Wasting Waste
A comparison on waste management in Serekunda and Nijmegen

Imke Bertens
Bachelor thesis Geography, Planning and Environment (GPE)
Nijmegen School of Management
Radboud University Nijmegen
June 2019
Wasting Waste
A comparison on waste management in Serekunda and Nijmegen

Imke Bertens
Bachelor thesis Geography, Planning and Environment (GPE)
Nijmegen School of Management
Radboud University Nijmegen
June 2019

Student number: 4543874
Supervisor: Jackie van de Walle
Word count: 18856
Preface

With pride I would like to present my thesis “Wasting Waste” about differences in waste management in Serekunda and Nijmegen. This research is the final assignment for my Bachelor Geography, Spatial Planning and Environmental Studies at Radboud University, and a new beginning for my future studies.

About a year ago a documentary was launched on television about the Dandora dumpsite in Nairobi, Kenya. When I saw this documentary, the topic of dumpsites has been in my field of interest. Yet, due to the difficulty of the problem, it seemed too big for me to attack, because of lack of knowledge and resources. But recently I heard about Bakoteh dumpsite in Serekunda. This dumpsite is located in the city centre, near an SOS Children's Village, causing lots of people to suffer. I chose to write my thesis about waste management in this city, because of my fascination for waste issues and new motivation for attacking this problem.

Jackie van de Walle was my mentor in writing my research. With her guidance I created a structured plan on how to shape this research, and via interviews I was able to make an analysis and form answers to my research questions. I want to thank Jackie van de Walle for letting me choose my own topic and guiding me through the process of creating this paper. Thanks to her, writing this paper was a meaningful and motivative experience that is useful for my future studies. Furthermore, I would like to thank my respondents for sharing knowledge, information and opinions with me. Without them, it would have been impossible for me to create this paper. I also want to thank my family and friends for listening to me and sharing their views on problems I have faced. And lastly, I want to thank my brother for motivating me to start my own research. Without him, I would not have picked my own topic, so I am very grateful for his guidance in the beginning.

Thank you and I wish you a pleasant reading.

Imke Bertens

Nijmegen, 24th of June 2019
Abstract

Serekunda, a city in The Gambia, deals with big waste issues, because of lacking waste regulation and limited access to money. Two theories that can bring solutions for these issues are Smart Regulation and Circular Economy. Nijmegen is a city in the Netherlands where waste management is well-regulated and circular initiatives are increasing. The objective of this study is to get more insights on how to improve waste management in Serekunda, the Gambia, by comparing waste management in Serekunda to waste management in Nijmegen. This research is therefore a multiple case study where these two cases are analysed. The main question follows the objective and is formulated as: How could waste management regulation in Serekunda be improved, by comparing waste management in Serekunda to waste management in Nijmegen?

To answer this question, four sub questions are formed. Two questions for two different cases:

- How is the waste management system arranged in Serekunda?
- What are problematic factors in waste management in Serekunda?
- How is waste management arranged in Nijmegen?
- What aspects of waste management in Nijmegen are applicable in Serekunda?

The Integrated Sustainable Waste Management model, which is a model that combines principles of Smart Regulation and Circular Economy, is used for formulating in-depth interview questions. Using this model, the full contexts of the cases have been pictured.

First, the context of Serekunda. Both formal and informal parties are involved in waste management in Serekunda, due to lack of formal structure, initiative, money and workforces. Corruption is a big contributor to this phenomenon, as corruption creates unclarity and makes money, that was meant for public space management, disappear. This unclarity is a reason why informal initiatives by donkey men and scavengers are existing in the city. New businesses in waste processing are on the rise in Serekunda, which are regulated by businesses themselves. Yet the government is slowing down these businesses, by slow negotiations and corruption.

Next is the case of Nijmegen. In this city three important parties are responsible for waste management, namely Nijmegen municipality, Dar and ARN. The municipality is in charge of collection of residential waste, and outsources this practise to Dar, which is the main waste collection business in Nijmegen. Dar in its turn brings collected waste to ARN, that processes residual and organic waste in a circular way, and distributes recyclables to partner companies. These three parties communicate and cooperate a lot, which leads to an efficient waste management system.

Comparing these two cases shows that the most important factor in proper waste management is communication. But, due to institutionalized corruption in Serekunda, better communication is a difficult task. Therefore, a new waste collection business should arise as an intermediary between the KMC and the community, just like Dar in Nijmegen. A public private cooperation between the government and a self regulating waste collection business could be what is missing in the city of Serekunda. Such a business could not only attack waste issues, but also create jobs, more structure and more circularity.
<table>
<thead>
<tr>
<th>Content</th>
<th>p.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>2</td>
</tr>
<tr>
<td>Abstract</td>
<td>3</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>6.</td>
</tr>
<tr>
<td>1.1. Research context</td>
<td>6</td>
</tr>
<tr>
<td>1.2. Research objective</td>
<td>9</td>
</tr>
<tr>
<td>1.3. Research questions</td>
<td>9</td>
</tr>
<tr>
<td>1.4. Relevance</td>
<td>10</td>
</tr>
<tr>
<td>1.4.1. Societal relevance</td>
<td>10</td>
</tr>
<tr>
<td>1.4.2. Scientific relevance</td>
<td>10</td>
</tr>
<tr>
<td>1.5. Structure of this paper</td>
<td>11</td>
</tr>
<tr>
<td>2. Theoretical framework</td>
<td>12</td>
</tr>
<tr>
<td>2.1. Circular economy</td>
<td>12</td>
</tr>
<tr>
<td>2.2. Regulation</td>
<td>15</td>
</tr>
<tr>
<td>2.2.1. Current regulation</td>
<td>15</td>
</tr>
<tr>
<td>2.2.2. Smart Regulation</td>
<td>16</td>
</tr>
<tr>
<td>2.3. Connection with Serekunda and Nijmegen</td>
<td>17</td>
</tr>
<tr>
<td>2.4. Integrated Sustainable Waste Management</td>
<td>18</td>
</tr>
<tr>
<td>2.4.1. Stakeholders</td>
<td>18</td>
</tr>
<tr>
<td>2.4.2. Process in sustainable waste management</td>
<td>19</td>
</tr>
<tr>
<td>2.4.3. Important aspects in an ISWM model</td>
<td>21</td>
</tr>
<tr>
<td>2.5. Conceptual framework</td>
<td>22</td>
</tr>
<tr>
<td>3. Methodology</td>
<td>23</td>
</tr>
<tr>
<td>3.1. Research design</td>
<td>23</td>
</tr>
<tr>
<td>3.1.1. Case design</td>
<td>23</td>
</tr>
<tr>
<td>3.2. Research approach</td>
<td>24</td>
</tr>
<tr>
<td>3.3. Data collection methods</td>
<td>24</td>
</tr>
<tr>
<td>3.4. Data analysis methods</td>
<td>26</td>
</tr>
<tr>
<td>4. Analysis</td>
<td>27</td>
</tr>
<tr>
<td>4.1. Case 1: Serekunda</td>
<td>27</td>
</tr>
<tr>
<td>4.1.1. Stakeholders waste management</td>
<td>27</td>
</tr>
<tr>
<td>4.1.2. Process in waste management</td>
<td>29</td>
</tr>
<tr>
<td>4.1.3. Important aspects in waste management</td>
<td>32</td>
</tr>
<tr>
<td>4.2. Case 2: Nijmegen</td>
<td>36</td>
</tr>
<tr>
<td>4.2.1. Stakeholders waste management</td>
<td>36</td>
</tr>
<tr>
<td>4.2.2. Process in waste management</td>
<td>38</td>
</tr>
</tbody>
</table>
4.2.3. Important aspects in waste management p. 40
4.3. Comparison p. 44
4.3.1. Stakeholders waste management p. 44
4.3.2. Process in waste management p. 45
4.3.3. Important aspects in waste management p. 47

5. Conclusion and recommendations p. 50

6. Bibliography p. 52

7. Appendix p. 56
1. Introduction

1.1. Research context

In the last few decades, waste has become a serious problem in African countries, including in the Gambia. Trash is found everywhere, on the streets, in nature or in water. Urbanization is seen as the main cause of problems regarding waste management in Africa. According to data derived from World Bank (2017) about 40% of people living in Sub-Saharan Africa are living in cities, while in 1960 this was only about 15%. In the Gambia the urbanization rate is now at 60%, whereas in 1960 the resident number of Gambian cities was less than 5%. This means that the urbanisation rate has been high over the last decades. Back in 1999 Onibokun & Kumuyi wrote about Africa and the connection between urbanization and waste issues: “The high rate of urbanization in African countries implies a rapid accumulation of refuse.” (p. 3). Other studies confirm this and say that because of urbanization, the waste generation rate rises more and more (Achankeng, 2003; Cohen, 2006; Drechsel & Kunze, 2001). Twenty years ago, the urbanization problem was already stated. How come that African countries still deal with waste issues, when the problem has been pointed out years ago?

The poor managing and regulation around urbanization is the main factor, as multiple studies in different African countries point out (Webster, 2015; Oteng-Ababio et al., 2013; Parrot et al., 2009; Kubanza & Simatele, 2015; Boadi & Kuitunen, 2004; Rotich et al., 2006, Sanneh et al., 2011). These studies show that there is waste collection in the cities, but collection methods vary a lot. Collection can be done by public organizations, private companies, or informal initiatives, but waste management in African countries tend to have: “A lack of clear responsibility lines between the various stakeholders.” (Parrot et al., 2009, p. 992). This problem is also existing in Serekunda, a city in the Gambia. There are initiatives to collect the generated waste, but organizing these initiatives in an efficient structure has been a problem (Sanneh et al., 2011). This is directly linked to regulation issues. There are no official rules and collaborations between parties, which results in that parties are unsure about what to do, considering waste collection and processing. There is no overview where rubbish is, where it is picked up, where it has been dumped et cetera, creating random rubbish at lots of places. However, there is one official place for dumping, namely Bakoteh Dumpsite. Most waste in Serekunda is brought to this site, from residential waste to hospital waste, and Bakoteh Dumpsite is located in the middle of the city, causing it to be a nuisance among residents (Sanneh et al., 2011). The problem of Bakoteh Dumpsite is an example of lacking regulation, as there are no rules or checks on what waste is coming in, how much is coming in, who is bringing it et cetera. It is a necessity in waste collection and processing to have good communication and regulation, because when there is communication, there is more exchange of knowledge about the waste (Gunningham et al., 1998). Knowledge makes it possible for regulations and structures to improve, and waste collection and processing can then become more manageable.
Next to the problems with regulations, some other aspects are relevant in how and why lots of countries deal with waste issues. These other problematic factors are the lack of money for waste management, and inadequate infrastructure, like garbage bins and accessible roads. Both of these aspects are present in Serekunda too: little money is available for waste management in the country, which results in shortage of types of technology for waste management as well as basic waste collection equipment (Badgie et al. 2009).

