layers of OPCT data inform of interactive maps that had added functionality such as pan, zoom and query. The finding of this study was that GIS is a viable proposition for the OPCT programme. The geographic dimension would add value in planning and decision making. The current trend in Information and Communication Technology is more towards Web technology. Web-based GIS therefore becomes a suitable option for analysis, presentation and dissemination of programme information due to ubiquitous access and low cost of ownership of internet-based solutions.

Table of contents

List of Tables

List of Figures

List of Abbreviations

API	Application Programming Interface
CGIS	Canadian Geographic Information systems
CSS	Cascading Style Sheets
CSV	Comma Separated Values
FAO	Food and Agricultural Organization
ESRI	Environmental Systems Research Institute
GIS	Geographic Information Systems
GPS	Global Positioning Systems
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol
IDE	Integrated Development Environment
IEBC	Independent Electoral and Boundaries Commission
KML	Keyhole Markup Language
KNBS	Kenya National Bureau of Statistics
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MIS	Management Information Systems
NSPP	National Social Protection Policy
PCK	Postal Corporation of Kenya
PWD	People with Disabilities
OPCT	Older Persons Cash Transfer
RDBMS	Relational Database Management System
RSS	Really Simple Syndicate
UN	United Nations
UNDP	United Nations Development Program
URL	Uniform Resource Locator

CHAPTER 1: INTRODUCTION

1.1 Background to the Study

Older Persons Cash Transfer (OPCT) Programme is one of the social protection programmes under implementation by the Ministry of Gender, Children and Social Development, in Kenya (Republic of Kenya, 2012; Mathiu and Mathiu, 2012). Social protection is mainly a kind of insurance policy against poverty and a tool for delivering social justice, as well as a means of promoting inclusive development. In using web-based Geographic Information System (GIS) to map OPCT, this study aims at exposing the spatial dimension in the management and monitoring of the programme.

Kenya's commitment to address the issues affecting the elderly is evident at both international and national levels. At the international level, Kenya has stated her commitment through the signing of various international declarations and treaties that now inform her policies, strategies and programmes for the elderly. Some of these international instruments include:

- The Universal Declaration of Human Rights (1948), Articles 22 and 25
- International Plan of Action on Ageing adopted in 1982, Vienna Austria World Assembly on Ageing.
- UN Principles and Rights of Older Persons to independence, participation, care, self-fulfilment and dignity, 1991.
- UN Principles of Older Persons, 1991.
- UN Proclamation on Ageing, 1992.
- The Madrid International Plan of Action on Ageing, 2002.
- African Union approved Policy Framework and Plan of Action on Ageing in 2002.
- Livingstone declaration of 2006 which urged governments to integrate social transfers in annual work plans and national budgets (Kazeze, 2007; Republic of Kenya, 2012; Mathiu and Mathiu 2012).

Commitment at the national level is clearly laid out through;

- The Constitution of Kenya in which Article 57 delineates the rights of older persons.
- Kenya's Development blue print (Vision 2030) that recognizes the need to take care of the elderly.

- Policy on Older Persons and Ageing that lays the basis for interventions of the elderly in Kenya
- Draft Social Protection Policy that recognizes the elderly as among the vulnerable groups to be targeted for Social Protection programmes (Republic of Kenya, 2012).

According to the 2009 Kenya population and Housing Census, Kenya had a population of 38.6Million. About 1.3M of these people were above 65 years of age, 53.2 % (708, 201) of which were categorised as absolute poor and 25.4% (337, 993) as hardcore poor (Republic of Kenya, 2009; Kenya National Bureau of Statistics (KNBS), 2010).

OPCT is one of the three main social cash transfer programmes (see Appendix C) under implementation in Kenya and marks the government's effort to address old age poverty and vulnerability in the country. According to Bryant (2009), social cash transfers are regular and predictable transfers provided by the state to its citizens with the objective of alleviating poverty, providing social protection and reduce economic vulnerability.

The rationale behind OPCT is that older persons are part of the poor and vulnerable constituents of the population and that they are often poorer than other age groups. The situation is seemingly worse for older women who face many socio-cultural barriers and discrimination. Consequently, there is growing appreciation of the fact that those entering old age in poverty are likely to remain poor as chances of improvement in quality of life diminish with age.

The overall objective of the OPCT programme is to strengthen the capacities of older persons and improve their livelihood while alleviating poverty through sustainable social protection mechanisms. This is to be achieved through provision of regular and predictable cash transfers to selected beneficiaries and building their capacity to improve their livelihoods.

The pilot phase of the programme was launched under the Rapid Results Initiative of the year 2007 in three Districts of Nyando (Nyanza Province), Busia (Western Province) and Thika (Central Province). This phase had an annual government allocation of 4 million Kenya shillings covering a total of 300 older persons registered in the three districts with each district awarded a quota of 100 beneficiaries (Ikiara, 2009). The monthly stipend was 1,000

Kenya shillings per older person in the programme. The selection criteria were age (persons above 65 years); income status; geographical and the requirement that those selected would not be beneficiaries of another cash transfer programmes. The results of the pilot and lessons learned were positive and showed that a cash transfer program for the elderly could significantly improve their welfare (Ikiara, 2009).

Following the successful pilot, the government increased funding of the programme to 550 million Kenya shillings for the financial year 2009/2010. This budget allocation facilitated the up scaling of the programme to cover 33,000 beneficiaries in 44 Districts (total of 78 constituencies). Each District was awarded a quota of 750 beneficiaries while the monthly stipend per beneficiary older person increased to Kenya shillings 1,500 resulting in each beneficiary receiving 3,000 shillings once every two months. From the financial year 2009/2010 up to financial year 2010/2011, the number beneficiaries in the programme were maintained at 33,000. The selection of the 44 Districts, (78 constituencies) was guided by the following:-

- Kenya Integrated Households Budget data Survey, 2005/2006
- District selection (HIV/AIDS prevalence and poverty indices)
- Regional balancing (Provincial distribution)
- Use of community poverty indicators

In the financial year 2011/2012, the budget allocation for the programme was increased to 1 billion shillings. The result was that the programme was up scaled in term of national coverage to reach all the 210 constituencies in Kenya but in limited numbers. The monthly stipend was also increased to 2,000 Kenya shillings per household. Consequently, the number of households was to increase to 33,036 households. Each of the additional 132 constituencies was awarded a quota of 23 older persons' households.

In the current financial year 2012/13, the programme's budget allocation stands at 1.5 billion shillings. This is meant to increase the number of beneficiaries to 59,036, which will be achieved by increasing the quota awarded to each of the 132 constituencies with 23 Older Persons' Households as shown in Appendix A.

The evolution of Kenya's OPCT programme clearly shows that spatial-temporal dimension is an important consideration in the implementation of the programme and hence the need to incorporate Geographic Information Systems (GIS) technology in monitoring and management of the programme.

A Geographic Information System (GIS) is a technology that incorporates geographical features with tabular data in order to map, analyze, and assess real-world problems. Data that is referenced to locations on the earth constitute spatial or geographic data while additional information about the spatial feature is attribute data (http://www.gislounge.com/what-is-gis/, viewed on 24th April 2007). In the case of OPCT, geographic coordinates for the location of a beneficiary constitute spatial data, while the beneficiary's name, identification number and others personal details forms the attribute data.

A web-based GIS on the other hand is an online tool that perform the GIS functions on spatial information over the internet and that provide access to the information with added functionality such as the ability to pan, zoom and query interactive maps.

In a white paper entitled "Place Matters in the Helping Professions: GIS for Human and Social Services organisation" Environmental Systems Research Institute (ESRI) (2011), observes that social workers and other human service professionals who leverage the data management, analysis and visualisation capabilities of GIS are empowered to understand community needs, measure environment forces (including those affecting access to services), deliver services more efficiently and detect fraud and abuse.

In using web-based GIS to map OPCT, the study aims at exposing its relevance, potential and suitability in the management, monitoring and evaluation of the programme as well as a tool for information dissemination.

1.2 Problem Statement

OPCT is a relatively new undertaking by the government of Kenya that involves application of scarce financial resources. The programme is targeted at alleviating poverty, providing social protection and reducing economic vulnerability among the elderly poor. As a result, there are many stakeholders that are interested in the programme's performance and impact. This implies that failure of the programme would result in great social, economic and

political ramifications. According to Kenya Social Protection Sector review (Republic of Kenya, 2012), the OPCT programme suffers from weak monitoring and evaluation regime that has resulted in lack of information on programme's performance and impact to inform program managers, planners and policy makers among other stakeholders. Therefore, there is need for the development of a cost effective system that would enhance transparency, accountability, availability and accessibility in programme management and monitoring. A web-based GIS system is a suitable solution that would meet the requirements.

1.3 Objectives of the Study

1.3.1 Overall Objective

The overall objective of this study is to develop a web-based GIS system that will help programme management at the Ministry of Gender, Children and Social Development to map Older Persons Cash Transfer programme to enhance transparency, accountability, accessibility, and availability.

1.3.2 Specific Objectives

The specific objectives of the study include to:-

- Investigate the role of GIS in OPCT programme.
- Identify the spatial indicators for the OPCT programme.
- Design a web-based GIS portal for OPCT programme.
- Populate the web-based GIS portal for OPCT programme.
- Demonstrate the system's functionality as a management monitoring and reporting tool for OPCT programme.

1.4 Justification for the Study

The OPCT programme has been running since 2007 when it was successfully piloted in the three districts of Nyando, Busia, and Thika and has since been escalated in terms of national coverage to reach all the districts in the country (Ikiara, 2009; Republic of Kenya, 2012). Increasingly, the government of Kenya continue to allocate scarce resources to address the well-being of the elderly poor in the society. With respect to the meagre resources available, the resources allocation targeted for alleviating poverty raises serious distribution problems to the government. It is therefore important for policy makers and planners to have access to the most precise and up-to-date detailed information about the targeted elderly poor. Apart from knowing the number, planners, policy makers and program management need to know who these people are, their spatial distribution, causes of their problems and how they are

responding to government policy interventions (KNBS, 2008). This same information is of great interest to the communities and the general public for purposes of ensuring transparency and accountability.

OPCT Program management at the Ministry of Gender, Children and Social development is currently setting up a Management Information System (MIS) for the programme; however, geographic location data that provide the very important spatial dimension is not incorporated in the MIS.

Undeniably, there are many advantages of viewing data inform of a map compared to viewing the same in tabular form. This study addresses this gap by developing a web-based GIS system that uses geo-referenced OPCT data to produce a variety of interactive map products that can be used to disseminate programme related information to various stakeholders.

1.5 Scope and Limitations of the Study

OPCT has nation-wide coverage in Kenya and the idea in this project is to develop a system that would map the "whole" instead of "part". However, owing to limited time and scarcity of human, material and financial resources, the scope was narrowed to that of developing a web-based GIS system that generates a limited number of interactive maps for OPCT in Langata constituency. This included maps on beneficiaries, pay points, payments, new targets/registrations and exits from the programme.

The study made use of existing OPCT programme data from the Ministry of Gender, Children and Social development to determine the nature, content and format of the information captured in the programme. The actual names of the beneficiaries were masked for privacy reasons. Geographic location information for the beneficiaries and payment points was generated using the Internet-based Google geo-coding tool. Consequently, the names and geographic coordinates' information for the beneficiaries on the maps are not those of the actual beneficiaries on the ground. Names, images and geographic coordinates for the payment points (Post Offices) are however the actual on the ground.

Another important limitation is that the geo-database used by the system was retained as received from OPCT programme management; with the exception of inclusion and exclusion

of some columns. As such the geo-database is based on MS-Excel spreadsheet as opposed to Relational Database Management System (RDBMS). Consequently, some adjustment would need to be made for the system to pick and map data stored in a RDBMS such as the one used by Management Information Systems (MIS) that was still under implementation at the time of the study.

1.6 Organization of the Report

This report is organised in five chapters. Chapter one generally presents the background to the study, problem statement, justification of the study, objectives, scope and limitations. Chapter two provides a review of literature that is relevant to the study. Chapter three details the methodology employed during the study. Chapter four presents the results and discussions. Lastly, chapter five puts forward the conclusions and recommendations that accrue from the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of literature as a background to OPCT, one of the instruments under social protection. The chapter also focuses on Geographic Information Systems (GIS) and Web GIS in relation to the development of a Web-based GIS portal for the OPCT programme.

2.2 MDGs and the fight against Extreme Poverty

In 2000, leaders from 189 nations adopted the Millennium Development Goals (MDGs), a set of 8 goals designed to significantly reduce global poverty and disease by 2015 (United Nations, 2000). At the top of the list was the goal on eradication of extreme poverty and hunger; a goal that was supported by the fact that around the world, 1.4 billion people were living in extreme poverty (earning less than $1.25 a day) and nearly one in seven people went to bed hungry every night. The target set for this goal was to halve the proportion of the world's people whose income is less than one dollar a day by 2015 (United Nations, 2000).

An important outcome of the United Nations Millennium Declaration is that governments around the world, with the help of various donors instituted focused strategies, policies and financial interventions to ensure that this goal is met by 2015. According to Food and Agricultural Organization (FAO) (2005), The Millennium Declaration brought in two important elements that were missing from the struggle against poverty and hunger in the past, that is, strengthened political will and resources.

The Millennium Development Goals Report 2012 indicates that the target of reducing extreme poverty by half has been reached three years ahead of the 2015 deadline (United Nations, 2012). Preliminary estimates indicate that the global poverty rate at $1.25 a day fell in 2010 to less than half the 1990 rate as shown in Figure 2.1.
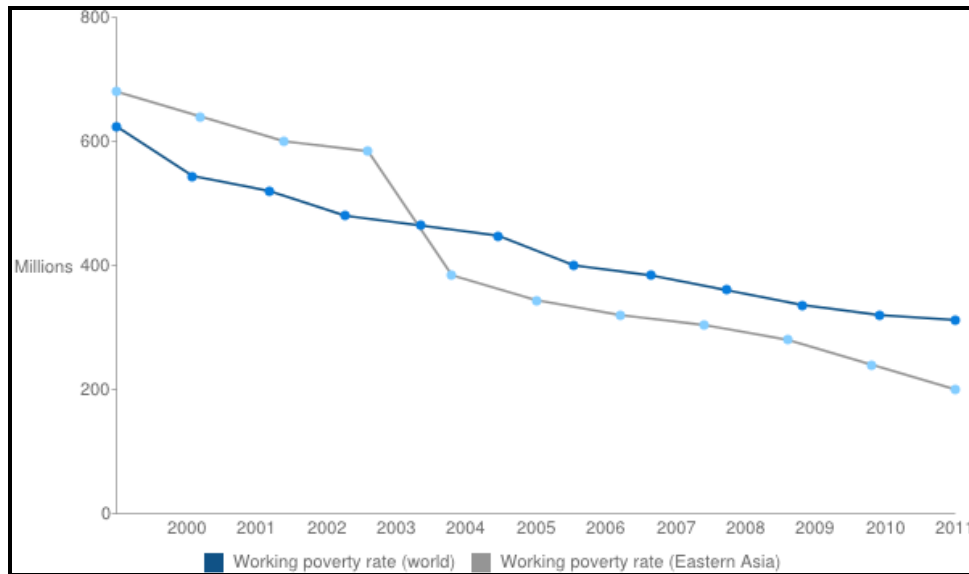
Figure 2.1: Proportion of people living below $1.25
(Source: United Nations Development Program (UNDP), 2012 http://www.undp.org,
viewed on 7 April 2013)

Despite this progress, it is estimated that about 1 billion people will still be living on less than $1.25 a day in 2015. Four out of every five of these people living in extreme poverty will live in sub-Saharan Africa and Southern Asia. Kenya is one of the countries in sub-Saharan Africa that has put in place a number of interventions geared towards this MDG. The following section reviews some of these efforts.

2.3 Fight against Poverty in Kenya

According to Republic of Kenya (2012), poverty remains widespread in Kenya despite the government's effort over the last four decades. Poverty estimates indicate that about 19.0 million people are absolute poor. Among these are 708, 201 older persons out of whom about 337,000 are categorised as hard-core poor as shown in Table 2.1. Important also is the fact that poverty is not evenly or randomly distributed in the country. Poverty rates are markedly higher in rural areas (49.7 percent) than in urban areas (34.4 percent). Also national poverty figures camouflage significant regional differences. A map of poverty by county is shown in Figure 2.2.

Table 2.1: Poverty Status of Selected Groups in Kenya, 2009.

(Source: Republic of Kenya, 2012)

Table 1.3: Simulated Poverty Status of Selected Groups in Kenya, 2009					
	Total	**Absolute Poor**		**Hardcore Poor**	
		Number	**Percent of Total**	**Number**	**Percent of Total**
Total Population	38,610,097	19,026,671	49.3	8,308,177	21.5
Children (0-18 years)	19,147,737*	10,252,805	53.5	4,636,046	24.2
Orphans and Vulnerable Children	3,612,679	1,953,418	54.1	933,734	25.8
Children with Disability	349,207	219,086	62.7	95,862	27.5
Total Adults	19,441,274*	8,732,179	44.9	3,671,305	18.9
Adults with Disability***	981,105	563,519	57.4	278,978	28.4
Older Persons	1,332,273*	708,201	53.2	337,993	25.4
Chronically-ill Adults	1,947,484	879,093	45.1	340,743	17.5
Food-insecure	1,834,367**				
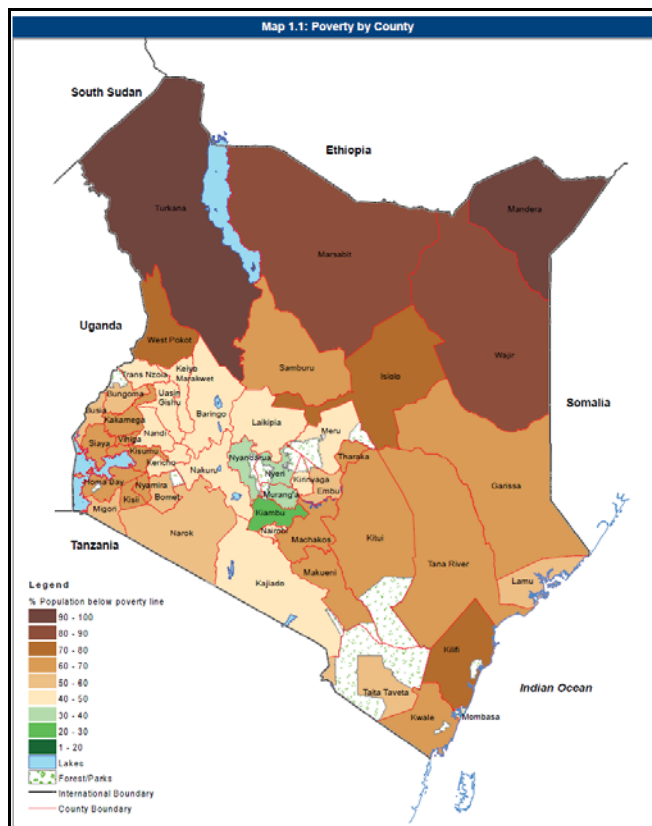
Figure 2.2: Poverty by County
(Source: Republic of Kenya, 2012. **Note:** Map Scale no specified at source)

Kenyan government commitment to poverty alleviation is documented in a number of policy, regulatory and legislative documents among them, the 2010 Constitution of Kenya, Kenya Vision 2030, the Draft National Social Protection (NSPP), various sector-specific laws that guide the implementation of interventions aimed at improving the welfare of the poor and

vulnerable members of society and various policies and laws that focus on specific vulnerable groups in the country (Mathiu and Mathiu, 2012 and Republic of Kenya, 2012).

