National Planning Support Systems Appropriation in Secondary Cities in Rwanda

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ABSTRACT

Planning support systems (PSS) are a set of computer-based geo-information tools which consist of special features that stakeholders within a planning process can utilise for tasks such as analysis, communication and handling information. These tools have captured the attention of many researchers who have shown that PSS can be used in various domains such as transport, water management and policy implementation. Many of the PSS studies have focused on the application at one administrative level (national, regional and local levels) but little on how PSS can link the different administrative levels. Therefore this study sought to understand how local governments might appropriate national level PSS tools and outcomes in the local planning processes. The study used special PSS (SDF's PSS tools and outcomes) that are part of the Spatial Development Framework of Rwanda (SDF), a methodology developed to guide spatial development in Rwanda and help in the implementation of the Rwanda National Urbanisation Policy (NUP). To understand how PSS can be used in linking national and local levels, the study operationalises the concept of appropriation. Appropriation is the process by which people make constructive use of an object, in this study, how people in the districts appropriate SDF's PSS tools and outcomes within the districts' planning processes.

The study was conducted in Rubavu and Musanze districts. The data sources were primarily *interviews* with key informants and *research workshops* with potential PSS users. In total, 10 people were interviewed and 21 staff members participated in the research workshops. Mixed methods (QUAL+quan) were used for data collection. Data analysis was done using Atlas.ti and SPSS software for qualitative and quantitative data respectively. The results revealed that existing *social-institutional structures* and *users' characteristics* are likely to influence PSS appropriation- first, there is a strong *institutional framework* in the districts with a clear definition of *roles* and *tasks* of the stakeholders involved in the planning processes:- second, *bottom-up* planning processes, involving multiple stakeholders at the different administration levels: - and third, a *top-down approach* for the *plans* and *policy implementation* were directives are established at the top level and passed to lower levels. The results suggest that the appropriation of SDF's PSS tools and outcomes can promote better *spatial understanding*, and *communicate* the planning needs in an *analytical* manner. This can serve to strengthen *regional competition* and *economic development* among the districts in line with national goals and policies (in this case, NUP). The *challenges* that may impede the SDF's PSS appropriation in the districts include issues related to trust of the SDF tools data and the preparedness of the potential users (in terms of finances, skilled personnel in PSS application and knowledge of the NUP and the Rwanda SDF).

This study concludes that the appropriation of SDF's PSS tools and outcomes, which were originally developed for national use, can be used for *policy transfer* by the national government and for *policy translation* by the districts. The Rwanda SDF implementation may help the national government in planning, monitoring, and evaluating the transfer of the Rwanda National Urbanisation Policy to the districts. On the other hand, the districts may appropriate the SDF's PSS tools and outcomes in translating the Rwanda National Urbanisation Policy and other local plans within the districts' planning contexts. The SDF's PSS appropriation in the districts can happen in two ways. First, the vertical appropriation where the national government *transfers* the SDF'S PSS tools and outcomes to early adopters in the districts and second, horizontal appropriation were early adopters in the districts *translate* the PSS to the late adopters in the districts. The study recommends an appropriation of the Rwanda SDF's PSS tools and outcomes both in national and district governments.

Key words: Appropriation, PSS, EAST, Planning processes, Policy translation, SDF, NUP, Districts, Rwanda.

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DEDICATION

I dedicate this thesis to my beloved family:
Mbaa Kilele Mwai
Your love has kept me strong.

And

The people of the Republic of Rwanda:
Your hardworking spirit and hospitality have inspired me to write this thesis.
Abanyarwanda, Murakoze!

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LIST OF ACRONYMS

AAP	Annual Action Plan
AST	Adaptive Structuration Theory
CIM	Centre for International Migration
DDP	District Development Plan
DSS	Decision Support Systems
EAST	Enhanced Adaptive Structuration Theory
EDPRS-2	Second Economic Development and Poverty Reduction Strategy
GIS	Geographic Information System
ICT	Information and Communication Technology
IMF	International Monetary Fund
ITC	Faculty of Geo-Information Science and Earth Observation at the University of Twente, the Netherlands
JADF	Joint Action Development Forum
MIFOTRA	Ministry of Service and Labour
MINALOC	Ministry of Local Governments
MININFRA	Ministry of Infrastructure, Rwanda
MoF	Matrix of Functions
MTEF	Medium-Term Expenditure Framework
NUP	National Urbanisation Policy
PPD	Project Profile Document
PSF	Private Sector Federation
PSS	Planning Support Systems
RHA	Rwanda Housing Authority
RNRA	Rwanda Natural Resources Authority
SDF	Spatial Development Framework
SDGs	Sustainable Development Goals
SDP	Sector Development Plan
SIP	Strategic Issue Paper
SMCE	Spatial Multi- Criteria Evaluation
TAM	Technology Acceptance Model
UTAUT	Universal Theory of Acceptance and Use of Technology

1. INTRODUCTION

1.1. Background and justification

Technological advancement in the recent past has contributed to the development of specialised tools. Such tools include Planning Support Systems (PSS) in the Geo technology domain that are designed to support stakeholders involved in any planning task (Geertman & Stillwell, 2009). PSS have been used in various domains such as transport (Te Brömmelstroet & Schrijnen, 2010), policy implementation (Batenburg & Bongers, 2001), water resource planning (Garriga, de Palencia, & Foguet, 2015; Giupponi & Sgobbi, 2013; Nyerges et al., 2016; Nyerges, Jankowski, Tuthill, & Ramsey, 2006). Nevertheless, different users in these domains have appropriated PSS differently.

Appropriation is a concept that traces its root in philosophical studies on how humans control and change the natural environment in order to advance the human society, in other words, appropriation seeks to understand the subject-object relationship where the user (subject), must realise the object and make meaningful use of it progressively in a constructive manner (DeSanctis & Poole, 1994). In technology, appropriation can be defined as how people make use of technology and at the same time how people continuously change that technology in adapting it to meet their needs (Jankowski & Nyerges, 2001). Understanding how advanced technologies such as PSS are appropriated constructively needs a longer period of time in order to establish a meaningful study on the use of such technologies (DeSanctis & Poole, 1994). However, several theories and scientific works can help new studies in building scientific claims on chances of appropriating a new technology and likeliness of its success within any planning context.

Several studies have shown that appropriation of PSS can happen at different planning levels. This includes municipal level (Elbeltagi & Mcbride, 2005), city level (Te Brömmelstroet & Schrijnen, 2010; Todes, 2012) or national level (Boerboom, Gibert, Spaliviero, & Spaliviero, 2015). Indeed, a lot has been done to show how PSS can help planning stakeholders in executing specific planning tasks and add value to a planning process at specific administrative level (Geertman & Stillwell, 2009; Pelzer, Geertman, Heijden, & Rouwette, 2014).

However, planning tends to be hierarchical, developing down from national to local levels. Many PSS tools are developed to meet specific policy concerns at a certain level of this hierarchy. Surprisingly, little has been done to show how PSS can help in aligning national and local planning goals (see literature search strategy table in appendix 7). In many governmental organisations, for example, policies, strategies and development goals are formulated at the national level and expected to be implemented across the country. Therefore, there is a need to study how national PSS tools are used at local levels and how meaningful are the outcomes to the targeted users. Although Pelzer, Geertman and Heijden (2015) do not consider explicitly the issue of hierarchy in planning, they recommend that PSS should be studied in a broader context of application not just within a specific domain.

Several approaches have been applied in PSS appropriation studies to engage potential PSS users. Many studies have recommended the incorporation of potential users in the designing and developing the PSS (Batenburg & Bongers, 2001; Olafsson & Skov-Petersen, 2014; Te Brömmelstroet & Schrijnen, 2010). The approaches aim to ensure that the interests of potential users are matched with the skills of the developers. Surprisingly, there is no clear contribution of any empirical work on how PSS can be appropriated across

the hierarchy of planning that is, from national to local levels. Therefore, there is a need to understand how national PSS could be appropriated at local levels.

With this regard, this study contributes to understanding how national PSS tools hereby referred to as SDF PSS, can be appropriated at local levels (districts in Rwanda). These questions can be answered from a theoretical argumentation as well as empirically through a research with the potential users. Many PSS testing happens in laboratories which have contributed to the poor widespread use of PSS (Reinig & Shin, 2002). This study went beyond such a limitation and experimented with the potential users who according to Batenburg and Bongers (2001) understand the existing planning hierarchy, specific needs and problems in their domains. Goodspeed (2016) argues that field studies are needed to complement the results obtained from laboratory studies in order to capture the complexity of planning stakeholders (Goodspeed, 2016).

A PSS appropriation study is arguably most relevant in Rwanda. Rwanda is ranked number one in government success in promoting ICT in Africa according to Global Information Technology Report of 2015 (World Economic Forum, 2015). Rwanda has made significant achievements in the use of advanced technologies in its national organisations. Some of these achievements include the development of a national Geoportal (RNRA, 2016) and Geodatabase in the Ministry of Infrastructure (MININFRA, 2016b). More significantly, Rwanda has developed a national spatial planning methodology hereby referred to as the Spatial Development Framework of Rwanda (SDF), which is targeted to support the implementation and actualisation of the National Urbanization Policy (NUP). However, little has been done to understand how national policies and initiatives are actualised in districts and secondary cities in Rwanda. This study, therefore, contributes to understanding how the national PSS (focusing on the tools and their outcomes) will be appropriated by secondary cities, in the process enhance the link between urban areas, and contribute to the implementation of the NUP. One of the goals of the NUP is to promote urbanisation and economic growth in the secondary cities through prioritisation and preparation for good governance (MININFRA, 2015). This study contributes to understanding how the use of advanced technologies such as PSS can help in achieving the NUP goals.

1.2. Research problem

The use of PSS in the recent past has increased and diversified to different disciplines. PSS have been used in areas such as water management (Garriga et al., 2015; Nyerges et al., 2006), transport planning (Todes, 2012), local governments' planning process (Arciniegas & Janssen, 2012), urban public policy assessment (Bakker & Jacob Trip, 2013), tourism and recreational planning (Lekies, Yost, & Rode, 2015). However, a few gaps are noticeable from the PSS literature. First, the appropriation of PSS appears to be targeted to a specific purpose within a specific discipline. Secondly, while planning is a hierarchical process, there is little work done to show how the appropriation of national plans and tools occurs at the local level. The question arising surrounds the contextual use of PSS at the local level and subsequently the need to understand how local governments make use of national plans, PSS tools and the associated outcomes. Therefore, there is a need to understand the link between national and local level as well as contextual issues that may contribute to success or failure in appropriating these planning tools and outcomes in the local planning processes.

Various issues affect PSS appropriation. Such issues include the technology itself, the dynamics of the potential users (their skills and background), willingness to appropriate (Wang, Ying, Jiang, & Klein, 2006), cultural issues (Elbeltagi & Mcbride, 2005), and the reliability of decision outcomes (Baud, Scott, Pfeffer, Sydenstricker-Neto, & Denis, 2015; Huber, 1984). However, little research efforts have been put into understanding how the above issues at local levels are likely to influence the national level PSS appropriation.

A deeper understanding of the local level (secondary cities) users' characteristics, their needs and planning processes will go a long way in helping the national government in implementing the national policies (NUP) and the appropriation of the SDF's PSS tools. Given the growing use of geospatial data in Rwanda and the need to implement the National Urbanisation Policy (NUP) at secondary cities, there is a need for research on how secondary cities will appropriate national PSS tools and make use of the outcomes within their local contexts. This study's findings should give insights to government authorities and other stakeholders on how national PSS tools and their outcomes are meaningfully utilised at local levels and perhaps show the importance of SDF in the implementation of NUP.

1.3. Research objectives and questions

1.3.1. Main objective

The main objective of this study was to understand how local governments might appropriate national level PSS tools and outcomes in the local planning processes.

1.3.2. Sub – objectives and research questions

1. To understand the local planning processes in Rubavu and Musanze cities.
    - 1.1 Who are the *people* involved in local planning processes and their *roles*?
    - 1.2 What are the local planning *procedures* and *processes*?
    - 1.3 What are the *outputs* of the local planning processes?
    - 1.4 In which ways are the outputs of the local planning processes *implemented*?

2. To discuss how secondary cities can make a meaningful appropriation of PSS outcomes and tools in their local planning processes
    - 2.1. What is the *perception* of local governments on the *usefulness* of PSS outcomes and tools?
    - 2.2. Where is PSS likely to be *appropriated* within the local planning procedures and processes?
    - 2.3. By which *Units*[1] are PSS perceived more *useful* in Rubavu and Musanze districts?

3. To understand how the national PSS tools are likely to be appropriated by users in the secondary cities.
    - 3.1. How can potential users appropriate the capabilities of the PSS tools?
    - 3.2. What are the *user- expert knowledge* gaps that may affect the appropriation of PSS in the districts?
    - 3.3. What *challenges* are likely to hinder appropriation of PSS tools in Rubavu and Musanze
    - 3.4. What *recommendations* can be made regarding PSS appropriation in Rubavu and Musanze cities

[1] Unit refers to an administrative entity in the districts that is headed by a director and consist of several departments. Each unit is mandated to carry out specific domain tasks such as governance, education, health, agriculture, and finance.

1.4. Conceptual framework

The application of PSS within group decision-making process presumes that groups are building blocks in any organisation, community societal setting (Jankowski & Nyerges, 2008). In this study, the focus was on how different districts staff and other stakeholders in secondary cities can make use of PSS in their planning processes. The study used innovative PSS tools and involved studying how potential users may appropriate the advanced technologies if formally introduced to their districts. Nyerges et al. (2006) write that when convening a planning situation (that is, getting things started at any planning situation), there are three constructs made of multiple aspects that need to be considered. The three constructs are: construct one, the *social-institutional influences* such as power, rules and norms, construct two, *participants characteristics influences* such as expectations and perspectives and construct three, the *advanced technology* such as PSS. These three constructs make the convening phase of the EAST framework (see Jankowski & Nyerges, 2001) which were adapted for this study as the basis for assessing appropriation (the constructs are boxes abbreviated as C1 to C8 and they their relationship is explained by premises P1-P7 as shown in figure 1.1).

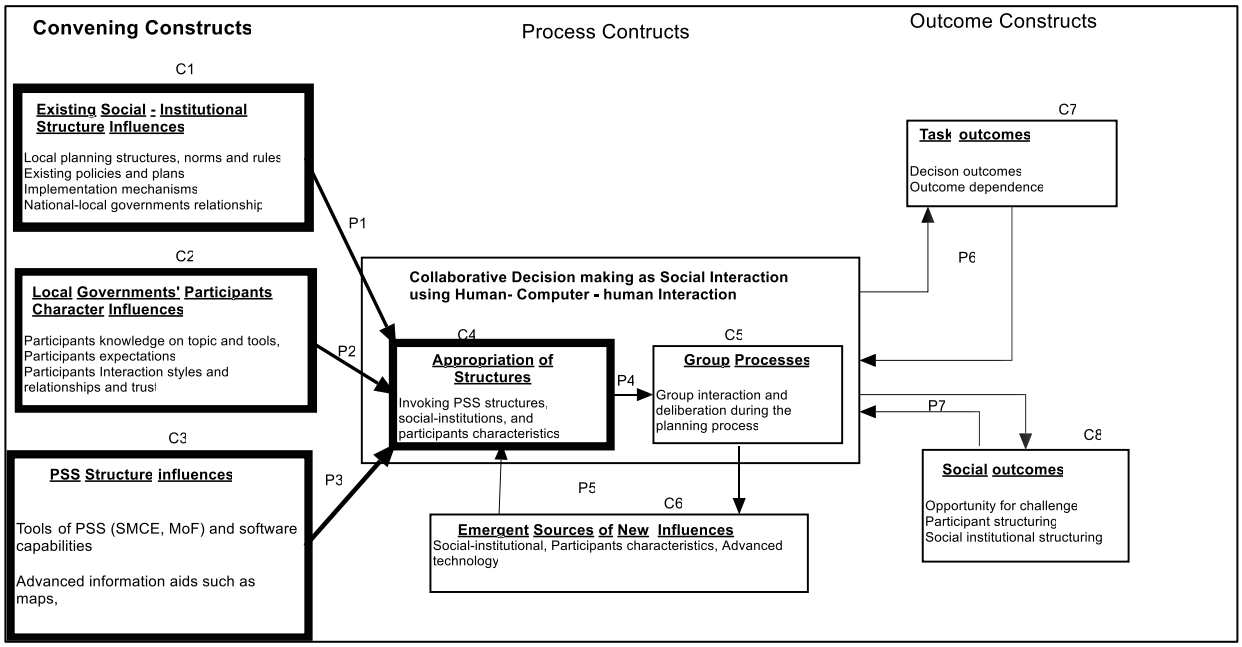

Figure 1:1 Contextualised diagram of EAST framework as adapted and operationalised in this study showing the convening, process and outcome phases (including the constructs C1-C8 and premises P1-P7)

Diagram adapted from Jankowski and Nyerges,2001

This study mainly focused on how advanced technology (adapted as C3 in figure 1:1) is likely to be appropriated (construct 4). The relationship on how advanced technology influences appropriation (in this study, how the SDF's PSS tools and outcomes are appropriated by users) is explained by premise 3 (shown as P3 in figure 1:1). Also appropriation according to Jankowski and Nyerges (2001) involves invoking the *social-institutional influences* (adapted as C1 in figure 1:1) and the *participants' characteristics influences* (adapted as C2 in figure 1:1). The relationship between the appropriation and the *social-institutional influences* and *participants' characteristics influences* is explained by premises 1 and 2 (P1 and P2 in figure 1:1) respectively. This means in adapting the EAST framework to this study, aspects related to construct 1 and 2 and their relationship to appropriation (explained by premises 1 and 2) were also explored in order to have a better understanding of how appropriation by potential users may happen. The rest of the constructs (C5 –C8)

and the premises (P4 –P7) that are part of the process and outcome[2] phases are assumed constant in the scope of this study.

Since this study involved studying small groups and how they are likely to appropriate PSS within their planning processes, EAST theory is perhaps the most suitable in explaining appropriation concept. This is because the convening phase constructs (see figure 1.1) can help in understanding how the districts are organised, the people from the districts who will use the PSS and the kind of PSS tools that they can utilise in their planning.

1.5. Research design

The research design presented in figure 1.2 summarises the main steps followed in carrying out this research. The first step shows how the research was conceived based on a literature review and study of existing policies in Rwanda. The materials served to scientifically define and frame the research problem, objectives and scientific methods that were used to answer the research questions. In addition, the existing SDF tools, outcomes, data and reports were reviewed and helped to define the SDF outcomes and tools that were used for data collection. This knowledge also helped in choosing the other data collection methods. The second step was preparation for fieldwork and data collection exercise in Rwanda that involved designing the data collection instruments and SDF's PSS tools and outcomes that were used for the research workshops. The third step was the actual fieldwork exercise, which was carried out in two phases.

The first phase included collecting secondary data and interviewing government officials in Rubavu and Musanze in order to understand local planning processes, stakeholders involved and the main planning outcomes in the districts (this was relevant in answering research objective one). Phase two involved research workshops sessions where SDF's PSS outcomes and tools were shown to the districts' staff members who were invited for workshops to discuss the applicability of SDF's PSS outcomes and tools in their local planning (this was relevant to answer objective two and three). This phase involved focus group discussion about SDF's PSS outcomes, interactive session of using SDF's PSS tools and then personal

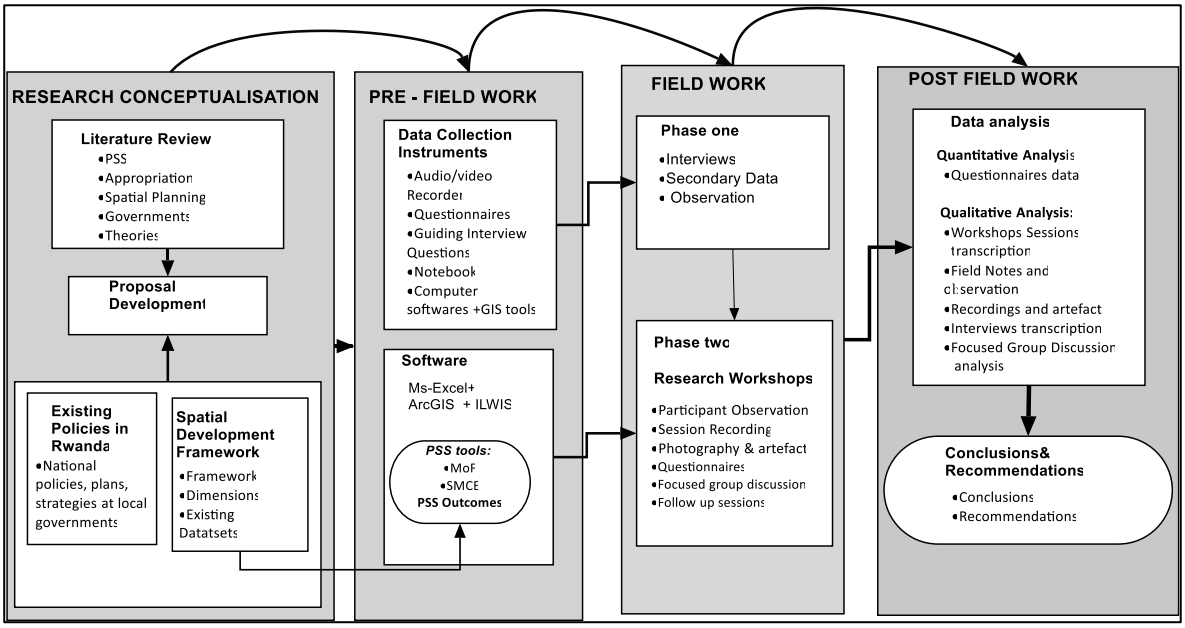

Figure 1:2 Research design diagram showing the main steps involved in the study

[2] Outcomes: refers to the long term results of using technology which reflect changes in the social structure and how people handle tasks after the introduction of the technology. This shouldn't be confused with SDF outcomes which are part of the introduced advanced technology (PSS).

feedback session through a self-administered questionnaire. The final step of this research involved data analysis and answering the research questions leading to conclusions and recommendations.

1.6. Thesis structure

This research work is organised in chapters.

Chapter 1: The first chapter introduces the research topic and gives background and justification, research problem, objectives and the study outline.

Chapter 2: The second chapter explores the key concepts and terminologies related to appropriation of PSS. This includes literature on the theoretical background, PSS appropriation and institutionalisation, latest evolution of PSS and their application as well as contextual analysis of Rwanda with regard to PSS potential application.

Chapter 3: The third chapter discusses the research method. This include choice of the study area, research strategy, data collection techniques, data analysis techniques, and a reflection on ethical issues related to the study.

Chapter 4: Chapter four presents the results and discussion related to the planning in Rubavu and Musanze districts, focusing on the stakeholders involved and their roles, the planning processes and the outcomes of those processes, and how are the outcomes of districts planning processes implemented, i.e. answering the first research objective.

Chapter 5: Chapter five presents the findings and discussion related to how districts can make meaningful use of the SDF's PSS tools and outcomes, where in the districts' planning processes can the tools and outcomes be appropriated and by which Units are the tools and outcomes perceived more useful, i.e. answering second research objective.

Chapter 6: Chapter six discusses the findings and results on understanding how the SDF'S PSS capabilities are appropriated by users in the districts, the local users- expert knowledge gap and the observed potential challenges that may influence the SDF'S PSS appropriation, i.e. answering the third research objective.

Chapter 7: Chapter seven outlines the conclusions, the contribution of this study to the research community and to the policy, and finally some recommendations for further research. Supportive materials and data used in this research are provided in the appendices.

2. LITERATURE REVIEW

2.1. Introduction

The concept of appropriation was first explained by philosophers Hegel and Marx to illustrate how people continuously learn to control and change the natural environment they live in and in return, how this changed human society. In other words, the concept is based on object – subject relationship with the main attention on the process of making constructive use of the object and how it successfully enters human activities (Poole & DeSanctis, 1989). Over time, the concept of appropriation has been applied differently in different disciplines such as advanced technologies. This section presents key literature used in the appropriation of planning support systems as an advanced technology being introduced to an organisation. The focus is centred on a theoretical framework that informed the researcher's approach in carrying out the study. First, the focus is on appropriation theories applied to the field of organisational studies, followed by the concept of PSS, relating PSS to policy translation and governance, and then focusing on the planning context in Rwanda.

2.2. Theoretical background

A theory is an array of constructs that are well organised to explain a certain phenomenon (Silverman, 2005). Several theories have been put forward to explain how technology is appropriated by organisations. These theories emerge from various disciplines such as sociology, information science, psychology and in the recent past, participatory GIS. Delaney (2010) devoted a whole chapter in his work to explore literature on the appropriation of information and technology. Although his work focused on the appropriation of information systems, it gives a grounded exploration of existing theories. Delaney (2010) further categorised the theories into three groups based on the theoretical background. These include adoption theories (*Technology Acceptance Model (TAM)* and *Universal Theory of Acceptance and Use of Technology (UTAUT)),* sociocultural theories (Participatory Appropriation) and Appropriation theories (*Adaptive Structuration Theory (AST), Structuration Model of Technology, and Technology Appropriation Model)* (Berend, 2013). This study focused on appropriation theories namely *Adaptive Structuration Theory (AST)* and *Enhanced Adaptive Structuration (EAST)* that focuses on processes of appropriating new technology within organisations. Furthermore, the focus was turned to a specific technology (GIS- technology) used in Planning Support Systems.

2.2.1. Adaptive Structuration Theory

Adaptive structuration theory (AST) draws from the concepts of structuration (Giddens, 1984) and appropriation (Ollman, 1971) to explain the technology and people interaction. The way to understand how people make use of an advanced technology, especially in a group setting is by focusing on how the people adapt to the technology. DeSanctis and Poole (1994) adapted Giddens' structuration theory in explaining how people adapt to advanced technology, specifically group decision support system. When technology is introduced to any organisation, it brings new *social structures* (patterns of social relationships) which are embedded in the *structural features* and the spirit of the technology (DeSanctis & Poole, 1994)

Structural features refer to those specific rules, resources and *capabilities* that a technology presents (DeSanctis & Poole, 1994). Examples of such structural features include the ability of a PSS to record videos, audios, support voting by users and multiple visualisation modes. On the other hand, the *spirit* can be defined as the general intent based on the objective and purpose of a given structural feature (Berend, 2013). The *spirit* is seen as a property of the technology that is presented to users, defining how to act when using the system,

how to interpret the features or explore the technology. In addition, AST explains that when people use technology, they create a *perception* about the importance, the role and the *usefulness* of the technology (Jankowski & Nyerges, 2001). Therefore, AST can be utilised to study the structures that advanced technologies introduce to an organisation and the new structures that are likely to emerge as people use these technologies. Several studies have confirmed the claim of DeSanctis and Poole (Berend, 2013) while others introduce new theories (Jankowski & Nyerges, 2001). AST serves as the mainstay for Enhanced Adaptive Structuration Theory (EAST) that Jankowski and Nyerges use to explain how an advanced technology is appropriated in organisations.

2.2.2. Enhanced Adaptive Structuration Theory

This study aimed to understand how local governments (districts) will appropriate PSS tools and in so doing implement national policies. The attention is to see the relevance of PSS tools as an advanced technology in helping local governments understand and implement national policies in Rwanda. In addition, this study touches on planning processes that are complex activities involving various stakeholders. This study was considerate of the dynamics of planning processes thus; the use of EAST was relevant to understand decision-making dynamics in a group, organisation or community setting. However, the EAST was adapted to capture the elements of PSS which are different from the DSS as studied by Jankowski and Nyerges (these differences are highlighted in section 2.3.1) although the concept of adaptive structuration remains the same as borrowed, originally from AST and other frameworks. That means in EAST the constructs (the C's boxes in figure 1.1), the premises (the P's in figure 1.1) and aspects (the texts inside the boxes in figure 1.1) are majorly borrowed from AST hence the name Enhanced AST.

The EAST was adapted to help position this study theoretically (see section 1.4). The EAST developed eight *constructs*, seven *premises* and twenty-one *aspects* (many of which are drawn from AST). Constructs refer to mental abstractions that are used to explain some phenomenon of interest (Merriam-Webster). The premises are statements that show the relationship between the aspects. In EAST, premises show how aspects of the *subject construct* relate to aspects of the *object constructs*. The premises are used in empirical studies to explore how some variables relate to each other (Jankowski & Nyerges, 2001). The *aspects* are the observable variables that build up the constructs. Jankowski and Nyerges (2001) also points out that when EAST is used in empirical research, some aspects, by means of premises may be more important than others. The importance depends on the research design and the focus of the study that explains why the EAST was partially adapted in this study to understand appropriation concept (see section 1.4).

To help researchers in understanding the theory, Jankowski and Nyerges positioned the EAST constructs into three phases namely: *convening, process* and *outcomes constructs* (see figure 1:1). The convening phase is concerned with the initial stages of the interaction between the users and the new technology. The convening phase includes three constructs aimed at understanding *social-institutional structures* (policies, laws, norms and power), *group participants influence* (local governments' officials and other stakeholders relation, trust, perspectives and expectations) and *technology influence (relating to PSS tools and their outcomes)*. The process phase involves decision-making and social interaction using *human- computer-human interaction*. The process phase includes three constructs namely *structure appropriation, group process* and *emergent influence*. The outcome phase includes two constructs namely task outcome and social outcome (Jankowski & Nyerges, 2001). Phase 2 and 3 takes a longer period of time to study in order to understand the appropriation (DeSanctis & Poole, 1994). Given the nature of this research, the study focused on convening phases to understand how appropriation might happen. According to Jankowski and Nyerges, appropriation is affected by three aspects that are related to the convening constructs.

The first aspect that affects appropriation relates to *social institutional structures*. This relates to existing organisational policies, power, norms and the ways of doing things. In any given organisation, there is

established a mechanism that dictates how people relate and respond to new ideas and challenges. Jankowski and Nyerges (2001) explains that technology being appropriated is likely to alter or completely change how people relate and communicate when faced with a common problem. For instance, if the PSS tools can only be used by a qualified facilitator, the relationship between the facilitator and other social norms, participants' mandates will affect how the tools are appropriated (Jankowski & Nyerges, 2001).

The second aspect that affects appropriation is related to the users. The potential users have a way of appreciating or rejecting technology depending on how they perceive it. If people feel appreciated and valued in the process of using the introduced tools, then they tend to attach value in the tools and help in the process of appropriation by disclosing genuine and useful information. In addition, EAST articulates that if people receive fair voice in an organisation, they treat the technology in a fair way and thus appropriate the technology accordingly (Nyerges et al., 2006).

The third aspect affecting appropriation relate to the technology being appropriated. Introducing advanced technologies such as PSS into organisation brings with it new structures. Jankowski and Nyerges (2001) argues that advanced technologies will be received differently depending on the nature of user engagement. For instance, if users are needed to meet in a specific room in order to use the tools or they can use the tools anywhere anytime. Another influence to the PSS tools is how the tools give an array of information. This related to diverse visualisation, communication and outputs display techniques. In many organisations, the use ranges from educative tools that are more to communication tools that help deliver information to less specialist personnel in a more understandable way. Jankowski and Nyerges explain that many people will understand maps and graphics more easily that table thus how these advanced technologies display the information affects the perception of the potential users and their willingness to appropriate the technologies (Jankowski & Nyerges, 2001, 2008).

