Analyzing fee and free spatial data sharing policies in public sector in Uganda

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Abstract

Public organizations in Uganda have adopted different spatial data sharing policies. Recommendations on the development of SDI in Uganda invite public organizations to harmonize spatial data sharing policies. The study uses isomorphism theory to investigate if those organizations tend to harmonize spatial data sharing policies. The theory is applied in public administration sciences, and used in explaining how organizations adopt and diffuse similar behaviour when they cope with environment influences pushing them to adopt similar practices. The study uses interpretative techniques in analyzing data obtained from field work and existing literature on spatial data sharing in Uganda. It assesses if spatial data sharing policies followed by public organizations in Uganda change over time and reflect any pattern of isomorphism namely coercive, normative and mimetic.

Findings show that there are two different policies followed by public organizations in Uganda in spatial data sharing. Some organizations follow the pricing policy and initially charge fees in sharing spatial data with public and private organizations and individuals, while others follow free access policy and share spatial data for free charge. Organizations which follow pricing policy face coercive forces resulting from the regulations and requirements pushing them to charge fees in spatial data sharing. Since 2000, those organizations have adopted new behaviour and started to share spatial data for free with other government organizations. Change in the behaviour reflects the normative process and relates to an increased awareness about appropriate ways for the cooperation in spatial data sharing between government organizations. Furthermore, normative forces shape in similar way the behaviour of organizations which have adopted free access policy. Sharing spatial data for free allows the optimal use of spatial data for meeting organizations goals

KEYWORDS: Public organizations, spatial data sharing policy, free, fees, isomorphism theory, Uganda

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List of Acronyms

DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
EIS	Environnent Information Network
GI	Geographic Information
GIS	Geographic Information System
GSDI	Global Spatial Data Infrastructure
IGN-France	Institut Géographique National de France
KCC	Kampala City Council
KW	Kampala Water
LD	Lands Department
MEMD	Ministry of Energy and Mineral Development
MLHUD	Ministry of Lands, Housing and Urban Development
MoU	Memorandum of Understanding
NARO	National Agricultural Research Organization
NEMA	National Environment Management Authority
NFA	National Forest Authority
NSDI	National Spatial Data Infrastructure
NWSC	National Water and Sewerage Corporation
RCMRD	Regional Centre for Mapping of Resources for Development
resp.12	respondent number 12
SDI	Spatial Data Infrastructure
SMP	Survey and Mapping Department
TC	Town Council
UBOS	Uganda Bureau Of Statistics
UMD	Uganda meteorological department
UNICEF	United Nations Children's Emergency Fund
UShs	Uganda Shillings
WDD	Water Development Department
WRMAD	Water Resources Monitoring and Assessment Department

1. Introduction

Spatial data are collected at an expensive cost and their values come from their optimal use (Onsrud and Rushton 1995). The increased awareness about the cost of spatial data has lead to formulation of strategies avoiding duplication in spatial data collection and providing mechanisms allowing different producers and users to share those resources. Omran and van Etten (2007) define spatial data sharing as transactions in which individuals, organizations or parts of organizations obtain access from other individuals, organizations or parts of organizations to spatial data. Spatial data sharing arrangements may or may not include payment (Omran and van Etten 2007). Those two alternative options induce spatial data produsers to develop different spatial data provision approaches, some including pricing condition while others share spatial data without that condition (van Loenen 2009). According to institutional theories, within any organizational fields, organizations adopt different practices and procedures in their early stages of development when there are no institutional norms pushing for homogenization of their practices. Organizational fields are defined as those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, producers, regulatory agencies, and other organizations that produce similar services or products (DiMaggio and Powell 1983; Powell and DiMaggio 1991). Within the field of spatial data industry, different practices may be observed when some organizations pose payment conditions on spatial data access whereas others do not. However, over time the practices that are initially different may become similar by adoption of and compliance to norms that are socially deemed to be legitimate (Powell and DiMaggio 1991; Dacin 1997; Gosain 2004).

This research focuses on spatial data sharing from the angle of isomorphism theory, to analyse the dynamic aspects of spatial data sharing policies in public organizations in Uganda. The literature on spatial data sharing in Uganda, states that due to lack of formal coordination of inter-organizations cooperation, public organizations have individually and differently developed spatial data sharing policies and practices (Karatunga 2002; Musinguzi 2004; Chaminama 2009). The study draws on isomorphism theory to examine if there is a tendency for homogenizing spatial data sharing policies or practices and tries to find out what could be its main drivers.

1.1. Background of the problem

In Uganda there is a governmental awareness to foster the development of a Spatial Data Infrastructure in order to solve the problems related to spatial data availability, access and sharing, duplicity in spatial data collection, and diverse spatial data standards (Karatunga 2002). In the process of implementation of SDI, some organizations have come up with their own practices and different approaches in provision and exchange of spatial data.

Previous studies have pointed out that spatial data sharing has been initiated through different arrangements and different forms of spatial data exchange between public organizations exist. Organizations like Survey and Mapping Department (SMD) include payment conditions in spatial data provision, while others, the National Environment Management Authority (NEMA), National Forest

Authority (NFA), Uganda Bureau of Statistics (UBOS), and Ministry of Local Government (MLG) do not include pricing in data provision and share spatial data for free (Nasirumbi 2006; Nyemera 2008; Chaminama 2009). Other studies mentioned that there are few formalized institutional structures to share spatial data and every organization has its own way of delivering spatial data (Karatunga 2002). However, different spatial data producers and users are invited to align their spatial data sharing practices to policies related to the development of SDI and to solve the institutional disparities observed in spatial data sharing in East African countries (GSDI 2007). Previous studies do not explain if there is an actual tendency for those organizations to increasingly cooperate in harmonized way. Therefore this research refers to the isomorphism theory lens in examining the extent to which those organizations harmonize spatial data sharing policies.

1.2. Research problem

SDI and spatial data sharing policies prescribe harmonization of access to governmental spatial data. In European countries for instance, INSPIRE directives propose access and use of spatial data in harmonized ways (European Commission 2007). In the United States, the policy on National Spatial Data Infrastructure (NSDI) recommends harmonized free access to spatial data held by government agencies (Maitra 1998). In Australia, SDI policy suggests a common provision of fundamental spatial data free of charge, over internet or with a marginal cost of transfer if spatial data are distributed as packaged product (Interdepartmental Committee on Spatial Data Access and Pricing 2001). In East African countries, spatial data users' community recommends harmonization of spatial data sharing practices and conformity to SDI policies (GSDI 2007).

In Uganda, where spatial data sharing arrangements have been initiated individually in the public sector, and with regard to theses few aforementioned cases narrating what spatial data sharing policies recommend, it is not known whether those arrangements tend to be harmonized. Terms on spatial data access are different because spatial data sharing practices have been developed out of the control of the mandates that ought to coordinate spatial data sharing cooperation between public organizations in Uganda (Musinguzi 2004). However, the decree on the development of SDI in Uganda recommends the adoption of common policies on spatial data access (Nyemera 2008). There is a need for an investigation aiming to explain how spatial data sharing policies were adopted and examine if spatial data sharing policies or practices are converging to homogeneity. Such investigation can help in understanding if public organizations solve the institutional disparities existing in spatial data provision observed in Uganda (GSDI 2007; Nyemera 2008; Chaminama 2009). With regard to antecedents that influence public organizations to decide on spatial data sharing policy, this research seeks to examine whether spatial data sharing practices are harmonized and thereby converge to similarity. The factors that may push public organizations in Uganda to homogenize their practices in spatial data sharing will be analyzed to assess whether those organizations propagate isomorphism behaviour.

1.3. Research objectives

1.3.1. Main objective

The main objective of the research is to examine if spatial data sharing policies in public sector in Uganda change over time and if they reflect a certain pattern of isomorphism.

1.3.2. Specific objectives

- To determine the nature of spatial data sharing policies adopted by public organizations in Uganda and the factors influencing their choice.
- To investigate if spatial data sharing policies are initially different and if they converge to look alike over time.
- To interpret if the changes in spatial data sharing policies relate to any isomorphism process namely coercive, normative and mimetic.

1.4. Research hypotheses

The research tends to test the following hypotheses in finding the answers to abovementioned research objectives:

- Spatial data sharing policies, initiated individually by public organizations in Uganda, tend to look similar over time by compliance to the national spatial data sharing directives.
- Professional communities of staff interested in SDI development are the cause for changes in spatial data provision as normative pressures affect organizations practices.
- Public organizations in Uganda adopt over time similar approaches in cooperation for spatial data provision by imitation of each other practices.

1.5. Research questions

The research intends to answer the following research questions:

1.5.1. Main research question

- How do spatial data sharing policies adopted by public organizations in Uganda reflect isomorphism trends?

1.5.2. Sub-research questions

- What is spatial data sharing legislation in Uganda?
- What are spatial data sharing policies followed by public organizations in Uganda?
- Do spatial data sharing policies change and tend to look similar over time?

- Do organizations show any isomorphic behaviour in adopting spatial data sharing policy?
- Do organizations behaviour in data sharing policies relate to any isomorphism process like coercive, normative or mimetic?

1.6. Justification of the research

Previous studies about geo-information management in Uganda underlined the need for harmonization in spatial data sharing policies because the disparities observed among spatial data sharing practices limit both the cooperation between public organizations and access to public information. This study refers to isomorphism theory to investigate if those organizations show any behaviour vis-à-vis the recommended harmonization of spatial data sharing policies. The theory is applied in public administration sciences, and used in explaining organizational change, behaviour and inter-organisational relationships when they cope with uncertainty or constraints existing within their environment. It is also used to explain how, through cooperation, organizations conform to procedures and legitimate rules and thereby become similar (DiMaggio and Powell 1983; Powell and DiMaggio 1991; Renshler 2007).

The aspects of organizational behaviour in spatial data sharing need to be more addressed because "*the technical issues of spatial data sharing are well studied and largely resolved, but institutional and individual behaviour aspects are less well studied and require more attention"* (Harvey and Tulloch 2006). There is a need for a research aiming at explaining the nature of current spatial data sharing practices between different public organizations in Uganda because those practices are questionable and not clearly elucidated. In Uganda, there are no established inter-organisational collaboration frameworks in spatial data sharing and there are no uniform conditions on spatial data access and provision (Musinguzi 2004).

This study is a continuation of on-going research; like "*Analysis of public sector cooperation and geoinformation sharing: a resource dependence perspective* (Chaminama 2009), "*Towards strategy of spatial data infrastructure development with focus on the private sector involvement: a case study in Uganda*" (Nasirumbi 2006); in the field of geo-information management and public administration which seeks to investigate the dynamic aspects of spatial data sharing practices in Uganda. Understanding of the inter-organizational relations in spatial data sharing can contribute in evaluating the extent to which such relations promote or obstruct the dissemination of geoinformation. The results of the research will be of general interest in the field of geoinformation management. At national level, they will give the picture of current practices in spatial data sharing, which are considered among the ingredients for the development and success of SDI when those practices are in line with SDI policies. In this context, it is argued that cooperation and partnerships between government organizations are among factors for the development of SDI (Nebert 2004). If the study finds out that spatial data sharing policies create uncertainty on spatial data access, it will reveal the challenges that decision makers should deal with in line with the dissemination of public information.

1.7. Study area

The study area for this research is Uganda. Primary data and secondary data for the research were collected in public organizations distributed in the three zones: Kampala city, Entebbe city and Mukono town (appendix 1).

1.8. Research methodology

1.8.1. Primary data collection

Primary data about spatial data sharing policies and practices between public organisations in Uganda were collected through interviews, surveys by questionnaires, and direct observations. The interviews and surveys by questionnaires were addressed to the staff of organisations that are located in study areas and operate in the different sectors, namely public administration, land registration and management, water resources management and utilities. The staffs to whom the survey questionnaire and interview were administrated are the managers, heads of the departments, GIS specialists and technicians.

The interviews were based on structured and open-ended questions and unstructured questions to enable respondents to narrate spatial data sharing policies and practices in their respective organizations. There was also passive observation in organizations offices like GIS laboratories to observe how people process the request related to spatial data sharing.

1.8.2. Literature review

Books, scientific articles and conference papers served to review the literature related to spatial data sharing worldwide, cooperation of public organisations in Uganda in spatial data sharing, public administration structure in Uganda and the theory of isomorphism with focus on drivers of change in organizational practices. The literature also helped in interpretation of data that were collected about the cooperation of public organizations in Uganda and to examine if they show any trend of isomorphism. The literature review focused on themes that are detailed in the research matrix below.

1.9. Research matrix

The table below shows the research matrix which indicates how the research was operationalised. It contains the type of required data, data source, methods for data collection and analysis in relation with the research questions and objectives.

Table 1-1 Research matrix

Research objective	Research question	Methods and data sources	Expected data
1. To determine the nature of spatial data sharing policies adopted by public organizations in Uganda and the factors influencing their choice	1. What is spatial data sharing legislation in Uganda? 2. What are spatial data sharing policies adopted by public organizations in Uganda?	- Review of the literature about spatial data sharing policies in general context. - Review of the literature about spatial data sharing in Uganda - Interviews, survey by questionnaire, and observations	- Review on spatial data sharing legislation, policies and practices - Description of cooperation in spatial data sharing in the public sector in Uganda - Types of spatial data sharing policies that are followed by public organizations in Uganda: similarities and difference in spatial data provision approaches, formal and informal spatial data sharing relations, motivations to adopt any spatial data provision approaches.
2. To investigate if spatial data sharing policies are initially different and if they converge to look alike over time.	3. Do spatial data sharing policies change and tend to look similar over time? 4. Do organizations show any isomorphic behaviour in adopting spatial data sharing policies?	- Review of documents related to spatial data sharing that are available in public organizations in Uganda - Interviews, survey by questionnaire - Review of literature on isomorphism theory and drivers of change in organizations practices	- Spatial data sharing practices at different dates: spatial data provision approaches, conditions placed on spatial data access and provision, partners in spatial data sharing, - Influential factor on spatial data provision approaches like law, directives on spatial data sharing.
3.To interpret if the changes in spatial data sharing policies relate to any isomorphism process namely coercive, normative and mimetic	5. Do organizations behaviour in spatial data sharing policies relate to any isomorphism process like coercive, normative or mimetic?	- Compilation and clustering of collected data - A comparative analysis of spatial data sharing practices in the past to those in the present. - Qualitative and interpretative data analysis: comparison of spatial data sharing practices -Interpreting factors of change in spatial data sharing practices with regards to different forces leading to isomorphism. - Validation of hypotheses on basis of results from data analysis	- A table grouping organizations according to spatial data sharing practices. - Description of the current spatial data sharing practices when compared to the past based on the feedback on questions 3 and 4. - List of organizations for which spatial data sharing is similar and those for which practices are dissimilar - A text explaining factors of change in spatial data sharing practices in Uganda and correlation of those factors with isomorphism forces. - Presentation of research findings: explaining changes in spatial data sharing practices, conclusion and recommendations

The study uses qualitative and quantitative research methods to explore the nature and trends of spatial data sharing policies in public sector in Uganda. The unit of analysis is organizations behaviour in decision making on spatial data sharing policies. Quantitative methods help to collect numerical data about the organisations that at any time in their institutional life show similar behaviour so that they share spatial data according to similar policy. Qualitative methods allow to collect data that help to explain how and why organization adopt such policy in spatial data sharing, so that the reasons for adopting any spatial data sharing policy can be explained. The combination of qualitative and quantitative data help to determine how many organisations adopt similar spatial data sharing policy or how many have over time aligned spatial data sharing policy to others and for which reasons.

1.10. Conceptual framework

The study addresses the dynamic aspects of spatial data sharing policies and trends. It investigates if there are factors pushing organizations to adopt any type of spatial data sharing policy and addresses individual behaviour in explaining if over time those organizations tend to harmonize the spatial data sharing policies. Individual's behaviour means influence of persons (actors) on organizations decisions and reflects organizational behaviour in the adoption of any spatial data sharing approaches (Omran 2007). The research examines if organizations tend to harmonize spatial data sharing policies and if the factors of harmonization relate to any of the mechanisms that propagate isomorphism, namely coercive, mimetic or normative processes.

1.11. Thesis structure

Chap.1. Introduction

The chapter provides an overview of the research, the background of the study, research problem, objectives, research questions and the methodology that is used.

Chap.2. Public organizations cooperation in spatial data sharing

The chapter makes an overview of the concept of spatial data sharing legislation, policies; forms spatial data sharing relationships, and terms of spatial data sharing practices. It also explains the theory of isomorphism which is central point for this research

Chap.3. Methodology of data collection

The chapter explains the methodology that is used in data collection and how isomorphism theory was operationalized in survey and interview questionnaire.

Chap.4. Nature of spatial data sharing in Uganda

The chapter gives an overview of spatial data sharing policies and practices in public organizations in Uganda: types and format of sharable spatial data, conditions placed on access to spatial data, beginning of spatial data sharing, and antecedents guiding policies adoption in relation with sharing spatial data for fee or for free. The results of fieldwork are presented in this chapter to show the degree of similarities or dissimilarities observed between organizations that constitute the unity of analysis for the research.

Chap.5. Spatial data sharing policies and practices in Uganda

The chapter analyses the results presented in chapter 4 to find out if spatial data sharing practices between public organizations reflect any isomorphism process.

Chap.6. Evaluation of isomorphism trends in spatial data sharing in Uganda

The chapter presents findings from the interpretation of results in chapter 5. A correlation between these findings and the forces that push organizations to behave similar in order to make conclusion on trends of isomorphism in spatial data sharing between public organizations in Uganda.

Chap.7. Conclusions and recommendations

The chapter presents general conclusion on research findings, summary of answers to research questions and recommendations for further research.

2. Public organizations cooperation in spatial data sharing

2.1. Introduction

This chapter makes an overview of the concepts related to spatial data sharing and isomorphism process. It is structured as follow: Firstly, it provides the definitions of spatial data sharing and other related concepts, and discusses the forms of spatial data sharing relations and terms placed on spatial data access. Secondly, it provides the definitions of spatial data sharing legislation and policies, and presents an overview of spatial data sharing policy in Uganda. Finally, the chapter presents general review of isomorphism theory which constitutes the lens of the study in the perspective of understanding how organizations change in their behaviour and look alike.

The chapter aims at answering the following sub-research question:

- What is the spatial data sharing legislation in Uganda?

2.2. Defining concept related to spatial data sharing

This section compiles (table 2-1) the definitions of the concepts related to spatial data, spatial data sharing and other related concepts like spatial data transaction, and spatial data access which are used in this thesis. These definitions are provided to narrow the domain of the study. They are compiled from the existing literature on spatial data sharing mainly: (de Omran 2007), (Harvey and Tulloch 2006), (Tulloch and Harvey 2005), (Montalvo 2003), and (Onsrud 1995).

Table 2-1: Definition of concepts

Concept	Definition
Spatial data	Spatial data is the data that relates to the geographic location of features and their boundaries on earth, such as natural or man-made features. It describes both the location of a geographic feature and its attributes. Geodata or geospatial data is also a term that is used to denote spatial data, and means data relating to a set of physical locations which may be area, line or point, that is referenced to the earth's surface.
Geographic information	Geographic information is information that derives from spatial data and is used interchangeably with spatial data.
Spatial data sharing	The act of the making available and distributing the same spatial data for and to other users without any alteration of original spatial data held by the producer. Spatial data sharing is defined as the (normally) electronic transfer of spatial data between two or more organizational units where there is independence between the holder of the spatial data and the prospective user. The participants may be separate organizations or may be departments within the same organization (Tulloch and Harvey 2005). Spatial Data sharing, when it occurs, is most often merely a means to pass geographic information to another agency (Harvey and Tulloch 2006). Spatial data sharing is the process of providing spatial data to, or accessing spatial data from someone or someplace outside one's organizational unit. It means the transactions relationships in which access to the spatial data is enabled under certain terms and conditions (de Montalvo 2003; Omran 2007).
Spatial data transaction	Spatial data transaction is a process of spatial data sharing between spatial data supplier and spatial data recipient, in which spatial data supplier receives something in return from spatial data recipient. Spatial data are accessed under certain conditions, like payment or barter. Organization B negotiates with organization A for access to its spatial data.
Spatial data access	Organization B obtains spatial data from organization A. Spatial data are obtained at organizational level through traditional methods of data transfer as copy or through modern technology on website or by connecting to spatial database.

Spatial data transaction and spatial data access which are instances of spatial data sharing are as well described, following the existing literature. Table 2-2 conceptualizes those concepts in the context of inter-organizations cooperation: their occurrence, their impacts on organizations relations, and observable facts resulting from the cooperation.

Table 2-2: Description of spatial data sharing concepts in the context of inter-organizations data sharing relations

Concept	Characteristics and effects		
	Occurrence	**Implication on inter-organization relations**	**Observable practices and facts**
Spatial data sharing	Permanent Irregular: on demand	- Existence of spatial data sharing relationships between individuals, organizations, or between organizations and individuals -Voluntary or involuntary partnerships between organizations - Spatial data are shared within the framework of an inter- organizational alliance - Cooperation in spatial data collection and development of common database - Collaboration may be regulated by common rules, adopted through common consensus or proposed and enforced by a regulatory bodies -Inter-organization cooperation may result in inter-dependence: organizations may become often vulnerable to more powerful organizations in a hierarchical system, and then collaboration may result in the loss of autonomy and, consequently, domination and power over another on spatial data use or redistribution - Dependence or inter-dependence on each other or another GI activities. - Harmonization of spatial data standards.	- Use of spatial data by other users as well as the producers - Spatial data transfer between organizations units and across organizations, or online access - Spatial data redundancy, use of datasets by different users - Spatial data provider and spatial data recipient - Formal or informal spatial data sharing relations - Legislation, acts, rules and policy for management of spatial data sharing relation - Network of spatial data users - Coordinating body for spatial data collection, and dissemination.
Spatial data transaction	- Regular: on schedule as periodic purchase or supply of spatial data - Frequent and irregular: when needed	- Economically based spatial data sharing relations - Formal or informal spatial data sharing contract - Profit -making venture	- Negotiation between spatial data producer and users -Terms on spatial data access: fees or exchange - Agreement on spatial data access - Prices list for spatial data - Authorized spatial data access - Spatial data supplier and buyer
Spatial data access	Regular: on schedule Irregular: on demand	- Formal or informal relations - Voluntary, incidental and ad hoc relations	- Copy and acquisition of spatial data from producer - Open access to spatial data in both analogue and digital format, - Restricted access to any of both spatial data formats, - Formal or informal spatial data access policies

2.2.1. Spatial data sharing relationships

Sharing of spatial data presupposes the existence of the relationships among individuals, organizations and/or governmental units (Onsrud 1995). These relationships can occur in formal or informal ways depending on the procedures that are followed in the process of spatial data sharing (Nedovic -Budic , Pinto et al. 2004), and in practice, informal sharing is more predominant than formalized spatial data sharing (Harvey and Tulloch 2006).

Informal relationships result from individual relationships between staffs from different organizations and have been regarded as the predominant mechanisms to share spatial data and information across organizations boundaries (Giordano, Béchamps et al. 1998; Harvey and Tulloch 2006). Spatial data are shared on basis of individual contacts (Tulloch and Harvey 2005).

Formal relationships are established through formal documentation, like inter-organisations agreements, memoranda of understanding, and data licenses, written rules, procedures, and policies for database sharing with regard to standards, development, maintenance, ownership, and use (Giordano, Béchamps et al. 1998; Nedovic-Budic, Pinto et al. 2004). The most common documents that are used to formalize interorganizational GIS activities are memoranda of understanding and intergovernmental agreements (Nedovic-Budic and Pinto 1999). Formal relations are greatly appreciated since they regulate spatial data sharing relationships and foster interorganizational cooperation for the development of geoinformation activities as they can be based on the contributions of the specific organizations to the joint GIS database development or spatial data exchange activities (Nedovic-Budic, Pinto et al. 2004). These relations occur only at the final stages of establishing sharing or cooperation agreements. They manifest administrative procedures and/or legal requirements and rules regulating inter-organizations spatial data sharing relationships (Harvey and Tulloch 2003). The successful spatial data sharing relations combine formal and informal relationships which facilitate the largest distribution of spatial data.