The existence of the first factor can be explained by how low waste management has been on the political and social agenda, due to other problems in these countries. Lots of African countries, the Gambia included, are currently marked as developing countries. Webster defines developing countries as “countries whose indexes in terms of living standard, industrial development, Gross National Income etc. is low relative to other countries” (2015, p. 4). There are multiple reasons on why these countries are lacking economic- and industrial activity, like corruption and international debts (Goode, 2010; Fanelli & Medhora, 2002). Because of the economic- and social problems, the environment has not been a priority on the political agenda. “Most developing country’s governments are faced with massive infrastructure and social problems and quite often do not have the time or funds or political support to attend to these types of problems” (Liebenberg, 2007, p.7).

The state of the environment is a slow developing problem, and impacts are not seen directly, nor does it affect a country financially. Therefore there hasn’t been given much political and social attention to this issue, which results in that little money has been invested in the environment and waste management. That is why many countries now have to cope with a lot of waste.

Another problem with waste management in African countries is infrastructure. Like mentioned above in the citation of Liebenberg, governments in Africa are experiencing infrastructure issues, mostly due to the rapid urbanization. More people are now living in the same limited area, which causes that cities become more narrow and so it becomes difficult to drive through with trucks. In context of waste management, the narrowness of roads in cities is seen as an infrastructure problem, as the narrow roads make waste collection inefficient for many vehicles. “Compactor trucks are not suitable for the small, untarred, inaccessible roads in many parts of the city” (Boadi & Kuitunen, 2004, p. 216). Other infrastructure problems with waste management are lack of basic waste collection materials, like garbage bags, bins and trucks. Due to lack of funding for waste collection equipment, various countries are missing these necessities (Torres & Bigot, 2010).

Out of these problems, two interesting aspects come forward. There is a need for money, and a need for regulation to solve waste issues (Badgie et al., 2009; Parrot et al., 2009). These aspects will be the main focus of this research. First, concerning the financial needs in Africa, combined with waste issues, the Circular Economy principle could be a possible solution. Circular economy is defined as an economic and industrial system, that takes the reusability of products/sources and the recovery of natural resources as a basis (Bastein et al., 2013). Furthermore, value destruction must be minimalized and value creation must be optimized. These principles are a new and interesting way of looking at an economy. At this moment, namely, the basic economic structure in the world is a “Linear Economy”. This linear economy implies the “take, make, waste” idea, where limited natural resources are taken to make a certain product.
After usage, the product is thrown away and becomes waste (Bastein et al. 2013, p. 8). In a Circular Economy, waste is looked upon as a resource, instead of a problem. The main focus of this principle is that waste will eventually not exist anymore, as the production cycle will be circular. When the thoughts of a Circular Economy are followed and waste is starting to be looked upon as a resource, more ideas to use it could arise and the efficiency of the waste industry could increase. This would create new jobs and new ways to make money.

The Circular Economy needs regulation to work properly, and as stated above, better regulation in general is needed in these countries with waste issues. The second possible solution for waste problems in African countries could be a new type of regulation called Smart Regulation. Smart Regulation is a form of regulation where responsibilities and regulating tends to be multi levelled, instead of just at the top of society. When regulation is only done by the top of society, regulation is more used as a guideline instead of rules and policies (Gale, 2005). In Smart Regulation a bottom-up approach is stimulated and more authority is given to surrogate organisations, so different parties become more involved in achieving a certain goal (Gossum et al., 2012). Another aspect in Smart Regulation is to use instruments more efficiently. For example, more attention is given to particular contexts, and appropriate measures are designed and implemented to reach desired goals. A measure or instrument is appropriate when the problematic situation, before implementation of an instrument, has disappeared. If a measure doesn't work, a heavier measure is implemented, up until the problem has disappeared. In waste management, combined with the discourse of Circular Economy, efficiency and regulation are necessary, because a good structure is a must to be able to close the loop of waste cycles (Jonker et al., 2016). Therefore a combination of the principle of Circular Economy and Smart Regulation is studied.

An example of a place where Smart Regulation as well as Circular Economy gets more and more attention is the Dutch municipal area of Nijmegen\(^1\). In 2018 Nijmegen was marked as the leader of the Netherlands in Circular Economy (Arnhem Direct, 2018). This is due to recent innovations in production of new materials, as well as processing waste more efficiently. This last point is connected to Smart Regulation, as it creates higher efficiency in waste management. Organizations associated with waste management in Nijmegen are looked upon as progressive and open to new ideas, which stimulates start-ups and individuals to work together with these organizations (ARN, 2019). These forms of collaboration can also be linked to Smart Regulation, as new ideas to make efficient use of waste create new potential instruments to reach the desired goal, which is to become a Circular Economy. Furthermore, when start-ups and individuals become involved in waste management and regulation, they get more responsibility in this sector (Gunningham et al., 1998). More power is therefore given to these new regulators.

---

\(^1\) In this research “Nijmegen” means the municipality of Nijmegen, with surrounding villages Beuningen, Druten, Groesbeek, Heumen, Millingen, Wijchen, Ubbergen and Nijmegen included.
The Gambia and the Netherlands are two completely different countries with different history, economy, culture and politics. Despite of all these differences, one aspect connects these countries, which is regulation. The municipality of Nijmegen has a proper form of waste regulation, while cities in the Gambia are struggling with this. Serekunda is among these cities, and has about the same population size and surface as Nijmegen. Therefore, it will be examined how regulation in Nijmegen works and to what extent it is possible to implement this regulation form in Serekunda.

1.2. Research objective

The objective of this study will be to get more insights on how to improve waste management regulation in Serekunda, the Gambia. This objective will be reached by looking into the waste management system of Nijmegen and how this system operates, and looking into the waste management system in Serekunda. By comparing these two systems, it is expected that recommendations can be made on how to improve waste management regulation in Serekunda.

1.3. Research questions

Main question

How could waste management regulation in Serekunda be improved, by comparing waste management in Serekunda to waste management in Nijmegen?

Sub questions

How is the waste management system in arranged in Serekunda?
What are problematic factors in waste management in Serekunda?
How is waste management arranged in Nijmegen?
What aspects of waste management in Nijmegen are applicable in Serekunda?
1.4. Relevance

1.4.1. Societal relevance

Waste is seen as one of the bigger challenges of the modern era. Cities in developing countries mainly experience waste as a problem, as more people that generate waste are concentrated on a smaller surface, combined with little waste management: ‘Waste is often disposed in unregulated dumps or openly burned. These practices create serious health, safety, and environmental consequences.’ (World Bank, 2018). This applies to the city of Serekunda too. Waste problems affect all members of the city. Because of open dumping and burning of waste, polluting and toxic gasses are exposed that create air pollution as well as diseases. Next to air pollution, water pollution is another result of poor waste management, as waste often ends up in the water. Waste piles in the water block water flows as well, which causes a rising risk for flooding, which is yet another problem with random disposal of waste (Kavegue & Eguavoen, 2016). These aspects show how big of a problem poor waste management is in society. If answers can be found for the question on how to improve waste management in Serekunda, solving the waste issues in this city will be one step closer. Moreover, as stated before, similar places in Africa deal with poor waste management (Parrot et al., 2009; Kubanza & Simatele, 2015; Boadi & Kuitunen, 2004). If ways for improvement of waste management can be found in Serekunda, these ways could possibly be useful to apply in other African places with poor management.

1.4.2. Scientific relevance

The theories of Smart Regulation and Circular Economy have not been combined yet in a research on waste management in Serekunda. Also, comparing the waste management of a developing city to a developed city has not been done in past studies. This comparison can be interesting as previous studies have shown that a lack of proper regulation is an important cause of waste problems in cities like Serekunda (Sanneh et al., 2011). Nijmegen, on the other hand, is known for successful waste management, which corresponds with the theory of Smart Regulation (Gossum et al., 2012). Also, the idea of Circular Economy is getting more attention in waste management in Nijmegen. Since both cities have about the same size and number of residents, a comparison is possible. Overall, comparing these two cities seems like a challenge, as Serekunda and Nijmegen differ in many aspects. Yet, if the research is focused on improving waste management regulations, interesting results can be obtained.
1.5 Structure of this paper

This paper starts with a description of the discourse of Circular Economy. Then, a broader explanation of the theory of Smart Regulation is given, starting with a short part about current regulation. These two terms will then be connected via the Integrated Sustainable Waste Management (ISWM) model. The ISWM model will be used for the interviews to get more information on both waste management in Serekunda as in Nijmegen. In the analysis, two contexts will be formed out of gathered information via interviews and literature. These contexts will then be analysed and compared. After the comparison, conclusions will be made and the main question will be answered.
2. Theoretical framework

In this chapter the useful theories concerning waste management are discussed. First, there will be a part about the discourse of the Circular Economy. Then, Smart Regulation will be described, followed by a connection of both Smart Regulation and Circular Economy with Serekunda and Nijmegen. Lastly, there will be a part about the Integrated Sustainable Waste Management model that uses the principles of Circular Economy as well as Smart Regulation.

2.1. Circular Economy

For a long time our economy has been linear, which follows the idea of “take, make, waste”. Man uses raw materials to make products, which are sold, used and eventually thrown away (Bastein et al., 2013). In a linear economy, selling a manufactured product is the most important aspect and the only part where profit is made. Thus production is stimulated, regardless of the actual need for more products. This causes overproduction and results in throwing away products before necessary, as it is easy to buy a newer, slightly better product (Jonker et al., 2016). Another problem is that overproduction with non-renewable resources causes that the world is slowly running out of these resources. In the discourse of Circular Economy, however, waste does not exist. Waste is actually seen as a resource. Systems are designed and redesigned to create closed production cycles, which means that everything in the cycle is used, including waste (Jonker et al., 2016). The principle of a closed production cycle is shortly explained below, accompanied by Figure 1, which pictures this process:

First, a product is manufactured, and sold via retailers. After that, the sold product is used until the consumer is done with it. Instead of throwing the product away, like in a linear economy, the product is first reused for other purposes. The product can also be repaired if broken, and be reused again. This process can be repeated until the product is out-used. Then, at the end of the product’s lifespan, the product can be dismantled and parts can be recycled, to be used again for new production.