2.3. What are planning support systems (PSS)?

Planning Support Systems (abbreviated as PSS) can be defined as a variety of geo- technology computer-based tools that are designed and organised to support both private and public planning processes at any spatial scale (national, regional or local) within any planning context (Geertman & Stillwell, 2003). PSS tools are specifically developed to aid stakeholders involved in planning processes in weighing/evaluating alternatives in making a future choice of action. PSS will always contain an element of GIS and in some cases, they are closely related to Decision Support Systems (DSS).

2.3.1. GIS, PSS and DSS

GIS can be defined as systems that consist of tools for processing geo-referenced data and they are usually used in diverse domains and problems (Geertman & Stillwell, 2009). GIS offers a generic solution whereas PSS are focused on the specific application which may involve both spatial and non-spatial data(Geertman & Stillwell, 2009). In many cases, PSS will contain elements of GIS, especially in spatial data analysis.

Decision Support Systems (DSS) on the other hand, are an interactive set of computer-based systems that are designed to help people who are engaged in a decision-making activity (Gray, 1987). DSS application in the real world has diversified, resulting in a plethora of terms. For instance, when DSS are used for spatially related tasks, they are referred to as Spatial DSS (SDSS) (Barton, Plume, & Parolin, 2005; Kim, Wunneburger, Neuman, & An, 2014; Ochola & Kerkides, 2004; Sugumaran, Ramanathan, Degroote, & John, 2010), in group meetings they are called Group DSS (GDSS) (Chun & Park, 1998; DeSanctis et al., 2008; Euske & Dolk, 1990; Lim, Raman, & Wei, 1994; Limayem, Banerjee, & Ma, 2006) and in collaborative processes, they are called Collaborative DSS (CDSS) (Karacapilidis & Papadias, 2001).

PSS are distinct from DSS in several aspects. PSS focuses on long-term and strategic planning and are made to help in group discussions and interventions. On the other hand, DSS are made for short term decision making (usually policy related) by a set of people consisting mainly of executive decision makers (Geertman & Stillwell, 2003). Consequently, PSS are developed from a broad scope of the planning process that involves three steps namely planning task, planning problem at hand and modelling capabilities that help in analysing and developing alternatives to a solution. In this sense, PSS contains in them the ability of DSS, which are primarily sharing information, modelling capabilities and visualisation made to help decision makers in solving problems. Moreover, in the real world, PSS have their entry point of application in planning processes while DSS have their entry point in decision making processes which are two distinct processes. In a nutshell, PSS are different from DSS although components of DSS are often found in PSS (Geertman & Stillwell, 2009).

The similarity between DSS and PSS is based on the fact that both have a computer-based set of components such as a database, user- interface and modelling options. In addition, both PSS and DSS are designed for specific tasks (supporting planning and decision making processes respectively) and their application cannot be generalised in the real world (Geertman & Stillwell, 2009; Geertman & Stillwell, 2003).

2.3.2. PSS in planning process

PSS are made for planning support but, the question is understanding how this happens. Geertman and Stillwell, from an inventory of PSS across 15 countries concluded that PSS are used and dedicated for four distinct uses. First, to assist and boost stakeholders' participation in planning processes. Second, specifically designed to handle particular planning problem and promote the uniform course of actions. Third, to inform stakeholders about key policies being implemented or targeted to their local area or at the country level. Fourth, the majority of PSS are designed to help professionals in specific planning tasks such as transport, policy planning, land - use planning environmental planning among others (Geertman & Stillwell, 2004).

Klosterman (1997) argues that PSS should be seen as *information infrastructure*. This implies that PSS are a set of organised tools for planning that enhance interaction and idea sharing among stakeholders. Klosterman further states that PSS should aim at supporting a continuous and *interactive process* of analysing, designing and evaluating outcomes and making meaningful use of the outcomes while adapting to any changes in the information demands (Klosterman, 1997). Klosterman's focus is on how PSS tools are organised to bring meaningful benefits into the planning processes as well as to give better outcomes that can be adopted by affected users. On similar view, Te Brömmelstroet (2013) argues that PSS application in the planning processes is a dual affair. First, it is concerned with improving planning processes by introducing new structures (which are embedded in PSS's *capabilities*) in order to make planning more *interactive* and improve on users' participation. Second, PSS application is concerned with the outcomes which touch on the plans, policies and strategies generated at the end. Whether the end products are used or not also depends on the structure PSS introduces and how the potential users are well informed about these outcomes. This implies another role of PSS other than merely an information infrastructure as Klosterman argues.

The PSS role in planning processes can be understood based on the underlying aim or goal of use. Te Brömmelstroet (2013) identifies three categories of PSS namely *informing*, *communicating* and *analysing*. Informing PSS can be seen as tools for information sharing. That means helping organisations achieve their goals or visions (De Man, 2000). In this regard, the developers of the PSS must consider the design that will provide information to users in the best way possible. Communication PSS are more tuned to enhance communication between different people in a groups, organisation or community setting. The majority of public participation oriented PSS falls into this category. Analysing PSS, according to Te Brömmelstroet *"aim to facilitate advance processing of data and information in order to find patterns and underlying*

processes, and to facilitate information modelling for projection, simulation and evaluation" (Te Brömmelstroet, 2013 p. 303).

Despite this knowledge, achieving PSS role is not an easy thing. Whichever role or aim a PSS is developed for, the success of PSS appropriation in the planning processes and any organisation at large, is determined by many factors and this explains why up to date the use of PSS is still low globally (See Vonk, Geertman, & Schot, 2005; Pelzer et al., 2014). Geertman & Stillwell (2009) studied the use of PSS in planning processes globally and underpin three approaches associated with the low usage of PSS. These include instrumental, transfer and user approach. *Instrumental approach* relates to capabilities of the PSS and how well they fit the context of the application. For example, how well does the PSS fit to the planning context. The *transfer approach* relates to measures used to move the PSS from the developers to the potential users and practically operationalise them within the planning processes. For example, how is the top-down transfer organised in case of inter-organisational settings. The *user approach* related to characteristics of the users that influences their perception and willingness to appropriate the PSS for example, the awareness and experience in PSS application (Geertman & Stillwell, 2009).

Whether PSS will achieve its expected role is highly determined by the reality in which it is being implemented (Klosterman, 1995). For instance, just like any other advanced technology information system, PSS are regarded as highly powerful tools and their outcomes reliable simply because they are computer generated. Because the outcomes are likely to affect multiples stakeholders, whether within or outside the government, the success of PSS appropriation depends on how well the tools integrate with existing *social-institutional structures* (norms, power, policies and laws), *users' characteristics* and the *advanced technology* being appropriated (based on EAST convening constructs) and how overt is the appropriation process in the planning context.

2.4. Application of PSS in urban governance

In the recent past, innovative technologies have revolutionised how urban planning and governance happens in many places. Particularly, the advancement in ICT, linked to Geographic information systems (GeoICT) has helped organisations consolidate knowledge and information about towns and urban areas (Pfeffer et al, 2013). These achievements have contributed to better engagement of stakeholders involved in urban governance.

Elwood (2001) pointed out that uses of advanced technologies in urban governance have contributed to changes in how government officials, citizens and communities make decisions. The use of advanced planning tools such as PSS has contributed to language, practices and paradigms changes, especially in community planning. For instance, Pfeffer et al. (2013) explain that we can use Geo-technology tools to link qualitative community information, district infrastructure, housing patterns and land information system together with a wealth of spatial knowledge that may be overlooked in typically written words. Similar thoughts are shared in the literature of participatory GIS and Public participatory GIS (see Auma, 2012; Batenburg & Bongers, 2001).

Other application studies have shown intergovernmental and departmental benefits of using advanced technologies. Pawlowska (2001) explains the potential of using GIS technology to convey information horizontally and vertically within any given context. For instance, the use of revenue systems to consolidate tax return across and within the administrative levels. One area that has benefited from the GIS technology is the land information system. Krakow municipality, for instance, recorded 15% efficiency and improvement in service delivery due to introductory of GIS technology (Pawlowska, 2001). In addition, O'Looney explains that advanced technologies' benefits cut across: economic development, health care,

public housing, law enforcement, education planning, land use and urban growth planning, infrastructure and transport planning, environmental monitoring, site selection for service delivery, public information system among other uses (O'Looney, 1997).

In another study, Lin, Zhang, and Geertman (2015) explore the opportunities of using PSS in China to promote smart urban governance. In their work, the authors argue that the use of PSS in China can promote social sustainability. In addressing the problem of rural immigrants in china form instance, Lin, Zhang, and Geertman (2015) point out the potential of PSS to help create a more reliable decision-making platform that brings together the key stakeholders such as government, the private sector and the society. Given the growing use of smartphones and the internet, there is also a growing need of PSS that can be easily integrated with a smartphone and social media and allow real-time public participation.

Although advanced technologies such as PSS offers commendable advantages in urban governance, some studies have argued against the potential of these technologies. The main shortcomings of application of advanced technologies relate to their technicalities and cost (Pfeffer et al., 2013). The cost of acquiring and installing new systems such as PSS, maintaining and keeping up to date technology has discouraged many organisations from fully adopting such technologies. However, global trends are changing, which has seen the development of open source software and services that can help cut down the cost and technicalities needed and thus many organisations can gradually afford the services of the innovative technologies (Kumar, Thakur, Umashankar, & Ramana, 2014).

2.5. Policy translation and institutionalisation

In Rwanda, the SDF's PSS tools and outcomes appropriation do not happen in isolation. The Rwanda SDF is specifically designed to help in National Urbanisation Policy implementation. Therefore, the appropriation of SDF's PSS tools in the districts makes it possible for policy translation and transfer to happen.

Translation is defined differently in various research fields (Freeman, 2009). Translation from organisational perspectives can be understood as how ideas, orders, artefacts, goods, concepts in the hands of people spread over time and in any space (globally, nationally, regionally or locally). People act differently by modifying, reducing, repelling, betraying, adding or even appropriating the subject (Czarniawska & Sev'on, 2005).

Policy translation reflects an interactive process by which new ideas are conceived, synthesised, turned into operational slogans, objects and actions in practice and then communicated across the organisation within the concepts of the original policy idea (Hossain, Scholz, & Baumgart, 2015; Mukhtarov, 2012). For instance, in addressing the climate change in the world, several countries deduced adaptation measures (Weisser, Bollig, Doevenspeck, & Muller-Mahn, 2014). But Gebauer and Doevenspeck (2015) argues that stating the problem does not bring all actors on board thus, the process of translating the idea of climate change adaptation involves understanding how multiple actors will act in moving the idea to the "ground" (Gebauer & Doevenspeck, 2015). The concept of translation is closely related to the concept of policy transfer.

Policy transfer, on the other hand, focuses on the actor and the agent in the process of moving the policy from one level to another (Mukhtarov, 2012). In other words, policy transfer assumes the policy is conformable and immutable which means the actors involved in the policy transfer have less role in influencing the policy. On the other hand, policy translations look into how multiple actors in a complex interaction are likely to contribute into how the idea travels and possibly influence the outcomes (Mukhtarov, 2012).

Translation can help in explaining how policies are institutionalised. *An institution* in this research is used to imply policies, customs, rules, and norms that govern people within an organisational setting. *Institutionalisation* is used to explain the process by which a new institution become formally embedded in the routine operations of an organisation. The process entails detailed and repeated application such that the subject (institution) application becomes the prescriptive choice of action in any course of the problem (de Man, 2000).

However, Freeman (2009) argues that implementing institutions is literally impossible in that, *"Words on paper, mandated by an executive or administrative order, a statute, or a court ruling are translated into actual operations in a real environment. The process of adaptive translation subjects a policy to the most fundamental evolutionary test, that of its viability within the environment."* (As cited in Freeman, 2009.p 431). In this regards, translation bridges the gap between institutions in papers and the existing local knowledge (see Dvora Yanow, 2004) and establish a working local practice that leads to the actualisation of the translated policy in the application context.

2.6. Planning in Rwanda

Rwanda has two forms of government namely central and local governments. The central government (sometimes referred to as national government) directs activities across the country through several ministries and agencies but the ministry of local government (MINALOC) specifically, oversees the activities of local governments. The central government includes the provincial administration levels (there are 5 provinces in Rwanda). The local governments (commonly referred to as the districts governments) include the districts the 30 districts (Akarere), the 416 Sectors[3] (Imerenge), the 2,148 Cells (Utugari) and the 14,837 Villages (Imudungu).

The local governments are the result of the decentralisation process in Rwanda. Decentralisation in Rwandan context refers to means of transferring authority, function and responsibilities from national government to the districts and Sectors (MINALOC, 2012). One of the decentralisation outcomes is the performance contracts, locally known as Imihigo.

Imihigo entails two concepts namely *" I challenge myself to deliver"* and "*compete among one another"* (Rwandapedia, 2016; Scher, 2010). The Imihigo is a unique tool in Rwanda that was institutionalised in 2007 to promote service delivery in the districts. For instance, the annual evaluation of districts performance. Over the years, Imihigo spirit has continued to motivate districts to endeavour to achieve the set goals as well as the national cohesion (Scher, 2010). Imihigo has continued to aid planning in Rwanda which led to the successful adoption in other government organisations such as national agencies, ministries and embassies (Bugingo & Interayamahanga, 2010).

In terms of policies, the National Urbanisation Policy (NUP) is the principle policy that guides urbanisation in Rwanda both in national and local governments. The NUP also promote decentralisation by underpinning the importance of decentralised development by focusing urbanisation attention to the secondary cities. The secondary cities as defined in NUP include Rubavu, Musanze, Huye, Rusizi, Nyagatare and Muhanga (MININFRA, 2015). The NUP is discussed below and its importance in Rwanda planning processes.

2.6.1. The National Urbanisation Policy (NUP)

The NUP was approved by the cabinet of Rwanda in 2015 and asserted to be the policy guiding urbanisation process in the country. The policy is set to guide how governmental and non-governmental stakeholders work together in the urban planning processes to achieve sustainable development (NUP, 2015). The NUP is based on values of sustainable land use, decentralised urban governance, social inclusion, participatory planning, integrative planning, urban resilience, urban competitiveness and use of appropriate tools and

[3] A Sector is the third level of administration in Rwanda after province and district.

technology for urban management which in this case supports the SDF's PSS introduction to secondary cities. NUP establishes four main pillars to guide urban development across the country:

I. *Coordination*: This pillar is centred on promoting good urban governance. The aim is to have all-inclusive governance, where organisations are well coordinated to promote effectiveness in urban planning and management.

II. *Densification:* This pillar is centred on having competitive cities. This means, urban areas that are sensitive to the environment, promotes efficient land use, local economic development (while preserving natural resources) and strives for strategic investment planning.

III. *Conviviality:* This pillar is centred on creating inclusive cities. The goal here is to have urban areas with a guarantee of quality of life in all regions, promote social integration as well as upholding traditional and cultural heritage.

IV. *Economic growth*: This pillar is centred on creating sustainable and smart cities. The target here is to have cities that are geared towards sustainable economic strategies, based on innovative and entrepreneurial methods that seek to promote socio-economic services and create more opportunities.

In implementing the NUP, the policy provides a room for use of advanced technologies in various governmental organisations and administration levels. For instances, in local governments revenue and financial management, the NUP proposes *"use of ICT technology such as GIS-based property taxation to reduce the constraints of spatial coverage, inefficient tax management and constraints to efficient payment" (NUP, 2015 p.41).* This among other provisions has led to a collaboration among stakeholders to develop a methodology of implementing NUP. This methodology is referred to as Rwanda Spatial Development Framework as discussed below.

2.6.2. The Spatial Development Framework of Rwanda

The SDF (see figure 2:1) is a methodology that is designed to promote the implementation of NUP and harmonise the urban development plans in any country (Boerboom et al., 2015). SDF can be implemented at a national (case of Rwanda), regional (case of Darfur) or local level where the vision is to establish a spatial framework for maximising returns on investments, balance regional developments and foster economic growth (Un-Habitat, 2015).

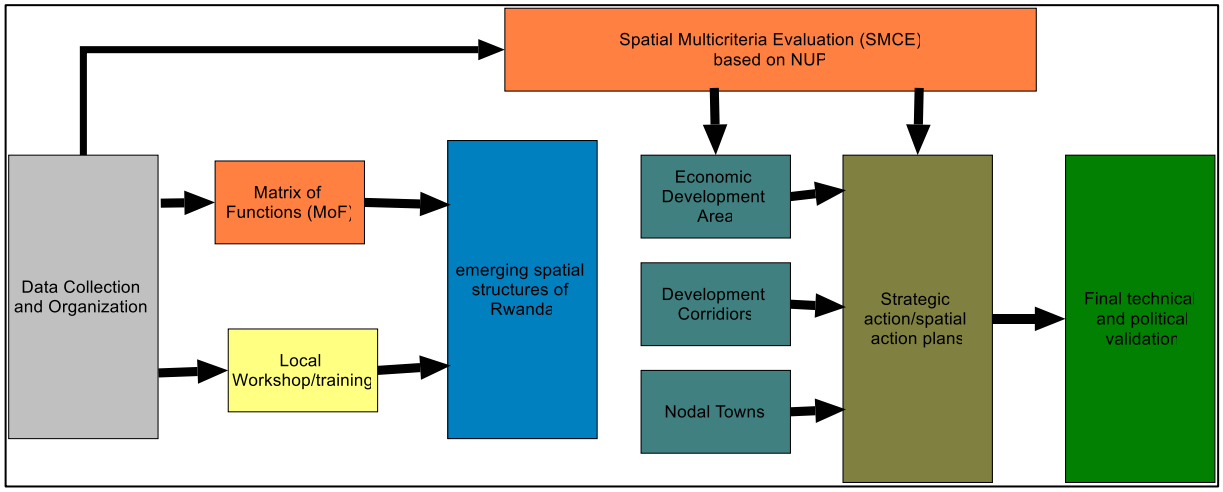

Diagram adapted from: Boerboom et al, 2015

Figure 2:1 The SDF methodology flowchart

The Rwanda SDF [4] was developed in the year 2016. The first phase includes data collection, workshops, the matrix of functions (MoF), spatial multi-criteria evaluation and emerging spatial structures (see figure 2.1). This first phase of the SDF methodology defines the PSS characteristics of the SDF methodology. The computer-based tools (SMCE and MoF) and their outcomes (spatial structures) are used in the second phase of the SDF methodology as the starting point for guiding planning, monitoring and evaluation processes in the country. The second phase involves the strategic/spatial action planning and final political validation as shown in figure 2.1. The final SDF will then be presented to the cabinet/parliament for approval.

The framework starts by identifying the spatial planning challenges and opportunities in each planning level (whether national, regional or local). The main source of information and knowledge about the spatial planning challenges is the NUP which also shapes the goals of the Rwanda SDF. The Rwanda SDF has three steps in addressing spatial planning issues:

I. *The matrix of Functions (MoF): The MoF* is used to categorise areas based on the availability or absence of key functions. A function is defined here to imply a specific service, activity, resource, social, economic or political facility in any given settlement (for example in domains of education, finance, health, security among others). MoF helps in identifying hierarchies the territories by finding the central functions such as universities and basic functions such as primary schools as well as functional completeness of the territories (Rondinelli, 1985). The first SDF's PSS tool (based on Ms-excel programming for non-spatial data and ArcGIS software for spatial data) uses MoF concept in generating some of the SDF's PSS outcomes.
II. *Consultative training/ workshops:* these meetings target the stakeholders to present results of the SDF PSS outcomes to them for validation and explanation including familiarising with the SDF's PSS tools.
III. *Spatial Multicriteria Evaluation (SMCE):* The concept of SMCE aims to stakeholders involved in the planning process to evaluate, compare and choose the best alternative based on how good it performs within the set conditions/criteria. SMCE has been used in several PSS tools to help in achieving the overall goal (Haaren & Fthenakis, 2011). The second SDF's PSS tool uses the SMCE concept in producing some of the SDF's PSS outcomes. The implementation of the SMCE was in the ILWIS GIS tool (Zucca, Sharifi, & Fabbri, 2008).

2.6.3. Some of the SDF's PSS outcomes and tools discussed with the districts' staff

SDF's PSS outcomes

The SDF's PSS outcomes as used in this study refer to the outcomes of the Rwanda SDF methodology which are generated using SDF's PSS tools. The SDF's PSS outcomes used in this research are adopted from the SDF methodology (Boerboom et al., 2015). Figure 2.2 shows the urban settlement typology in Rwanda. This is as a result of MoF analysis which established hierarchies of urban areas. There are three urban hierarchies namely Local Urban Centres (LUC), Intermediate Urban Centres (IUC) and Main Urban Centre (MUC). The classification is based on the availability of basic, intermediate and central functions[5]. Figure 2.3 shows the socio-economic linkages in an isopleth map. The isopleth map shows how regions relate and link not only in terms of functions availability but also social, economic and physical aspects. This concept is important for planning and regional balance as well as motivation for potential investment. The Rwanda SDF developers have identified economic potentialities in every region in Rwanda based on the

[4] The second phase of the SDF (Strategic action/spatial action plans and final technical and political validation in figure 2:1) is not yet implemented. But the first phase (method and outcomes) has been approved by the senior management of Ministry of Infrastructure.
[5] A video explaining how SDF's PSS outcomes are generated is found can be found in https://www.youtube.com/watch?v=CqDad75SpBU (ITC Utwente, 2016)

findings of the MoF and consultation meetings. These results are shown in Figure 2.4. The final outcome considered in this research that relates to MoF is the resulting spatial structure which is shown in figure 2.5. The map shows emerging spatial structures that are likely to spur development and regional integration in Rwanda. They include economic development area, nodal cities, gateway cities, northern corridor, primary corridors and secondary corridors (Boerboom et al., 2015).

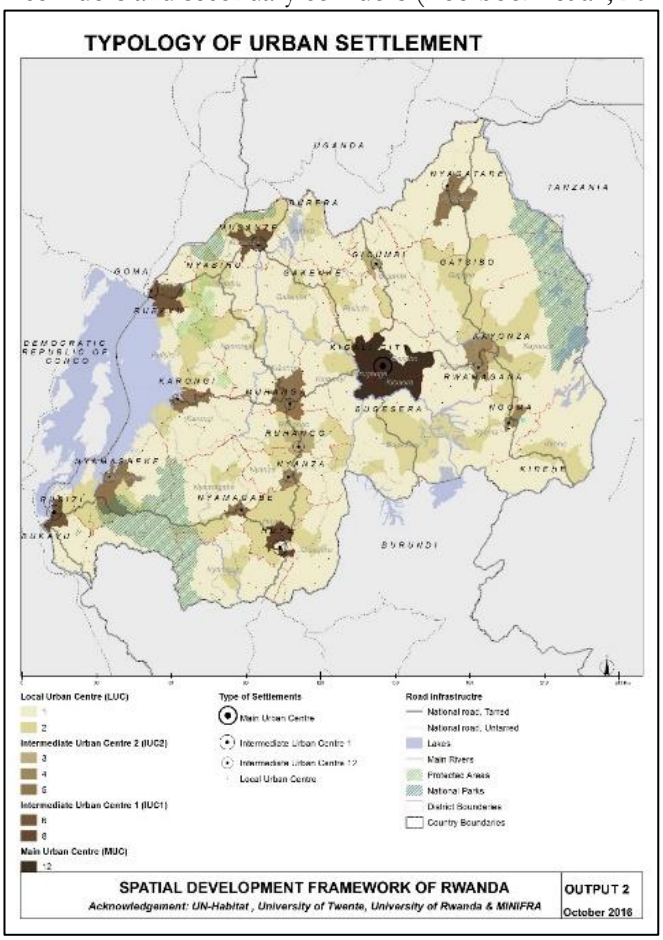

Figure 2:2 SDF outcome showing the three urban settlement typology: local, intermediate and main urban centres which are based on Rwanda demographic data

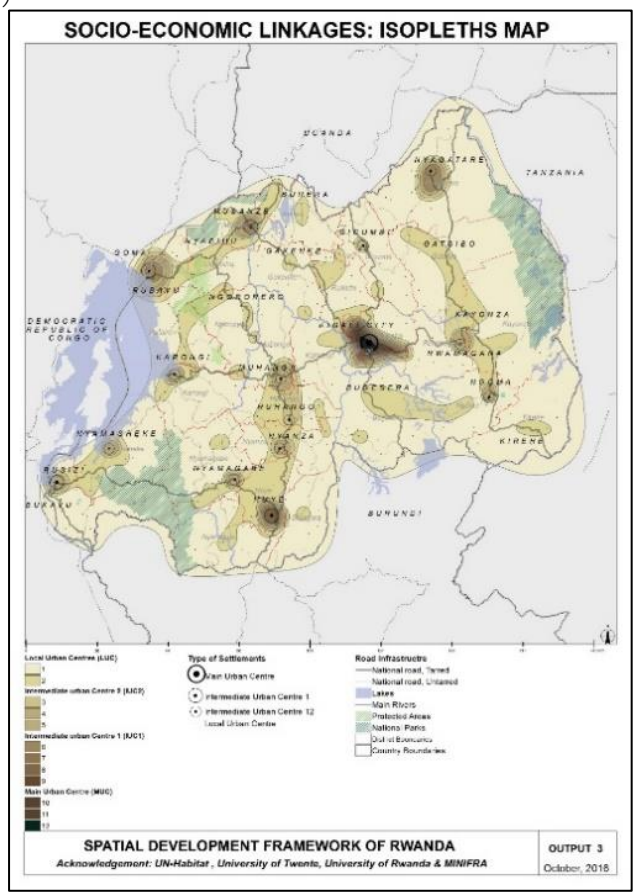

Figure 2:3 SDF outcome showing the Rwanda socio-economic linkages in an isopleth map which is based in Rwanda demographic data.

Data source: Rwanda SDF, 2016

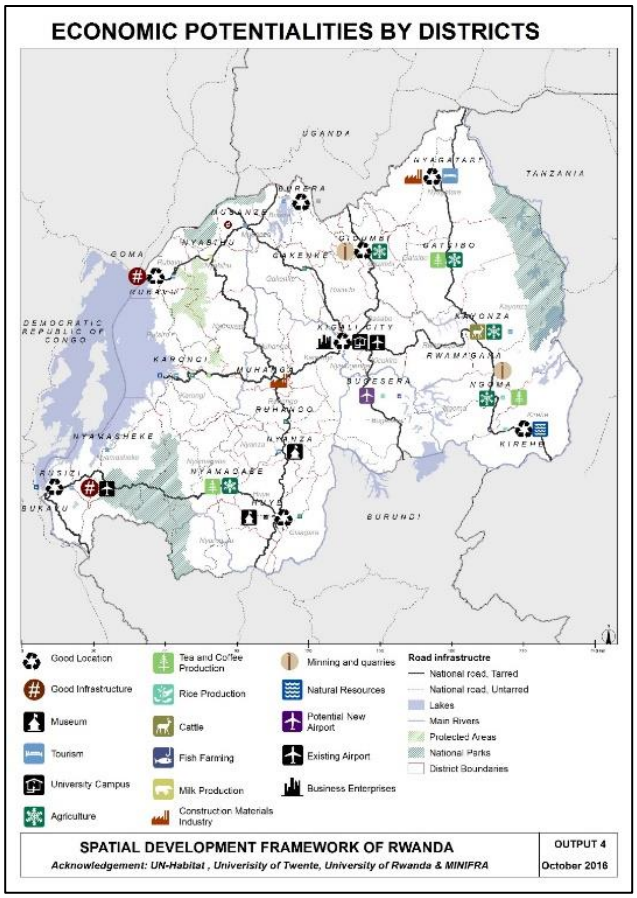

Figure 2:4 SDF outcome showing the districts' economic potentialities across the whole of Rwanda

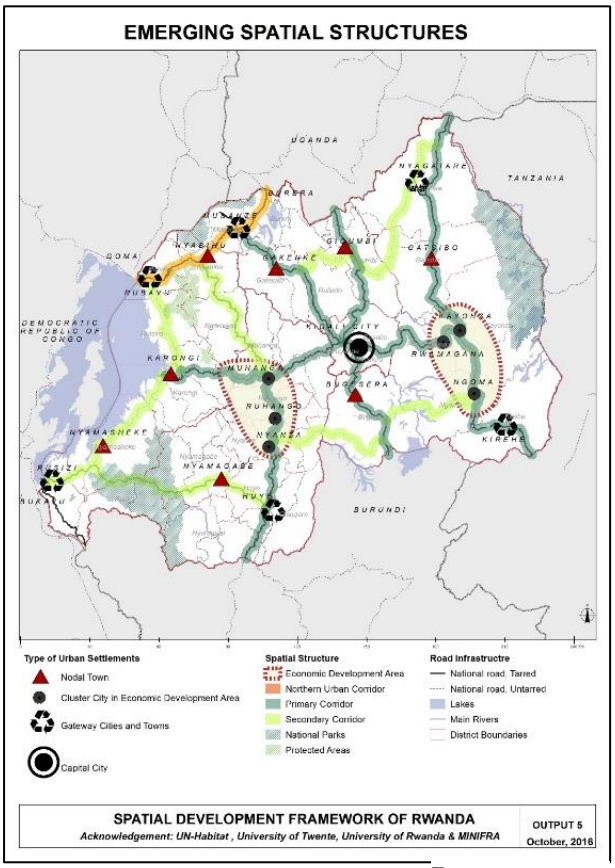

Figure 2:5 SDF outcome showing the emerging spatial structures in Rwanda

Data source: Rwanda SDF, 2016

The SDF's PSS Tools

I. The matrix of functions (MoF)

The MoF is used to give an understanding of how physical development and social-economic activities vary spatially across a territory. The tool involves a table where columns represented functions and the rows represented the Sectors in the study districts as shown in figure 2.6. The functions are categorised into 13 functional classes that are presented as column heads for each class of functions. If a function is present, then it is recorded with value 1 (black box) or else 0 (white box). After the data entry, the summation of the functions is done based on the frequency of the each function. The frequency is then converted into function weight by dividing by 100. The higher the frequency the lower the weight which means a function that is found in few Sectors has more weight (more rare and central function) than a function that is found in almost all Sectors (basic function). When the Sectors are sorted according to the weight, MoF can show (from a large set of functions) various categories and centrality of urban areas. The final sorted matrix table shows ordered Sectors according to centrality score where stakeholders can distinguish basic, intermediate and central functions (Boerboom et al., 2015).