2.2.2. Terms in spatial data sharing cooperation

Spatial data sharing take place in variety of forms and under a range of different terms guiding access to spatial data. The terms include among other data format that vary from paper maps to tabular information, as well as digital spatial data (Onsrud and Rushton 1995), the amount of dataset or number of GIS layer that can be provided to users, the users who can access spatial data: individual users, public or private organizations, financial conditions under which spatial data are released, that may or may include barter, financial payment, payment in kind or no payment (de Montalvo 2003; Omran 2007). The frequent terms guiding in spatial data sharing cooperation, are free access versus access for fees, sharable spatial data, and process to access spatial data.

2.2.2.1. Free access versus access for fees

There are financial requirements, involving the payment or no payment of fees to access spatial data. This result in observing two approaches on spatial data access: free access and access for fees.

Free access approach assumes spatial data is available for all users, at a price not exceeding the cost of reproduction and distribution, with as few restrictions to use as possible (van Loenen 2006; van Loenen 2009) or on a non-discriminatory basis. Accepted restrictions include information concerning national security, trade secrets, and information relating to an individual's privacy (van Loenen 2009). Public and private organizations have access to geoinformation on equal terms, at the cost of dissemination or cost of reproduction like the cost of printing a map or preparation and printing a map; license fees, a marginal cost of spatial data or merely for free without any payment for data reproduction (de Montalvo 2003).The primary meaning of sharing is that spatial data are freely provided for no return (Omran 2007).

Access for fees approach makes profits from the sale of spatial data to support the development and maintenance of datasets. The cost of collection, maintenance and dissemination of geoinformation is covered through the sale of spatial data or information (de Montalvo 2003). The price of geoinformation dissemination may also include a return on investment (van Loenen 2009).

This approach relies on the principles which provide that organizations have to generate income from the collection, creation and maintenance of the spatial datasets. Compared to free access approach, the access for fees approach implies that spatial data are shared at a higher price than the cost of their reproduction and dissemination. There may be also use restrictions which are often imposed through contracts and licenses. This approach may also be associated with the competition behaviourbetween spatial data producers, being public or private organizations towards the provision of geographic information to users (Onsrud and Rushton 1995; de Montalvo 2003) and spatial data is visible commodity that can be distributed, bought, and sold (Sieber 2007).

2.2.2.2. Sharable spatial data

The users of spatial data can access it in different ways and different formats. They can have access to a part of database like a file of the database or a dataset or a copy of the whole database in vector and or raster format. They can have access to spatial data in hard copy of data, like a printed map or the map in soft copy. Spatial data users can also access a copy of all available spatial data in any format, like a map, vector and or raster data. In this case, there is no restriction about the format of data that be provided (Onsrud and Rushton 1995; de Montalvo 2003).

2.2.2.3. Process to access spatial data

There are different processes for access to spatial data, following the nature of cooperation between spatial data provider and spatial data users. Spatial data can be accessed and provided by subscription, upon a request, or following the terms prescribed in a memorandum of understating on spatial data sharing. Under subscription mode, spatial data can be accessed upon an authorized subscription: the users can download spatial data from the database of producers. Spatial data can also be accessed on request, and the most used process is a written request or personal contact to spatial data provider when the need arises. In this case there is an officer who receives the request and authorizes the provision of data. In the case of memorandum on spatial data sharing, partners agree to exchange spatial data periodically, on regular update of each other database. In other cases, spatial data are provided to users on a regular period, on basis of data provision contract (Onsrud and Rushton 1995; de Montalvo 2003)

2.2.3. Defining spatial data sharing legislation, policy and practices

This section provides the definitions of the concepts of spatial data sharing legislations, policies and practices, used in this study. Theses definitions are compiled from different sources like (Nancy 1995; Onsrud 1995; de Montalvo 2003; Harvey and Tulloch 2003; Harvey and Tulloch 2006) and the Oxford English Dictionary Online (2005).

2.2.3.1. Spatial data sharing legislation

Spatial data sharing legislation is law which was promulgated or enacted by a legislature or a government body. It comprises of a set of institutions that are enforced and shape the behaviour of organizations and people, within the country, in spatial data sharing relations. It is established to regulate and facilitate spatial data sharing cooperation, and provides common principles and rules on access and use of spatial data for the benefits of the community and general users. The legislation addresses the questions relating to copyright, ownership, privacy, legal obligation weighing on the spatial data provider and users. It specifies within the public body the officer, tasked to ensure the functions related to spatial data provision and defines the ways that officer exercises its power. At national level, the legislation indicates a body, its functions and powers, responsible for coordinating activities related spatial data sharing including gathering and managing, to enable spatial data accessible for all users for the common interests.

2.2.3.2. Spatial data sharing policy

A policy is typically described as a deliberate plan of action to guide decisions and achieve rational outcomes. It serves in guiding actions toward those which or who are most likely to achieve a desired outcome. The term may apply to government, private sector organizations and groups, and individuals. There are different examples of policy like presidential order, organization policy, and parliament rules of order. Policy can also be interpreted as political, management, financial, and administrative mechanisms arranged to reach the explicit goals.

In spatial data sharing, the policy is like a regulation framed or adopted by an organization, group of organizations or people for governing its or their conduct and that of its or their members in spatial data sharing between organizations or individuals. As the legislation, the policy prescribes the legal process and conditions on spatial data access for data users, the actor responsible for data provision and his/her power, the legal obligation of spatial data recipient on the use and the distribution of spatial data.

2.2.3.3. Spatial data sharing practices

Spatial data sharing practices refer to the actual application or implementation of the legislation or the policy related to spatial data sharing as being the realization/execution of or in contrast to that legislation or policy. Spatial data sharing practices reflect the behaviour of organizations and people in compliance or no compliance with spatial data legislation or policy.

2.3. Spatial data sharing legislation and policy in Uganda

Based on above section providing the definitions of general concepts related to spatial data sharing and describing common aspects of spatial data sharing cooperation between organizations, this section gives an overview of spatial data sharing in Uganda, according to the exiting literature. The main focus is spatial data sharing legislation and policies.

2.3.1. Spatial data sharing legislation in Uganda

In Uganda, there is no specific legal framework for spatial data sharing (Kalande and Ondulo 2006; Nyemera 2008). At national level, the article 41 of the Constitution of the Republic of Uganda provides for “the public right of access to information in the possession of the State or any other organ or agency of the State except where the release of information is likely to prejudice the security or sovereignty of the State or interfere with the right to privacy of any other persons” (The Republic of Uganda 1995). The Access to Information Act (2005) gives effect to Article 41 of the Constitution, defines a legal process by which government information is accessed by the citizens and the procedures that are followed to access to data as presented in table 2-3. The table gives an overview of what is prescribed by the law on the issues related to data access such the types of data stated in the law, the authority who is

accountable to handle the matters related to data provision, procedures to access to data and terms that might be posed on access.

Table 2-3: Legislation on access to information in Uganda

Aspect	**Statement and prescription** (according to the Access to Information Act , 2005)
Application	- The Act applies to all information and records of government ministries, departments, local governments, statutory corporations and bodies, commissions and other government organs and agencies, unless specifically exempted by the Act. - Information includes written, visual, aural and electronic information. - Record means any recorded information, in any format, including an electronic format in the possession or control of a public body, whether or not that body created it.
Information officers	The act proposes that there must be an information officer, and the Chief Executive of each public body that shall be responsible for ensuring the accessibility of records of the public body.
Form of request	The act states that the users must make request for access to a record or information in writing in the prescribed form to the information officer of the public body in control of the required record or information.
Decision on request and notice	- The information officer determines whether to grant the request, and notify the person requesting the access of the decision. - When the access is granted, the information officer states the fee, if any, to be paid upon access. - When the request for access is refused, the information officer states adequate reasons for the refusal.
Refusal of access	-The request for access is refused when the release of the information is likely to prejudice the security or sovereignty of the State or interfere with the right to the privacy of any other person. -The request for data access may also be refused if the information was supplied in confidence by a third party and if it can not be supplied at the moment of the request because it will be published in the future for the whole public.
Access and forms of access	- When an access fee is payable, data are accessed upon payment of that fee. - When no access fee is payable, the access is given in the applicable forms as indicated in the request for access. The record can be accessed in the following forms: - Copy of the record in written or printed form, by supplying a or by making arrangements for the inspection of the record; - Visual images or printed transcriptions of images or copies; - Electronic or machine readable form, in a printed copy or electronic copy.
Fees for access	The fee for access shall be a fee representing the actual cost of retrieval and reproduction of the information.

Source: (The Republic of Uganda 2005)

All types of information or data is shared with the public and between government and private organizations according to the procedures included in that act, following the principle of public freedom to access to information held by organs of the state. In general the Act applies to information and records

of all government bodies at the national, regional and local level. The fundamental tenet of the act is the provision of timely, accessible and accurate information for the promotion of transparent, accountable and participatory governance.

2.3.2. Spatial data sharing policy in Uganda

There is no national law on spatial data sharing. Government organizations in Uganda have initiated spatial data sharing individually, from many years before the issue of the Access to Information Act. Most of organizations have developed unwritten informal policies that they follow, while few organizations like MEMD (appendix 4), NEMA, NFA, UBOS have the written policies guiding spatial data sharing and dissemination (Muhwezi 2004, Tukugize 2005, Nasirumbi 2006, Christoph Schwarte, 2008). Those policies prescribe the process to get access to spatial data, the format of accessible spatial data, copyright issues and the price of spatial data and the procedures of payment in the case spatial data access is for fees as presented in the table 2-4.

Table 2-4: Summary on GI policy status in Uganda

Aspect	Status
Spatial data sharing policy	There is no central policy on spatial data sharing in Uganda. Each organization has its own policy on spatial data sharing.
Data custodians	Organization has custodianship of data that it produces
Data access and forms of access	Data are accessed at organization office Data are provided in forms of paper maps or digital data on request.
Form of request	Data users make request for access to spatial data through office visit, e-mail or written letter. Some organizations have data requisition form on which the persons requesting for data have to fill in and specify the types of data requested.
Free access versus access for fees	There are two approaches on data access: Free access: organizations charge nominal fees for data reproduction or provide data free of charge, without any payment. Access for fees: some organizations charge fees for spatial data based on cost recovery approaches based on total cost of data
Coordination mechanism	There is no coordination for spatial data sharing. Act of Parliament of 1998 mandated UBOS, to coordinate the activities aiming at the development of GIS and SDI in Uganda, but UBOS has not played its role due different constraints, such as lack of budgets and consensus on SDI role.
Copyright and licensing issues	Copyright on spatial data is covered by the Uganda copy right law of 1964 under the international copyright law. Spatial data sharing between organizations is made through MoU (appendix 5). There are no licensing agreements.

Source: (Muhwezi 2004; Tukugize 2005; Kalande and Ondulo 2006; Nasirumbi 2006; Nyemera 2008)

Data sharing by its nature is a human behaviour and therefore is explored from a human behavioural context (de Montalvo 2003). An understanding of human behaviour in spatial data sharing framework is mostly researched from the angle of organizational motives and willingness to share spatial data (de Montalvo 2003; McDougall, Rajabifard et al. 2006; McDougall, Rajabifard et al. 2007; Omran and van Etten 2007). The behaviour of organization can also be explored towards organizations policies and practices related to spatial data sharing. Organizations may adopt similar behaviour in adopting policies or practices on data sharing. Such behaviour can be investigated from the angle of isomorphism theory which is discussed in the following sections.

2.4. Spatial data sharing practices and isomorphism

Isomorphism theory addresses the research question of why organizations behave homogeneously, and adopt very similar structures, strategies and practices. This theory is used to explain the adoption and diffusion of organizational practices among organizations within an organizational field (DiMaggio and Powell 1983; Powell and DiMaggio 1991). Organizational practices are defined as an organization's routine use of knowledge for conducting a particular function that has evolved over time under the influence of the organization's history, people, interests, and actions. Organizational practices come to reflect the shared knowledge of the organization and tend to be accepted and approved by organizational members (Kostova and Roth 2002). A central tenet of the isomorphism is that when organizations share the same environment they employ similar practices and thus become similar with each other (Kostova and Roth 2002).

This study uses isomorphism theory to explore the behaviour of organizations in spatial data sharing because through data sharing cooperation, organizations may face similar environment influences, pushing them to adopt similar strategies or practices to achieve their goals. Following the aspects of spatial data sharing discussed in table 2-2, inter-organization cooperation in spatial data sharing can be cause for organizations to adopt similar spatial data sharing practices or policies which can be explained by isomorphism theory.

2.4.1. Definition of Isomorphism

Isomorphism is a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions. There exist two types of isomorphism, competitive and institutional (DiMaggio and Powell 1983). Competitive isomorphism involves pressures towards similarity resulting from market competition (Mizruchi and Fein 1999). These pressures exist when organizations adopt similar practices to achieve better what they do or to minimize the competitive risk of losing a market. Organizations may adopt the same practices because not doing so would disadvantage them relative to the competition and erode their edge in the marketplace (Guler, Guillén et al. 2002). Institutional isomorphism induces organizational change for political and institutional legitimacy as well as market position (Mizruchi and Fein 1999). A fundamental outcome of institutional isomorphism is organizational legitimacy, which guarantees acceptance of the organization by its external environment

(Powell and DiMaggio 1991). In this study we focus on institutional isomorphism as the aim is to investigate if organizations show isomorphic behaviour towards adoption of common work practices according to the societal expectations and not for competition.

The theorists of isomorphism process assert that within the same organizational field, organizations follow an evolutionary path from diversity to homogeneity. There exist three processes of institutional isomorphism: mimetic, coercive and normative forces. These processes are rooted in different conceptions of how behaviour diffuses (Mizruchi and Fein 1999), and are often intertwined, but they tend to stem from different conditions so that they ca be described separately.

2.4.1.1. Coercive processes

Coercive isomorphism takes place when organizations are submitted to external pressures, formal or informal, originating from other organizations of which they are dependent or owing to the cultural expectations of the society in which the organization is inserted. The common mechanism through which coercive isomorphism happens, is the action of the government on organizations, by compliance to laws, norms and demands concerning production patterns, and organizational behaviour (Freitas and Guimarães 2007). Coercive isomorphism also results from regulations, law requirements, rules and standards imposed outside the governmental arena, such as less explicit pressures coming from the stakeholders constituting the community surrounding the organization (Salvato 1999). Other argument state that coercive isomorphism arises from asymmetric power relationships. Change is imposed by an external source such as a powerful constituent (e.g., customer, supplier, and competitor), certification body, politically powerful referent groups, or a powerful stakeholder (Powell and DiMaggio 1991).

There are two ways through which coercive pressures affect organizations. Top down pressures is manifest through a condition for funding or approval for lower level jurisdictions providing regulated services. Improvement of these services is centrally decided on and locally applied. Top down pressures related to coercion exerted by authority, and push organization to conform to national standards, and are driven by requirements from the legislature or central administrative office. Bottom up coercion is linked with cultural expectations in the society within the organizations function. It shapes organizations by increasing its efficiency in services delivery and increases organizations legitimacy when they conform to the ways the society thinks that they should look (Roy and Séguin 2000). The mechanism of coercive forces in institutional theory highlights the impact of political rather than technical influences on organizational change.

2.4.1.2. Mimetic processes

Mimetic isomorphism occurs when environment forces compel organizations to copy or emulate other organizations' practices, activities, processes or structures. They reflect the adoption of innovations that are deemed to be successful or to enhance legitimated practices that are seen as desirable. Those pressures exert their effects when organizations face uncertainty about the outputs of their own practices or processes (DiMaggio and Powell 1983; Powell and DiMaggio 1991). In situations in which a clear course of action is unavailable, organizational leaders may decide that the best response is to mimic a peer that they perceive to be successful (Mizruchi and Fein 1999). There exist three fundamental modes

for imitation: frequency based imitation, trait based imitation, and outcome based imitation (Haunschild and Miner 1997; Salvato 1999).

In frequency-based imitation, organizations tend to imitate actions that have been taken by large numbers of other organizations. This imitation occurs because the desire for legitimacy leads organizations to adopt legitimate practices or because the practices are frequently used, as they are taken for granted and are then adopted without thinking. "*It is the purest form of mimetic isomorphism, because it is the sheer number of other users that forms the decision base for an organization and determines the desirability of a structure, practice or decision"*(Lu 2002).

In trait-based imitation, organizations imitate practices that have been used by some subset of other organizations. It is based on social influence because it is the traits themselves that influence organization decision, independent of whether the practices used by organizations with these traits produce any benefits (Haunschild and Miner 1997). Organizations adopt practices of legitimate organizations and that legitimacy is inferred from traits like large size and success. This type of imitation is a selective mimetic process, in which an organization models itself after a subset of organizations. The subset is based on identifiable characteristics such as success. Successful organizations are more likely to be imitated than non-successful, because successful organizations are highly visible and success is a trait that organizations strive to achieve (Lu 2002).

In outcome-based imitation, organizations use the outcomes that occur after other organizations use a practice to determine whether they should adopt it. Practices that produced positive outcomes for others will be imitated; those that produced negative outcomes will be avoided. Like trait-based imitation, outcome-based imitation is a selective mimetic process that results from perceived outcome of the practice, and is linked more closely to technical processes. In outcome-based imitation, *an organization looks to the success of decisions or practices adopted by other organizations. It then imitates the decisions or the practices that generate successful outcomes* (Lu 2002).

The process of imitation can occur through information exchange and inter-organization cooperation. Organization may initiate contact with another because the agents of the first perceive those of the second to possess important information about technologies, production skills, socio-economic connection, and market opportunity that might enable the initiator to accomplish and achieve its tasks more efficiently (Kenis and Knoke 2002). Mimetic isomorphism results from efficient response to uncertainty and drives from a social constructionist role, called obligatory action, described as follow: "*once enough social actors do things a certain way, that particular course of actions becomes taken for granted or institutionalized and thereafter, other social actors will undertake that course of action"* (Haveman 1993).

2.4.1.3. Normative processes

Normative isomorphism results from the effect of professional standards and the influence of professional communities on organization. These communities describe the ways that organizations are expected to conform to standards of professionalism and techniques and processes that are considered as legitimate by relevant professional groupings (Powell and DiMaggio 1991). From the influences of the professional communities, organizational decision makers learn appropriate techniques and adjust their practices accordingly (Calhoun, Gerteis et al. 2002). Professionalization leads to organizational isomorphism when "*members of professions receive similar training which socializes them into similar worldviews, and members of professions interact through professional and trade associations, which further diffuses ideas among them"*(Mizruchi and Fein 1999). Norms and standards are communicated through workshops, seminars, training sessions, trade magazines, and through personnel moving from office to office (Galaskiewicz and Wasserman 1989). In that case, members of a profession or occupational community share a common understanding and knowledge base (Guler, Guillén et al. 2002). Normative isomorphism can also result from the necessity of conformity to norms that apply in organizational fields and derives from a desire to comply, for example in order to avoid conflict (Brandsen, Munckhof et al. 2007).

Table 2-5: Summary on isomorphism processes

Issues	Coercive isomorphism	Mimetic isomorphism	Normative isomorphism
Sources of isomorphism forces	-Law and legal requirements from government/regulator or father organization. - Coercive isomorphism is linked to environment surrounding organizational field.	Copy or emulate other organizations' practices, activities, processes or structures: - Imitation of peers - Imitation of successful organization - Mimetic processes are internal to organizational field.	-Learning/adoption of appropriate process/ standards. Professionalization - Normative processes are internal to organizational field.
Drivers of isomorphism	-Political and legal power -Resource dependency	- Uncertainty about the outputs of own practices or processes.	Social construction beliefs and professional network
Flow of influential forces	Top down: through a condition for funding or approval for low level agency.	Bottom up and horizontal: due to cultural expectations in the society within the organization functions.	Bottom up and horizontal: due to cultural expectations in the society within the organization functions.

Isomorphism shapes organizations behaviour in different domains. In order to understand to which extend organizations practices look similar and how isomorphism shapes organizations practices, the effects of isomorphism processes were investigated in the existing literature. Table 2-6 presents the summary on finding from the most cited articles.

Table 2-6: Summary on institutional theory and isomorphism processes from existing literature

Main focus	Reference	Statement and central arguments
Normative isomorphism and strategic isomorphism	(Deephouse 1996)	There is similarity of a focal organization's strategy to the strategies of other organizations in the same industry. Organizations become similar through conformism to work strategies defined by government. Organizations adopt prescribed strategies, for increasing their legitimacy, due to the control exerted by regulators.
Coercive isomorphism and adoption of ISO standards	(Guler, Guillén et al. 2002)	Subsidiary organizations adopt ISO standards diffused and imposed by parent organizations. When standards are diffused in government policy, they are adopted by conformism to the policy of the country within the firm operates. Standards are also communicated through the network trade and once some organizations follow the standards, other organizations follow by imitation.
Mimetic, normative, and coercive isomorphism in public sector	(Frumkin and Galaskiewicz 2004)	Public sector organizations are subject to mimetic, normative, and coercive pressures as well as organizations in the business and non-profit sectors. Coercive pressures affect public organizations through government rules and control of organizations' activities. Normative isomorphism affects public organizations through adoption of similar structures as proposed by the central government. Mimetic process affects organizations through inter-organizations linkage, when they copy each other practices.
Coercive, mimetic, or normative forces in adoption of quality management practice.	(Kostova and Roth 2002)	Coercive isomorphism affect subsidiaries corporation when practices favored by parent organizations are enforced through regulatory system by local institutions. Practices adopted by parent organizations are internalized and implemented by subsidiary organization, by trust and imitation. By identification, subsidiary firms become isomorphic by adoption of practices from parent organizations, through mimetic and normative conformity to quality management practices propagated from high level.
Imitation and corporate acquisitions	(Haunschild 1993)	Horizontal and vertical relationships tying organizations with each other are causes for imitation and adoption of corporate acquisitions of other organizations.
Imitation in the investment banker	(Haunschild and Miner 1997)	Frequency and trait-based imitations are observed in investment banker. Both salient outcomes and uncertainty linked with unreliable technical information are influential factors for outcome imitation in investment.

Table 2-6 presents findings from different papers on the effect of isomorphism on organizations behaviour. In common, those papers show that coercive and normative forces affect organizations through regulations and norms prescribed by the government or the parent organizations. The organizations facing those forces implement and follow the norms or regulations for the quest of legitimacy. The process of imitation occurs through inter-organization networks, when organizations learn, share, exchange, and adopt norms of behaviour as prescribed by regulators. Imitation is also driven by perceived uncertainty about the outcome of organization's practices. Organizations copy and emulate strategies or practices used by the great number of other organizations and which are more successful, or considered to be more experienced in the domain. Table 2-6 is an illustration of the theoretical concepts of isomorphism introduced in previous paragraph, and shows how three processes of isomorphism affect organizations in different domain of activities, like corporation and global economy, public sector services delivery, and manufacturing at both national and international levels. The question is then whether isomorphism process can be expected in spatial data sharing since there are no studies showing how the mechanisms of isomorphism shape the behaviour of organizations in that domain.

Scholars show the extent to which organizations cooperate in spatial data sharing to avoid data duplication and how spatial data sharing creates the relations of inter-dependence between data providers and data recipients (Onsrud and Rushton 1995), (de Montalvo 2003; Nedovic -Budic , Pinto et al. 2004) Those relations can affect behaviour of organizations through adoption of similar data sharing policy. Spatial data recipients can be required to conform to certain norms when they use data from the providers, like adoption of similar spatial data sharing policy on data redistribution or similar norms on spatial data confidentiality. When spatial data sharing relations are regulated, States or regulating bodies contribute to the homogenizations of organizations activities through diffusion of laws or directives to follow. If organizations cooperate in network, they can adopt similar practices on spatial data sharing. That is, isomorphism can be expected in spatial data sharing if any of these mechanisms exists. Assumptions on isomorphism processes in spatial data sharing are summarized table 2-7.