An ideal circular production system works in the same way as cycles that exist in a natural system, as the loop is closed and there are no residues (Cardozo, 2017). But in reality, there is a long way to go for creating a Circular Economy, as only 9,1% of production systems in the world are circular (Friedl, 2018). The task for creating a Circular Economy is to find ways to create closed cycles, which can be achieved step by step. This step by step approach can be explained in five phases, which are pictured and described by figure 2 to figure 6 (Jonker et al., 2016, p. 8-9):
The first phase is to create circularity in an individual system, like a company. This phase is the least complex, as just one actor is included in this system. An example for circularity in an individual system can be using organic waste in a household to compost, and use this compost for gardening.

The second phase is slightly more complex, as a partly closed loop is created in a production chain. An example of this phase is to use waste from one company as a resource for another.

The third phase is to create a material mono-stream, or a closed loop for one resource, iron for instance. The resource is taken from nature, and kept in the production cycle, via reuse, recovery and recycle. This phase is already a lot more complicated and needs regulation and cooperation, because multiple actors are involved in using this one resource.
The next phase is to create multiple mono-material streams, which is a closed loop for one product. A product is made from multiple resources, then sold and used. After using, it can be reused or resold until the end of the product’s lifespan. Then the product can either be recovered, or dismantled and recycled for manufacturing new products. Again, multiple actors are involved and must work together to be able to close the loop of a product efficiently.

![Figure 5: Multiple mono-material streams](image)

The final phase is to create a full system with closed production loops, that are interconnected and complementary. All previous phases are combined in this final one. When this phase is reached and working, a fully organized and circular economic system will be existing. It takes about 30 to 40 years to create a system like this (Jonker et al., 2016).

![Figure 6: Circular economic system](image)
A circular economy can be described as a system with cooperative value creation, in which it's necessary to work together to create value for products and materials. Cooperation, communication and regulation is needed for it to succeed. Implementation of Smart Regulation could contribute to creating a more Circular Economy, as communication and cooperation are key elements in this idea. So in the next part Smart Regulation will be elaborated on, but first traditional regulation will be described.

2.2. Regulation

2.2.1. Current regulation

Traditionally, environmental regulation is done by the government and in lesser cases, by businesses. Examples of environmental regulation can be pacts like the Kyoto Protocol, or the Paris Agreement (UNFCCC, 2008; 2015). These agreements are seen as important and are necessary to take serious. However, the pacts are rather formed as guidelines than specific laws or regulations. This is a problematic phenomenon in environmental regulation, as it's not mandatory to follow guidelines. Gale (2005) states that there are two problems attached to the traditional way of environmental regulation: The environment is a common good and therefore no party is specifically assigned to take charge, and environmental problems are only measurable on longer terms, while people rather think and act in short terms.

The first problem he indicates is the widely known concept of “Tragedy of the commons”. When different actors use a resource that is open to all, and no actor is responsible for the state of the resource, it is likely that the resource decreases in quality (Ostrom, 2015). In this scenario, no actor is responsible for the state of the resource, so all actors involved pursue their own successes. These successes tend to be short-term achievements, without thinking about the long-term effects, which leads to the second problem stated.

Waste management issues in Serekunda are a good example for the problems described above. The common good in this example is the cleanliness and quality of this city. All actors are using Serekunda for living, working and recreation, but no actor, as well as every actor, is really responsible for how clean this city is. So the actors dump their waste randomly. This is seen as a short-term success, as the problem ‘waste’ is solved for them individually. Now the problem is shifted to the common good. In the long term, when all actors keep dumping their waste randomly and leaving it in the common good, the waste becomes a problem for the common good too and the problem returns to all actors (Gale, 2005).

Traditional environmental regulation is therefore sub-optimal and should be changed in a way that the practice of Tragedy of the Commons occurs in a lesser degree. Smart regulation could be a solution for this.
2.2.2. Smart regulation

In Smart Regulation, a few aspects are different from traditional regulation. Traditional regulation is done by higher levels like governments and businesses, which causes that regulations are more seen as guidelines than concrete rules that must be followed. Smart Regulation is a form of regulation, that aims for regulation on more levels and more efficient usage of instruments in policy making and implementation (Gunningham et al., 1998). Regulation on more levels means that not only the governmental- and business level can regulate, but also other levels in society, like small businesses, communities and neighbourhoods. Outsourcing regulation practices to surrogate regulators, that are more in connection with that specific part of the system, can create more involvement and more effective regulation (Gunningham et al., 1998). When the smaller regulators are held responsible for a segment of the regulation system, these regulators need to make sure that regulations are followed by every party in their segment. Improvement and mistakes in regulation is now their responsibility, which would create more involvement.

Moreover, with multi-levelled regulators, more regulation can be achieved on scales where the government in traditional regulation cannot control or check if regulations are followed (Gunningham, 1998). An example can be waste regulation in a neighbourhood. When one group in a neighbourhood is held responsible for proper waste separation, it is easier to achieve compliance by the neighbourhood. But it is necessary that the responsible regulator is feeling involved and committed to stimulate the neighbourhood. Partly this can be achieved with voluntarism, which is when an individual takes charge on its own to change behaviour and improve the system without regulation: “Voluntarism is based on the individual firm undertaken to do the right thing unilaterally, without any basis in coercion.” (Gunningham et al., 1998, p 54.). The role of the government in voluntarism is to facilitate and guide. Forcing is not necessary in voluntarism, as parties choose themselves to change behaviour and therefore have enough motivation to reach their own goals. Therefore, stimulating voluntarism is an important aspect in Smart Regulation.

Next to regulation on multiple levels, more efficient use of instruments is desired in Smart Regulation. Efficient usage of instruments means that based on the context, a fitting instrument or combination of instruments can be applied and goals can be achieved using the right ways (Gunningham et al, 1998). In some cases, when instruments are used together, the effectiveness and efficiency of a policy can be increased. A note here is that man should avoid using too many instruments for the desired result, as it would not make sense to use a lot of instruments if the goal could be met when using the minimum. A possible way to avoid using too many instruments at once, is to start policymaking with a little intervention and then reflect outcomes. If outcomes are not meeting the goal, a bigger intervention can be done etc. This method can save excessive work and investments (Gunningham et al.,1998).
Communication is necessary for these aims to be reached. In general, communication is a must for structures and organisations to work more effectively, since information can be exchanged and more information can result in more knowledge in a certain field. More knowledge in its turn can improve organising. The more communication there is, the faster man can judge the effectiveness of an instrument and therefore the faster an intervention can be done. This will result in faster and better policy making. Therefore, communication is the most important factor in Smart Regulation (Gunningham et al., 1998).

2.3. Connection with Serekunda and Nijmegen

In the previous, Smart Regulation as well as Circular Economy were explained. But what is the connection of these theories with waste management in Serekunda and Nijmegen? Sanneh et al. have an answer to this question:

“This paper argues that the solution to waste management is not merely technical, but also organizational. There is a great need to move away from the disposal-centric approach toward the recovery-centric approach of waste management. This paradigm shift requires some level of public participation by regulating and monitoring waste collection and disposal.” (2011, p. 1071).

First, the recommendations in this paper are matching with principles of Smart Regulation and Circular Economy, and second, these recommendations are specifically about an area near Serekunda. Therefore the theories of Smart Regulation and Circular Economy are useful to find an answer to the main question on how waste management could be improved, as regulations in the Gambia are almost absent at this moment (Sanneh et al., 2011).

Next to this, the citation of Sanneh et al. also has a connection with Nijmegen. Nijmegen, namely, has a working regulation and monitoring of waste, and is increasingly approaching waste as a resource, instead of something to get rid of (DAR, 2019). Thus, the waste management system of Nijmegen is an interesting concept to compare to Serekunda.
2.4. Integrated Sustainable Waste Management

As explained, there is a need for proper regulation to be able to reach a Circular Economy. Since regulation is inadequate in the Gambia at this moment, an opportunity for the introduction of Smart Regulation can be possible. The model for Integrated Sustainable Waste Management (ISWM) is a suitable model where Smart Regulation and Circular Economy are combined (Klundert & Anschutz, 2001).

This model will be explained in chapters 2.4.1. - 2.4.3.

2.4.1. Stakeholders

Stakeholders is the first part of the ISWM model that is essential to include. By various authors the term stakeholders can be defined as: “those without whom the organisation could not survive” or: “those who can affect the firm or be affected by it” (Fassin, 2009, pp. 117). In this context the term stakeholders is not specifically about business and organisations, but the definitions are still suitable. In the first definition the “organisation” is the waste management system. So, the waste management system could not survive without its stakeholders. If waste collectors, recycling businesses, waste depositors and generators would disappear, the whole system would too.
In the second definition “the firm” is the waste management system (Fassin, 2009). Stakeholders in waste management keep the system going, or can make changes in the system. And the system always affects stakeholders. If the management is done in a proper way and the streets are clean, stakeholders are affected in a good way. If the management is lacking and there is trash everywhere, then stakeholders are affected in a bad way.

To get back to Smart Regulation, the term stakeholders can be linked to the principle of communication (Fassin, 2009; Gunningham et al., 1998). In policy making and regulating, communication between stakeholders is crucial. As stated before, in the Gambia there is a lack of responsibility on waste management. Stakeholders are not sure who is in charge of which segment in the waste management structure, which is caused by inadequate communication. A solution for this miscommunication can be that different stakeholders become in charge of a part of the waste management structure. This idea is linked with Smart Regulation, and could be useful in the Gambia.

2.4.2. Process in sustainable waste management

The second part of the ISWM model is the main focus of ISWM, as it is the practical part and can be implemented for waste management. A number of steps are taken in creating sustainable production and waste management, which are described below (Klundert & Anschutz, 2001). In the analysis in chapter 4, this part is used in form of tables. The table that explains this part can be found in the appendix.

The first step in production is to supply raw materials and energy to make a certain product. When this raw material and energy is supplied, a manufacturer with enough capital and knowledge can start making a product. Then, the product can be sold to consumers, who use the product. When this consumer is done with usage, the product can be reused, either by the same consumer for another purpose, or by another consumer. After re-usage, if the product is damaged or broken, the product can be repaired by the manufacturer and then again be reused. When it’s not possible to repair the product, it can be dismantled and parts can be recycled for new production. Parts or products that can’t be used for new production can be incinerated, and out of incineration energy or heat can be gained. The final step that can be taken is landfilling or dumping, and can be done when incineration of products is ineffective.
As seen in figure 8, the steps from raw material to waste are prolonged, just as in a Circular Economy. In a Linear Economy the steps would be: supply, production, retail, use and incineration or landfilling, but here multiple steps are added to extend the usage time of materials. So the connection with Circular Economy is obvious, but a link with Smart Regulation needs to be made too. In Smart Regulation, the term “instrument” is used (Gunningham et al., 1998), but in this case “instruments” can be seen as “methods” to deal with waste. Here, the heaviest instruments to deal with waste are incineration and landfilling, whereas reuse and recycling are lighter instruments. The lighter the instrument you use, the more effective and efficient waste regulation is.
2.4.3. Important aspects in an ISWM model

Because of the fact that every waste management system has its own characteristics, resources and context, it is important to study these and gain reliable information. It would not make sense to implement a waste management system in an area where part of the system won’t be accessible. Smart Regulation also stresses this. Every situation where a policy could be made has its own context and specifications. It is therefore important to set out the specific context in a comprehensive way, so that a new policy will fit theoretically in the situation.