1									Private Professionals			
2	Provin	Distric	Sector	National Private University	International school/universit	Research and development ntre	Public Library	Lawyer Office	Engineer/Urban planning/ Landscape rfices	Accountant Office	Architect Office
3	Western	Rubavu	GISENYI-RUBAVU-RUGERERO-NYAKILIBA-NYAMYUMBA-NYUNDO-KNAZENZE-CYANZARWE-KANAMA								
4	Western	Rubavu	BUGESHI								
5	Western	Rubavu	MUDENDE								
6	Western	Rubavu	BUSASAMANA								
7	Western	Nyabihu	MUKAMIRA-KARAGO-JENDA-BIGOGWE								
8	Western	Nyabihu	SHYIRA								
9	Western	Nyabihu	RAMBURA								
10	Western	Nyabihu	RUGERA								
11	Western	Nyabihu	JOMBA								
12	Western	Nyabihu	KINTOBO								
13	Western	Nyabihu	MURINGA								
14	Western	Nyabihu	RUREMBO								
15	Western	Nyabihu	KABATWA								
16	Northern	Musanze	MUHOZA -CYUVE-KIMONYI-MUSANZE-BUSOGO								
17	Northern	Musanze	KINIGI								
18	Northern	Musanze	NKOTSI								
19	Northern	Musanze	GATARAGA								
20	Northern	Musanze	GASHAKI								
21	Northern	Musanze	GACACA								
22	Northern	Musanze	NYANGE								
23	Northern	Musanze	REMERA								
24	Northern	Musanze	RWAZA								
25	Northern	Musanze	SHINGIRO								

Figure 2:6 An Extract of the matrix of function showing the data entry window with list of provinces, districts and sectors on the rows and the functions list and categories in the columns.

Data source: Rwanda SDF, 2016

II. Spatial Multi-Criteria Evaluation (SMCE)

The SMCE helps to spatially evaluate, compare and prioritise possibilities in an area, giving an understanding of how well certain areas compare to others. The tool was developed using ILWIS software which is an open source GIS software (Zucca et al., 2008).

The SMCE starts by establishing a criteria tree. In this case, four criteria trees each based on one of the four pillars of the Rwanda National Urbanisation Policy (see section 2.6.1). The criteria tree consist of the objectives, sub-objectives, criteria and indicators (see figure 2.7). In ILWIS raster data is applied into the indicators which are then aggregated to criteria by means of weighted summation. ILWIS allows standardisation of raster pixels such that the values range between 0 and 1. The final output which is called composite index map shows the overall performance of the territory according to the specified criteria and used indicators (Boerboom et al., 2015). The colour red shows areas that are performing poorly while green shows regions performing well based on the input data (see figure 2.8)

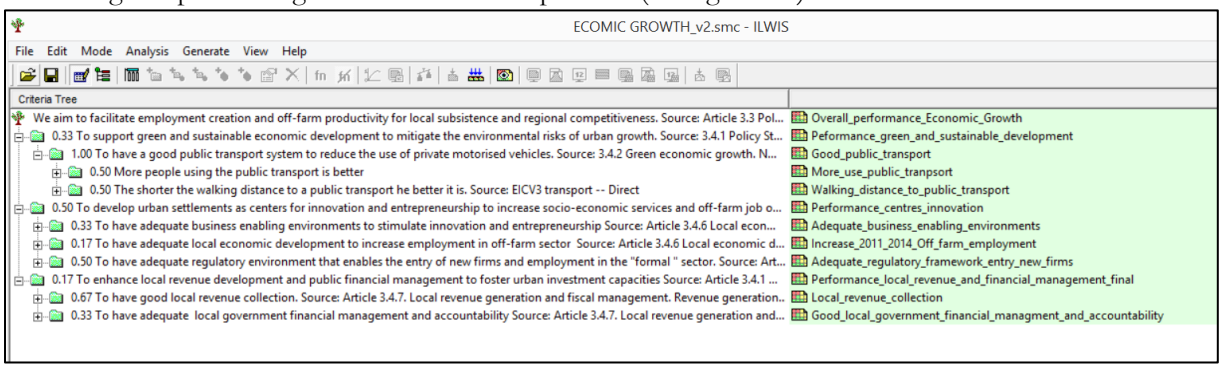

Figure 2:7 Image of the ILWIS SMCE window showing the criteria tree, the three objectives under economic pillar economic tree, their weights, the sub-objectives and the outputs in form of raster maps at far right.

Data source: Rwanda SDF, 2016

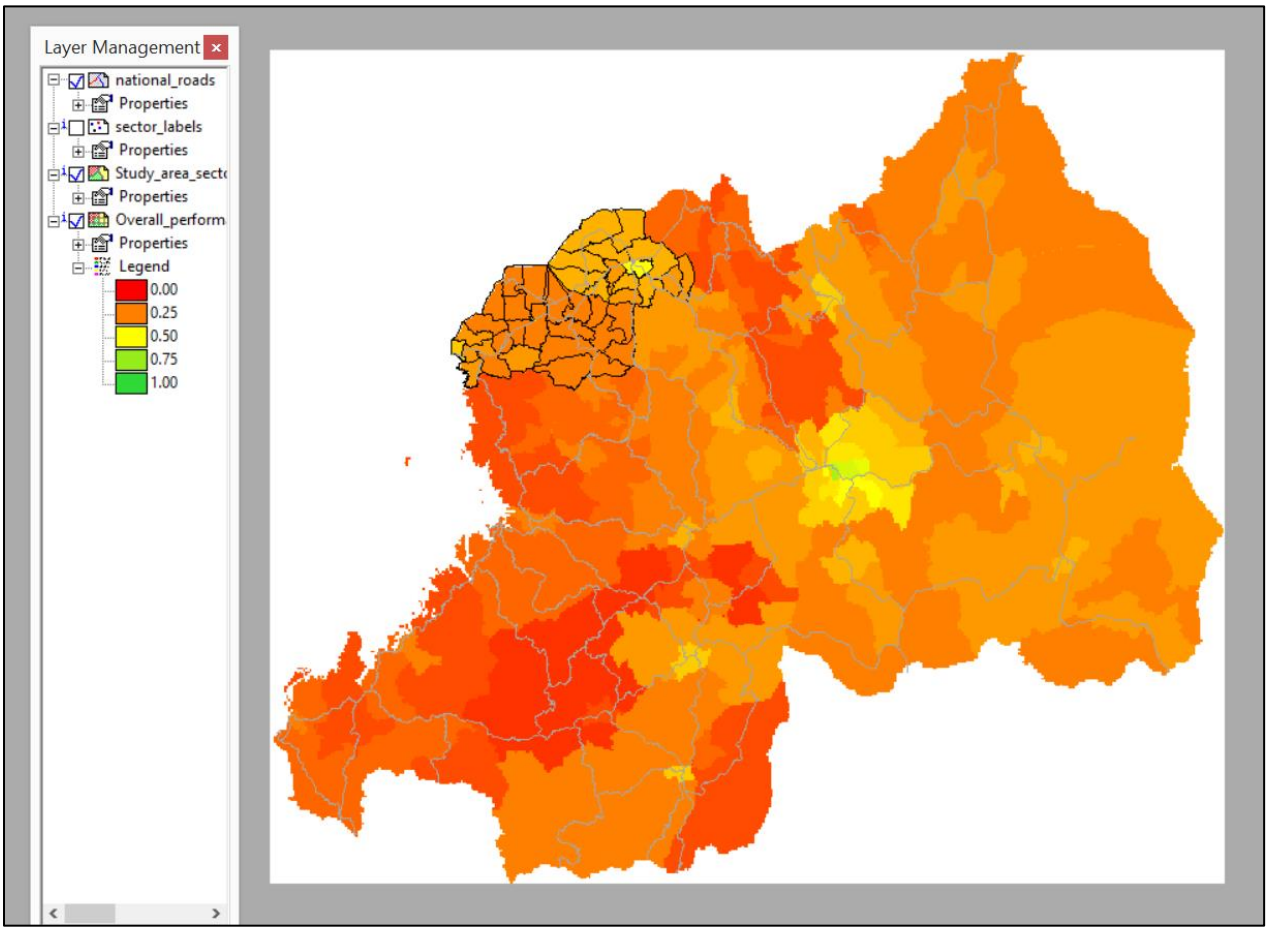

Figure 2:8 A composite index map showing the Economic pillar performance in Rwanda overlaid with the roads layer shown in grey and the study area Sectors boundaries layers shown in black. Data source: Rwanda SDF, 2016

3. RESEARCH METHODOLOGY

This chapter discusses the research methodology for this study. The first section is the selection of the study area and justification on the choice of Rubavu and Musanze districts in Rwanda. The next section explains the research strategy followed by a section on the methods used in data collection, processing and analysis. The section ends with a reflection on some ethical issues that were considered throughout the study.

3.1. Selection of study area

In this study, two secondary cities[6] in Rwanda were used to study the PSS appropriation. These cities are Rubavu and Musanze. Rubavu is the second largest city in Rwanda after Kigali (the country's capital city) while Musanze is the third in terms of population. In addition, the choice of these cities was informed by their geographical location (relatively closer) as well as their role in implementing the SDF. These two cities are considered key pillars in the tourism industry and infrastructure development in Rwanda (Boerboom et al., 2015). It is, therefore a valid study to explore the possibility of implementing the Rwanda SDF by focusing on the major secondary cities in the country.

3.1.1. Rubavu district

Rubavu district is one of the 30 districts in Rwanda and it is located in the Western Province, 152 Km from the Capital City Kigali. Rubavu City, in particular, is found in the northeast of Lake Kivu and near the border city of Goma, in Democratic Republic of Congo (DRC) hence Rubavu is commonly regarded as International Gateway city. Rubavu district the following hierarchy of administrative levels: 12 Sectors, 80 cells and 525 villages. Although Rubavu city (Sometimes called Gisenyi) is the second largest city, there is no autonomous urban administration authority for the city. The urban Sectors that make the Rubavu secondary city include Gisenyi, Rubavu[7] and Rugerero. The rest of the Sectors make the rural part of the district (see figure 3.1).

Rubavu district has a population of about 423,000 out of which 149000 are living in the urban area. Rubavu city has an estimated urban growth rate of 5% that is higher compared to 3.3% in the whole district. The national bureau of statistics projects an urban population of 200,000 inhabitants by the year 2020 (Rubavu DDP, 2013). The land is characterised by physical features such as volcanic mountains, Gishwati Forest and Lake Kivu. In the recent past, the national government launched the KivuWatt project which is power project aimed to tap deposit of methane and carbon dioxide gases which is one of the major economic investment in the district (MININFRA, 2016b).

3.1.2. Musanze district

Musanze district is among the five north province districts. Musanze district borders Uganda and DRC to the north, Gakenke and Burera districts to the East and Nyabihu district to the West. Musanze district has a total surface area of 530km^2. Some of the major attractions in the district are the Virunga national park which is approximately 60km^2 and Lake Ruhondo which is about 28 km^2. Musanze has got 15 Sectors. The

[6] The secondary cities are part of the larger districts administrations because there are no autonomous administration authorities for the secondary cities in Rwanda. Therefore, the word secondary cities is interchangeably used with the word districts.

[7] The word Rubavu here is used to refer to a Sector but has not been used elsewhere in this study. The word is used throughout this study to refer to the Rubavu districts.

urban area (making the Musanze secondary city) includes Muhoza, Cyuve, Kimonyi, and Musanze (Ruhengeri) Sectors as shown in figure 3.2.

By the year 2012, Musanze had a population of about 307,078 people with a population density of 695 habitats per km$^{2.}$ The annual growth rate in the district is 1.8%. Musanze is ranked third best district in terms of poverty reduction with 70.9% of the population in Musanze regarded as non-poor (Musanze DDP, 2013). This can be attributed to high level of agricultural activities with the largest population in the district practising farming in pyrethrum, potatoes, sorghum and foliage (Musanze DDP, 2013). Musanze takes pride in been the home of the gorillas which is one of the major tourism attraction in Rwanda. In addition, Musanze has the highest mountains in Rwanda. With the five of the eight Virunga chain mountains namely Karisimbi, Bisoke, Sabyinyo, Gahinga and Muhabura are all found in this district.

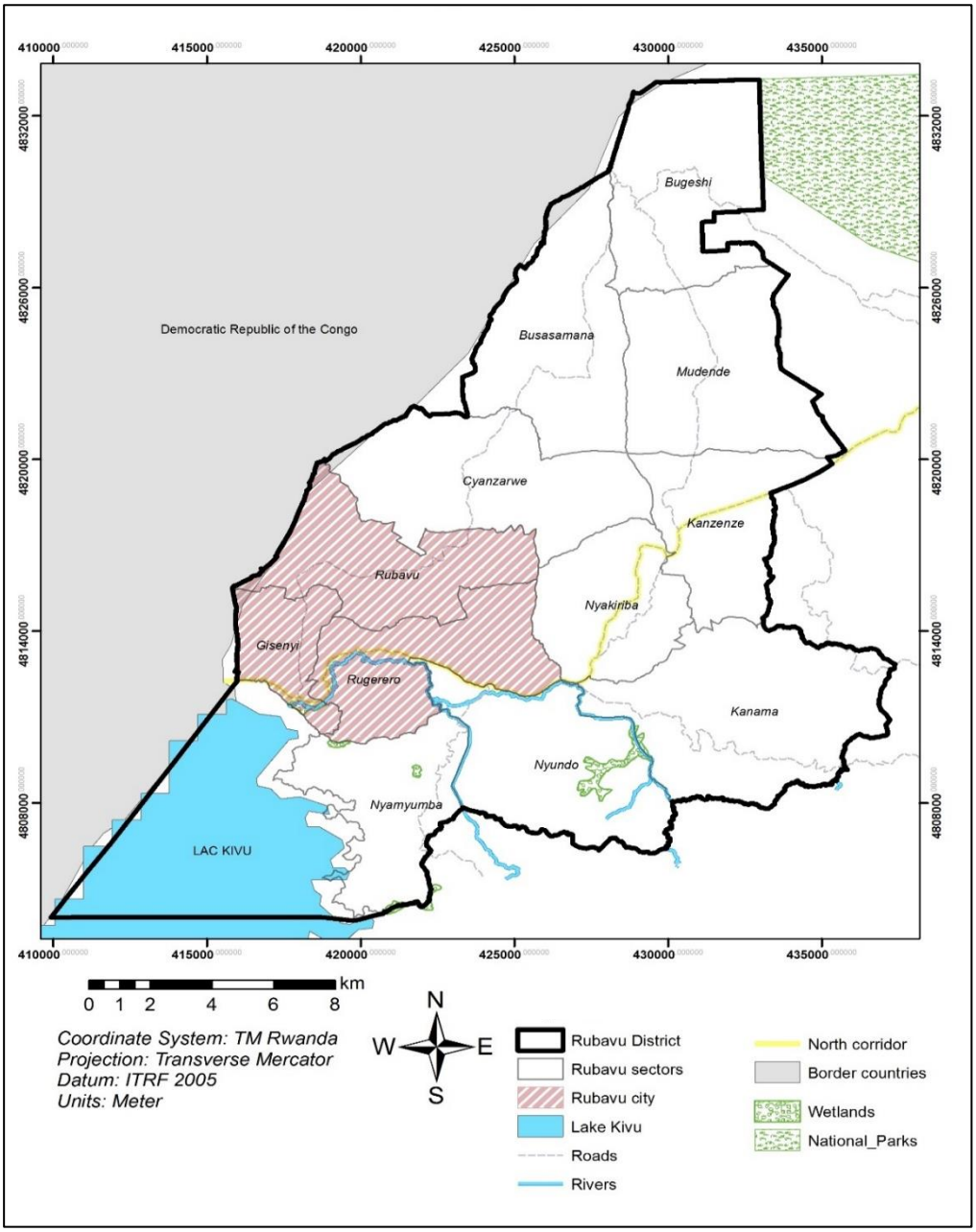

Figure 3:1 A map of Rubavu district showing the 12 Sectors, and other physical features

Data Source: Rwanda SDF, 2016

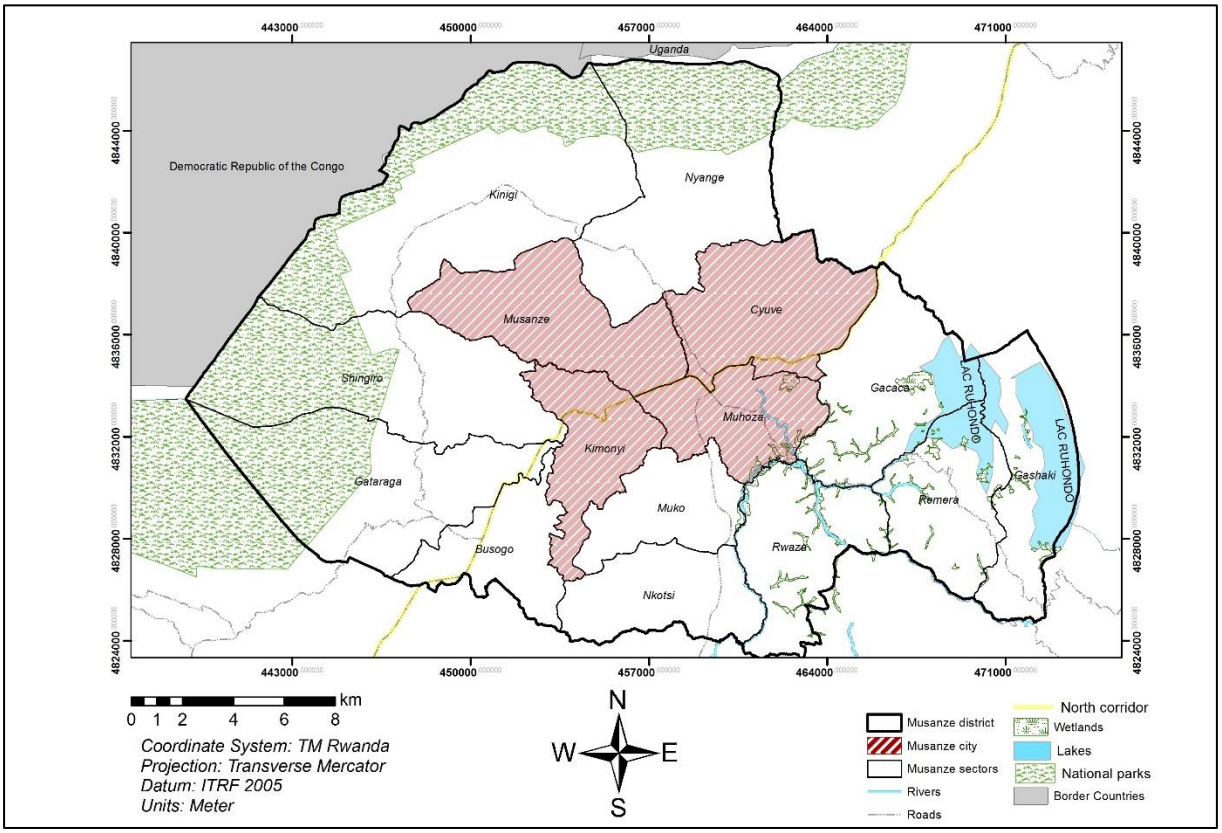

Figure 3:2 A map of Musanze district showing the 15 Sectors and the urban area

Data Source: Rwanda SDF, 2016

3.2. Research strategy

A case study approach was used in this study. This helped in understanding how PSS appropriation in the districts is likely to happen in Rwanda and understand key factors that are likely to influence the appropriation process. A case study, as a research type was preferred because it gives a researcher an opportunity to explore the case study area in line with the study objectives in a detailed and intensive manner (Bryman, 2012). For example, in this study, the choice to study PSS appropriation in the districts in Rwanda was based on the fact that, Rwanda has developed a spatial framework, hereby referred to as Spatial Development Framework of Rwanda. The choice of a case study allows a detailed understanding of how the PSS appropriation can happen in the study area (Rubavu and Musanze).

This study used mixed method approach. That means, integrating qualitative and quantitative (QUAL+quan) approach in data collection (Bryman, 2012). Although qualitative methods took centre priority in this study, the importance of a mixed approach that triangulates between the qualitative and quantitative methods helped in building a strong argument and offer variant approaches to explain the real situation in the case study area (Iacono, Brown, & Holtham, 2011). Similar justification is supported by Mahmood (2013) who explains that using all possible methods in research gives a researcher a broader scope to explain the problem rather than focusing on method (Mahmood, 2013).

3.2.1. Data sources

The primary data needed in this study was mainly obtained from the districts. Secondary data was obtained from the Ministry of Infrastructure, government policies and documents (both at national and districts), ITC database and websites of key partners in the districts' planning processes. The spatial data was obtained mainly from the Rwanda SDF database developed during the first phase of the SDF methodology (see section 2.6.2). More specifically, the matrix of functions (MoF) and the Spatial Multicriteria Evaluation

(SMCE) were used in designing the research workshop materials that are explained in appendix 4. Table 3.1 below shows the summary of main data needed and the relevant sources.

Table 3:1 Primary and secondary data needed and their sources

Category	Data Need	Sources
Secondary data	SDF framework, Dimension and SMCE, MoF relevant in Rubavu and Musanze.	SDF report, ITC, Un-Habitat, Rwanda, MININFRA and RHA
Secondary and primary data	Mechanism of adoption of national policies, strategies at local governments.	Key informants, documents, websites, reports and websites
Secondary and primary data	Secondary Cities Planning process	Reports, Official documents, websites, Key informants,
Primary data	Perception about SDF outcomes	Focus group discussion, Questionnaire
Primary data	Applicability of PSS tools in the secondary cities	Focus group discussion, questionnaire
Primary data	Challenges of appropriating PSS tools and Outcomes in the Districts	Focus group discussion, observation, and questionnaire.

3.2.2. Sampling strategy

This study was targeted to the secondary cities staff members who are the potential users of the SDF's PSS tools and outcomes. Therefore, the participants were purposely selected from the two case study cities (Rubavu and Musanze). Representative sampling approach was used to ensure that all interest of potential PSS users in the districts were represented in the study. Representative sampling aims to ensure the chosen sample is as accurate as possible to represent the entire population (Bryman, 2012), in this case, all Rubavu and Musanze administration Units and other stakeholders involved in planning processes. See the details of the workshop participants and interviewees list in appendix 3.

3.3. Data collection methods

The data collection involved a five weeks fieldwork. The fieldwork started on 19th September up to 22nd October 2016. This section discusses the methods used in data collection namely. Qualitative (Semi-structured interviews, research workshops, notebook, recording, observation and focused group discussion) and quantitative (questionnaires) methods.

Semi-structured interviews

Semi-structured interviews were conducted with the key informants (see appendix 3). This is a method of collecting data that involves an interviewer gathering detailed information from an interviewee by asking directing questions but giving room for the interviewee to explore their area of interest and disclose important issues (Silverman, 2005).

The interviews aimed at giving the researcher a depth and detailed understanding of the planning processes in the two cities (Rubavu and Musanze), the stakeholders involved, the key issues affecting policy implementation and challenges facing adoption of such policies (see appendix 2 for the semi-structured interview directing questions). The sessions were also recorded and later transcribed for qualitative analysis. The completeness of the interviews depended on the response to the directing questions and the willingness to allow recording for the interview session. After the interviews, the key informants were notified of the SDF's PSS research workshops and invited to attend or even nominate other staff from their departments to attend.

Figure 3:3 Interview session with the Building Inspector, Rubavu district

Figure 3:4 Interview session with the Director of Planning, Monitoring and Evaluation Unit, Rubavu district

Research workshops

Research workshops involved testing the PSS appropriation with the potential users. The testing was in two sessions namely outcomes and tools session. This is a planning task which the researcher designs prior to the fieldwork to be used as a data gathering instrument as well as testing how PSS will be used and perceived. Similar approaches have been used in testing PSS at different levels (Batenburg & Bongers, 2001; Hwang, 1998; Jankowski & Nyerges, 2008). In this case, the researcher designed a presentation[8] of the outcomes drawn from the Rwanda SDF reports. The presentation was aided by a video clip that explained further the outcomes and the concepts behind the SDF's PSS tools used (ITC Utwente, 2016). A moderator who understood the cultural issues, the language and the Rwanda SDF methodology did the presentation. Also, the moderator was a member of the team that developed the Rwanda SDF and a person who understood the planning context well. The role of the moderator during the workshop is explained in appendix 4.

The MoF was developed using Ms-Excel software while the SMCE was adapted from the existing SDF database that is developed using ILWIS software thus all the tools and capabilities were considered. A control group (without PSS) was not necessary in this case because the PSS tools were all new to all participants as suggested by Batenburg and Bongers (2001). At the start of each workshop, a brief session was held to explain the purpose of the workshop and what is expected of the participants. This was also done to seek informed consent and define the freedom of participants and rules of engagement that was also part of the research. For details about the workshops sessions including the script, see appendix 4.

[8] The presentation can be found in: http://www.slideshare.net/bensonmutindam/sdfrwanda-workshops-slides

Figure 3:5 A workshop in Musanze showing the introduction session

Figure 3:6 Participants interacting with the MoF outcome in a printed format

Field notebook

The researcher used a notebook to record discussions, reactions and comments during the interviews, workshops and focus group discussion. This proved to be helpful especially with the language challenges. Any question asked by the participants in Kinyarwanda would be translated to the researcher by the moderator and then written down in the field notebook. Field notes are also considered in this research as a supporting method to write down insights and quotes which were used as a supplement to the findings of analysed data just as some authors have recommended in similar studies (Iacono et al., 2011).

Recording

Both the interviews and the workshop sessions were audio recorded. During the *experiment workshop* sessions, the interaction between the participants was *video* recorded to allow after session analysis. Video recording is a helpful method of qualitative studies which does not only keep the verbal information but also keeps the non-verbal information that many methods may not disclose (Nyerges et al., 2006).

Observation

An independent *observer* kept a record of observed patterns and interactions during the research workshop. The observer was an expert with knowledge of the PSS as well as qualitative research skills. The observation was targeted on issues related to difficulties in understanding the tools, interactions of participants, groups' ability to make a decision based on the PSS tools and outcomes and the peculiarities of participants regarding the SDF's PSS tools and outcomes. An observer in PSS testing sessions has proved to be reliable in qualitative data analysis (Nyerges, Jankowski, & Drew, 2002). Although the presence of an observer may influence the participants (Bryman, 2012), this was done with minimal influence on the process whereby the observer focused on the behaviour of participants within a given framework (in this case, in line with PSS tools).

Focused group discussion:

After the workshop, the participants were engaged in a *focused group discussion* to share their experience and challenges in using the SDF's PSS tools and outcomes. The moderator who understood the cultural issues,

the language and the Rwanda SDF methodology but guided by a script designed by the researcher facilitated the sessions. In addition, the moderator helped to lead the sessions and offer assistance when needed especially regarding clarification or explanations of the SDF's PSS tools and outcomes. This is commonly so in such exercises to avoid getting stuck in the research workshops when using the new tools such as PSS (Huber, 1984).

Questionnaires

Quick self-administered *questionnaires* were given to the participants focusing on evaluating the impact of the workshop and the knowledge of Rwanda SDF methodology based on the workshop experience. In addition, the questionnaire provided a quantitative measure of assessing how the capabilities of the SDF's PSS tools will be appropriated. The questionnaires were the main source of quantitative data in this study. The sample of the questionnaire is found in appendix 1.

A mix of data collection methods will help not only in building a firm argumentation but also in justifying the theory behind appropriation of PSS. Such research requires a balance of social-behavioural settings (what is observed in the field, mainly empirical) and techniques for data collection (which are based on variables defined by the researcher mainly theoretical). Therefore triangulating through these methods will help in validating the results within the empirical and theoretical frameworks (Nyerges et al., 2002).

3.4. Data analysis methods

Upon completion of the fieldwork, primary data was processed and analysed. Secondary data mainly from reports, documents, presentations and website information was extracted to support in answering the research objectives. The data collected using the questionnaires was coded and analysed using Statistical Package for the Social Sciences (SPSS) version 23 (SPSS, 2013). The responses were coded on a five-point Likert scale (1 = "strongly disagree", 2 = "somehow disagree", 3 = neither agree nor disagree, 4 = Somehow agree, and 5 = "strongly agree". The responses from the participants were computed to get a rating for each question and then interpreted in line with purpose and objective. The interviews were transcribed verbatim in a Ms- Word document and then *Atlas.ti* software for windows version 7 (Atlas.ti, 2017) was used to code the text for detailed analysis. The coding process started with open coding where remarks and direct statements from interviewees and workshops were given labels based on the research questions. During open coding, free quotations were created and then codes developed from the keywords in the quotes. The codes were then sorted into distinctive categories to establish findings and answer the research questions (Johannessen & Hornbæk, 2014). These categories of codes were then grouped into families based on research objectives which lead to the interpretation of the data. In addition, observation by the observer and field work notes were added as memos to support the process of interpretation. The coding practice was checked and confirmed by two supervisors by sampling codes. Validation of the data was done by data triangulation from all the research methods (interviews, questionnaires, documentations, videos and planning outcome) leading to conclusions and recommendations.

3.5. Ethical issues

Qualitative studies involve understanding the situation being studied by associating with people in their normal daily life and operations (Silverman, 2005). The choice of the study area influenced daily activities of targeted local governments' officials. Thus, it needed a clear understanding of how to engage participants and interviewees during the fieldwork. Usually, this is done through informed consent of the participants and interviewees even before engaging them (Bryman, 2012). This was considered in the research workshops, interviews and questionnaire.

Several authors have written about key ethical issues related to qualitative research. Sanjari, Bahramnezhad, Fomani, Shoghi, & Cheraghi, (2014) gave a detailed explanation of such issues and their views shed some light in this study. Table 3:3 shows a summary of the ethical issues and the solutions adopted.

Table 3:2 Research ethical issues and potential solution used in this study

Ethical issues	**Potential solutions**
Role of researcher	Seek informed consent from interviewees and participants. This was done first by brief identification of the researcher, through a formal writing by the university and the RHA. And second, by clearly explaining to participants, the purpose of the session, expected role, the use of outcomes and right to participate.
Researcher - participants relationship	The researcher had to minimise chances of intrusion by focusing on guided questions for interview and questionnaires that relate directly to the research. The researcher also sent the meeting request in advance (2 to 4 weeks) to allow participants and interviewees to prepare for the sessions. This was followed by phone call and confirmation few days before the actual meeting. Disclosing the role of every participant in the research. Such include the roles of researcher, workshop participants, observer, and moderator, among others.(see appendix 4)
Research design challenges	The choice of case study meant working closely with local government officials in Rubavu and Musanze. The researcher aimed at no harm policy by focusing on protecting the privacy of the involved people as well as their rights to benefit from the study. Thus, measures to protect the identity of participants was highly considered throughout the research. For example, workshop numbers (workshop 1, 2, 3 and 4) identifies participants and interview schedule number identifies interviewees during the data analysis.
Data collection issues	Ethnographic studies (studying culture, socio behaviour and ethical characteristics within people's context) may raise eyebrows among the participants. The researcher was, therefore aware of potential conflicts. Thus informed consent and overtness in every process were sought before the start of any activity. To deal with potentials of conflicts, the research sought approval from the right government authorities, including been introduced to participants by the right person and authority.
Workshop scripts translators	Many useful data from the workshop was collected in Kinyarwanda, which needed to be translated into English for interpretation during data analysis phase. In order to avoid partialities, the interpreter was a "neutral" person who does not take interest in Rubavu and Musanze districts.