Table 2-7: Assumptions on isomorphism behaviour in spatial data sharing

Isomorphism process	Spatial data legislation	Spatial data sharing practices	Spatial data sharing policy
Coercive	State or coordinating body for spatial data sharing cooperation within a country can promulgate spatial data sharing law and recommends spatial data produsers or users to conform to the law. Organizations may follow and comply with the law, because they want their behaviour to be perceived as legitimate by the public and the regulating bodies. Organizations which spatial data sharing practices contrast with the law may be warned through official letters and invited to conform to law. Spatial data users (GIS professional, organizations) can point out through media, conference/meeting/workshops the practices of organizations which do not conform to national law on spatial data sharing and persuade them to follow the law.	A parent organization may constrain its subsidiary to adopt similar spatial data sharing practices due to budget or other resources dependence. Parent organization imposes its spatial data sharing practices to subsidiary agencies.	Organization A which provides spatial data to organization B , and can compel B to follow its policy on spatial data sharing when B has to share spatial data acquired from A with other users: Organization B is forced to adopt the policy of organization A.
Mimetic	If there is law on spatial data sharing and it is followed by most of organizations in the country, any organization which engages in spatial data sharing cooperation may follow the law because it perceives the necessity to conform to law as well as others.	Organizations may mimic spatial data sharing practices adopted by the leading body for Geoinformation activities. Those organizations may believe that the practices adopted by the leader are legitimate.	Organization X may follow spatial data sharing policy adopted by most of other organizations, because it perceives that the policy adopted by most of organizations may be appropriate.
Normative	Organizations may follow a national law on spatial data sharing due to simple willing to conform to formal laws as prescribed by legal environment within it operates.	Spatial data sharing practices adopted by most of organizations within geographic area become the common norms to follow. They may be taken for granted for all organizations in that area, and implemented through organizations routines of sharing spatial data in similar ways.	If organizations cooperate in network for spatial data collection or exchange, they may formulate and adopt similar policies related to spatial data distribution. New organizations may model themselves after other organizations in spatial data sharing cooperation and follow similar policy.

2.5. Conclusion

The chapter focused on definition of the concept related to spatial data sharing: spatial data sharing legislation, policies; spatial data sharing practices and inter-organizations spatial data sharing relationships. It also presented an overview of isomorphism theory, the tenet point for this research and the extent to which the mechanism of isomorphism affects organizations behaviour in different domains of activities. In relation to the question posed in introduction, "What is the spatial data sharing legislation in Uganda?" the chapter provides the following answer: There is not a national legislation on spatial data sharing in Uganda. There is a national law guiding access to data or information held by government bodies for all citizens. The law prescribes the legal procedures for the citizens to get access data and information held by government body. Data can be accessed in both analogue and digital format, at organization office and are provided on written request. Access may be refused if its provision is likely to prejudice the security or sovereignty of the State or it is subject to compromise the confidentiality or privacy of any other person. In this chapter, the study shows that public organizations follow individual spatial data sharing. Some organizations pose payment conditions on spatial data access, while others do not and share spatial data with other users for free charge. Organizations are custodian of spatial data they collect, and share those data on demand.

3. Methodology of data collection

The collection of primary and secondary data needed to answer the research questions and to achieve research objectives as presented in chapter 1. This chapter describes the research methods including survey questionnaire, structured and unstructured interviews, observations and secondary data collection. The questionnaire (appendix 2) and interviews were administrated to stakeholders (appendix 3) participating in data collection and provision. The field work aimed at finding data that will help to answer the following questions:

- What are spatial data sharing policies followed by public organizations in Uganda?
- Do spatial data sharing policies change and tend to look similar over time?

Both primary and secondary data were collected, and are presented in chapter 4. Data are analyzed following interpretative approach, to derive from respondents' responses indicators of isomorphism trends in spatial data sharing in Uganda.

3.1. The case study

The case study in which I investigate organizational behaviour in spatial data sharing comprises of public organizations at national and local levels in Uganda, in different locations to test whether organizations located in different areas my show similar or dissimilar isomorphism behaviour when comparing one zone to another or national level and local level.

I visited 3 organizations located in Kampala city, 3 organizations located in Entebbe city and 3 organizations located in Mukono town. Those organizations participate in the collection and sharing spatial data. The research tends to examine if the target organizations shows different or similar isomorphic behaviour comparing the vertical cooperation between organizations operating at national level and organizations operating at national level. This may be possible in the case of coercive isomorphism which stems from political influence and may come from national level to local level and mimetic isomorphism which may be observed when organizations located in the same area collude by adoption of each others practices. The distribution of organizations which were visited in each area is given in the table 3-1.

Table 3-1: Distribution of visited organizations

Location	Number	Name of Organization	Operation level	Sector of activities
Kampala	1	National Water and Sewerage Corporation (NWSC)	National	Utility: water supply and sewerage
	2	Kampala water (KW)	Local	Utility: water supply and sewerage
	3	Kampala City Council (KCC)	Local	Political and public administration
Entebbe	4	Survey and mapping Department (SMD) under the Ministry of Lands, Housing and Urban Development	National	Land administration, survey and mapping
	5	Directorate of Water Resources Management (DWRM)	National	Water resources management
	6	Entebbe town council	Local	Political and public administration
Mukono	7	Mukono town council	Local	Political and public administration
	8	Mukono district/ Department of Lands	Local	Land registration
	9	Mukono district/ Department of Water Development	Local	Water resources management

According to table 3-1, these organizations operate in different sectors (public administration, water supply, land administration, water resources management) with regard to their missions. This aspect allows the research to investigate whether isomorphism affect similarly or dissimilarly organizations within the same sector or if organizations from different sectors may adopt similar practices, independently from their peers.

3.2. Operationalisation of organizations behaviour in spatial data sharing in the perspective of isomorphism theory

Interview and survey questionnaire were designed following the perspective of isomorphism theory. The investigation tried to find out whether the behaviour of visited organizations show any patterns of isomorphism, commonly coercive mimetic, or normative.

The key areas covered in survey and interview included organizational policy and approaches which are followed in spatial data sharing: free access or access for fees. It was investigated for instance if organization charges fees or do not charge fees because other organizations do so, or due to any national law or directives; if the policy on spatial data sharing that was adopted at initial stage had changed any time in the course of spatial data sharing cooperation and then any organization has recently adopted a different policy, or if organizations adopt other organizations practices and regulations related to spatial

data provision. These questions reflect the process of organization's environment that shape organizations' behaviour according to isomorphism theory (Powell and DiMaggio 1991; Dacin 1997). The indicators of isomorphism behaviour in spatial data sharing which were addressed in data collection are presented in the table 3-2.

Table 3-2: Spatial data sharing practices and isomorphism trends

Concept under study	Indicator	Source of evidence	Criteria for interpretation
Isomorphism behaviour	Spatial data sharing policy	Questionnaire, Interview, Memorandum of understanding, client charter, data dissemination policy	- Degree to which organizations adopt similar pricing or no pricing policies - Degree to which organizations place similar price on GI products - If there organizations follow any laws or directives to decide on spatial data sharing policies
	Change in conditions placed on access to data: from fee to frees or vice versa	Questionnaire, Interview, Memorandum of understanding	- Degree to which organizations spatial data sharing policies change and are aligned to each other - If there are any laws or directives that invite organizations to change data sharing policies
	Format of shared data: maps, vector, raster	Questionnaire, Interview, Memorandum of understanding	Degree to which organizations provide similar GI products
	Sources of budget allocated in Geoinformation activities	Questionnaire, Interview, organizations budget plan	- Degree to which GI related budgets are allocated at organizational level - Degree to which GI related budgets are allocated at government level
	Coordinator of data sharing activities	Questionnaire, Interview, internal regulations,	Degree to which spatial data sharing activities are coordinated
	Inter-organization consultation on GI development	Questionnaire, Interview, cooperation agreement	- Degree to which organization face similar uncertainty on GI projects - Degree to which organization cooperate in GI activities - Degree to which organization adopt each other spatial data sharing practices
	Forms of data sharing relationships: formal or informal	Questionnaire, Interview, Memorandum of understanding	- Degree to which spatial data sharing relations are formalized or not formalized

3.3. Primary data collection methods

Three techniques were used in collection of primary data for this study: a survey questionnaire, structured and unstructured interviews, and observations. The survey questionnaire and interviews were addressed to the commissioners, heads of the departments, project manager, GIS specialist, surveyors and GIS technician of the departments participating in data collection and dissemination within the visited organizations.

The study considers those categories of staff to be the key informants for the following reasons: the managers and heads of departments are the influential actors in decision making about the cooperation of their organizations with others. They participate in formulation of agreements on spatial data sharing, decide on spatial data sharing policies and play a key role in policy adoption or enforcement of directives related to spatial data sharing with other organizations or individual users.

GIS specialists/technicians and surveyors participate in spatial data collection and dissemination. They have information about the conditions placed on spatial data access by external users. They are among people who participate in forum and workshops about spatial data dissemination, and may have an influence on decision making about spatial data sharing with other organizations.

3.3.1. Questionnaire

A survey questionnaire was designed using two methods: survey monkey and Microsoft word offices. These two options were provided for the preference of the respondents and to let them respond by filling in printed hand out or by online questionnaire. It was realized that, among the target respondents, there wasn't any people who requested the online questionnaire. For almost all the respondents, the questionnaire was personally administered. At any moment I arrived in the office of the target respondents, they requested the questionnaire and filled it immediately. In some cases, respondents read the question, provided the responses and I made note of the responses and so on. This technique helped in the collection of distributed questionnaires because they were returned once the respondents had finished filling in questionnaires. Moreover, they could ask some clarifications for any question which was not clear.

3.3.2. Structured and unstructured interviews

As the research focus on organization behaviour, the structured interview was the most used technique to collect the perception, opinions of individuals in order to have evidence explaining how they interpret their organizations practices about spatial data sharing. The interview had also helped to perceive the respondents feelings and ideas on the questions concerning environment influences their organizations may face when they formulate policies related to spatial data sharing. The questions which were asked during the survey questionnaire were incorporated in the interview questionnaire. Beside that, the interview comprised additional questions aiming at understanding the antecedents of spatial data sharing policy, environmental forces that may persuade organizations to adopt any spatial data sharing practices, to investigate if there are mechanisms of isomorphism that affect public organizations in Uganda in spatial data sharing.

Unstructured interview was used in different cases:

- In collecting further evidence from the decision makers and senior officers on any points which were not clarified during the interview with technical staffs. In that case, the common questions which were clearly answered from the survey questionnaire and structured interview were not asked as some managers seemed to be very busy and only accepted short interview.
- For validation on data collected from interview: as I had to go several times to the same organization, I passed in the office of the respondent that I contacted previously. We had a short discussion through which I reported the summary of what he/she told me in previous meeting to confirm the information I collected from him/her. Such discussions were done with the respondents I met during the three first weeks of the field work.
- I also used phone calls to ask additional details about some responses that seemed to be incomplete or not clear when I was writing summary of the interviews and when I was back to school, interpreting field data.

3.4. Secondary data collection

Other source of evidence for the case studies consisted of documents, available either in the archives of organizations or on web site. Some of these documents describe the framework of organizations activities in general, others relate to partnerships in spatial data sharing, like clients charter for spatial data products MoU on spatial data sharing, and spatial data sharing policy. The main documents which were collected are presented in table 3-3.

Table 3-3: Sources of secondary data

Document	Contents	Aspects which are addressed
Constitution of the Republic of Uganda	In its article 41, the constitution promulgates the right of citizen to information which is in the possession of state of any government agency and cases in which any may be applied	Public right for access to information held by government body
The access to information	Following the article 41 of the constitution, the act provides the rights of the public to government information, describes the procedures for obtaining access to information.	Procedures for access and provision of information to the public
Decree on SDI	Directives that public organizations should follow in spatial data handling and spatial data sharing cooperation for the development of SDI.	Directives on spatial data sharing between public organizations
Ministerial Policy Statement for Lands, Housing and Urban Development 2008/2009	The policy statement presents the budget and revenues for the years 2008-2009, including the budget for the activities related to Lands surveying and mapping Department. The plan comprises the expected budget for survey and mapping activities and revenues which will be recovered from the sale of geoinformation products.	Cause for adopting pricing policy towards spatial data sharing.
Land Sector Strategic Plan 2001-2011 Utilising Uganda 's Land Resources for Sustainable Development	The Land Sector Strategic Plan provides the operational, institutional and financial framework for the implementation of sector wide reforms and land Management. It provides strategy for the development of Land information and prescribes how land Information constitutes one of the sources of land sector through sale of information.	Cause for sale of land related data.
DRWM-Profile of water Resources Monitoring and Assessment department	The profile describes the activities of the Resources Monitoring and Assessment Department, including the collection and dissemination of spatial data related to water resources. It specifies the type of collected spatial and access fees.	Data produced and disseminated by Organization and policy on data sharing
Administrative note: Revision of map prices	The note provides the prices of maps in both hard and digital formats from 1996, at the Survey and mapping department.	Policy of the department in relation with access to spatial data.
Memorandum of understanding	The memorandum of understanding between the UMD and WRMD explain the context of cooperation between those departments in spatial data collection, exchange and dissemination	Formalization of inter-organizations relationships in spatial data sharing
Airborne geophysical digital data dissemination policy	The document describes geophysical digital data, collected by the Department of Geological Survey and Mines of the Ministry of Energy and Mineral Development and policy on the dissemination of geoinformation.	Data dissemination policy; data access process and data prices.

3.5. Observations

During the fieldwork, I observed individuals' attitudes, reactions and feelings during the interviews. The respondents showed negative attitude or laughed when asked questions related to policy or law on spatial data sharing. They frankly highlighted that organizations make their own decisions on how to share spatial data, and underlined that there is no national law or directives to follow when they were asked if their organizations follow any laws or directives in spatial data sharing. They openly negated copying other organizations practices in spatial data sharing, for instance, when asked question if they share spatial data according to policy adopted by other organizations. Those questions were posed for collecting evidence on isomorphism trends, in relation with indicators presented in table 3-2 like "spatial data sharing policy, inter-organization consultation on GI development". A part those negative attitudes, respondents showed positive feeling for adopting similar spatial data standards, and felt that the use of common standards is a necessity for the development of GI. Some respondents seemed hesitant to respond to some questions for which they could have a precise answer. They contacted their colleagues before responding to such question or skipped it, and advised me to ask the question to the manager. Those observations were noted in field notes and were taken into account in data analysis.

3.6. Preparation of data analysis

The preliminary of field data analysis consisted on the summarizing the respondents answers from survey questionnaire and interview. When the summaries were compiled, field data were organized in tabular form and grouped according to themes that were addressed in the questionnaire. It is on the basis of those data that a qualitative and interpretative analysis was done, for deriving the similarities or dissimilarities between organizations that constitute the case study for this research.

The analysis started from the coding of collected data, according to the meaning of answers. I developed the themes following the meanings of answers, and gave label each answer. The responses were then classified under the main themes, mainly data access policy, beginning of cooperation in data sharing, data format, coordination of data sharing, regulation on data provision, etc. The frequencies of responses were counted under each theme.

Coded data were analyzed manually. The use of computer software was not possible due to time constrain and for not being familial with the software for qualitative analysis. The presentation of result in form of graphs was made with use of excel. Other method like literal reporting of answers was used in quoting the respondent's answers.

3.7. Limitation of fieldwork

During the fieldwork, I faced some problems, which obstructed the work plan. These problems are related to unavailability of the target respondents.

- Most of time, I could not find the respondents in their offices when I wanted to make first contacts with them. I found the office closed, and their colleagues suggested me to wait for their arrival as they were expected to come to work. Some times, it happened that the staff did not come and I had to change the schedule and try to make contact with other target respondents which were not on schedule of the day. In the afternoon, in the most of visited organizations, there were very few staffs in the office. This implied that I could not expect to find many respondents in the afternoon.

- Once, I came in the offices of the target respondents, few of them tried to find time and respond to my survey questionnaire or interview. However, most of the other respondents fixed an appointment and invited me to go back in their office. When I went back to the respondent office, I found that the respondent was very busy and I had to wait for him till he/she was available. This happened for some of the respondent from Kampala City Council and Entebbe town council and affected my daily timetable as I could not visit all offices I had planed to visit on the same day.

- It happened that the respondent postponed the appointment for another day. It was the case with the respondents from Mukono lands department who, when I arrived at the office on time and day of appointment, postponed the appointment for a next day, arguing that they were very busy with routine work. As I had to walk from Kampala to Mukono, the day was not successfully used due to unavailability of the target respondents.

- Another limitation of the work progress was related to requirement of the target respondents. When I arrived in the office of any of the manager, he sent me to technical staffs, expecting that they could give me all information I was looking for. He proposed me to go back to his office in case there were some details that I could not find from the technical staffs. In that case it took me a long time before I could meet the managers as I could not immediately find the technical staffs who were not regularly in the office.

The irregularity of the target respondents in their offices, affected the field work because I could not organize a focus group discussion as it was planned. I expected to use this technique for validation of data collected through interviews. Interviews were conducted even during the days reserved for focus group discussion. Collected data were validated through unstructured interviews, by revisiting respondents in their offices as explained in sub-section 3.3.2.
I did not also observe the activities related to spatial data sharing in the offices where staffs were irregular. I expected to observe how organizations share spatial data with the users, but the observations were not possible in KCC, Entebbe TC, Mukono TC, Mukono LD and Mukono WDD because staffs of those organizations were most of time not available in the offices. Once interviews were ended, they left the offices so that I did collect evidence on the process and procedures of spatial data sharing in relation to indicator of “spatial data sharing policy” as indicated in table 3-2.

3.8. Conclusion

Field data collection was done using different methods including questionnaire, face to face interviews, and observations. The fieldwork was an opportunity to collect some documents that are used as complement to primary data and help in understanding and explaining organizations activities in spatial data sharing. The results from data collection are presented in next chapter that allows providing the answers to the research questions announced in the introduction of this chapter.

4. Nature of spatial data sharing in Uganda

4.1. Introduction

This chapter provides the results from fieldwork on spatial data sharing policies and practices, in public sector in Uganda. It aims at answering the following research questions:

1. What are spatial data sharing policies followed by public organizations in Uganda?
2. Do spatial data sharing policies change and tend to look similar over time?

The chapter starts with the overview of spatial data sharing activities within visited organizations. The emphasis is on the types of spatial data sharing policies or practices and the types of collected spatial data which allows organizations to engage in spatial data sharing cooperation. In this chapter, spatial data sharing policies refer as the informal or formal rules or the guidelines developed at organization level. Those rules or guidelines prescribe the conditions on spatial data access, restrictions posed on spatial data access, the prices for spatial data, sharable spatial data products, and the officer who copes with the activities related to spatial data sharing. The term spatial data sharing practices is used to denote the ways organizations implement their policies in daily activities of spatial data sharing. The chapter presents also trends of changes in spatial data sharing practices based on the ways spatial data sharing policies are implemented.

4.2. Spatial Datasets holding and ownership

The survey was conducted within 9 organizations. All visited organizations hold different spatial datasets of which they are custodian and maintain. 2 of those organizations collect spatial data in the context of their mandate and mission, to provide spatial data to the public. 7 organizations collect and use spatial data as input for the achievement of their missions. In this section, the study presents an overview on spatial data collected by each organization.

4.2.1. Department of Survey and mapping

The Department of Survey and Mapping operates at national level, under the ministry of Land, Housing and Urban development. It is responsible for topographic and thematic mapping and survey activities in the whole country. It coordinates the activities of mapping, provides standards for data collection, and insures data quality control (Moyin, Bemigisha et al. 2000). The department of survey and mapping is among key players in the initiative of establishing SDI in Uganda (Swedish consortium 2001; Karatunga 2002). Its main functions are: to formulate the national surveys policies strategies and plans, to direct the implementation of all mapping programs, to coordinate and supervise national survey activities in compliance to the national policies standards and legislation, to review and initiate national mapping

standards, to regulate and control the printing, updating and distribution of national maps (Karatunga 2002; Musinguzi 2004; Nasirumbi 2006).

The department collects and holds the following spatial data: topographic data, (elevation, contour lines), hydrographic data (lakes and rivers) geodetic data, man made structures such as buildings, transport infrastructure (roads, railways and ferries) and cadastral data. It holds aerial photographs and satellite images for the whole countries as provided by international organizations like IGN-France and RCMRD. The department use GIS software like Arc View 3.2a since 1995 and Arc GIS 9.2 since 2005 in data collection, processing and maintenance, and in the development of the National Cartographic Database.

The use of GIS software was introduced in spatial data collection in the context of the project aiming at development of EIS, under initiative of NEMA. The aim of the project was to set up mechanisms for the collection and dissemination of environmental information, serving in the management of natural resources and environmental conservation. The project was backed by the government, as provided in the national environment action plan of 1994 and national environmental management policy adopted in 1995 by the government of Uganda (Moyin, Bemigisha et al. 2000; Schwarte 2008). The use of GIS software resulted from the need for capturing and maintaining spatial data in digital format enabling spatial data exchange and integration. It is in this context, SMD as well as others organizations involved in collection of spatial data related to natural resources started to use GIS.

4.2.2. Directorate of Water Resources Management

The Water Resources Management Department of the Directorate of Water Resources Management is responsible for the monitoring, assessment, planning and regulation of water resources in the country, at national level. It collects and holds spatial data on rainfall, hydrology, and water bodies (river, lakes, water points, and borehole). It disseminates spatial data and information about River flows and levels, lake bathometric information (levels, cross section and depth), groundwater records (location, overburden thickness, water strikes, borehole yields, static water level, lithology and hydro chemical data), groundwater resources maps (groundwater potential, technology options, groundwater coverage, hydrogeological characteristics maps, hydro chemical characteristics, water quality maps, and surface water maps (DWRD 2004). The department has used GIS software (Arc View 3.2a and Arc GIS 9.1) in data collection, processing and maintenance from 1999 when a GIS unity was created under sponsorship of European Union and DFID. From 1980, spatial data were collected manually. The introduction of GIS derived from the need for the department to develop a system using modern technology for handling efficiently spatial data related to water resources after the training of staffs in GIS, and to provide spatial data which were requested by different stakeholders involved in natural resources and environment management and protection.

4.2.3. National water and Sewerage Corporation

The National Water and Sewerage Corporation (NWSC) is responsible for water supply and sanitation in urban areas at national level, except for Kampala city. It collects and maintains spatial data related to water and sewerage infrastructures: water pipe lines systems with house connections, valve, washout, water tank, and sewerage canals. Since 1988 until 2008, NWSC had used AutoCAD in processing and maintenance of those spatial data. It has started to use GIS software (Arc View 9.2) from 2008, and is developing a Management Information System that facilitates an effective management of its infrastructures. The use of GIS software at NWSC was introduced by the head of engineering department, following the lessons learnt from Kampala Water. At Kampala water, the use of GIS software was found more efficient and friendly, compared to Auto CAD which was used since several years for spatial data handling.

4.2.4. Kampala Water

Like National Water and Sewerage Corporation, Kampala Water collects and holds spatial water supply and sanitation at local level, in Kampala city. It collects and maintains similar spatial data as NWSC like pipe lines systems with valve, washout, water tanks, customers' premises and sewerage canals. Spatial data are collected with use of modern survey equipments, GPS, satellite images, and GIS software (Arc View 9.2). GIS has been implemented since 2007. From 1988, the software that was used is AutoCAD. The use of GIS software was introduced by the head of GIS unity, upon the completion of training in GIS. Through that training, he realized that GIS software is easier to use in handling and maintaining important amount of spatial data than AutoCAD and allows the integration of different spatial datasets which are produced with use of GIS technologies. It is in that context the unity decided to shift from Auto CAD to Arc GIS 9.2.

4.2.5. Kampala City Council

The departments of engineering and land management and planning of Kampala City Council, use spatial data in their daily activities related to city planning, management, infrastructures maintenance and land registration. The two departments are mandated to fulfil those activities since 1994, through the process of decentralization as adopted by the government of Uganda. Before 1994, these activities related to city planning, management, infrastructures maintenance and land registration in Kampala City were fulfilled by the Ministry of Land, Housing and Urban development. Since the decentralization then, the departments collect and hold spatial data related to public infrastructures like roads, buildings, water, electricity and land parcels. At the initial stage of data collection, they used traditional methods (drawing with use of paper and pencil) in spatial data collection. Since 2003, they are using GIS software (Arc View 3.2a and Arc GIS 9.0) in all activities related to mapping, and have been converting spatial data from analogue to digital format. In 2003, the heads of these departments decided to adopt the use of GIS technology to devolve the technical problems related to the integration of spatial data in digital format,

acquired from other organizations like SMD with their own spatial data which were in analogue format. At that time, the City had financed the training of staffs in GIS and requisitioned GIS equipments.

4.2.6. Entebbe Town Council

The Department of Physical planning was created in 1986 under Entebbe City Council, for insuring the planning and management of the city and infrastructures development. Since that year, the department collects and holds spatial data related to roads, land use and cells boundaries. Since 2004, the department use GIS software (Arc View 3.2a), for maintaining spatial data in digital format. The use of GIS software was introduced by the head of department, after the training of the staffs of the department in GIS.