Appendix C shows a list of 19 Social protection programmes that are currently under implementation in Kenya. Among the 19 are several Cash Transfer programmes (shown in Table 2.2), one of which the Older Persons Cash Transfer programme (OPCT) that is targeted at the elderly poor. Geographically, OPCT is targeted for a nation-wide coverage which at the moment is low as shown in the map in Figure 2.3. Besides coverage, the other important question that comes to the forefront with regards to these programmes is their effectiveness in poverty reduction. According to Pearson and Alviar (2007), effectiveness of cash transfer programmes in poverty reduction can be assessed by at least two measures; the extent to which the programme reaches the poor (vertical efficiency) and the proportion of the poor who are covered by the programme (horizontal efficiency). A number of tools can be used to do this analysis but a Geographic Information System (GIS) is most suitable owing to its capability to bring-in the spatial dimension and show the results graphically.

Table 2.2: Social Cash Transfers Programme.
(Source: Republic of Kenya, 2012).

	Programme	Beneficiaries	Number of Beneficiaries	Funding Agency	Implementing Agency	Transfer Type
IV. Social Cash Transfers						
12.	Hunger Safety Net Programme (HSNP), Phase 1 Pilot	Chronically food-insecure, extremely poor, and vulnerable people	289,480** (2010)	DFID	Min. for the Development of Northern Kenya and Arid Lands	Cash
13.	Cash Transfer for Orphans and Vulnerable Children (CT-OVC)	OVC	412,470 (2010)	UNICEF, DFID, WB, GoK	MGCSD	Cash
14.	Older Persons Cash Transfer (OPCT)	Older people	33,000 (2010)	GoK	MGCSD	Cash
15.	Disability Grants	People with disabilities and institutions serving people with disabilities	2,100 (2010)	GoK	MGCSD	Cash
16.	Urban Food Subsidy	Poor households in urban areas	5,150	Several donors	WFP, Oxfam, Concern	Cash
17.	General Food Distribution (GFD)*	Poor households and disaster victims	2,180,058 (2010)	GoK	Special Programmes, WFP	Food
18.	Supplementary Feeding (including Mother & Child Nutrition)*	Poor women and children	454,667 (2010)	GoK	WFP	Food
19.	Food/Cash for Assets*	Vulnerable communities	140,000 (2010)	Several donors	WFP, Ministry of Northern Kenya	Food or Cash

Figure 2.3: Geographic coverage of Cash Transfer programmes
(Source: Republic of Kenya, 2010. **Note:** Map Scale no specified at source)

2.4 Geographic Information Systems (GIS)

Geographic Information Systems (GIS) refers to a system of hardware, software and procedures that capture, store, edit, manipulate, manage, analyse, share and display georeferenced data (Fu and Sun, 2011).

GIS technology has been in existence well before the emergence of the Internet and the Web. It was developed in 1962 by Roger Tomlison for Canada's Federal Department of Forestry and Rural Development. At the time, it was called the Canada Geographic Information System (CGIS) and was used for Canadian land inventory and planning.

GIS is used to produce a wide range of maps but its capabilities go beyond mapping. It offers a rich set of analytical functions that can reveal hidden relationships, patterns, and trends that are not readily apparent, enabling people to think spatially to solve problems and make smart decisions (Fu and Sun, 2011).

Environmental Systems Research Institute (2011), in a white paper entitled "Place Matters in the Helping Professions: GIS for Human and Social Services Organizations" gives remarkable insights on the usefulness of GIS in the field of Human and Social services. According to ESRI, leveraging data management, analysis, and visualization capabilities of GIS would benefit core activities or processes such as needs assessment, program planning, case management, information and referral, routing and logistics, research and evaluation, and communication and reporting.

With regard to needs assessment, ESRI notes that GIS generated maps are an important tool that helps to bring to light unmet needs and overlapping or redundant services through such GIS functions as thematic mapping and geo-coding locations of existing service centers for mapping and proximity analysis. On the other hand, for communication and reporting process, interactive maps from a GIS, enables programme management, policy makers and the public to stay informed about the progress made in meeting programme goals. Inclusion of GIS in OPCT programme could have direct benefit since the processes described in these two examples are core to their work.

2.4.1 Web GIS

Web GIS is a combination of the Web and Geographic Information Systems, a discipline that has evolved rapidly since its inception in 1993 when the Xerox Corporation Palo Alto Research Center (PARC) developed a Web-based map.

Web GIS can also be described as a type of distributed information system, which in its simplest form is composed of at least a server and a client, where the server is a Web application server, and the client is a Web browser, a desktop application, or a mobile application as shown in Figure 2.4. In terms of how this works, the client uses the server's Uniform Resource Locator (URL) to locate the server on the web. The client then uses the HTTP protocol to send requests to the server which performs the requested GIS operation and sends a response to the client using HTTP. This forms a two tier architecture. Three tier architecture includes a data tier. The tiers and components can be distributed to a variety of locations over the internet hence its being described as a type of distributed information system.

The definition of Web GIS can therefore be stated as any GIS that use Web technology to communicate between components.
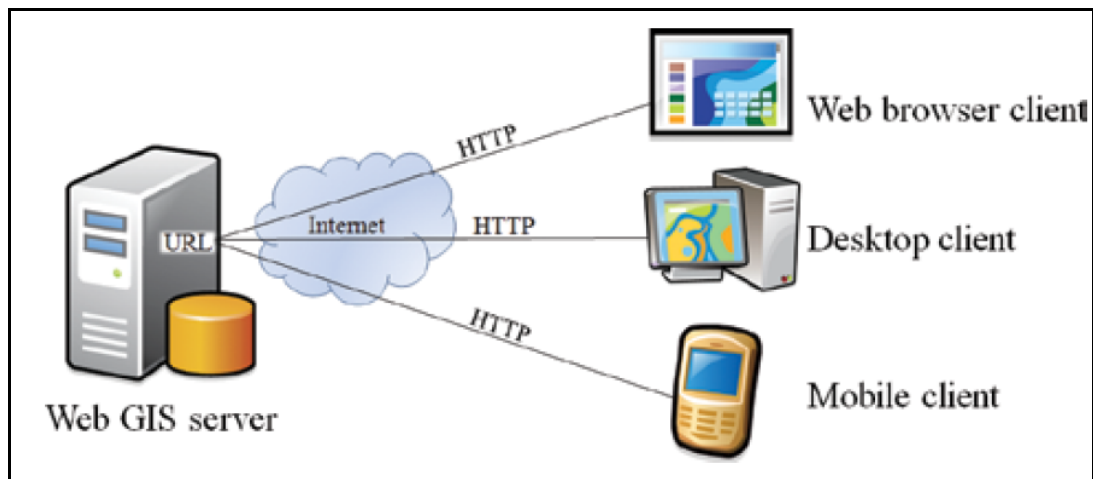
Figure 2.4: The simplest architecture of Web GIS
(Source: Fu and Sun, 2011)

2.4.2   Characteristics of Web GIS

Fu and Sun (2011) have identified the following as key characteristics of Web GIS:

- **A global reach**: Users can access web GIS applications from their home computers or cell phones.

- **A large number of users:** Web GIS can be used by dozens or hundreds of users simultaneously whereas a traditional desktop GIS is used by only one user at a time.

- **Better cross-platform capability:** The majority of clients of Web GIS are Web browsers which largely comply with HTML and JavaScript standards making Web GIS which relies on HTML clients typically supports different operating systems.

- **Low cost as averaged by the number of users:** The vast majority of Internet contents are free of charge to end users, Web GIS included. Users do not need to buy software or pay to use Web GIS. One Web GIS which can be shared by many users; from home, at work, or in the field. Also, organizations that need to provide GIS capabilities to many users can keep their costs low by setting up one. The results are reduced costs in purchasing and maintenance that provide a high return on investment.

- **Easy to use for end users:** Web GIS is targeted at a broad audience, including public users with no knowledge of GIS. Web GIS is commonly designed for simplicity, intuition, and convenience, making it much easier for end users than desktop GIS.
- **Unified update:** New versions of Web GIS program and data are updated on the server and the one update works for all clients, making updating a lot easier.
  Diverse applications: Web GIS broad audience have diverse demands resulting in Web GIS being used in a variety of applications, both formal and informal

Owing to these characteristics of Web GIS, OPCT programme would greatly benefit if a web-based GIS portal was in place.

Important also is the fact that Web GIS can perform all GIS functions involving spatial information, that is, capture, storage, editing, manipulation, management, analysis, sharing, and visualization. Fu and Sun (2011) highlight the following as some of the strengths of Web GIS.

- **Mapping (visualization) and query:** Web mapping is the most commonly used function where GIS data and analysis results are usually presented as maps.
- **Collection of geospatial information:** Involves volunteered geographic information often through crowd sourcing. Examples are Wikimapia Web site and OpenStreetMap that are collaborative project based on data collected by users using personal portable Global Positioning Systems (GPS) devices.
- **Dissemination of geospatial information:** GIS Web portals provide ideal platform for the wide distribution of information.
- **Geospatial analysis:** Web GIS provides analytical functions such as measuring distances and areas, finding the optimum driving path (i.e., navigation), finding the location of an address or place, and using proximity analysis to find the businesses nearby.

2.4.3 Success Stories on Applications of GIS and Web GIS

2.4.3.1 Cloud GIS for Crime Mapping

Singh et al. (2012) did a study on how the cloud could be exploited to develop a Cloud-based GIS system for crime mapping. The objective of their study was to develop a cost effective decision support system which would help the police department to map and analyse crime. The system combined the spatial and non-spatial data to derive meaningful information.

Google's cloud and GIS technology were used in the study. Crime information which was mainly non-spatial data was acquired through RSS (Really Simple Syndicate) feeds from various newspapers and news channels websites. Spatial data used was in the form of satellite imagery on Google maps.

In their methodology, collected RSS feed were captured in Google docs spreadsheet, location attribute data was added and the table was converted to Fusion Tables. In Fusion Tables, the option Visualise map was used to geo-coded the data based on the location attribute in the table and the table was visualized as a map which was then exported to KML for purposes of embedding on system web page. The point layer was generated daily to map the crime in the area of interest

The results was a blog which could provide daily, weekly and monthly maps that would help identify crime patterns and clusters, categorise crimes. The objective of the maps was to help identify crime prone areas. Google Maps were used provide ancillary map information such as the location of police stations, while Google Maps API was used to automate the tasks. The final result was an efficient and cost effective decision support system for the administrators. The only limitation of the system was that location of the crime specified in the online newspapers was mostly generalised.

2.4.3.2 GIS: A Planning Tool for Human Services Agencies

Mandayam (2002) project was to study the application of GIS technology for analysing needs assessment data pertaining to senior services. Data used in the study was acquired from the agency that was responsible for planning, developing, funding, administering and delivering the service to the elderly in the study area

The GIS software used was ArcView 3.2a. Its application in the needs assessment study comprised mainly of data, data management and manipulation, analysis and visualisation. In the methodology, data was checked for accuracy and saved in a database format compatible with ArcView. Base map data layers for study area were brought into ArcView from secondary sources. With survey data in appropriate database and base map ready in ArcView, the next thing was manipulation, analysis and visualisation of the data.

The results were three maps that visually indicated the location of the senior centres and the social economic profile of the seniors in the study area. Evident from the maps was the finding that most of the senior centres were located within urban areas of the study area except for four that were in the rural areas. The maps also showed that there were many seniors living in the study area with an annual income below $20000. The conclusion of the study was that GIS application in the field of human service was more effective due to visual maps on client communities and their need as an alternative to tables of numbers. GIS make information easier to grasp and also provide more dimensions to studying human service data.

All this therefore indicate that a study focused on the application of GIS in OPCT programme has the potential to yield useful finding and become another success story.

CHAPTER 3: METHODOLOGY

3.1 The Study Area

Langata constituency is one of the seventeen constituencies in Nairobi County, in Kenya (Figure 3.1). It lies on the south-western part of the county and is within about 10 kilometres from Nairobi City centre. It is located at approximately 1°22'S 36 °44'E or 1.367S 36.733E.
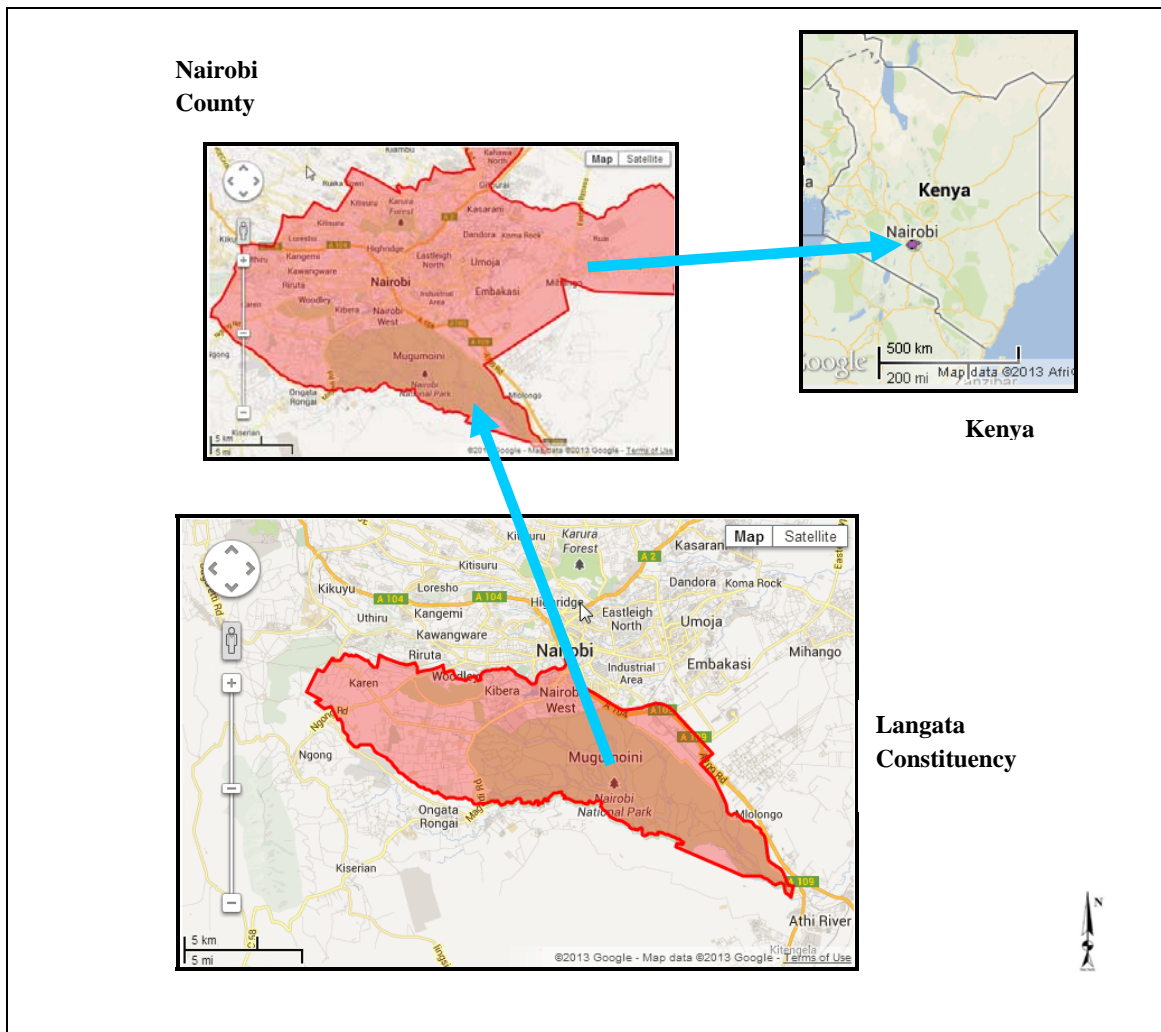
Figure 3.1: Map showing the Study Area

The constituency covers an area of 196.80 Km^2 and has a population of approximately 176,314 people (KNBS, 2010). It constitutes five county wards, whose names, area and population are shown in Table 3.1. Formerly, the Langata constituency used to encompass Kibera location however, with the promulgation of the 2010 Kenya Constitution and the

review of administrative boundaries by the Independent Electoral and Boundaries Commission (IEBC), Kibera became a constituency on its own called Kibra Constituency.

Table 3.1: County Wards in Langata Constituency
(Source: http://softkenya.com, viewed on 20th April 2013)

Location/Ward Name	Population (Approx.)	Area (Sq. Km)	Description
1. Karen	24,507	48.00	Comprises Karen, Langata, Hardy and Lenana Sub-Locations of Nairobi County
2. Nairobi West	33,377	6.90	Comprises Nairobi West Sub-Location of Nairobi County
3. Mugumo-ini	47,037	126.40	Comprises Mugumo-ini and Bomas Sub-Locations of Nairobi County
4. South C	47,202	15.10	Comprises South C Sub-Location of Nairobi County
5. Nyayo Highrise	24,191	0.40	Comprises Highrise Sub-Location of Nairobi County

According to the 2009 Kenya Population and Housing Census (KNBS, 2010), the distribution of the elderly in Langata constituency was as shown in Table 3.2.

Table 3.2: Population Distribution for the Elderly in Langata by Years of Age and Gender
(Source: KNBS, 2010)

Population Distribution for the Elderly in Langata by Years of Age and Gender								
Age/Years	Male	Female	Total		Age/Years	Male	Female	Total
60	755	488	1,243		70	220	205	425
61	358	217	575		71	69	67	136
62	374	218	592		72	120	90	210
63	304	194	498		73	95	68	163
64	297	202	499		74	69	47	116
60-64	**2,088**	**1,319**	**3,407**		**70-74**	**573**	**477**	**1,050**
65	370	250	620		75	104	115	219
66	151	118	269		76	76	47	123
67	215	122	337		77	58	49	107
68	170	103	273		78	67	59	126
69	139	91	230		79	49	52	101
65-69	**1,045**	**684**	**1,729**		**75-79**	**354**	**322**	**676**
					80+	430	601	**1,031**
					Total	**4,490**	**3,403**	**7,893**

Langata constituency is home to the affluent Karen and Langata estates and a number of middle class residential housing estates such as Nairobi Dam, Otiende, Southlands, Ngei, Jambo, Onyonka, Madaraka among others. It has a wide range of shopping, social and recreational amenities and is also well covered by all-weather road network making it easily accessible.

The constituency has a large number of spatial features some of which serve as great tourist attractions. These include but not limited to; the Nairobi National Park, Nairobi Animal Orphanage, The Giraffe Centre, Wilson Airport, Bomas of Kenya, Mamba Village, Langata Cemetery, Uhuru Gardens among many others (http://softkenya.com, viewed on 20th April 2013).

3.2 Data Sources and Tools

3.2.1   Data Sources

The data used in this study mainly relates to OPCT programme execution and was provided by the OPCT Programme Office at the Department of Gender in the former Ministry of Gender, Children and Social Development. Additional supportive data was accessed from various other sources. Table 3.3 below provide the list of the datasets and their characteristics.