4. RESULTS AND DISCUSSION: PLANNING IN THE DISTRICTS

4.1. Introduction

The first sub-objective of this study was to understand the existing planning processes and procedures in Rubavu and Musanze districts. These included understanding the people involved in the planning processes, their roles, the key outputs (plans) and their preparation process, and finally, measures taken to implement the planning processes outcomes (the plans). It is important to understand the existing procedures, people and policies in Rwanda in order to have a contextual understanding of the where the SDF's PSS appropriation will happen (Jankowski & Nyerges, 2001). This chapter presents the findings related to existing governance structures, policies, planning processes and their outcomes and implementation methods in the Rubavu and Musanze districts. The results are based on the interviews and cross-checked with secondary materials. The details of the interviews are attached in appendix 2.2. The chapter ends with a discussion on the findings of the planning in the districts in Rwanda.

4.2. Governance and structure of the districts

The districts' governments in Rwanda are established by the constitution and order papers which give all the districts the same structure of government (see figure 4:1). The head of a district is the mayor who is assisted by two assistant mayors and the Executive Secretary in charge of administrative duties in the districts. Below the office of the Executive Secretary, there are autonomous agencies, corporate service division, District Administration Security Support Organ (DASSO) and 10 units. The Units that are involved in the district planning processes include the One Stop Centre, Planning, Monitoring and Evaluation, Finance, Education, Social Development, Good Governance, Health, Human Resource and Administration, Agriculture and Natural Resource and Business Development and Employment units.

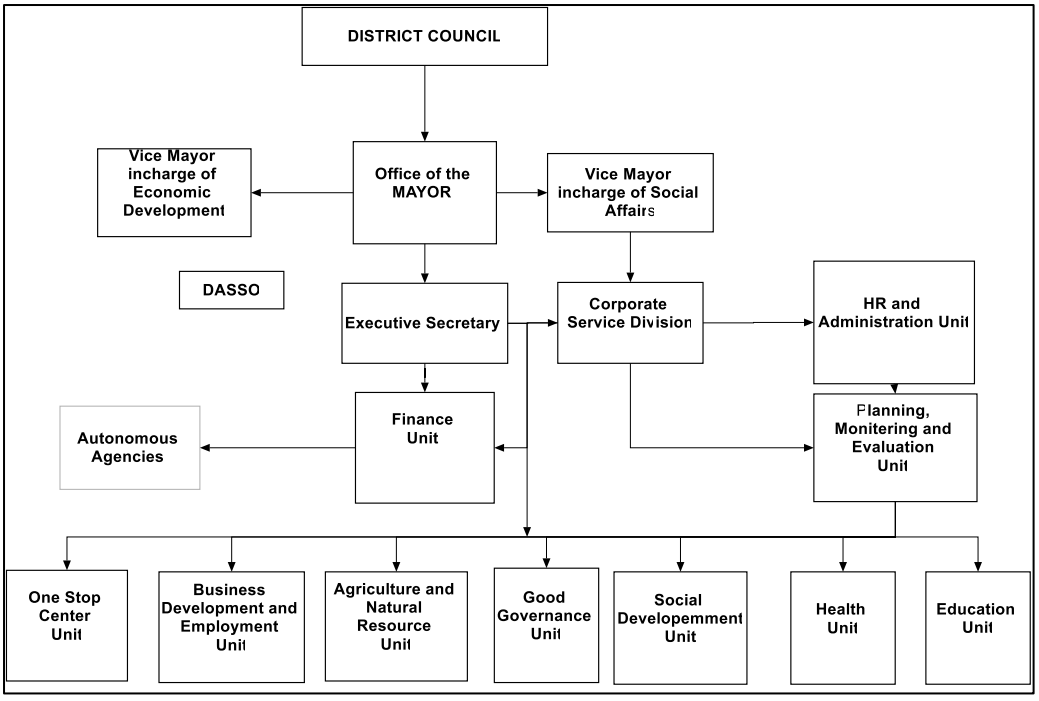

Figure 4:1 Structure of the districts in Rwanda showing the existing Units Source: (MIFOTRA, 2015)

The approval of districts projects and plans is done by the District Council (DC) which is the supreme body in the district. The DC is composed of representatives from all stakeholders[9] in the districts which include the district government, Private Sector Federation (PSF), Joint Action Development Forum (JADF), police, youth, executives of the Sectors and people with disabilities.

"The District Council is the highest organ of the district, we have district council, executive committee. The district council is elected from the population and every Sector must have his or her representative in the district council and youth, private Sector, people with disabilities, women they must be represented" - Interviewee 5.

4.3. Stakeholders in the districts' planning process

4.3.1. Key stakeholders

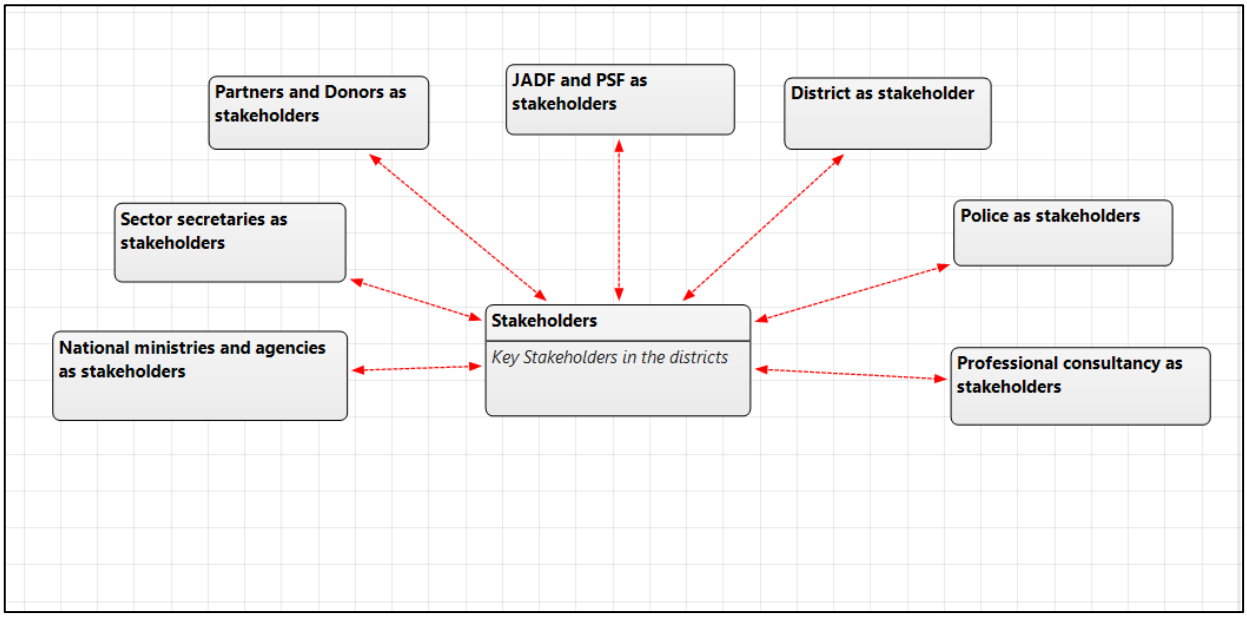

Figure 4:2 Atlas.ti analysis results showing the key stakeholders involved in the districts' planning processes

Planning in the districts reflects the strong institutional framework that exists in Rwanda as directed by various policies such as Vision 2020, Decentralisation policy. In addition, planning in the districts is a collaborative process that involves different stakeholders. Figure 4:2 shows the key stakeholders involved in the district local planning processes both in Rubavu and in Musanze based on interviews. The coding results (refer to section 3.4 for analysis procedure) shows that the district, national agencies and ministries, JADF, PSF, consultancies, partners and donors, national government, Sector secretaries and police are the key stakeholders. The detailed coding results are shown in appendix 5.

Both the central and district governments are represented in the planning process. The districts are usually represented by directors (heads of a unit) of the 10 Units who represent the planning needs within their units while the central government carries activities in the districts through ministries and national agencies. Notably, the MINALOC carries out supervision of the central government programs in the districts through a national agency called Local Administrative Entities Development Agency (LODA). Other ministries and national agencies include the Ministry of Finance and Economic Planning (MINECOFIN), Ministry of Infrastructure (MININFRA), Rwanda Natural Resource Authority (RNRA), Rwanda Transport

[9] Stakeholders: Refers to different interest groups, individuals, organizations, and government entities that are involved in the process of planning in the districts.

Development Agency (RTDA), National Union of disability Organisations on Rwanda (NUTOR), Rwanda Development Board (RDB), and Rwanda Agricultural Board (RAB).

The civil society and private business community are represented by the Joint Action Development Forum (JADF) and the Private Sector Federation (PSF) respectively. JADF is a combination of all civil society organisations, non-governmental organisations (NGO's), Community Based Organisations (CBOs) and other development partners. JADF was established in 2007 by ministerial instruction No 04/07 and the forums have expanded their operations not only in Musanze and Rubavu but also in other 20 districts (Rwandapedia, 2016). The PSF, on the other hand, is divided into 9 operational themes namely agriculture, art & craft, tourism, women entrepreneurship, commerce, youth empowerment, industry, finance and liberal professionalism districts (Private Sector Federation, 2017). Not all of these themes are currently found in Rubavu and Musanze districts.

Donors and international agencies operate in the district either directly or indirectly. That is, the international development partners can initiate projects in a particular district directly or through national ministries and agencies such as RHA and LODA. For instance, development partners like Netherlands embassy in Kigali give financial support to the districts through the MINECOFIN and LODA, World Bank gave planning tools for online construction permitting directly to Musanze district. In another case, Japan International Corporation Agency (JICA) and Volunteer Services Overseas (VSO) implemented capacity-building projects directly in Musanze district.
Interviewer: The project by VSO and JICA, did they come directly to Musanze or through national government?
Interviewee 7: they come directly…like VSO we worked here together for 3 years their volunteers we worked together for three years.

4.3.2. Roles of stakeholders in the districts

Table 4:1 below shows the analysis results for the roles played by some of the stakeholders discussed in section 4.1.1. The focus is on the districts' Units, national government, JADF and PSF whose roles are considered relevant in this study, that is for the SDF's PSS appropriation in the districts.

Table 4:1 Role of some stakeholders in planning processes as identified from the interviews results and secondary materials and considered relevant for SDF's PSS appropriation in the districts.

Stakeholders	Roles in the planning process
Central Government	• Hires and awards tenders to the consultants, to undertake development projects in the districts on behalf of the districts. • Supervises the operation of hired consultancies in the undertaking of any assigned projects on behalf of the people and the national government. • Supports the districts in the planning process through training and capacity building • Gives financial support to the district for planning and development projects • Elaborates national plans and vision to the districts through relevant ministries and agencies. • Oversees and support districts' decentralisation progress.
Districts	• Gives supportive information (local knowledge) to consultancies and national government agencies in preparation, implementation and evaluation of any development projects. • Prepares annual action plans, performance contract (Imihigo) annually. • Data collection and profiling the district for planning purposes. • Elaborates districts' plans, vision and development strategies to the Sectors and Cells. • Validates the districts' plans, budget and policies

One Stop Centre	• In charge of the preparation, drafting and elaborating the Master plan. • Coordinates the urban planning activities in the districts. • Works closely with RHA and MININFRA to implement urbanisation goals and visions in the districts • Prepares local development plans, layout plans and help in elaborating the outputs to others district units. • Approval of development and investments projects within the districts in accordance with building codes and permissions.
Planning, monitoring and evaluation Unit	• Consolidates districts' actions plans from all units and other strategic documents emanating from different units and Sectors. • In charge of implementing, monitoring and evaluating the DDP and Action plans with the supervision of Executive secretary. • In charge of budgeting and financial allocation for all development projects within the districts • In charge of preparing Strategic Issue paper (SIP), Project Profile Document (PPD), district's Annual action plan and tender plans • In charge of data storage, analysis and providing information relevant for planning in the districts such as statistical data, evaluation criteria and performance indicators.
JADF and PSF	• Participates in all district planning processes, evaluation and elaboration of plans • Serves as an intermediate body between the civil society, private organisation and the districts by advocating corporation and joint governance. • Represent the interest of the civil society and Private organisations in the districts planning process. • Accountability role, which includes working with district planning, monitoring and Evaluation Unit to ensure private organisations, NGOs and civil societies, honour their development commitment and support in the districts, especially in community development and investment.

Source: MIFOTRA, 2015

4.4. Outcomes of districts planning processes

The following section highlights some of the key planning processes and their outcomes in the districts (these relate to research questions 1.2 and 1.3). The main outcomes of the district planning processes include long (master plan and DDP), medium (MTEF) and short (Imihigo and Annual action plans) term plans.

4.4.1. The Master Plan

The master plan is one of the long-term plans in the districts. Master plans in Rwanda are designed to guide development and urban growth for a period of 20 years. According to the urban planners in Rubavu and Musanze, the master plan is an important plan in the districts for guiding implementation of infrastructural development projects such as roads.

The master plan is prepared by the One Stop Centre unit, in collaboration with the district technical committee (see MIFOTRA, 2015). The process of preparing a master plan starts with tendering process done by the MININFRA through the RHA. The hired consultant prepares the master plan with the supervision of the districts (usually the One Stop Center Urban planners). The consultant provides technical skills in understanding the development processes in the districts and conceptualising the spatial challenges. The draft master plan is then presented to the District Council for consultative discussion followed by a series of field exercises. After the consultative meetings, preliminary plans and economic strategy are designed which are presented to members of JADF and PSF to communicate the district's vision and receive

private sector and civil society inputs. The next step is the preparation of the final master plan together with a financial plan developed in conjunction with Planning, Monitoring and Evaluation Unit. The financial plan and the master plan are finally presented to the District Council for approval. This process is summarised in figure 4:3 below.

Master plan preparation process

Step 1: Understanding the development process

Step 2: Assessing the existing master plan

Step 3: Set targets (after consultation with stakeholders)

Step 4: Preliminary physical plan and economic strategy development

Step 5: Consultation with stakeholders (discuss the preliminary plan)

Step 6: Develop the final plan

Step 7: Elaboration and draft financial plan (done in two phases each 10 years)

Step 8: Approval by district council

Figure 4:3 The steps followed in master plan preparation process and review proces: Source: Musanze district, 2016

The communication of master plan to different administrative levels is a top – down approach. The approach involves districts' staff drawn from One Stop Centre Unit, going up to the Sector level to elaborate the plans to Sector's staff. The elaboration involves several communication techniques such as the use of general public workshops, formal meeting invitations, printed copies and online platform. In Rubavu, specifically, the master plan is hosted on the website (this is effective communication channel given that all the 12 Sectors in Rubavu district have reliable internet connection.

4.4.2. District Development plan (DDP)

The DDP is the main planning document in the districts. The provision for preparation of DDP is in line with the vision of decentralisation that aims to transfer power and responsibilities to local authorities in Rwanda (MINALOC, 2012). Thus, in line with national goals and visions, the districts prepare the DDP, every 5 years which aims to achieve economic growth and poverty reduction (Rubavu DDP, 2013).

The DDP preparation process starts with needs identification activities (see figure 4.4). This involves a bottom- up approach where the districts' staff go up to smallest administration levels for data collection. The findings of the families are harmonised to formulate needs at the Villages while the needs in the Villages are consolidated and prioritised to identify needs at the Cell level. Similarly, needs at the Cells are consolidated to become the Sectors' development priorities which then are consolidated to become districts' priorities. The process at each administrative level is led by the head at that level with financial support from the district through Planning, Monitoring and Evaluation Unit.

After needs identification, the planning team chooses the indicators and targets for addressing those identified needs. This involves consultative meetings with all stakeholders in the districts, mainly led by a professional consultant hired by the central government. In choosing the indicators, the districts are guided not only by the identified needs but also a set of national and international policies such as EDPRS-2, Vision 2020, Seven Year Government Program and SDG's. The set of priorities identified helps the professional

consultant in drafting a DDP then followed by input meetings with District Council. After the input meetings, a final DDP copy is prepared and submitted to the districts. The whole DDP preparation process takes approximately three months.

The District Council is responsible for the implementation of the DDP although the implementation must happen in a collaborative and inclusive approach as stated in the DDP.
"The District Council on regular basis, will evaluate the progress made in implementing DDP, identifies challenges and strategies to overcome them and set strategies for next step of implementation" –Musanze DDP, 2013 p. 60).

The districts' planning process reflects a high level of collaboration and inclusion which is provided for in the policies and exercised accordingly in the districts. This has been possible given a strong institutional framework in the whole of Rwanda which is seen in how people adhere to the policies (see Goodfellow, 2013).

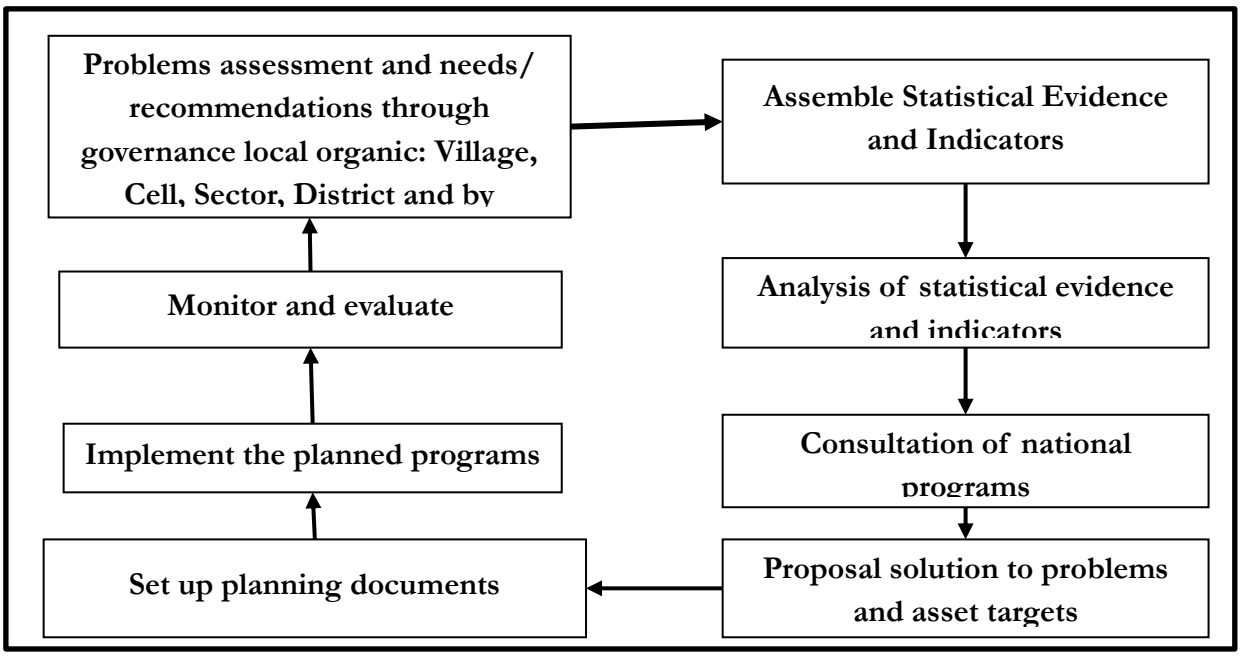

Figure 4:4 DDP Preparation process in the districts

Source: Musanze District, 2016

4.4.3. Performance contracts (Imihigo)

Performance contracts are locally known as Imihigo. The Imihigo entails two concepts namely *"I challenge myself to deliver"* and "*compete among one another"* (Rwandapedia, 2016; Scher, 2010). The Imihigo is a unique tool in Rwanda that was institutionalised in 2007 to promote service delivery in the districts. Over the years, Imihigo concepts have continued to motivate districts to endeavour to achieve the set goals as well as the national cohesion (Scher, 2010). In this regards, Imihigo is now used in other government organisations such as national ministries, embassies, public service among others. However, the concept of Imihigo (see section 2.6) started in the districts with an aim of fostering public participation and holding the mayors in the district accountable to perform (Scher, 2010). The Imihigo preparation process is summarised in figure 4.5 below.

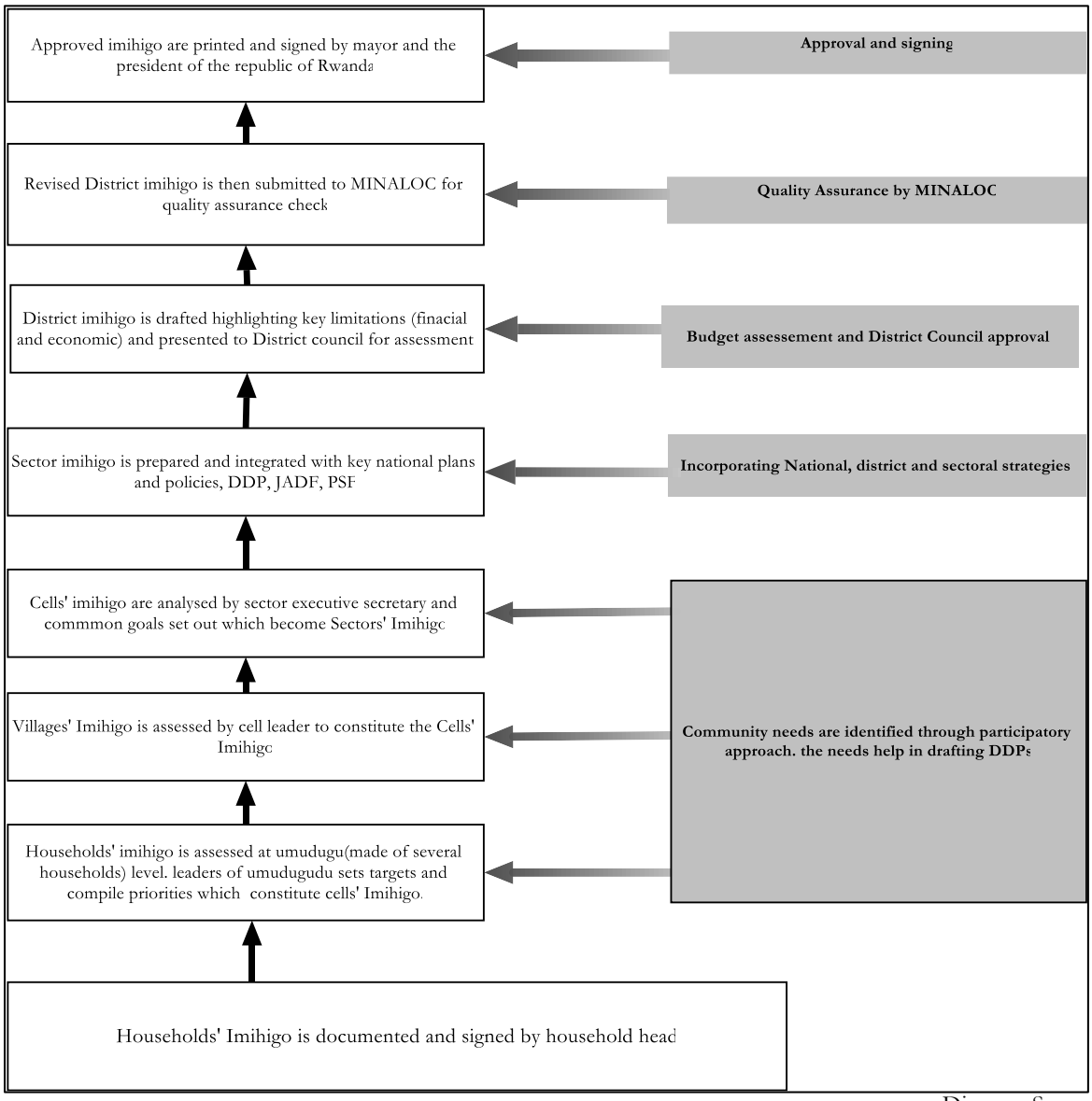

Diagram Source: Rwandapedia, 2016

Figure 4:5 The Imihigo preparation process and the flow of information in a bottom – up approach various administration levels

The Imihigo preparation process starts from the lowest administration levels[10] up to the national level. In the districts, the districts' Imihigo is prepared in a collaborative approach. The district executive committee (see MIFOTRA, 2015) holds several consultative meetings with representatives from the lower-level councils. Each district is divided into Sectors, each Sector into Cells, each Cell into Villages, each Village into Umudugudu and each Umudugudu is made of several households. Members of the households set a representative to the Umudugudu council, members from each Umudugudu set a representative to the Village council, and so on, up to district level. The district executive committee considers the inputs from the lower-level councils and other stakeholders in the districts such as JADF and PSF in drafting the final districts' Imihigo. The final draft of Imihigo in the districts is then presented to the District Council for approval.

[10] The administration levels below the districts include: Sector, Cells, Villages, Umudugudu, and Household in the order of hierarchy.

The districts' Imihigo is finally signed by the mayors (see figure 4.1) in a national ceremony headed by the President of Rwanda. The annual ceremony marks the end of the current year's Imihigo cycle as well as the start of the following year's Imihigo cycle. The awarding of the best performing districts is done by the President while the decision to remove any underperforming mayors can be removed from the office by the District Council (see Scher, 2010)

4.4.4. Annual Action plans

The action plans are prepared annually and individually by every staff working in the districts. As the name suggests, any individual, department or unit prepares a plan that guides the action of the entity within the next year of operation. The ideas, visions, goals and targets are centred on the long-term plans, mainly the provision in the DDP.

"I have my own action plan as staff. Then the action plan for all staff becomes the action plan of the unit. The action plans from all the units become the action plan for the district that which shows all the activities done in the district. We plan every year but we have also another planning plan which is called DDP. The annual action plan comes from the DDP and we are involved in every step" – Interviewee 6

The individual staffs' Action plans are consolidated into departments' plans and subsequently consolidated into Units' Action plan. The final district action plan is prepared by the Director of the Planning, Monitoring and Evaluation Unit which incorporates all action plans from all the Units. The final draft is then presented to the district staff drawn from all Units for verification and implementation strategy formulation. The success in designing and preparing the Action plans is based on the fact that Rwanda has a strong institutional framework as written by Goodfellow (2013). For instance, the DDP that establishes how Action plans will be prepared, who are the stakeholders involved and how reporting should be done (Rubavu DDP, 2013). This is strictly adhered to not by the districts' staff but also all the stakeholders involved in the planning processes.

The preparation process for annual Action plans is similar to the Imihigo. However, the Action plans contains many activities to be achieved within the year in a normal working environment, while the Imihigo contains a set of measurable indicators that shows national focus guided by policies such as vision 2020, EDPRS-2, DDP, SDP, SDG and aims on achieving good governance, economic development, poverty reduction and social wellbeing (Rwandapedia, 2016). Some of the district Action plans' activities end up becoming the indicators of the Imihigo used in scoring the districts' performance annually.

4.4.5. Medium term expenditure framework (MTEF):

The MTEF is an initiative of World Bank and International Monetary Fund (IMF) to help developing countries in managing financial resources by focusing not only on short term plan but also multi-annual budgeting approaches (World Bank, 2013). In Rwanda, MTEF in the districts is a fiscal planning concept that is used to promote transparency, efficiency in resource allocation and create a link between different levels of administration such as Sectors, districts and the national government. MTEF is prepared to cover a period of 3 years (Short, 2003). Which was also confirmed by interviewee 1.

"When I'm planning and preparing the action plan we use the following: MTEF (Medium Term Expenditure Framework) which is prepared for a 3 year period" – Interviewee 1

The MTEF is aimed at aligning both the national and districts' budgetary processes (see figure MTEF in figure 4.7). The alignment targets to create consistent national and local practice that is trustworthy to even international stakeholders. As a result, the MTEF has been adopted at strategic planning levels (positioned in line with national policies such as Vision 2020, EDPRS-2, Poverty Reduction Strategy Paper (PRSP), with

its indicators being part of the Sectoral plans, ministerial plans and DDPs, and operationalised as a channel of translating strategies into action (Short, 2003).

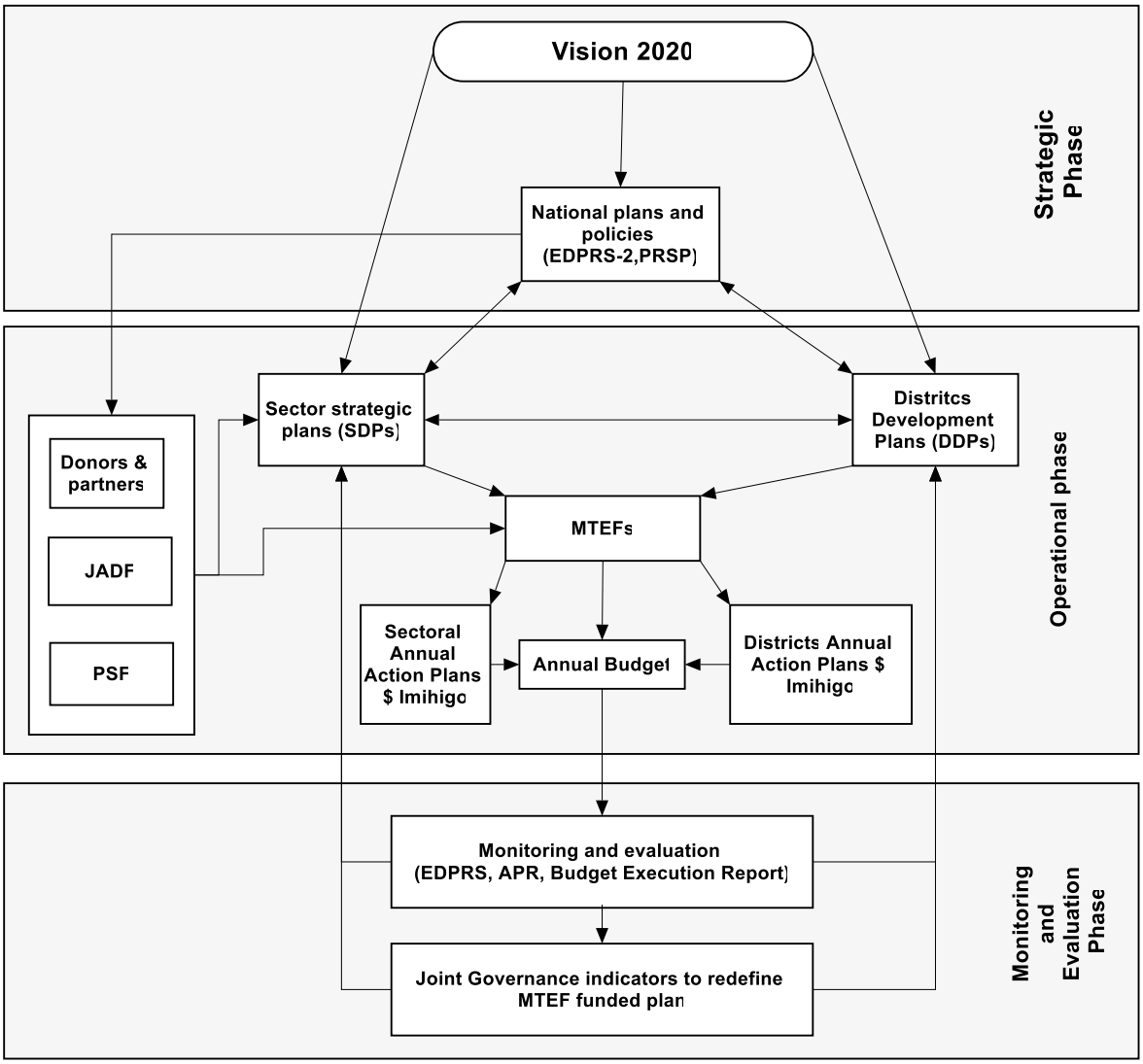

Figure 4:6 A diagram showing the link between MTEF to national and district planning and budgetary processes, stakeholders involved and actions at various phases

Source: Short (2003)

4.5. Implementation of planning processes outcomes

This section shows the results in understanding the implantations mechanism for the planning outcomes in the districts (this relate to research question 1.4). The outputs in the districts are implemented in a top-down approach. That means outputs of the planning processes are communicated to lower levels for implementation. For instance, the results of districts planning are communicated to Sectors through relevant Units and from Sectors to cells through cell leaders. The implementation process commonly entails elaborating the outputs and the roles of the people towards actualising any development plans. For example, as indicated concerning master plan, the One Stop Centre unit staff member said

"We go down and try to explain to the people and we went in each Sector that the master plan covers and we tell them about the project, explaining how it will look like so that we can make them understand about the master plan."- Interviewee 1

The implementation phase in the districts reflects a collaborative process. During the interview with the district staff, it comes out clearly that the district cannot do anything without involving the JADF and PSF representatives. In addition, the districts operate closely with the national ministries and agencies to implement the projects initiated by those ministries. Some plans and outputs have the roles of each stakeholder formulated and clearly defined as shown in table 4.2. However, the District Council is the supreme organ that monitors and evaluates the implementation of many plans in the districts. For instances, according to the DDP*, "The district council is the main responsible for the implementation of this DDP"* (Musanze District, 2013. *P 58).*

Table 4:2 Stakeholders in the DDP implementation, their reporting method, and duration.