Six aspects must thus be studied before creating an ISWM model in a certain area (Klundert & Anschutz, 2001, p. 13-14). The aspects are described in table 1:

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical possibilities</td>
<td>Equipment and facilities (trucks, recycle plants, bins); the design of this equipment; and the reliability and efficiency of it</td>
</tr>
<tr>
<td>Environmental aspects</td>
<td>State of the air, water and land; how pollution from waste is managed; and how people that are surrounding the area are affected by pollution</td>
</tr>
<tr>
<td>Financial aspects</td>
<td>Privatisation; the impact of environmental services on economic activities; efficiency of current waste management; income generation; costs and effects of resources use; cost reduction; potential profits on better management</td>
</tr>
<tr>
<td>Socio-cultural aspects</td>
<td>Views on generating, collecting and using waste; involvement in waste management in residents</td>
</tr>
<tr>
<td>Institutional aspects</td>
<td>In different political and social structures, different behaviour with waste is shown and therefore different techniques to change behaviour should be considered.</td>
</tr>
<tr>
<td>Legal boundaries</td>
<td>Goals and priorities; laws; jurisdiction</td>
</tr>
</tbody>
</table>

The model of Integrated Sustainable Waste Management can be used in any context, because in every situation there are different actors and aspects, but structurewise ISWM remains the same. Following this model with interviews can therefore make sure that the outcomes of different interviews will have the same structure.
2.5. Conceptual framework

Below the conceptual framework of this research is presented. This study will be about waste problems in Serekunda and how to improve waste management in this city. This will be done by analysing the full context around waste management in Serekunda as well as in Nijmegen. The theories that will be used for studying how to improve waste management in Serekunda are Smart Regulation and Circular Economy, but are combined in the ISWM model, as explained above. The ISWM model will be the red line throughout this research. First, separated ISWM models will be made for the two cities. After that, these ISWM models will be compared to each other, to eventually draw conclusions and make recommendations on how to improve waste management in Serekunda.

Figure 9: Conceptual framework
3. Methodology

In this chapter the methodology of the research will be described. First, the chosen research design will be explained, together with the research approach. After that, the research method and forms of data collection will be described. And lastly, the reliability and validity of the methods will be discussed.

3.1. Research design

This study will be a multiple case study, which is a known form of qualitative research. The method of a case study is chosen, because waste management is a complex system and to understand how such a system works, it’s necessary to examine it in great-depth. The specific method of multiple case study is chosen, as Yin (1981, p. 101) states: ‘‘Multiple-case designs are appropriate when the same phenomenon is thought to exist in a variety of situations.’’. The phenomenon of waste management will be studied in two different situations, of which one is problematic and one is a possible solution. It’s true that the phenomena of management are different in each situation, but that’s the gap in this study. The gap is expected to be filled by comparing the two situations. That is why a multiple-case design is suitable for this research.

3.1.1. Case design

The chosen subject for this research is waste management. Two different cases on waste management are chosen, namely waste management in Serekunda, The Gambia, and waste management in Nijmegen, The Netherlands. The reason for choosing the case of Serekunda is rather coincidental. Lots of cities in developing countries deal with waste problems, because of lacking regulation and money shortage, which is an interesting phenomenon to study. Serekunda is one of those cities, and therefore represents more cities with similar problems. Yet, Serekunda is just one specific city with its own context, thus generalisations cannot be made.

The reason for choosing the case of Nijmegen is that waste management in Nijmegen is an advanced system considering principles of Smart Regulation, in combination with Circular Economy initiatives. In this research, combined with these two theories, Nijmegen is taken as an example for successful waste management.

Moreover, Serekunda and Nijmegen have a similar number of residents, and the surface of these areas is similar (Osanjo, 2011; CBS, 2019). Therefore it is interesting to compare the waste system in Nijmegen to waste management in the Gambia.

The ISWM model will be followed to set out a full picture on these two different cases. First, stakeholders in both waste management systems will be described. Secondly, the process of different practises of generating, collecting and dumping waste (and all other practises) will be explained. And lastly, the differences in the full contexts will be described. Out of these results, comparisons can be made and conclusions can be drawn.
3.2. Research approach

The approach of this study will be deductive research. There already is a lot of knowledge on better regulation forms and effective waste management. The niche in countries in Africa, like the Gambia, is the lack of knowledge and management to implement this. Therefore, using existing theories in a new context, in combination with waste management, is a suitable approach.

3.3. Data collection methods

Data collection for this research is done by mostly in-depth interviews, studying literature and attending a meeting related to waste management. The in-depth interviews are semi-structured, which means that the interviews exist of different subjects that must be covered, but there is space for other input (Lindeman & Reulink, 2005). Next to interviews, literature has been studied. Partly for creating the research context, and partly for additions to the analysis. Lastly, for the case of Nijmegen, a meeting related to waste management has been attended. Attending this meeting was useful for making contacts for interviews.

For the case of waste management in Serekunda interviews were done using Facebook, Whatsapp and Skype. Four respondents have been interviewed in Serekunda. The first respondent is Omar Malmo Jr, the owner of environmental organisation Green Up Gambia. Omar was found coincidentally on Facebook and is an expert on the field of waste management in Serekunda, making him a reliable respondent.

The second respondent is Kemo Fatty, who is member of the Kanifing Municipal Council. Kemo Fatty was contacted, because Omar Malmo Jr recommended interviewing this Council member. Kemo has an interesting position in Serekunda as he is able to watch political practises from up close, and he is a committed person in improving life in Serekunda.

The next respondent is Dawda Nenegalleh Jallow, who is an environmental health student in Serekunda. Interviewing Dawda was chosen, as it’s interesting to learn more about how the Gambian youth looks upon the waste issues in the city. And lastly, the CEO of a new Waste to Energy initiative is interviewed. Recent news showed that this company is interested in starting a business in the city. This respondent is therefore an important information source, as this company could be a potential solution to waste problems in the area.

For the case of waste management in Nijmegen, three parties are interviewed, namely Nijmegen municipality, Duurzaam Afval Ruimtebeheer (Dar) and Afvalenergiecentrale Nijmegen (ARN BV). First, Marcel Peters is interviewed, who is the contractor between Nijmegen municipality and Dar. Second, Pouwel Inberg, head advisor and relations manager of Dar, is interviewed. And lastly, Gert van Rootselaar is interviewed, who is head manager of the landfills at ARN.

Interviewing Nijmegen municipality is chosen, because this party is in charge of waste collection in Nijmegen. Nijmegen cooperates with Dar for collection and therefore Dar is an important respondent too. Lastly, ARN is interviewed, because this company is a waste distribution partner of Dar.
These three parties are connected to each other and interact about waste processing, so in-depth interviews with the municipality, Dar and ARN will create a meaningful image for the case of Nijmegen.

Since the data collection method is via semi-structured interviews, various subjects are mentioned in all interviews. Following the ISWM model, these subjects include: Stakeholders, steps in waste management, techniques, environment, finance, society, and governmental support. With including these subjects in the interviews, a proper image of waste management can be pictured in both cities.

All interviews are recorded. The recordings are transcribed and coded, and placed in a code web for overviewing connections between factors. The interviews are used for outcomes of this research, and for drawing conclusions and recommendations.
3.4. Data analysis methods

In this research, data analysis is done by coding. Like mentioned before, the interviews are first transcribed, as transcripts are a necessity for coding to be done. Transcripts are often a source with lots of data, that can skip from one subject to another. Coding the interviews is therefore chosen, because coding creates more structure in these transcripts. The process of coding happens in three phases, namely the phases of open coding, axial coding and selective coding (Creswell, 2013).

Open coding is the first step. In this step, transcripts are being read and interesting aspects are marked and given a code, or a short explanation to describe that aspect. After this, axial coding will be done. Axial coding is the step of clustering multiple open codes together in an overarching code. When different codes have the same subject and correspond with each other, they are given the same code, so axial coding is coding the codes.

Selective coding is the last step. In this phase, the codes from axial coding are used to create connections between codes in a code web. This code web gives a clear overview of data that can be used for the analysis.

Respondents in both cases were asked the same questions, so the same subjects are covered. But expectations are that there will be lots of differences between the cases. These differences can be looked upon as niches and used for the conclusion and recommendations.

Lastly, the program that will be used for coding the interviews is Atlas.ti 8. This program is chosen as it is a known and reliable program in qualitative research. In Atlas.ti 8 transcripts can be uploaded and coding will be done. The codes that will be used are different aspects that are notable throughout the interviews, and aspects that are repetitive. Since both cases differ a lot, the interviews will have different points of attention. Therefore, in the first step of coding, both cases will be analysed with different codes. For the second step of axial coding, the codes from both cases will be grouped in subjects of the ISWM model. These subjects are: stakeholders, process of waste management, technical-, environmental-, financial-, socio-cultural-, institutional- and legal aspects. Then, the interviews will be clear and a structured description can be made. The cases will be described separately and after describing both cases, differences as well as similarities between the two will be analyzed. The differences and similarities can clarify the aspects that are missing in Serekunda and out of that, conclusions can be formulated and recommendations can be done.
4. Analysis

4.1. Case one: Serekunda

4.1.1. Stakeholders waste management

The stakeholders in waste management in Serekunda vary a lot. There is a distinction between the formal parties such as waste businesses and the government, and the informal parties like individual collectors and scavengers. Table 2 includes all parties in waste management in Serekunda, derived from interviews:

<table>
<thead>
<tr>
<th>Formal</th>
<th>Informal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanifing Municipal Council (KMC)</td>
<td>Donkey carts</td>
</tr>
<tr>
<td>New Mayor</td>
<td>Motorbike collectors</td>
</tr>
<tr>
<td>Waste collectors KMC</td>
<td>Scavengers</td>
</tr>
<tr>
<td>Private waste collection companies</td>
<td>Metal dealers</td>
</tr>
<tr>
<td>Security at Bakoteh Dumpsite</td>
<td>Children</td>
</tr>
<tr>
<td>Plastic recycle Gambia</td>
<td>-</td>
</tr>
<tr>
<td>Waste to Energy company</td>
<td>-</td>
</tr>
<tr>
<td>Dresden Banjul Organisation (DBO)</td>
<td>-</td>
</tr>
<tr>
<td>Residents</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2: Stakeholders Serekunda

Out of interviews it came forward that residents are the biggest group of stakeholders in waste management in Serekunda. Residents generate most of the waste, dump waste and experience lots of nuisance from poor waste collection and treatment in the city. Therefore, residents play a role in all dimensions of waste management.

