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Lahti University of Applied Sciences

SUSTAINABLE DEVELOPMENT OF WASTE MANAGEMENT IN RUSTENBURG, SOUTH AFRICA

Creating value through waste management

LAHTI UNIVERSITY OF APPLIED
SCIENCES
Faculty of Business and Hospitality
Management
Degree Programme in International
Trade
Autumn 2019
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Tiivistelmä

Tekijä(t) Eerola, Antti	Julkaisun laji Opinnäytetyö (AMK)	Valmistumisaika Syksy 2019
	Sivumäärä 32 sivua + 1 liite	
SUSTAINABLE DEVELOPMENT OF WASTE MANAGEMENT IN RUSTENBURG, SOUTH AFRICA Creating value through waste management		
Tutkinto Tradenomi (AMK) Kansainvälinen kauppa		
<p>Muuttuva maailma ja huoli kaupunkien kestävydestä on todellista tänä päivänä. Monet yritykset, maat ja kaupungit luovat strategioita toimiakseen kestävämmiin ja ympäristöä suojelevampiin. Yksi näistä kaupungeista on Rustenburg Etelä-Afrikassa. Vuosina 2017-2018 Lahden ammattikorkeakoulu on työskennellyt yhdessä Rustenburgin ja Hon (Ghana) kuntien kanssa yhteistyössä kehittäen mainituista kaupungeista tulevaisuuden kestäviä kaupunkeja.</p> <p>Siirtyminen lineaarisesta taloudesta vaihtoehtoiseen kiertotalouteen tarkoittaa muutoksia monissa asioissa, kuten tuotannossa, tuotteiden käyttöiässä ja syntyvän jätteen määrässä. Lineaarille taloudelle on ollut ominaista edullisten tavaroiden tuotanto alhaisella uudelleenkäyttöasteella. Opinnäytetyössä keskitytään kehittämään kestäväää kaupunkia ja kestäviä toimia, jätehuollon kautta. Kiertotalouden tarjoamat ratkaisut ja vaihtoehdot voivat olla osa kestäväää jätehuoltoa kaupungin toiminnassa ja osa kestäväää kaupunkia. Opinnäytetyöhön on valittu viisi kiertotalouden mallia. Näiden mallien soveltuvuutta kunnan jätehuollossa ja vaikutuksista on tutkittu.</p> <p>Tutkimuksessa on käytetty laadullisia tutkimusmenetelmiä. Kirjoittaja on tutkimuksen aikana ollut työharjoittelijana projektissa ja näin lähellä tutkimuksen ydintä, tutkimusongelmaa. Lähteitä tutkimuksessa ovat olleet kirjoittajan oma havainnointi, kahden henkilön haastattelu ja erilaiset luotettavat teokset ja kirjallisuuslähteet, kuten julkaistut kirjat.</p> <p>Opinnäytetyön tutkimuksessa on usein korostettu kolmen kestävään tavoitteen merkitystä. Nämä kolme usein mainittua tavoitetta ovat kestävyys taloudellisesti, sosiaalisesti ja ympäristöllisesti. Nämä kolme tavoitetta yhdessä rakentavat kestävään kaupungin ja kestävään tulevaisuuden. Suunnitelmallisuus ja toimintojen virallistaminen auttavat saavuttamaan nämä tavoitteet.</p> <p>Kestävään jätehuollon avulla on mahdollista luoda niin taloudellista kuin sosiaalista arvoa kaupungille, yhteisölle ja ympäristölle. Kestävään kaupungin ja tulevaisuuden tavoitteiden saavuttaminen on mittava tavoite, mutta oikeilla toimilla sen saavuttaminen on mahdollista.</p>		
Asiasanat Kiertotalous, Kestävä, Etelä-Afrikka, Rustenburg, Jäte		

Abstract

Author(s) Eerola, Antti	Type of publication Bachelor's thesis	Published Autumn 2019
	Number of pages 32 pages + 1 appendices	
<p>SUSTAINABLE DEVELOPMENT OF WASTE MANAGEMENT IN RUSTENBURG, SOUTH AFRICA Creating value through waste management</p>		
<p>Name of Degree Bachelor of Business Administration</p>		
<p>Changing world and amount of waste is a big concern in today's world. Many businesses, countries and cities are creating strategies to be more sustainable. One of these cities is Rustenburg in South Africa. Between the years 2017 and 2018 Lahti University of Applied Sciences has worked together with Rustenburg and Ho (Ghana) aim to create sustainable cities. Name of this project was Co-creating Sustainable Cities.</p> <p>Moving to the circular economy means moving away from old and traditional model called linear economy. Characteristic of the linear economy has been - and still is - low-cost production and goods with low level of reuse. This causes a large amount of waste from the markets while circular economy focuses on cutting the amount of waste or more specifically, using the waste as a source of production. Circular economy activities play a key role in the creation of a sustainable city and therefore is important to understand the reasons for the transition to the circular economy and the possible effects of it. This thesis focuses on the future sustainability of the municipality and creating value through it. Five of the well-known circular economy models have been selected in this thesis and main model in this thesis is recovery and recycling.</p> <p>Used research methods are qualitative research methods. For creating reliability to the study qualitative methods are used because the author has been close with the research problem. Used data sources are primary data and secondary data. Primary data is collected via author's observation and interviews. Secondary data of the thesis has been previous publications, mostly reliable books. Key findings of the thesis are taking account of social conditions when developing sustainable waste management operations. Research has often highlighted the importance of three main objectives in developing of sustainable development and future. These three main objects are economic, social and environment. Every country and municipality have their own environment. In Rustenburg, developing of waste management includes formalization of the informal sector where operates informal recyclers making their livelihood thru it but actions are not controlled at all. Conclusions made from key findings are the big role of the environment and society. Well-developed plan and actions will create different types of value for the city, for the economy and for the citizen - as long it is designed paying attention influencers like environment and society.</p>		
<p>Keywords Circular Economy, Rustenburg, South Africa, Sustainability, Waste</p>		

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1 INTRODUCTION

1.1 Background of the study

Climate change has become a serious threat for the environment globally. However, climate change also affects a lot of different things that may not come to mind, such as businesses and economies. Thinking from a business point of view climate change is an opportunity for the businesses as well. Reacting to climate change can create new markets and supply chains. (Hoffman & Woody 2008, 1-3.)