Stakeholders	**Duties**	**Means of Verification**	**Periodicity**
Central government	Elaboration of policies, Budget financing	policies, annual budget	Annually
Province	Ensures the implementation of national policies and directives. Monitor and evaluate performance contracts	Reports	Termly (every 3 months)
District executive committee	Coordinates, monitors and evaluates the DDP, prepare and implement performance contracts of district	Reports and field visit reports	Monthly, termly and annual
Sector executive committee	Carries out monitoring and evaluation, decides strategies of actions at their level. Collects and analyses quantitative and qualitative data and transmits reports to District.	Report and field visit report	Monthly, termly and annual
Beneficiaries (from household to cell level)	Contribute to the implementation of projects, participate in the field evaluation.	field visit reports	Monthly
JADF	Act as the bridge between partners and District	meeting reports	Termly

Information obtained from the Rubavu and Musanze DDPs (Musanze District, 2013; Rubavu District, 2013).

4.6. Discussion

The districts and the whole of Rwanda at large reflects a powerful institutional framework for planning and governance. This explains why the structure, organisation and administration of the Villages, Cells, Sectors, districts, and provinces is the same across the country. There exists a strong link between national and districts governments. National policies such as vision 2020, EDPRS-2, Cabinet Resolutions, MTEF, and Seven Year Government Programs are strictly observed from national to Sector level. According to Goodfellow (2013), such policies and regulations have been effective and culminated to transformation in government service delivery and credibility in Rwanda. Although the districts are decentralised units, there is strong upward accountability and supervision across the levels of administration (Goodfellow, 2013). In line with the EAST framework, the *socio-institutional influence* (refer to section 2.2.2) in Rwanda reflects a strong power and control aspects (refer to Jankowski and Nyerges, 2001) related to policies which direct how people in the districts carry out planning activities.

The strong *social-institutional structures* are seen in how the districts planning processes clearly define the goals and task of all stakeholders across the administration levels. The existing *social-institutional structures* have

influenced the participants' characteristics and the decision-making process. For example, the Imihigo, a home - grown and unique tool within Rwanda planning and governance framework has promoted planning, decentralisation and improved performance output (MINALOC, 2011). Imihigo is argued to have nurtured a *culture* of transparency and accountability as well as *norm* and *perception* of competition for development. Similar findings were presented by Scher (2010) who points out that Imihigo is a key tool that has a promising long-term effect on achieving decentralisation in Rwanda. Applying EAST framework aspects according to Jankowski and Nyerges (2001), the SDF's PSS tools should be in line with *existing structures* such as: *methods of implementation* (strictly top – down approach), people engagement style (collaborative processes involving all stakeholders) as well as *interaction styles* (methods of meetings and sharing ideas) that promote inter-organisational relationship.

The interests and roles of the districts and national government are clearly defined in Rwanda. The national government seeks to achieve national goals outlined in national and global documents by *transferring* the policies, ideas to the districts and financing the implementation of such ideas. On the other hand, the districts must integrate the national ideas with the needs of the people which are gathered from within the districts. Thus despite the common national policies and visions, local planning in Musanze and Rubavu differs on the priorities and the objectives. This is what Freeman (2009) attributes to *policy translation* (see section 2.5) which aims at creating a common local modification of the national policies and then materialising them into working ideas and plans.

The *policy transfer* mechanism in Rwanda follows a strictly top-down approach which aims at implementing the visions, policies as envisioned from national levels. However, the districts *translate* the national policies locally and operationalise them differently which explains why the Rubavu and Musanze have different priorities in their DDPs. Also, the policy translation is also reflected in how the districts score differently in the annual Imihigo evaluation which is based on national goals of well-being, economic growth, governance and poverty eradication. Therefore, the SDF'S PSS appropriation in the districts will help the districts in translating the national policies locally while at the same time strengthening the existing link between national and district governments.

This chapter has expounded on the existing institutional framework in the districts and the people involved the planning processes. These relate to *social-institutional* and *user' characteristics* constructs in the EAST framework which provides a background understanding of where the PSS tools are being introduced. Such aspects like local planning processes, norms, and rules, implementation procedures and national-local governments' relationships will influence the perception of the users. This corroborates the Jankowski and Nyerges (2001) formulation in the EAST framework.

5. RESULTS AND DISCUSSION: APPROPRIATION OF PSS OUTCOMES AND TOOLS

5.1. Introduction

The objective two of this study focused on understanding how secondary cities (Rubavu and Musanze) will make meaningful use of SDF's PSS tools and outcomes in their local planning processes. To this regard, three questions were formulated to understand the users' perceptions (positive and negative) of the usefulness of the SDF's PSS outcomes and tools, how the tools are likely to be appropriated to the local planning processes and which Units in the districts are likely to appropriate these outcomes and tools. The results are from research workshops held in Musanze (workshop 1 and 2) and Rubavu (workshop 3 and 4) districts. The list of participants and their Units is attached in appendix 4. The following sections report on the results in answering these questions (related to research objective two) and finalises with a discussion on the findings.

5.2. Perception of PSS outcomes and tools usefulness

The quantitative results in figure 5.1 show that there was high satisfaction among the 21 workshop participants in using the SDF's PSS tools. In figure 5.1, the numbers refer to the participants' questionnaire number, the asterisks means extreme outliers (cases that fall 3 times away from the lower or upper fence of the box plot) and the circles means the normal outliers (cases that fall outside the lower fence of the box plot). In general, the questions relating to the SDF's PSS tools and the willingness to appropriate the tools show a median score of 4 (agree) and a mean of above 4.00 (the detailed analysis results are presented in appendix 6).

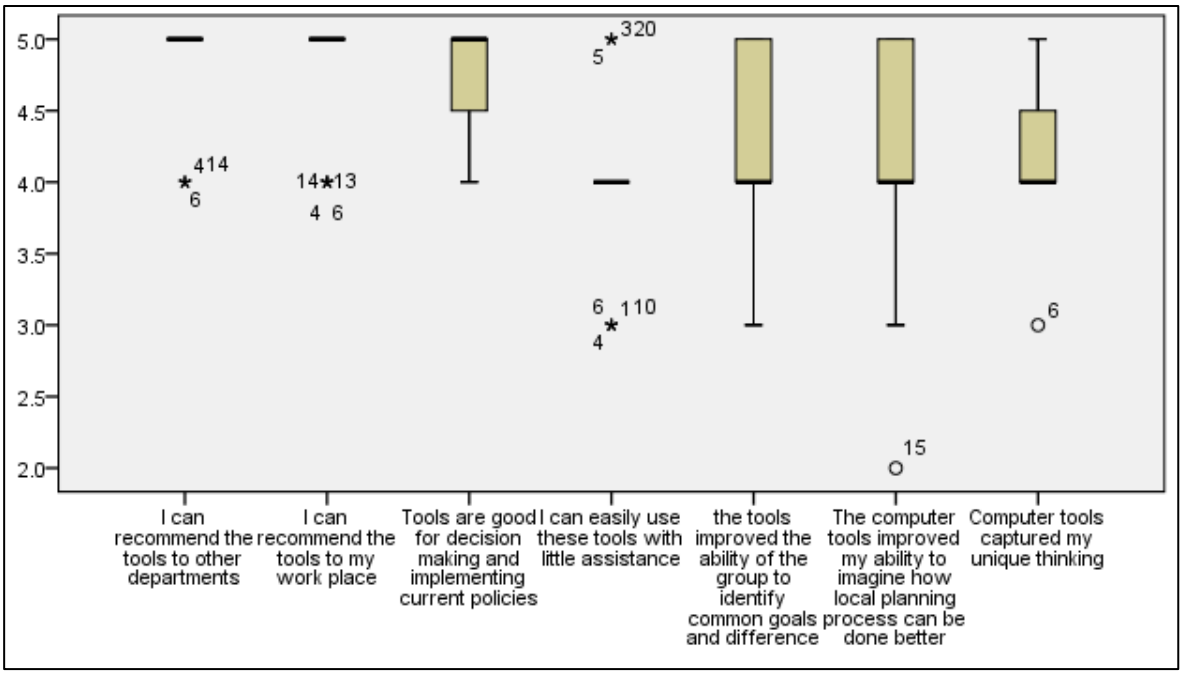

Figure 5:1 Box plot presentation for perception of workshop participants on the SDF's PSS tools and willingness to appropriate

All the questions represented in figure 5.1 show that the central tendency with participants' responses median of 5.0 (for question-related to appropriation, that is, the first three representations in figure 5.1) and median of 4.0 (for question-related to tools, that is, the last four representations in figure 5.1).

The central tendency shown by high median score implies that many people were satisfied in using the SDF's PSS tools which agree with the qualitative findings as discussed in section 5.2.2. Few participants (shown by numbers 4,6,10, and 15 in the box plot as outliers) expressed negative perception in some questions. A follow-up discussion with these participants revealed their feedback was influenced by the lack of prior disclosure of the workshop material and language barrier which limited their participation freedom.

5.2.1. Perception on SDF's PSS outcomes

The research workshops were organised to demonstrate the SDF PSS outcomes and allow potential users in the districts to assess the outcomes' usefulness within the districts. Generally, in Musanze and Rubavu, potential users perceived the outcomes to be useful for planning, decision-making and monitoring and evaluation.

The SDF's PSS outcomes can be used in the district as an aid for *planning*. The potential users in the districts pointed that the SDF's PSS outcomes can be used in urban planning for example, in *guiding* the process of master plan formulation and updating. Specifically, the information of MoF (presence or absence of function) can help in knowing what are the set targets, what is missing and what actions need to be taken.
"In our district, such outcomes can be used in the urban planning for updating master plan. What we need to achieve, what we need to do... For instances, if some parts or Sectors here there no health cares, it is interesting to us and us as planners we need to know and we can take necessary measures and see the needs. So I think it is useful in all Units." – Participant 1:2

In addition, the outcomes of SMCE can be used in the district for planning. According to the participants, the information of SMCE showing territorial differences based on availability or absence of the functions is helpful in guiding the districts towards achieving regional balance and development by focusing on closing the gaps in the Sectors.
"For example take a village that people live near classrooms or schools. So if you see one Sector where you have to do 4 or more km going to school and there is another Sector where we find that someone can go maybe 500m, it means that there is somehow a gap. So this kind of maps should help you in planning those. How to fill those gaps …." Participant 4:1

The other aspect how SDF's PSS outcomes were perceived useful relates to *decision making*. The users in the districts are engaged in various development projects that need decision making. Each unit works closely with relevant national ministry or agencies in implementing national goals and vision in the districts e.g. MININFRA working through One Stop Centre unit, MINECOFIN working through planning unit (refer to section 4:2). The SDF outcomes thus can be useful in decision-making in where to invest and how much to invest in which area. Accordingly, decision making in the districts involves several stakeholders (see section 4.3.1) and these outcomes are useful in decision-making while involving all these interested parties. The outcomes point out territorial gaps based on reality thus making-decision process is made easier guided by a factual understanding of the region. Similarly, the decision in resource allocation especially budgeting can be aligned with SDF outcome which helps in seeing the development need and where to implement it and who are the involved stakeholders.
*"It (*referring to MoF outcomes*) is good for decision-making and filling the gaps…and budgeting for the activities and then take action and the same time involving the government." - Participant 4.2*

The other usefulness of SDF's PSS outcomes in the district relates to *monitoring and evaluation*. Monitoring and evaluation can be either for the set goals in the districts or any development project undertaken in the districts. In Rwanda, development projects are usually initiated in the districts by national ministries or

agencies (see section 4.3.2). During the project implementation, the national agencies usually carry out monitoring and evaluation activities as part of their oversight role in the district. The SDF's PSS outcomes can be a baseline for performance evaluation by the districts as well as by the national agencies thus helping the stakeholders understand the current state of the projects and the progress towards the set goals.

The SDF's PSS outcomes can also be used in evaluating the development potentialities in the districts especially in the ranking of territories based on performance and function availability. The MoF scoring can be useful in evaluating the territorial performance, not just locally, but also nationally towards national goals. *".. If you are working knowing what is required. I mean the standards, vision, (*uses French word "ideale:" which mean what you what to achieve*) in that vision you have the set target which will help you measure the task which is covered and which is not covered. In every planning, you have the projection, you have the base for setting the projection." - Participant 2:3*

The SDFs PSS outcomes can be used to promote *regional competition and development.* According to the Rwanda SDF methodology, the analysis of spatial structures should capture uniqueness in the territories and help in promoting internationally competitive urban areas (Boerboom et al., 2015). The findings from workshop show an existing culture of competition as a result of Imihigo scoring and awarding. Scher (2010) explains that because of the Imihigo "Now *districts both citizens and mayors want to compete and want to be the best. This competition drives development."* (As cited in Scher, 2010 p8). Relating to SDF's PSS outcomes the participants referred to their districts with respect to other districts which are secondary cities in competitive terms like "we want to be the best", "compare us" or as one participant said "*you can see this district or Sector is higher than my Sector and my Sector or my district, for example, we want to be higher than that other district" – Participant 3.1*

Clearly, the drive to be the best pushes the districts to compete in performance and development. Therefore, the SDF's PSS outcomes depict the national and regional picture allowing the districts to compare their current status to the other districts of the same categories (for this case, the other secondary cities).
"*Ok, you see.... There (*pointing to the spatial structure, a MoF outcome, see figure 2.4*) When you look there around university campus (*Huye secondary city) *we have agriculture, ok? But here in Rubavu agriculture is a very good opportunity because we are near the park and we have good seasons. And we get a good quantity of food when we invest in agriculture." – Participant 3.2*

5.2.2. Positive perception on the SDF's PSS tools

The responses from the research workshops about the SDF's PSS tools shows variant perceptions of the SDF's PSS tools. Both in Musanze and Rubavu, there was a positive perception by the potential users in the districts to appropriate the SDF's PSS tools across the planning hierarchies and in their daily processes.

Positive perception is interpreted from the remarks of the workshop participants and their willingness to own the tools. For instance a participant in workshop 1 said "*So I like this* (referring to the MoF tool) *very much"*, during workshop 2, participants asked for the SDF's PSS tools to use them in their workplaces, in workshop 3, one participant was asking for the SDF's PSS tools to be installed in his workplace and in workshop 4, one participant commented that the tools are interesting to own and very easy to use.

The participants pointed out the usefulness of SDF tool also in the Cells and Sectors planning. The workshop presented SDF's PSS outcomes and tools with Sector as analysis unit. Interestingly, the users pointed out that such tools would be more useful in the Cells and Sectors for the leaders at those levels of administration to understand their areas better. This is based on the fact that the districts get their data from the Cells and Sectors (noted from interviews and secondary materials). Therefore, having correct data from the Cells and Sector would be more useful even for the district in planning and profiling the territories for development. In fact, planning in the districts is based on the reality in the villages, Cells and the Sectors

because Rwanda uses bottom – up approach in needs identification for planning and only top – down approach applies for policy implementation and capacity building (refer to roles of stakeholders in section 4.3.2). For example, participant 2.5 in workshop 2 pointed out the usefulness of having the focus on cells and Sector while relating such to national policies and goals.

"You have shown use the Sectors. You have shown us the situation of the Sectors, do you have for the situation in the Cells in our Sectors, because I want to know that. For example, now we have studied the health situation in the every cell. And it is the vision of the ministry of Health is to put a health care in every Cell and even to arrive in every village. Even if we consider the education domain, in every village, we want to put an ECD in every village, like nursery school to put there so that the pupils therein, those small children can reach those schools without a problem. So I think, because this is Sector situation, I think if you have the cell situation and the village situation it will be very fortunate." – Participant 2:5

The participants showed a willingness to appropriate the PSS tools in their daily operations. These operations include activities such as data collection, profiling the Villages, Cells and Sectors based on indicators, and ranking the performance of villages, Cells and Sectors towards districts' goals and vision. The participants saw the usefulness of the tools because the data collection for the matrix of functions crosscut all the Units and thus participants could easily relate their work and the data they use with the data in the SDF's PSS tools especially the MoF. However, the more positive reaction was inclined towards the MoF which is non–spatial data collection and analysis tool, unlike the ILWIS SMCE that was referred to as "technical" tool that can only be used by some Units as discussed in section 5:2.3.

"We want these tools to use them in our daily activities and do the data collection. We want this in Musanze, can we get the software now…" – participant 2.1

"It can help in several items like what he has said(referring to participant 4:3) in terms of classrooms, schools, availability, in terms water to our schools, which schools have water in terms of electricity we can use it in the education system. I think it can be used in several items in our day to day activities…" – participant 4:2

5.2.3. Negative perception on the SDF's PSS tools

Appropriation of the SDF's PSS tools and outcomes may face some challenges in the districts. In all the research workshops, the focus was to capture the participants' perceptions either positively or negatively regarding the SDF framework, SDF's PSS outcomes and tools. The negative perceptions as coded in the analysis related to SDF methodology, data and relating SDF with existing policies and procedures. In order to protect the participants' identity and allow free criticism, this section does not disclose the participants and workshops details for *ethical issues* (refer to section 3.5) but they were mentioned in earlier drafts of this study to the supervisors.

The Rwanda SDF preparation process according to the expert was inclusive and participatory with representatives from all the districts (SDF report). However, the participants, who are mainly the people involved in the districts' planning processes were not involved in the Rwanda SDF preparation process. This resulted in a *lack of trust* in the data collected and the quality of the SDF's PSS data. Although the SDF's PSS data was collected from secondary sources, the negative perception, in this case, was not because of the SDF framework, tools and outcomes rather the planning approach adopted in collecting data.

Data collection is usually done in a bottom – up approach in Rwanda. The districts are therefore more confident with their own data collected from the Cells and Sectors. In all four workshops held during this research, there was heated debate concerning data which related to who collects the data, the criteria, updating and territorial ranking. One participant pointed out that the tools are useful but questioned the data collection and quality:

"It is a very useful tool ***but*** *the question is who is getting the data. We have to get the indicators together as a team and control the database. If you do not get the backgrounds of the district… Who makes the data, who writes the data who shapes the data and who is responsible for updating?"*

The existing perceptions about the data collection procedures by other organisations (mainly national agencies) from which SDF developers obtained their data, may influence the acceptance of Rwanda SDF. For instance, negative feelings and reactions were expressed by one participant, who questioned the use of secondary data from statistic department which according to him, was not well collected and does not represent their district well.

*"That kind of **things** (*meaning statistics, with raising voice*). Do you know that our district was ranked 29th in collaborating with financial companies?* …. (a lady clicked and said What kind of data!) …. (Participants laughing*)... we have banks, we cannot compare with Nyabihu. But they took guy who don't know even where banks are, people who don't know where banks are and they said they are ahead of us"*

Such perceptions may be influenced by existing practices. This can happen positively or negatively as demonstrated during the workshops. One of such negative influence by existing practice is mistakes and loopholes in the preparations of the master plan and local urban development plans in the districts.

"Am worried about data because I see even in our master plans, local urban development plans I see a lot of mistakes. Yes. And even in all organisations, they have a problem with data."

5.3. PSS within districts planning processes

Research question 2:2 sought to understand where SDF's PSS tools are likely to be appropriated in the districts' planning processes. The planning processes and procedures are discussed in section 4.3 which leads to several outcomes in the districts. Table 5.1 shows the summary of how SDF's PSS tools and outcomes can be used in various stages of districts planning. The planning stages are drawn from DDP which is the main long term plan in the districts from which, other plans are formulated.

Table 5:1 Summary on how PSS tools and outcomes can be applied within the planning processes across the administration levels.

Planning steps (from DDP)	Administration Level	Who uses	PSS Application (based on workshop discussions)
Problem assessment, data collection and community need identification step	Household (HH), Umudugudu, Village, Cells, Sectors and districts.	The general public in a participatory approach, planning team and hired consultant	*"Getting data from field and inserting to PSS and making buffer according to Rwanda building codes the buffer distance needed for such infrastructure, I think we now know what we exactly need and where we need it. It will be very easy. We go through the structure by structure we find that we have many of the elements but where do we have it? Where is it necessary to have it? I think it will be necessary to have these tools?" – Participant 1:3*
Districts' data analysis, target setting and indicators identification	Sectors, Districts	Sector Executive secretaries, Districts Unit staffs, JADF, PSF	*"..If you are working knowing what is required. I mean the standards, vision, in that vision you have the set target which will help you measure the task which is covered and which is not covered. In every planning we have the projection, you have the baseline for setting the projection. To that point, I believe everyone can have that tool." – Participant 2.1*
Consultation stage and linking national programs	Sectors, Districts	Sector Executive secretaries, Districts Unit	*"For the vision 2020, the planning for the whole country, by 2020 all villages will be at the same level for basic functions, So this is in line with the existing policies" – participant 2:4*

		staffs, JADF, PSF	
Collaboration meetings in asserting targets and needs solutions	Districts	District Council, JADF, PSF	*"..It is good for making a decision, budgeting for the activities and then takes action and the same time involving the government (meaning other stakeholders)"- Participant 3.2*
Implementation, Monitoring and evaluation	Sectors, Districts	Units, District Council	*"..In fact, when we are here when we go to the system, we can see in our country we are moving like that. We are here and we want to go to that step. You can see this district or Sector is high and we are performing how". – participant 3.2*

5.4. PSS appropriation within the districts' Units

The research question 2:3 in this study aimed to understand how the Units in the districts are likely to appropriate SDF's PSS tools. The question asked during the research workshop was *"which Units in the districts can make use of these tools and outcomes?"* The results show that Units in the districts will appropriate SDF's PSS tools and outcomes differently.

The One Stop Centre and the Planning, Monitoring and Evaluation Units are likely to be the early adopters of SDF's PSS tools. According to the participants in the workshops, the Director of Planning in the districts is in charge of the overall district planning activities and consolidating units' plans. Thus, the SDF's PSS tools can be more helpful in the Planning Unit by making the planning, monitoring and evaluation processes easier.

"For the district, we have the department of planning which gathers all the ideas and what we need to do so about these tools we can help us to know where to put the emphasis where there is gap according to existing conditions." – Participant 2.3

The interviews carried before the works confirmed that the Planning Unit has used similar tools and procedures which make SDF framework easier to understand and execute within the Unit.

"*We use Excel Sheets, recently we developed the software for management and data collection. Not yet finalised but It is under process but soon we will be using that system in Years' time" – Interviewee 1.*

In addition, in the past, there has been the institutionalisation of national tools in the Planning, Monitoring and Evaluation Unit such as MTEF which is discussed in section 4.3.5.

Similarly, the One Stop Centre Unit is in charge of urban development in the districts. The Unit has been using tools of planning similar SDF's PSS tools which according to the urban planners, SDF may not be a complex concept to them. The Unit also has a responsibility for preparing maps and plans on behalf of the districts which gives the staff a quick understanding of spatial data and information. It was observed that the participants from One Stop Centre and the Planning, Monitoring and Evaluation Units easily understood the maps, the SDF's PSS tools and the concepts of Rwanda SDF and even helped their colleagues to better understanding and interpreting the SDF's PSS outcomes.

Although the other Units involved in planning (refer to section 4.2.1) understood the PSS outcomes, the appropriation of the PSS tools may take longer time and more capacity building may be needed. All the Units in the district carry out planning assignments and the desire to appropriate the PSS tools over time may be effective and useful even to all Units as expressed by participants. Interestingly, in the districts, such advanced tools and concepts like GIS are passed to the other districts' Units through the One Stop Centre Unit from the national government. The national government vertically *transfers* the skills and tools to the

districts and then they are translated horizontally to the other Units in terms of suitable outputs such as plans, maps and with clear elaborations.

"You see, the central government, first of all give us guidance to follow and you know every year or sometimes the tools of planning or for the project planning format change. They are going to send use the new format or the new way to elaborate projects, development project"- interviewee 2

"Why don't you discuss this with One Stop Centre and then take these to them to put in action in master planning of the master plan. They are the one concerned with maps" – Participant 4:3

5.5. Discussion

The objective 2 focused on understanding how secondary cities will make meaningful use of PSS tools and outcomes. The results show a high level of satisfaction which is explained by the willingness to appropriate among all the workshop participants. The results are from research workshops held in Musanze (workshop 1 and 2) and Rubavu (workshop 3 and 4) districts, with a total of 21 participants (n=21) for the four workshops. The list of participants and their Units is attached in appendix 4. In figure 5.2, the circles show the outliers falling below the lower fence of the box plots.

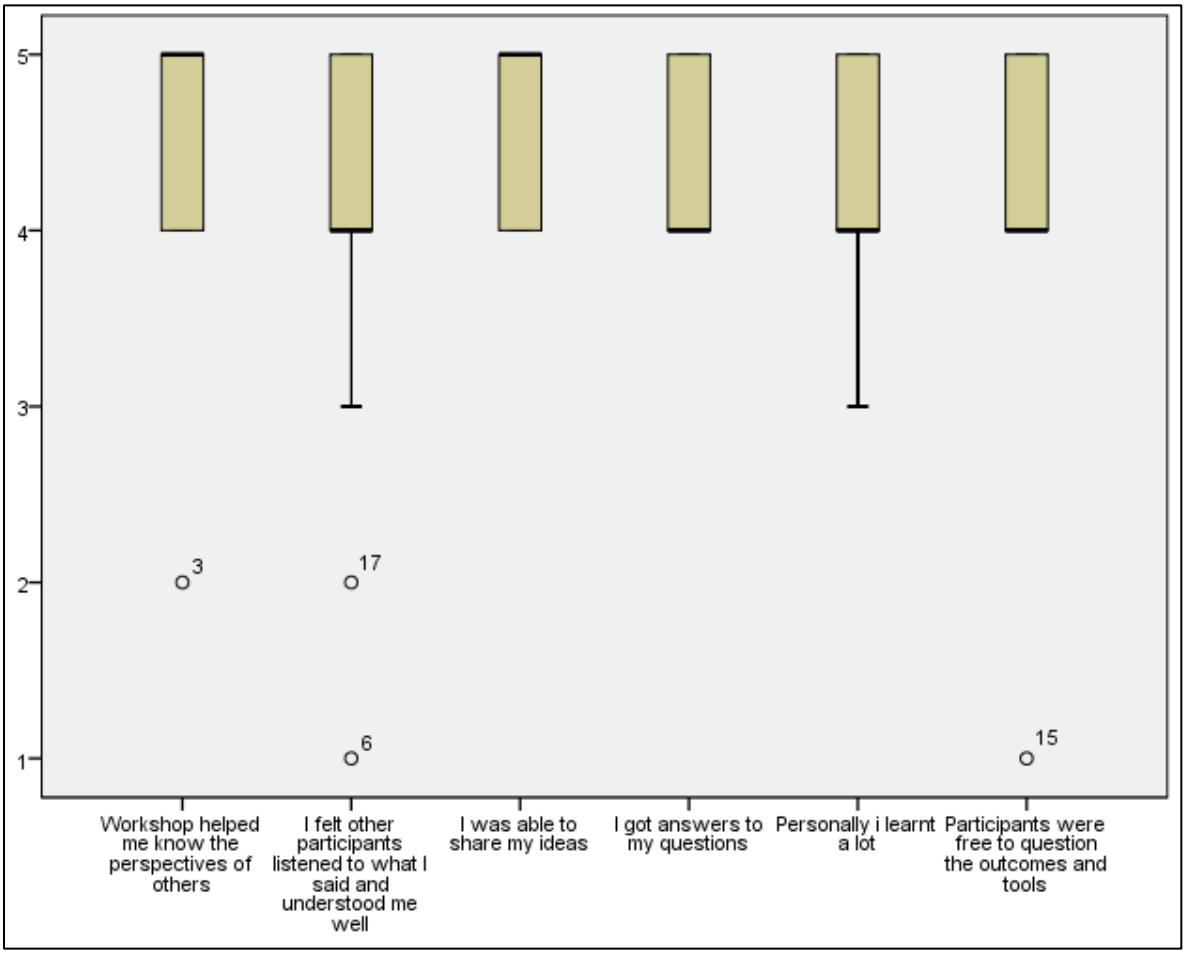

Figure 5:2 Box plot presentation of participants' perceptions of the effectiveness of the workshop sessions

The boxplot in figure 5.2 shows a median greater than 4.0 which implies that people highly agreed in all questions asked related to the workshop. Focusing on the participants' mean (m) and standard deviation (s.d) as shown in appendix 6, there was high learning level among the participants. The workshop participants were free to question the outcomes and tools (m =4.1 s.d=1.1), learnt the perspectives of others (m = 4.4, s.d=0.93), asked questions and got answered (m =4.4, s.d= 0.59) and shared their ideas (m= 4.5,

s.d = 0.75). The quantitative analysis results show a high factual learning (see Goodspeed, 2013) through sharing ideas in active engagement and evidence seeking attitude through questioning new information in the workshops.

The findings also confirm the existing structures in the districts where the decisions are made through dialogue as pointed out by interviewee 5: *"in our meetings, we like dialogue and we must have a conscience, we don't vote"*. The EAST framework establishes that gathering people from diverse knowledge background to address a specific problem needs a clear task definition at the start to reduce decision-making time and avoid chances of conflicts (Jankowski & Nyerges, 2001). The results of this analysis show that participants from districts understood each other and shared common *social-institutional structures,* where roles and tasks for all stakeholders are clearly defined and institutions from which planning references is drawn, are strictly observed by all involved stakeholders. These existing structures may have contributed to the perceptions of potential users to appropriate the SDF' PSS tools and outcomes.