Another important stakeholder is the Kanifing Municipal Council (KMC). The Kanifing Municipal Council is the group of people that are officially in charge of municipal waste collection, among other responsibilities like cleaning streets, city planning and collecting taxes. The KMC has about 50 people employed for waste collection and about 10 for security at Bakoteh Dumpsite, Kemo noted. These employees are another group of stakeholders in waste management. Two respondents stated that waste collectors and security here get paid a monthly salary of 3000 dalasi or about 56 euros (Omar & Kemo, 2019). According to statistics of the Worldbank (2017), this is about the average monthly salary of Gambian people.
Next to the 50 waste collectors from KMC, there are private waste collection companies. These companies operate in wealthier neighbourhoods, as prices for private collection are higher than municipal collection. Private waste collection services are therefore more reliable than municipal collection, because in Serekunda people that pay "extra money" are certain for collection, Omar stated. Man can speak of "extra money", because residents of Serekunda pay taxes already, which should cover waste collection costs. Yet, it doesn't. Dawda has big question marks where those taxes are going, which will be discussed later in paragraph 4.1.3.

Among residents, lots of initiatives on waste collection and processing are happening. Because of unreliable waste collection by the KMC, bottom up approaches like donkey carts and motorbike collection are taking place. Donkey carts are described as the following: "It's just a cart that is attached to a donkey, and those people walk around on a daily basis on different compounds and if you have any waste, you put the waste on their cart. You pay them an amount and they will dump the waste for you." (Dawda, 2019). Motorbike collectors work in the same way, but the difference is the type of vehicle they collect waste with. Both groups of collectors bring the waste to Bakoteh Dumpsite.

Next to informal collection, there is also informal processing of waste happening in Serekunda, as stated by multiple respondents. Scavengers are key players in this, as they are somewhat sorting out waste in Serekunda, predominantly at Bakoteh Dumpsite. In some types of waste, like metals, clothing, reusables and e-waste, money can be made, so scavengers will search for these types of waste and sell them. Metals and parts of e-waste are often sold to dealers, that sell these resources again for manufacturing new products. Clothing and other reusables are sold by scavengers themselves. In paragraph 4.1.2. this process will be further explained, as that paragraph elaborates on waste processes.

Kemo Fatty also mentioned children as stakeholders in waste management in Serekunda. There is a SOS Children’s village located next to Bakoteh Dumpsite, which causes that the children living there need to deal with this dumpsite everyday. Furthermore, Kemo called out the importance of children in Serekunda, as educating them properly on waste management will potentially bring solutions in the long run. Lastly, some children in Serekunda are scavenging too to earn money. Therefore children are an important stakeholder in waste management.

The last group of stakeholders are foreign companies with initiatives to solving waste issues. Recently, new activities on processing of waste have emerged in Serekunda. Foreign initiatives to use waste as a resource like Plastic Recycle Gambia, Compost making by Dresden Banjul Organisation and Waste to Energy have started to develop (Kemo; CEO Waste to Energy, 2019), so these companies are stakeholders too.

What is notable in analysing the stakeholders, is that there are multiple official parties included in waste management, but the unofficial groups are actually present in bigger numbers. Due to lack of structure, regulation and official initiative in waste management in Serekunda, lots of people take own initiative in getting rid of waste.
Because of these own initiatives, however, waste management gets even less structured, as there are many self-employed people, individual money flows and individual dumping places. This finding is corresponding with paragraph 2.3.1., where it was stated that there is little communication and responsibility on waste management in the city, causing increasing unclarity between stakeholders.

4.1.2. Process in waste management

This part of the analysis will be done by using figure 8 from the ISWM model, which shows the steps in the process of waste management in Serekunda. Table 3 is made, following figure 8, as a summary of findings. Explanation of this table is to be found in the appendix. The findings will be further explained below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage/Generation</td>
<td>Mainly organic and plastic waste, not a lot of waste generation in households</td>
</tr>
<tr>
<td>Collection</td>
<td>Donkey carts, KMC, private waste collectors, infrequent, own initiatives</td>
</tr>
<tr>
<td>Re-use</td>
<td>Residents reuse products, compost</td>
</tr>
<tr>
<td>Repair and re-use</td>
<td>Scavengers collect, repair and sell</td>
</tr>
<tr>
<td>Recycle</td>
<td>Scavengers collect and sell, metals, e-waste, plastics → Plastic Recycle Gambia</td>
</tr>
<tr>
<td>Incineration</td>
<td>Mostly done, wire burning, other waste burning, potential waste to energy business</td>
</tr>
<tr>
<td>Landfilling</td>
<td>Mostly done, illegal dumps, Bakoteh Dumpsite</td>
</tr>
</tbody>
</table>

Table 3: Process Serekunda

The first step in the process of waste is generation and usage. In the interview with the owner of an environmental organisation in the Gambia it came forward that waste generation per household is not too big: “People don’t really generate a lot of waste. Many times it’s like kitchen waste, what people generate in the Gambia. (...) I don’t think people generate a lot of waste.” (Omar, 2019). The problem with waste generation is that there are lots of people living in Serekunda, and with a lacking regulation system, the waste piles up to problematic amounts. According to a respondent, the generation of non-degradable waste like plastic is one of the bigger problems that is facing the city, because when dumped, this type of waste will not disappear over time. Plus, plastic is highly toxic when burned, which causes air pollution and an unhealthy environment for the surroundings.
After usage and generation of waste, waste is collected for further processes. In Serekunda, there are multiple ways for collecting waste. The KMC is supposed to collect waste in the city, as residents pay taxes for waste collection, but collection is infrequent and not structured. It is even said to be kind of rare to see the KMC collecting waste: "Seeing the KMC within the environment is like “Thank God” (they are here)." (Respondent 1, 2019). This can be explained by the amount of waste workers that KMC holds. Due to this infrequent waste collection and lack of employees and structure, multiple individuals take own initiative to collect waste locally, in either formal or informal initiatives. These initiatives are donkey carts, motorbike collectors and private collection businesses, as discussed in part 4.1.1.

The next step in the ISWM model is re-use of waste. Since the Gambia has a high poverty rate, people do not have the capability to buy new products often. Reusing products is therefore normal among the population. Like stated before, waste generation is not high in this country, so re-use is often practised. Mostly, waste from cooking is generated, which can be reused for compost. One respondent told about a project he is working on with Dresden Banjul Organisation to make compost from organic waste:

“We gave them 2 bins and gave them a simple concept. If it is something that is biodegradable, put it in the green one. And if it is not biodegradable, plastic or other sources of waste, put it in the blue one (...) But by then, we can get our clean organic component: the fishes and all this other organic waste that the women throw. We can use these things and get back our topsoil.” (Kemo, 2019)

The practise of composting is rising in Serekunda, despite lacking governmental help. The government is practically discouraging circular initiatives in for instance the compost business: instead of investing in local compost production, the KMC is importing chemical fertilisers that cost money and are not good for topsoil in the country, Kemo explained in the interview. The reason that they are doing this is unclear, but it was stated that it has to do with corruption. This will be further elaborated on in 4.1.3.

Repair and re-use are practised too in Serekunda, but only after dumping. Scavengers search for waste products that are potentially salable, take them, repair and clean them, and put them up for sale. This practise is good for stimulation of a circular economy, but scavengers are looked upon negatively, and thus taken less serious. Scavengers are also involved in recycling practises. Mostly metals like iron and copper are scavenged and sold to metal dealers. These dealers sell the waste metals to companies that make new products again.
Plastics are nowadays also scavenged. Since the beginning of 2019 a plastic recycle business, called Plastic Recycle Gambia, has started in the Gambia, where people can bring certain types of plastic waste and get paid some Dalasi for it. The plastics are cleaned, shredded and packed for transportation to factories.

It is expected that this business will expand, despite, once again, discouragement of the government: “Every now and then people from the government come by the recycling plant and ask for money (...) The government says this is tax money, but there are no documents or receipts to prove so.” (Summary call Dawda, 2019, can be found in the appendix).

The owner of the plant is not planning to stop, and since this plastic recycle business is a strong concept, it is expected to become successful. Yet, it’s uncertain how it will further develop.

The last two steps are incineration and landfilling, which are both predominantly practised in Serekunda. Incineration is done by residents that want to get rid of waste and they have a choice between burning and dumping. Waste is still looked upon as useless and rubbish: “People don’t think. It’s a default thinking. Waste is: just burn it. In your house or in your backyard.” (Kemo, 2019). Another reason for burning waste is for scavengers to get clean metals: ‘‘In car tires, they burn the tire and then get that metallic stuff and then go and sell it. So they are just trying to get reusables and metals.” (Omar, 2019). Incineration is very bad for the environment and adds greatly to air pollution in Serekunda. Especially rubber and plastic burning releases toxic smoke, and the population suffers from it, Dawda mentioned.

Landfilling gets done in the city too. Most of the waste gets dumped at Bakoteh Dumpsite, but it was stated by Omar that there are numerous other dumpsites in Serekunda, which are illegal. These illegal dumpsites came to being because of the lack of structure, regulation and unreliable waste collection services. People themselves are mostly in charge of dumping their waste, and some people live too far away from Bakoteh dumpsite, so illegal dumping is the only way for them.
4.1.3. Important aspects in waste management

In this part aspects for waste management in Serekunda are discussed, to get an overview of the rest of the context. These aspects are derived from the ISWM model (Figure 7), and explained by using information from interviewing respondents.