Table 3.3: Datasets: Source and characteristics

Data	Source	Characteristics
Point Data (x,y) for • OPCT Beneficiaries • Post Offices (payment points in Langata constituency)	• Google Maps • Internet-Based Geocoding Tool. (http://gmaps-samples.googlecode.com/svn/trunk/geocoder/singlegeocode.html)	Geographic coordinates (x,y) in Decimal Degrees. (Generated using Internet based geo-coding tool) Date of acquisition: 28th April 2013.
OPCT Data • Enrolled Beneficiaries • Post Offices (payment points • Constituency Beneficiaries Quota allocations	OPCT Programme Office in the Department of Gender, Ministry of Gender, Children and Social Development	MS – Excel Spreadsheets Date of acquisition: 4th, 5th and 11th April 2013
Administrative Boundary Maps • Kenya Counties • Constituency Boundaries • Locations	• ArcGIS Website (http://www.arcgis.com) • Common and Fundamental Operational Datasets Registry (http://cod.humanitarianresponse.info	Shapefiles Date of Acquisition: 15th April 2013.
Online Base Map	Google Maps	Google map showing road maps, satellite imagery and terrain). Date of initial acquisition: 15th April 2013
Digital Map of the study area	• Independent Electoral and Boundary Commission (IEBC) • Mudavadi2013 Campaign Web sites (http://mudavadi2013.com)	Administrative Boundaries map showing Country Wards in Langata constituency Date of acquisition: 27th April 2013

3.2.2   Tools
Hardware

Lenovo B570e Laptop; Intel Core i3-2350M @2.30GHz 500GB Hard Disk, 4.0 GB RAM, 15.6" LED Display and running 64-bit Windows 7 professional was used in this project.

Kyocera KM-C3232E KX was used to print a hand copy of this project report.

4.0 GB Transcend Flash disk was used to keep a copy of the project through-out the duration of the project.

Two 700MB Imation Compact Disk – Read Only (CD-R) were used to keep and distribute copy of the project.

Nokia C2-01 3.2-megapixel camera with resolution of 2048x1536 pixels was used to take digital photographs for the three Post Offices in Langata constituency.

Software

Microsoft Office 2010 was used during the project as follows:
- Microsoft Excel 2010 was used to edit and clean up OPCT data provided in MS-Excel-based database format and to incorporate simulated geographic coordinates data for the beneficiaries and post offices. MS-Excel 2010 was also used for converting the resultant database into a comma delimited (csv) files for the purpose of exporting to Google Fusion Tables.
- Microsoft PowerPoint 2010 was used to produce preliminary and final project presentations.
- Microsoft Word 2010 was used to produce the final project report.
- MS-Publisher 2010 and MS-Picture Manager were used to create the banner for the OPCT Web-based GIS system's portal.

HyperText Markup Language (HTML), Cascading Styles Sheet (CSS) and JavaScript were used to create the front-end user interface for the web-based GIS system developed during the study.

Notepad was used as an Integrated Development Environment (IDE). It was used as a HTML, JavaScript and CSS editor during the process of creating the GIS system's web pages

Google Fusion Tables which is an experimental data visualization web application for gathering, visualizing, and sharing larger data tables was used to store and visualize OPCT's geo-database.

Shape Escape an Internet-based tool was used to convert the County shapefiles to format supported by Google Fusion Tables.

Google Maps JavaScript Application Programming Interface (API) and Google Fusion Tables API were used to embed map layers visualized in Fusion tabled on to the portal's web pages.

Google Maps, an Internet-based web mapping service application and technology was used to provide base maps upon which OPCT related layers were overlaid. As base map, it provided essential features such as the administrative boundaries, road network and other points of interest and the capability for user to pan, zoom and query the maps.

3.3 OPCT Web-Based GIS Portal Development

The flow diagram shown in Figure 3.2 provides an overview of the methodology used in the study. It starts with the identification of datasets needed for the study, acquisition of the data from OPCT Programme Office at the Ministry of Gender, Children and Social Development, geo-referencing to include geographic location coordinates, editing and formatting to ensure the geo-database had appropriate data, designing and development of web interface for the web-based GIS system and using the resultant system to visualize the OPCT data to produce various outputs and finally was the drawing of conclusions and recommendations.
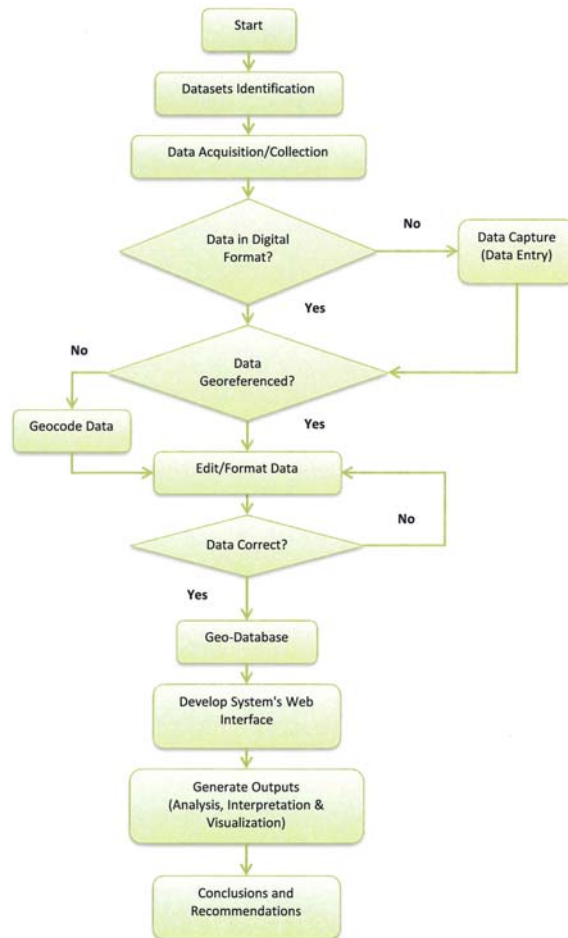
Figure 3.2: Methodology Flow Chart Diagram

3.3.1 User Needs Assessment

User needs assessment was carried out informally by talking to OPCT Programme officers at the time of programme data acquisition. The discussions revealed that OPCT programme management was at the time rolling out a Management Information System (MIS) but geographic location (point coordinates data) for existing beneficiaries, new registrations and pay points was still not part of the data captured under the new system. There was however a strong acknowledgement that incorporation of geographic location data and subsequent mapping of the programme to show the location and distribution of OPCT beneficiaries would add value and benefit the programme especially during the periodic programme evaluation that requires locating the beneficiaries in the field.

However, an important challenge that was highlighted with regard to the capturing and incorporation of geographic location data, is that the households of the urban poor live in rented houses and from time to time find themselves moving houses due to the dynamics in

urban areas. This is unlike the households of the rural poor who live mainly on their own land and therefore their geographic locations rarely change.

Other highlights from the discussions with OPCT Program Officers are as described in the subsections here below.

Target for OPCT Programme.

The OPCT programme targets older persons aged 65 years and above who are poor.

Rationale for targeting Older Persons aged 65 years and above

- They tend to be poorer due to diminished production ability.
- Most of them take care of orphans.
- They lack regular income and have no access to formal employment.

OPCT Programme Implementation steps

The following were highlighted as the main steps in the implementation of the programme.

1. Sensitization at the Provincial and District levels
2. Programme sensitization at the community level
3. Formation of locational committees
4. Recruitment and training of enumerators
5. Household identification and filling of targeting forms
6. Ranking of beneficiaries
7. Community validation of potential beneficiaries
8. Enrolment of the beneficiaries

The programme management has developed a selection and ranking criteria that guides the selection of the poorest household in the Constituencies and these are as follows:

Selection Criteria

Selection criteria for target beneficiaries has the following as key considerations;

- Household with an older person of 65 years and above.
- Is extremely poor.
- Is NOT enrolled in other cash transfer programme.
- Is NOT receiving a pension.
- Has resided in a particular location for more than a year.
- Must be a Kenyan citizen.

Criteria for Ranking/Prioritization

1. Age of the oldest member in a household.
2. Poverty level of a household.
3. Number of Orphans and Vulnerable children in a household
4. Number of People with Disability (PWDs) in a household.
5. Number of chronically ill individuals in a household.

All eligible beneficiaries are ranked in order to ensure fairness and transparency.

Cash Transfer Delivery Mechanism

From the start of the programme up to June, 2010 older persons in the programme were paid though the District Treasury and payments were effected at the Location level. This channel of Cash delivery was considered risky hence alternative delivery mechanisms were explored. As a result, the Postal Corporation of Kenya was contracted to deliver cash transfer to beneficiary households in 35 of the 44 Districts implementing the programme then. Nine (9) Districts in Arid and Semi-Arid areas continue to disburse cash transfers through the District Treasury.

In Financial year 2011/2012, all beneficiaries were paid through the post office. The use of post office alone is however still a challenge especially in terms of distance. Therefore, more options are being explored to ensure that Older Persons access their pay points with ease.

Exit from Programme

Exit from the programme by a beneficiary is mainly as a result of three things:

- Provision of falsified information by beneficiary during targeting and registration.

- Improvement in welfare of beneficiary, for example, if a dependent in the household gets gainful employment and start supporting the household.
- Death of a beneficiary.

Programme Success

- Households have increased from 300 to over 33,000.
- Delivery moved from districts treasuries to the Postal Corporation of Kenya (PCK) with prospects of having PCK take up all the implementing Constituencies.
- A manual has been developed to standardize operations.
- Beneficiaries are able to access markets.
- Beneficiaries are able to meet basic needs, access medical care, pay for their grandchildren education.
- Older persons' households have been enabled to make small investments.
- It has enhanced self-esteem of beneficiaries.

Programme Challenges

- Delay of funds release by Treasury, especially at the beginning of a financial year. This leads to delay in disbursement of funds to beneficiaries.
- Inadequate resources to match the demands of all the needy elderly persons.

3.3.2 Data Collection

Primary data on OPCT was acquired from OPCT programme office. This data was primarily attribute data on enrolled OPCT beneficiaries, list of Post Offices that served as pay points in the study area and a summary of the number of beneficiaries by constituency. This data was provided in form of Microsoft Excel spreadsheet.

Actual and/or simulated geographic point data for the enrolled beneficiaries and post offices were collected using web-based geocoding tool shown in Figure 3.3. The images of the post offices were collected using a digital camera.

Figure 3.3: Geocoding Tool displaying point coordinates for Nyayo Stadium Post Office

3.3.3 Data Pre-processing

This phase involved editing of the attribute and spatial data collected. During the editing the following was done:

- Masking of Beneficiaries personal information to ensure privacy of the actual beneficiaries enrolled on to the programme. Fictitious names and identification numbers were used in place of the actual names and identification numbers.

- Removal of fields in the OPCT attribute data that were found to be unnecessary in relation to the development of the web-based GIS system and subsequent maps visualization such as marital status, number of people with disability in the household, Farming acres of land among others.

- Inclusion of additional fields that were seen to be important for the objectives of the study such as the beneficiaries and post offices geographic point data (geographic location co-ordinates).

- Correction of typographical errors and overall quality control.

- Conversion of Excel worksheets to Comma Delimited Values (CSV) files to make them ready for importation in to Google Fusion Tables.

- Conversion and importation of Kenya's County shapefiles in to format compatible with Google Fusion Tables. Shape Escape, shown in Figure 3.4, is the internet-based tool that was used to do the conversion and importation.
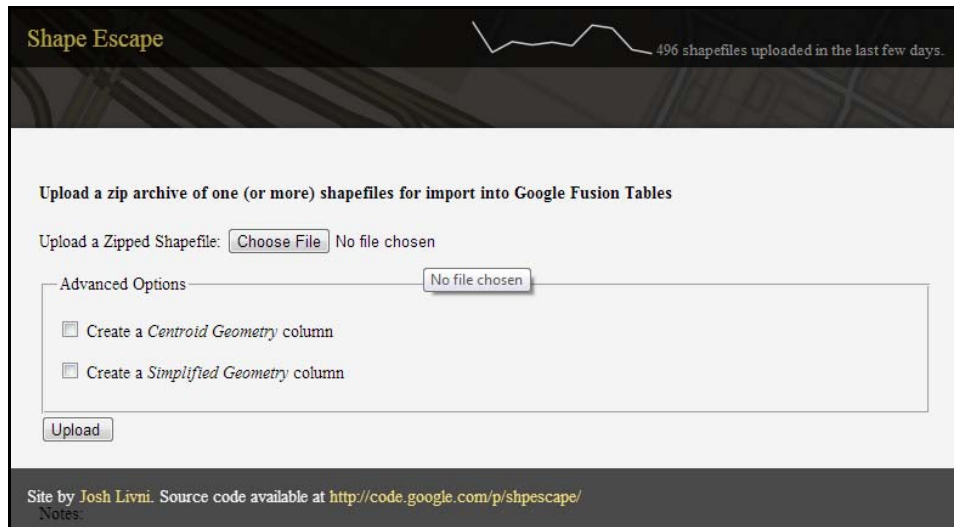
Figure 3.4: Shape Escape: The Tool used in Shapefiles conversion
(Source: http://www.shpescape.com, viewed on 15 April 2013)

3.3.4 OPCT GIS Database Development

The attribute data provided by OPCT programme office was already in MS-Excel database format and contained the fields and the data that has been captured for the period the programme has been under implementation in the study area. Consequently, there was no need to design the database from scratch and therefore except for a few minor modifications involving inclusion of some columns and the exclusion of others that were thought to be unnecessary, the design of the database remained almost intact. The next thing was to transform the database in to geo-database by geocoding the data in Fusion Tables.

The following steps were used to develop the geo-database that stores the OPCT data in the back-end.

1. The comma delimited values (CSV) database files were imported into Google Fusion Tables. Figure 3.5 shows the list for Fusion Tables that constituted the OPCT geo-database. Figure 3.6 shows one of the tables "the OPCT_Enrolled_Record" displayed in Fusion Tables.
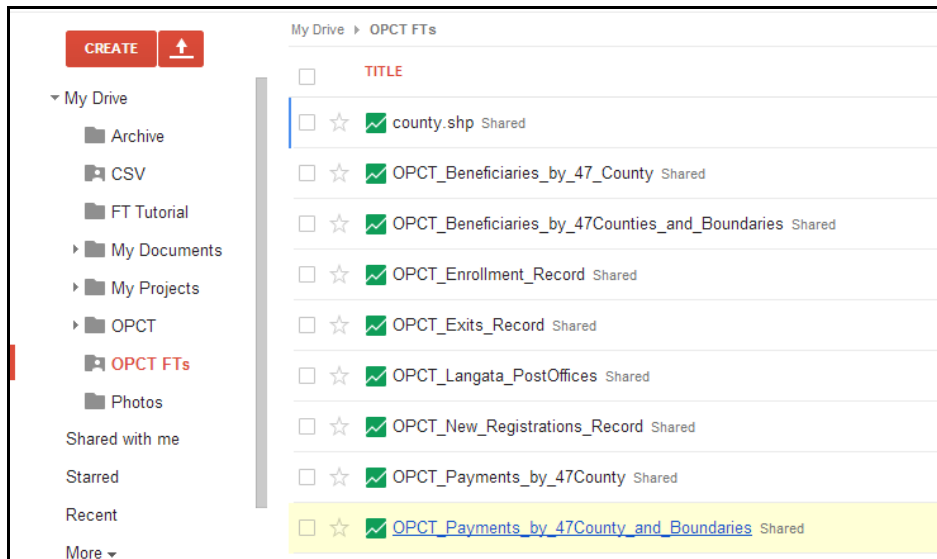
Figure 3.5: OPCT Geo-database - List of Fusion Tables stored in Google drive.

Figure 3.6: "OPCT Enrolled Record" table displayed in Fusion Tables

2. For each table the column with geographic location data was set as the *"location"* type field enabling Fusion Tables to geocode the database based on the column and overlay the data on Google maps during visualization. For example, The OP_LatLng column in the "OPCT_Enrolled_Record" table was marked as the *"location"* as shown in Figure 3.7.
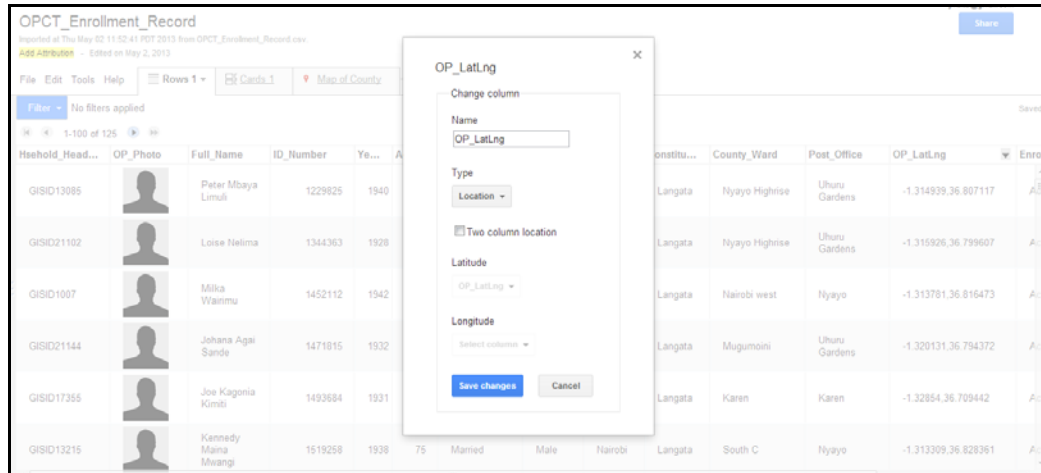
Figure 3.7: "OP_LatLng" field type set as "Location" in Fusion Tables.