Participants who expressed positive perception are influenced by existing policies in the districts. Existing policies such as building codes and standards which govern development in the secondary cities where mentioned across all the workshops. Potential users drawn from One Stop Centre who understand the master plan preparation process linked the use of SDF's PSS tools in planning such that *"after getting data from field and inserting to GIS and making buffer according to Rwanda building codes the buffer distance needed for such infrastructure, I think we now know what we exactly need and where we need it and thus we can use these tools, it will be very easy*". There is perceived the usefulness of the SDF's PSS tools and outcomes which can be associated with the understanding of the PSS concepts, capabilities and interpretation of the outcomes by the users (Jankowski & Nyerges, 2001).

In the districts, there is a clear establishment of the mandates, roles and planning procedures. The roles of each Unit and staff members are clearly defined and matters related to GIS and map making are handled by One Stop Centre. The success of SDF'S PSS tools and outcomes will depend largely on how it is placed within these norms. EAST framework stipulates that such *norms*, *mandates* and practices existing in the districts influence the participants' views. This can explain why the SMCE tools were referred by some participants as One Stop Centre tools because all map making activities and tools related to spatial matters are owned by the One Stop Centre Unit.

The results show potential early and late adopters of SDF's PSS tools in the districts. The One Stop Centre and the Planning, Monitoring and Evaluation Units are likely to be early adopters (see DeSanctis & Poole, 1994). These two Units are more likely to appropriate the SDF's PSS tools within their normal operations quickly than the other Units because the concepts behind the tools are in line with their existing duties and match their expectations. The One Stop Centre and the Planning, Monitoring and Evaluation Units, therefore, can learn from the national government and receive the tools on behalf of the districts and facilitate the local translation in the districts. The translation in the districts involves elaborating the SDF tools and outcomes to the other stakeholders (late adopters) within the districts and at various steps in the districts' planning process. Late adopters, on the other hand, would appropriate the SDF outcomes easily but may need more capacity building to appropriate the SDF's PSS tools. This is because, the late adopters which include staff members from other Units such as Social, Education and Health, may not have high expectations for spatial analysis within their roles and duties.

6. RESULTS AND DISCUSSION: NATIONAL PSS APPROPRIATION IN THE DISTRICTS

6.1. Introduction

This chapter focuses on the research objective 3 that aimed to understand how the national PSS tools are likely to be appropriated by users in the secondary cities. This is answered in three dimensions. First, understanding how the SDF'S PSS tools' capabilities are appropriated by users in the districts, second, discussing the local and expert knowledge gap and third, the observed potential challenges that may influence SDF'S PSS tools appropriation.

6.2. SDF's PSS capabilities appropriation

According to the Rwanda SDF developers, the SDF tools and outcomes were developed to help national, regional and local planning stakeholders in implementing the NUP (see Boerboom et al. 2015). In general, the results of this study show that the SDF's PSS tools and outcomes can be used in the districts to achieve the implementation of NUP and set goals. This can be seen in how the potential users used the SDF tools' capabilities and the outcomes during the research workshops. The following section presents the capabilities of SDF'S PSS that are more desired by potential users in the districts namely communication, decision-making and analysing capabilities (see Te Brömmelstroet, 2013) of the SDF'S PSS tools and outcomes (refer section 2.3.2).

Communication support capability: The SDF'S PSS tools and outcomes were useful in stimulating debates and discussion aimed at planning issues relevant to the districts. In all the four workshops, participants easily understood the SDF outcomes. The participants understood the information contained in the outputs and recognised the implications which resulted in constructive discussions. This is because many of the SDF outcomes are delivered to users in form of easy to understand maps. Jankowski and Nyerges (2001) explain that many people will understand maps and graphics more easily that table thus how these PSS tools display the information affects the perception of the potential users and their willingness to appropriate (also see O'Looney, 1997). This explains the high willingness to adopt SDF'S PSS tools and outcomes even to non-GIS specialists.

The SDF outcomes helped the users understand the spatial situation in their districts and the country at large. The maps were easy to understand and interpret by the users. For instance, one participant helped another to understand the meaning of the map showing the current status of the green transport system.

Participant 2.2: I want to know where the red colour in the West come from. ...

*Participant 2.3: the red is because in the west there are no much roads, the terrain is bad… Those data that make the map colour to be like that, they are entered into the software and then you can display the results in different colours and the software can tell you that if cars which are using this road (*pointing to the Musanze –Rubavu road next to workshop venue*), if they were not emitting gases that pollute the environment, then Musanze would be very very green. Like he (presenter) said Kigali is very green because of those big buses in Kigali city and Kigali city is green (**pointing to the map**) compared to Musanze which has pale green. It does not mean cars which are there (Kigali) are not emitting the CO2.*

The SDF's PSS tools and outcomes present a strong mapping and visualisation capabilities (see Jankowski, Andrienko, & Andrienko, 2001) which make it easy for users to have a common understanding of the spatial situation. For instance, the colour red is used throughout all the SDF's PSS outcomes to show poor performance and green colour showing excellent performance towards a particular goal (see figure 6.1). This

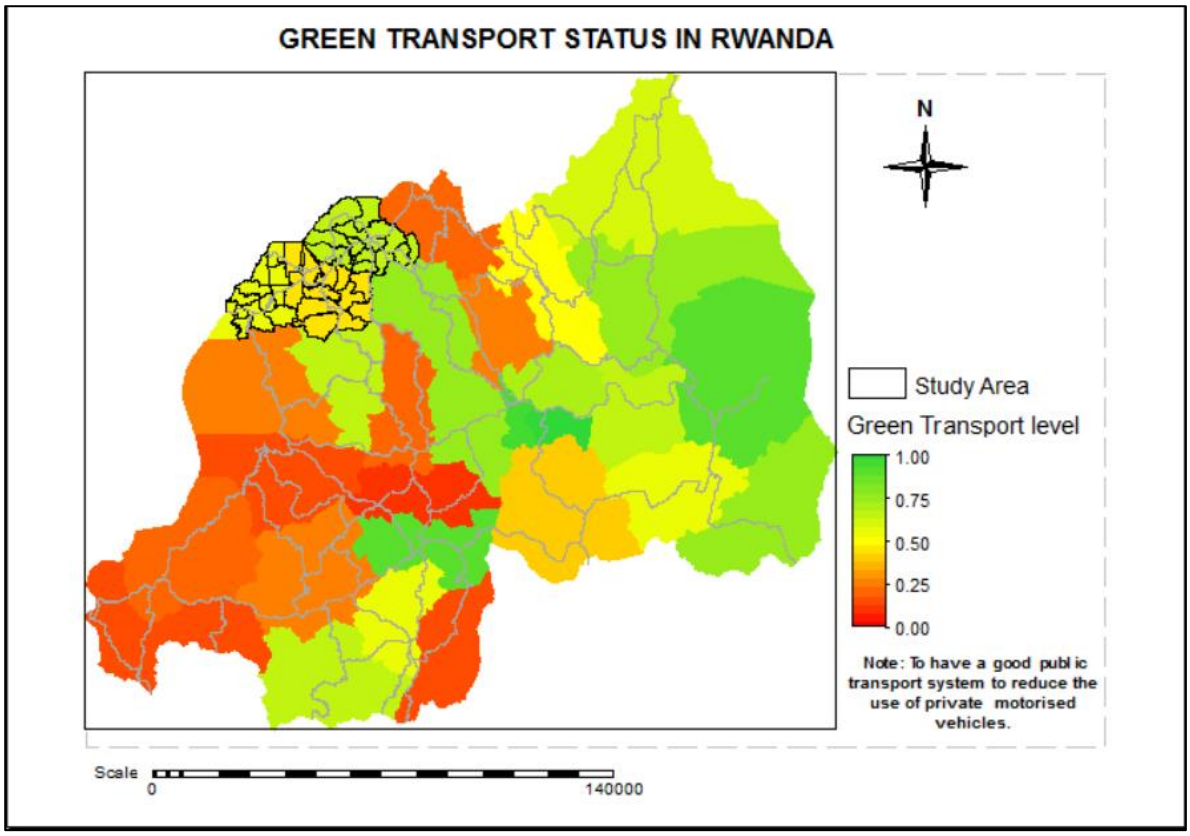

Figure 6:1 Visualising the green transport status in Rwanda as presented in SDF outcomes Data Source: Rwanda SDF, 2016

was easily understood by all participants in the workshops. Based on this understanding, then planning needs are identified and decisions can be made.

Decision support capability: The aim of any decision-making tools in planning, is to make the planning process more effective and efficiency (Huber, 1984). This can be related to the finding of this study where participants would see what is missing and where it is missing and then make a well-versed decision. For instance, the SMCE criteria tree allowed the participants to vary weight on indicators based on their priority. The SMCE outcomes can be seen in real time and allow the participants to reach the best decision within the short time. Another capability is the Euclidean distance in the spatial analysis which allows the participants to assess territorial performance more easily by factoring all existing policies such as building codes. The participants can then see which areas are more suitable for specific development and take the best decision.

"After getting data from field and inserting to PSS and making buffer according to Rwanda building codes, the buffer distance needed for such infrastructure, I think we now know what we exactly need and where we need it" – participant 1.3

In addition, Participants' response to a question on decision making capability of the tools and outcomes shows they agree with the question "Tools are good for decision making and implementing current policies" (mean= 4.29, s.d=0.72). This reflects a strong internal commitment to the choices made by the participants during the workshops.

Analysis support capability: the analysing capability of PSS is aimed at bringing advanced data manipulation and processing in order to help the potential users to derive meaning. SDF PSS tools use both primary and secondary data. The secondary data is collected from national organisation such National Institute of Statistics of Rwanda (NISR). The data is analysed and visualised to convey meaningful information to the users in spatial perspectives. The analysis involves multiple inputs of both spatial and non-spatial data. Multi-attribute decision analysis such as weighing of functions, decision criteria and performance ranking generates a superior decision and informative results (see Malczewski & Rinner, 2015). The data is visualised in an advanced manner in the MoF and SMCE outcomes. For instance, the analysis of Integrated Household Living Conditions Survey (EICV), which is a national survey done every five years on changes in wellbeing as shown in figure 6.2 for Musanze, Nyabihu and Rubavu, resulted in a debate about the territories' differences and also new perceptions about the territories in terms of basic functions. The SDF's PSS outcomes allow the participants to see the performance difference between the territories in an advanced manner as compared to the normal tables and charts.

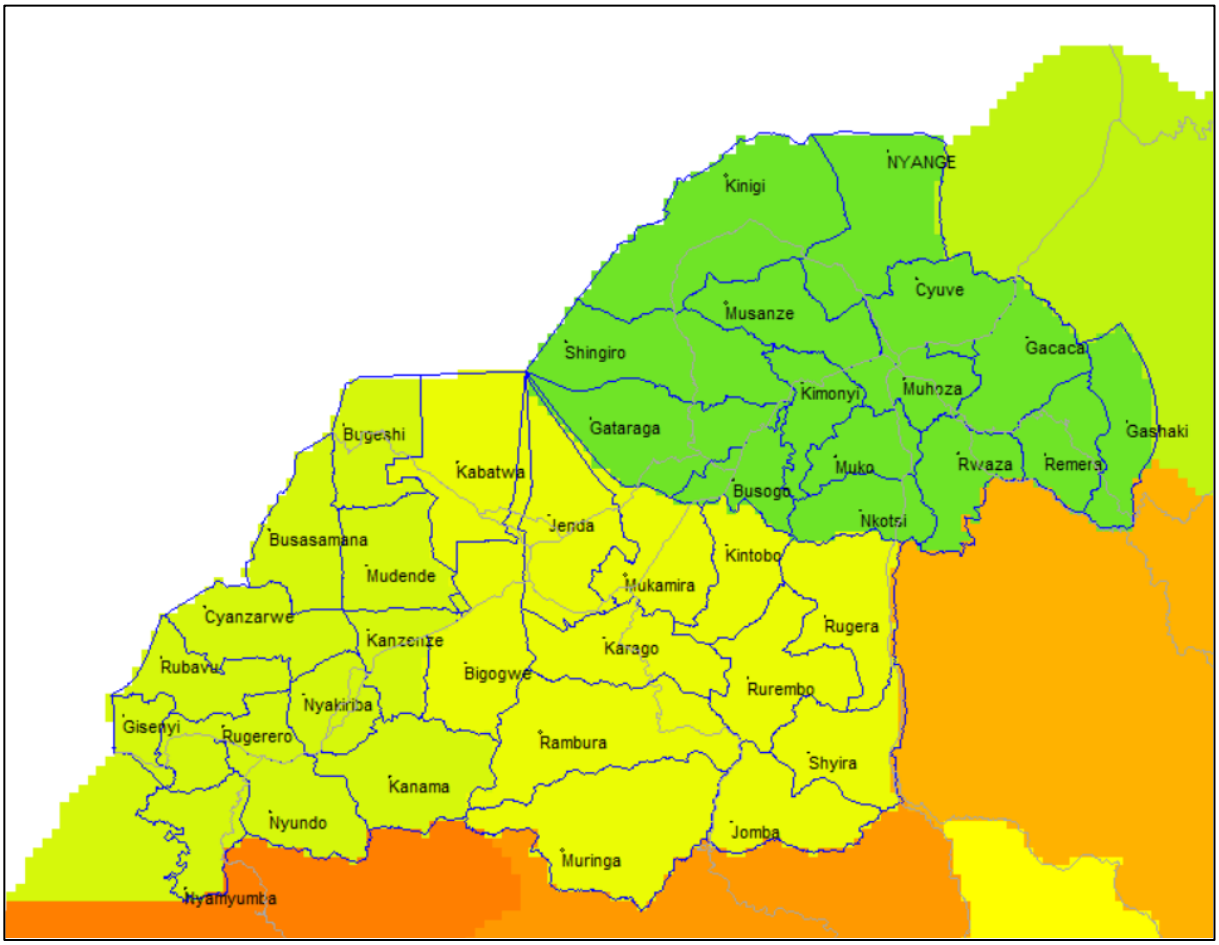

Figure 6:2 An extract of the visualisation of EICV 3 data on transport accessibility showing better performance in Musanze than Rubavu

Data Source:
Rwanda SDF, 2016

Interactive support capability: Interaction is used here to refer to two processes namely user- user interaction and user- computer interaction. User-computer interaction is a process that allows the users to interact with the tools and their capabilities. The SDF intractability was limited due to the fact that data entry and analysis has to be done prior to stakeholders' meeting. In addition, the design of the tools and the outcomes are made as reference tools for any decision making and planning meetings. The question on how

the SDF's PSS outcomes were prepared and the demand by participants to understand the whole process clearly highlights the need for interactive PSS in the districts where users can be involved in generating the outcomes. For instance, one participant inquired *"I was just asking for example if you see in excel if you are inputting data in excel, then you need to produce graphs, they are produced automatically based on that data. Are the tools functioning like that?"*
Although the analysis is done using technical software (MS-excel, ArcGIS and ILWIS), the ability of the designed SDF'S PSS to show the analysis in real –time can help in improving the interaction and acceptability of the tools. This could allow the users have hands-on interaction with the tools and understand the process, the data and the outcomes.

6.3. User – Designer knowledge gap

Geertman and Stillwell (2009) wrote a detailed survey about the use of PSS in the real world and identified key bottlenecks that have contributed to poor penetration and usage of PSS. They summarise these into three aspects namely *instrumental, transfer* and *user* approach.

The instrument approach is concerned with the quality of the instruments and how they can fit the purpose they are designed for (Geertman & Stillwell, 2009). From the preliminary results, the developers have considered the local planning needs and the policy frameworks in designing PSS tools which clearly addresses the planning needs in the districts. The SDF's PSS tools are based on the local planning context in Rwanda and also guided by Rwanda National Urbanisation Policy. The tools are adapted to the needs in Rwanda guided by the NUP and aimed to help the stakeholders involved in any planning processes in Rwanda (see Boerboom et al., 2015). This adaptation of the SDF's PSS tools gives the relevant of the tools in the districts planning processes as discussed in section 5.3.

The user approach relates to the users' characteristics and how these influence the perception of PSS. The main issue identified in the districts relates to awareness and knowledge about Rwanda SDF and the NUP. There is lack of information about the NUP and SDF methodology in the districts as pointed by one participant who said: *"…some of us are not informed about that National Urbanisation Policy"*. In addition, there are no qualified experts in the PSS application in the districts to facilitate the implementation of these SDF'S PSS tools and outcomes. These findings corroborate Vonk et al (2005) who wrote that key issues that affect widespread use of PSS include lack of experience, a little awareness and lack of intention to use the PSS (Vonk et al., 2005). However, the designers of the SDF'S PSS proposed a solution aimed at the capacity building across the districts in Rwanda.
"The use of GIS as a decision-making tool for regional and urban planning purposes is still low and skilled professionals working at the governmental institutions at the national and local level are scarce. Given these circumstances, the SDF focused on capacity building to start raising awareness on the use of GIS as a decision-making tool and reduce the capacity barrier within national institutions." (SDF, 2016 p 66).

Another main issue related to users which may affect the acceptance of SDF'S PSS is data related issues. In the districts, there is low trust in data gathered by national agencies as opposed to locally collected data. It was established that the districts collect data from and aggregated at the Villages, Cells and Sectors that they consider more useful for local planning. The data from the lower administrative levels give more accurate background situation of the districts which guides the districts in formulating Action plans and Imihigo. The national agencies' data, on the other hand, is collected across the country and aggregated at Sector and district levels. The national agencies data is then analysed with national interest which sometimes does not address specific issues as it may be needed in the districts. This study has found a difference in aggregation levels between the data by national agencies and the data by the districts which leads to the low trust of the national data by the districts.

In addition, the Rwanda SDF development process appeared to have not factored in local knowledge in the districts. Such knowledge like who is answerable to issues of SDF'S PSS, who are the key person to supply specific information among others.
"….where is the data coming from if you are not asking us… If you are not asking urban planners if you are not asking our mayors, how you got the information, how did you make the information, how did you make the questionnaires?" – Participant 1.2

Challenges related to SDF'S PSS design as identified in the district include categorisation of functions. This relates to how the SDF's matrix of functions scores the districts based on absence or presence of function. There is no adaptive strategy to classify and categorise functions according to preference and importance in the districts. Thus it is unrealistic to say Musanze scores less because they do not have harbour and ports which in reality is impractical. Therefore, the performance evaluation and ranking should be based on existing standards that govern secondary cities and not just comparing the performance based on the cities themselves, as one participant *said "There are the standards that certain cities need to reach. We see that Musanze is not just comparing to Huye but the standards that we need to reach. I think that is important to follow".*
Therefore, the design of the tools will be more meaningful to the districts, if they allow data integration from the districts, allow regular updates and offer visualisation of the local situation at the same time integrating national goals.

Another design challenge is related to implementing urban building codes and standards within SDF. Rwanda urban building standards are adhered to strictly in the urban development. The Rwanda SDF is made to guide urbanisation in Rwanda and thus, it should incorporate the principles envisioned in Rwanda building codes and standards. The importance of this aspect is, the districts will not be assessed only by availability or absence of function but the efforts towards implementing the urban planning rules. For instance, the SMCE results should incorporate buffer zones around protected areas or distance from central functions such as an airport, because it is not practical to have an airport in each Sector. As stated by participant 1.1:
"For me, I think we cannot make airport in all Sectors. I think we can ask about distance from the Sector to the airport. If we get one airport in all districts is enough. Or even one in two districts or all Northern Province. For me, I think the checklist that we use must put the distance that is needed to access those infrastructure…. And we can use GIS to implement those codes. GIS can help in implementing those codes." –participant 1.1

The transfer approach is concerned with how PSS appropriation and use in the districts happens and moves from a new concept to practices within the local planning process. For the workshops, there is high excitement and willingness to appropriate the SDF'S PSS and need to own the tools. The transfer can happen in two folds in the districts. It was observed that some Units are likely to understand the tools and outcomes quickly than others (hereby referred to as early adopters). To this regards, the top – down strategies can easily be transferred to these Units which will, over time, translate the SDF'S PSS tools to the other Units (late adopters) in line with local planning needs.

6.4. Potential challenges for PSS appropriation in the districts

Existing challenges in the districts can be classified into three categories namely understaffing, financial constraints and capacity building. Understaffing refers to a situation where Units have less number of staff than the formally established positions. For instance, during data collection, one of the staff was working as construction and permitting officer, GIS expert and urban planner. Such experiences have resulted to low performance and motivation and staff have no time to engage in other tasks. This is likely to affect the

effectiveness of appropriation within the districts if the introduction of the SDF'S PSS tools and outcomes implies more duties and responsibilities to the staff.

"The problem I saw here in Rwanda, we have good laws (meaning policies). *All is very clear about the building permits, the urban procedures all are clear by law. The problem here is colleagues are always overwhelmed by work and they do not have time to read the procedures /laws" – interviewee 4.2*

The financial constraint is a major issue in the districts given the fact that the districts operate under limited financial resources (also confirmed by Planning, Monitoring and Evaluation Directors during the interviews). Pfeffer et al. (2013) wrote that some of the challenges of using advanced technologies are its technicalities and cost. Appropriating such tools in the districts needs budgeting which is a challenge for both central and local governments.

"We are trying to link district priorities with national priorities and national program or national financial capacity, as you know our financial capacity is very low due to the lack of budget and finance which is a big problem to implement the activities set." - Interviewee 1.

However, the designers of the SDF used a free open source software (see Prem Kumar et al. 2014) called ILWIS which significantly reduces the infrastructure cost.

Capacity building is related to lack of enough skilled labour in the districts. From the questionnaires feedback, 18 out of 21 people identified the issue of knowledge and skills on the use of the SDF's PSS tools as the main challenge that can affect appropriation of the SDF'S PSS as shown in figure 6.3 (A copy of the questionnaires is attached in appendix 1). Currently, in the districts, there is no qualified staff to appropriate the SDF'S PSS tools and use them effectively. To overcome this challenge, the Rwanda SDF proposes a capacity building grogram across all the districts to empower potential users on the use of SDF tools as an alternative for decision-making (Rwanda SDF, 2016).

The Implementation of the Rwanda SDF is likely to face challenges related to tools ownership and data. The results from the workshops indicate a need for tools ownership by the users in the districts and also accessibility to the SDF tools database. The challenge in the appropriation process may include: how the districts can use their locally acquired data within the SDF's PSS tools and then generating the outcomes, who updates the databases and how frequently the data should be updated.

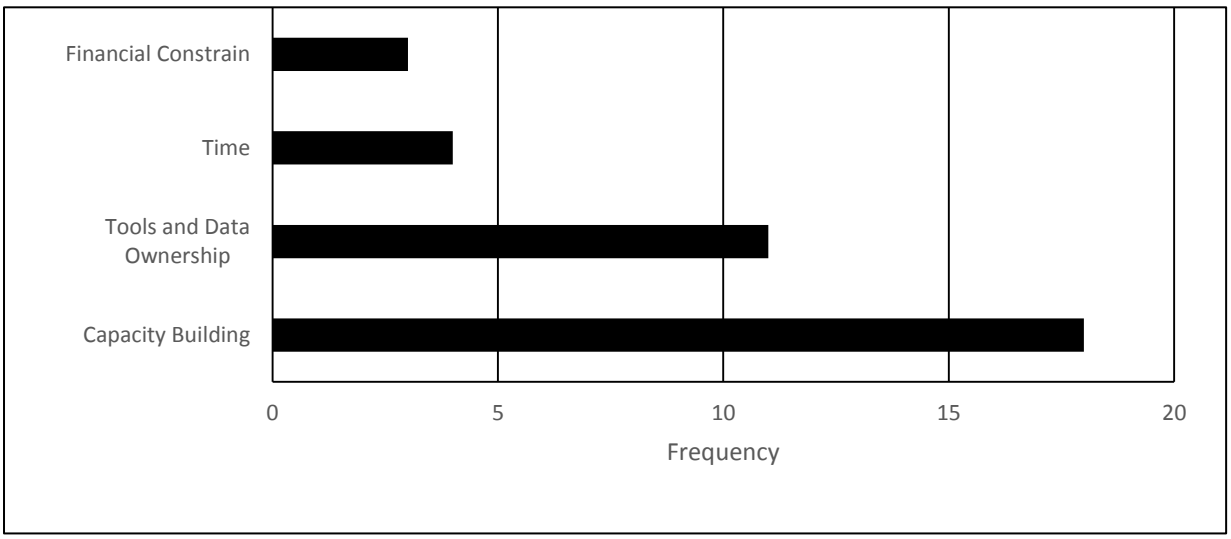

Figure 6:3 Questionnaire results showing the challenges that may impede SDF's PSS tools appropriation in the districts. Data source: workshops participants' feedback

6.5. Discussion

The results in this chapter depict which PSS tools' capabilities are needed in the districts. The research workshops revealed that the participants need SDF'S PSS tools for assessing their districts situation and linking to existing local and national policies. There is an identifiable need for tools that can help the potential users in the district's plan, make a decision and understand their territories better. A clear distinction why the need for SDF'S PSS for long term planning is needed but also with the ability to support short-term managerial decision making (see Geertman & Stillwell, 2009). The results also show the potential users' ability to correctly appropriate SDF'S PSS *structural features* such as maps, charts and tables within their context. The SDF'S PSS tools and outcomes use visualisation aids (maps and tables) which allow deep thinking that forces users to interpret the results and evaluate their performance in details. EAST framework establishes that such aids make a meeting more explicit, technical, and practical (Jankowski & Nyerges, 2001).

Another aspect related to PSS *structural features* is time and place of meeting. Apart from having good tools for communication, analysis and decision making as shown in the results, there is a need for PSS that can be accessed by all stakeholders when needed. The potential users in the districts work closely with respective staff in the Cells and Sectors. This implies the need for PSS tools that can be accessed not only in the office but also in the field. Poole and DeSanctis (1989) writes that the number of meetings, the flexibility of venue and the comfort level in using the PSS determines the appropriation perception by users. The SDF'S PSS tools should, therefore reduce the meeting time and data collection which was identified as a potential challenge in the districts (see figure 6.3).

Challenges that may impede SDF's PSS appropriation relate to the *expert – user* knowledge gaps. Vonk and Geertman (2008) points out that one of the bottlenecks of the use of PSS is the mismatch of the designer knowledge and the intended users need. For example, the district desire for SDF'S PSS tools that factor in building codes and standards in the secondary cities confirm the need for tools that are adaptive to local planning needs. This corroborates with the recommendation by Vonk, Geertman, and Schot (2007) on the need to incorporate existing local knowledge in designing the PSS tools. This study also supports Goodspeed (2016) claim that PSS study should be done with real users' who reveal detailed information that cannot be found in a lab- setting experiments (also see Batenburg and Bongers, 2001). The real stakeholders disclose useful information about the context of PSS application such as norms, mandates and practices which cannot be explored in a laboratory setting experiment.

Despite the potential challenges in the districts (capacity building, time, tool ownership and finances), there are potential opportunities for SDF'S PSS appropriation. First, Early adopters (One Stop Centre Unit and the Planning, Monitoring and Evaluation Unit) have prior experience in using similar tools such as Excel sheets, GPS and DPIMS, which make it easier to appropriate SDF'S PSS tools and outcomes. Second, the focus on secondary cities as important centres for urbanisation in Rwanda (as defined in NUP), offers a conducive opportunity for Rwanda SDF appropriation in the districts.

While many participants in the districts were puzzled about data used in SDF tools, the Rwanda SDF presents an opportunity for an integrated system that stakeholders can access remotely. This will promote data *interoperability* within the districts and national government. The strength in the district is that there is internet connectivity that makes it suitable to appropriate the SDF'S PSS tools and outcomes into a dynamic online system.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

The main objective of this study was to understand how secondary cities in Rwanda are likely to appropriate national Planning Support Systems (PSS), which are part of the Rwanda Spatial Development Framework (SDF). Based on the results derived from the research workshops in Rubavu and Musanze districts in Rwanda, this study has established that existing *social-institutional structures* (policies, laws, norms and power*)* and *user characteristics (*knowledge, mandate and expectations) in the districts are likely to influence SDF'S PSS appropriation and users' perceptions.

The analysis of the existing *social-institutional structures* in the districts as discussed in chapter 4 revealed a strong link between the national and district governments. Typically, in Rwanda, there is a strong institutional framework that defines *task*s *a*nd *roles* of stakeholders in the planning processes. This corroborates Goodfellow (2013). The planning processes in the districts reflect a collaborative bottom – up process (mainly districts, Private Sector Federation, Joint Action Development Forum, and Sectoral Executives as stakeholders) and a participatory approach that starts from household level up to district level (see section 4.4). In terms of policy implementation, there is a top – down approach of policy transfer where directives are issued from higher to lower administration levels (see section 4.5). This study, therefore concludes, in line with Jankowski and Nyerges (2001), that the *e*xisting *social-institutional structures* are likely to influence the PSS appropriation.

The *users' characteristics* such as *participants' knowledge* and *expectations* reveal potential of vertical and horizontal SDF'S PSS appropriation in the districts. Some staff in the districts such as the staff of the One Stop Centre Unit and the Planning, Monitoring and Evaluation Unit are likely to appropriate SDF'S PSS more quickly than the other Units. In addition, the One Stop Centre Unit and the Planning, Monitoring and Evaluation Unit staff members are more likely to appropriate both SDF's PSS tools and outcomes (see section 5.4) more quickly than the other Units because such tools and outcomes are in line with their existing *duties*, *mandates* and *knowledge* (see section 4.3.2). The SDF'S PSS tools (Matrix of Functions and Spatial Multi-Criteria Evaluation) facilitate data collection, analysis and help in decision making process. The SDF'S PSS outcomes (mainly maps) are the products of the SDF'S PSS tools and are used to communicate information (see section 6.2). The staff in the One Stop Centre Unit and the Planning, Monitoring and Evaluation Unit are involved in data collection (spatial and non- spatial), analysis and communication hence both the SDF's PSS tools and outcomes are relevant to them (see section 5.2.2). Therefore, the staff in One Stop Centre Unit and the Planning, Monitoring and Evaluation Unit represent early adopters (DeSanctis & Poole, 1994) whom the national government can vertically transfer the SDF's PSS tools and outcomes.

The other Units in the districts such as Education, Health and Social Units represent late adopters who are likely to fit in the horizontal appropriation. The horizontal appropriation happens when the early adopters in the districts translate the SDF'S PSS tools and outcomes to the late adopters in the districts. The horizontal appropriation is based on the fact that the late adopters, within their existing *mandates*, do not have *high expectations* and *knowledge* of spatial matters. Since late adopters' expectations and knowledge are aligned with using the products of the analysis process, only the SDF'S PSS outcomes are more relevant to them. Therefore, the late adopters may need translation by the early adopters in order to make meaningful use of the SDF's PSS tools and outcomes.

The results of the users' perception analysis revealed different perceptions of SDF's PSS tools and outcomes. The result of this study in section 5.2.1 shows that the SDF's PSS outcomes can be used in the districts, in line with existing plans and policies for: *planning* (long term goals), *decision making* (short term goals), *monitoring and evaluating* and promoting *regional competition and development* (comparing one district performance to another and competing to be the best in line national policies). The results on SDF's PSS tools in section 5.2.*2* show that the districts are likely to appropriate the tools for improving their operations in terms of *communication*, *data analysis*, *visualisation* and *interactivity* (see section 6.2).