When thinking of climate change and transition to a sustainable future, there are also certain constraints that hinder the transition to the sustainable solutions. Such constraints include economic barriers, informational and infrastructural issues as well as actions of humans. (Gallaud & Laperche 2016, 67-68.)

In addition to environmental benefits, recycling also has a considerable economic advantage. In addition to the environmental and social conditions, recycling and waste itself has a role in international trade as well. (Worrell & Reuter 2014, 479-482.)

In order to achieve the economy advantage via waste it is important to understand models of circular economy and which models to use when moving towards circular economy actions from linear economy actions. For example, changing wasted resources in production into new resources requires understanding of what and how the transition to the circular economy should be made. Transition from linear economy to the circular economy models is influenced by other factors as well such as the environment and the sector. (Lacy & Rutqvist 2015, 117-119.)

This thesis is a part of the Co-creating Sustainable Cities project between Finland (Lahti), South Africa (Rustenburg) and Ghana (Ho). Project is funded in 2017-2018 by the Ministry of Foreign Affairs of Finland. One of the mentioned goals in the project in Rustenburg is to create sustainable business actions together with private cooperation. (Co-creating Sustainable Cities 2017.) Collaboration between the public and private sector could create common goals for developing environmental and economic goals together (Gallaud & Laperche 2016, 96-98).

It has been essential for the researcher to be able to write and define the research problem and the objectives of the study from critical, analytical and professional views. These aspects have evolved in the progress of the research. More time gave an opportunity to the writer to challenge preset assumptions and theories from critical point of view. (Cottrell 2017, 2-4.)

Ideas and creating a plan before moving to the circular economy models and actions are important actions because environment and society can be and are different than in other places where similar activities have been done. That is why it is important to create a strategy for the actions. Strategy which pays attention to the earlier emissions and policies of the city as well to achieve the long-term goals of the plan. (Hoffman & Woody 2008, 24-26.)

This thesis focuses on developing the economic growth of the municipality by developing waste management and circular economy actions. In this study, the impact on the social conditions, like effects to the unemployment and social services, are left out. The core of the study is to develop a more sustainable future and to find new more environmentally friendly solutions for the municipality's actions on different sectors – in this study focusing on the waste management. Greener and sustainable actions which are more profitable economically as well.

This thesis will create ideas for the development of municipal waste management and recycling in the transition to the circular economy actions. These ideas are made for the future and will help to reach the goals of the economy, labor force and natural resource of the long-term vision.

1.2 Thesis objectives, research questions and limitations

This part introduces the objectives, limitations and research questions, which help to achieve the goals of the thesis. The objective of the thesis is to summarize how the waste management in Rustenburg currently operates and how it could be developed for the future to meet the needs of climate change, changes in the city industry and urbanization generally and to become and to be sustainable city. What are the opportunities and key issues in the waste management sector?

This study will supply some ideas, models, facts and tools for the development of waste management to become more environmentally friendly, profitable and economically viable actions. In the years of 2017 and 2018 the project included different activities and goals in Rustenburg: roadmap to green economy and sustainable townships. At Rustenburg few key points have been solutions for recycling and recovery and creating energy via waste. (Co-creating Sustainable Cities 2017.)

A good research question tells what is being researched and what is left outside the study. Good research question tells what is essential for the research. In this study, the research

question was developed during the author's observation period through the project and during the literature review of thesis writing. The research question of the study has changed during the study which can happen generally while formulating the study. Research question is important for the study to keep it logical and clear. (Flick 2007, 22-23.)

There are different factors that can help identify the research problem. Problem is equal to question in this study. These factors are literature, experience, discussions with professionals, desire to explore something new that has not yet been studied or as in this study "field experience" which the author took part in as an intern. All of these above-mentioned factors have been used in this study to recognize the research question. (Krishnaswami & Satyaprasad 2010, 23-25.)

The research question was formed after the observation period came out by the author as well as the identification of the research problem of what to study. Observation of the author is a part of this study. Research question and the research itself finds an answer together with the observation for the research question and problem (Ghauri & Grønhaug 2002, 9-10).

The main research question of this study is:

- *How could Rustenburg create more value for the city through waste management?*

Sub-questions are also used. Sub-questions have been formulated to help and control the study to find an answer to the research question. (Krishnaswami & Satyaprasad 2010, 31.)

Sub-questions of the study are:

- *How to improve waste management to be more sustainable?*
- *Which model of circular economy would be most efficient for improving recycling in Rustenburg?*
- *What kind of different type of value Rustenburg could create through waste management?*

There are some previous theses written about Rustenburg made in the years 2008, 2010 and 2011. These are called *Waste management in Rustenburg Local Municipality during 2010 FIFA World Cup™* (2008), *Low cost ambient air quality monitoring : developing a simple dust collecting system in Rustenburg Africa* (2010) and *An Investigation on Managing the Recovery of Hazardous Household Waste in Rustenburg, South Africa : A Preliminary Operational Plan of Pilleri II* (2011).

All these three theses are made by students of Lahti University of Applied Sciences Ltd, Faculty of Technology. Few of these theses have dealt with large mass and household waste. This study will focus on waste management and recycling from the point of economy although the environment and climate change are, of course, also present and play a key role in this study. The author of this study is a student from Lahti University of Applied Sciences Ltd from the Faculty of Business and Hospitality Management. This study will provide a new approach for the future solutions and studies.

The purpose of this study is to bring development ideas to the waste management. Study will focus on the development of waste management actions in landfills and households. The research is limited to the waste management and landfill of the Rustenburg municipality and thesis has not been done for other areas.

This thesis explores value creation for the municipality through recycling and creation of the circular economy activities. The objectives of the thesis are environmental and economical, but at the same time, the research is also associated with the organizational structure of the municipality's waste management unit. In the thesis, the organization is the municipal waste management unit but the study of the structure organization and/or the research and development of its activities are excluded from the thesis and are not researched in this thesis.

Research methods used in this study are a qualitative research method and the method is selected based on the data needed for the research. Interviews of the waste management official and waste education and awareness officer from waste management unit are used as a part of the data collection.