4.2.7. Mukono Town Council

Department of physical planning of Mukono Town Council collects spatial data related to public infrastructures such as roads, schools, hospitals, and land parcels boundaries since 1980, when the town council was created. Spatial data are used in town planning and management, mainly in designing settlement and infrastructures plans. The department does not use any modern technology like GIS for spatial data collection, processing and maintenance. Its uses traditional methods in spatial data collection like theodolites and spatial data are manually processed on paper with pencil. Thus spatial data are produced and presented in form of structure plans, including parcels boundaries, roads and socio-economic infrastructures boundaries. The staffs of that department aspire at using GIS software in their activities, but the department lacks financial means to set up a GIS.

4.2.8. Mukono district/Department of Lands

Department of lands of Mukono district collects and holds spatial data related to land parcels boundaries and ownerships, since 1962 when the district was created. Spatial data are collected with use of tradition methods like theodolites and manually processed on paper with pencils, in the context of sporadic adjudication for land registration. Theses data are presented in form of cadastral plans in hard copy. Like the staffs from Mukono Town Council, the staffs of Mukono Land Department would like to develop a computerized system with GIS software, but the program is still a challenge due to lack of funds.

4.2.9. Mukono district/ Department of Water Development

The Department of Water development of Mukono district does not have a system for data processing. It cooperates with the Water Resources Management Department, under DWRM in spatial data collection. After the collection, spatial data are processed and maintained at the Water Resources Management Department. The Department of Water development of Mukono district acquires spatial data in form of analogue maps from Water Resources Management Department, and shares those maps with any people who need to use them.

4.3. Inter-organizations cooperation in spatial data sharing

The cooperation and partnerships for spatial sharing between public organizations in Uganda started many years ago. The practices of spatial data sharing started at the same time organizations started mapping or GIS activities as indicated in previous section. From field data, respondents argued that once the organization started to collect spatial data, the cooperation for spatial data sharing started voluntarily. Either the public or other organizations need to use those spatial data, or organization itself felt the need to use spatial data from other organizations to fulfil its mission. Some respondents reported that they use topographic map provided by SMD as basic spatial data in the activities of spatial data collection. That is, as their organizations embarked on spatial data collection, the cooperation with SMD became a necessity.

Organizations operating in the field of land management, including land registration have initially embarked on spatial data sharing at early stages when compared with other organizations. These organizations are SMD and Mukono LD, which started to share spatial data in 1960s when the government of Uganda initialized the process of land registration and mapping (The Republic of Uganda 1964). Most of other organizations started to collect and share spatial data in 1980s, with respect to dates they were created or they introduced mapping/survey unities within their structures. The beginning of inter-organization cooperation in spatial data sharing is presented in the table 4-1.

Table 4-1: Reported beginning of spatial data sharing with other organizations

Organization name	Beginning of data sharing	Antecedents for engagement in spatial data sharing
SMD	1962	Beginning of land registration in Uganda: collection of cadastral data
Mukono LD	1962	Beginning of land registration in Uganda: collection of cadastral data
Mukono TC	1980	Creation of the town council The department of physical planning started to use spatial data in city planning
Entebbe TC	1986	Creation of the department for physical and planning under the town council The department started to use spatial data in city planning
NWSC	1988	Creation of engineering department hosting survey unity
KW	1988	Creation of GIS unity
KCC	1994	Decentralization of city planning and land management functions KCC started to collect spatial data for city planning
DWRM	1980	Creation of mapping unity within DWRM
Mukono WDD	1994	Creation of the Department of Water development Beginning of spatial data collection for water resources monitoring

4.4. Spatial data sharing partners

All visited organizations share spatial data with any users, government or private organizations and individuals. The degree to which each organization participates in spatial data sharing cooperation was measured on basis of the number of other organizations it shares spatial data with. Table 4-2 shows the partners in spatial data sharing of each organization in the study.

Table 4-2: Partners in data sharing

N°	Organization name	Provides spatial data to	Uses spatial data from
1	SMD	DWRM, NWSC, KW, KCC, Entebbe TC, Mukono TC, Mukono LD	DWRMC, NWS, KCC, KW
2	DWRM	SMD, NWSC, KCC, Entebbe TC. Mukono WDD	SMD, NWSC, Entebbe TC
3	NWSC	SMD, DWRM, KW, Entebbe TC, Mukono TC	SDM, DWRM, Mukono TC, KCC
4	KW	SMD, NWSC, KCC.	DWRM, SMD, NWSC, KCC
5	KCC	SMD, KW, NWSC.	DWRM, SMD, KW, NWSC
6	Entebbe T C	DRWM, NWSC.	SMD, DWRM, NWSC
7	Mukono TC	NWSC, Mukono LD.	NWSC, SMD, Mukono LD, Mukono WDD.
8	Mukono L D	Mukono TC, NWSC	SMD, Mukono TC
9	Mukono WDD	Mukono TC	DWRM

The table above shows the most spatial data providers and recipients in the unity of analysis. SMD, NWSC and DWRM are the key spatial data providers compared the numbers of data recipients they provide in spatial data. Those organizations are among organizations mandated to collect and disseminate spatial data at national level (Musinguzi 2004, Muhwezi 2004, Karatunga 2002). SMD as well as KCC, Mukono TC, NWSC, and DWRM are main spatial data users since they are the most organizations that use spatial data from other organizations. Organizations at local level, like Mukono LD and Mukono WDD are the least spatial data providers and users. The flow of spatial data between all organizations under study is shown by figure 4-1.

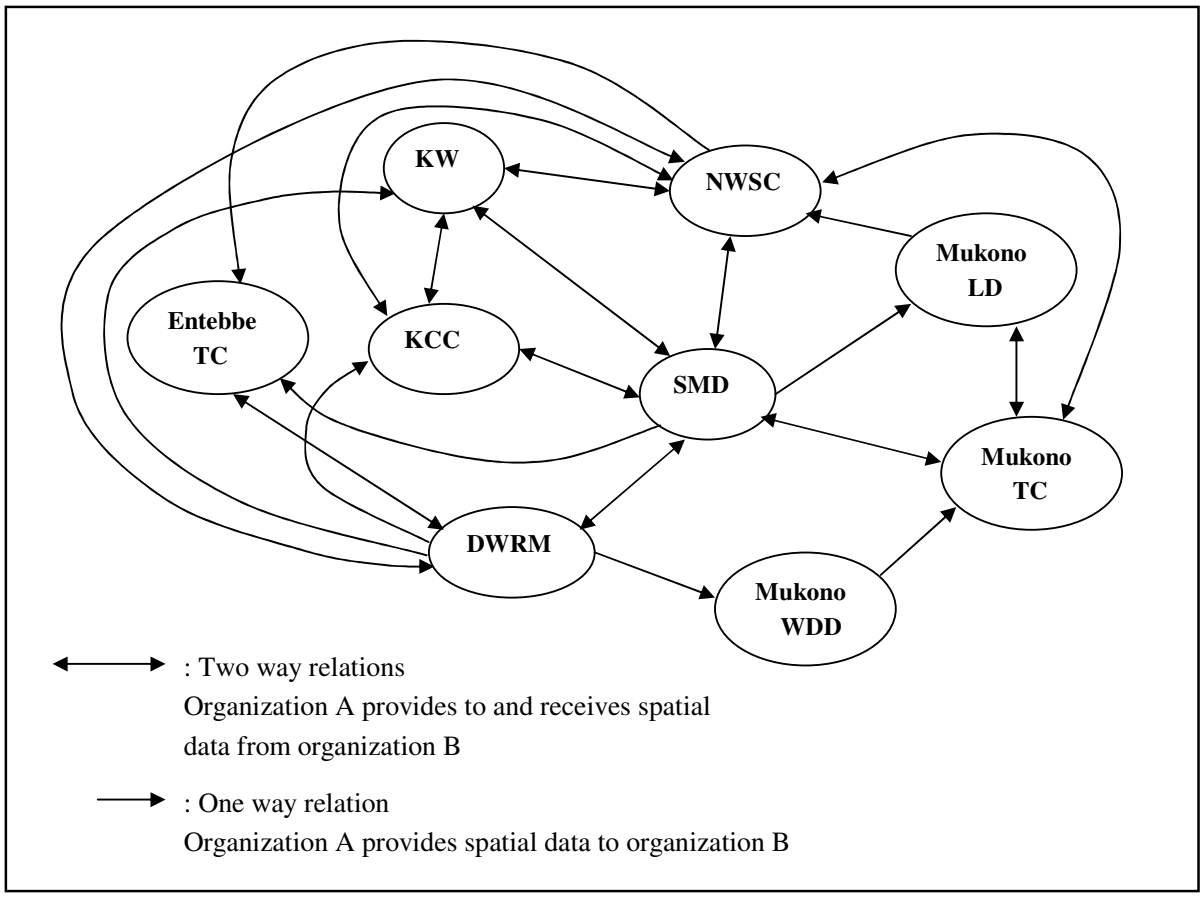

Figure 4-1: Spatial data sharing network

The figure 4-1 shows that the potential spatial data provider is SMD. SMD provides spatial data to 88% of organizations in the study. It plays key role in data provision, and this may result in relation of dependence for other organizations, because if the function of SMD as main spatial data provider vanishes, activities of other organizations may be paralyzed.

SMD is also one of the potential users of spatial data. It receives spatial data from 57% organizations in the network. That is, SMD is not only spatial data provider, but also spatial data user, and then benefits from the cooperation with other organizations.

Each of the organizations presented in the figure 4-1, cooperates with more other organizations than the partners presented in that figure. Those organizations use satellite images provided by RCMRD, administrative boundaries and demographic data provided by UBOS, forest covers provided by NFA, and land use data provided by the Ministry of agriculture to mention some of them. Appendix 6 shows the types of spatial data collected by each organization and spatial data acquired from other organizations.

4.5. Sources of budget for spatial data handling

56% of visited organizations use mainly their own funds in the activities related to spatial data collection, maintenance and dissemination. 44% of organizations use the budget from the central government, with some contribution from donors. Only 22% of organizations produce spatial data in the context of their mission to collect and disseminate geoinformation. 78% of organizations participate in activities related to spatial data handling for collecting and producing spatial data that are used as tools for meeting their goals.

Table 4-3: Context of GI activities and sources for budget

N°	Organization name	Context of GI activities	Source of GI Budget
1	SMD	Mandate to collect and disseminate geoinformation: topographic data and cadastral data, and to provide mapping standards	Government and donors
2	DWRM	Mandate to collect and disseminate geoinformation for water resources management.	Government and donors
3	NWSC	Use of spatial data in the management of water and sewerage infrastructures	Organization budget: internally generated revenue
4	KW	Use of spatial data in the management of water and sewerage infrastructures	Organization budget: internally generated revenue
5	KCC	Use of spatial data in town planning	Organization budget: internally generated revenue
6	Entebbe TC	Use of spatial data in town planning	Organization budget: internally generated revenue
7	Mukono TC	Use of spatial data in town planning	Organization budget: internally generated revenue
8	Mukono L D	Use of spatial data in lands registration process	Government budget
9	Mukono WDD	Use of spatial data in the management of water resources	Government budget

4.6. Spatial data access policy

4.6.1. Spatial data access for free versus access for fees

There are two types of spatial data access policies that are followed by public organizations in spatial data sharing in Uganda. 33% of visited organizations charge fees for access to spatial data while 67% share spatial data with the users for free as shown by the figure 4-2.

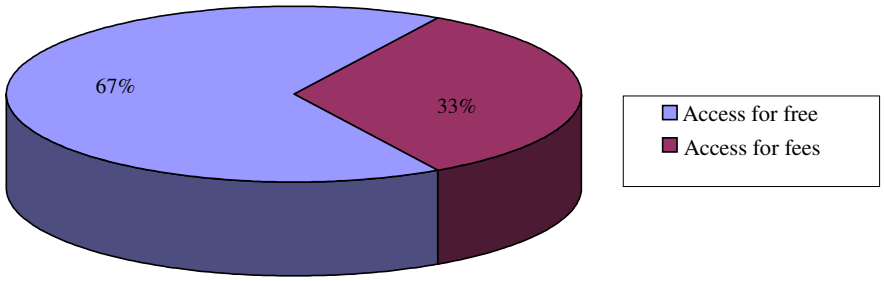

Figure 4-2: Terms of access to organizations spatial data

Pricing policy for spatial data access is adopted by organizations which operate in land sector mainly SMD and Mukono LD and water resources management like DWRM. The study classified those organizations which charge fees for spatial data access in category A. Organizations, like SMD and DWRM, are mandate to produce and disseminate spatial data and depend on government budget (table 4-3), in collecting and managing spatial data. Respondents from those organizations argued that their organizations charge marginal cost of spatial data collection or cost for spatial data reproduction (table 4-4 and 4-5), and the prices for spatial data (appendices 7 and 8) do not include all cost of spatial data collection and processing. In general, the policy is to charge fees for access to their spatial data for any user, being a public or government organization and individuals.

Table 4-4: Price for analogue spatial data

Spatial data format	Map format	Organization and price		
		DWRM	SMD	Mukono LD
Analogue	Any format: A0-A4	50 000 UShs	5 000-10 000 UShs	10 000 UShs
Soft copy: Pdf	Any format: A0-A4	50 000 UShs	5 000-10 000 UShs	-

Source: Organizations prices charter

Table 4-5: Price for digital spatial data

Spatial data format	Number of layer	Organization price	
		DWRM	SMD
Digital spatial data	1	500 000 UShs	150 000 UShs

Source: Organizations prices charter

Organizations like NWSC, KW, KCC, Entebbe TC, Mukono TC, and Mukono WDD which follow free access policy were classified in category B. This category comprise organizations operating in different domains of activities at both national and local level, like water supply and sewerage services, public administration, and water resources management. They use internally generated revenues in collecting spatial data which are used as tools for meeting their missions. In contrast to organizations in category A, organizations in category B are not mandated to disseminate spatial data, although they share their spatial data with any users who need to use them.

4.6.2. Open access versus restrict access

Access is a fundamental issue in the exchange of spatial data. In all organizations, spatial data are accessed at office and shared on demand. Figure 4-3 shows that 78% of organizations provide full open access to spatial data. Organizations that have developed GIS, like SMD, KCC, and DWRM provide spatial in both analogue and digital formats. 22% of organizations create restriction on spatial data in digital format. Those are KW and NWSC. They do not provide spatial data in digital format. Staffs from those organizations stated that it is organization policy to restrict access to spatial data in digital format. The pretext is that if spatial data are provided in digital format, the users may manipulate the datasets and in return providing wrong information to the public. They argued that, they share spatial data with other organizations and individuals to let the location of water and sewerage infrastructures. Before the provision of spatial data in the form of maps, they make sure the map shows the correct location of infrastructures and guide different companies and individuals in construction so that they prevent the damage of water and sewerage infrastructures in their work. Following this idea, they feel that if the users refer to a wrong map, there are risks for damaging the infrastructures and the consequences come to KW and NWSC which have to support the cost for the reparation of those infrastructures. The arguments are clear, but the reason for not sharing spatial data in digital format is not relevant as in the field of geoinformation, spatial data providers can adopt different mechanisms preventing the manipulation of spatial data, like the provision of user license or agreement on keeping the spatial dataset unmodified, and then prevent the spatial data recipient to misuse it. The users who can comply with those conditions can have access to their spatial data. It appears like that KW and NWSC do not provide access to spatial data. Users can only access printed maps. Such practice does not promote spatial data sharing cooperation and use of geoinformation in the real context of GIS industry.

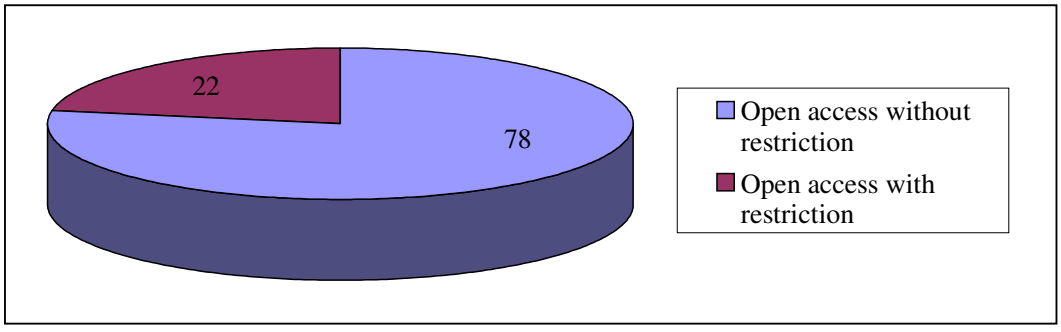

Figure 4-3: Access and restriction to spatial data in digital format

4.6.3. Format of shared spatial data

67% organizations have implemented the use of GIS software in data collection and maintenance, and can provide spatial data in both analogue and digital formats. 33% do not have a computerized system for data capturing and storage. They share spatial data in form of paper maps. In this context, the technology which is used in spatial data collection reflects the types of spatial data format which are shared between public organizations. That is, both traditional data sharing and modern data sharing are practiced (table 4-6).

76% of organizations which have developed GIS provide spatial data in form of printed maps, or pdf format and in digital format as copy of database. 22% don't provide spatial data in digital format because there is a restriction to provide a copy of their datasets (sub-section 4.6.2).

Table 4-6: Format of shared spatial data products according to organization policy and spatial data collection techniques

N°	Organization name	Category	Spatial data access policy	Shared spatial data format	Access restriction	Spatial data recipients	Spatial data handling techniques
1	NWSC	B	Free access	Printed maps and Pdf format	Restricted access to digital format	All users	GIS
2	K W	B	Free access	Printed maps and Pdf format	Restricted access to digital format	All users	GIS
3	KCC	B	Free access	Analogue and digital	No restriction	All users	GIS
4	SMD	A	Access for fees	Analogue and digital	No restriction	All users	GIS
5	DWRM	A	Access for fees	Analogue and digital	No restriction	All users	GIS
6	Entebbe TC	B	Free access	Analogue and digital	No restriction	All users	GIS
7	Mukono TC	B	Free access	Printed maps	No restriction	All users	Manual system
8	Mukono LD	A	Access for fees	Printed maps	No restriction	All users	Manual system
9	Mukono WDD	B	Free access	Printed maps	No restriction	All users	No mapping system.

4.6.4. Spatial data sharing relationships

All organizations have developed informal spatial data sharing relations with their partners. Spatial data are provided to users on demand basis. The request for spatial data provision is made through written and verbal request. Personal contact to the officer who authorizes the provision of spatial data is the most used way for making data request. Most of all organizations do not have partners that they provide spatial data on a schedule basis. Only one organization in the study, DWRM has signed a memorandum of understanding with the UMD on spatial data collection, processing, analysis, dissemination and exchange. Spatial data are exchanged upon completion of collection and processing of spatial dataset. DWRM has a formal cooperation with UMD, but shares spatial data with other users through informal relations as well as other organizations.

Table 4-7: Spatial data sharing relations

Data sharing relationships	Organization number
Informal data sharing relationships	8
Formal and informal data sharing relationships	1
Total	**9**

4.6.5. Internal coordination of spatial data sharing activities

In all visited organizations, the activities of spatial data sharing are coordinated at organization level. There are internal regulations that are followed in spatial data provision to the users. Depending on the structure of organization, the officers who coordinate the provision of spatial data are heads of department, commissioners, and head of survey unity, chief administrative officer, or town clerk. Town Clerk is the Technical Head of the Council while the commissioner is like the head of department. There are few cases in which respondents cited the director general to participate in spatial data sharing process (table 4-8). Official documents like data dissemination policy (appendix 4), memorandum of understanding on data exchange (appendix 5) and local government act, provide that the request for spatial data is addressed to the commissioner or head of department or the town clerk as officers who deal with information dissemination and participate in decision making on data sharing.

Table 4-8: Officer coordinating information sharing

Officer	Frequency of responses
Head of department	37%
Commissioner	35%
Town clerk or chief administrative officer	18%
Head of survey unity	6%
Director general or permanent secretary	4%
Total	**100%**

The request for spatial data is generally made through physical contact with the officer (table 4-8) who coordinates spatial data sharing and who decides on spatial data provision. At national level, whenever the request for spatial data is addressed to the director general, it is sent to and handled at the department level. At local level the request for spatial data is addressed to the town clerk. After approval of the request, the officer instructs the technical staff in possession of spatial data to provide it to the customer. The work procedure is similar in all organizations although there are cases some technical staffs can provide spatial data without the approval of the head of department or unity. 71% of respondents believe that the authorization of the officer is prerequisite to release spatial data, because once the request for spatial data is approved, they receive instructions to provide it to the recipients. 29% of them perceive that they can make their decision on spatial data sharing as shown by table 4-9.

Table 4-9: Perception on level of individual decision on data provision

N°	Decision	Percentage of respondent
1	Dependence on decision of officer	71%
2	Individual decision	29%

4.7. Trends of change in spatial data sharing policy

The study investigated if public organizations in Uganda tend to change spatial data sharing policy and align with each other spatial data sharing policy. Through interviews, respondents were asked whether organizations charging fees for spatial data sharing have ever changed the policy and provided spatial data for free or vice versa. 100 % of respondents reported that their organizations have not changed spatial data sharing policy. The policy has remained the same over time as shown in table 4-10.

Table 4-10: Frequencies of responses about change in spatial data sharing policy

Response	Percentage of respondents
Our organization has not changed spatial data sharing data policy	33%
The policy has always been the same	67%
Total	**100%**

Table 4-10 shows that organizations have not changed their policies in spatial data sharing. However, through the discussion on the ways visited organizations cooperate with other government organizations, staffs reported that public organizations do not pay fees in spatial data sharing practices. That is, spatial data sharing practices contrast with the spatial data sharing policy in theory.

Organizations in category A, namely SMD, DWRM and Mukono LD initially follow pricing policy. They charge fees for spatial data access for all users, including government bodies. However, staffs from organizations in category A, and other organizations in category B, like KCC, Mukono LD, and KCC reported that since 2000, those organizations do not pose the payment conditions to other government organizations when they cooperate in spatial data sharing. Respondents from those organizations stated that, when the request for spatial data is from the top management level like from the minister or permanent secretary, spatial data are provided for free. Moreover, spatial data are provided for free if there is a formal agreement like a memorandum of understanding or informal agreement on spatial data exchange between the managers from spatial data provider and spatial data recipient.

In the discussion held with staffs from the Department of Geological Survey and Mines, under the Ministry of Energy and Mineral Development, they stated that since 1999, the department shares spatial data with other government bodies for free. However, the policy on spatial data dissemination provides that spatial data are distributed to users upon payment of a nominal reproduction cost reflected in the price list. Only research organizations receive spatial data free of charge (appendix 3). Current practices of sharing spatial data for free reflect change in behaviour of organizations towards spatial data sharing. They result from the awareness to free exchange of spatial data between government organizations as stated by interviewees. The general argument is that government bodies should share spatial data for free if they are used for the public interest.

Changes in organizations behaviour towards spatial data sharing are discussed an existing literature on spatial data sharing in Uganda. In his report on development of environmental information systems in Uganda, Moyin, Y. et al., (2000) pointed out that, since 2000, government organizations which generally had to charge fees for spatial data sharing with other government organizations, have started to share spatial data for free with those organizations and other organizations that are non-commercial. In 2000, under NEMA initiative, an Environment Information Network (EIN) was established. It comprises organizations producing main spatial datasets like agricultural, meteorological, topographical and other spatial data related to forests, soil and biodiversity. Organizations constituting the network, are namely

Department of Agricultural Planning, Department of Land and Surveys, Department of Meteorology, Kawanda Agricultural Research Institute, NARO, Makerere Institute of Environment and Natural Resources, National Biomass Study, Forest Department, and have signed a MoU on free data exchange (Karatunga 2002).The aim of the network was to exchange information in compatible formats at minimal cost, to solve problems related to spatial data access, and to promote the management of natural resources and environment (Schwarte 2008). The constitution of the network was a decisive step for those organizations to start sharing spatial data for free with each other, while initially spatial data were shared upon payment of access fees.