In contrary, challenges that could impede the appropriation of SDF's PSS tools are those which are associated with SDF's PSS data on one hand, and preparedness of the potential users on the other hand. The results in section 5.2.3 show that SDF methodology used secondary data from national agencies such as National Institute of Statistics Rwanda, which is not trusted by some of the participants in the districts. This is because National agencies aggregate their data at Sector and district levels. The districts collect their data from the Cells and Sectors (see section 4.4) in a bottom-up approach and use such data for district planning purposes. The SDF's PSS tools should integrate the locally acquired data in order to improve acceptability of SDF's PSS tools in the districts. The preparedness of the potential users in the districts relate to issues of finance, skilled personnel in the PSS application, which corroborates Klosterman (1995), and the knowledge about the Rwanda Spatial Development Framework and the Rwanda National Urbanisation Policy (NUP).

There have been successful policy transfers from national government to districts in Rwanda. Such policies as Medium Term Expenditure Framework and Imihigo have been successfully institutionalised and implemented in the districts under the supervision of national agencies and ministries. Similarly, this study concludes that the Rwanda Spatial Development Framework, under the Ministry of Infrastructure (in charge of urbanisation and spatial development) can follow a similar procedure and be appropriated across the country. The strong institutional framework in Rwanda is likely to offer a favourable ground for national policies such as Rwanda Spatial Development Framework to succeed because national initiatives are strictly implemented in a top-down approach as identified in this study and agree with Goodfellow (2013).

This study concludes that the SDF's PSS tools and outcomes are likely to be appropriated in the districts not only for spatial planning but also as a platform for the Rwanda National Urbanisation Policy transfer and translation. The policy transfer happens between the national government and the districts' early adopters where the policy is moved to the districts and expected to be implemented (as the SDF's PSS tools and outcomes are being appropriated). The policy translation happens locally within the districts when potential users in the district operationalise the NUP goals in the local context.

7.2. Study limitations

This study aimed to understand how PSS appropriation would happen in the districts. Though this target has been achieved, the study focused on potential users in the districts. Therefore, it is inevitable to overlook the interest of other stakeholders such as Private Sector Federation and Joint Action Development Forum who are actively involved in the district planning processes. The conclusions of this study, therefore, may be limited to the interests of the districts' staff and not representing the interest of the other stakeholders.

This study found no significant differences in Rubavu and Musanze districts. This is in terms of existing social-institutional structures, user' characteristics and perceptions of SDF's PSS tools and outcomes. The similarities may be due to factors such as the location (close to each other), planning needs and economic goals (tourism and gateway cities) in Rubavu and Musanze districts. These similarities may not apply in other

secondary cities such as Huye that has different planning needs and economic goals (education and innovation).

The duration of each workshop was 2 to 3 hours. The time may have limited the possibilities to explore all relevant aspects of the SDF methodology, tools and outcomes. This was overcome by use of printed copies of the SDF's PSS outcomes, PowerPoint presentation and video clips that helped the participants to understand the SDF's PSS tools and outcomes. However, a more detailed study with longer period may allow the users in the districts to explore, in details, the aspects of the SDF's PSS tools and outcomes.

Qualitative data acquired in this study need to be understood in the right context. The information disclosed by the people involved (interviewees and research workshop participants) may be limited to their knowledge of the districts planning processes and their own perspectives and attitude towards new ideas. Cross-checking the information from these people (triangulation) with other sources helped in building consistency in the study.

Another limitation is related to the language barrier. The language barrier was minimised by interviewing staff who could speak English and Swahili, and the use of a moderator for the research workshops. However, the participants and interviewees would have expressed themselves more freely to the researcher if they were engaged in the native Kinyarwanda language. In addition, the language translation may have led to the loss of some data that would have been useful (to the researcher and the participants).

While this study focuses on how appropriation would happen, the complexity of any process may not happen as anticipated by potential regular users. The appropriation also may be influenced by other factors such as political will. For example, L. Boerboom (Personal Communication, December 19, 2016) confirmed the Ministry of Infrastructure is committed to the Rwanda Spatial Development Framework. Political will among other factors were not the focus of this study although they may influence SDF's PSS appropriation.

The study of appropriation also demands a long-term investigation of how people make use of technology in planning processes. While this study builds on existing literature in understanding its appropriation potentialities, a future research window exists in Rwanda to understand how PSS appropriation will happen in real time once the PSS are introduced and institutionalised.

7.3. Contribution to policy

The findings of this study should serve as a guideline in implementing Rwanda SDF in the six secondary cities. This study recommends an appropriation of the Rwanda SDF in the secondary cities, within the One Stop Centre Units with support from MININFRA (central government). The MININFRA within their established urbanisation roles can transfer the NUP and Rwanda SDF to the One Stop Centre Units. The One Stop Centre can then translate SDF's PSS tools and outcomes into an understandable local context in the districts for all other Units.

The SDF'S PSS tools should be adaptive to the peculiarities of the districts. That is, allowing districts to integrate their locally acquired data from the Sectors and Cells, and then comparing to a national database that gives a national outlook. This is because of the differences in the aggregation level for the national government's data (Sector and district level) and the districts' data (Cell and Sector levels). The SDF's PSS tools appropriation presents an opportunity for data interoperability between the national and districts the

governments through a networked database accessible by both national and districts governments although the capacity building is needed at district levels.

This study has identified a need for capacity building in the districts. Capacity building includes financial support, staff training and tools ownership in the districts. This study recommends that the national government, within its mandate, should train staff in the districts on the Rwanda National Urbanisation Policy and Spatial Development Framework of Rwanda and how the SDF's PSS tools and outcomes are relevant in implementing the NUP at the districts levels.

These recommendations are in line with what MININFRA intends to implement, that is, the project to roll out GeoData platforms in the MININFRA national database and districts (MININFRA, 2016a). The GeoData platform implementation should benefit from this study in its background survey.

7.4. Contribution to research

This study contributes to the scientific community in understanding how PSS appropriation can link the national and district administration levels. The study contributes to the ongoing studies on the application of PSS in various domain and goes further to show how the PSS can be used for *policy transfer* and *translation*. The study concludes that PSS appropriation has the potential to help in national policy transfer to the districts and policy translation in the districts.

This study goes beyond a laboratory experiment and tests the appropriation of PSS with real world stakeholders who understands the *planning needs* and *policies* in the PSS application context (Batenburg & Bongers, 2001). Such real world study gives rich knowledge and information to the PSS experts and developers as opposed to just role-play studies organised in laboratories which are part of the bottlenecks that have hindered widespread use of PSS according to Vonk et al (2005). The study has shown how various social-institutional aspect such as policies, norms, mandates can influence the PSS appropriation in the real world. Furthermore, the study has explored how PSS appropriation is influenced by user characteristics such as knowledge and expectation. The study identified that user' mandates, roles, knowledge and expectations, sets two groups of PSS adopters namely: the early adopters who can appropriate the PSS within a short time and the late adopters who may take a longer period to appropriate the PSS.

In terms of PSS literature, the study was based on the EAST framework and it's constructs, aspects and premises (Jankowski & Nyerges, 2001). The study has contributed to the empirical studies that have applied EAST aspects in studying how advanced technology introduced in an organisation get to be appropriated. Further, this study has shown that PSS as an innovative technology can be studied within the EAST framework. The EAST framework has been used to explain how the PSS appropriation can be influenced by the *existing social-institutional* and *user characteristics aspects* in the PSS's application context.

However, this study creates a chance for series of future studies related to SDF's PSS appropriation. First, the need to repeat this study with all stakeholders involved in the district's planning processes and incorporate diverse interests. This includes carrying out interviews and research workshops with participants from the JADF, PSF, the Sectors' Executives and representatives of the donor community.

Second, once the Spatial Development Framework of Rwanda is introduced and institutionalised in Rwanda, there is a need to study the process and the outcome of appropriation of the SDF's PSS tools in all the districts. The future studies can be carried out in the same districts and compare to the findings of this study or compare to the process and outcome phases as defined in EAST framework (Jankowski & Nyerges, 2001).

Third, comparative studies are recommended. The comparative studies can be in two ways. One, comparing the other secondary cities in Rwanda with Rubavu and Musanze in order to establish factors that influence successful PSS appropriation and policy translation in the secondary cities. The second way is by comparing the PSS appropriation in another institutional framework, probably in a different country and establish how appropriation differs from the Rwandan context.

Fourth, this study focused on the appropriation of PSS tools but not much on the institutionalisation concept. While the case in Rwanda PSS appropriation involves policies, there is a need to study the role of PSS tools in policy translation in the districts.

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APPENDICES

Appendix 1: Questionnaire

Spatial Development Framework (SDF) tools workshops
Planning Evaluation Survey

This survey is part of a research project on the use of Planning Support Systems in Secondary cities in Rwanda. The research is conducted by Benson Mutuku an MSc student at Faculty of Geo-Information Science and Earth Observation at the University of Twente, in the Netherlands. Your participation is highly appreciated and of great help to me. The responses and feedback will be kept anonymous and will be used to analyse people's responses on both the SDF tools and outcomes which were shown during the workshops. Please fill this form as part of your participation in helping me in undertaking this research. Thank you for your help.

A. Please respond to the following questions <u>about the workshop in general</u> (*Please tick one choice per question*)

	Questions	Strongly Agree	Somehow Agree	Neither Agree nor Disagree	Somehow Disagree	Strongly Disagree
1.	I was able to share my ideas and opinions with others	☐	☐	☐	☐	☐
2	The workshop helped me to know the perspectives of the other participants	☐	☐	☐	☐	☐
3	I felt the other participants listened to what I said and understood me well	☐	☐	☐	☐	☐
4	I got answers to my questions during the workshop	☐	☐	☐	☐	☐
5	Workshop participants discussed issues in a clear and open way	☐	☐	☐	☐	☐
6	Personally, I have learnt a lot	☐	☐	☐	☐	☐
7	The workshop helped me understand what is SDF	☐	☐	☐	☐	☐
8	I would support the final decision made by the participants of the workshop	☐	☐	☐	☐	☐

B. Please respond to the following questions <u>about the impact of the workshop in your learning and understanding level</u> *(please tick one choice per question)*

	Questions	Strongly Agree	Somehow Agree	Neither Agree nor Disagree	Somehow Disagree	Strongly Disagree
9	The computer tools captured my unique thinking and concerns	☐	☐	☐	☐	☐
10	Workshop participants were free to questions the outcomes of the computer tools	☐	☐	☐	☐	☐
11	I am now familiar with the terms and concepts used in the computer tools	☐	☐	☐	☐	☐
12	The computer tools improved my ability to imagine how local planning process can be done better	☐	☐	☐	☐	☐
13	What I learnt with the computer tools changed what I thought can happen in my city	☐	☐	☐	☐	☐
14	Computer tools improved the ability of the group to identify common goals and differences	☐	☐	☐	☐	☐
15	I can easily use these tools with little assistance	☐	☐	☐	☐	☐
16	I feel the computer tools are good for making decision and implementing current policies	☐	☐	☐	☐	☐
17	I can recommend these tools to my workplace	☐	☐	☐	☐	☐
18	I can recommend these tools to other departments in my city.	☐	☐	☐	☐	☐

C. Please respond to the following open questions about the implementation of the tools used in the workshop and the SDF.

19. What **challenges** are likely to delay the use of these tools in your local planning process? (List them)

---

20. Please provide any general comments about the **Computer tools** or **GIS** below

---

---

21. Please provide any general comment about the **SDF** below (optional)

Appendix 2: Semi-structured interview

Appendix 2.1: Semi- Structured Interviews

Interviewer: Benson Mutuku

Leading questions

1. **Background / introduction**

1.1 What is your job/what do you do in the city?

1.2 What role do you play in the local planning process?

2. **Planning process**

3.1 How can you describe the planning process in the city?

3.2 Is there any recent city planning project that you were part of?

- Explain more about it
- How long did it take?

3.3 Who are the other stakeholders involved in the planning process?

- Their background and
- Interest in the planning process

3.4 How do you manage differences interest during the process? How do you achieve a decision?

- Vote
- Chair thumb rule

3.5 How is the collaboration/ togetherness/oneness of stakeholders during the planning process?

- Do you remember any special incidence?

3.6 Do you use any support tools like computers, maps, graphs etc.

- In which stage?
- Who uses these tools

3.7 Is there any influence of the local planning process by other interest?

- National government
- Regional
- Politics
- International agencies

3. **Planning outcomes**

3.1 What are the outcomes of the planning process? End products?

3.2 How are they produced?

- Can I see some of the outcomes?

3.3 How are the outcomes communicated to the stakeholders?

3.4 Are all stakeholders satisfied with the outcomes?

4. **Implementation**

- *Which methods /strategies do you use in implementing the outcomes?*
- Any formal policy /procedure
- Who are in charge to of the implementation of the outcomes?
- Jointly as a city or department wise?
- Regular assessment and monitoring?

5. **General and Closure**

5.1 Do you think the local planning process can be more effective with planning support tools like maps, GIS software among other?

5.2 Any additions

5.3 Thank you.

Appendix 2.2: List of interviews conducted in Rubavu and Musanze districts

	Interviews Carried Out In The Districts						
	Interviewee			Relevant in Understanding:			
	Job Title	Completeness[11]	Name of District	District planning	Unit planning	Department planning[12]	In-text interviewee number
1	Hygiene and Sanitation Officer	Complete	Rubavu	No	yes	yes	
2	Director Planning, Monitoring and Evaluation	Complete	Rubavu	yes	yes	yes	Interviewee 2
3	Terrestrial administration and decentralised governance officer	Complete	Rubavu	yes	yes	yes	Interviewee 5
4	Director Planning, Monitoring and Evaluation	Complete	Musanze	yes	yes	yes	Interviewee 1
5	Disability mainstreaming officer	Complete	Musanze	No	yes	yes	Interviewee 6
6	Director of urban planning and decentralisation (CIM rep)[13]	Complete	Musanze	yes	yes	yes	Interviewee 4
7	Secondary and VTC education officer	Complete	Rubavu	No	yes	yes	
8	Director Agriculture and Natural Resources	Complete	Rubavu	No	yes	yes	
9	Construction and Permitting Officer	Complete	Rubavu	yes	yes	yes	Interviewee 3
10	Construction and Permitting Officer, urban planner/Acting GIS Expert	Complete	Musanze	yes	yes	yes	Interviewee 4
11	Director One-stop Center	Incomplete	Rubavu	yes	yes	yes	
12	SMEs and cooperative development officer	Incomplete	Rubavu	No	yes	yes	
13	Director Health Unit	Incomplete	Musanze	No	yes	No	
14	Director One-stop Center	Incomplete	Musanze	yes	yes	yes	
15	Community-based health insurance officer	Incomplete	Rubavu	No	No	yes	

Appendix 2.2: A table showing the list of the districts' officers interviewed, the completeness of the interview in line with research objectives and the relevant in understanding district planning processes, and the interviewee number for some of the interviewees quoted in the text of the study.

In some Units, the person interviewed depended mainly on the experience and the how long the person has worked in the Unit. For instance in Musanze, the urban planner was interviewed instead of the director of the One Stop Center Unit because the director new to the Unit.

[11] Completeness of the interview depended on how well the interviewee responded to the leading questions (See appendix 2.1). Some of the interviews are not quoted in the text of the study but are mentioned here for their role in acquiring secondary materials and first-hand knowledge of the districts', Units' and departments' planning.
[12] Departments are the smaller administrative entities making up a Unit in the districts. Each department is headed by an officer who is answerable to the Unit's Director.
[13] Director of urban planning and decentralization (CIM representative) was interviewed together with the urban planner in Musanze district thus their contributions in text is referred to as interviewee 4.

Appendix 3: Workshop participants invitation

Appendix 3.1 Invitations for SDF's PSS Outcomes & Tools Workshops per Unit

1. Planning, Monitoring and evaluation unit: 1 PERSON
    - Director or Planning M & E officer
2. Infrastructure One Stop Centre unit: 3 PERSONS
    - Director or
    - GIS and land surveyor
    - Construction and Permitting
3. Business development and employment unit: 1PERSON
    - Director or investment promotion and Finance
4. Agriculture and natural resources unit: 1 PERSON
    - Director or Animal Resource Officer or environmental officer
5. Good governance unit: 1 PERSON
    - Director or Territorial admin and Decentralisation governance officer
6. Social development unit: 1 PERSON
    - Director or Disability mainstreaming officer or disaster management officer
7. Health unit: 1 PERSON
    - Director or hygiene and sanitation officer
8. Education unit: 1 PERSON
    - Director or secondary and VCT education officer
9. Finance unit: 1 PERSON
    - Director or Local Revenue inspector
10. Human Resource Unit: 1 PERSON
    - Director or logistic officer

Appendix 4.2: Research workshops held in Rubavu and Musanze districts

Workshop	Venue	Participants from:
Workshop 1	Musanze	Planning, Monitoring and evaluation, One Stop Centre, Business development and employment, Agriculture and Natural Resources and Good governance Units
Workshop 2	Musanze	Social development, Health, Education, Finance Human Resource Units
Workshop 3	Rubavu	One Stop Centre, Business development and employment, Agriculture and Natural Resources and Good governance Units
Workshop 4	Rubavu	Planning, Monitoring and evaluation, Health, Education, Finance

Appendix 4.2: Details of the research workshops held in the districts with the workshop numbers used to define the participant's groups as cited in the text of this study. For example, a participant number one in workshop one is referred to as participant 1:1.

Appendix 4: Workshop details

Appendix 4.1: Research Workshops

Planning Support Systems Appropriation: A Nexus between national Spatial Development Framework (SDF) and Secondary cities in Rwanda.
Fieldwork workshops to be held in Rubavu and Musanze cities, Rwanda between 19th September and 21st October 2016. This workshop script is a guideline manual for the Moderator of the research workshops and the Researcher.

1. WORKSHOPS PREPARATION

- About 4 weeks before the first physical meeting, contacts were made with MININFRA official to help in welcoming participants. Probably people who are expected to be users of SDF tools and outcomes in the secondary cities.
- Invitations were sent to potential participants and asked to confirm attendance.
- A day before the workshop session, the researcher will confirm the availability of all needed materials. This follows setting up the necessary tools and outcomes ready for the workshop.
  - Things to check: power connection. Spacious room, tables and chairs, set out camera positions, a projector (beamer), coffee (soft drinks), confirm participants' attendance through a phone call.

2. INTRODUCTION AND WELCOMING REMARKS

- This will take at most **15 minutes**.
- The workshops will start with welcome remarks by the moderator.
- Moderator will introduce himself as a staff working with RHA and also as a qualified person who was part of the SDF task force.
- Moderator will then introduce the researcher. Benson as a graduate student in the University of Twente, the Netherlands who is interested in how Districts and secondary cities in Rwanda can make use of SDF outcomes and Tools which is the reason we are having these workshops.
- Moderator will then make a welcome remark for all participants. This will be done based on Units represented.
- **Morning team**: Planning, Monitoring and evaluation unit, Infrastructure One Stop Centre unit, Business development and employment unit, Agriculture and natural resources unit and Good governance unit
- **Afternoon team**: HR and Admin Unit, Social development unit, Health unit, Education unit and Finance unit
- The moderator will introduce the aim and purpose of each workshop. *"The aim of the workshops is to show the outcomes of the SDF and the tools used in producing those outcomes and for you to judge the applicability in your District planning. Therefore, you will be expected to contribute actively throughout the sessions. We will have two workshop sessions.* ***The first session,*** *I am going to do a short PowerPoint presentation of the SDF outcomes then we will have* ***focused group discussion*** *concerning those outputs. Afterwards we will have a short break before coming in for the* ***second session*** *where Benson will show us the planning tools used in generating SDF outcomes and then finally a quick self –administered questionnaire to give feedback about the workshop."*
- A final point on introduction is the participants' rights and freedom. At any point during the workshop, the participants are free to ask any question related to what will be shown or discussed.

3. WORKSHOP SESSIONS

Session 1: SDF outcomes Workshop (30 minutes)

- This session will start after introduction.
- PowerPoint presentation should be already projected!!
- The moderator explains the meaning of "*SDF"* and "*outcomes*". The aim is to create a common thinking ground for all participants regarding what is been called **SDF outcomes.**

Make this statements before moving the first slide!

- **SDF:** A methodology designed to support national, regional and **local government** decision-making by creating a 'spatial' understanding of the current state of the territory to support vision and strategy development specific to a particular region.
- **Outcomes:** these are fundamental products of the SDF methodology which outlines spatial development in Rwanda and aimed to complement the implementation of National Urbanisation Policy (NUP). They are produced using special computer tools which will be demonstrated during the next workshop session.

PowerPoint presentation Slides starts:[14]

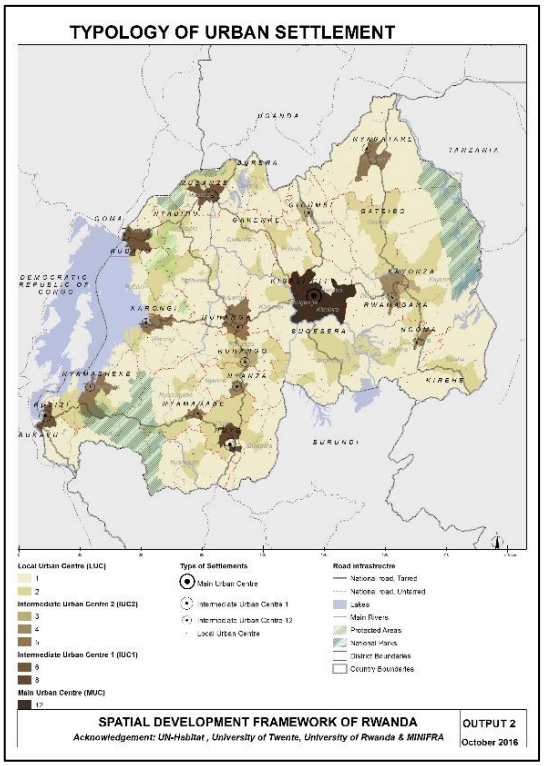
In this workshop, the following 6 outcomes will be shown:

- *List of functions (MoF):* OUTPUT 1: this should give participants an understanding of the initial profiling of functions across the country and emphasis should be on the fact that SDF uses Sector level data. All Sectors across the country. Please see the PowerPoint slides for the definition of the **function.**

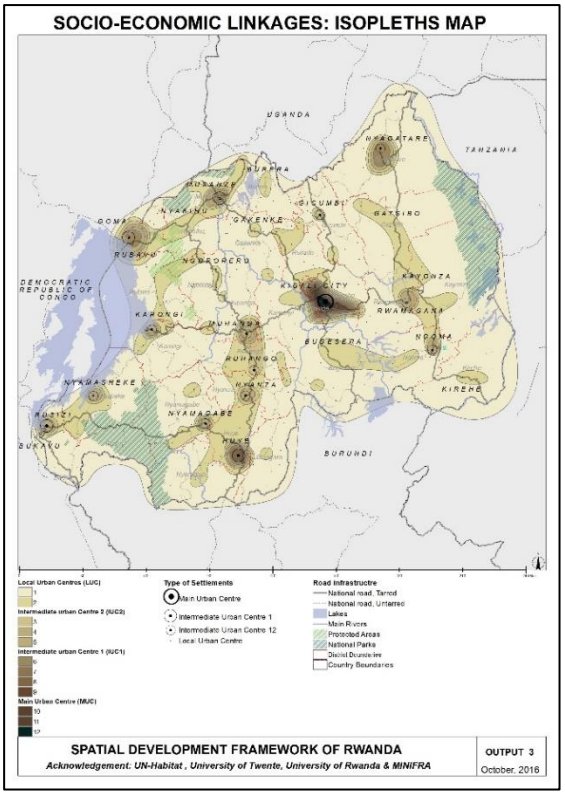
			Public Utilities and Facilities							Road Connection and Transportation Services					
Province	District	Sector	Mobile Phone Company Outlet	Telecommunication Transmitter	Broadband	Radio station	TV station	National Electricity On Grid	Water Public Network On Grid	Sewerage and storm water drainage system	National Paved roads	Bus Terminal	Heliport	Airport	Harbour/port	Petrol Supply Station
Northern	Musanze	GACACA	0	0	0	0				0		0	0	0	0	0
Northern	Musanze	GASHAKI		0	0	0			0	0	0	0	0	0	0	0
Northern	Musanze	GATARAGA	0	0	0	0				0		0	0	0	0	0
Northern	Musanze	KINIGI	0	0	0	0				0			0	0	0	0
Northern	Musanze	MUHOZA -CYUVE-KIMONYI-MUSANZE-BUSOGO		0		0								0	0	
Northern	Musanze	NKOTSI	0	0	0	0				0		0	0	0	0	0
Northern	Musanze	NYANGE	0	0	0	0				0		0	0	0	0	0
Northern	Musanze	REMERA	0	0	0	0			0	0	0	0	0	0	0	0
Northern	Musanze	RWAZA	0	0	0	0			0	0	0	0	0	0	0	0
Northern	Musanze	SHINGIRO	0	0	0	0			0	0	0	0	0	0	0	0
Western	Rubavu	BUGESHI		0	0	0				0	0	0	0	0	0	0
Western	Rubavu	BUSASAMANA		0	0	0				0	0	0	0	0	0	0
Western	Rubavu	GISENYI-RUBAVU-RUGEREFO-NYAKILIBA-NYAMYUMBA-NYUNDO-KNAZENZE-CYANZARWE-KANAMA		0		0							0			

[14] The PowerPoint presentation can be found here: http://www.slideshare.net/bensonmutindam/sdfrwanda-workshops-slides

❖ *Map of the MoF centrality score*: OUTPUT 2: visualising the MoF centrality score spatially. A better way to communicate. This shows how Sectors perform depending on the number of functions present in each Sector. Emphasis on the **basic**, **intermediate** and **central.** See the PowerPoint slides. This will be explained in details in the **video**[15] within the PPT**.**

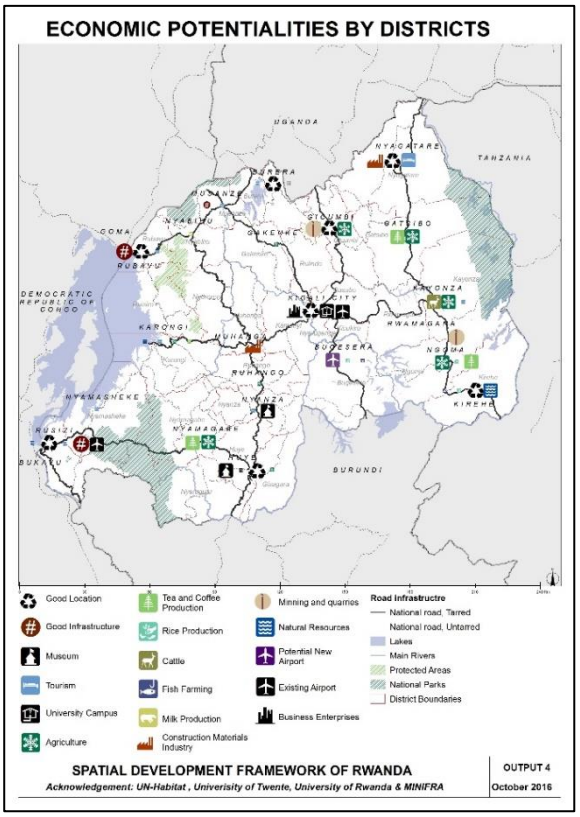


❖ *Isopleth map*: OUTPUT 3: Explaining territorial linkages. This map captures a regional perspective in planning. The regions are not only shown by functions but also how they are integrated in terms of socio-economic and physical connections. This is a key concept in influencing investment and infrastructure development in these regions.

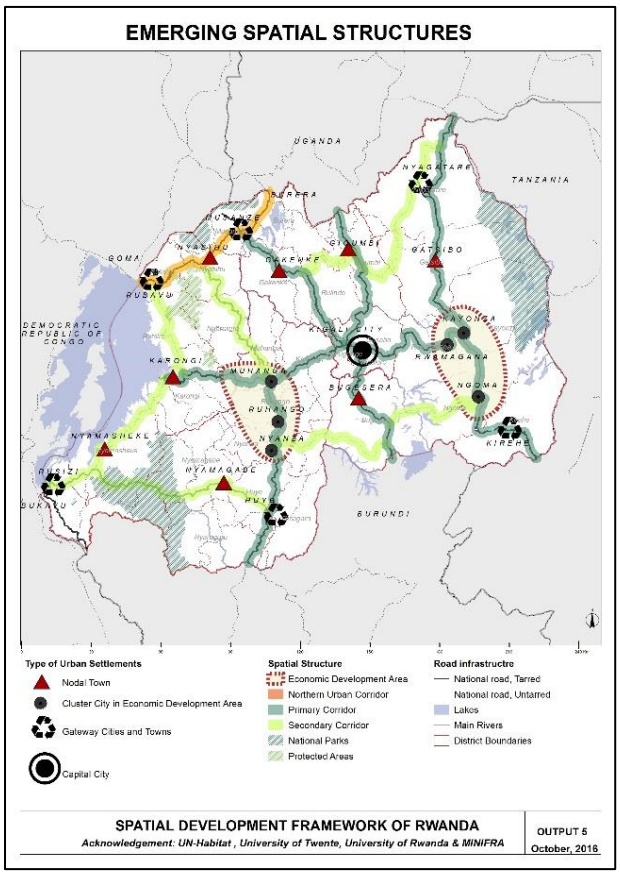


[15] The video can be found in the following link: https://www.youtube.com/watch?v=CqDad75SpBU

❖ *Consultative workshop map*: OUTPUT 4: this is the result of MoF and consultation workshops which identified economic potentialities for each settlement across the country and clusters for development.



❖ *Spatial structures:* OUTPUT 5: Several Spatial structures emerges from a spatial analysis of Matrix of Functions and the results of District Consultative Workshop.Economic Development Areas (EDA), Nodal cities, Gateways, Corridors.



❖ *SMCE*: OUTPUT 6: Explain what SMCE is: Guided by the Slide.
Criteria tree is formed consisting of the **overall objective** of the evaluation, its **sub-objectives**, and **criteria** that are applied to **indicator** maps.

- The SDF SMCE was based on the pillars of NUP: coordination, densification, governance and economic growth. For the purpose of this workshop, we focus on economic development (see the screenshot on the left).