This thesis is geographically limited to the Rustenburg municipality area in South Africa. Thesis is limited only to the development of sustainable waste management in the municipality. Although sustainable development is intrinsically linked to this thesis, among other things, the development of a sustainable environment and sustainable social conditions are left out from the thesis.

1.3 Theoretical framework

Sustainable waste management is a part of the strategy when moving towards becoming a sustainable city through circular economy. What sustainable development and a sustainable city are is explained in the Chapter 1 *Sustainable Development*. Concept of circular economy is explained briefly as well as models of circular economy in the Chapter 2 *Circular economy*. In the Chapter 3 *Waste Management* is introduced waste management activities important to this research – such as waste recycling and informal sector.

Secondary data, which are mostly books related to the study, are theoretical base of the study (Stokes 2011, 32).

1.4 Research methodology and data collection

Used research methods are qualitative methods and data collection was carried out by observation and interview. Qualitative methods have been chosen because they serve best the purpose and goal of this study when the main focus is on ideas of how to develop recycling on the waste management unit in the municipality and big data or statistics are not needed at this point nor in this thesis. (Ghauri & Grønhaug 2002, 86.)

A few words about qualitative and quantitative research methods in general. Quantitative research methods analyze logically collected data and derive the result based on collected data, i.e. focusing analytically on the result when in qualitative research, the research results are obtained during the process using author's observation and understanding of the research. In qualitative methods it is common to be close to the research problem during the study. That is why qualitative methods were chosen to be used in this study because observing and interviewing has been used as a research method. (Ghauri & Grønhaug 2002, 86.)

Data is information for the research and thus an essential part of it. Data can be defined differently to be either primary data, secondary data or discrete data. (Stokes 2011, 32.)

Data sources are different methods to use to find a relevant data for the study. Data sources used in this study are primary data and secondary data. (Ghauri & Grønhaug 2002, 76.)

Primary data in this study is relevant information that the author has found for the study to find the answer to the research question. Primary data can be collected in different ways and for the thesis observation and interview have been used. Via primary data the author of the thesis found information for this particular research that has not been found from a previous publication, from so-called *secondary data*. Fortunately, in this study this did not happen but there may also be disadvantages in collecting primary data such as long process or to find a person to interviewee. (Ghauri & Grønhaug 2002, 81-82.)

Secondary data as mentioned in the previous paragraph is data that can be searched from previous publications, such as reliable books and reports. Therefore, it is good to be familiar with previously available information before starting to collect primary data to know what to look for. At the beginning of the thesis, secondary data helped the author to

shape the research question to focus more on economical issues and findings than environmental issues in the transition to the circular economy models. (Ghauri & Grønhaug 2002, 76-78.)

Should always remember the difference between the study of the author's "new findings and data" and previous studies because the objectives of the research may be different and probably, they are when the author is creating new information. It is important to understand the aims and backgrounds of the previous studies which are used as a secondary data to avoid using wrong data. (Ghauri & Grønhaug 2002, 78-79.) Among other things this is one of the main reasons why this thesis is limited only for the development of waste management in Rustenburg because this study does not provide information for wider regions or municipalities.

1.5 Thesis structure

This study has seven chapters. In the first chapter, *Introduction*, the background of the study, the objects used in the study, the limitations of the study and research questions are introduced for the reader.

In the second chapter *Sustainable Development* is introduced as well as what sustainable development is and what the word sustainable means in modern development. The following two chapters of theory focus more closely on the actions which are relevant in this research, the introduction of the *Circular Economy* and *Waste Management* actions.

Third chapter, *Circular Economy*, is the second of three theory chapters. This chapter introduces what is circular economy and what are the models of circular economy which could be relevant to use in this study.

Fourth chapter, *Waste Management*, is the third theory chapter. This chapter introduces shortly what is waste recycling and treatment generally.

Fifth chapter introduces collected data for the reader and sixth chapter is the empirical part of the research introducing results of the collected data – in this case of the interview and shows suggestions for the further research.

Sixth chapter shows conclusions of the study, new findings and ideas and seventh chapter summarizes the study. The figure below shows the structure of the thesis easily and simply from top to the bottom and from left to the right starting from introduction and ending to the summary.



Figure 1 The structure of the study

As the Figure 1 shows, research progresses systematically to find the answer to the research problem. The research problem explores how the city of Rustenburg can create more value through waste management. Waste management and its development are part of the circular economy and all research is part of the Co-creating Sustainable Cities - project. It is good to first introduce the introduction chapter to the reader and then three parts of theory in order. The first part of theory explains what sustainable development means because the project aims to create a sustainable city.

Once the reader has been introduced to what are the characteristics of sustainable city, next step is to introduce one of the alternatives of the sustainability - *Circular Economy*. After introduction of five well-known models of circular economy comes the final part of the theory, *Waste Management*. Waste management is the last part of theory because this research explores how recycling operations can be developed to be more sustainable and profitable at a same time - to create more value for the economy, environment and society.

First part of theory is sustainable development because in ideal situation correct actions in waste management work as a part of the sustainability plan via circular economy and is an important part for creation of sustainable environment, society and economy in the future and for the future.

2 SUSTAINABLE DEVELOPMENT

In this chapter is briefly introduced the concept of sustainable development and focuses more specifically on the activities that are relevant for this research, *Circular Economy*, and more importantly, sustainable *Waste Management*. As the thesis is part of a *Co-creating Sustainable Cities* -project, it is good to begin the theory of research by first briefly explaining what sustainable means and what needs to be considered in a sustainable city and its development.

2.1 Sustainability as a strategy

Today, sustainable development and especially the word sustainability is recognized well. Sustainable development can be defined as to be the process itself. This study focuses on the sustainable actions from the economic and environmental views but there are many other sectors and parts in the society and world globally where sustainable actions can be taken and implemented. These other sectors are not specifically addressed in this study, but it is good to know that there are other sectors as well. It is good to understand the so-called big picture of sustainable development that it is not only the production process of the goods or the life cycle of product but there are many other sectors that need to be focused on as well, such as social conditions and social institutions which effects on the society and the sustainable development of it. (Donaldson, Azzam & Conner 2013, 165-166.)