<table>
<thead>
<tr>
<th>Technical possibilities</th>
<th>Tractors, new trucks from China, plastic recycle gambia, waste to energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental aspects</td>
<td>Bad located dumpsite, air pollution by rubber/plastic burning, water pollution, water blockage, no protection</td>
</tr>
<tr>
<td>Institutional aspects</td>
<td>Corruption</td>
</tr>
<tr>
<td>Financial aspects</td>
<td>Lots of poverty, no idea where taxes go, corruption, Follow the Money, informal businesses</td>
</tr>
<tr>
<td>Socio-cultural aspects</td>
<td>Inadequate education and awareness, lax, social media important</td>
</tr>
<tr>
<td>Legal boundaries</td>
<td>Good laws, bad execution, empty promises</td>
</tr>
</tbody>
</table>

There are relatively little technical possibilities in Serekunda, but there are recent activities that show development in this field. The overall waste system in the Gambia is so far proven to be inefficient and unreliable, because of lacking structure and tools for proper waste management. For instance, waste bins are hard to find in the Kanifing Municipality. On social media the KMC posted about donating 1000 bins to the city, but Omar told that this has happened a few times before, and these bins are only given to institutions where waste is not much of a problem in the first place. "They don't put them into strategic locations in the street because people will steal them. So what they do is: they probably give it to institutions." (Omar, 2019). Other tools that are lacking are waste “tractors”, that are used in Serekunda: “tractors are not even designed to collect waste but we use them anyway (...) we used to have about 25 tractors, sometime in 2008. But this has numbered down to 10 tractors.” (Kemo, 2019). What is striking about this number, is that the KMC is supposed to collect and process waste from 300,000 inhabitants with just 10 vehicles. However, on social media the KMC recently posted about purchasing multiple new waste trucks in China, so there is some improvement in the technical aspect.
Other hopeful improvements are Plastic Recycle Gambia and Waste to Energy. Only the government is slowing down both of these initiatives. Plastic Recycle Gambia is experiencing discouragement because of unofficial taxes, as seen in 4.1.2, and the Waste to Energy business is slowed down because the KMC is holding back:

“So the ball is in their corner, KMC needs to work. We have provided all the materials we have provided what they asked, we have all the technical material. We just need the financials and contracts so. We are now waiting that they will be ready within their organisation.” (CEO Waste to Energy, 2019).

The CEO of Waste to Energy explained that 20 million euros are needed for this project to start. Although there are great money flows coming into the Gambia every year, the money disappears due to corruption by the government, as stated by the respondents. Therefore, the project is feasible, but the government must be willing to invest.

The next aspect is the environment. What came forward multiple times is that the biggest problem in Serekunda is the Bakoteh Dumpsite, and more specifically its location. The dumpsite is located in the middle of the city, next to a SOS Children’s village, hospital, schools and houses, that have to deal with air pollution. All kinds of waste get dumped on the site, causing bad smells. Plus, due to rubber and plastic burning on the site, toxic smoke releases often, which affects the health of people that are in the surroundings of the dumpsite. People who are working on the dumpsite are not protected against the smells and smoke, and thus experience an unhealthy environment everyday.

Next to air pollution, there is water pollution and water blockage because of waste. The KMC has been lax in this aspect too. Because of hindering waste piles, water fluxes get blocked. According to Kemo, instead of removing the waste piles, the KMC leaves it as it is. Only when there is lots of political pressure they will implement a short-term solution, like digging a hole where the water could go into. This hole gets filled with water and children would come and play in it, with all dangerous consequences.

The dominant institutional aspect that needs to be considered in Serekunda is corruption. As a respondent stated: ‘Generally in the Gambia corruption is institutionalised.” (Kemo, 2019). In Serekunda, the Kanifing Municipal Council decides what happens with public areas. Out of interviews came forward that this council consists of various departments where multiple people work, and all these members of the council get paid a decent salary. So, many people are working in the governmental office, discussing and making laws, but there are not enough people to enforce these laws. Moreover, according to respondents Dawda and Kemo, the council consists of lots of people that are not interested in developing the city, as they are more interested in earning money. Kemo stated that this is a form of corruption, as in Gambian politics it’s important to know the right people. “If a good hearted man wants to occupy a place in the council, and if somebody is there whose nephew is not a good hearted man but also needs a job, obviously his nephew will be there, there are not like equal opportunities of employment.” (Kemo, 2019)
The next aspects that will be discussed are finances. The Gambia is a country with lots of poverty and as stated before, corruption is institutionalised. Despite of poverty, residents in Serekunda still need to pay annual taxes. These taxes should be used for managing public spaces, city planning and waste management, but a lot of this tax money disappears and is nowhere to be found: “Millions of dollars that are brought from waste or taxes, we are actually not knowing where the money is going” (Dawda, 2019).

In the introduction it was discussed that one of the main factors for waste issues is lack of money. What is interesting is that there actually is potential access to money for waste management, but due to corruption this is made impossible. Money flows for management disappear, causing the rise of informal waste businesses, that get paid by residents on the spot. These bottom-up waste businesses are an important group in waste management in Serekunda, because they add value to waste collection. Without these businesses Serekunda would probably have even bigger waste issues.

Next is the socio-cultural aspect. In Serekunda, no separation of waste is done from households. The only type of separation that is seen, is separation by scavengers after dumping. This is due to multiple factors, of which the most important factor is lacking awareness and education. Because of the high poverty rate in Serekunda, people have other priorities than separating waste. Omar thought of this as a logic way of thinking, because if people have to worry about having enough to eat, why would they care about waste separation? If people would be more aware of the importance of decent waste processing, and what happens if they dump or burn it, waste separation could become more interesting to practise. Another socio-cultural aspect that is interesting in Serekunda is the use of social media. Kemo and Dawda tended to share the same perspective of the KMC and its own promotion on social media. The KMC wants to create a good image of itself on social media, while in reality this image is not corresponding with what is pictured: “They tell people: Look at us, this is what we are doing, but when you go in the town you see a different thing.” (Dawda, 2019).

In Serekunda, findings in the legal aspect are interesting as well. Omar, Dawda and Kemo talked about laws and jurisdiction in the Gambia, and how well written and environmentally friendly these laws are. But there is lacking law enforcement: “We have very good laws, when you read our laws, believe me, you will just fall in love with the Gambia. But when you look at how the laws are implemented, you are going to wonder: No, something is terribly wrong.” (Kemo, 2019). Kemo also gave an example of bad law enforcement. The Plastic Ban act is active in the Gambia, which bans the distribution of plastic bags. So these bags are not sold anymore, but yet the same amount of plastic gets distributed in the Gambia, only in different forms (e.g. cups). The government is a bit reluctant and lax to listen to professionals that have more expertise in the field of waste, and thus it takes a lot of time to change laws. This leads to frustration among many people.

Yet, the new mayor is giving some hope for improvement among Dawda and Kemo. They stated that he is really trying to improve waste management: “I saw the mayor himself going in the streets and clean the streets. But that is because a foreign business was coming, so this is why he did that. But former mayors have never done that before, so that was recommendable.” (Dawda, 2019).
However, Kemo as well as the CEO of Waste to Energy mentioned that the mayor tends to be interested in becoming president, which could be the reason why he is so keen on improving waste management. Respondents are sceptical about every action taken, as they are convinced that the actions are political. Though, the main goal is to solve waste issues in Serekunda, which is shared by the mayor as well as other parties, including sceptics (Dawda, 2019).
4.2. Case two: Nijmegen

4.2.1. Stakeholders waste management

In table 5 all stakeholders from Nijmegen and its subgroups are shown. Due to lots of regulations, contracts and transparency within the field of waste management, there are solely official stakeholders in Nijmegen. Every group is documented and taken into account, which creates structure.

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Subgroups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality</td>
<td>Policy makers, neighbourhood managers, waste coaches</td>
</tr>
<tr>
<td>Duurzaam Afval en Ruimtebeheer (Dar)</td>
<td>CEO, Head managers, Integraal Beheer Openbare Ruimte (IBOR) manager, collection manager, team leaders, workers</td>
</tr>
<tr>
<td>ARN BV</td>
<td>CEO, managers, workers</td>
</tr>
<tr>
<td>Company waste collectors</td>
<td>SUEZ, Renewi</td>
</tr>
<tr>
<td>Residents</td>
<td>Involved residents, misbehaving residents, opposing residents</td>
</tr>
<tr>
<td>Volunteers</td>
<td>Wijkhelden, children, recreative unions</td>
</tr>
<tr>
<td>Recycle businesses</td>
<td>-</td>
</tr>
<tr>
<td>Dutch government</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 5: Stakeholders Nijmegen

The first stakeholder in waste management in Nijmegen is the municipality. Policy documents point out that the municipality is responsible for domestic waste collection in the city (Gemeente Nijmegen, 2012). The municipality is not responsible for waste collection of companies like the catering industry or other businesses, because businesses have different needs than residents. Waste companies like SUEZ or Renewi are collectors of businesses in the city, and are a whole different market than domestic waste collection. In this research domestic waste collection is mainly focused on, and therefore analysed.

As said, domestic waste collection is the responsibility of the municipality. The municipality has outsourced this practice to Dar, the main waste collection company in Nijmegen and surroundings. Dar used to be a part of the municipality, but in the year 2000, due to municipal costs savings, Dar became an independent company for waste collection and public space management (Gemeente Nijmegen, 2012). The municipality and Dar have a close partnership in waste management, because of the fact that the municipality is a shareholder of Dar. The two parties refer to their cooperation as a ‘forced marriage, but a happy one’ (Marcel Peters, 2019).
The municipality and Dar have different subgroups, that work together on different fields and issues within waste management. The municipality has policy makers, waste coaches and neighbourhood managers, that are important for creating and reflecting solutions to waste problems within the city. Dar has, next to the waste workers, various managers that are responsible for parts of waste collection and public space management. Waste coaches and neighbourhood managers gather every month with team leaders and managers of Dar to discuss problems they face within parts of the city, which is a proven efficient approach (Pouwel Inberg, 2019).

Next to waste workers, Dar also has various volunteers for maintenance of the city, a respondent pointed out. Recreative unions collect paper waste in return for the monetary value of that collected paper. They do this for supporting their union (for instance a football union), as well as contributing to the cleanliness of the municipality (Marcel Peters, 2019). Furthermore, there are ‘Wijkhelden’ in Nijmegen. These are volunteers of any age, including children, that collect public litter. The fact that children are included in volunteering is a powerful idea, as not only the city gets cleaner, but also children get educated on not dumping waste in the streets (Pouwel Inberg, 2019; Dar, 2017).

Another group of stakeholders are residents. Residents play a role in efficiency of collection in Nijmegen, as waste separation in this city is done within the household. The better residents separate their waste, the more valuable recycling will be. And also, the more residents misbehave and dump waste illegally, the less efficient recycling will be. In 4.2.2. this will be further elaborated on. The municipality and Dar are leading waste management policies, but the voice of residents is relatively big in policy making too. For instance, Dar wanted to implement a certain waste collection technique called ‘reversed collection’ (see 4.2.3.) in Wijchen, but a group of opposing residents stopped this. Even though this particular technique has been proven to be successful, the municipality and Dar listened to the residents and the plan was canceled (Pouwel Inberg, 2019).