3.4 Pillar 4: Economic Growth

3.4.1 Policy statements

The following policy statements are promoted under this pillar:

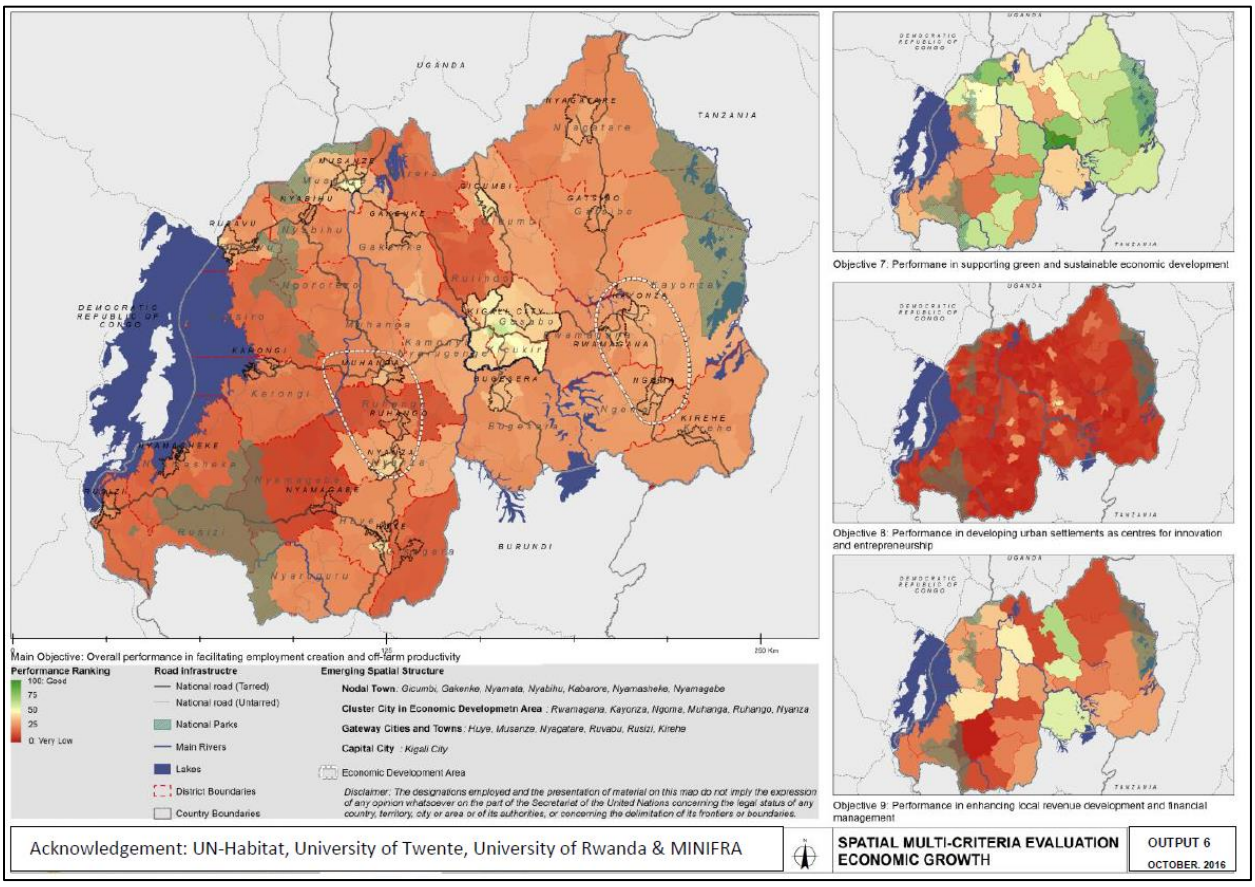
PS 8: Urban management shall be guided by green economic criteria and market-responsiveness.

PS 9: Urban areas shall be enhanced to become centres for innovation and entrepreneurship and sources for socio-economic services and opportunities.

PS 10: Local revenue development and efficient financial management shall foster urban investment capacities with consideration of principles of equity.

- Explain the Economic pillar starting from the overall objective (which is the NUP pillar), the objectives 7, 8 & 9 (which are also driven from NUP), then how to break those objectives into sub-objectives (see the example of Objective 7) and then into criteria upon which we can establish a measurable indicator.

- At each level of the tree, inputs are given weight depending on their importance.



4. FOCUSED GROUP DISCUSSION (FGD)

- The moderator, at the end of the presentation, will notify the participants about the FGD.
- The following questions will guide the session:

Specific questions to each output: (1 hour)

Let's go step by step, output by output. Starting with MoF to SMCE. The moderator rolls back the PowerPoint presentation to the output in the discussion. We can also make use of the printed maps during this time. After sufficient discussion and time, we move to the next.

i. **What have we learned from these SDF outcomes? Give us your Responses in terms of comments or questions (30 minutes)**

a. MoF
b. Centrality score Map
c. Isopleth maps
d. Consultative workshop result map
e. Spatial structures (EDA, Nodal towns, gateways, corridors)
f. SMCE concept

ii. **Are these outputs useful to us and in our departments? (10 minutes)**

a. How can we use these outcomes within our city planning process? (5 minutes)

iii. **Which are departments/units likely to benefit quickly/easily from these outcomes? (10 minutes)**

General questions about the Outcomes: (20 minutes)

i. Any challenges that we may have here locally in adopting these outcomes? (10 minutes)

ii. Finally, any comments, or burning concern from participants. (10 minutes)

NOTE:

- Moderator will oversee the discussion and let all ideas come from the participants.
- Moderator will keep time spend on one question to ensure all questions are discussed within the set time. On average 5 minutes per output.

In the case of clarification, the Researcher will help in making the questions more clear and understandable. Any misunderstanding or discussion outside the question on the table will be controlled through coordination between researcher and moderator.

5. COFFEE BREAK (15 MINUTES)

- The moderator will facilitate the transition between tasks in the workshop as indicated in the workshop timetable. Tell people we are breaking for **15 minutes** to have coffee/snacks and then continue.

SESSION 2: SDF TOOLS WORKSHOP

Introduction (5 minutes)

- Moderator will introduce the session by welcoming the participants back to the second session.
- Invite participants to a session where tools used in the SDF will be demonstrated.
- The researcher will do the demonstration of the tools. Moderator will help in case of any translation needed.
- The moderator will facilitate the session. Timekeeping and flow management are important here.

- Confirm everyone can work with a computer. At least the assumption is all participants can us a computer.

Part 1: MoF (20 minutes)

The aim of this session is to show how data about Functions was collected, programmed in Ms-Excel and the ranking of Sectors based on centrality score is done in the special worksheet.

This is a hand on session where participants will use the tools and understand the concepts used.

Exercise:

- Open the Excel document containing the Study area worksheet.
- Explain the collection of function based on *the Public Utilities and Facilities, Road Connection and Transportation Services, Industries and Commercial Establishments, Markets, Health Facilities, Public recreational and Cultural Facilities, Public Spaces, Judiciary Services, Security Services, Community Organizations, Specialized Health Staff and services, Educational Institutions and Private Professionals.*

Public Utilities and Facilities							Road Connection and Transportation Services						Indus			
Mobile Phone Company Outlet	Telecommunication Transmitter	d Broadband	Radio station	TV station	National Electricity On Grid	Water Public Network On Grid	Sewerage and storm water drainage stem	National Paved roads	Bus Terminal	Heliport	Airport	Harbour/port	Petrol Supply Station	International knowledge-based lustries and manufacturing	International and national ICT and ecommunication cluster	National knowledge-based lustries and manufacturing	Manufacturing Cluster Based on tional Resources

- Let the participants understand this is input data for many outputs which were demonstrated. If anything is wrong at this point, the subsequent reporting will be wrong.
- Explain the data is focused on Sectors, within the districts. Show the left-most columns.
- Next, explain how the centrality score is done and the other calculation. Because this is a demonstration workshop, the *programming has already been done. Make the participants understand how it works. (Starting with the Sum functions frequency, Standard and Function Weight) then centrality score.*

Sector	Building Contractor	Total number of functions	Total centrality score
NKOTSI		0	0.00
GATARAGA		0	0.00
GASHAKI		0	0.00
GACACA		0	0.00
NYANGE		0	0.00
REMERA		0	0.00
RWAZA		0	0.00
SHINGIRO		0	0.00
Sum functions frequency	0		
Standard	100		
Function Weight	#DIV/0!		

- Next is the sorting of functions and Sectors based on functions weights and then the total functions (no of functions) in each Sector. For this open the Excel document containing the final MoF computations. Connect this to output 1!!

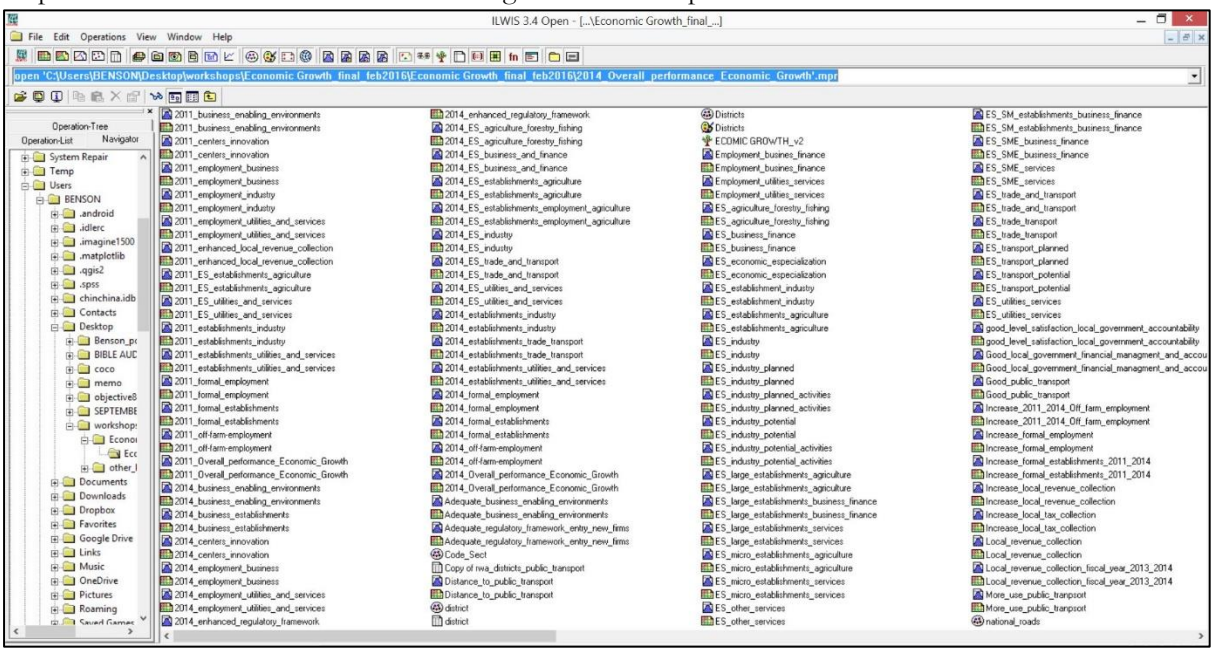
Province	District	Settlement/Sector	Sector_Code	Total Population 2012	Total Urban Population 2012	Private Hospital	Harbour/port	Police/Military Hospital	Fire Station	Specialized Hospital/clinic	University Hospital	Supreme Court	Total number of functions	Total centrality score	Level of hierarchy	
Kigali City	Gasabo-Nyarugenge-Kicukiro	KIGALI CITY	1,208	1,045,005	847,485	■		■	■	■		■	75	695.2	12	MUC
Southern	Huye	HUYE	2,402	132,427	52,768	■		■			■		66	488.6	8	IUC1
Western	Rubavu	RUVABU	3,306	287,076	149,209		■		■				46	263.7	6	
Western	Rusizi	RUSIZI	3,609	78,283	28,488								50	239.1	6	
Northern	Musanze	MUSANZE	4,310	233,715	96,307								49	229.9	6	
Western	Karongi	KARONGI	3,101	64,979	22,756		■						48	193.3	5	IUC2
Southern	Nyamagabe	NYAMAGABE	2,503	41,522	16,695								46	171.5	5	
Western	Nyamasheke	NYAMASHEKE	3,705	91,145	5,272	■							43	168.2	5	
Southern	Muhanga	MUHANGA	2,705	145,444	50,608								45	166.4	5	
Eastern	Nyagatare	NYAGATARE	5,210	282,313	41,537								46	165.5	5	
Eastern	Ngoma	NGOMA	5,605	28,338	11,537								35	150.1	4	
Eastern	Rwamagana	RWAMAGANA	5,105	85,268	21,901								48	141.2	4	
Southern	Nyanza	NYANZA	2,101	42,870	25,417								45	140.0	4	
Southern	Ruhango	RUHANGO	2,609	65,700	17,051								40	105.1	3	
Northern	Gicumbi	GICUMBI	4,503	36,401	18,981								41	104.6	3	
Western	Ngororero	KABAYA	3,504	34,085	6,481								28	84.4	2	LUC
Western	Ngororero	GATUMBA	3,502	23,707	0								29	80.5	2	

- Emphasise on the classification (basic, intermediate, and central functions) which emerge after sorting based on Sectors performance.
- Emphasise on the level of hierarchy which is used in the classification of urban centres. Make a connection to output 2.
- Explain how the data is then exported to ArcGIS software for visualisation.
- End of part one.

Part 2: SMCE (30 minutes)
The aim of this part is to let participants understand the concept of SMCE. This will be demonstrated using the product of Economic pillar.

EXERCISE
Open the ILWIS Software.

Open the Economic Pillar folder containing the SMCE outputs.



Explain what these outputs mean. Why are they many?
Hide all the outputs and then open the criteria tree.

Concept:

The economic pillar in SDF is developed based on the NUP article 3.4

3.4 Pillar 4: Economic Growth

3.4.1 Policy statements

The following policy statements are promoted under this pillar:

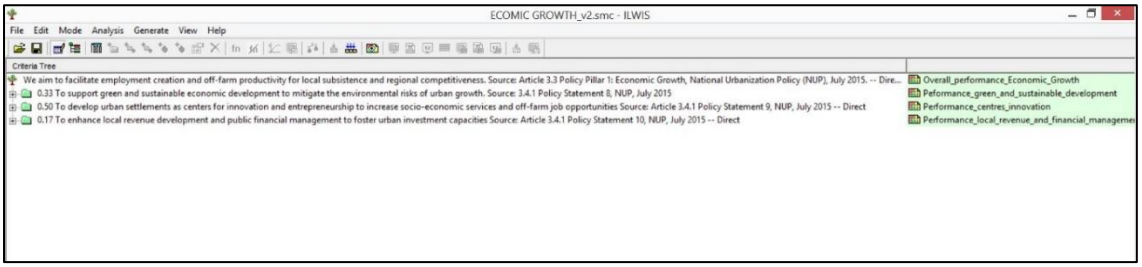
PS 8: Urban management shall be guided by green economic criteria and market-responsiveness.

PS 9: Urban areas shall be enhanced to become centres for innovation and entrepreneurship and sources for socio-economic services and opportunities.

PS 10: Local revenue development and efficient financial management shall foster urban investment capacities with consideration of principles of equity.

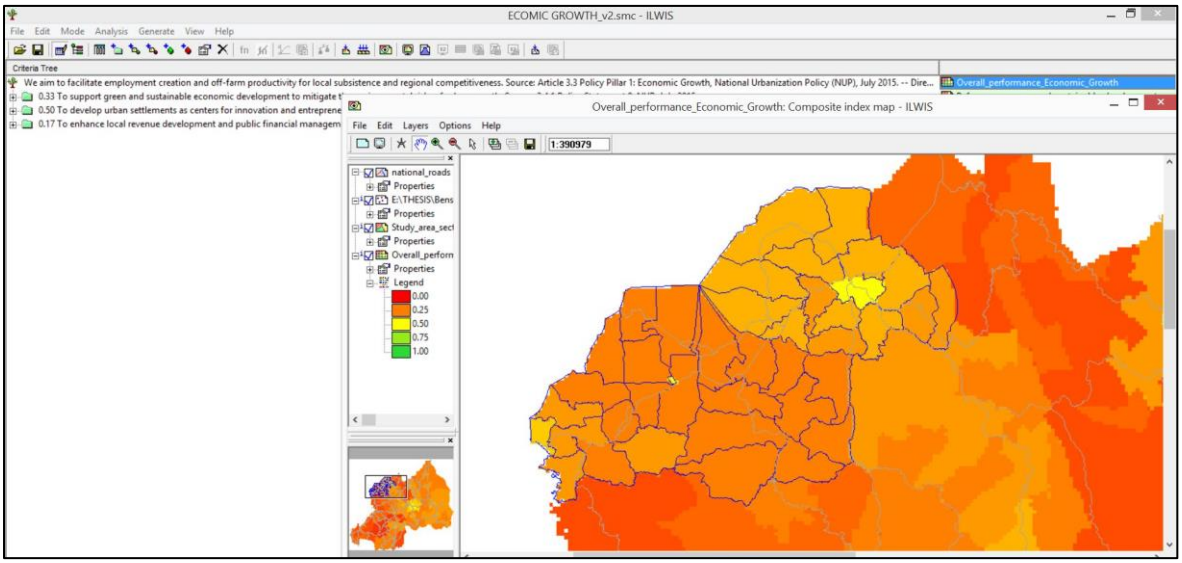
Based on these three policy statements (PS), SDF developed three objectives to achieve this pillar.

Now, Expand the Tree by double clicking it to see the statements. Maximise the Criteria window. Note: The SDF team gave different weight to these Policy Statements depending on their



importance. The policy statement 9 which is Objective 8 on "urban settlements as centres for innovation and entrepreneurship to increase socio-economic services and off-farm job opportunities" was given a higher weight of 0.5.

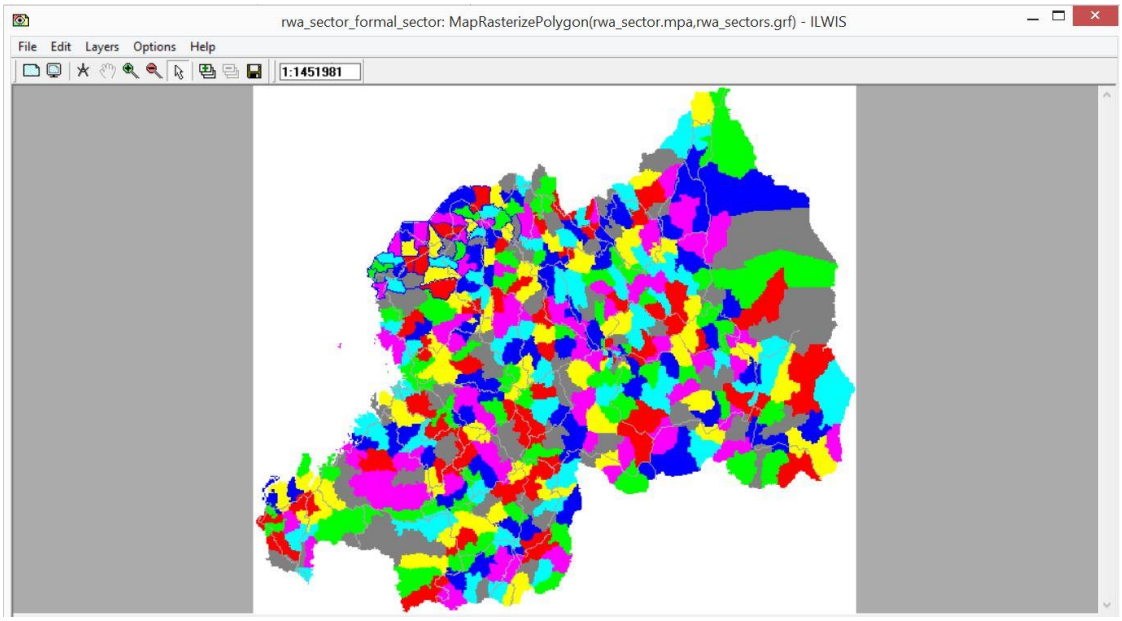
- Confirm the weights for the other objectives.
- On the right side of the objectives, the ILWIS shows the map output of these objectives.
- Explore these output. See the performance of your District and compare to the others. Focus only on Rubavu, Musanze and Nyabihu. Then see the overall Economic Performance output



Next step: Sub-objectives, criteria and Indicators

- These three objectives are realised through more specific sub – objectives.
- Expand "To develop urban settlements as centres for innovation and entrepreneurship to increase socio-economic services and off-farm job opportunities Source: Article 3.4.1 Policy Statement 9, NUP, July 2015" by clicking + sign on the left.
- How many sub-objectives does this Objective have? What is the weight for each Sub-objective?
- Check the corresponding output maps on the right-hand side by double clicking the map icons.
- Expand the "To have an adequate regulatory environment that enables the entry of new firms and employment in the "formal" Sector. Source: Article 3.4.6 Local economic development, Job creation and skills development., NUP, July 2015, and EDPRS2"

- Notice the sub-objective has two criteria. Check their corresponding maps on the right.
- Expand these criteria and check the least possible level. This shows the indicators which contain the



input data.

- The input data is at Sector level. Double click one of the corresponding input of the indicators. This is shown by a column - icon

- Note: the operations in SMCE starts with data. If we have any data about the Sectors we can do a spatial analysis to compare the Sectors and see their performance. Not only for NUP policy but much more application.
- This data can be obtained from various agencies.
- Think of some within your department.

End of part 2.

- **Part 3: Questionnaires and Feedback (20 minutes)**
- Moderator will facilitate a quick feedback discussion session. This involves a quick questionnaire and also discussion.
- At the end of Tools Workshop, the moderator should tell the participants to fill the questionnaire as part of their participation in the workshop
- We give participants 10 minutes to fill the questionnaire.
- After this, we have a feedback session about the workshop for 10 minutes.
- A quick feedback session for 10 minutes
- General feedbacks about the two workshops.

6. CLOSING (5 MINUTES)

- Roles (Moderator and researcher to give their views and comments including thanking all participants for sacrificing their time to be part of the workshop)
- Expectations management (moderator and researcher). Explain to the participants what they should expect. From the research view and also the SDF itself as a new method of doing things.
- The moderator should close the workshops officially.

Thank you

END OF WORKSHOPS

7. ROLES AND RESPONSIBILITIES

A. Researcher/ observer

- Organise for the workshop logistics: snacks and coffee
- Observe the participants interactions and reaction during the workshop
- Create a good atmosphere by interacting with the participants. Learn from within
- Give clarification in consultation with the moderator
- Respond to any questions arising regarding the tools and outcomes
- Explain the research at the end of the workshops and what people should expect
- Thank the participants

B. Participants

- Feel free to ask any question relating to the workshops
- Participate, contribute to the discussion and share experience
- Actively participate the focus group discussion. Please contribute and share your thoughts
- Fill a self-administered questionnaire at the end of the tools workshop

C. Moderator

- Greet all the participants and welcome them (at the start of the workshops).
- Introduce all the people: researcher and the participants according to their departments.
- Explain the **aim of the workshop** and the idea of SDF with a focus on the use of SDF at local levels.
- Moderate/facilitate the sessions. Timekeeping is important, good communication, create a learning atmosphere
- Respond to questions asked by the participants about the outcomes. Can consult the researcher for a more collaborative response.
- Give people time for break (at 11 am and explain when the next session is starting)
- Keenly lead and moderate the focus group discussion. See the guiding questions in the workshop timetable.
- Close the workshop sessions with a vote of thanks and explain what participants should expect. Please, emphasis on the link between NUP and SDF and the tools being shown today.

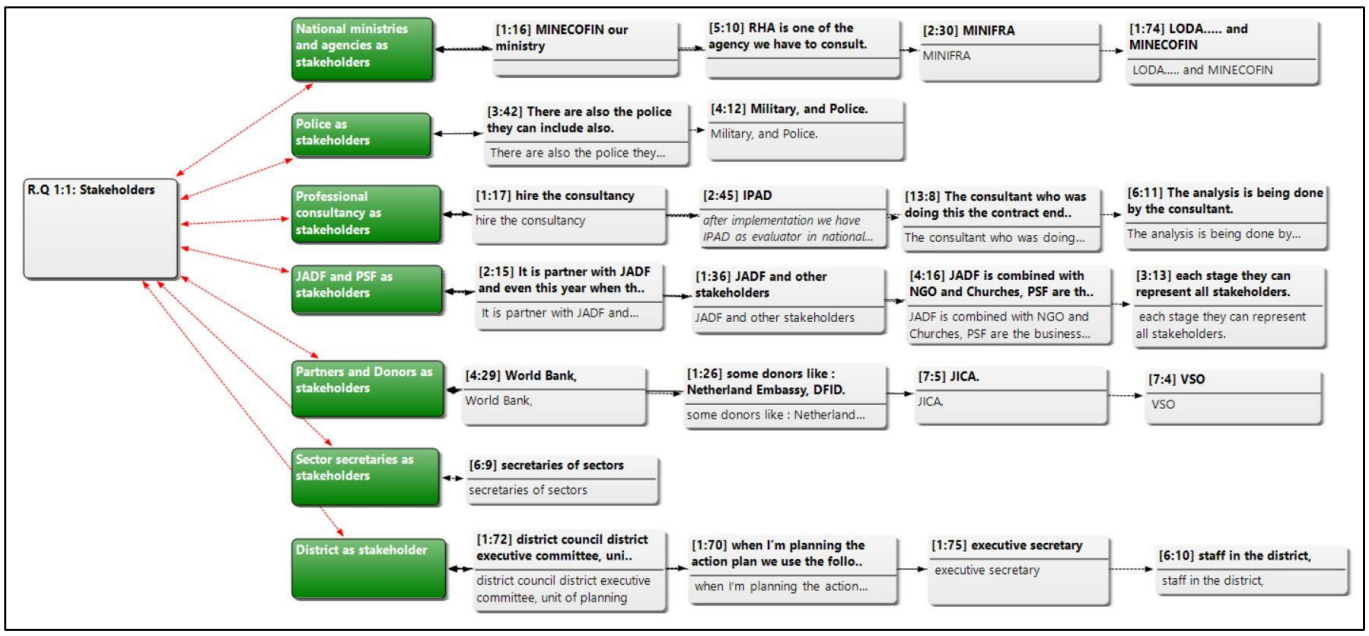
Note: No Suggestions or Opinions from the Moderator. Every Idea And Concerns Should Come From The Participants. Let Allow the Participants to Expose Their Thoughts about the SDF Outcomes and the Tools.

8. CONTINGENCY PLAN (RESEARCHER)

- In the case of a power blackout, what possible solutions do we have? Print out maps and the PowerPoint presentations?
- In the case of a new moderator, the researcher will meet him/her a day or two before the workshop for acquainting with the tools and outcomes. I hope Theo will be available for the possible 4 workshops
- Accommodation: Organise accommodation a day before the workshops.
- Transport. Confirm travelling plan and time for a moderator to and from the two cities.
- Snacks: organise and buy the snacks a day before the workshop. Consult with local people what is offered in such workshops.

Appendix 5: Qualitative analysis results

A. Stakeholders' roles in the Districts



Appendix 5.1: Key stakeholders involved in the districts' planning processes

Results of the Atlas.ti analysis showing the key stakeholders (in green background) and sampled quotes (grey background). These data is from the interviews held in Rubavu and Musanze districts.

Appendix 6: Quantitative analysis results

The table below shows the analysis if the questionnaire that summarise the feedback for each question, presenting the mean and standard deviation (s.d) for all the participants (n=21).

1. Learning

Appendix 6.1: Questionnaire feedback analysis for questions related to learning and user perceptions

Question	**Variable**[16]	**Governing Principles**	**N**	**Mean**	**s.d**
Personally, I learnt a lot	Reported learning	Factual learning	21	4.24	.768
Participants discussed issues in clear and open way	Valid information	Open discussion	21	4.62	.805
I got answers to my questions	Answered questions	Evidence seeking	21	4.38	.590
I would support the final Decision	Internal commitment	Commitment to choice	21	4.29	.717
I felt other participants listened to what I said and understood me well	Engagement	Others listened	21	3.90	1.091
I can easily use these tools with little assistance	Quick learning	Tools usage	21	3.90	.625

2. Results related to workshop, PSS tools and outcomes

[16] The variables are the same as used by Goodspeed (2013). The word variable is used in this research to support the governing principle behind every asked questions.

Appendix 6:1 Table showing the questionnaire feedback analysis for questions related to tools and the workshops

Question	Variable	Governing Principles	N	Mean	s.d
I was able to share my ideas	Shared views	engagement	21	4.52	.750
Workshop helped me know the perspectives of others	alignment	Others perspectives	21	4.43	.926
Computer tools captured my unique thinking	Identification	Unique issues	21	4.10	.700
I am now familiar with the terms and concepts of the tools	Identification	tools familiarity)	21	4.00	.775
The computer tools improved my ability to imagine how local planning process can be done better	Imagination	Ability to imagine	21	4.10	.768
the tools improved the ability of the group to identify common goals and difference	Alignment	Group discussion	21	4.19	.680
Participants were free to question the outcomes and tools	Reification	Question outputs	21	4.14	1.15
Tools are good for decision making and implementing current policies	Negotiation	Policy implementation	21	4.57	.926

Appendix 7: Literature search strategy

Synonyms were combined using the conjunction OR while concepts were combined using conjunction AND. The results below shows a summary of such from two academic resource databases science direct (SciDir) and Web of Science (WoS). This search was done between August and September 2016

Appendix 7.1: Literature search strategy showing the combination of key concepts and their synonyms

	Concept 1: Appropriation	Concept 2: Spatial Planning	Concept 3: Tools	Concept 4: Government	Concept 5: Theory
Synonyms 1	Appropriation	National Spatial Plan*	Planning Support Systems or PSS	National government*	Enhanced Adaptive Structuration Theory or EAST
Synonyms 2	Adoption	Local Spatial Plan*	Decision Support Systems or DSS	Local government*	Adaptive Structuration Theory or AST
Synonyms 3	Usage	Regional Spatial Plan*	Spatial Planning Support Systems or SPSS	Municipal*	Diffusion of Innovation
Synonyms 4	Acceptance	National Development Plan*	Spatial Decision Support Systems or SDSS	District*	Technology Acceptance model or TAM
Synonyms 5	Embrac*	Regional Development Plan*	Group Decision Support Systems or GDSS		

Synonyms 6	Diffusion	Local Development Plan*			
Synonyms 7	Rejection				
Hits: SciDir, WoS	828,421, 2,535,963	1,152, 2,886	128,844 48,193	22,561 75,796	3,221 8,940

Search Words: Synonym OR Synonym: Concept AND concept

CONCEPTS	Hits: Science direct	Hits:Web of Science
Appropriation AND Tools AND Theory	34	58
Appropriation AND Tools AND Spatial Planning	30	53
Appropriation AND Government AND Theory	8	11
Tools AND Government AND Appropriation AND Spatial Planning	2	4
Tools and Government and Spatial planning	9	12
Tools AND Appropriation AND Theory AND Spatial Planning	1	1
Tools AND Spatial Planning AND Appropriation	4	6

Appendix 8: Workplan

The work plan of the research is summarised in the table below. The table show highlights of the key steps in the research process and the specific time (month and week) in which the steps were carried out.

No	Activities: (Aug 2016- Feb 2017)	Aug				Sept				Oct				Nov				Dec				Jan				Feb			
	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Proposal Development																												
2	Proposal Presentation																												
3	Pre-Field work Preparations																												
4	Literature Review																												
5	Prototype Design and Testing																												
6	Data collection instruments Design																												
7	Field work																												
8	Data cleaning, Decoding and analysis																												
9	Mid-Term Presentation																												
10	Statistical and text analysis																												
11	compailing Mixed methods outputs																												
12	Validating results																												
13	Report writing																												
14	Final Thesis Presentation																												

Appendix 8.1: Table showing the work plan for the research which was carried from August 2016 to February 2017