2.2 Sustainable future

When talking about sustainable development generally, it is about a broad range of activities that affect not only to the environment but also living standards, quality and conditions, food and the climate. Sustainable development and sustainability itself is a goal and ideal situation for the present moment and for the future where and when production and actions can replace themselves - a situation where waste and environmental damage do not occur. (Seiler-Hausmann, Liedtke & von Weizsäcker 2004, 28-32.)

In the book *Emerging Practices in International Development Evaluation (2013)* is mentioned "three pillars" concept of integrating environmental, economic and social objectives. These three objectives are interconnected and contribute to each other in the sustainable development. (Donaldson et al. 2013, 168.)

There are many ways to promote, influence and create a sustainable future and to develop sustainable actions e.g. legislation, laws and agreements - international and national and different plans and strategies (Donaldson et al. 2013,168-169).

3 CIRCULAR ECONOMY

With urbanization and other factors leading us to the situation where our consumption is becoming more than our planet can handle, to the situation where and when something must be done. Not only are our unrenovable sources running out, but our renewable sources are also threatening to run out as well because of the fast consumption. (Lacy & Rutqvist 2015, 3-4.)

This chapter presents a brief comparison between the linear economy and the circular economy. What are the differences between them and why circular economy is more suitable – and necessary – globally for the present time and for the future?

After this, five models of circular economy are presented focusing mostly on recycling because recycling is the main model in this research.

3.1 Traditional economy model versus circular economy model

The currently used linear economic model has focused on producing products of low-cost for customers with low level of reuse. In many cases the life cycle of these products is not designed for reuse and the product has ended up being a waste (although reuse or use as a raw material has certainly been utilized on some scale). However, for the circular economy model the product is designed, since the beginning, to be a raw material more than waste. In the circular economy actions, production and products are aimed to be sustainable to everyone, for the renewable sources and for the product itself. (Lacy & Rutqvist 2015, 4-5.)

3.2 Circular economy models

Circular economy models are those "tools" which help businesses and economies to move from the linear economy to the circular economy. It must be remembered that in many companies moving to a circular economy requires major internal changes, for example, changes in strategies and supply chains. Turning actions and goals into circular economy models and becoming economically profitable requires innovation from the company. (Lacy & Rutqvist 2015, xxi-xxii.)

Circular Supply-Chain is a model where more environment friendly and sustainable resources in production are used. Simplified the idea is to find an alternative material - which fits in to the circular economy actions - to replace the old material which was based on the actions of linear economy. (Lacy & Rutqvist 2015, xxii.)

The recovery and recycling model utilize all the material used in production and consumption and benefits from it. It is a planning and designing of consumption that everything can be reused in some way and no waste is generated. (Lacy & Rutqvist 2015, xxii-xxiii.)

The product life-extension model focuses on - according to its name - extending the lifetime of the product via different actions, such as repairing. This model will safeguard sustainable and high-quality products because the focus is on the product itself. (Lacy & Rutqvist 2015, xxiii.)

Sharing platform - this model is based on sharing and is characterized by digital technology (for businesses and consumers) but as well on a wider scale, for example, by renting and sharing products. When this model is used, there is no need for high production to produce a large number of products because the model is based on being a platform of sharing single products. (Lacy & Rutqvist 2015, xxiv.)

Product as a service - in this model the costs for the consumers arise from consuming and using the product and not from the product itself. Instead of buying a product consumer pays for the benefits s/he would want and need from the product. (Lacy & Rutqvist 2015, xxiv-xxv.)

Circular economy models combine and support each other offering long-lasting and sustainable products via circular supply-chain and recycling to the consumers for consumption (Lacy & Rutqvist 2015, xxii-xxv).

4 WASTE MANAGEMENT

4.1 Waste recycling

Recycling is one of the main activities in the future world on the transition from the linear economy to the circular economy - these economy models are presented in Chapter 3.1 *Traditional economy model versus circular economy model*. Modern waste management should be resource efficient, reduce waste generally via recycling and reuse, save energy and organize an appropriate treatment for the waste on the landfills. (Worrell & Reuter 2014, 10.)

Badly designed or otherwise unadvanced waste treatment and landfill are threats for the environment a big scale, for humans themselves and for sure for the economy of the city, country or region (Worrell & Reuter 2014, 11-12). In this study waste management and landfill of the Rustenburg play a key role.

4.2 Economic value in waste recycling

Economic thinking is a part of developing a sustainable future. If natural resources are running out and changes in consumption are needed, the economy will change as well. (Kahn 2005, 7-12.) Natural resources have a role on the production process of goods. If natural resources are scarce its effects are on the markets and prices of the goods. (Hus- sen 2004, 4-5.)

Waste recycling has many economic benefits but there is also a drawback. Recycling in households already contributes the collection, promotes landfill operations and reuse ma- terials - mentioned *the recovery and recycling model* as one of the models of the circular economy in the Chapter 3.2 *Circular economy models*. These activities also have eco- nomic disadvantages which occur as costs in collection and treatment. (Porter 2002, 133- 138.)

4.3 Informal sector

At first, we need to understand what informal sector is, how it works and affects the envi- ronment and economy. Good way to explain it is to compare informal sector and so-called formal sector. In this example, formal sector is that sector where large scale businesses operate, trade is wide, and taxes are paid. Figure 2 below shows the differences and op- posites of informal and formal sector.