Another important stakeholder in Nijmegen is the ARN. The ARN is a public private waste processing company, that processes residual and organic waste, and distributes other types of waste to factories outside of Nijmegen. Residual waste gets incinerated and is turned into energy and heat, that is used in the city. Organic waste is used for making biogas and composting (ARN, 2019). In paragraph 4.2.2. these processes will be further explained.

The last stakeholder is a more general one, namely the Dutch government. The government has set goals in terms of reducing residual waste and emissions and how to stimulate this (Marcel Peters, 2019; Rijksoverheid, 2016). The municipality is obliged by the government to execute the laws the government makes on reducing waste. The Dutch government is therefore the stakeholder behind guidelines for a better waste management system in the Netherlands.
This part of the analysis will be done by using figure 8 from the ISWM model, which shows the steps in the process of waste management. Table 6 is made, following figure 8, as a summary of findings for Nijmegen. Explanation of this table is, like mentioned before, to be found in the appendix. The findings will be further explained below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage/Generation</td>
<td>More waste generated, waste separated in the household</td>
</tr>
<tr>
<td>Collection</td>
<td>Separated collection: plastic and metals, paper, organic, glass, different collection technique per city/district, clear and organised collection frequency (calendars), customization</td>
</tr>
<tr>
<td>Re-use</td>
<td>Little reuse</td>
</tr>
<tr>
<td>Repair and re-use</td>
<td>Little reuse</td>
</tr>
<tr>
<td>Recycle</td>
<td>Waste = resource, separated waste valuable, biogas and compost from organic waste, business initiatives for recycling, waste transported to recycle factories</td>
</tr>
<tr>
<td>Incineration</td>
<td>ARN: for energy and heat, no open burning</td>
</tr>
<tr>
<td>Landfilling</td>
<td>Dumping when nothing else can be done with the waste, distant landfills, gas treatment residue from incineration, asbestos</td>
</tr>
</tbody>
</table>

Table 6: Process Nijmegen

In the case of Nijmegen, there is lots of generation of waste. In the 2017 Dar report it was stated that the city of Nijmegen has about 106 kg of residual waste per person per year. Yet, this is only a small part of all waste generated, as in Nijmegen separation is common. The total number of waste per person is therefore higher. Despite the fact that Nijmegen produces a lot of waste, the waste does get separated a lot by households, as mentioned. Residents practise separation, because Dar designed its collection models on separation. Dar facilitates waste collection more on recyclables than on residual waste, and therefore it’s more attractive to separate waste (Pouwel Inberg, 2019).

Dar’s waste collection in Nijmegen works very structured and transparent. Every resident gets a calendar with dates when and what kind of waste gets picked up, and these collection moments always happen. Every city has a specific type of waste collection, that suits wishes of the municipality (Dar, 2019). Nijmegen specifically practises ‘de wijk voor wijk aanpak’ (the district approach), where every district in the city has a district manager that takes care of problems in there.
Every month, the managers speak with Dar and the municipality to discuss the state of the districts and to talk about issues residents face. Policies can be altered to solve issues in the districts, because of good communication between parties (Marcel Peters, 2019; Gemeente Nijmegen, 2012).

The next part in the process is reuse and repairing products. In the interviews there has not been given much attention to this part, as all parties in Nijmegen have more expertise in reuse of waste instead of reuse of products. As stated before, there is a lot of waste generation in Nijmegen, which means that improvement in reuse of products in Nijmegen could be interesting. In paragraph 4.3.2. on the comparison of Serekunda and Nijmegen, this part will be discussed more.

In terms of recycling, Nijmegen has come a long way. Back in 1950 dumping was a customary in the Netherlands, resulting in ground and water pollution. Then, waste incineration was introduced, and later waste incineration with electricity and heat generation started, which made the use of waste more efficient (Pouwel Inberg, 2019). Waste incineration with energy generation is still happening in the city, using residual waste. The waste is placed in a big oven that is almost always burning, and the heat warms up water pipes that are installed in the oven. The water in these pipes becomes steam, that actuates an electricity generator. This is how heat and electricity is generated. The smoke derived from the residual waste burning gets filtered as much as possible, gets packed and dumped at a designated landfill. And the ashes from this waste are used for new roads (ARN, 2019). Yet, this type of waste is the least efficient in the Netherlands, as incineration destroys the products. The most efficient type of waste is organic waste. In Nijmegen organic waste is turned into biogas and compost, using fermentation techniques. The biogas is used as fuel for busses in Nijmegen and the compost is used for crops in different areas in the Netherlands. This type of compost does not stay within the region of Nijmegen, as it has a specific composition and is more effective on other types of grounds in the Netherlands (Gert van Rootselaar, 2019). A big part of organic waste processing stays within the region of Nijmegen, and is already rather circular. Yet, it is getting more and more efficient because of innovations.

Next to organic and residual waste, there is paper-, plastic-, metal- and glass waste. These types of waste get transported to various places in or near the Netherlands, to make new products with. For instance, plastic- and metal waste from Nijmegen is brought to ARN, who sends it to a partner company that separates the different types of plastic and metal. After separation, the waste is transported to Rotterdam, where it is used for new products (Gert van Rootselaar, 2019). So far, there is no business in Nijmegen for these types of waste, but more and more business initiatives are arising and the government is keen on cooperation. Therefore, in the future these types of waste could become circular in the region of Nijmegen too.

The last step in waste processes is landfilling. Landfilling is only practised when residual waste is impossible to burn, like asbestos, agricultural foils, or the gas treatment residue from ARN’s chimneys (Gert van Rootselaar; ARN, 2019). This residual waste gets packed safely and is placed on landfills in sparsely populated places, so that dumping is not affecting people too much.
4.2.3. Important aspects in waste management

In this part aspects for waste management in Nijmegen are discussed, to get an overview of the rest of the context. These aspects are derived from the ISWM model (Figure 7), and explained by using information from interviewing respondents.

<table>
<thead>
<tr>
<th>Technical possibilities</th>
<th>Different collection methods: separated collection, expensive residual waste bags, reversed collection, circular partners for waste distribution, organic waste for biogas and compost, waste to energy &amp; heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental aspects</td>
<td>Clean streets, smoke filters for incineration, good air and water quality, water treatment plant circular heating, dumpsites in sparsely populated areas</td>
</tr>
<tr>
<td>Institutional aspects</td>
<td>Lots of communication and transparency, behaviour studied by municipality, customization, regulation, contracts</td>
</tr>
<tr>
<td>Financial aspects</td>
<td>Wealth, transparency and clarity, contracts, money in waste, taxes for recycle, cost reduction when separating</td>
</tr>
<tr>
<td>Socio-cultural aspects</td>
<td>Behaviour studied by municipality, involved residents, creating involvement via communication and financial stimuli, media bad impression</td>
</tr>
<tr>
<td>Legal boundaries</td>
<td>Big European and Dutch influence, laws are made, executed, reflected, adjusted, communication important, customization</td>
</tr>
</tbody>
</table>

Table 7: Aspects Nijmegen

Technical possibilities in Nijmegen are very broad. As seen in part 4.2.2. the techniques used in various steps of processing waste are highly developed and thought out. Nijmegen and the other cities where Dar operates all have a certain waste collection technique, chosen by the municipality (Pouwel Inberg, 2019). They have in common that all municipalities practise separated collection, only the execution differs, as well as efficiency. A very efficient technique is ‘reversed collection’, where residents get lots of facilities for recyclable waste and no facilities for residual waste. Moreover, residents themselves must bring residual waste to municipal containers. The reason for this is: the lesser residual waste people generate, the less effort people must do for getting rid of waste. This technique has caused residual waste generation to decline, and separation to increase (Pouwel Inberg, 2019).
Another technique is ‘expensive residual waste bags’, which is practised in Nijmegen. Dar only picks up residual waste when it is thrown in a specific type of bag, and one roll of these waste bags costs about €10,- in supermarkets. So the better residents separate waste, the less rolls they have to buy (Pouwel Inberg, 2019). Another plus side of this system is that ‘the polluter pays’, because residual waste is the least efficient type of waste, as stated before. If people don’t separate well, they pay more money to the municipality.

In terms of processing waste, a technique that is used is distribution to manufacturers that recycle types of waste like plastic, paper and glass. Organic waste gets turned into biogas and compost and is used in the region of Nijmegen. And lastly, incineration techniques are used for turning residual waste into energy and heat, which is used for electricity and heat supply in parts of the city (Gert van Rootselaar; ARN, 2019). These practises are examples of beginning circularity, as stated before. Furthermore, another technical aspect in Nijmegen that is worth mentioning is the water treatment plant next to ARN. This plant exchanges its waste water with ARN in return for heat. The wastewater is used by ARN for electricity generation, which is explained in paragraph 4.2.2., and heat from ARN is used by the water plant for cleansing water. This business model is a partly closed loop and an example of the second phase in creating a circular economy (ARN, 2019).

Considering waste management, the surrounding of Nijmegen is well maintained. Streets are clean, there is little air pollution by waste, and there is little soil pollution (ARN, 2019). Streets are clean, because the municipality and Dar are very involved in proper collection and management. When there is a waste problem, residents can easily communicate to these parties about it, and it will be solved as much as possible (Marcel Peters, 2019). Also the air in Nijmegen is reasonably clean (Milieudefensie, 2019). There is air pollution, but not because of the waste industry in the city, ARN states. Waste trucks are fuelled by green gas, half of the waste gets recycled and the other half gets incinerated for energy. The incineration creates emissions, but polluting substances get filtered out and only water damp gets released into the atmosphere. These substances are packed and dumped safely at a designated landfill (Gert van Rootselaar, 2019). Landfills in Nijmegen are in areas where little to no people live, so that potential soil pollution is not a problem for residents.