Through interviews, respondents from SMD agued that their organization shares spatial data for free with other members in the network from the time they started to cooperate under EIN. These arguments confirm the ideas of Schwarte (2008) who stated that organizations which initially have pricing policy in spatial data sharing and had to charge fees for access to spatial data have started to share spatial data for free charge since the time the EIN was created. Working under a framework is recognized is a driver for change in organizations behaviour and adoption of similar practices. When organizations are tied through network, they adopt and share similar norms and thereby behave alike. Organizations network constitute a normative template facilitating the diffusion of appropriate norms that organizations have to follow in discourse of their missions (Frumkin and Galaskiewicz 2004). It is in this context that public organizations in Uganda which are tied by EIN have adopted new norms related to spatial data sharing. Table 4-11 shows changes in spatial data sharing practices since the time public organizations in Uganda started to cooperate under EIN.

Table 4-11: Comparison between spatial data sharing policy and practices after 2000

Organization name	Official spatial data sharing policy for all users	Term on spatial data access in practice (for government organizations)	Driver of change in term on spatial data access	Beginning of practices
DWRM	Access for fees	Free charge	- Cooperation under EIN - Informal agreement on spatial data exchange; MOU; Official request from top management	2001
SMD	Access for fees	Free charge	- Cooperation under EIN - Informal agreement on spatial data exchange; MOU; Official request from top management	2000
Mukono LD	Access for fees	Free charge	- Informal agreement on spatial data exchange - Official request from top management	2003

Table 4-11 shows changes in spatial data sharing practices. These changes are driven by awareness on free exchange of spatial data between government organizations. They are made possible by decision makers who informally contact each other and agree on free exchange of spatial data. Stakeholders perceive that it is not relevant to charge fees on spatial data access for government organizations. They support free access policy when government organizations cooperate between each other, as shown by figure 4-4. In the opinions of most of respondents (88%), spatial data access should be free when sharing involves government agencies, and fees should be charged for private users. Only 12% of respondents support charging fees for spatial data access when sharing spatial data with other governments.

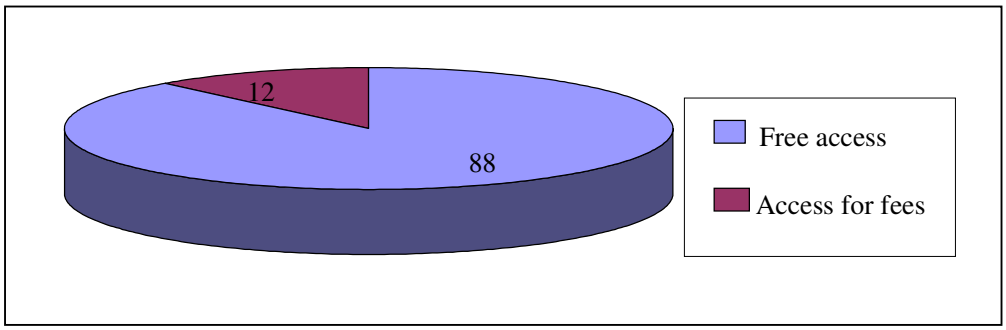

Figure 4-4: Perception on spatial data access policy between government organizations

4.8. Inter-organization consultation on spatial data sharing policy

The survey investigated if organizations contact each other when they formulate spatial data sharing policy or when they handle any matters related to spatial data sharing. 78 % of respondents reported that their organizations do not contact other organizations when they decide on the policy to share spatial data with external users as reported in table 4-12:

Table 4-12: Opinions on inter-organization agreement on spatial data sharing policy

Opinions	**Respondent number** (appendix 2)
"Our organization does not look at other organizations practices. There is not any body that gives advice or directives on the ways to share data with external users"	27
"Our organization does not copy practices of other organizations. Government organizations have their procedures in data sharing"	29
"We do not have to discover what other organizations do when they share data, before we provide our data to public"	30
"I do not think that we have to contact other organizations about data sharing"	34

Only 22% of respondents from KW and NWSC, two organizations which have parents and sisters relations, reported that those organizations adopt similar policy on spatial data sharing. The frequencies of responses about organization's decision to spatial data sharing policy are presented in table 4-13.

Table 4-13: Frequency of responses on organization's decision to spatial data policy and GI activities

Response	Percentage of respondents
No consultation on data sharing policy	78%
Own decision on data sharing policy	78%
Use of similar standards in data collection	61%
Adoption of each other data access policy	22%

One of reasons for organizations to decide individually on spatial data sharing policy relates to the lack of national policy on spatial data sharing (Muhwezi 2004; Kalande and Ondulo 2006). Moreover, there is no coordination of GI activities and most of organizations work individually (Kalande and Ondulo 2006). UBOS had a program to coordinate its efforts with other GIS stakeholders in Uganda for building a spatial data infrastructure. However, the program faced some constraints including lack of policy on GI, lack of financial resources for integration mechanisms with other spatial data produsers, and lack of consensus on SDI roles, etc (Muhwezi 2004; Ssetongo 2004). Inter-organizational coordination is necessary for accomplishment of common goals in geoinformation field. Organizations agree on common rules and standards to follow in spatial data collection and dissemination and show similar behaviour through implementation of those rules and standards. If there is no coordination, organizations decide on their own ways to achieve their missions and this becomes the cause for development of individual policies on spatial data sharing.

In the context of inter-organizations cooperation on the spatial data handling activities, some organizations tend to adopt similar standards in spatial data collection as stated by respondents from KW, NWSC, Entebbe TC, Mukono TC, Mukono LD and KCC. They perceive the necessity to use similar standards which make possible integration of spatial from different sources. Standards are provided by SMD. Other organizations consider SMD as key leader for spatial data handling activities through coordination of spatial data collection, and provision of standards for data quality and format.

4.9. Awareness and opinions on national spatial data sharing policy

The survey investigated if organizations are aware or have knowledge about any national policy to follow when they cooperate in spatial data sharing. Respondents from all organizations reported that there is no national policy to follow in spatial data sharing. With regard to organizational policy on spatial data access (access free or for fees), 47% of respondents from organizations in category A argued that they follow government policy when they charge fees. 53% of respondents from organizations in category B argued that they do not charge fees because it is public right to have access to government

information as stipulated in national constitution. This category does not attach any economic value to spatial data, and uses it for the achievement of its activities. Spatial data is considered as a public good to share for free for social benefit. It is used as input to organization missions as stated by one of respondent who said that "*data are not used as source of revenue, there are used as input for any work*" (resp.12). Table 4-14 presents the summary of the respondents' perceptions about environment influence on organization decision on spatial data sharing policy.

Table 4-14: Perception about environment influence on organization decision on spatial data access policy

Opinion on environment influence on formulation data access policy	Organization number	Number of respondents	Percentage of respondents
Government policy for charging fees	3	21	47%
Public right and national constitution for free data access	6	24	53%
No national policy on spatial data sharing	9	45	100%

4.10. General observations on spatial data provision

This section presents the summary of observations made in visited offices during the field work.

The first observation was made at Kampala water office, on 5th October 2009, when a staff from technical department was being provided a water network map showing the location of water infrastructures in Nakulabye zone, in Kampala city. This case concerned the internal spatial data sharing between GIS section and technical department. The staff who was looking for the map came in the office of GIS unity, talked to a GIS staff and asked him to print a map of the aforementioned zone. The GIS staff visualized on computer screen the portion of Kampala water network, showing the extension of the water infrastructures of the target zone. He asked the staff if he could identify on the map the water infrastructures he was looking for. They agreed that the zone is well selected and the map showed the requested information. The GIS staff printed then the map and handed it to the user.

After that observation, I had a short discussion with the GIS staff on the way KW provides the water maps to the users. He reported that the provision of maps follows the same processes. If the users come in the office, they explain what map they want. The map is visualized before the printing process, so that the staff makes sure if the map contains the information the users need. If there is any missing information, it can be added if it is available. If the maps are requested through phones calls or written letter, the requesters give details about the type of information they need and GIS staffs prepare the maps according to the details provided in the request.

The second observation was made at Entebbe, in the DRWM, in the office of GIS, at 10:12 Am, of 14th October 2009, when a GIS staff was preparing a rainfall map of Uganda (appendix 9). The map was being provided to external customer. The customer was a consultant in underground water assessment

studies, for UNICEF, at Kampala office. He came in GIS office at DWRM and presented to the GIS technician the receipt from bank, proving the payment for two sheets of maps. After the presentation of the receipt, the GIS technician printed two maps, AO formats, for the customer. The customer checked the maps, and found out some typing errors. He asked the staff to correct the errors. After the correction, the maps were reprinted and handed out to the customer.

I asked to the GIS technician some questions about the process for the payment; because I realized that the customer came in the office with the receipt for collecting the maps that were already prepared. The staff told me that the customer had passed in the office the day before. She reported that when people need spatial data, they go to the office, make request and give details about what types of spatial data they want. The staffs give them information about payment process. The customers go and pay prescribed fees to the bank and come back to the office to collect the requested spatial data. If the requested spatial data are available, they are immediately delivered. If they are not in requested formats, the staffs agree with the users on time the requested data can be provided. The staff told me that the ways she processed the requests from that customer is similar to the ways she handles the requests for any spatial data from other customers.

The final observations related to the aspect of the offices of the visited organizations. Organizations like KW, NWSC, DWRM, SMD, and KCC have implemented a GIS, and their GIS units are well equipped with new computers, small printers and plotters that are used for printing the maps at different formats. There were different printed maps hanging on the walls of the offices. This aspect directly shows at what extend those organizations are using information technology in spatial data capturing and management. But that was not the case at Mukono TC, and Mukono LD where staffs are still using traditional equipments. Maps are manually produced with paper and pencils. These observations show differences in term of use of GIS technology in spatial data handling as discussed in section 4.2 of this chapter.

4.11. Conclusion

The aim of this chapter was to find the answers to the following questions:

1. What are spatial data sharing policies followed by public organizations in Uganda?
2. Do spatial data sharing policies change and tend to look similar over time?

Question 1: Findings show that public organizations follow two policies in spatial data sharing. Some adopt pricing policy and charge fees for access to spatial data. Others adopt free access policy and provide spatial data for free. Free access is the most adopted policy. In all organizations, spatial data are shared on demand basis, in both analogue and digital format depending on the capacity of organizations to produce spatial data in analogue or digital formats, in relation with the technology which is used in spatial data capturing. However, there are few organizations which have restriction on access to spatial data in digital format. Spatial data are accessed at organization offices and informal spatial data sharing relationships are the most types of relations that characterize organizations cooperation in spatial data sharing.

Question 2: The study finds that the current spatial data sharing policies remain similar compared to initial stages, but in practices there are changes in spatial data sharing. From early 2000s, organizations which follow pricing policy show new behaviour and have started to share spatial data for frees with other government organizations. However, the policy was initially to charge fees for all users of data, being government or private and individuals. The new behaviour reflects changes in spatial data sharing practices. Public organizations in Uganda tend to share spatial data for free, and charging fees for spatial data access is currently applied for private organizations and individual users.

5. Spatial data sharing policies and practices in Uganda

The results of fieldwork presented in previous chapter provided some indicators of current behaviour of organizations in spatial data sharing cooperation and changes in spatial data sharing practices. These indicators describe spatial data sharing practices, and help to find out if public organizations in Uganda show similar or dissimilar behaviour, and if their behaviour reflects any isomorphism trend. The aim of this chapter is to find an answer to the following research question: Do organizations show any isomorphic behaviour in adopting spatial data sharing policies?

The chapter is structured as follows: the first section explains which influential factors affect organizations behaviour in adopting spatial data sharing policy. The second section describes spatial data sharing practices in relation to the national law on access to information. The final section presents the analysis of isomorphism trends observed in spatial data sharing practices.

5.1. Duality of spatial data sharing policies

Two spatial data sharing policies were distinguished in the previous chapter. Table 4-6 shows that some organizations share spatial data for free, whereas others share spatial data for fees. Various factors pushing organizations to adopt any spatial data sharing policy are explained according to stakeholders' opinions. Some organizations charge fees for access to spatial data in compliance to rules and regulations guiding their activities within the sector they operate, while other organizations do not follow any regulations and consider spatial data as a resource to share for free and input for the achievement of their missions.

5.1.1. Pricing policy

Pricing policy is adopted by organizations under category A as presented in previous chapter. According to survey responses, there are different reasons for charging fees in spatial data sharing. Organizations in category A, like SMD and Mukono LD, operating in land sector, charge fees in spatial data sharing in compliance to the registration of titles acts and land sector strategic plan which prescribe that the public have to pay fees for access to land information and cadastral data (table 5-1). Other motives for charging fees related to the revenue generation purpose, in relation with the requirements from the Ministry of Finance. Respondents from SMD and DWRM stated that their organizations charge fees for access to spatial data because they report every year to the Ministry of Finance how much money they collect from the services they provide to the public. One respondent from DRWM argued that the Ministry expects

from government bodies to generate revenues in return to the budget they receive every year for the achievement of their missions. He stated that the collected fees go to government treasury as follows: "*there was a time that some departments were being closed because they were not generating revenues for the government. The practice of charging fees for data sharing is a necessity because the organization needs to collect fees for the government treasury*" (resp.33, appendix 2). He commented that in the annual assessment, government organizations report how much money they had collected and the budget plan is approved taking into account the expenditure and the expected revenues in terms of fees. In that context, an organization like SMD includes maps sales, as one of sources of revenues, in its annual strategic plan (MLHUD 2008). In this line, the pricing policy is practised for meeting the expectations of the Ministry of Finance. "*Charging fees for information is a directive, a government directive. The departments declare what they produce. Charging fees for information sharing is a government policy"* (resp.24, appendix 2). A summary about the factors pushing organizations to adopt the pricing policy in spatial data sharing is presented in table 5-1.

Table 5-1: Drivers for adopting a pricing policy

N°	Organization name	Driver of data access policy
1	SMD	- Registration of titles Act 1964 and 1998. Fees are charged for compliance to the registration of titles Acts: spatial data are collected in the context of land survey, and products like cadastral map or plan are provided to users upon payment according to the acts. - Land sector strategies plan provide that the public pay fees for land registration services and access to land information. - Charging fees for spatial data access is practiced because government bodies are required to generate revenues from the services they provide to the public.
2	DWRM	Charging fees for spatial data access is practiced because government bodies are required to generate revenues from the services they provide to the public.
3	Mukono LD	- Registration of titles Act 1964 and 1998. Fees are charged for compliance to the registration of titles Acts: spatial data are collected in the context of land survey, and products like cadastral map or plan are provided to users upon payment according to the acts. - Land sector strategic plan provide that the public pay fees for land registration services and access to land information.

Source: (The Republic of Uganda 1964; The Republic of Uganda 1998; MLHUD 2001; Karatunga 2002)

Table 5-1 shows that some organizations charge fees for spatial data for revenues generation as required by the Ministry of Finance. Organizations operating in land sector, like SMD and Mukono LD are influenced by regulations related to land registration that prescribe that the public have to pay for access to land related data (section 27 of the 1964 and 1998 registration of titles acts).

5.1.2. Disparities in data prices

Organizations which follow pricing policy in spatial data sharing do not adopt similar prices for spatial data products. Tables 4-4 and 4-5 show that there are disparities in data prices when comparing the price for the same type of GI product from one organization to another. There are different reasons for organizations to adopt different prices:

- Prices for spatial data are individually determined taking into consideration the cost of data, the cost for data processing and staff, and the cost involved in data provision (like printing of maps). As shown in table 4-12, 78% of respondents stated that the decision on data sharing is made individually. As organizations that charge fees for data access do not consult each other, they thereby set different prices for similar spatial data.

- There is no national pricing policy for spatial data. Organizations follow individually and internally developed written or unwritten policies on spatial data sharing, although the policy may incidentally be similar for different organizations. Previous studies highlight the necessity for the formulation of the national policy on spatial data sharing (Musinguzi 2004; Kalande and Ondul bo 2006; Kayondo Ndandiko 2007, Nyemera 2008). The national Access to Information Act states that the ministry tasked with its implementation will determine the prices for data where access to information requires the payment of fees, but in the practice, there are no national prices to follow (Schwarte 2008).

5.1.3. Free access policy

67% of the visited organizations (figure 4.2) have adopted free access policies. Those organizations were classified in category B. Respondents from those organizations consider spatial data as a resource to share with other stakeholders, and a freely sharable good for the public. In their opinions, spatial data are provided for free because the information is for the public. Free access to spatial data is a mechanism allowing its optimal use for the public interest and meeting organizations goals. They perceive that their organizations provide spatial data for free as stated by the national constitution which prescribes that the public have the right to access to government information.

5.1.4. Conclusion on disparity in data sharing policies

Public organizations in Uganda adopt different policies in spatial data sharing for different reasons. Most of organizations, in category B share spatial data for free in respect to government constitution that provides freedom of the public to have access to information held by government bodies. Other organizations, in category A, charge fees for spatial data access and make it available to all users upon payment of prescribed fees. The practice for charging fees is backed by the government since the national law on access to information provides that fee can be charged for access to data depending on

the types of requested data. However, the law does not define the prices for access to data held by any public organizations. This law needs amendment and should include pricing list for data that the public have to pay for, so that organizations could follow similar pricing list for data access. In the field of geoinformation, there is an organization like SMD that plays key roles in coordinating spatial data handling activities (section 4.2.1). This organization should set standards prices for spatial data at national level for solving disparities observed in spatial data prices. This may be effective because, in relation to its mandate, it controls other organizations in GI activities and it is the main provider for spatial data (figure 4-1). If SMD sets standards prices for spatial data, other organizations may follow those prices as well they adopt and conform to data standards it provides (table 4-13).

5.2. Government legislation on information sharing and organizations practices

The study finds that the procedures related to spatial data provision look alike and are coordinated in a similar way within all organizations. They are followed as informal rules as the procedures proposed in the national law on public access to information as presented in the table 5-2. The table compares the practices of organizations in spatial data sharing and what the government law prescribes as the procedures and legal matters guiding the access to data held by a government body.

Table 5-2: Government directives on access to information and organizations practices

Theme	Government directives ("The access to information Act, 2005")	Organization practices and policy on ground
Right of access	Section 5: (1) Every citizen has a right of access to information and records in the possession of the State or any public body, except where the release of the information is likely to prejudice the security or sovereignty of the State or interfere with the right to the privacy of any other person	All organizations share spatial data on their possession with all users: public and private organizations, and individuals.
Form of request	Section 11: (1) A request for access to a record or information shall be in writing in the prescribed form to the information officer of the public body in control of the record or information required and shall provide sufficient details to enable an experienced employee of the body to identify the record or information	In all organizations, spatial data are provided on demand, through written and verbal request for data. Verbal request is the most used way to request for data.
Payment for access	Section 20 (1) Where a person has been notified under section 16(1) that the request for access has been granted, that person shall be given access, subject to subsections (3) and (10); (a) where an access fee is payable, upon payment of that fee	Organizations that charge fees provide spatial data to the users, upon payment of requested fees. The payment is made at organization's cashier or at bank account.
Free access	(b) where no access fee is payable, immediately, be given access in the applicable forms referred to in subsection (2) as the person indicated in the request for access	All organizations provide spatial data immediately upon the approval of the request by the officer who authorizes the provision of spatial data as long as the requested spatial data are available.
Chargeable fees	Section 47: Fees for access are cost of retrieval and reproduction of the information	Charged fees are cost for spatial data reproduction fees or minimal cost for spatial data collection.
Information officer	Chief Executive of each public body	In all organizations, there is an officer who authorizes the provision of spatial data to the users: commissioner or head of department; chief administrative officer of district; town clerk; head of department or GIS/survey unity.

Theme	Government directives ("The access to information Act, 2005")	Organization practices and policy on ground
Forms of access and data format	Data are supplied in printed records, in copy of images, sounds, in electronic copy of record (2) The forms of access to a record in respect of which a request of access has been granted are: (a) if the record is in written or printed form, by supplying a copy of the record or by making arrangements for the inspection of the record; (b) if the record is not in written or printed form: (i) in the case of a record from which visual images or printed transcriptions of those images are capable of being reproduced by means of equipment which is ordinarily available to the public body concerned, by making arrangements to view those images or be supplied with copies or transcriptions of them; ……. (iii)in the case of a record which is held on computer, or in electronic or machine readable form, and from which the public body concerned is capable of producing a printed copy of: (aa) the record, or a part of it; or (ab) information derived from the record, by using computer equipment and expertise ordinarily available to the public body, by supplying such a copy; (iv) in the case of a record available or capable of being made available in computer readable form, by supplying a copy in that form; or (v) in any other case, by supplying a copy of the record.	Spatial data are provided in both analogue and digital format. All organizations can share spatial data in analogue format. 67% of organizations which hold spatial data in vector and raster formats provide them in digital format as copy of database. 37% of organizations restrict the provision of spatial data in digital format for the security of their database. This behaviour does not conflict with the law as it states that data access can be refused if there are motives for the holder to refuse the access to data.

Source: (The Republic of Uganda 2005)

The comparison was made to examine the extent to which organizations in the study behave according to the national law on data access or if their behaviour in spatial data sharing practices conflicts with the law. Tables 5-2 shows that, the behaviour of public organizations in Uganda in spatial data sharing practices relates to the national law on access to information held by government body. Organizations provide spatial data for free or fees, define similar procedures on data access as prescribed by the law, and data are provided in both analogue and digital format as stated in the law. The law does not also conflict with other regulations like the registration of titles Acts, followed by organizations operating in land sector, like SMD and Mukono LD, when they charge fees for spatial data access. In general organizations behave according to the national law. It seems as if the law constitutes a legal back for organizations practices in spatial data sharing since it was enacted in 2005, while all organizations engaged in spatial data sharing before 2000.

5.3. Discussion regarding isomorphism trends and change in spatial data sharing policies

The results presented in chapter 4, show that there are indicators of isomorphism trends in spatial data handling and sharing in public sector in Uganda. These trends relate to adoption of spatial data standards which enable the integration of spatial data from different sources, organization decision on spatial data sharing policies and changes in spatial data sharing practices.

5.3.1. Isomorphism trends in adopting similar standards in spatial data collection

Table 4-13, shows how by 61% of respondents reported that their organizations cooperate with SMD and use similar spatial data standards in data collection. This behaviour is a response to uncertainty most of organizations using spatial data in Uganda had faced from several years as pointed out by previous studies. Those studies mentioned the use of different standards as one of barrier for spatial data sharing in Uganda because, there were no standards to follow at initial stage of GIS development. Some of efforts so far made, are the development of spatial data standards in 2000, under World Bank, for the development of SDI, and public organizations were invited to follow those standards (Karatunga 2002).
Staffs from KW, NWSC, Entebbe TC, Mukono TC, Mukono LD and KCC, stated having started to collect spatial data according to national standards as provided by the leading agency of the survey activities at national level. This change in organization behaviour seems to be a response to government recommendation, as stated in SDI decree which invites spatial data produsers, to use similar standards for solving the problems that may impede the development of SDI, as follow: "*use of common technical standards, including a common geodetic reference frame, so that data from numerous databases can be brought together to create new products and solve new problems, both nationally and locally* (appendix 10).

5.3.2. Isomorphism trends in adopting spatial data sharing policy

Findings presented in table 5-1 show that organizations in category A face different influences pushing them to charge fees in spatial data sharing. Organizations operating in land sector, namely SMD and Mukono decide on spatial data sharing in compliance to registration of titles acts of 1964 and 1998 and land sector strategic plan of 2001. The registration of titles acts and land sector strategic plan prescribe the norms those organizations have to follow in the activities related to land registrations and dissemination of land information. The general rule is that the users have to pay fees for access to land information or cadastral data. It is in this context those organizations have adopted the practice for charging fees to any users of spatial data they collect, being public or private organization and individuals.

Moreover, SMD and DWRM which operates in water resources management, comply with the expectation from the Ministry of Finance to generate fees that go to the public treasury. Generating fees for the public treasury is a requirement for all government organizations in Uganda. The fund was created to receive the revenues or monies raised or received by government bodies for the purpose of or on behalf of, or in trust for the Government (The Republic of Uganda 1995). SMD and DWRM have adopted similar strategies through charging fees in spatial data sharing for complying with the expectations of the government. They engaged in spatial data sharing at different years (table 4-1), but adopt similar norms on spatial data access to comply with the requirement of the Ministry of Finance.

Another aspect of isomorphism trend in relation with organization decision on spatial data sharing was identified within organizations in category B, which have adopted, at different times (table 4-1), similar spatial data sharing policy. Those organizations share similar beliefs for sharing spatial data for free (sub-section 5.1.3). There are not any environmental influences pushing them to adopt any spatial data sharing policy, but follow the same principle in deciding on spatial data sharing policy. The fundamental principle is the public right to government information. Free access to spatial data is believed to be a mechanism to allow optimal use of spatial data for the public interest and meeting organizations goals.