3. The geo-database was then visualized in the Google Fusion Tables producing various OPCT layers overlaid on Google maps. Figure 3.8 shows the results of visualizing "OPCT_Enrolled_Record" in Fusion Tables.
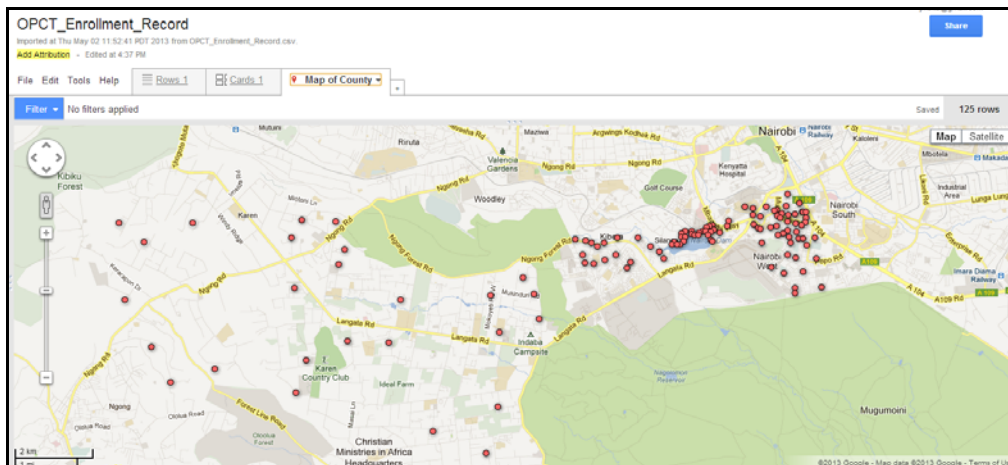
Figure 3.8: A geo-database table visualized in Fusion Tables

4. The Information Window settings were then configured to define the fields that would be displayed in the Information Windows whenever a marker icon was clicked on the map as shown in Figure 3.9 and Figure 3.10. Columns to be displayed on the information window were checked while those to be omitted were left unchecked.
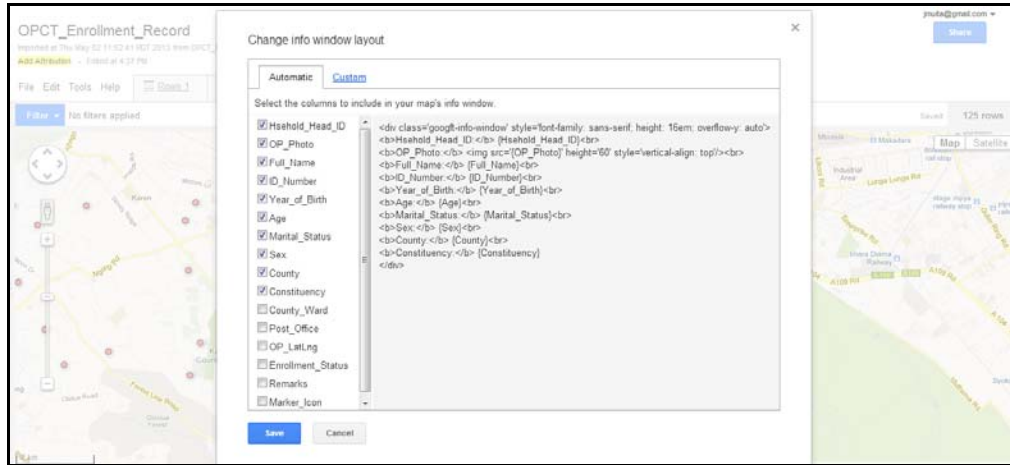
Figure 3.9: Configuration of Information Windows layout settings
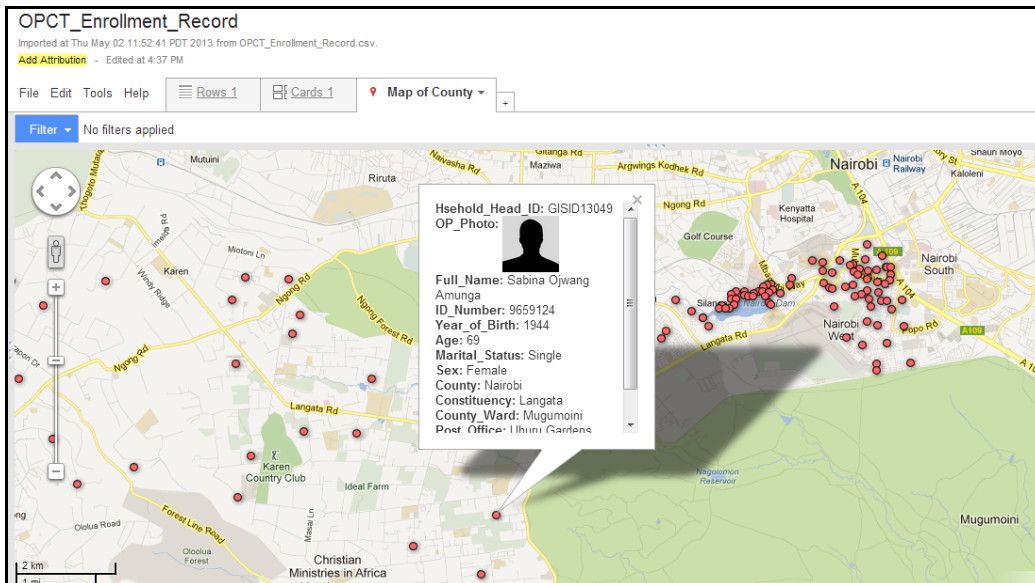
Figure 3.10: Information Window displayed based on configured settings

5. The map styles settings were configured to define the styles to be applied on the visualized map both in Google Fusion Tables and on the OPCT web-based GIS system portal as shown in Figure 3.11 and Figures 3.12.
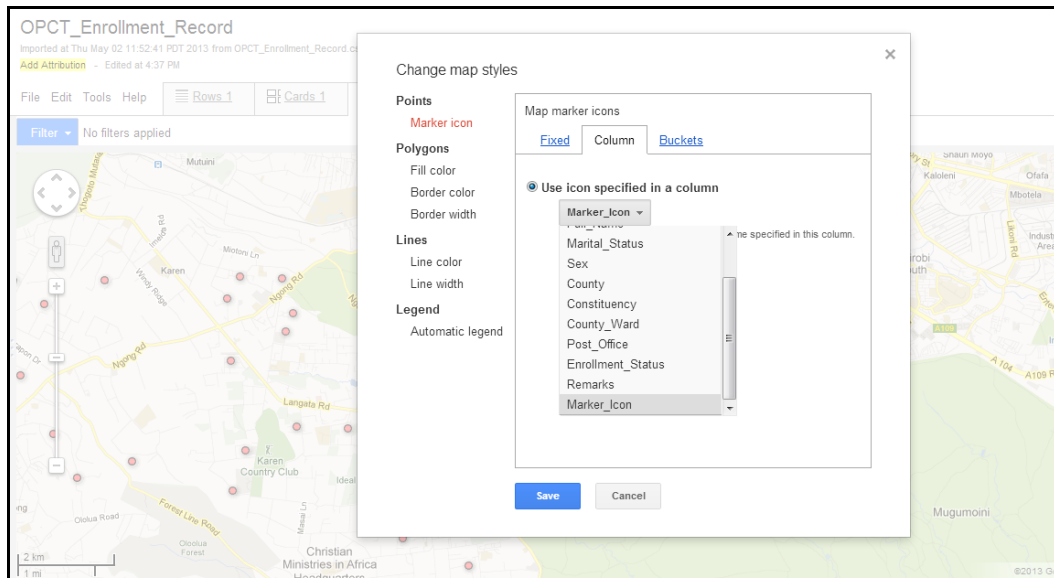
Figure 3.11: Configuration of Map styles to be applied
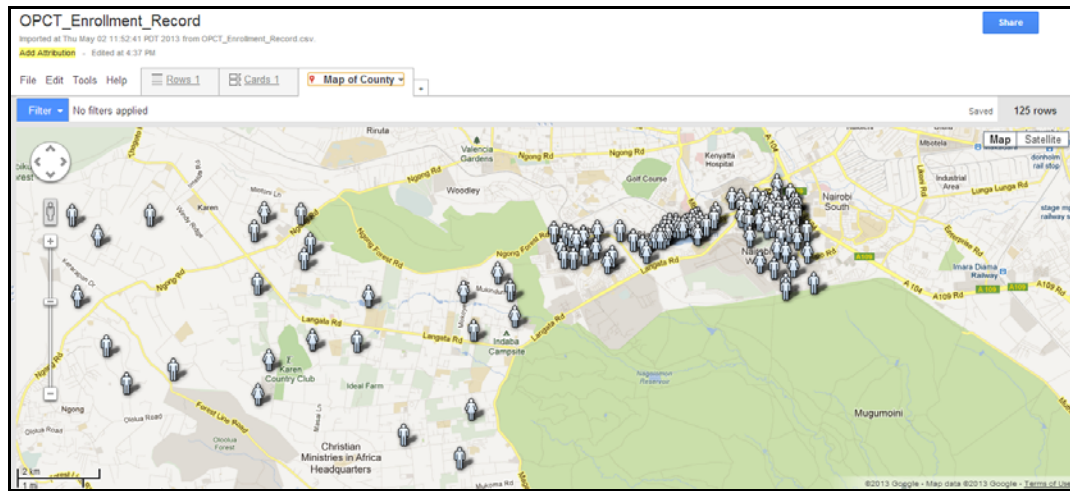
Figure 3.12: Configures map styles applied on map
(Note: change of marker icon)

These five steps were completed for all the tables in the OPCT geo-database to make it ready
for the front-end web interface that was to be developed next.

3.3.5 Design of OPCT Web-Based GIS Portal

The layout of the web interface was developed using HyperText Markup Language (HTML)
and Cascading Style Sheets (CSS). The Integrated Development Environment (IDE) used for
this work was Notepad. Google Maps JavaScript API was used to embed the visualized map
layers onto the developed portal web pages. The API was also used to implement map scale

and map controls such as map type, pan and zoom making the maps generated to be interactive.

HTML was used to create the search/query form allowing for selection of search criteria on each map or web page.

The web-based GIS system user interface developed constituted of:

- The web page banner: This was developed and placed at the header to identify the Web-based GIS Portal. The web page banner was created using Microsoft Publisher and Picture Manager.
- The navigation: This was included to help the user navigate the web-pages on the portal
- The sidebar: This was included and placed on the left side of the page to provide the user with a query/search. It's also used to provide short description about the web-page and/or portal.
- The Map area: This was included to display visualized maps that show the layers based on search/query data.
- The footer. This was included to provide an alternative Navigation at the bottom of the page to avoid user scrolling to the top of the page to access the Navigation bar. The footer also contains some final contents such as the copyright tagline as shown in Figure 3.13.
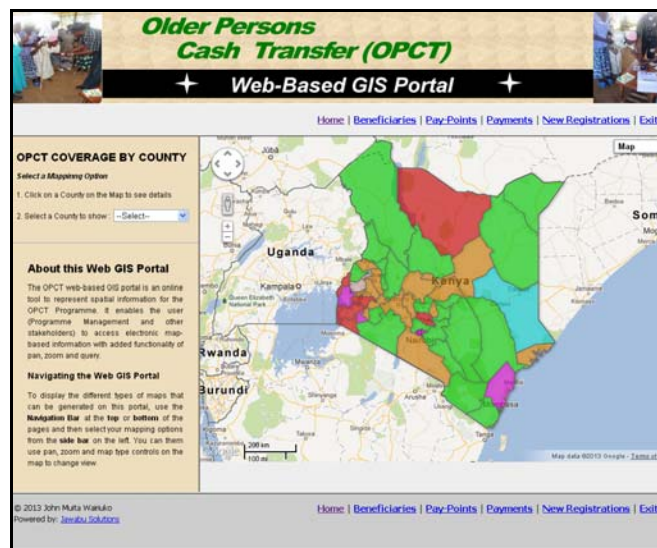
Figure 3.13: User Interface for the OPCT Web-Based GIS System

3.4 Application of the OPCT Web-Based GIS Portal

The query form located on the sidebar on the left of each page was developed using HTML code shown in Appendix B. The search was set mainly to provide single field/criteria query. Multi-field queries/search capability was left for future implementation. On all pages the query/search form was developed to allow user to select preset mapping options to avoid mistakes when the user is constructing or typing the contents of the query as shown in Figure 3.14.
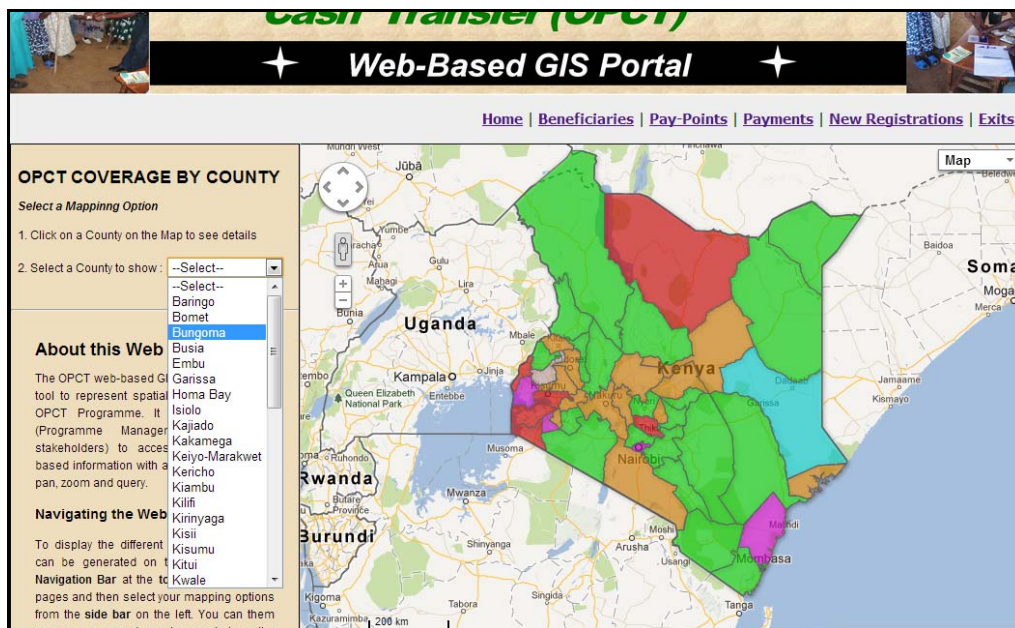
Figure 3.14: Query/Search Form open on the User Interface Home page

4.1 OPCT Web-Based GIS Application

The final result of the system development effort under this study was an interactive web-based GIS system. This system employed geo-referenced OPCT Programme data for the study area to produce a number of interactive map products that showed the spatial dimension of the OPCT programme.

4.2 OPCT Web-Based GIS Interface

The resultant system was made up of a geo-database that ran at the back end in Google Fusion Tables, and a web-based user interface with six web-pages that ran on user's Web browser providing the user with access to OPCT data in form of interactive maps. The six web pages that constituted the OPCT Web GIS portal included; Home, Beneficiaries, Pay Points, Payments, New Registrations and Exits. From the Home page, the user can access the other web pages through the Navigation bar at the top or bottom of the page as shown in Figure 4.1.
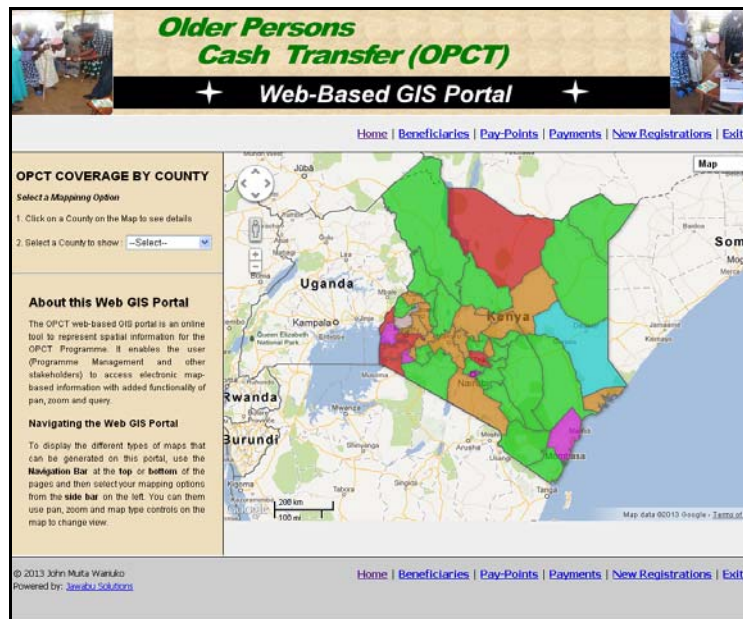
Figure 4.1: OPCT Web-based GIS portal Home page

4.2.1   Homepage

This is the first page that the user sees when the OPCT Web-Based GIS Portal is loaded. The page displays a thematic map of Kenya showing OPCT coverage by County.

From the Home page the user can do four things to interact with the system and the maps that are generated.

1. The user could click within the boundaries of a given county upon which an information window would be displayed to show the underlying OPCT data for the selected constituency as shown in Figure 4.2.
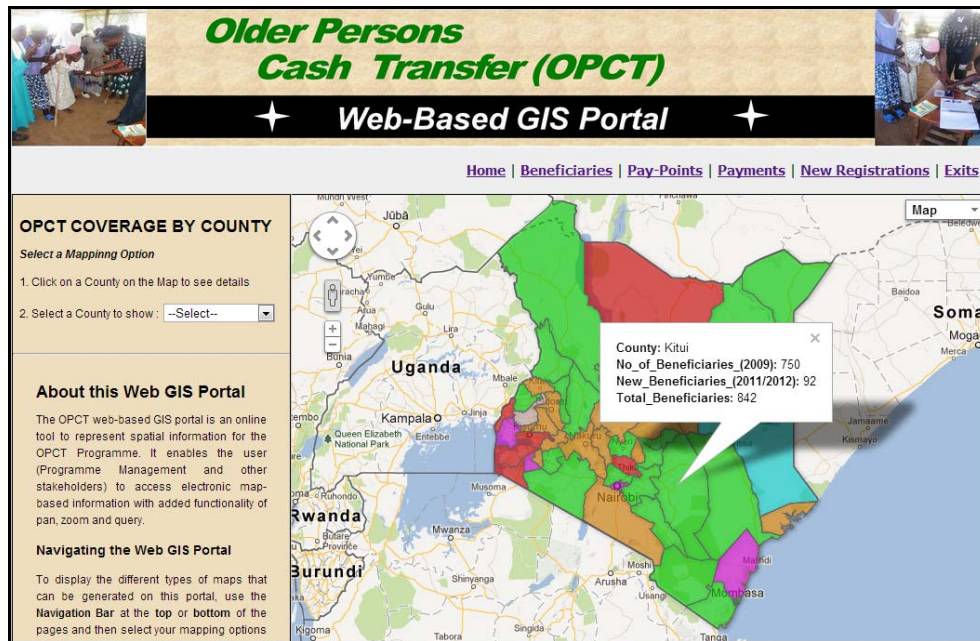
Figure 4.2: OPCT Coverage by County - Information Window showing underlying OPCT data

2. The user could also use the search form on the side bar to select a county to be shown on the map as shown in Figure 4.3. When a county is selected on the query form, all other counties are hidden and the user could then click within the boundaries of the selected county and information window would be displayed to show the underlying OPCT data.
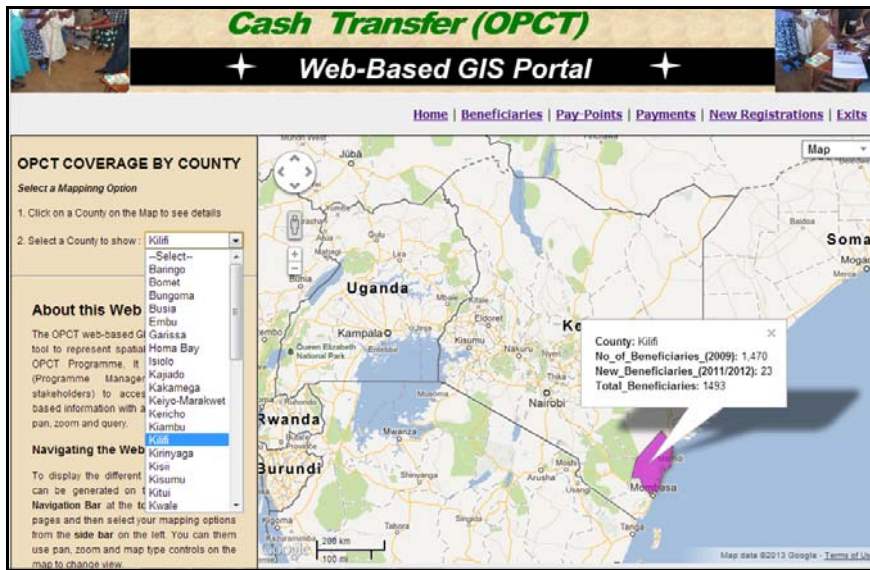
Figure 4.3: Coverage by county: Results of using Search function to map a county

3. The user could also use the **map type**, **zoom** and **pan** controls to further interact with the map as follows:

    3.1. **Map type**: The user could click on the Map Type control located on the top right corner of the Map area to change map type from Map to Satellite or Terrain as shown in Figure 4.4 and Figure 4.5.
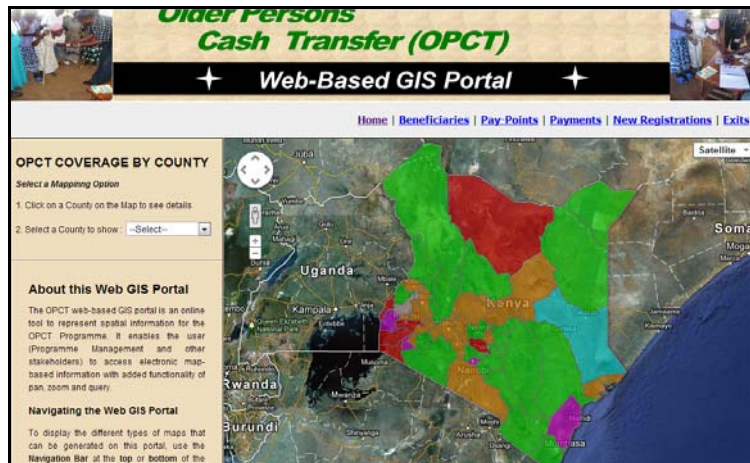
Figure 4.4: OPCT Coverage map based on Satellite Imagery Map Type
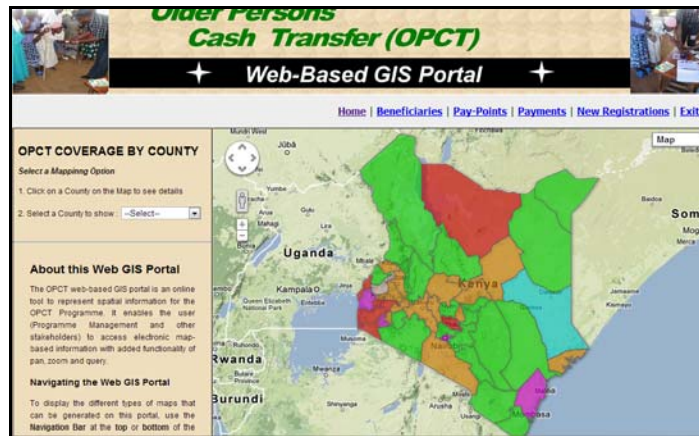
Figure 4.5: OPCT Coverage Map based on Terrain Map Type

    3.2. **Zoom**: The user could click on the zooms control on the left side of the map area to zoom in on an area on the map to have a closer look at finer details and the zoom out when done.