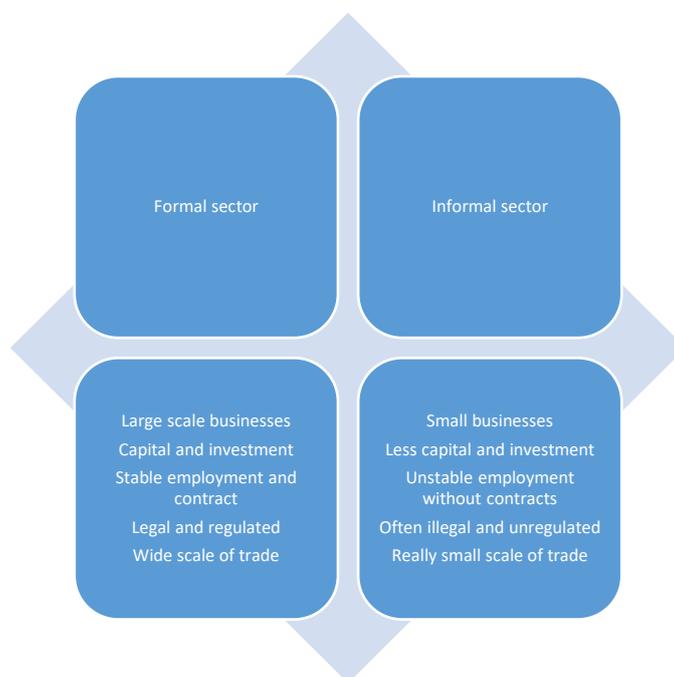


Figure 2 Differences and opposites of the formal and informal sector (Allen & Thomas 2000, 107)

Large number of workers operates on the informal sector by making their living from it does not only affect the economic situation of the municipality but also the conditions of the informal collectors themselves, such as a healthy working environment which does not exist. Without the legislation from municipality and appropriate working conditions and possibilities to recycle all the waste, informal workers are not the only ones who are suffering bad working conditions. Informal sector causes a lot damage for the environment because of, among others, illegal dumping. These are real threats. Municipality must therefore operate and organize an appropriate waste recycling system which is under control in order to improve working conditions and to eliminate the health and environmental disadvantages. (Worrell & Reuter 2014, 439-440.)

4.4 Waste treatment in the future

In the future the population will grow more globally, and cities need to be prepared for it. Cities must work to prevent potential adverse incidents which are reality already in many countries globally. Adverse incidents such as formation of shanty towns and other densely populated and insecure places. (Perkiö 2009, 105.)

The growing population in the world affects the growth of the amount of waste globally. At the present moment, when is getting a lot of attention to develop and finally achieve sustainable world and consumption, one important factor in waste management is the landfill and how the landfill operates. One of the aims of this study is to find a way to develop landfill operations. Develop on the direction that the landfill can recycle and reuse all sorted waste. In this case, waste would just not been dumped there like in some countries worldwide where it is still a way to operate. (Ekström 2015, 67-69.)

In addition to having knowledge about what to do for the waste: recycle, reuse etc. it is good to think about the possibilities and constraints as well. What could happen and what could affect when developing waste management and treatment system in different countries. What is relevant in this study is that the founding and developing ideas are not necessarily suitable for the development of waste management in other municipalities or countries than Rustenburg, this has been mentioned in the Chapter 1.2 *Thesis objectives, research questions and limitations*.

4.5 International trade of waste

International trade in waste is mostly controlled by industrial countries and portable and traded waste also includes hazardous waste, not only recyclables. Actually, recyclable waste can be reason for preventing the export of the waste. Waste can be used in sources creation via recycling or incineration. (Porter 2002, 110-113.)

Although international trade in waste takes place between industrialized countries as well, waste is exported in significant amounts to the developing countries. Exporting from industrialized countries to developing countries can raise negative impacts for the environment and for the people, if treatment of the waste is not as much regulated or rules are not followed than in the origin country. (Porter 2002, 113.)

5 QUALITATIVE RESEARCH AND ANALYSIS

5.1 Design and selection of research method

In the thesis, development ideas are sought on how current and future waste can be treated to become economically productive, and how waste can be minimized "loss", i.e. how to turn waste into a source by using circular economy models. The purpose of the thesis is different than earlier theses about Rustenburg and therefore qualitative research methods have been selected as methods to be used when there is no big data which could be analyzed logically to get the result. Qualitative research methods are used in this study because observing and understanding close to the problem have helped to achieve the desired development ideas.

Mentioned earlier in the section 1.4 *Research methodology and data collection* the aims of the thesis and the backgrounds of the previous studies have influenced and helped in the selection of research methods used.

Figure 2 presents some differences in qualitative and quantitative research methods:

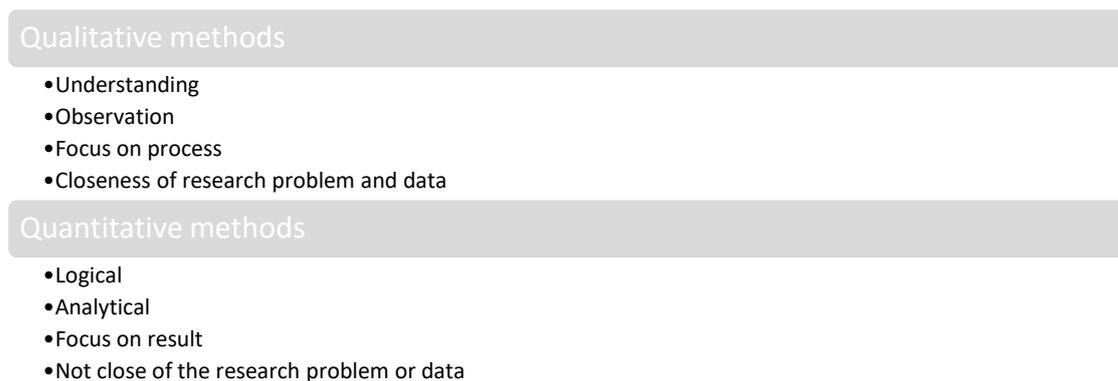


Figure 2 Differences between qualitative and quantitative methods (Ghauri & Grønhaug 2002, 87)

Qualitative research methods were used in this study, and their importance is highlighted to the reader as the research progresses. In this study is important to understand the larger entity of sustainable development, circular economy actions and waste management. How these three now mentioned contribute to each other. Qualitative research methods were logical choice as well because the researcher was close to the research problem and the observation role was strong.

5.2 Data collection

From the point of view of this study, qualitative research methods are more effective in understanding the development target when data is collected by interview and observation, and data analysis is assisted by theory in the process (Ghauri & Grønhaug 2002, 87).

The author was an intern of the Co-creating Sustainable Cities -project for three months in the summer of 2018, and observation part of this study was made in Rustenburg in the units of the municipality: in the waste management, local economic development and environmental units. *Field observation* happened when the author was working on units and officers have been aware of his position (Ghauri & Grønhaug 2002, 90-91).