In the category B, the study found a particular case which reflects also a trend of isomorphism. Table 4-13 shows that there are organizations that consult each other and make similar decision on spatial data sharing policy. This is the case for KW which is a sister organization for NWSC and adopt similar spatial data sharing policy as NWSC. Respondents from both organizations reported that the decision on spatial data sharing is made through inter-departmental meeting, grouping heads of departments and unities in charge of collection and management of spatial data from both organizations. They agree on similar policy and strategy to follow in spatial data sharing since they face similar environmental constraints. As explained in sub-section 4.6.2, both organizations pose restriction on access to spatial data in digital format, because they fear that if they provide the copy of spatial dataset, the recipients may manipulate it and provide in return the false information to the public. That is why they adopt similar behaviour in sharing only spatial data in form of maps.

5.3.3. Isomorphism trends and changes in spatial data sharing practices

Table 4-11 shows that organizations in category A, which follow pricing policy in spatial data sharing, have adopted new behaviour in data sharing practices since 2000. Initially, those organizations charge fees for data access to all users, government and private organizations and individuals. Before 2000, government organizations as well as private organizations and individual had to make a request for spatial data and pay access fees, before they could be provided the requested data. In current practices, government organizations make a request for spatial data or spatial data provider and recipient make an agreement on spatial data exchange, and then spatial data are provided without any payment conditions.

Spatial data produsers do not charge fees for other government organizations. They have started to exchange spatial data with other government organizations and the access to each other spatial dataset becomes free. Charging fees is still practiced when spatial data are provided to private organizations and individual as shown on figure 5-1.

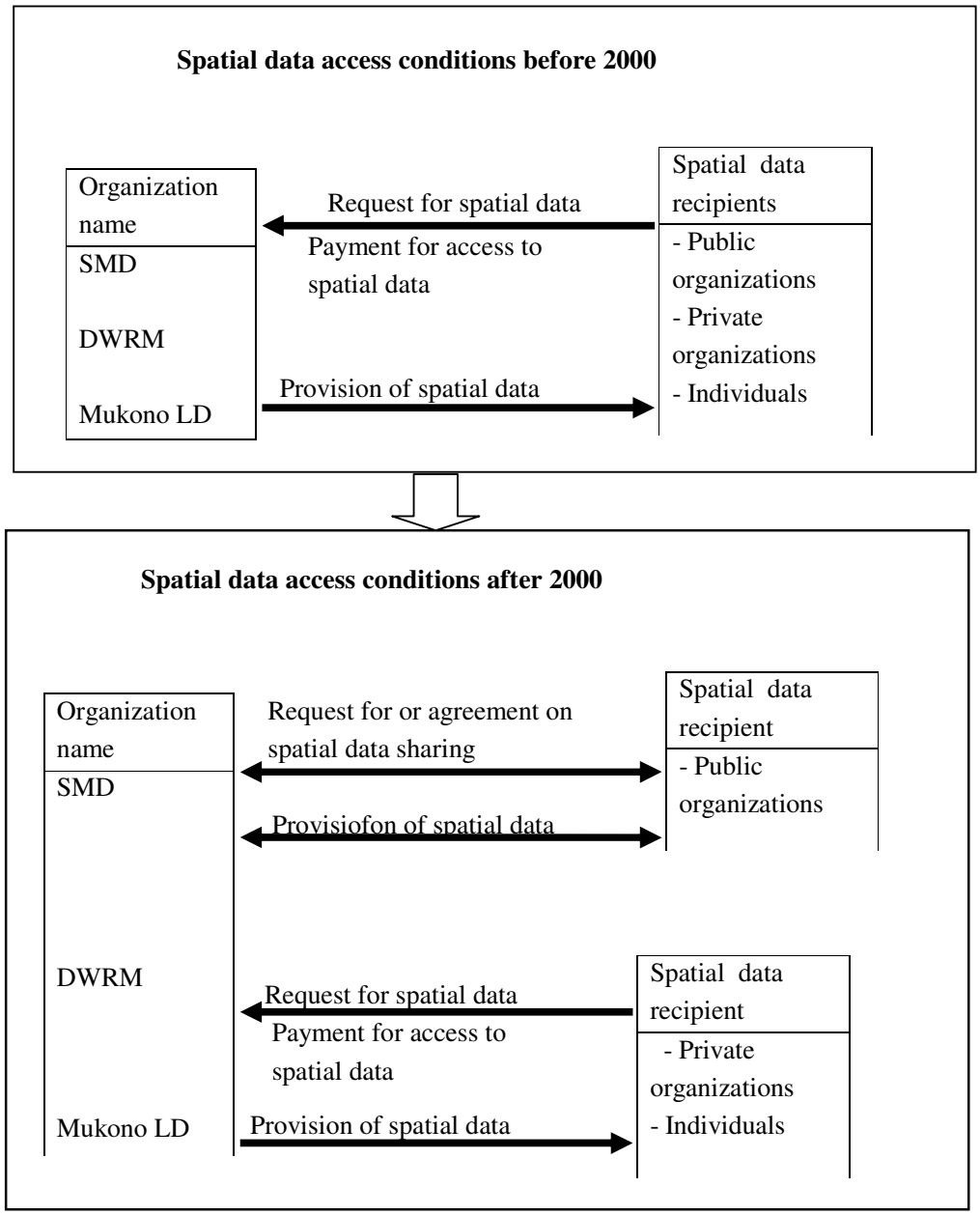

Figure 5-1: Change in spatial data sharing practices between government organizations

Figure 5-1 shows change in conditions, in term of payment, for access to spatial data when spatial data sharing practices involve government organizations. Current practices give insight about new behaviour and change in spatial data sharing practices. The general trend is the convergence for all public organizations towards adoption of similar data sharing policy when they cooperate with other public bodies. The common factor for these organizations to behave alike is the awareness on the principle of

exchange data for free between government organizations. They share similar belief that it is not relevant to charge fees for another government body. They contact each other and agree to share each other spatial data for free. They share a common understanding on free exchange of spatial data as appropriate way to cooperate. They believe that spatial data are used for the public interest and should be shared for free. That belief tends to look alike the believes of organizations in category B, which share spatial data from the initial stage of their cooperation in spatial data sharing, stemming that free access policy is an appropriate mechanism to promote the use of spatial data. The convergence of the behaviour of organizations in category A to the behaviour of organizations in category B was visualized as follows:

Table 5-3: Changes and convergence in behaviour of organizations in spatial data sharing practices

Category of organizations	**Before 2000**		**After 2000**	
Organizations A	Spatial data access	Users	Spatial data access	Users
	Fees	Public organizations	**Free**	Public organizations
	Fees	Private organizations and individuals	Fees	Private organizations and individuals
Organizations B	Free	Public organizations	**Free**	Public organizations
	Free	Private organizations and individuals	Free	Private organizations and individuals

Table 5-3 shows that, after 2000, there is change in spatial data sharing practices and organizations A tend to adopt similar behaviour as organizations B through sharing spatial data for free when they cooperate with other government organizations. The complete change of spatial data sharing practices is not yet reached because organizations A still charge fees for spatial data sharing with private organizations and individuals, while organizations B do not charge any fees for any users.

The current change in spatial data sharing practices reflects a response to different directives inviting public organizations in Uganda to adopt the similar practices in sharing spatial data with other government bodies like the Swedish Consortium report on development of SDI and GIS in Uganda“ *We recommend adopting the principle of free exchange of key spatial datasets within the government organizations to promote a further development of GIS in Uganda*” (Swedish consortium 2001), and SDI decree which states that government organizations should contribute to the development of SDI through achieving the following tasks (Appendix 10):

- To document geospatial data it collects or produces, either directly or indirectly, using the standard set by the Spatial Data Infrastructure Committee, and make that standardized documentation electronically accessible to a coordinating body.

- To define their contribution to the National Key Data Set and distribute them freely to other government agencies on request.

Based on change observed in current spatial data sharing practices, public organizations tend to behave according to SDI decree and other directives regarding spatial data sharing, rather than according to regulations or other requirements which had compelled them to charge fees for spatial data access.

5.4. Conclusion

Public organizations in Uganda, adopt two approaches on spatial data sharing. Some organizations follow pricing policy and share spatial data for fees; others follow free access policy and provide spatial data for free charge. Charging fees for data access is not illegal practice since the national law on access to information prescribes that access to data held by government body may be provided upon payment of fees if required by data holder. The challenge is still the promulgation of standard prices to harmonize different spatial data prices that are individually set at organizational level. A part from disparities observed in spatial data prices, public organizations in Uganda show similar behaviour in spatial data sharing policies and practices. The answer to the question posed in the introduction of this chapter "Do organizations show any isomorphic behaviour in adopting spatial data sharing policies?" is the following:
- Organizations A face similar environmental influences pushing them to charge fees for spatial data access, while organizations B share similar belief on free access to spatial data and decide to share spatial data for free. Within the category B, the study finds that there are organizations namely KW and NWSC that adopt similar strategy and make similar decision in sharing spatial data only in form of maps and then restrict the access to spatial data in digital format.

- The study finds that organizations A which initially follow pricing policy in data sharing show new behaviour that reflects change in data sharing practices. They are currently providing spatial data for frees when sharing involves government organizations. The practice to charge fees for spatial data is currently applied in sharing spatial data with private organizations and individuals.

In additional to that trends related to spatial data sharing policies, the study finds other isomorphism trends in the activities of spatial data handling in Uganda:

- 67% of organizations have recently started to produce and maintain spatial data according to the national standards, whereas they were using individual and different standards in collecting spatial data. The use of different standards was claimed to be a barrier for the development of GIS in Uganda, so that SDI decree recommended in 2000, the use of similar standards to overcome that barrier. The study concludes that the adoption of similar standards in spatial data handling is a response to SDI recommendation.

6. Evaluation of isomorphism trends in spatial data sharing in Uganda

6.1. Introduction

This chapter draws a correlation between the findings from data analysis in chapter 5 and the theoretical framework developed in chapter 2 to examine if public organizations in Uganda show any isomorphic behaviour in spatial data sharing cooperation. The focal point of the isomorphism is that organizations facing the same environment influences adopt similar practices and then become isomorphic with each other. The chapter attempts to answer the following question: Do organizations behaviour in spatial data sharing policies relate to any isomorphism process like coercive, normative or mimetic?

6.2. Isomorphic behaviourin inter-organizations data sharing practices

Findings presented in chapter 5, show that public organizations in Uganda show similar patterns in making decision on spatial data sharing policies and other activities related to spatial data handling. The question is then if those patterns reflect any of or all three processes of isomorphism, mimetic, coercive and normative.

6.2.1. Coercive isomorphism

Section 2.4.1.1 discussed how coercive forces affect organizations practices through formal or informal laws guiding organizations behaviour in relation to what they are mandated to do and how they have to do it, and then become isomorphic. The results of the study, presented in section 5.4.3, show that organizations like SMD, Mukono LD and DWRM which follow the pricing policy in spatial data sharing, face similar coercive forces, compelling them to charge fees for spatial data access. These forces result from land regulations and the requirement from the Ministry of Finance. They shape the behaviour of these organizations in a similar way; following top down relations (table 2-5) as coercive forces affect organizations practices.

On one hand, organizations operating in land sector, at both national level like SMD and local level, like Mukono LD conform to titles registration acts and land sector strategic plan of Uganda. They charge fees for spatial data sharing for compliance to those regulations and principles guiding the activities of land sector within they operate. The titles registration acts and land sector strategic plan state that the users

have to pay fees for access to land information and cadastral data. It is in that context of conformism that those organizations adopted pricing policy in spatial data sharing. In a nutshell, they become isomorphic though adoption of similar pricing policy by compliance to norms prescribed by the regulations.

On other hand, SMD and DWRM adopt pricing policy to comply with expectation from the Ministry of Finance, for generating fees from the services they provide to the public. This requirement shapes the behaviour of those organizations following top down relations and relates more to resource dependency than legal requirement. Isomorphism theory asserts that organizations may show certain behaviour, originating from other organizations of which they are dependent. In relation with the source of budget, this study found that SMD, and DWRM depend on government funds for collecting and handling spatial data (table 4-3). As government funds are allocated through the Ministry of Finance, the study found that those organizations comply with the requirements from the Ministry of Finance as a consequence of resource dependency. They charge fees for maintaining funding relations, rather than a voluntary decision. Sub-section 5.1.1 and 5.3.2 discussed how SMD and DWRM are bound to collect fees which go to the public treasury because their budget is approved on basis of the expected revenues. It is like that those organizations face top down pressures for collecting fees. For those organizations, selling spatial data is one of way to generate fees for meeting the requirement from the budget provider.

6.2.2. Normative isomorphism

Figures 5-1 and 5-2 show that there are changes in spatial data sharing practices between public organizations. Organizations A (SMD, Mukono LD, and DWRM) which had to charge fees for access to spatial data have started to share spatial data for free with other government organizations. Table 6-1 shows that change in the behaviour of organizations A relates to different influential factors.

Table 6-1: Patterns of normative isomorphism in spatial data sharing in Uganda

Isomorphism pattern	Mechanism of isomorphism	Drivers or influential factors
Change in spatial data access terms: access for fees to access for free	Organizations which follow pricing policy have adopted new behaviour for sharing spatial data for free when they cooperate with other government bodies.	- Organizations network (EIN) that allows organizations to cooperate, and agree on rational norms to spatial data sharing - Awareness on free data access between government bodies, consultation between spatial data users and informal agreement on spatial data exchange. - SDI decree and Swedish consortium report which recommends public organizations to exchange spatial data for free.

Changes in spatial data sharing practices in Uganda have also been observed since public organizations operating at national level, started to cooperate under EIN (section 4.7), through which they agreed to exchange spatial datasets for free. It is in this context SMD and DWRM adopted new norms to follow in spatial data sharing with other government organizations. Cooperation under network is a normative

mechanism that shapes the behaviour of organizations because they choose the appropriate norms to follow in their activities (table 2-5), and then become similar.

Further more, changes in spatial data sharing practices were observed at both national and local levels, and relate to increased awareness of decision makers on free spatial data sharing policy. Heads of departments and survey unities at SMD, DWRM and Mukono LD reported that the officers, coordinating the activities related to spatial data collection and sharing, meet and agree on sharing spatial data for free. They feel that spatial data should be shared for free between public bodies. Increased awareness on free exchange of spatial data is the other factor for public organizations in Uganda to start sharing each other spatial data for free. These awareness and change in the behaviour of organizations are the responses to the recommendations of SDI decree and Swedish consortium report which invite public organizations in Uganda to share spatial data for free. SDI decree and Swedish consortium report have exerted normative effect on behaviour of organizations since 2000, when changes in spatial data sharing practices have been observed (sub-section 5.4.4). The study found that, after 2000 organizations in category B adopted new behaviour in similar way and started to conform to expectations of SDI decree and spatial data users who expected public organizations (table 2-5) to share spatial data for free and then promoting the use of geoinformation in public sector.

Another example of mechanism leading to normative isomorphism in spatial data sharing in Uganda is the ways organizations share similar beliefs towards adopting spatial data sharing policy. Organizations in category B show similar behaviour in making decision on spatial data sharing policy. They have common belief that sharing data for free is appropriate way to promote the access and the use of spatial data for users. Table 4-1 shows that Organizations in that category like KW, NWSC, Entebbe TC, Mukono TC, Mukono WDD and KCC have started to share spatial data at different years, and adopted similar policy on spatial data access. This convergence reflects an isomorphism process, resulting from the common social belief affecting the behaviour of those organizations assuming that sharing spatial data for free increases the optimal use of data and helps organizations to meet their goals. Moreover, they state that they conform to the National constitution providing the freedom of the public to have access on government data.

Within category B, the study observed another instance of normative isomorphism. Organizations like NWSC and KW operating in water and sewerage services, at both national and local levels respectively, have adopted similar norms in spatial data sharing. They share similar beliefs and perceptions about the misuse of their datasets, and pose similar restriction on access to spatial data. Section 5.3.2 discussed the motives for those organizations to restrict access to spatial data in digital format, and explained that the decision on spatial data sharing policy is made through inter-department meetings. The study found that those organizations share common understanding and opinions, and then adopt similar strategy to cope with the environmental constraints that they face.

Public organizations in Uganda show also isomorphism behaviour in spatial data handling activities through adoption and use of similar standards in spatial data collection. Section 5.4.2 discussed how organizations like KW, NWSC, Entebbe TC, Mukono TC, Mukono LD and KCC have started to collect

spatial data following national standards. Adoption of similar spatial data standards is an indicator of change in organizations behaviour. The use of individual spatial data standards had characterized GI activities in Uganda, and was barrier for the development of SDI. By adopting national standards, these organizations which were using different standards, converge in similar direction and become isomorphic. This case reflects the way change in organizations practices follow the principle of normative process asserting that organizations change behaviour and look similar by learning and adopting appropriate standards (table 2-5).

6.2.3. Summary of findings on isomorphism process

There are forces that affect the behaviour of public organizations in Uganda in spatial data sharing. Those forces shape the behaviour of organizations which change in similar ways, and thereby become isomorphic. On the one hand, isomorphism was observed in decision making towards spatial data sharing policies, and in activities related to spatial data handling on the other hand. Table 6-2 shows that there are the convergences of different organizations operating in different domains at both national and local levels towards similar directions.

Table 6-2: Patterns of isomorphism in spatial data sharing policies in Uganda

Isomorphism pattern	Trend of isomorphism	Organization behaviour and sources of influences	Category of organizations	Organization name	Sector of activity	Operation level
Coercive isomorphism	Adoption of pricing policy in spatial data sharing	Compliance to: - Registration of titles Acts: charge fees for access to land information - Land sector strategies plan providing the sale of land information	A	SMD; Mukono LD	Land administration, survey and mapping	National and local
		- Requirement from the Ministry of Finance for generating fees for the public treasury		SMD; DWRM	-Land administration, survey and mapping -Water resources management	National
Normative isomorphism	Adoption of free access policy in spatial data sharing	1. Shared social beliefs on public right to have access to government information 2. Conformism to National constitution providing the freedom of the public to have access to government data.	B	KCC; KW; NWSC; Entebbe TC; Mukono TC; Mukono WDD	- Political and public administration - Water supply and sewerage services	National and local
Normative isomorphism	Restriction on access to spatial data in digital format	1. Similar beliefs about the misuse of spatial datasets 2. Inter-department meetings to decide on spatial data sharing policy.	B	NWSC KW	Water supply and sewerage services	National and local

Isomorphism pattern	**Trend of isomorphism**	**Organization behaviour and sources of influences**	**Category of organizations**	**Organization name**	**Sector of activity**	**Operation level**
Normative isomorphism	Change in spatial data sharing practices: from pricing policy to free access	1. Compliance to SDI decree and Swedish consortium report: recommendations for free exchange of spatial data between public organizations 2. Increased awareness on free exchange of spatial data between public organizations	A	SMD; DWRM; Mukono LD	-Land administration, survey and mapping -Water resources management	National and local
Normative isomorphism	- Change in use of spatial data standards: from individual standards to national standards - Adoption of national spatial data standards	1. Quest for harmonization of spatial data standards for spatial data integration 2. SDI recommendations	A and B	KCC; KW; NWSC; Entebbe TC; Mukono TC; Mukono LD	-Land administration, - Political and public administration - Water supply and sewerage services	National and local

6.3. Conclusion

The aim of this chapter was to find an answer to the question: Do organizations behaviour in spatial data sharing policies relate to any isomorphism process like coercive, normative or mimetic?

Findings show that there are coercive and normative forces that shape the behaviour of organizations in adopting spatial data sharing policy.

1. Coercive forces push organizations in category A, operating in both land sector and water resources management to adopt pricing policy in spatial data as follows:
- In land sector, organizations operating at national and local level behave according to the registration of titles Acts and land sector strategic plan which prescribe that the users of land information and land related data have to pay access fees.
- Organizations that operate in Land sector and water resources management at national level depend on budget from the central government. They adopt pricing policy in spatial data sharing due to the requirements of the Ministry of Finance which compel them to sell spatial data for the collection of fees that they are required to generate for the public treasury.

2. Normative forces shape the behaviour of organizations in three ways:
- Organizations in category B show similar behaviour and adopt free access policy in spatial data sharing because they believe that sharing spatial data for free is the appropriate way to promote the optimal use of spatial data. They perceive that they conform to national constitution which provides the freedom of the public to have access to information held by government body.
- Organizations operating in water supply and sewerage services show similar behaviour in posing restriction on access to spatial data in digital format. They perceive similar environment constraint and then adopt similar strategy in spatial data sharing.
- Organizations in category A which initially follow pricing policy, have adopted a new behaviour and started to share spatial data for free since 2000, when they cooperate with other government bodies. They tend to behave as organizations in category B, due to increased awareness on sharing spatial data for free between government bodies as prescribed by SDI decree and other recommendations aiming at promoting the development of SDI in Uganda.
- Other case of normative process was observed within organizations which adopt similar standards in spatial data collection to solve the complexity resulting from the use of different spatial data standards.

7. Conclusions and recommendations

7.1. Conclusions

The objective of this study was to examine if spatial data sharing policies followed by public organizations in Uganda change over time and reflect a certain pattern of isomorphism. The main research question to attain the research objective was the following: How do spatial data sharing policies adopted by public organizations in Uganda reflect isomorphism trends?

Findings show that public organizations in Uganda have individually and differently adopted spatial data sharing policies and practices. Some organizations adopted pricing policy and charge fees for sharing spatial data with public and private organizations and individuals, while other follow free access policy and share spatial data for free. Organizations which have adopted pricing policy in spatial data sharing, have changed behaviour and follow the principle of free exchange of spatial data when cooperating with other government organizations. Change in behaviour results from increased awareness about appropriate ways of cooperation between government organizations as recommended by SDI decree, Swedish consortium report, and the inter-organizations network which constituted the mechanism for change in spatial data sharing practices.

In relation to the factors influencing public organizations in Uganda in making decision on spatial data sharing policies, the study find that organizations adopting pricing policy in spatial data sharing face coercive forces related to the registration of titles Acts and land sector strategic plan which push organizations operating in land sector to charge fees for spatial data access. There are also the requirements from the Ministry of finance which compel organizations operating in land and water resources management sectors at national level to charge fees in spatial data for collecting fees that go the public treasury. This pressure affects specifically organizations which depend on the government budget for spatial data handling.

Findings show that the behaviour of organizations which share spatial data for free relates to normative isomorphism. Staffs from those organizations share similar belief and assert that free access policy allows the optimal use of spatial data for the public interest and meeting the organizations goals. They state that they conform to national constitution which provides the freedom of the public to have access to information held by government body.

In relation to main research objective and question, sub-research objectives and questions were formulated. Findings to these sub-research objectives and questions are presented as follows:

Specific objective 1: To determine the nature of spatial data sharing policies adopted by public organizations in Uganda and the factors influencing their choice

Q 1: What is spatial data sharing legislation in Uganda?

The research did not find any national legislation on spatial data sharing in Uganda, although there is a national law guiding access to data or information held by government bodies for all citizens. The law (chapter 2, sub-section 2.3.2, and table 7-1) prescribes the legal procedures for the citizens to get access data and information held by government body. Data are accessed in any format, both analogue and digital, at organization office. Data are provided on written request addressed to the information officer who makes decision on request before the release of data. Access may be refused if its provision is likely to prejudice the security or sovereignty of the State or if it is subject to compromise the confidentiality or privacy of any other person. Data are immediately provided upon the approval of requested if access is for free or after the payment of prescribed fees if access is for fees. These are procedures and norms that government organizations follow in data sharing as well as the citizens.

The law on access to government data or information was issued in 2005, but government organizations in Uganda have engaged in spatial data sharing cooperation since many years before the issue of the law (table 4-1). They have developed individual and informal spatial data access policies providing the procedures and conditions on access to spatial data under their possession. Findings show that those organizations have adopted similar procedures related to spatial data access and provision. The procedures look alike the processes on access to data held by government body as prescribed by the national law (tables 5-2 and 5-3). The study assumes that Access to information act formalizes organizations practices on spatial data provision since they do not conflict with the act.

Q2: What are spatial data sharing policies adopted by public organizations in Uganda?