    3.3. **Pan**: The user could use the pan control located at the top left corner of the map area to pan (move) the map up or down, left or right.

4. The user could navigate to other pages on the portal using the navigation bar at the top or bottom of the page.

4.2.2 Beneficiaries

This page presented a map of enrolled beneficiaries as shown in Figure 4.6. The marker icons on the map showed the geographic location (latitude and longitude co-ordinates) where a beneficiary household was located based on the data recorded in the geo-database.

Additionally, the marker icons used to represent beneficiaries on the map helped the user to differentiate between genders hence and enhanced visual interpretation of map information. Important to note also is that one marker icon on the map represented one beneficiary household on the ground.
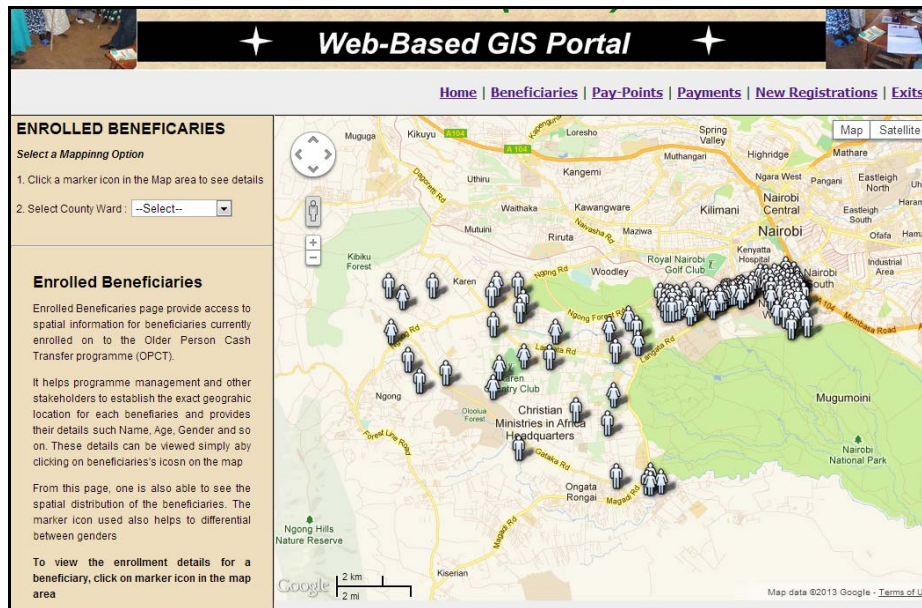
Figure 4.6: Beneficiaries Web page

From the beneficiaries' page, the user could do the following:

1. Click on a marker icon in the map area, to view the underlying enrollment details for the selected beneficiary. Among the important details displayed in the information window was a picture of the beneficiary (enhanced identification) and the geographic location information (can ease traceability of beneficiary by a person using Global Navigation Satellite System, for example, Global Positioning Systems (GPS) enabled device). This would be useful during periodic programme evaluation as shown in Figure 4.7.

2. The user could also use the query/search form on the sidebar to map beneficiaries by county ward as shown in Figure 4.8. Depending on the County Ward selected, marker icons for beneficiaries in that ward would be displayed while those of beneficiaries in other Wards would be hidden from the map.

3. The user could also use the **map type**, **zoom** and **pan** controls displayed on the map area to further interact with the map in the same ways described under the home page. Similarly, the user could use the Navigation bar at the top or bottom of the beneficiaries' page to navigate to other pages on the portal.
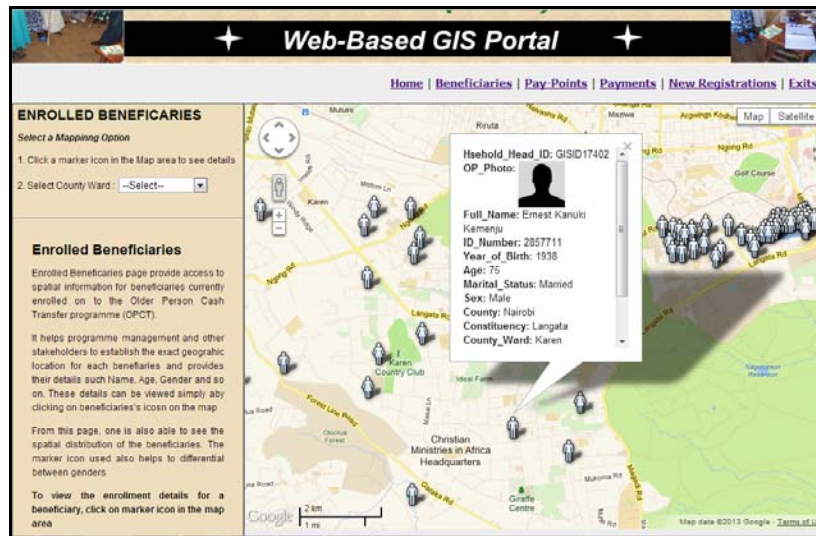
Figure 4.7: Beneficiary Page - Information Window showing enrollment data for a beneficiary
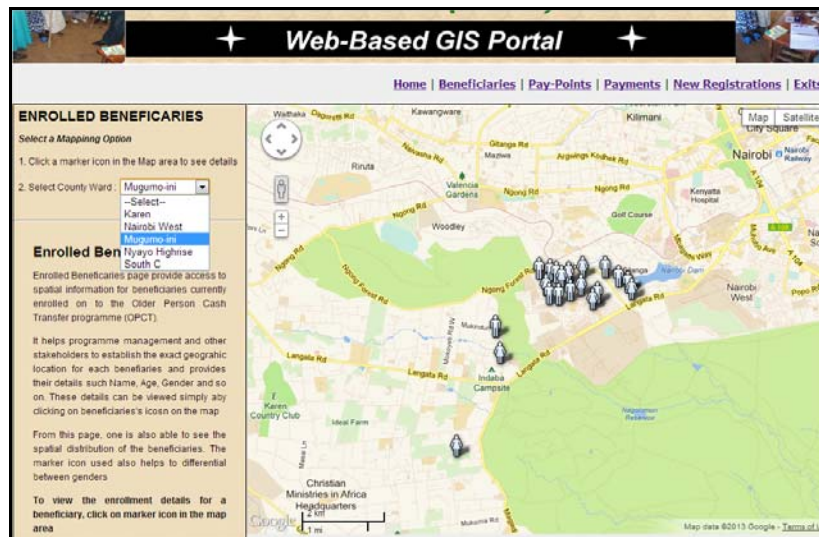
Figure 4.8: Beneficiaries Page: Result of Search by County Ward

4.2.3   Pay-Points

This page displayed the post office map layer which showed the post offices in the study area, through which payments were made to the enrolled beneficiaries. On this page the user could click on the post office marker icon in the map area and the data for the selected post office would be displayed in an information window as shown in Figure 4.9.

The user could also use the search function on the sidebar to select the name of a post office to search and map. Only the marker icon for the selected post office would be displayed in the map area. The user would then click on that marker icon to see the post office data. The use of map controls such as map type, pan and zoom was also applicable on this page.
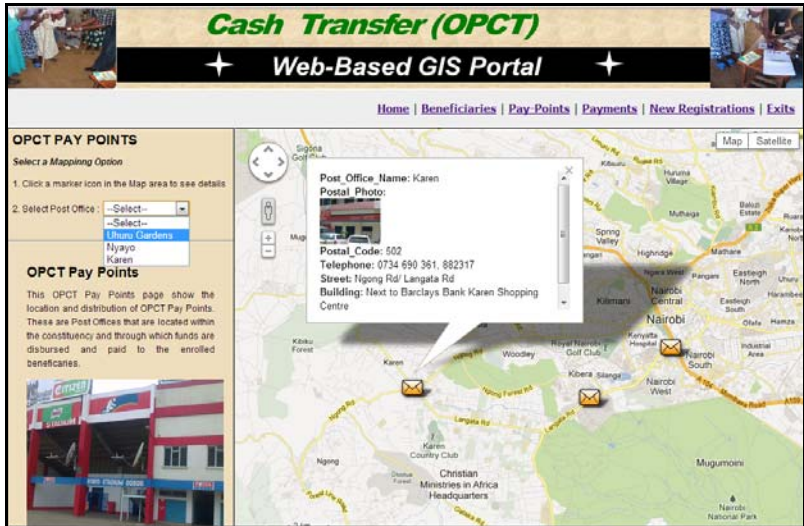
Figure 4.9: Pay-Points page showing data for a Post Office and Search options on side bar

4.2.4 Payments

This showed the distribution of OPCT payments by county. The user could click within the boundaries of any county to display an information window that displayed data on the amount that was spent on the county bimonthly as financial benefits to those enrolled on to the programme as shown in Figure 4.10.

The Search function on the side bar allowed the user to search by county.
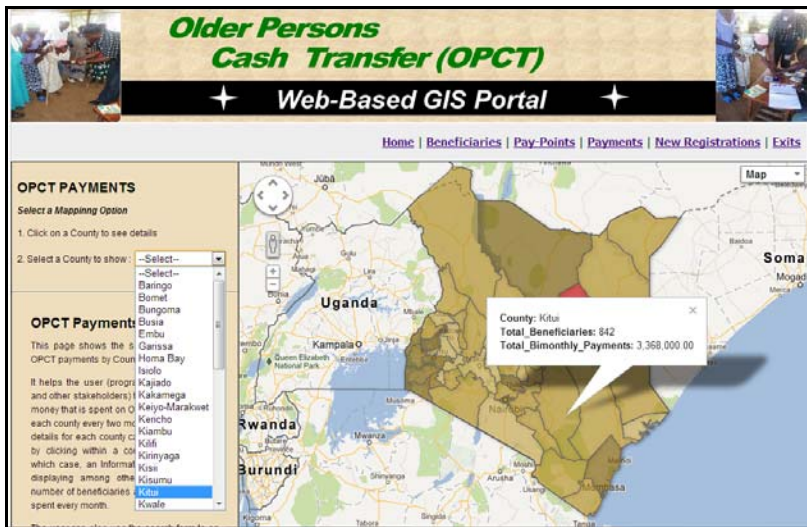
Figure 4.10: Payment page showing data for selected county

4.2.5 New Registrations

This page, shown in Figure 4.11, presented a map that showed the spatial distribution of older persons who were going through the screening process to determine their eligibility for

enrollment as beneficiaries in the OPCT programme. This page was in many ways similar to the beneficiaries' page. The search function on the side bar however allowed the user to search by gender. Male and female were the two options that the user could pick.
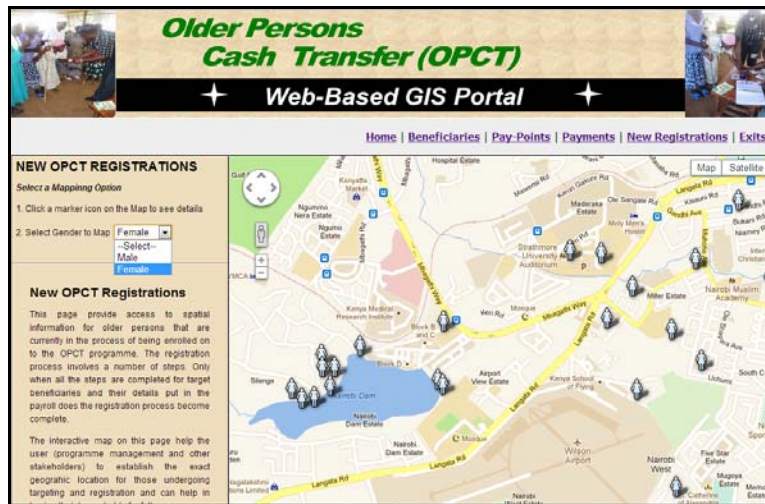
Figure 4.11: New Registrations page showing Search by gender

4.2.6 Exits

This was the last page on the portal as was as shown in Figure 4.12. This page presented a map of those who had exited from the programme. There were three main reasons that lead to exit. These included, welfare improvement in the part of a beneficiary's household, providing falsified information at the targeting and registration stage and death of beneficiary. The user could click on a marker icon on the map to display data for an exited beneficiary. The search function allowed the user to generate map based on reason for exit.

Figure 4.12: Exit Web page showing Search Option and Information Windows

4.3 Discussion of the Results

The Kenya Social Protection Sector review conducted in year 2010 (Republic of Kenya, 2010) brought to the fore many issues that are currently affecting programmes in the sector, OPCT included. A few of the issues highlighted that were of great relevance to the objectives of this study relate to programmes performance management, targeting of beneficiaries, accountability, data sharing and information dissemination.

With regard to performance management, the report indicate that programmes allocated between 0.3 and 7 percent of their budget to monitoring and evaluation costs yet only a few programmes were found to have complete and operational Management Information Systems (MISs) and Monitoring and Evaluation (M&E) systems.

Management Information Systems in this case was defined as the procedures, processes, and routines that meet the information needs of the programme management team while Monitoring and Evaluation was described as a subset of MIS that involves the regular collection and analysis of data to assess the relevance of a programme's objectives, efficiency, effectiveness, impact, and sustainability.

The finding was that of the programmes reviewed, nearly all (96 percent) had developed some type of indicator framework to be used for monitoring and evaluation and most (91 percent) indicated that they conducted ongoing monitoring activities. However, only 61 percent of programmes had a planned or ongoing impact evaluation and 39 percent had no M&E reports for public consumption. Similarly, the programmes collected only a limited range of data. While 65 percent of programmes collected data on registration and enrolment, only 26 percent systematically tracked information on transfers to beneficiaries. Some 57 percent reported having some type of independent spot check monitoring process. Few programmes (22 percent) monitored graduation or exit through their MIS, and even fewer (17 percent) track complaints and grievances in a systematic way, including how complaints are followed up.

A GIS based MIS system and in this case a web-based GIS system like the one developed and demonstrated in this study can make enormous contribution in nearly all the areas identified. This would however require the OPCT programme and others to address one fundamental requirement of GIS-based systems, that is, the need to incorporate geographic

location data in MIS. The result would be MIS that is based on geo-referenced databases that can then be used to map the programmes, support monitoring and evaluation and produce report for public consumption.

The OPCT web-based GIS portal developed in this study demonstrates this quite well in that it has used attribute data provided by the OPCT Programme office, incorporated geographic point data to produce geo referenced database, analyzed and visualized the same using freely accessible internet tools. Among the interactive maps produced and which demonstrate the wide range of possibilities in its application are; maps of enrolled beneficiaries, new registrations and exits or graduation from OPCT programme. From these maps the user is able see the spatial distribution and could query and display information on individual beneficiary or group of beneficiaries among other things. Based on information on these maps important decision can easily be made that could promote the welfare of the beneficiaries or make the work of programme staff easier.

On the subject of data sharing, the 2010 Sector review report highlighted the importance of sharing of data among the programmes both for monitoring registration and showing exactly who is covered by the individual programme and the sectors as a whole. The report noted that lack of consistent registration data makes it impossible to arrive at more than a rough approximation of how many people are covered by the programmes and in particular how many vulnerable groups are included. This problem is seen as being caused by the fact that some programme had stand-alone MIS that function individually with no capacity to interact with others. The report cited a scenario where county level officials share the names of beneficiaries with each other on paper, to avoid beneficiaries accessing two programmes. The conclusion in this case was that such practice was unsustainable as the programmes grow and hence the need to develop harmonized registration systems and common protocols for capturing and sharing data. Therefore, there is enormous potential for a web-based GIS system like the one developed and demonstrated in this study because (before the different MIS systems are integrated) sharing the GIS Portal's Uniform Resource Locator (URL) would provide instant access to information-rich interactive maps that would provide for data sharing among the programmes.

With regard to targeting, the review reports noted that targeting of beneficiaries could be improved by fine-tuning Geographic targeting by adjusting the location level allocations to

reflect relative numbers of poor. The report also underscored the need for evidence that poverty information and not political pressure is used for geographic targeting at least in the selection of counties and locations for this would ensure that resources are focused on those areas that are poorest according to national statistics and the seasonal assessments.

The web-based GIS system developed in this study has new registrations as one of the map products generated from OPCT programme data. In this case, the interactive map generated showed the spatial distribution of targeted older persons and the geographic location point coordinates for these individuals. By just including census data as an additional layer, it is possible to achieve evidence based fine-tuning of geographic targeting to ensure that resources are focused on those areas that are poorest according to national statistics and the seasonal assessments.

The other issue that was highlighted and that can be addressed to some extent by web-based GIS system demonstrated in this study is that of accountability. According to the report two forms of accountability are involved, that is upward accountability and downward accountability. Upward accountability is described as the accountability of programme implementers to programme managers, policy makers and members of parliament in which case the report noted that use of technology to create robust controls over payments process was key though would not eliminate all risks.