In the next two sub-sections *5.3 Waste management in Rustenburg* and *5.4 Interview* is explained how waste management currently operates in Rustenburg and the interviewees of the study are introduced and explained why they were selected.

5.3 Waste management in Rustenburg

Waste management collects domestic waste in Rustenburg weekly on pre-scheduled days, so residents are aware of the actions. Residents can also be asked to sort waste before collection. From businesses, waste is collected weekly as well and as often as necessary. If the waste accumulates substantially it can be collected more than once a week. (Rustenburg Local Municipality 2017.) On the next page two images taken by the author from the Waterval landfill.



Image 1. Collected plastic bottles at Waterval landfill (Eerola 2018)



Image 2 Recycling actions at Waterval landfill (Eerola 2018)

Images 3 & 4 On the next page shows waste and results of waste collection organized by waste management from predefined areas on the day of informing and inspections on the field.



Image 3 Dumped waste (Eerola 2018)



Image 4 Packed dumped waste (Eerola 2018)

Separated and recyclable wastes e.g. plastics, paper, glass and metal can be dropped on the Waterval Landfill site in separated bags or drop-off centers from where waste is collected from bulk containers and which are, like business waste, collected at least weekly or as often as necessary (Rustenburg Local Municipality 2017).

5.4 Interview

For this study, two people were interviewed: Interviewee 1 and Interviewee 2.

Ideas and designing of research questions was helped and carried out by *Aarrevaara*, who is an expert in circular economy solutions and a Principal Lecturer of Technology of Lahti University of Applied Sciences. She was asked to help for two reasons. First because she has been in Rustenburg where she presented and hosted workshops for the project and second because she had a clearer view of which could be relevant research questions for the research in terms of research.

The interviewees were selected based on their professional knowledge of recycling in Rustenburg in general and how recycling should be developed in the future.

Interviewee 1: According to his job title, he is a responsible of the waste education and management in the city of Rustenburg. He was chosen to be interviewed because during

observing of this research he showed professional way to work with a strong base of knowledge

Interviewee 2: According to his position as a representative of landfill and waste management official he was selected to be interviewed.

5.5 Data analysis

This chapter analyze the primary data of the study. Primary data - which is new data and collected by the author - of the study are the observation of the author and the interview of two officials from waste management unit in Rustenburg municipality (Stokes 2011, 32).

Primary data of this study are interview of two officials from Rustenburg municipality waste management unit and observation of the author. The interview took place on July 17th, 2018 at the Rustenburg waste management unit. The author recorded the interview and started to analyze it on autumn 2018.

Figure 3 below presents different steps of the study.



Figure 3 Steps of the study and data collection

The thesis started in May 2018 on an internship period in Rustenburg, South Africa. During the entire internship time, the author carried out observations while he was on the environment of the study. The research question started to take shape during this time, but the final research question came out on its final form when the author started to explore the theory part of the study.

The author is studying a bachelor's degree in business administration, international trade. Therefore, was clear that this thesis focuses on the future challenges in Rustenburg from the point of the economy.

Interview included seven questions and main goal of this interview was to clarify the current state of recycling and materials, future of the waste treatment, development ideas, challenges, landfill operations and potential cooperation with private companies.

The questions can be divided into four main topics. Main objectives of the questions are introduced on the Figure 4 below to facilitate understanding of how questions are related to each other. Below the Figure 4, all seven questions and answers are presented and analyzed separately.

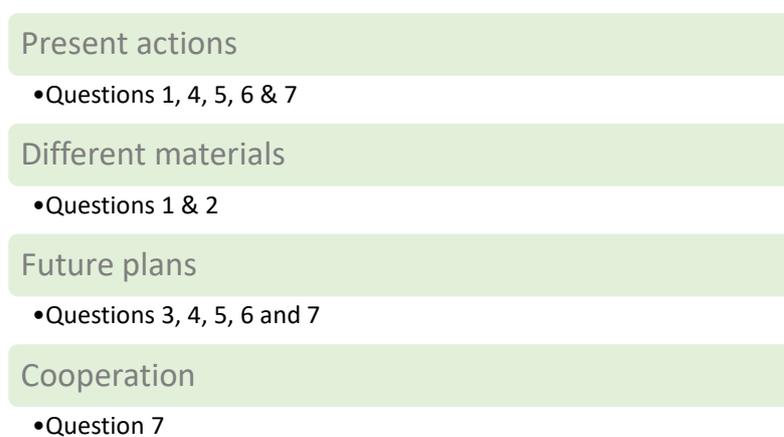


Figure 4 Interview topics

Figure 4 lists the topics of the interview and presents interview questions which are relevant for each topic.

5.6 Interview analysis

Purpose of the first question was to *find out what currently collected materials can be recycled and how the materials are used.*

From the answers can be find out that *not all materials currently collected could be recycled but can still be transferred elsewhere.* One "sector" in Rustenburg are the *local buy-back centers* where waste pickers can take recycling materials directly and this activity contributes on the recycling. However, important is that *many materials such as plastic, paper, cans and metals can be recycled.*

The purpose of the second question was to find out *what these non-recyclable materials could be.*

The answers showed that some materials are difficult to recycle. The actual breakdown was not found by the author, but some specific products came out such as diapers and special foam which is used in packaging.

The purpose of the third question was to find out of *the ideas how to improve the situation*.

This question is one of the most important questions for the research because the research is developing activities for the future. Answers gave a lot of idea and main points like using the waste on the landfill that it would not just be a collected waste there.

Other really important points were separation of the waste, source initiatives and formalizing informal recyclers. Instead of collecting one bag of mixed waste at the source, waste could be separated already in different bags at the source before it is transferred to the landfill.

Formalizing informal recyclers and include them to the actions of waste management and recycling because they are collecting all around. Actions for formalizing informal recyclers is already started having regular meetings, using a database to recognize informal recyclers and informing about the programs.

The purpose of the fourth question was to find out *how the chain of material collection works at the moment, is there something challenges, and could it be improved and how*.