Government organizations in Uganda have individually developed spatial data sharing policy. Some organizations provide spatial data for free while other charge fees for spatial data access. The study classified organizations that follow pricing policy in category A. Organizations operating in land sector, charge fees in spatial data sharing for compliance to the registration of titles acts and land sector strategic plan which prescribe that the public have to pay fees for access to land information and cadastral data. Other motives for charging fees related to revenue generation purpose, in relation with the requirements from the Ministry of Finance. This factor affects also organizations operating in land as well as organizations operating in water resources management at national level.

Organizations which follow free access policy were classified in category B. They consider spatial data as a resource to share for free and a tool for meeting organizations goals. Those organizations share spatial data with other organizations and individuals for conformism to the national constitution which prescribes that the public have the right to access to government information.

In both categories, spatial data are shared in both analogue and digital format, although there are some organizations which restrict access to spatial data in digital format. There are informal procedures which

are followed for spatial data access and provision. Spatial data are provided on verbal or written request, upon approval of officer coordinating activities related to spatial data dissemination.

Specific objective 2: To investigate if spatial data sharing policies are initially different and if they converge to look alike over time

Q 3: Do spatial data sharing policies change and tend to look similar over time?

Currently, there are instances of change in spatial data sharing policies compared to initial stages. Organizations in category A, which follow pricing policy on spatial data access are adopting new behaviour, and have started to share spatial data for free with other government organizations since 2000. This change shows the convergence of the behaviour of organizations in category A to the behaviour of organizations in category B. Organizations in category A share spatial data with other government bodies for free, and then tend to adopt a similar policy as well as organizations in category B. However, there is not a complete convergence, because organizations in category A still charge fees when the cooperation involves private organizations and individuals.

Q 4: Do organizations show any isomorphic behaviour in adopting spatial data sharing policy?

Organizations in category A, which charge fees for spatial data access, face similar environment influences. They make similar decision on spatial data sharing policy following regulations and requirements pushing them to charge fees for spatial data access. Organizations in category B, which share spatial data for free show similar beliefs and perceive that information is a freely sharable good for the public. They perceive that they behave according to the national constitution, which provides the freedom of the citizens to access information held by government organization. Within this category, the study found another isomorphism trend between organizations operating in water and sewerage services which pose restriction on access to spatial data in digital format.

Organisations which initially follow pricing policy in spatial data sharing show new behaviour reflecting change in spatial data sharing practices. They have currently started to share spatial data for free with other government organizations, while they had to charge fees for spatial data access to all users, including government organizations.

Other isomorphism trends relate to adoption and use of similar standards in producing and maintaining spatial data and solving then the complexity resulting from the use of different standards in spatial data handling. This trend was observed within organizations operating in land sector, political and public administration, and water supply and sewerage services at both national and local levels.

Specific objective 3: To interpret if the changes in spatial data sharing policies relate to any isomorphism process namely coercive, normative and mimetic

Q5: Do organizations behaviour in spatial data sharing policies relate to any isomorphism process like coercive, normative or mimetic?

The study identified two types of isomorphism process, coercive and normative in spatial data sharing in Uganda.

1. Coercive isomorphism:

- Organizations in category A, operating in both land sector, at national and local level adopt similar behaviour and conform to the registration of titles Acts and land sector strategic plan which prescribe that the users of land information and land related data have to pay access fees. They charge fees in spatial data sharing as stated by the regulations guiding their activities.
- Organizations operating in land sector and water resources management at national level adopt pricing policy in spatial data due to resources dependency. They depend on budget from the central government for the collection and management of spatial data. The budget provider which is the Ministry of Finance expects from those organizations to generate fees that go the public treasury, from the services they provide to the public. Those organizations charge fees in spatial data sharing for compliance to that requirement from the Ministry of Finance and for maintaining the financial relations.

2. Normative isomorphism:

- Organizations in category B, which share spatial data for free show similar behaviour, in making decision on spatial data sharing policy. In opinions of staffs from those organizations, free access policy promotes the use of spatial data for achievement of organizations mission. Furthermore, they adopt free access policy to conform to the national constitution which provides the freedom of the public to have access to information held by government body.
- Since 2000, organizations in category A have adopted new behaviour, and share spatial data free as well as organizations in category B, when they cooperate with other government organizations. They consider free exchange of spatial data as the appropriate way to cooperate with other government organizations.
- Other instance of normative isomorphism relates to the similar behaviour of organizations from different sectors of activities which have adopted the use of similar standards in spatial data collection for solving the problems affecting spatial data integration due to the use of individual and different spatial data standards.

7.2. Validation of research hypotheses

The study formulated three hypotheses in investigation on isomorphism trend in spatial data sharing in public sector in Uganda. Findings on research questions help to draw conclusions on research hypotheses as follows:

Hypothesis 1: Spatial data sharing policy, initiated individually by public organizations in Uganda, tend to look similar over time by compliance to the national spatial data sharing directives.

There are no national directives that guide activities of public organizations in spatial data sharing in Uganda. A national law on spatial data dissemination is inexistent. The law is still needed for guiding organizations' activities in spatial data sharing. If there was law, organizations would be expected to show defiant or conforming behaviour to the law. The study finds that there is a national law guiding and prescribing the legal procedures for the citizens to get access to government data and information, and the current spatial data sharing policies or practices do not defy the national law on data access. The study assumes that the law constitutes a legal back of individual spatial data sharing policies adopted by public organizations in spatial data sharing.

Hypothesis 2: Professional communities of staff interested in SDI development are the cause of changes in data provision as normative pressures affect organizations practices.

Public organizations which charge fees for access to spatial data are currently adopting new behaviour and share spatial data for free with other government organizations. This behaviour is observed from 2000, when stakeholders like the heads of departments, survey unities and other officers, coordinating the activities related to spatial data collection and sharing, started to meet through and make agreement on sharing spatial data for free. They behaviour is a response to different directives aiming at the development of SDI, like DI decree and Swedish consortium report that recommend public organizations to adopt similar spatial data sharing policy and to share spatial data for free with other government organizations.

Hypothesis 3: Public organizations in Uganda adopt over time similar approaches in cooperation for spatial data provision by imitation of each other practices.

There is no evidence that show that public organizations in Uganda copy or emulate spatial data sharing practices of other organizations. Organizations under study negated to mimic other organizations spatial data sharing practices (tables 4-12 and 4-13).

To sum up, the study examined whether public organizations in Uganda tend to harmonize policies related to spatial data sharing. Findings show that organizations which charge fees on spatial data access are showing new behaviour and tend to adopt similar practices in sharing spatial data for free with other government bodies. The change in the behaviour of organizations relates to normative process. Following the current trend, it can be predicted that, public organizations in Uganda will adopt similar spatial data sharing policy as other countries at international level like the USA, European countries,

Australia, Canada and South Africa where policies on spatial data sharing provide free flow of geoinformation between government organizations.

7.3. Recommendations

Based on the findings, this study makes two recommendations categorized into two: promotion of spatial data sharing in Uganda and further researches.

7.3.1. For the promotion of spatial data sharing in Uganda

The government of Uganda could promulgate spatial data sharing law which states clearly the terms on spatial data access for both government bodies and private users. The law should include the standards prices for spatial data in the case the users have to pay fees for access to spatial data held by government body. The law should aim at solving the disparities observed in spatial data prices, practiced by different organizations in Uganda. The government may also declare a coordinating body of spatial data dissemination and which should insure the implementation of the law.

7.3.2. For further research

In this study, isomorphism behaviour was investigated in the context of spatial data sharing policies. Another study should be extended to other aspects like the use of common spatial data standards in spatial data handling. This aspect was partially discussed in this study. A further research should aim at investigating the standards public organizations in Uganda were using at initial stage of their activities related to spatial data collection and when they have started to follow national standards.

Spatial data sharing is an international practice and harmonization of spatial data sharing policies is a common trend worldwide. The theory of isomorphism can be used in examining how public organizations in other countries of Africa or elsewhere harmonize spatial data sharing policies. A research on such issue in different countries may help in assessing if any of the processes of isomorphism is more prominent in a country rather than in another or whether isomorphism forces affect public organizations in different countries in similar ways.

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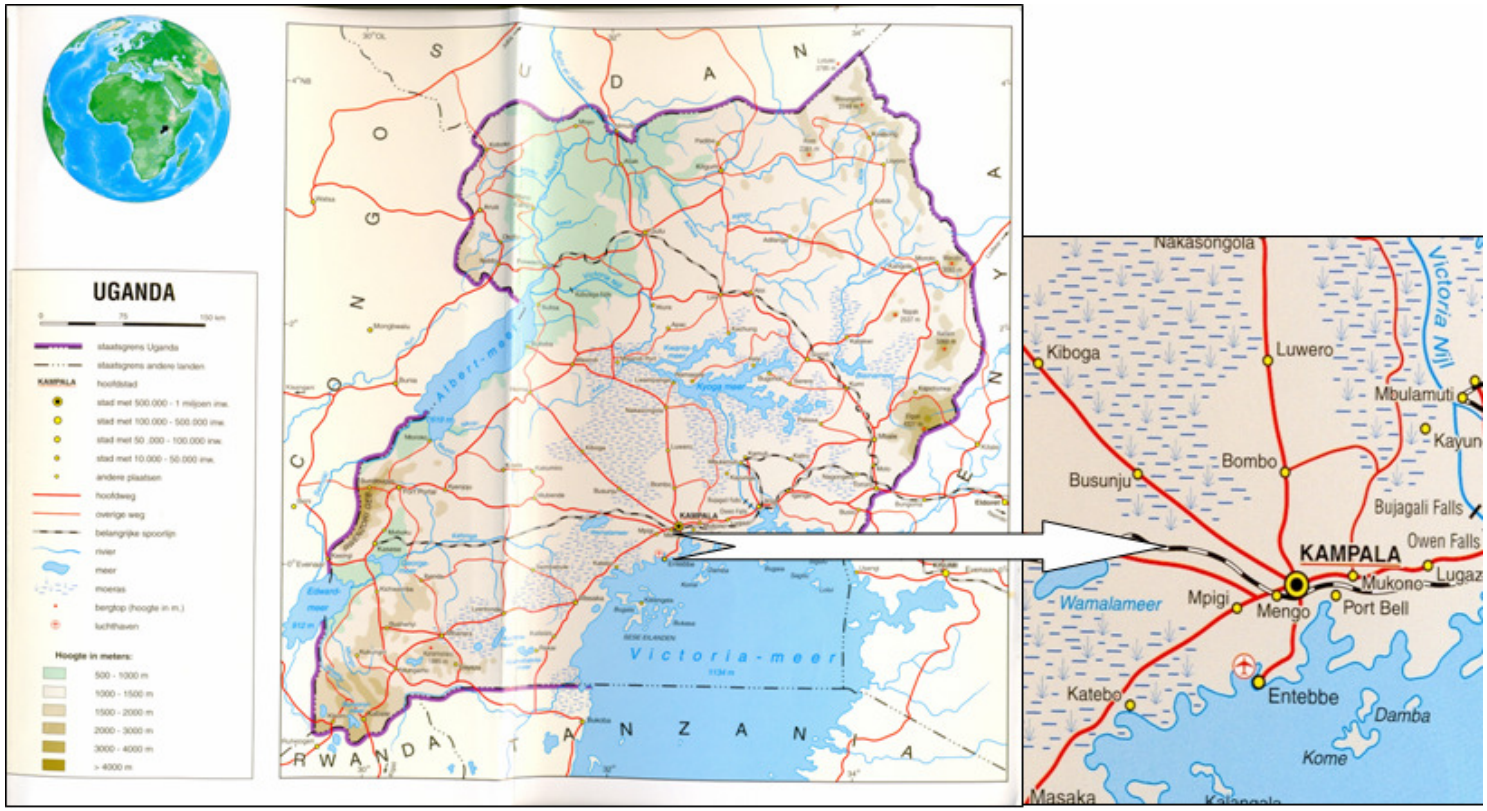
Appendix 1: Location of the study area



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Appendix 2: Survey questionnaire

SURVEY QUESTIONNAIRE FOR THE STUDY ON:
Analyzing behaviour of public organizations in spatial data sharing in Uganda

The purpose of this survey is to find out how public organizations cooperate in geo-information sharing in Uganda. This fieldwork is part of the thesis research project above and a requirement for the MSc Degree in Land Administration at ITC. We are committed to keep privacy of all the information provided by the respondents and the information will be used for study purpose only.

Name of surveyor: UWAYEZU Ernest **Questionnaire number:** ……..
Tel: 0784513502 **E-mail:** uwayezu20576@itc.nl

Section 1: Profile of Respondents

Name of respondent…….

Organization……Position or Job title:……

Address…….E-mail…….

Tel……Fax……

…Date of interview:…….. Time for interview:

Section 2: Questions

1. What types of spatial data does your organization collect or produce?
……
……
……
……
…

2. If your organization provides these spatial data in any form to someone else from another government organization, do you generally expect money in return?
No: ☐ Yes: ☐
- Is there any law or directive to provide data for free or fees?
……
……
…

2.1 What are the people who have to pay when your organization provides them spatial data?
…….

2.2 If your organization needs payment for providing spatial data to other government organization, when did the practice of request for payment start?
…….

2.3. If your organization does not need payment for providing spatial data to other government organization, when did this practice of no payment start?

…….....

2.4. What were the conditions to provide spatial data before that date?

……
……
……

3. Has your organization ever changed conditions placed on data access: shifting from free access to access for fees or vice versa?

No: ☐ Yes: ☐

If yes, what are the reasons?

……
……
……

4. If other government organizations provide your organization any spatial data, do they expect a payment for this data? No: ☐ Yes: ☐

4.1. If ever you have to pay for other government organizations spatial data, when did this practice (of having to pay) start?

……..

5. From where does your organization get funds to collect or produce spatial data?

……
……
……

6. How does your organization allocate funds to lower level organizations to ensure spatial data production?

……
……
……

7. For what sort of spatial data or Geoinformation products do you need to pay when you get them from other organizations?

……
……
……

8. With what sort of organizations do you need to pay for their spatial data or related products? (Please, tick the correct answer)

- Government organizations: ☐
- Semi-government organizations: ☐
- Private organization: ☐
- Other (to be specified):

9. Who in your organization makes decisions about sharing spatial data with other organizations?

……
……
……

10. Has your organization defined Geo-information products or related services to be provided to other organizations? Yes: ☐ No: ☐

If yes, which ones?
……
……
If not, why not?
……
……
……

11. Have you ever contacted people from other organizations when you have to make decision about providing spatial data or Geoinformation products to other organization?

Yes: ☐ No: ☐

11.1. If yes, for which matters do you contact them? (Please, briefly explain)
……
……
……

12. Do you think that providing spatial data and services to citizens is a core activity of your organization?
Yes: ☐ No: ☐

13. In your organization, is the provision of spatial data to third parties similar to the provision of non-spatial data to third parties? Yes: ☐ No: ☐

If no, what are the reasons? (Please, briefly explain)
……
……
……..

14. Can any staff in your organization provide spatial data or related products to someone from another organization without prior approval of the boss?
Yes: ☐ No: ☐

If no, what are the reasons? (Please, briefly explain):
……
……
……

Thanks for the cooperation

Appendix 3: List of respondent

Number	Names	Organization	Phone number	Role in organization	Job title
1	Moses Ronald Oteng	Kampala water	0717316566	Technician	Surveyor
2	Namuli Pauline	Kampala water	0717316578	Technician	Surveyor
3	Dora Mwesigye	Kampala water	0717316564	Technician	Surveyor
4	Gilbert Akoli	Kampala water	0717316562	Decision maker	Senior GIS Officer
5	Mugisha Feriha	Kampala water	07121956638	Technician	Engineer network modelling
6	Karl Tiller	Kampala water	0717316194	Decision maker	Senior GIS expert
7	Lawrence Muhairwe	National Water and Sewerage Corporation	0777474048	Decision maker	Manager of mapping block
8	Waiswa Ben	National Water and Sewerage Corporation	0782918161	Technician	Surveyor
9	Tumuheirwe Evas	National Water and Sewerage Corporation	0772618364/ 0717315009	Technician	Surveyor
10	Ayusasire Barigye Emily	National Water and Sewerage Corporation	0717315012	Technician	Assistant Surveyor
11	Bonnie K. Nsambu	KCC	0772200353	Decision maker	Programme engineer
12	Sam Okiya Okiiso	KCC	07722456252	Technician	Staff surveyor
13	Katebaliwe Peter	KCC	0772434852	Technician	Senior physical planner
14	Joseph Ssemambo	KCC	0772522861	Decision maker	Head of GIS unity
15	Waseni George	KCC	0772462748	Technician	Senior staff surveyor
16	John Kitaka	Department of Survey and Mapping	0772681996	Technician	Acting head of mapping unity
17	Moddy Kajumbura	Department of Survey and Mapping	0772603866	Decision maker	Commissioner of Survey and mapping department

18	Asizua Fax	Department of Survey and Mapping	0414320304	Technician	Cartographer
19	Ebunyu Wilson Ogaro	Department of Survey and Mapping	0772516125	Decision maker	Principal land Officer
20	Dr. Yafesi Okia	Department of Survey and Mapping	0772563152	Decision maker	Principal staff surveyor
21	Mrs Kaliisa Kabahuma Beatrice	Department of Survey and Mapping	0772314411	Technician	Principal Cartographer
22	Kabundama Richard	Department of Survey and Mapping	0772464497	Technician	Cartographer
23	Okitela Crispin	Department of Survey and Mapping	0712425171	Technician	Senior Cartographer
24	Richard Oput	Ministry of Lands, Housing & Urban Development	0772412702	Decision maker	Land Tenure Reform Project coordinator
25	Mukiibi Joseph	Entebbe Municipality Council	0772586260	Technician	Municipality engineer
26	Kadama Ruuwa Margaret	Entebbe Municipality Council	0712836993	Technician	Physical planner
27	Caroline Wafula	DWRM	0755890250	Technician	Head of GIS unity
28	Pule Johnson	DWRM	0772441677	Technician	Senior Hydrologist
29	Ssekamuli Benjamin	DWRM	0772894236	Technician	Hydrologist
30	Eva Lwanga	DWRM	0772409378	Technician	Senior Hydrologist
31	Kataratambi David	DWRM	0712937855	Technician	Acting Senior water officer
32	Richard Musota	DWRM	0772520966	Technician	water officer
33	Kyosingira Wilson Fred	DWRM	0772441265	Decision maker	Assistant commissioner water resources
34	Leodinous Mwebembezi	DWRM	0772427656	Decision maker	Principal Water Officer
35	Migadde Robert Ndugwa	Mukono Town Council	0776212972	Technician	Town physical planner
36	Sserunjogi Josiah	Mukono Town Council	0772507118	Officer	Senior Town Engineer

37	Mutaawe Musa	Mukono Town Council	0712860525	Technician	Physical planner assistant
38	Bbuye Martin	Mukono District	0772591893	Technician	District physical planner
39	Musiitwa George	Mukono District/ Lands Department	0772521180	Technician	District staff surveyor
40	Kyedde Wilberforce	Mukono District/ Lands Department	0772303932	Technician	Cartographer
41	Kiyini James	Mukono District/ Lands Department	0772494204	Technician	Cartographer
42	Kalule James	Mukono District/ Water Development department	0772655252	Officer	District water officer
43	Kavuma Vincent	Mukono District/ Water Development department	Not provided	Technician	Assistant water officer
44	Buteraba Eunice	Mukono District/ Water Development department	0772560867	Technician	Assistant water officer
45	Grace Nassuma	Ministry of Energy and Mineral Development	0414300118	Technician	Principal documentation Officer
46	Agnes Alaba Kuterema	Ministry of Energy and Mineral Development	Not provided	Technician	Principal Staff Cartographer

Appendix 4: Airborne geophysical digital data dissemination policy

The Republic of Uganda

MINISTRY OF ENERGY AND MINERAL DEVELOPMENT

AIRBORNE GEOPHYSICAL DIGITAL DATA DISSEMINATION POLICY

Introduction

The High Resolution Airborne Geophysical Survey Programme involving magnetic, radiometric and electromagnetic surveys that is aimed at assisting and promoting mineral exploration commenced in December 2006.

The large volume of data and the increasing number of requests by mineral investors and other interested parties for data windowed to their areas of interest has necessitated the development of a data dissemination policy which will eventually be transformed into a dedicated online data storage and management system including a customised viewing, handling and archiving system.

The airborne geophysical management system shall store all grid and line archives in a consistent format that guarantees data integrity and facilitates data distribution. Where areas of interest encompass more than one survey, grid data are supplied as individual survey grids and also as windowed supergrids. Supergrids are compilations from all available high-resolution and regional data and are upgraded regularly as new survey data become available.

The current high resolution surveys followed the regional airborne geophysical surveys for mineral exploration that was funded by United Nations Development Programme (UNDP) in 1961 and Government of Uganda in in1980 and achieved almost 50% national coverage. These surveys were typically flown with 1 km line spacing, 10 km ties and 120 m ground clearance. All magnetic data of the regional programme were subsequently compiled into one consistent data set merged during the African Magnetic Mapping Project in 1992. Therefore in addition to the new high resolution airborne geophysical data, the regional airborne geophysical data including magnetic and radiometric data are also available for dissemination.

Due to industry demand, the Ministry of Energy and Mineral Development (MEMD) and Department of Geological Survey and Mines (DGSM) may decide to release certain airborne geophysical data in preliminary form. These data will have been fully processed by Fugro Airborne Surveys, and reviewed independently by DGSM's quality control experts. The final products may contain minor adjustments, and will include additional channels and grids. Any purchase of preliminary data will include a copy of the final data for the same area when those products are released.

Objectives of Establishing Airborne Geophysical Data Dissemination Policy

To put in place efficient, effective and transparent tools for disseminating airborne geophysical data of Uganda so as to attract mineral investment in the Country.

Policy Goal: Increase mineral sector investments as a result of wide dissemination of Airborne geophysical data to potential investors.

Strategic Tools for Disseminating Airborne Geophysical Data

The following comprises the Strategic Tools for Managing Airborne Geophysical Data:

1. Both the old regional geophysical data and the new high resolution data including all data types shall be part of the data archive for dissemination.

2. Data shall be distributed to interested parties upon completing a data requisition form (Annex 1) and payment of a nominal reproduction cost reflected in the price list in Annex 2.

3. Whether an entity (company or individual) has a mineral right or not, he/she is entitled to acquire any data of his/her interest covering any part of the country.

4. Research Institutions shall receive the data free of charge but on condition that they use the data only for the purpose they acquired it. They shall also provide feedback in form of the copies of their thesis or research paper.

5. Before data is handed over, a data Confidentiality Agreement between the individuals/company/organisation who takes the data and the Department of Geological Survey and Mines shall be signed. The data confidentiality agreement (Annex 3) shall be adhered to by all those taking the data.

6. The funds shall accrue to a Fund to be established within Ministry of Energy and Mineral Development to support the promotion of the mining industry.

7. In some cases data may be released in preliminary form after being fully processed and reviewed independently by DGSM's quality control experts. The final products may contain minor adjustments, and will include additional channels and grids. Any purchase of preliminary data will include a copy of the final data for the same area when those products are released.

Airborne Geophysical Digital Data Sales – Pricing Schedule

Data Format

Grid data are delivered in Oasis Montaj Geosoft grid file format.

Line data are delivered in Oasis Montaj Geosoft format and ASCII file format and a format description file accompanies each data file.

Data Windowing

Data shall generally be sold on the basis of standard topographical map sheets. However, data can also be windowed to any boundary on request.

Payments

All process stated below are exclusive of shipping charges

PROCEDURES FOR ACQUISITION OF AIBORNE GEOPHYSICAL DATA

1. First get a copy of the airborne Geophysical Data Dissemination Policy.

2. Geophysicist calculates the Total line Km and Amount to be paid.

3. Fill the data requisition form specifying which data is required.

4. Geophysicist fills the Pro forma Invoice indicating the amount to be paid.

5. Obtain Bank Advice Forms (BAF'S) from Accounts Section

6. The filled Bank Advice Forms (BAF'S) are taken to Diamond Trust Bank (DTB)- Kampala Road and money paid to MEMD Bank account.

7. Present the URA Bank Payment receipt and the stamped Copy of the BAF to DGSM Accounts section and a copy to Geophysics Section

8. The receipt is entered in the Hard cover book in Accounts for Accountability

9. The Customer then signs a Confidentiality and Copyright Agreement

10. Lastly, the hard or digital copy of the requested data is handed over to the customer with any guidance that may be required from the Geophysicist.