On the other hand, downward accountability also called the demand side accountability is seen as government's accountability to the beneficiaries and their communities. The key to downward accountability is identified as providing information. This entails ensuring:

- Information is clear, with no jargon and is presented by programme staff to public meetings.
- Information about the programme is prominently displayed in different languages.
- Reports on programme progress and implementation, including financial reports are availed.

With the internet becoming ubiquitous due to advances in information and communication and mobile technologies, the web-based GIS system developed and demonstrated in this study can easily be made accessible by many and in the process help promote downward accountability.

For instance, the maps generated and accessed through the portal provide information on beneficiaries, new registrations and their distribution, payment points and their distribution, and payments by county. The marker icons and colours used are intuitive and promote visual interpretation making it possible for people from different backgrounds to understand the contents because it is presented in graphical map/form.

Information dissemination and reporting is the other issue highlighted in the sector's review report, which the web-based GIS system in this study could address effectively if adopted. The argument made in this case is that social protection programmes such as the OPCT are globally relevant and hence the need to ensure that key reports and results are broadly disseminated. According to the report this requires a broad dissemination strategy that would ensure that MIS reports, particularly monitoring and evaluation information, are designed for a more general audience. A major problem that was noted was that monitoring and evaluation reports tended to be in English, often used technical language, and assumed an advanced knowledge of social protection policy issues, economic concepts, and statistical techniques.

The recommendation made in the report was on the establishment of a sector-wide website and/or public Library to disseminate information on the activities and results of social protection programmes in order to increase the public's access to documents and data.

With regard to OPCT programme, the web-based GIS portal developed in this study meets the stated requirements for information dissemination and reporting. First, because it is web-based it can be made available to a wide and diverse audience. Second, visualization and presentation of programme data in form of maps bridges language and technical knowledge barriers and enables many people to assimilate the information. As such it can be said that by having this GIS Portal as part of MIS, the programme would enhance transparency, accountability, accessibility and availability

The OPCT web-based GIS system is not without limitations. An important one is that the system relies heavily on Google Fusion Tables for storage and visualization of geo-database. Google Fusion table is an experimental tool from Google that may be discontinued without notice. The tool is also limited in terms of the size of the geodatabase that can handle and therefore may not be a suitable geodatabase for production systems.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this study was to develop a Web-based GIS system for the Older Persons Cash Transfer programme that would enable programme management to enhance transparency, accountability, accessibility and availability. The system was successfully developed and various interactive maps were generated and used to demonstrate the system's functionality as a management, monitoring and reporting tool. For instance, with just a few clicks of a button programme managers (right from the desk in their offices) could see the spatial distribution of beneficiaries in a constituency, know where they are exactly located and view their personal details. Through the payments web page, the officers could graphically see the representation of how much money was disbursed to each county in the country. From the pay-points web page, the office could see the number of pay points in an area and thereby determine their adequacy and accessibility. The Exits web page could inform the officers on those who had exited from the programme and reason behind the exit.

The target user of the system was the OPCT programme management, yet, the easy to understand online maps products demonstrated that the system could also be used as an information sharing and dissemination tool.

The overall finding of this study was that Web GIS is a viable proposition for the OPCT and that the geographic dimension depicted would add value in planning and decision making. It can therefore be concluded that the study met its stipulated objectives.

5.2 Recommendations

The outcome of this study has shown that a Web-based GIS System can provide great value proposition to the Older Persons Cash Transfer programme as a management, monitoring and evaluation and information dissemination tool. The recommendations of this study are therefore that:

OPCT Programme management adopt the findings of this study.

OPCT Web-based GIS portal is made part of the Programme's Management Information System (MIS).

OPCT programme management consider scaling-up the Web-based GIS Portal developed in this study to attain a nation-wide coverage.

Geographic location data for beneficiaries, payments points and programs offices be incorporated into the programme's management information system (MIS).

That the screen tool used in targeting new registrations is modified to include geographic point location data and digital photographs for beneficiaries as part of the data collected during targeting and registration of beneficiaries.

Criterion for continued eligibility is modified to state beneficiary's responsibility of informing program management whenever geographic location for their house holds changes.

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APPENDIX A

Sample Data Used in OPCT Geodatabase

No. of Beneficiaries by County – 2009 and 2011			
County	**No_of_Beneficiaries_(2009)**	**New_Beneficiaries_(2011/2012)**	**Total_Beneficiaries**
Baringo	736	92	828
Bomet	750	69	819
Bungoma	750	115	865
Busia	1,500	46	1,546
Embu	750	69	819
Garissa	716	23	739
Homa Bay	1,462	46	1,508
Isiolo	-	-	-
Kajiado	-	69	69
Kakamega	1,686	115	1,801
Keiyo-Marakwet	750	46	796
Kericho	-	92	92
Kiambu	634	161	795
Kilifi	1,470	23	1,493
Kirinyaga	-	92	92
Kisii	1,348	46	1,394
Kisumu	1,500	92	1,592
Kitui	750	92	842
Kwale	734	46	780
Laikipia	-	46	46
Lamu	-	46	46
Machakos	750	115	865
Makueni	750	46	796
Mandera	750	46	796
Marsabit	1,500	69	1,569
Meru	-	161	161
Migori	1,498	69	1,567
Mombasa	750	-	750
Murang'a	1,629	46	1,675
Nairobi	1,314	138	1,452
Nakuru	-	138	138
Nandi	-	92	92
Narok	749	46	795
Nyamira	-	46	46
Nyandarua	-	92	92
Nyeri	750	115	865
Samburu	747	23	770

Siaya	1,478	-	1,478
Taita Taveta	750	-	750
Tana River	750	-	750
Tharaka	750	23	773
Trans Nzoia	-	69	69
Turkana	750	46	796
Uasin Gishu	-	69	69
Vihiga	-	92	92
Wajir	750	69	819
West Pokot	750	-	750

Office_Name	Postal_Photo	Postal_Code	Telephone	Street	Building	Postal_LatLng	Marker_icon
Nyayo		506	0734 660 866/ 6001140	Langata Road	Nyayo Stadium	-1.30476,36.823959	post_office
Karen		502	0734 690 361, 882317	Ngong Rd/ Langata Rd	Next to Barclays Bank Karen Shopping Centre	-1.322957,36.707066	post_office
Uhuru Gardens		517	735764304	Kitengela Road off Langata Road	Poravin Building near Uhuru Pry. Sch.	-1.327403,36.787543	post_office

APPENDIX B

OPCT Web-Based GIS Portal Front End User Interface Code Representation

Home Page (index.html)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
          "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
<head>
<!--These lines define the header information for this web-based GIS portal web page.-->

        <meta http-equiv="Content-type" content="text/html; charset=UTF-8" />
        <title>OPCT WEB-BASED GIS PORTAL</title>
        <meta http-equiv="Content-Language" content="en-us" />

        <meta http-equiv="imagetoolbar" content="no" />
        <meta name="MSSmartTagsPreventParsing" content="true" />

        <meta name="description" content="This is a Web-based GIS Portal for the OPCT Programme " />
        <meta name="keywords" content="OPCT, 'Web-Based GIS', Web-Mapping" />

        <meta name="author" content="John Muita Wairiuko" />

<!--This line references Cascading Styles Sheet that provides the range of styles
        that are applied to this webpage for richer appearance.-->

        <style type="text/css" media="all">@import "css/opctmaster.css";
     </style>  <style type="text/css" media="all">@import "css/opctmaster.css";</style>

<!--The style here define the size of the Map embeded on the web page.-->

    <style>
     #map-canvas { width:750px; height:520px; }
    </style>

<!-- The script tag below sets the URL for the location of a JavaScript file that loads all of the symbols
and definitions needed for using the Google Maps API.-->

 <script type="text/javascript"
   src="http://maps.google.com/maps/api/js?sensor=false">
 </script>

<!--This is the Google Maps JavaScript API that queries the geo-database in Fusion Tables and
visualizes the map on the webpage.-->

 <script type="text/javascript">
  var map;
  var layerl0;
  function initialize() {
    map = new google.maps.Map(document.getElementById('map-canvas'), {
    center: new google.maps.LatLng(-0.131836,37.375488),
    zoom: 6,
    mapTypeControl: true,
    mapTypeControlOptions: {
     style: google.maps.MapTypeControlStyle.DROPDOWN_MENU
    },
    mapTypeId: google.maps.MapTypeId.ROADMAP,zoomControl: true,
```

```
            zoomControlOptions: {
              style: google.maps.ZoomControlStyle.SMALL
            },
           scaleControl: true,
            scaleControlOptions: {
            position: google.maps.ControlPosition.BOTTOM_LEFT
            },
           });
```

`<!--This segment of fetchs map layer from Fusion Tables-->`

```
            layerl0 = new google.maps.FusionTablesLayer({
            query: {
             select: "'geometry'",
             from: '1TaoxaFFcjGQFzqVp8SZa6N05bVez44CtDGA7DYQ'
            },
            map: map
            });
            }
```

`<!--This segment of code implements the search function-->`
```
            function changeMapl0() {
             var searchString = document.getElementById('search-string-l0').value.replace(/'/g, "\\'");
             layerl0.setOptions({
              query: {
               select: "'geometry'",
               from: '1TaoxaFFcjGQFzqVp8SZa6N05bVez44CtDGA7DYQ',
               where: "'County' = '" + searchString + "'"
           }
           });
           }
            google.maps.event.addDomListener(window, 'load', initialize);
         </script>
```

`</head>`

`<body>`

`<!--This page-container div defines the entire body of the web page.-->`

```
    <div id="page-container">
```
`<!--This opct-heade div allocates the space for the Web page banner at the top of the page.-->`
```
        <div id="opct-header">
          <h1><h1><img src="images/general/OPCTheader3brotex.gif"
                width="1050" height="150" alt="Older Persons Cash Transfer(OPCT): Web-Based GIS Portal"
border="0" />
          </h1></h1>
        </div>
```

`<!--This opct-main-nav div contains a small table for the main navigation on web page.-->`
```
    <div id="opct-main-nav">
        <table style="height:10px;
          font-family:Tahoma,Arial,Helvetica,Sans-serif;
          font-size:15px;
          color: #000000;border-top: 0px solid#efefef;
          padding: 15px 10px;"align="right" border="0" cellpadding="0" cellspacing="0" >

          <tr>
            <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
            <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
            <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
```

```
          <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
          <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
          <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
       </tr>
     </table><br><br>
   </div>
<!--This opct-sidebar-a div creates a side bar on the left side of the page where the page titles, Search form
and page narrative are located.-->
   <div id="opct-sidebar-a"><br>

<!--This creates the search form on the side bar on the web page-->
      <table style="height:10px;
    font-family:Arial,Tahoma,Helvetica,Sans-serif;
    font-size:12px;text-align="left";
    color: #000000;border-top: 1px solid#efefef;
      padding: 15px 10px;"align="left" border="0" cellpadding="5" cellspacing="2" >

      <tr>
      <th><h2>OPCT COVERAGE BY COUNTY</h2></th></tr>
      <tr><td><em><strong>Select a Mappinng Option</strong></em></td></tr>
      <tr><td>1. Click on a County on the Map to see details</td></tr>
      <tr><td><label>2. Select a County to show :</label>
       <select id="search-string-l0" onchange="changeMapl0(this.value);">
       <option value="">--Select--</option>
       <option value="Baringo">Baringo</option>
       <option value="Bomet">Bomet</option>
       <option value="Bungoma">Bungoma</option>
       <option value="Busia">Busia</option>
       <option value="Embu">Embu</option>
       <option value="Garissa">Garissa</option>
       <option value="Homa Bay">Homa Bay</option>
       <option value="Isiolo">Isiolo</option>
       <option value="Kajiado">Kajiado</option>
       <option value="Kakamega">Kakamega</option>
       <option value="Keiyo-Marakwet">Keiyo-Marakwet</option>
       <option value="Kericho">Kericho</option>
       <option value="Kiambu">Kiambu</option>
       <option value="Kilifi">Kilifi</option>
       <option value="Kirinyaga">Kirinyaga</option>
       <option value="Kisii">Kisii</option>
       <option value="Kisumu">Kisumu</option>
       <option value="Kitui">Kitui</option>
       <option value="Kwale">Kwale</option>
       <option value="Laikipia">Laikipia</option>
       <option value="Lamu">Lamu</option>
       <option value="Machakos">Machakos</option>
       <option value="Makueni">Makueni</option>
       <option value="Mandera">Mandera</option>
       <option value="Marsabit">Marsabit</option>
       <option value="Meru">Meru</option>
       <option value="Migori">Migori</option>
       <option value="Mombasa">Mombasa</option>
       <option value="Murang'a">Murang'a</option>
       <option value="Nairobi">Nairobi</option>
       <option value="Nakuru">Nakuru</option>
       <option value="Nandi">Nandi</option>
       <option value="Narok">Narok</option>
       <option value="Nyamira">Nyamira</option>
       <option value="Nyandarua">Nyandarua</option>
       <option value="Nyeri">Nyeri</option>
```

```html
        <option value="Samburu">Samburu</option>
        <option value="Siaya">Siaya</option>
        <option value="Taita Taveta">Taita Taveta</option>
        <option value="Tana River">Tana River</option>
        <option value="Tharaka">Tharaka</option>
        <option value="Trans Nzoia">Trans Nzoia</option>
        <option value="Turkana">Turkana</option>
        <option value="Uasin Gishu">Uasin Gishu</option>
        <option value="Vihiga">Vihiga</option>
        <option value="Wajir">Wajir</option>
        <option value="West Pokot">West Pokot</option>
    </select></td></tr>
    </table><br/><hr/>

<!--These lines forms the narrative on the side bar on the web page-->
    <div class="padding">
        <h2> About this Web GIS Portal</h2>
          <p>The OPCT web-based GIS portal is an online tool to represent spatial information for the
            OPCT Programme. It enables the user (Programme Management and other stakeholders) to access
            electronic map-based information with added functionality of pan, zoom and query.
          </p>


        <h3>Navigating the Web GIS Portal</h3>
          <p>To display the different types of maps that can be generated on this portal, use the
            <strong>Navigation Bar</strong> at the <strong>top</strong> or <strong>bottom</strong>
            of the pages     and then select your mapping options from the <strong>side bar</strong> on
            the left. You can them use pan, zoom and map type controls on the map to change view.
          </p>

    </div>
    </div>

          <div id="opct-content">

<!--This "map-canvas" div define the map area on the web page.-->
        <div id="map-canvas"></div>
        <div class="padding"></div>
      </div>

<!--The "opct-footer" div define the footer of the web page where the copyright tag-line and altnative
  navigation are provided.-->
          <div id="opct-footer">
        <div id="altnav">
              <table align="right" border="0" cellpadding="0" cellspacing="0" style="height:10px;
                          font-family:Tahoma,Arial,Helvetica,Sans-serif;
                          font-size:15px;color: #000000;border-top: 0px solid #efefef;
                          padding: 1px 5px;">
        <tr>
         <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
         <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
         <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
         <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
         <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
         <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
        </tr>
      </table>
          </div>

      <div id="copyright">
```

```
                &copy 2013 John Muita Wairiuko<br/>
                    Powered by: <a href="http://www.jawabusolutions.com/">Jawabu Solutions</a>
            </div>
        </div>


    </div>
</body>
</html>
```

Beneficiaries Page (beneficiaries.html)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
<head>
<!--These lines define the header information for this web-based GIS portal web page.-->
        <meta http-equiv="Content-type" content="text/html; charset=UTF-8" />
        <title>OPCT WEB-BASED GIS PORTAL</title>
        <meta http-equiv="Content-Language" content="en-us" />

        <meta http-equiv="imagetoolbar" content="no" />
        <meta name="MSSmartTagsPreventParsing" content="true" />

        <meta name="description" content="This is a Web-based GIS Portal for the OPCT Programme " />
        <meta name="keywords" content="OPCT, 'Web-Based GIS', Web-Mapping" />

        <meta name="author" content="John Muita Wairiuko" />

<!--This line references Cascading Styles Sheet that provides the range of styles that are applied to this webpage
   for richer appearance.-->

        <style type="text/css" media="all">@import "css/opctmaster.css";
     </style>  <style type="text/css" media="all">@import "css/opctmaster.css";</style>

<!--The style here define the size of the Map embeded on the web page.-->
   <style>
      #map-canvas { width:750px; height:550px; }
   </style>

<!-- The script tag below sets the URL for the location of a JavaScript file that loads all of the symbols
and definitions needed for using the Google Maps API.-->
   <script type="text/javascript"
      src="http://maps.google.com/maps/api/js?sensor=false">
   </script>
<!--This is the Google Maps JavaScript API that queries the geo-database in Fusion Tables and
visualizes the map on the webpage.-->

   <script type="text/javascript">
   var map;
   var layerl0;
   function initialize() {
    map = new google.maps.Map(document.getElementById('map-canvas'), {
      center: new google.maps.LatLng(-1.341583,36.753044),
      zoom: 12,
      mapTypeControl: true,
      mapTypeId: google.maps.MapTypeId.ROADMAP,
      zoomControl: true,
      zoomControlOptions: {
        style: google.maps.ZoomControlStyle.SMALL
   },
     scaleControl: true,
     scaleControlOptions: {
     position: google.maps.ControlPosition.BOTTOM_LEFT},
     });
     var style = [
     {
      featureType: 'all',
      elementType: 'all',
      stylers: [
```

```
          { saturation: 40 }
        ]
      }
    ];
    var styledMapType = new google.maps.StyledMapType(style, {
      map: map,
      name: 'Styled Map'
    });
    map.mapTypes.set('map-style', styledMapType);
    map.setMapTypeId('map-style');
```

<!--This segment of fetchs map layer from Fusion Tables-->
```
    layerl0 = new google.maps.FusionTablesLayer({
      query: {
        select: "'OP_LatLng'",
        from: '1Am9V7mBfP3NU51PwwXbeRn0Tt0BBgEjWNidUjIw'
      },
      map: map
    });
  }
```

<!--This segment of code implements the search function-->
```
  function changeMapl0() {
    var searchString = document.getElementById('search-string-l0').value.replace(/'/g, "\\'");
    layerl0.setOptions({
      query: {
        select: "'Beneficiary_LatLng'",
        from: '1Am9V7mBfP3NU51PwwXbeRn0Tt0BBgEjWNidUjIw',
        where: "'County_Ward' = '" + searchString + "'"
      }
    });
  }
  google.maps.event.addDomListener(window, 'load', initialize);
  </script>
```

```
</head>
<body>
```

<!--The page-container div defines the entire body of the web page.-->
```
<div id="page-container">
```

<!--This opct-heade div allocates the space for the Web page banner at the top of the page.-->
```
    <div id="opct-header">
       <h1><h1><img src="images/general/OPCTheader3brotex.gif"
                 width="1050" height="150" alt="Older Persons Cash Transfer(OPCT): Web-Based GIS
Portal" border="0" /></h1></h1></div>
```