The answers carried out different challenges from the logistics to the behavior of the people. First, *transporting and space* for retaining the waste which is collected by informal recyclers is one challenge. There could have a one place for carrying the recyclable waste. Transporting the waste effects on the traffic as well. Without proper land or transporting the distance to carry the recyclables can be long. This effects on the financial situation of the recyclers as well, for example, in the situation when transporting recyclable materials to another city or town where waste is processed further.

One other important challenge which should be paid attention is the *attitude from the general community*. Everyone wants recycling to happen, but it is not the most wanted action to take a place where people live. When there is an open space which could be good for recycling it can already be zoned for some other purposes because it is close to the residential area.

This challenge is a difficult. Residents may does not want recycling to happen close where they live but for the recyclers it would be good to happen where materials are close. At the moment recyclables and waste generally is carried far away before separation. In this

challenge, behavior of the people plays a role. If the space is too far away from the residents and homes, it is too far for the reclaimers but at the same time if you bring the actions close to the source - homes – it is not a pleasant solution for everyone either. Other issues come up as well such as issues in zoning and rezoning.

The purpose of the fifth question was to find out operations at the *Waterval landfill*. *How is the safety of the landfill and ideas of how it could be improved?*

From the answers came out that there is a challenge on the landfill side such as *issues on the safety*, but those challenges are improving.

There is a challenge and risks with *uncontrollable reclaimers* when actions on the landfill should be on management. But *formalizing process of the reclaimers to be a part of the landfill activities under the management is going on*.

Fighting of the materials and jumping to the vehicles which are bringing waste creates problems in the safety. One phenom as well is that some *reclaimers would like to stay over the night at the landfill, but policies does not allow this*.

The purpose of the sixth question was to find out *how the municipality inform and should inform the residents about recycling and is it enough*.

From the answers to this question came out many important points and actions. Actions focusing to *change attitudes and reputation*.

Programs on the schools and communities.

For the challenges in schools and communities is integrated programs and plans.

Involving community leaders to share the information of the programs for the communities and schools. That groundwork of the information would had already done. But as long as there are people, education and awareness are important and *it is never too enough*. Targeting smaller groups as well, like for the people who are *already interested of taking a part in recycling actions* and to spread the information and awareness.

The purpose of the seventh question find out some thoughts about cooperation with private companies to contribute the recycling and does some cooperation exist already.

From answers to this question came out that *some of the private companies contribute for the waste management and recycling and help the municipality*, for example, on the separation and recycling. *Has been a workshop where there have been representatives of private companies and reclaimers*.

Some estate managers are really helpful and willing to spread the message and develop separation on their complex buildings finding - *financial solutions as well* - that separation and recycling could be done. This is important because municipality officers need a permission to visit private building and it is great help for the waste management when managers of the complex buildings are taking a part and contribute to help.

5.7 Analysis of interview answers

As shown in the Figure 4 Interview topics, the interview topics can be divided into four parts. Questions 1, 4, 5, 6 and 7 answered for the first topic "Present actions".

Present actions

Current waste management in Rustenburg and recycling activities are affected by municipal waste collection, informal recyclers and local buy-back centers as well. Buy-back centers are private companies where collectors bring the waste and recyclables for payment or money (Porter 2002, 164). During observation the author paid attention to how many buy-back centers advertised how they buy scrap material in cash.

Came out in in the interview that in Rustenburg not all the currently collected materials can be recycled but materials can be transferred to another place for treatment. This is good because it avoids of creating dumped waste on the landfills (Ekström 2015, 67-69).

But transferring waste to another place have costs which comes up. Transferring the non-recyclable waste to another city cause longer transferring distances for the waste which in turn requires more transport vehicles and more time. (Porter 2002, 169-170.)

Came out in in the interview that current challenges are logistics of the waste and attitude of the people. Buy-back centers can be far away, but residents may not want recycling to happen near where they live.

Short quote which summarizes buy-back centers from the book *The Economics of Waste (2002)*. Porter (2002, 164) states that "*the range of items purchased is usually small, the distances are usually great, and the prices are usually low*".

Municipality landfill is called Waterval and municipality courage people to use the landfill. It receives general waste and industrial waste but no hazardous waste. (Waste Management 2017.) On the landfill there is some problems on the safety because uncontrollable reclaimers pose risks, but those problems are improving. Formalizing process to becoming a part of the landfill actions is going on.

Actions for informing communities and schools about recycling is going on when waste management officers inform and educate people. Different briefings or campaigns have been designed for people who live in an informative environment. The audience and the environment can vary, so planning is a part of information and communication (Worrell & Reuter 2014, 522).

Some cooperation with private companies is going on and private companies mostly operate and help in the middle of the municipality and residents. During observation of the author was organized at least one workshop by municipality waste management awareness and education officer where was representatives from private companies and reclaimers.

Different materials

Not all currently collected materials could be recycled but still many materials such as plastic, paper, cans and metals can be recycled. According to the website of municipality hazardous waste is one form of waste that cannot be recycled. According to the interview, one challenging waste is diapers.

Future plans

Using the waste on the landfill. Separation of the waste and source initiatives. Formalizing informal recyclers and reclaimers at the landfill to be a part of the activities. Having regular meetings for informing about programs and recycling. Informing and having programs in schools and communities, spread the word and changing attitudes of people generally. Cooperation with private companies and estate managers.

Cooperation

Some cooperation with private companies exists. Has been a workshop where participated representatives of private companies and reclaimers. Some estate managers have been helpful for creating and developing waste recycling in Rustenburg.