11. DGSM shall not be liable to any data taken without a Geophysicist's endorsement.

Magnetics and Radiometrics

Complete digital magnetic and radiometric data (line data) are sold for Ug Shs 30 (1 US $ =Shs 1800/=) per line-kilometre. In case of grids only the price is calculated on the area covered by the data at Ug Shs 150 per km2 for each grid (magnetic and radiometric).

Geotiffs

Digital Geotiffs are produced from the Supergrids, which are compilations of all high resolution and regional data available. Geotiffs are based on the standard 1:50.000 topographical map sheets and are sold at Ug Shs 10,000 per sheet, for magnetics and Ug Shs 10,000 for radiometrics.

Electromagnetics

Electromagnetic data are sold for Ug Shs 300 per line-kilometre including grid and line data.

Regional Geophysical Data

The regional airborne geophysical surveys for mineral exploration which was funded by UNDP from 1960s and achieved almost 50% coverage in the early 1980's. These surveys were typically flown with 1 km line spacing, 10 km ties and 120 m ground clearance. These magnetic and radiometric surveys have been merged and compiled into consistent data grids. Therefore in addition to the new high resolution airborne geophysical data, the regional airborne geophysical data including magnetic and radiometric data are also available for dissemination. The entire data set is sold for Ug Shs 1,500,000.

Contacts:

1. Joshua. T. Tuhumwire

Phone: +256 (0)414 320559 or +256(0)312262902

Commissioner, Department of Geological Survey and Mines

Email: joshua.tuhumwire@minerals.go.ug

dgsm@minerals.go.ug

2. Edwards Katto Phone: 256 414 323432 or +256 (0)414 320656

Project Coordinator, Email: minerals@infocom.co.ug

Sustainable Management of Mineral Resources Project

Appendix 5: Cooperation agreement between the Uganda Meteorological Department (UMD) and Water Resources Monitoring and Assessment Department (WRMAD)

THE REPUBLIC OF UGANDA

Government of Uganda

Ministry of Water and Environment

CO-OPERATION AGREEMENT BETWEEN THE UGANDA METEOROLOGICAL DEPARTMENT (UMD) AND WATER RESOURCES MANAGEMENT DEPARTMENT (WRMD)

CONCERNING COLLABORATION IN THE MANAGEMENT AND OPERATION OF AUTOMATIC WEATHER STATIONS, MANUAL WEATHER STATIONS, DATA EXCHANGE, DATA PROCESSING AND WATER RESOURCES ASSESSMENT

A. PREAMBLE

Recognising

- The importance of meteorological services in the successful implementation of the water resources activities under the Water Resources Management Department
- And the need to build climatological statistics for continued related studies and monitoring of the environment.

And Considering

- That meteorological service requires a highly multi-disciplinary science competence with several areas of specialisation.
- That the implementation of the Water Resources Assessment is being co-ordinated by Water Resource Management Department (WRMD)

And Noting

- That there is no hydro-meteorologist specialist on the WRMD staff.
- That in the past, limited consideration for the participation of UMD has been made at the time of design of the related project and programs.

It Is Hereby Agreed

That there be collaboration between Water Resources management Department and Uganda Meteorological Department (UMD):-

- For the sole purpose of addressing the operation of the network of automatic weather stations in the operational areas per the attached schedule.
- That the end result is to provide suitable data for environmental management in general and Water Resources Assessment in particular to facilitate Water Resources Assessment activities.
- Future cooperation related to addressing weather and climate issues as they relate to water resources assessment and management will start prior to the design of related programs.

B. OBJECTIVES

- This Agreement concerns the co-ordination and operation of the network of automatic & manual weather stations in the country and the related data processing activities.

GENERAL ISSUES

- The implementing agencies are WRMD and UMD
- The operational areas shall be the entire country of Uganda
- A network comprising of automatic weather stations has been agreed between the two parties. The downloading of the data from these stations will be in accordance with a field visit schedule as shall be planned by WRMD.

C. AREAS OF COOPERATION

The following will be the areas of cooperation:-

- data exchange
- Installation of automatic weather stations
- climatological data collection, processing, analysis and dissemination
- Water Resources Assessment studies that involves climatological information
- Operation of any other type of weather stations and its data collection platforms and technologies
- Any other area that will be mutually identified by the two parties.

D. OBLIGATIONS

D1. UMD obligations and activities

UMD will provide:

- A specialist in hydro-meteorological data processing.
- A specialist in meteorological instrument maintenance.
- Installation of the equipment and instruments according to World Meteorological Organisation (WMO) standards;
- Routine inspection of the specified stations, in accordance with WRMD work plans;
- Provide professionals and technical staff in Hydrometeorology to participate in carrying out Water Resources Assessment studies

- UMD shall avail required quality-assured hydro-climatological data in a usable format and most especially rainfall data, evaporation data and information to WRMD on request;
- Standardisation of equipments
- UMD will participate in working sessions for data interpretation with WRMD;

D2. WRMD obligations and activities

The WRMD will provide:

- Access by UMD to relevant processed data from all automatic weather monitoring stations, within 20 days from the date of observation;
- Transport and subsistence allowances sufficient for installation of equipment monitoring and maintenance on a monthly/quarterly visits, in accordance with the work plan prepared by WRMD;
- WRMD will participate in working sessions for data interpretation with UMD;
- After completing the data analyses, a copy of the data will be made available to UMD
-

E. OTHER PROVISIONS

- This Agreement will come into force immediately following the signing ceremony, and will continue in force until mutually terminated by the two parties.
- Both parties agree that the signing of this Agreement is the prerequisite for the provision of services as described in Paragraphs C, D and E.
- This Agreement will become due for review every three years. However, either party can request for a review of this Agreement at any time through a written notice.
- It is the mutual responsibility of UMD and WRMD to ensure the security of equipment in collaboration with the relevant authorities to guard against vandalism.
- In the event any of the two institutions change in structure, then the new bodies should subsume the provisions of this MOU.

F. SETTLEMENT OF DISPUTES

Amicable Settlement

The parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this agreement or interpretation thereof.

Right to Arbitration

Any dispute between the parties as to matters arising pursuant to this agreement which cannot be settled amicably within thirty (30) days after receipt by one party of the other party's request for such amicable settlement may be submitted by either party for arbitration to the Permanent Secretary of the Ministry responsible for Water and Meteorology.

G. SIGNING OF THE AGREEMENT

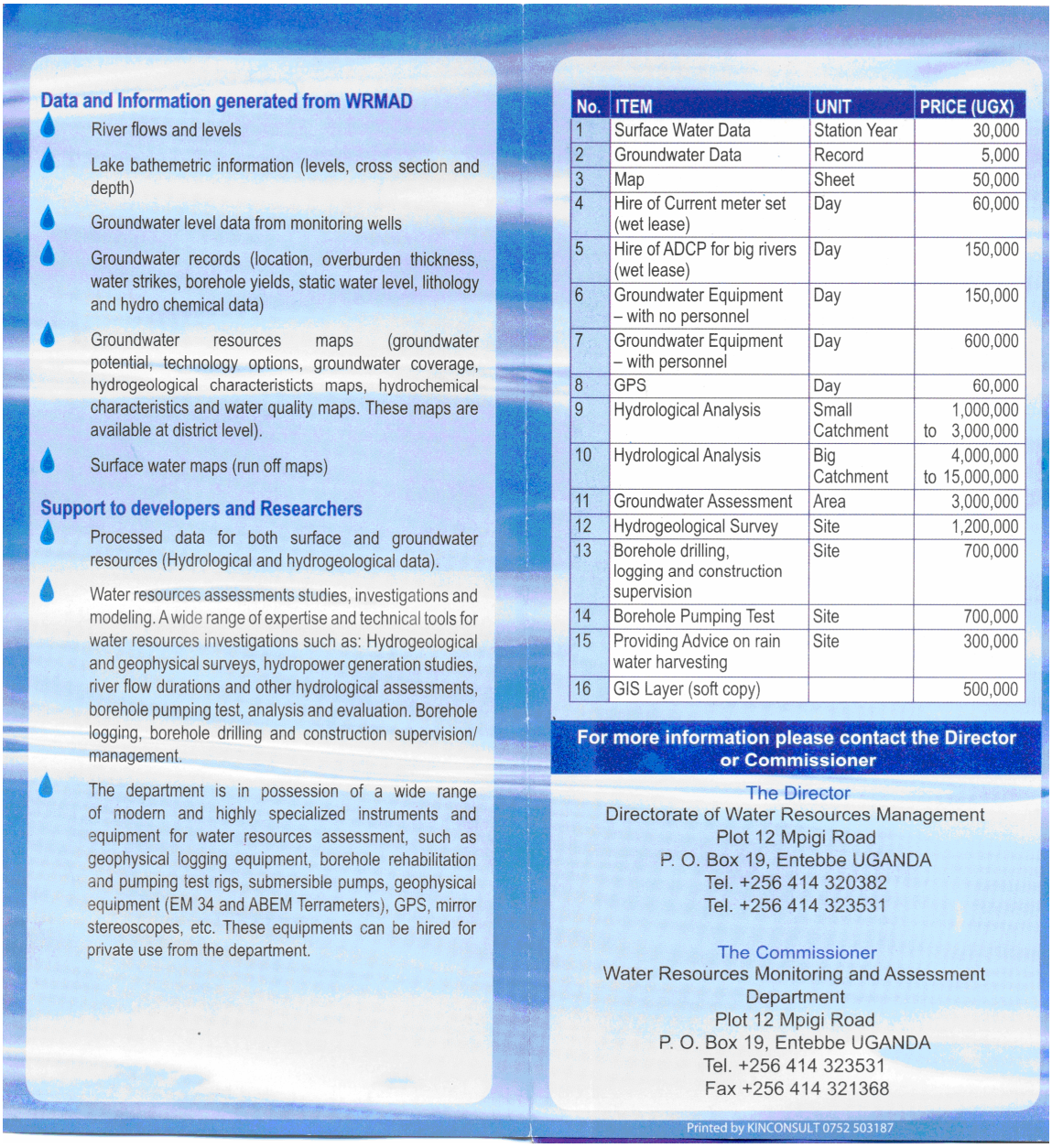
The Commissioner for Meteorology Uganda Meteorological Department Signed ... Date ..15th August 06....	The Commissioner for Water Resources Management Water Resource Management Department Signed ..... Date ..01 AUGUST 2006.....
The Assistant Commissioner (Applied Meteorology & Data Processing) Uganda Meteorological Department Kampala Witnessed..... Date .....15th August 06	The Assistant Commissioner (Water Resources Monitoring & Assessment) Water Resource Management Department Entebbe Witnessed..... Date .....09.08.2006.....

Appendix 6: Types of spatial data collected by each organization and spatial data acquired from other organizations

Organization name	Spatial data captured by organization	Spatial data acquired from other organizations	
		Type of spatial data	**Spatial data provider**
SMD	Topographic data (contour lines), hydrographical data (lakes and rivers) geodetic, buildings, transport infrastructure (roads, railways) and cadastral data.	Aerial photographs	IGN-France
		Satellite images	RCMRD
		Tourist sites location	Ministry of Tourism, Trade and Industry,
		Roads, buildings, and land parcels boundaries	KCC
		Forestry boundaries	NFA
		Cells boundaries	Electoral commission
		Water infrastructures data	NWSC and KW
		Water bodies boundaries (river, lakes), water points and catchments.	DRWM
		Statistical and population data	UBOS
DWRM	Rainfall, hydrology spatial data, water bodies (river, lakes, water points, boreholes, and catchments.	Topographic data, cadastral data; aerial photographs; satellite images	SMD
		Land cover and irrigation sites	Ministry of agriculture
		Forest cover	NFA
		Geological data	Ministry for Mines and Energy
		Water and sewerage infrastructures data	NWSC
		Roads, land use	Entebbe TC
NWSC	Water and sewerage infrastructures spatial data: water pipe lines systems valve, washout, water tank, and sewerage canals, customers locations and premise	Satellite images	RCMRD
		Aerial photographs, cadastral data, topographic data, building and roads	SMD
		Building and roads	KCC
		Public infrastructures : roads, schools, and land parcels boundaries	Mukono TC
		Cadastral data	Mukono LD
		Water bodies boundaries (river, lakes), water points	DRWM
		Water and sewerage infrastructures data	NWSC
		Satellite images	RCMRD

Organization name	Spatial data captured by organization	Spatial data acquired from other organizations	
		Type of spatial data	**Spatial data provider**
KW	Pipe lines systems with valve, washout, water tanks, customers' premises and sewerage canals	Building and roads	KCC
		Aerial photographs, cadastral data, topographic data, building and roads	SMD
		Water bodies boundaries (river, lakes), water points	DRWM
		Water and sewerage infrastructures data	NWSC
		Satellite images	RCMRD
KCC	Spatial data related to public infrastructures like roads, buildings, water, electricity and land parcels boundaries	Aerial photographs, cadastral data, topographic data, building and roads	SMD
		Satellite images	RCMRD
		Water infrastructures data	NWSC and KW
		Water points and water bodies	DWRM
Entebbe TC	Spatial data related to roads, land use, land parcels boundaries, and cells boundaries	Cadastral data, topographic data, building and roads	SMD
		Water infrastructures data	NWSC
		Water bodies (river, lakes)	DWRM
Mukono TC	Spatial data related to public infrastructures such as roads, schools, hospitals, and land parcels boundaries	Topographic data	SMD
		Water infrastructures data	NWSC
		Cadastral data,	Mukono LD
		Water resources boundaries and water points	Mukono WDD
Mukono L D	Land parcels boundaries and ownerships	Topographic data	SMD
		Public infrastructures	Mukono TC
		Forest cover	NFA
		Land cover	Ministry of agriculture
Mukono WDD	Water resources location and boundaries and catchments	Water bodies boundaries and catchments	DRWM

Appendix 7: Data and information generated from WRMAD and prices



Data and Information generated from WRMAD

- River flows and levels
- Lake bathemetric information (levels, cross section and depth)
- Groundwater level data from monitoring wells
- Groundwater records (location, overburden thickness, water strikes, borehole yields, static water level, lithology and hydro chemical data)
- Groundwater resources maps (groundwater potential, technology options, groundwater coverage, hydrogeological characteristicts maps, hydrochemical characteristics and water quality maps. These maps are available at district level).
- Surface water maps (run off maps)

Support to developers and Researchers

- Processed data for both surface and groundwater resources (Hydrological and hydrogeological data).
- Water resources assessments studies, investigations and modeling. A wide range of expertise and technical tools for water resources investigations such as: Hydrogeological and geophysical surveys, hydropower generation studies, river flow durations and other hydrological assessments, borehole pumping test, analysis and evaluation. Borehole logging, borehole drilling and construction supervision/ management.
- The department is in possession of a wide range of modern and highly specialized instruments and equipment for water resources assessment, such as geophysical logging equipment, borehole rehabilitation and pumping test rigs, submersible pumps, geophysical equipment (EM 34 and ABEM Terrameters), GPS, mirror stereoscopes, etc. These equipments can be hired for private use from the department.

No.	ITEM	UNIT	PRICE (UGX)
1	Surface Water Data	Station Year	30,000
2	Groundwater Data	Record	5,000
3	Map	Sheet	50,000
4	Hire of Current meter set (wet lease)	Day	60,000
5	Hire of ADCP for big rivers (wet lease)	Day	150,000
6	Groundwater Equipment – with no personnel	Day	150,000
7	Groundwater Equipment – with personnel	Day	600,000
8	GPS	Day	60,000
9	Hydrological Analysis	Small Catchment	1,000,000 to 3,000,000
10	Hydrological Analysis	Big Catchment	4,000,000 to 15,000,000
11	Groundwater Assessment	Area	3,000,000
12	Hydrogeological Survey	Site	1,200,000
13	Borehole drilling, logging and construction supervision	Site	700,000
14	Borehole Pumping Test	Site	700,000
15	Providing Advice on rain water harvesting	Site	300,000
16	GIS Layer (soft copy)		500,000

For more information please contact the Director or Commissioner

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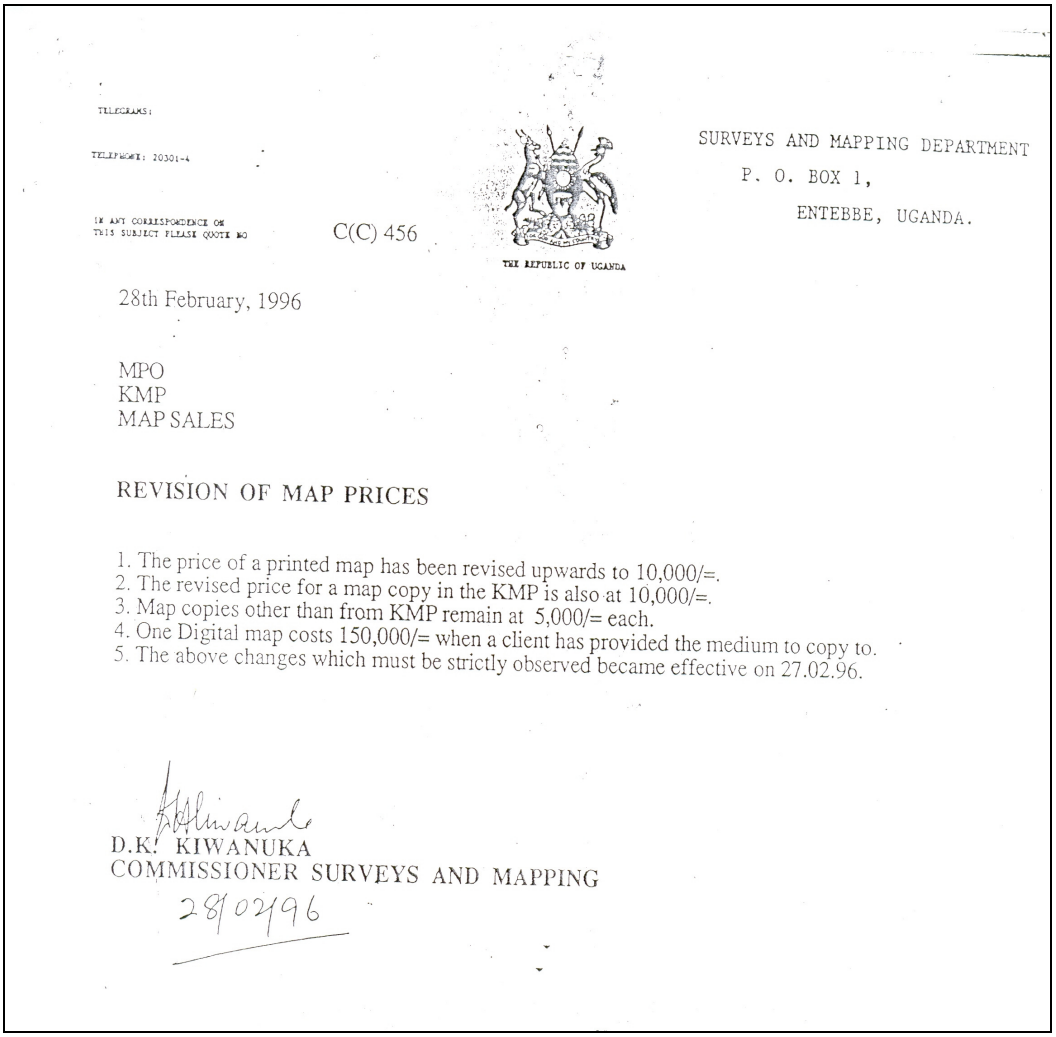
Appendix 8: Prices for spatial data provided by Survey and Mapping Department



TELEGRAMS:

TELEPHONE: 20301-4

IN ANY CORRESPONDENCE ON THIS SUBJECT PLEASE QUOTE NO.

C(C) 456

THE REPUBLIC OF UGANDA

SURVEYS AND MAPPING DEPARTMENT
P. O. BOX 1,
ENTEBBE, UGANDA.

28th February, 1996

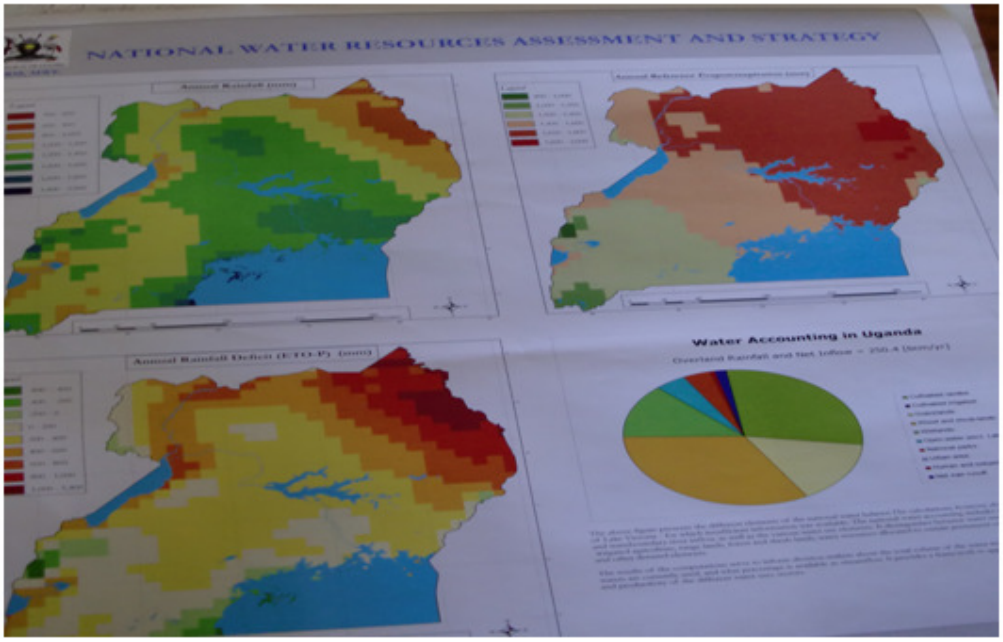
MPO
KMP
MAP SALES

REVISION OF MAP PRICES

1. The price of a printed map has been revised upwards to 10,000/=.
2. The revised price for a map copy in the KMP is also at 10,000/=.
3. Map copies other than from KMP remain at 5,000/= each.
4. One Digital map costs 150,000/= when a client has provided the medium to copy to.
5. The above changes which must be strictly observed became effective on 27.02.96.

D.K. KIWANUKA
COMMISSIONER SURVEYS AND MAPPING
28/02/96

Appendix 9: A GIS technician at DWRM prints a map for a customer



Appendix 10: DECREE ON SPATIAL DATA INFRASTRUCTURE

Land and geographic information or spatial information describes information that can be related to a position on the earth's surface whether that be on the land, sea or in the air. There are few areas of the economy which do not rely either directly or indirectly on this kind of information for planning, maintaining or rationalising activities.

The Government of Uganda views land and geographic information as an infrastructure, with the same rationale and characteristics as roads, communications and other infrastructure. Uganda shall have the spatial data infrastructure needed to support their economic growth, and their social and environmental interests, backed by national standards, guidelines, and policies on community access to that data. Everyone can collect the spatial information that they need at the national, regional and local level, but this leads to costly duplication of data and inconsistency. It also results in data that cannot be integrated with other data and used as a basis for spatial modelling and analysis to produce value added information. In other words, excessive costs, inefficiencies, confusion and decision making based on poor information.

The Government of Uganda believes that this country does not have the resources to waste on such duplicated efforts.

Therefore the implicated organisations should reach agreement on what fundamental datasets are required in the national interest, to what standards they should be collected and maintained, which agencies should have custodianship of those data, and what the national priorities are for collection of those data. The implicated organisations shall establish a Spatial Data Infrastructure Committee, and commit to:

- Institutional cooperation that provides mechanisms for sharing experience, technology transfer and coordination of the development of the national fundamental datasets;
- Use of common technical standards, including a common geodetic reference frame, so that data from numerous databases can be brought together to create new products and solve new problems, both nationally and locally
- Adoption of common policies on data access, pricing, privacy, confidentiality and custodianship;
- Implementation of inter-governmental agreements on data sharing of Key Data Sets
- Contribution to freely accessible directory of available data sets containing descriptions and administrative information that accords with agreed standards for metadata.

Within one year of the issue of this decree each of the institutions shall have accomplished:

- To document geospatial data it collects or produces, either directly or indirectly, using the standard set forth by the Spatial Data Infrastructure Committee, and make that standardized documentation electronically accessible to a coordinating body.
- To define their contribution to the National Key Data Set and distribute them freely to other government agencies on request.