<!--This opct-main-nav div contains a small table for the main navigation on web page.-->
```
    <div id="opct-main-nav">
     <table style="height:10px;
         font-family:Tahoma,Arial,Helvetica,Sans-serif;
         font-size:15px;
         color: #000000;border-top: 0px solid#efefef;
         padding: 15px 10px;"align="right" border="0" cellpadding="0" cellspacing="0" >

       <tr>
         <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
         <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
         <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
         <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
```

```html
            <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
            <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
          </tr>
        </table><br><br>
        </div>

<!--This opct-sidebar-a div creates a side bar on the left side of the page where the page titles, Search form
and page narrative are located.-->
            <div id="opct-sidebar-a">
<!--This creates the search form on the side bar on the web page-->
        <table style="height:10px;
         font-family:Arial,Tahoma,Helvetica,Sans-serif;
         font-size:12px;text-align="left";
          color: #000000;border-top: 1px solid#efefef;
           padding: 15px 10px;"align="left" border="0" cellpadding="5" cellspacing="1" >

          <tr>
          <th><h2>ENROLLED BENEFICARIES</h2></th></tr>
           <tr><td><em><strong>Select a Mappinng Option<strong><em/></td></tr>
            <tr><td>1. Click a marker icon in the Map area to see details</td></tr>
            <tr><td><label>2. Select County Ward :</label>
              <select id="search-string-l0" onchange="changeMapl0(this.value);">
               <option value="">--Select--</option>
               <option value="Karen">Karen</option>
               <option value="Nairobi West">Nairobi West</option>
               <option value="Mugumoini">Mugumo-ini</option>
               <option value="Nyayo Highrise">Nyayo Highrise</option>
               <option value="South C">South C</option>
               </select></td></tr>
        </table><br/><hr/>

   <div class="padding">
<!--These lines forms the narrative on the side bar on the web page-->
         <h2>Enrolled Beneficiaries</h2>
         <p>Enrolled Beneficaries page provide access to spatial information for beneficiaries
           currently enrolled on to the Older Person Cash Transfer programme (OPCT).</p>

         <p>It helps programme management and other stakeholders to establish the exact geograhic
           location for each benefiaries and provides their details such Name, Age, Gender and so on.
           These details can be viewed simply aby clicking on beneficiaries's icosn on the map</p>
         <p>From this page, one is also able to see the spatial distribution of the beneficiaries.
           The marker icon used also helps to differential between genders</p>
         <p><strong>To view the enrollment details for a beneficiary, click on marker icon in
           the map area</strong></p>


</div>
      </div>

         <div id="opct-content">
<!--This "map-canvas" div define the map area on the web page.-->

         <div id="map-canvas"></div>


      </div>
<!--The "opct-footer" div define the footer of the web page where the copyright tag-line and altnative
   navigation are provided.-->

         <div id="opct-footer">
```

```
        <div id="altnav">
            <table align="right" border="0" cellpadding="0" cellspacing="0" style="height:10px;
                            font-family:Tahoma,Arial,Helvetica,Sans-serif;
                            font-size:15px;color: #000000;border-top: 0px solid #efefef;
                            padding: 1px 5px;">
        <tr>
        <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
        <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
        <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
        <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
        <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
        <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
        </tr>
            </table>
            </div>

        <div id="copyright">
            &copy 2013 John Muita Wairiuko<br/>
                Powered by: <a href="http://www.jawabusolutions.com/">Jawabu Solutions</a>
        </div>
      </div>

    </div>
</body>
</html>
```

Pay Points Page (paypoints.html)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
<head>
<!--These lines define the header information for this web-based GIS portal web page.-->

        <meta http-equiv="Content-type" content="text/html; charset=UTF-8" />
        <title>OPCT WEB-BASED GIS PORTAL</title>
        <meta http-equiv="Content-Language" content="en-us" />

        <meta http-equiv="imagetoolbar" content="no" />
        <meta name="MSSmartTagsPreventParsing" content="true" />

        <meta name="description" content="This is a Web-based GIS Portal for the OPCT Programme " />
        <meta name="keywords" content="OPCT, 'Web-Based GIS', Web-Mapping" />

        <meta name="author" content="John Muita Wairiuko" />

<!--This line references Cascading Styles Sheet that provides the range of styles that are applied
to this webpage for richer appearance.-->

        <style type="text/css" media="all">@import "css/opctmaster.css";
    </style>  <style type="text/css" media="all">@import "css/opctmaster.css";</style>

<!--The style here define the size of the Map embeded on the web page.-->
 <style>
  #map-canvas { width:750px; height:550px; }
 </style>

<!-- The script tag below sets the URL for the location of a JavaScript file that loads all of the symbols
```

and definitions needed for using the Google Maps API.-->

```
  <script type="text/javascript"
    src="http://maps.google.com/maps/api/js?sensor=false">
  </script>
```

<!--This is the Google Maps JavaScript API that queries the geo-database in Fusion Tables and visualizes the map on the webpage.-->

```
  <script type="text/javascript">
    var map;
    var layerl1;
    function initialize() {
      map = new google.maps.Map(document.getElementById('map-canvas'), {
        center: new google.maps.LatLng(-1.3182216048688902, 36.75956726074219),
        zoom: 12,
        mapTypeControl: true,
        mapTypeId: google.maps.MapTypeId.ROADMAP,zoomControl: true,
        zoomControlOptions: {
          style: google.maps.ZoomControlStyle.SMALL
        },
        scaleControl: true,
         scaleControlOptions: {
          position: google.maps.ControlPosition.BOTTOM_LEFT
        },
         });
      var style = [
        {
          featureType: 'all',
          elementType: 'all',
          stylers: [
            { saturation: -7 }
          ]
        }
      ];
      var styledMapType = new google.maps.StyledMapType(style, {
        map: map,
        name: 'Styled Map'
      });
      map.mapTypes.set('map-style', styledMapType);
      map.setMapTypeId('map-style');
```

<!--This segment of fetchs map layer from Fusion Tables-->

```
      layerl1 = new google.maps.FusionTablesLayer({
        query: {
          select: "'Postal_LatLng'",
          from: '1bOpVA06_MoayTC_20cNnKQ_SkE9autLlkCMutPw'
        },
        map: map
      });
    }
```

<!--This segment of code implements the search function-->

```
    function changeMapl1() {
      var searchString = document.getElementById('search-string-l1').value.replace(/'/g, "\\'");
      layerl1.setOptions({
        query: {
          select: "'Postal_LatLng'",
          from: '1bOpVA06_MoayTC_20cNnKQ_SkE9autLlkCMutPw',
          where: "'Post_Office_Name' = '" + searchString + "'"
        }
      });
```

```
        }
    google.maps.event.addDomListener(window, 'load', initialize);
  </script>

</head>

<body>

<!--The page-container div defines the entire body of the web page.-->
<div id="page-container">
<!--This opct-heade div allocates the space for the Web page banner at the top of the page.-->
     <div id="opct-header">
        <h1><h1><img src="images/general/OPCTheader3brotex.gif"
                    width="1050" height="150" alt="Older Persons Cash Transfer(OPCT): Web-Based GIS
Portal" border="0" /></h1></h1></div>
<!--This opct-main-nav div contains a small table for the main navigation on web page.-->
     <div id="opct-main-nav">
      <table style="height:10px;
          font-family:Tahoma,Arial,Helvetica,Sans-serif;
          font-size:15px;
          color: #000000;border-top: 0px solid#efefef;
          padding: 15px 10px;"align="right" border="0" cellpadding="0" cellspacing="0" >

       <tr>
        <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
        <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
        <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
        <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
        <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
        <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
       </tr>
      </table><br><br>
      </div>

<!--This opct-sidebar-a div creates a side bar on the left side of the page where the page titles, Search form
and page narrative are located.-->

<!--This creates the search form on the side bar on the web page-->
        <div id="opct-sidebar-a">
      <table style="height:10px;
        font-family:Arial,Tahoma,Helvetica,Sans-serif;
        font-size:12px;text-align="left";
        color: #000000;border-top: 1px solid#efefef;
        padding: 15px 10px;"align="left" border="0" cellpadding="5" cellspacing="1" >

       <tr>
       <th><h2>OPCT PAY POINTS</h2></th></tr>
        <tr><td><em><strong>Select a Mappinng Option<strong><em/></td></tr>
         <tr><td>1. Click a marker icon in the Map area to see details</td></tr>
         <tr><td><label>2. Select Post Office :</label>
           <select id="search-string-l1" onchange="changeMapl1(this.value);">
            <option value="">--Select--</option>
            <option value="Uhuru Gardens">Uhuru Gardens</option>
            <option value="Nyayo">Nyayo</option>
            <option value="Karen">Karen</option>
           </select></td></tr>
       </table><br/><hr/>

    <div class="padding">
<!--These lines forms the narrative on the side bar on the web page-->
```

```
        <h2>OPCT Pay Points</h2>
        <p> This OPCT Pay Points page show the location and distribution of OPCT Pay Points. These are Post
Offices          that are located within the constituency and through which funds are disbursed and paid to the
enrolled            beneficaries.</p>
        <img src="images/post_offices/Nyayo0528.jpg"
                    width="260" height="200" alt="Nyayo Stadium Post Office" border="0" />

    </div>
     </div>

<!--This "map-canvas" div define the map area on the web page.-->
        <div id="opct-content">
        <div id="map-canvas"></div>
    </div>

<!--The "opct-footer" div define the footer of the web page where the copyright tag-line and altnative.-->
        <div id="opct-footer">
        <div id="altnav">
            <table align="right" border="0" cellpadding="0" cellspacing="0" style="height:10px;
                        font-family:Tahoma,Arial,Helvetica,Sans-serif;
                        font-size:15px;color: #000000;border-top: 0px solid #efefef;
                        padding: 1px 5px;">
        <tr>
         <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
         <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
         <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
         <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
         <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
         <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
        </tr>
       </table>
        </div>

      <div id="copyright">
          &copy 2013 John Muita Wairiuko<br/>
              Powered by: <a href="http://www.jawabusolutions.com/">Jawabu Solutions</a>
      </div>
    </div>

  </div>
</body>
</html>
```

Payments Page (payments.html)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
<head>
<!--These lines define the header information for this web-based GIS portal web page.-->
        <meta http-equiv="Content-type" content="text/html; charset=UTF-8" />
        <title>OPCT WEB-BASED GIS PORTAL</title>
        <meta http-equiv="Content-Language" content="en-us" />

        <meta http-equiv="imagetoolbar" content="no" />
        <meta name="MSSmartTagsPreventParsing" content="true" />

        <meta name="description" content="This is a Web-based GIS Portal for the OPCT Programme " />
```

```html
        <meta name="keywords" content="OPCT, 'Web-Based GIS', Web-Mapping" />

        <meta name="author" content="John Muita Wairiuko" />
<!--This line references Cascading Styles Sheet that provides the range of styles that are applied
 to this webpage for richer appearance.-->

        <style type="text/css" media="all">@import "css/opctmaster.css";
    </style>  <style type="text/css" media="all">@import "css/opctmaster.css";</style>

<!--The style here define the size of the Map embeded on the web page.-->
    <style>
     #map-canvas { width:750px; height:520px; }
    </style>

<!-- The script tag below sets the URL for the location of a JavaScript file that loads all of the symbols
and definitions needed for using the Google Maps API.-->

 <script type="text/javascript"
   src="http://maps.google.com/maps/api/js?sensor=false">
 </script>

<!--This is the Google Maps JavaScript API that queries the geo-database in Fusion Tables and
visualizes the map on the webpage.-->

 <script type="text/javascript">
  var map;
  var layerl0;

<!--This segment of fetches map layer from Fusion Tables-->
   function initialize() {
     map = new google.maps.Map(document.getElementById('map-canvas'), {
     center: new google.maps.LatLng(-0.131836,37.375488),
     zoom: 6,
     mapTypeControl: true,
     mapTypeControlOptions: {
      style: google.maps.MapTypeControlStyle.DROPDOWN_MENU
     },
     mapTypeId: google.maps.MapTypeId.ROADMAP,zoomControl: true,
      zoomControlOptions: {
       style: google.maps.ZoomControlStyle.SMALL
   },
     scaleControl: true,
      scaleControlOptions: {
      position: google.maps.ControlPosition.BOTTOM_LEFT},
     });
     layerl0 = new google.maps.FusionTablesLayer({
      query: {
       select: "'geometry'",
       from: '1rPV6zkOL4Db4etTtJYLl5lwdL943WL9m6f3HWPM'
      },
      map: map
     });
     }
     function changeMapl0() {
      var searchString = document.getElementById('search-string-l0').value.replace(/'/g, "\\'");
      layerl0.setOptions({
       query: {
        select: "'geometry'",
        from: '1rPV6zkOL4Db4etTtJYLl5lwdL943WL9m6f3HWPM',
        where: "'County' = '" + searchString + "'"
```

```
            }
          });
       }
       google.maps.event.addDomListener(window, 'load', initialize);
    </script>

</head>

<body>
<!--The page-container div defines the entire body of the web page.-->
  <div id="page-container">
      <div id="opct-header">
        <h1><h1><img src="images/general/OPCTheader3brotex.gif"
             width="1050" height="150" alt="Older Persons Cash Transfer(OPCT): Web-Based GIS Portal"
border="0" />
        </h1></h1>
      </div>

<!--This opct-main-nav div contains a small table for the main navigation on web page.-->
  <div id="opct-main-nav">
      <table style="height:10px;
        font-family:Tahoma,Arial,Helvetica,Sans-serif;
        font-size:15px;
        color: #000000;border-top: 0px solid#efefef;
        padding: 15px 10px;"align="right" border="0" cellpadding="0" cellspacing="0" >

        <tr>
         <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
         <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
         <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
         <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
         <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
         <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
        </tr>
      </table><br><br>
   </div>

<!--This opct-sidebar-a div creates a side bar on the left side of the page where the page titles, Search form
and page narrative are located.-->
   <div id="opct-sidebar-a"><br>

<!--This creates the search form on the side bar on the web page-->
     <table style="height:10px;
       font-family:Arial,Tahoma,Helvetica,Sans-serif;
       font-size:12px;text-align="left";
       color: #000000;border-top: 1px solid#efefef;
        padding: 15px 10px;"align="left" border="0" cellpadding="5" cellspacing="2" >

       <tr>
       <th><h2>OPCT PAYMENTS</h2></th></tr>
       <tr><td><em><strong>Select a Mappinng Option</strong></em></td></tr>
       <tr><td>1. Click on a County to see details</td></tr>
       <tr><td><label>2. Select a County to show :</label>
        <select id="search-string-l0" onchange="changeMapl0(this.value);">
        <option value="">--Select--</option>
        <option value="Baringo">Baringo</option>
        <option value="Bomet">Bomet</option>
        <option value="Bungoma">Bungoma</option>
        <option value="Busia">Busia</option>
        <option value="Embu">Embu</option>
```

```html
        <option value="Garissa">Garissa</option>
        <option value="Homa Bay">Homa Bay</option>
        <option value="Isiolo">Isiolo</option>
        <option value="Kajiado">Kajiado</option>
        <option value="Kakamega">Kakamega</option>
        <option value="Keiyo-Marakwet">Keiyo-Marakwet</option>
        <option value="Kericho">Kericho</option>
        <option value="Kiambu">Kiambu</option>
        <option value="Kilifi">Kilifi</option>
        <option value="Kirinyaga">Kirinyaga</option>
        <option value="Kisii">Kisii</option>
        <option value="Kisumu">Kisumu</option>
        <option value="Kitui">Kitui</option>
        <option value="Kwale">Kwale</option>
        <option value="Laikipia">Laikipia</option>
        <option value="Lamu">Lamu</option>
        <option value="Machakos">Machakos</option>
        <option value="Makueni">Makueni</option>
        <option value="Mandera">Mandera</option>
        <option value="Marsabit">Marsabit</option>
        <option value="Meru">Meru</option>
        <option value="Migori">Migori</option>
        <option value="Mombasa">Mombasa</option>
        <option value="Murang'a">Murang'a</option>
        <option value="Nairobi">Nairobi</option>
        <option value="Nakuru">Nakuru</option>
        <option value="Nandi">Nandi</option>
        <option value="Narok">Narok</option>
        <option value="Nyamira">Nyamira</option>
        <option value="Nyandarua">Nyandarua</option>
        <option value="Nyeri">Nyeri</option>
        <option value="Samburu">Samburu</option>
        <option value="Siaya">Siaya</option>
        <option value="Taita Taveta">Taita Taveta</option>
        <option value="Tana River">Tana River</option>
        <option value="Tharaka">Tharaka</option>
        <option value="Trans Nzoia">Trans Nzoia</option>
        <option value="Turkana">Turkana</option>
        <option value="Uasin Gishu">Uasin Gishu</option>
        <option value="Vihiga">Vihiga</option>
        <option value="Wajir">Wajir</option>
        <option value="West Pokot">West Pokot</option>
    </select></td></tr>
    </table><br/><hr/>

    <div class="padding">

<!--These lines forms the narrative on the side bar on the web page-->
        <h2> OPCT Payments</h2>
        <p>This page shows the spatial distribution of OPCT payments by County.
        </p>

        <p>It helps the user (programme management and other stakeholders) to see the amount of
          money that is spent on OPCT beneficiaries in each county every two months. The payments
          details for each county can be viewed simply by clicking within a county boundaries,
          in which case, an Information Window pop-up displaying among other details, the total
          number of beneficiaries and the total amount spent every month.</p>

        <p>The user can also use the search form to on the sidebar to select a county to be shown
          on the Map. In this case only the selected County is shown on the map.</p>
```

```
        </div>
      </div>

          <div id="opct-content">
<!--This "map-canvas" div define the map area on the web page.-->
        <div id="map-canvas"></div>
        <div class="padding"></div>
      </div>

<!--The "opct-footer" div define the footer of the web page where the copyright tag-line and altnative
   navigation are provided.-->

          <div id="opct-footer">
       <div id="altnav">
             <table align="right" border="0" cellpadding="0" cellspacing="0" style="height:10px;
                         font-family:Tahoma,Arial,Helvetica,Sans-serif;
                         font-size:15px;color: #000000;border-top: 0px solid #efefef;
                         padding: 1px 5px;">
         <tr>
          <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
          <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
          <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
          <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
          <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
          <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
         </tr>
       </table>
         </div>

       <div id="copyright">
          &copy 2013 John Muita Wairiuko<br/>
              Powered by: <a href="http://www.jawabusolutions.com/">Jawabu Solutions</a>
       </div>
      </div>

      <div id="map-canvas"></div>

   </div>
</body>
</html>
```

New Registrations page (targets.html)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
<head>
<!--These lines define the header information for this web-based GIS portal web page.-->
        <meta http-equiv="Content-type" content="text/html; charset=UTF-8" />
        <title>OPCT WEB-BASED GIS PORTAL</title>
        <meta http-equiv="Content-Language" content="en-us" />

        <meta http-equiv="imagetoolbar" content="no" />
        <meta name="MSSmartTagsPreventParsing" content="true" />

        <meta name="description" content="This is a Web-based GIS Portal for the OPCT Programme " />
```

```
        <meta name="keywords" content="OPCT, 'Web-Based GIS', Web-Mapping" />

        <meta name="author" content="John Muita Wairiuko" />
<!--This line references Cascading Styles Sheet that provides the range of styles that are applied
to this webpage for richer appearance.-->

        <style type="text/css" media="all">@import "css/opctmaster.css";
    </style> <style type="text/css" media="all">@import "css/opctmaster.css";</style>

<!--The style here define the size of the Map embeded on the web page.-->
    <style>
        #map-canvas { width:750px; height:550px; }
    </style>

<!-- The script tag below sets the URL for the location of a JavaScript file that loads all of the symbols
and definitions needed for using the Google Maps API.-->
    <script type="text/javascript"
        src="http://maps.google.com/maps/api/js?sensor=false">
    </script>

<!--This is the Google Maps JavaScript API that queries the geo-database in Fusion Tables and
visualizes the map on the webpage.-->