Below Figure 5 presents answers in summarized and developing plans for the future:

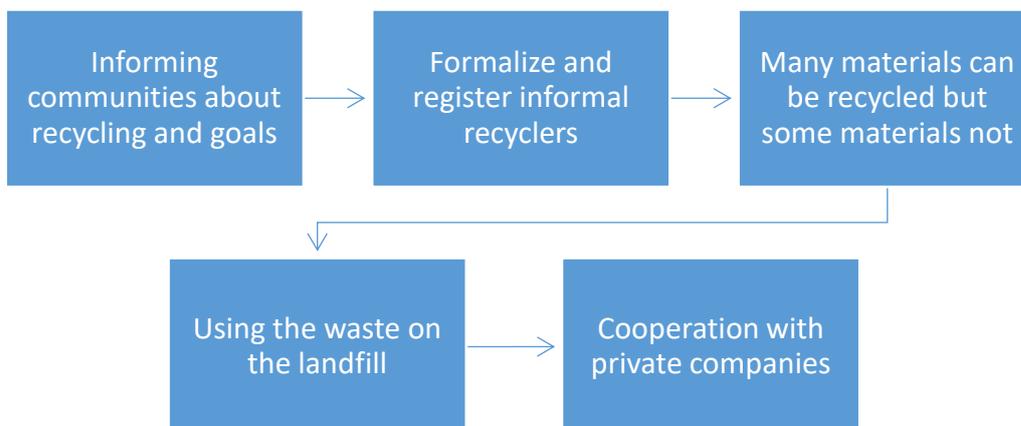


Figure 5 Summarized answers

As the Figure 5 shows, same themes are repeated in the responses of interview as in the three different theory sections of this research. The research has focused on developing the operations of the waste unit. The importance of informing communities, formalizing operations, and considering the environment and community has come up very noteworthy. Results shows how to create sustainable development for the city in the future and how activities like informing the community and the recycling of waste are important activities for a circular economy and sustainable waste management.

6 CONCLUSIONS

This chapter presents the findings and conclusions of the study. These conclusions are the result of empirical research of the study. First is presented the research questions and sub-questions of the study, then the validity and reliability of the study and last the suggestions for further research. As in the theory chapters, the theory is presented in a logical order so that the previous chapter helps to understand the next one, in this chapter the sub-questions will help answer the research question.

6.1 Answers to research questions

First sub-question has been *How to improve waste management to be more sustainable?*

From the answers come up that planning, information and control contribute the sustainability and functionality of waste management. This involves not only collection and treatment of the waste itself, but also the formalization of the informal reclaimers.

Second sub-question has been *Which model of circular economy would be most efficient for improving recycling in Rustenburg?*

Of the five circular economy models in this study and considering future plans for the waste management and challenges, the best model of circular economy to adapt being a part of the actions is the recovery and recycling model. Moving from linear economy to circular economy, is important consider the environment and society.

The thesis has not come up objectives or plans to use for example sharing or products as a service models, but recycling and recovering are already part of the actions when goals are to use waste as a source and generate zero waste.

Third sub-question has been *How could Rustenburg create more value for the city through recycling?*

From the answers come up that via recycling activities will improve the economy because of reducing the number of informal pickers which effects on the unemployment rate and improve social and environmental conditions generally.

The main research question has been *How could Rustenburg create more value for the city through waste management?*

Value in this study deals with many things such as creating value for the environment, for local economy and for social conditions. During the research it is highlighted that the development of recycling, waste management and the awareness of the residents will create

value for these three mentioned goals and that these goals also contribute each other. Controlled waste recycling improves the conditions of environment and recyclers.

6.2 Validity and reliability

The validity of the research depends on whether the research objectives are fulfilled, i.e. whether the research questions have been answered and are the answers credible (Stokes 2011, 131).

This study the research questions and sub-questions have built the results of the study. The reliability of findings from the empirical part of the research are confirmed by secondary data. Primary data of the study is collected by interview and observation of the author. Secondary data is collected by using reliable written sources. Number of the interviewees was two and both interviewees are Waste Management officers from Rustenburg Local Municipality and, therefore, highly reliable interviewees because the study is focus on developing recycling actions in Rustenburg. However, adding that, the research would have had higher validity and quality if there had been more than two interviewees.

Observation of the author happened in Rustenburg at the waste management unit as a colleague and, therefore, can be kept reliable field observation. Adding that a longer period of observation could have improved the quality and validity of the observation by monitoring the development of the waste unit's operations and the results obtained.

Findings from empirical part and according to the mentioned reliabilities the research is valid.

6.3 Suggestions for further research

Purpose of the thesis is to find out how the city of Rustenburg could create more value via recycling and sustainable waste management. The research is focused on creating values in general economically, environmentally and socially via recycling.

Suggestions for further research is research which would focus more specifically on how sustainable recycling activities affect the environment or social conditions. Does the development of one of these actions automatically have a positive effect to each other's or can that effect be negative?

Future studies could include research of the improving social conditions and the impact of it to the environment and economy. Or do the sustainable solutions for the agriculture and forests could boost the economy of the society via the sustainable land and clean food production?

Other possible further studies could be review of the municipal waste management unit as an organization. Paying attention and focusing on the organization designs and structures, taking advantage of previously identified theories that have been published and researched, could it be possible - and useful - to develop and promote changes in organizational structures, when moving towards a sustainable and green future.

7 SUMMARY

In this study data, data was collected during the author's internship period via observation and participation, from previously published reliable and carefully selected literature sources, and interview with two waste management officers.

Waste management is part of sustainable development and sustainable operations for the future. Sustainable future and development include three objectives. Economic, environmental and social objectives. These three main objectives are characterized by many other actions and goals such as education, clean food, clean land, clean air, recycling, re-use of goods and many other important actions.

Moving from linear economy into a sustainable alternative circular economy, understanding how the circular economy is one of the actions of sustainable development and sustainable cities is important. Sustainable waste management and recycling - along with the other waste management actions - together with sustainable social development and sustainable environment, create sustainable development and future together in interconnection.

Waste management and its activities are only one part of the circular economy and one of the drivers of the three main objectives that are important for sustainable development - economic, environment and social. Therefore well-designed, develop and sustainable waste management can create environmental, social and economic value for the city.

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Interviewee 2. 2018. Waste education and management officer. Waste Management Rustenburg Local Municipality. Interview 17 July 2018.

APPENDICES

Appendix 1 Interview Questions

1. What currently collected materials can be recycled and how those materials are being used?
2. Is there some materials that cannot be recycled now and if yes, what material would be?
3. Do you have ideas of how the (recycling) situation could be improved?
4. How the chain of material collectors works now? Is there some challenges and how it could be improved?
5. The Waterval the landfill? how is the safety there and how it could be improved on that side? Some ideas?
6. How do the municipality should inform the residents about recycling and how it is happening now? And is it enough?
7. Do you have any thoughts of could co-operation with private companies to contribute the recycling?