    <script type="text/javascript">
    var map;
    var layerl0;
    function initialize() {
      map = new google.maps.Map(document.getElementById('map-canvas'), {
        center: new google.maps.LatLng(-1.341583,36.753044),
        zoom: 12,
        mapTypeControl: true,
       mapTypeId: google.maps.MapTypeId.ROADMAP,
        zoomControl: true,
        zoomControlOptions: {
          style: google.maps.ZoomControlStyle.SMALL
      },
        scaleControl: true,
        scaleControlOptions: {
        position: google.maps.ControlPosition.BOTTOM_LEFT},
        });
        var style = [
        {
         featureType: 'all',
         elementType: 'all',
         stylers: [
           { saturation: 40 }
         ]
        }
      ];
      var styledMapType = new google.maps.StyledMapType(style, {
        map: map,
        name: 'Styled Map'
      });
      map.mapTypes.set('map-style', styledMapType);
      map.setMapTypeId('map-style');

<!--This segment of fetches map layer from Fusion Tables-->
      layerl0 = new google.maps.FusionTablesLayer({
        query: {
          select: "'OP_LatLng'",
```

```
                from: '1ZgA1xhEjh4wBvxULpGja1FpqbJws6tHad9zSerg'
            },
           map: map
        });
      }
```
<!--This segment of code implements the search function-->
```
      function changeMapl0() {
        var searchString = document.getElementById('search-string-l0').value.replace(/'/g, "\\'");
        layerl0.setOptions({
          query: {
           select: "'OP_LatLng'",
           from: '1ZgA1xhEjh4wBvxULpGja1FpqbJws6tHad9zSerg',
           where: "'Sex' = '" + searchString + "'"
          }
        });
      }
      google.maps.event.addDomListener(window, 'load', initialize);
   &lt;/script&gt;

&lt;/head&gt;

&lt;body&gt;
```
<!--The page-container div defines the entire body of the web page.-->
<div id="page-container">

<!--This opct-heade div allocates the space for the Web page banner at the top of the page.-->

```
     <div id="opct-header">
       <h1><h1><img src="images/general/OPCTheader3brotex.gif"
                  width="1050" height="150" alt="Older Persons Cash Transfer(OPCT): Web-Based GIS
Portal"
          border="0" /></h1></h1></div>
```

<!--This opct-main-nav div contains a small table for the main navigation on web page.-->
```
     <div id="opct-main-nav">
      <table style="height:10px;
          font-family:Tahoma,Arial,Helvetica,Sans-serif;
          font-size:15px;
          color: #000000;border-top: 0px solid#efefef;
          padding: 15px 10px;"align="right" border="0" cellpadding="0" cellspacing="0" >

      <tr>
        <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
        <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
        <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
        <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
        <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
        <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
      </tr>
     </table><br><br>
     </div>
```
<!--This opct-sidebar-a div creates a side bar on the left side of the page where the page titles, Search form and page narrative are located.-->

```
        <div id="opct-sidebar-a">
```
<!--This creates the search form on the side bar on the web page-->
```
      <table style="height:10px;
       font-family:Arial,Tahoma,Helvetica,Sans-serif;
        font-size:12px;text-align="left";
         color: #000000;border-top: 1px solid#efefef;
```

```
                    padding: 15px 10px;"align="left" border="0" cellpadding="5" cellspacing="1" >

            <tr>
             <th><h2>NEW OPCT REGISTRATIONS</h2></th></tr>
              <tr><td><em><strong>Select a Mappinng Option<strong><em/></td></tr>
               <tr><td>1. Click a marker icon on the Map to see details</td></tr>
               <tr><td><label>2. Select Gender to Map</label>
                 <select id="search-string-l0" onchange="changeMapl0(this.value);">
                  <option value="">--Select--</option>
                  <option value="Male">Male</option>
                  <option value="Female">Female</option>
                  </select></td></tr>
          </table><br/><hr/>

   <div class="padding">

<!--These lines forms the narrative on the side bar on the web page-->
          <h2>New OPCT Registrations</h2>
          <p>This page provide access to spatial information for older persons that are currently
            in the process of being enrolled on to the OPCT programme. The registration process involves
            a number of steps. Only when all the steps are completed for target beneficiaries and their
            details put in the payroll does the registration process become complete.</p>

          <p>The interactive map on this page help the user (programme management and other stakeholders)
             to establish the exact geograhic location for those undergoing targeting and registration
             and can help in tracing their households for follow-ups.</p>
          <p><strong>The user can used the search function on the sidebar to display map by
gender.</strong></p>


</div>
      </div>

          <div id="opct-content">

<!--This "map-canvas" div define the map area on the web page.-->
        <div id="map-canvas"></div>


      </div>
<!--The "opct-footer" div define the footer of the web page where the copyright tag-line and altnative
   navigation are provided.-->

          <div id="opct-footer">
       <div id="altnav">
             <table align="right" border="0" cellpadding="0" cellspacing="0" style="height:10px;
                        font-family:Tahoma,Arial,Helvetica,Sans-serif;
                        font-size:15px;color: #000000;border-top: 0px solid #efefef;
                        padding: 1px 5px;">
         <tr>
          <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
          <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
          <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
          <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
          <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
          <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
         </tr>
       </table>
          </div>
```

```
        <div id="copyright">
            &copy 2013 John Muita Wairiuko<br/>
                Powered by: <a href="http://www.jawabusolutions.com/">Jawabu Solutions</a>
        </div>
    </div>

  </div>
</body>
</html>
```

Exits page (exits.html)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
        "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html>
<head>
<!--These lines define the header information for this web-based GIS portal web page.-->
        <meta http-equiv="Content-type" content="text/html; charset=UTF-8" />
        <title>OPCT WEB-BASED GIS PORTAL</title>
        <meta http-equiv="Content-Language" content="en-us" />

        <meta http-equiv="imagetoolbar" content="no" />
        <meta name="MSSmartTagsPreventParsing" content="true" />

        <meta name="description" content="This is a Web-based GIS Portal for the OPCT Programme " />
        <meta name="keywords" content="OPCT, 'Web-Based GIS', Web-Mapping" />

        <meta name="author" content="John Muita Wairiuko" />
<!--This line references Cascading Styles Sheet that provides the range of styles that are applied to
this webpage for richer appearance.-->

        <style type="text/css" media="all">@import "css/opctmaster.css";
    </style>  <style type="text/css" media="all">@import "css/opctmaster.css";</style>

<!--The style here define the size of the Map embeded on the web page.-->
  <style>
     #map-canvas { width:750px; height:550px; }
  </style>

<!-- The script tag below sets the URL for the location of a JavaScript file that loads all of the symbols
and definitions needed for using the Google Maps API.-->
  <script type="text/javascript"
     src="http://maps.google.com/maps/api/js?sensor=false">
  </script>

<!--This is the Google Maps JavaScript API that queries the geo-database in Fusion Tables and
visualizes the map on the webpage.-->
  <script type="text/javascript">
  var map;
  var layerl0;
  function initialize() {
   map = new google.maps.Map(document.getElementById('map-canvas'), {
    center: new google.maps.LatLng(-1.341583,36.753044),
    zoom: 12,
    mapTypeControl: true,
   mapTypeId: google.maps.MapTypeId.ROADMAP,
    zoomControl: true,
    zoomControlOptions: {
```

```
        style: google.maps.ZoomControlStyle.SMALL
    },
     scaleControl: true,
      scaleControlOptions: {
      position: google.maps.ControlPosition.BOTTOM_LEFT},
     });
     var style = [
     {
      featureType: 'all',
      elementType: 'all',
      stylers: [
        { saturation: 40 }
      ]
     }
    ];
    var styledMapType = new google.maps.StyledMapType(style, {
     map: map,
     name: 'Styled Map'
    });
    map.mapTypes.set('map-style', styledMapType);
    map.setMapTypeId('map-style');

<!--This segment of fetches map layer from Fusion Tables-->
    layerl0 = new google.maps.FusionTablesLayer({
     query: {
      select: "'OP_LatLng'",
      from: '1XL9356j5kYA9qju91gh4eGoESR5pjwRwjA7h9w4'
     },
     map: map
    });
   }

<!--This segment of code implements the search function-->
   function changeMapl0() {
    var searchString = document.getElementById('search-string-l0').value.replace(/'/g, "\\'");
    layerl0.setOptions({
     query: {
      select: "'OP_LatLng'",
      from: '1XL9356j5kYA9qju91gh4eGoESR5pjwRwjA7h9w4',
      where: "'Remarks' = '" + searchString + "'"
     }
    });
   }
   google.maps.event.addDomListener(window, 'load', initialize);
 </script>

</head>

<body>

<!--The page-container div defines the entire body of the web page.-->
<div id="page-container">

<!--This opct-heade div allocates the space for the Web page banner at the top of the page.-->
     <div id="opct-header">
        <h1><h1><img src="images/general/OPCTheader3brotex.gif"
                   width="1050" height="150" alt="Older Persons Cash Transfer(OPCT): Web-Based GIS
Portal"
            border="0" /></h1></h1></div>
```

```html
<!--This opct-main-nav div contains a small table for the main navigation on web page.-->
    <div id="opct-main-nav">
     <table style="height:10px;
        font-family:Tahoma,Arial,Helvetica,Sans-serif;
        font-size:15px;
        color: #000000;border-top: 0px solid#efefef;
        padding: 15px 10px;"align="right" border="0" cellpadding="0" cellspacing="0" >

      <tr>
       <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
       <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
       <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
       <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
       <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
       <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
      </tr>
     </table><br><br>
     </div>
<!--This opct-sidebar-a div creates a side bar on the left side of the page where the page titles, Search form
and page narrative are located.-->
        <div id="opct-sidebar-a">

<!--This creates the search form on the side bar on the web page-->
      <table style="height:14px;
       font-family:Arial,Tahoma,Helvetica,Sans-serif;
       font-size:12px;text-align="left";
        color: #000000;border-top: 1px solid#efefef;
        padding: 15px 10px;"align="left" border="0" cellpadding="5" cellspacing="1" >

       <tr>
        <th><h2>OPCT EXITS</h2></th></tr>
        <tr><td><em><strong>Select a Mappinng Option<strong/><em/></td></tr>
        <tr><td>1. Click a marker icon on the map to see details</td></tr>
        <tr><td><label>2. Select an Exit Reason to show on map:</label>
          <select id="search-string-l0" onchange="changeMapl0(this.value);">
           <option value="">--Select--</option>
           <option value="Welfare Improved">Welfare Improved</option>
           <option value="Falsified Targeting Information">Falsified Targeting Information</option>
           <option value="Deceased">Deceased</option>
          </select></td></tr>
      </table><br><hr/>

  <div class="padding">

<!--These lines forms the narrative on the side bar on the web page-->
        <h2>OPCT Exits</h2>
        <p>OPCT Exits page provide access to spatial information for older persons who for one reason or
          another have exited from the Older Person Cash Transfer programme.
          It helps the user (programme management and other stakeholders) to establish the exact geograhic
          location for those who have existed. This would enable programme management and/or other
stakeholders
          to make follow-up where needed</p>

        <h3>Reason for Exits</h3>
        <p>The search form displays the three main reasons for existing from the programme:</p>
        <ol>
          <li>Welfare improvement</li>
          <li>Falsified Targeting information</li>
          <li>Deceased</li>
        </ol>
```

```html
</div>
    </div>


        <div id="opct-content">
<!--This "map-canvas" div define the map area on the web page.-->
        <div id="map-canvas"></div>



    </div>
<!--The "opct-footer" div define the footer of the web page where the copyright tag-line and altnative
  navigation are provided.-->

        <div id="opct-footer">
      <div id="altnav">
            <table align="right" border="0" cellpadding="0" cellspacing="0" style="height:10px;
                        font-family:Tahoma,Arial,Helvetica,Sans-serif;
                        font-size:15px;color: #000000;border-top: 0px solid #efefef;
                        padding: 1px 5px;">
        <tr>
         <td valign="top" ><a href="index.html"><b>Home</b></a> | </td>
         <td valign="top" ><a href="beneficiaries.html"><b>Beneficiaries</b></a> | </td>
         <td valign="top" ><a href="paypoints.html"><b>Pay-Points</b></a> | </td>
         <td valign="top" ><a href="payments.html"><b>Payments</b></a> | </td>
         <td valign="top" ><a href="targets.html"><b>New Registrations</b></a> | </td>
         <td valign="top" ><a href="exits.html"><b>Exits</b></a></td>
        </tr>
      </table>
          </div>

      <div id="copyright">
          &copy 2013 John Muita Wairiuko<br/>
            Powered by: <a href="http://www.jawabusolutions.com/">Jawabu Solutions</a>
      </div>
    </div>

  </div>
</body>
</html>
```

Cascading Style Sheets (CSS) – (opctmaster.css)

```
/* This Cascading Style Sheets defines the styles that are applied on HTML elements in OPCT Web-Based GIS
Portal*/

/* The styles are grouped according to the section of the code on the OPCT Web-Based GIS Portal they are
applied to.*/

.hidden {
        display: none;
}
/* Styles for the body section of the webpage*/
body {
        font-family: Arial, Helvetica, Verdana, Sans-serif;
        font-size: 12px;
        /*color: #666666;*/
    color:#000000
        background: #ffffff;
    text-align:center;
}
/* Styles for Main Navigation */

#opct-main-nav {
    height: 50px;
    padding-left: 11px;
    padding-left: 11px;
    overflow: hidden;
}
/* Specify styles for page container */
#page-container {
        width: 1050px;
        margin: auto;
        background:#eeeeee;
    text-align:left;
    border-top: 0px solid #ccc;
    border-bottom: 1px solid #ccc;
    border-right: 1px solid #000;
    border-left: 1px solid #ccc;
}
html, body {
        margin: 0;
        padding: 0;
}
/* Styles for Page Header*/
#opct-header {
        background: #dddddd;
        height: 150px;
/*      background: #db6d16; */
}
/* Styles for Side Bar on the left */
#opct-sidebar-a {
    float: left;
    width: 298px;
    line-height: 18px;
    text-align: justify;
        background:#efdebd;
    border-top: 1px solid #000;
    border-bottom: 0px solid #000;
    border-right: 1px solid #000;
    border-left: 1px solid #000;
```

```css
}
#opct-sidebar-a .padding {
     padding: 25px;
}
/* Styles for the contents segment (Map area) in the body of the page*/
#opct-content .padding {
          padding: 25px;
}
#opct-content {
     float: right;
          width: 748px;
     line-height: 18px;
          background:;
     border-top: 1px solid #000;
     border-bottom: 0px solid #ccc;
     border-right: 1px solid #ccc;
     border-left: 1px solid #ccc;
}
/*Styles for headers, paragraphs*/
h1 {
          margin: 0;
          padding: 0;


}
h2 {
          margin: 0;
          padding: 0;


}
#opct-content h2 {
          margin: 0;
          padding: 0;
     padding-bottom: 15px;
}
#opct-content p {
          margin: 0;
          padding: 0;
     padding-bottom: 15px;
}
/* Styles for Page Footer */
#opct-footer {
     clear: both;
          height: 66px;
          background:#cccccc;
          font-family: Tahoma, Arial, Helvetica, Sans-serif;
          font-size: 12px;
          /*color:#c9c9c9 ;*/
          /*border-top: 1px solid #efefef;*/
          padding: 13px 5px;
          line-height: 18px;
     border-top: 1px solid #000;
     border-bottom: 1px solid #000;
     border-right: 0px solid #ccc;
     border-left: 0px solid #ccc;
}
#opct-footer #altnav {
          clear: both;
     width: 750px;
          float: right;
          text-align: right;
```

```
     padding-top: 0px;
}
#opct-footer #copyright {
     padding-top: 0px;
}
```

APPENDIX C

Kenya's Social Protection Programmes

	Annex 1: Kenya's Social Protection Programmes					
	Programme	**Beneficiaries**	**Number of Beneficiaries**	**Funding Agency**	**Implementing Agency**	**Transfer Type**
A. Non-contributory Programmes						
I. Agriculture						
1.	National Accelerated Agricultural Inputs Access Programme (NAAIAP)	Small-scale poor farmers	120,750 (2010)	Govt. of Kenya (GoK), WB	Ministry of Agriculture (MoA)	Farm inputs
2.	*Njaa Marufuku* Kenya (NMK) - Component 1 Farmers' Groups	Farmers' groups	12,180 (2010)	GoK	MOA	Cash
3.	Food and Agriculture Organisation (FAO) Farmer First Programme	Household members with HIV/AIDS, TB, and/or severe malnutrition	1,200 (2010)	FAO	-	Farm inputs
II. Education						
4.	Most Vulnerable Children (MVC)	Schools in poor areas	1,778,297 (2009)	GoK, DFID	Ministry of Education (MoE)	Cash
5.	Expanded School Feeding*	School-children	1,115,830 (2009)	GoK, WFP	World Food Programme (WFP)	Food
6.	Home Grown School Meals (HGSM)	Schools in marginalised areas	538,457 (2010)	GoK, JICA	MoE, WFP	Cash
7.	Regular School Feeding	Primary school children	803,669 (2010)	GoK, WFP	MoE, WFP	Food
8.	Secondary Education Bursary Fund	Vulnerable secondary school students	66,570 (2010)	GoK	MoE	Cash
III. Health and Nutrition						
9.	HIV/AIDS Nutrition Feeding	HIV clients on ART and OVCs in affected households	72,065 (2010)	WFP	Several implementing agencies	Food
10.	Health Voucher – OBA Scheme	Poor women in ASAL areas	59,982 (2010)	UNICEF, GoK	MoMS	Cash
11.	NMK Component 2	School-children	37,196 (2010)	GoK	MoA	Cash

	Programme	**Beneficiaries**	**Number of Beneficiaries**	**Funding Agency**	**Implementing Agency**	**Transfer Type**
IV. Social Cash Transfers						
12.	Hunger Safety Net Programme (HSNP), Phase 1 Pilot	Chronically food-insecure, extremely poor, and vulnerable people	289,480** (2010)	DFID	Min. for the Development of Northern Kenya and Arid Lands	Cash
13.	Cash Transfer for Orphans and Vulnerable Children (CT-OVC)	OVC	412,470 (2010)	UNICEF, DFID, WB, GoK	MGCSD	Cash
14.	Older Persons Cash Transfer (OPCT)	Older people	33,000 (2010)	GoK	MGCSD	Cash
15.	Disability Grants	People with disabilities and institutions serving people with disabilities	2,100 (2010)	GoK	MGCSD	Cash
16.	Urban Food Subsidy	Poor households in urban areas	5,150	Several donors	WFP, Oxfam, Concern	Cash
17.	General Food Distribution (GFD)*	Poor households and disaster victims	2,180,058 (2010)	GoK	Special Programmes, WFP	Food
18.	Supplementary Feeding (including Mother & Child Nutrition)*	Poor women and children	454,667 (2010)	GoK	WFP	Food
19.	Food/Cash for Assets*	Vulnerable communities	140,000 (2010)	Several donors	WFP, Ministry of Northern Kenya	Food or Cash
B. Contributory Programmes						
20.	National Hospital Insurance Fund (NHIF)	Formal and informal sector workers	367,886 (2010)	MoPHS	NHIF	Cash
21.	National Social Security Fund (NSSF)	Formal and informal sector workers	38,339 (2010)	Ministry of Labour	NSSF	Cash
C. Other						
22.	Civil Service Pension	Civil servants	209,384 (2010)	Ministry of Finance	-	Cash