The next aspect is the financial aspect. The Netherlands is a wealthy country, with lots of transparency, contracts and regulations around waste management. In Nijmegen, waste management is also regulated via solid contracts. Residents pay taxes, which is partly used for management of public space. The municipality outsources this management to Dar, which gets paid with tax money. It was stated that a solid contract between the municipality and Dar is very important: “We want to know: this is what we have to do, this is how we will do it, and these are the budgets we have. Then you can start with a project. And a year later you can justify: this is what we did, and these were the costs.” (Pouwel Inberg, 2019). It shows that transparency and clarity stimulates productivity, as every party knows what to do and how to do it.
Furthermore, the reason that recycling is developing in Nijmegen has to do with the increasing value of waste. For instance, energy, heat and biogas generation creates businesses where money can be made. Plastic and paper recycling is financed by taxes, so that businesses see potential in making money with sustainable production, which stimulates the governmental goals for circularity (Pouwel Inberg, 2019). Another financial stimulant for more efficient waste management is a stimulant in the household, namely cost reduction by separating waste. The more valuable waste streams are collected for little to no money, and the less efficient residual waste is paid for. Better separation therefore creates cost reductions.

In Nijmegen, the institutional and socio-cultural aspect are connected, as for both terms the most important aspect is communication. It is easy for actors to contact one another, there is lots of clarity what needs to happen with waste, and regulation is customized. Because of this customization, involvement by residents is large. This is also the most notable socio-cultural aspect in Nijmegen. Separation is done in great quantities and is seen as normal, which is due to communication and policy making. The municipality first hires experts that study behaviour, and these experts then talk about what behaviour is shown by residents and give advice on how to change it. Policies are designed for improvement of behaviour of residents, which is a focus on the long run. Change of behaviour takes some effort, but the municipality is keen to focus on this aspect, as the benefits will stay for a long time (Marcel Peters, 2019). These findings can be linked back to Smart Regulation (Gunningham et al, 1998). Yet, the respondents have not given much information about the term Smart Regulation itself and how it is applied. But when practises around waste were explained, a lot of principles of Smart Regulation were found. This indicates that there is unplanned Smart Regulation in waste businesses in Nijmegen. Gert van Rootselaar stated that this is due to the Dutch way of communication, as he said: "We talk a lot to each other, the government and businesses deliberate a lot".

Another interesting socio-cultural aspect is the media in Nijmegen. Respondents talked about how sometimes the media can create a bad image about waste management:

"Last year, a picture appeared in the newspaper that a little horse was eating a plastic bag in nature around Nijmegen. It gets enlarged so much. Only one person has to dump a plastic bag and the media can take a picture, and all of a sudden the whole natural area is depicted as a mess." (Respondent 5, 2019).

Waste management is well-regulated and taken care of in this area, yet the media can portray the contrary. In paragraph 4.3.3., this will be further discussed.
Lastly, legal aspects in Nijmegen are analysed. Out of interviews it became clear that the biggest reason for sustainable waste management in Nijmegen is due to European and Dutch governmental influence. “The government made rules for the municipality until 2023: residual waste can only be a certain percentage of the total amount of waste. The government has created certain guidelines, and municipalities are obliged to follow them.” (Marcel Peters, 2019). New policies that support the European and Dutch laws are first researched, then created, and executed. After execution, the policies are reflected and adjusted when necessary. This way of customized policymaking is a very efficient concept, and a form of Smart Regulation, as policies can be designed to fit specific situations.
4.3. Comparison

In this comparison, only important differences and similarities are discussed. These differences and similarities are shown in the tables, and further explained below.

4.3.1. Stakeholders

The biggest difference between stakeholders in Nijmegen and Serekunda is that in Nijmegen almost all parties are official. There are contracts and all parties are documented, which creates a better structure. Another difference that is seen, is how ‘leader’ stakeholders, like the municipalities, are leading the community. In Nijmegen, the municipality feels responsible and is really in charge of waste collection. In Serekunda, this feeling of responsibility is lacking. According to respondents, there is corruption within the KMC and making money is more interesting than taking care of the community. This lax attitude causes residents themselves to take action, creating unofficial structures that are not regulated. There is a need for a greater feeling of responsibility on waste management in Serekunda, and the KMC must start collaborating with informal structures. These structures, namely, are developed and have great expertise in the field of waste management. The KMC could actually learn from donkey men and scavengers on the best techniques in collecting and separating waste. A certain collaboration could be achieved via a new waste collection business, that serves as an intermediary between the KMC, informal structures and residents. This new business should cooperate with the government, but regulate money flows independently. Donkey men and scavengers should be employed officially, as these people are experts in the field of waste management and should be taken more seriously. Also, the waste collection business should create its own method of working, based on the context of Serekunda, because different parts of the city need different methods, as seen in the case of Nijmegen.
4.3.2. Process in waste management

Below table 8 shows a comparison between Serekunda and Nijmegen in terms of waste processing:

<table>
<thead>
<tr>
<th>Step</th>
<th>Serekunda</th>
<th>Nijmegen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage/Generation</td>
<td>Mainly organic and plastic waste, not a lot of waste generation in households</td>
<td>More waste generated, waste separated in the household</td>
</tr>
<tr>
<td>Collection</td>
<td>Donkey carts, KMC, private waste collectors, infrequent, own initiatives</td>
<td>Separated collection: plastic and metals, paper, organic, glass, different collection technique per city/district, clear and organised collection frequency (calendars), customization</td>
</tr>
<tr>
<td>Re-use</td>
<td>Residents reuse products, compost</td>
<td>Little reuse</td>
</tr>
<tr>
<td>Repair and re-use</td>
<td>Scavengers collect, repair and sell</td>
<td>Little reuse</td>
</tr>
<tr>
<td>Recycle</td>
<td>Scavengers collect and sell, metals, e-waste, plastics → Plastic Recycle Gambia</td>
<td>Waste = resource, separated waste valuable, biogas and compost from organic waste, business initiatives for recycling, waste transported to recycle factories</td>
</tr>
<tr>
<td>Incineration</td>
<td>Mostly done, wire burning, other waste burning, potential waste to energy business</td>
<td>ARN: for energy and heat, no open burning</td>
</tr>
<tr>
<td>Landfilling</td>
<td>Mostly done, illegal dumps, Bakoteh Dumpsite</td>
<td>Dumping when nothing else can be done with the waste, distant landfills, gas treatment residue from incineration, asbestos</td>
</tr>
</tbody>
</table>
Nijmegen could learn from Serekunda in terms of re-use. In Serekunda less waste gets generated, because products are reused more (Omar, 2019). Re-use is, as seen, important in waste reduction and stimulating a circular economy. But despite of the low waste generation, Serekunda still experiences lots of waste issues and Nijmegen doesn't. This is because in Nijmegen the waste is processed better. This shows that waste processing and management is more important for public space maintenance than the amount of generated waste. Serekunda can learn from Nijmegen in terms of processing, but Nijmegen in its turn can learn from Serekunda about reducing waste generation.

Collection policies from Nijmegen are really interesting for Serekunda and could be adopted. But before this, Serekunda must get more official workforces. There is a great need for more structure and clarity, because at this point, the unclarity causes people to take charge for themselves. And as stated above, this creates multiple structures that are difficult to picture, causing even less structure. But creating more structure and clarity via the KMC can be an impossible task to do, as corruption is institutionalised in the council (Kemo, 2019). Therefore, a new waste company that cooperates with the municipality but takes care of its own employees and money, like Dar, could be the way to more structure and clarity.

In Serekunda, little waste separation gets done by residents, and most waste separation happens by scavengers after dumping. In Nijmegen, lots of waste separation gets done by residents because of facilitation by the municipality and Dar. Multiple behavioural studies have been done in this city, which creates knowledge on how to change behaviour on separating. Customized policies for waste collection are a result of this. This knowledge and these policies can be used by Serekunda to change behaviour and also to raise awareness. Furthermore, the new recycling businesses in the Gambia need more governmental encouragement, following the example of Nijmegen. At this point, namely, the Gambian government is discouraging recycling businesses, either because of corruption or a lax attitude. For instance, incineration for energy can become a big business in Serekunda, that can solve the problem of Bakoteh Dumpsite. The KMC just has to sign the contracts and invest money for the project to start, but so far, nothing has happened. On the contrary, in Nijmegen the recycle industry is actually blooming because of the government. The government has set certain goals in terms of waste regulation and improvement, and businesses as well as the community are following the rules they set out.

The last big difference is the practise of dumping. In Serekunda, all waste in every kind of condition gets dumped in the middle of the city, surrounded by schools, hospitals, houses and a SOS children’s village. In Nijmegen, waste that is not useful for any other practise gets dumped. Dumpsites are located in sparsely populated areas, and the waste first gets packed safely before dumping. Serekunda should follow this idea and open a new dumpsite outside of the city, while closing down Bakoteh Dumpsite.
### 4.3.3. Important aspects in waste management

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Serekunda</th>
<th>Nijmegen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical possibilities</td>
<td>Tractors, new trucks from China, Plastic recycle Gambia, waste to energy</td>
<td>Different collection methods: separated collection, expensive residual waste bags, reversed collection, circular partners for waste distribution, organic waste for biogas and compost, waste to energy &amp; heat</td>
</tr>
<tr>
<td>Environmental aspects</td>
<td>Bad located dumpsite, air pollution by rubber/plastic burning, water pollution, water blockage, no protection</td>
<td>Clean streets, smoke filters for incineration, good air and water quality, water treatment plant circular heating, dumpsites in sparsely populated areas</td>
</tr>
<tr>
<td>Institutional aspects</td>
<td>Corruption</td>
<td>Lots of communication and transparency, behaviour studied by municipality, customization, regulation, contracts</td>
</tr>
<tr>
<td>Financial aspects</td>
<td>Lots of poverty, no idea where taxes go, corruption, Follow the Money, informal businesses</td>
<td>Wealth, transparency and clarity, contracts, money in waste, taxes for recycle, cost reduction when separating</td>
</tr>
<tr>
<td>Socio-cultural aspects</td>
<td>Inadequate education and awareness, lax, social media important</td>
<td>Behaviour studied by municipality, involved residents (voluntarism), creating involvement via communication and financial stimuli, media bad impression</td>
</tr>
<tr>
<td>Legal boundaries</td>
<td>Good laws, bad execution, empty promises</td>
<td>Big European and Dutch influence, laws are made, executed, reflected, adjusted, communication important, customization</td>
</tr>
</tbody>
</table>
The most important technical difference is technical development in the two cities. However, there are already starting some businesses with a higher technical development in the Gambia, but these are yet to be expanded (CEO Waste to Energy; Summary call Dawda, 2019). In the Netherlands, machines replace low-salary employees. There are too little people that want to work in waste processing for a low income, so technical innovations are necessary for waste processing to happen (Pouwel Inberg, 2019). But in Serekunda, people are interested in working for a low income, as the average monthly income in the Gambia is about 56 euros (Worldbank, 2017). So machines are unnecessary for processing of waste, as there are plenty of people that are possibly interested in working in this field. The fact that Serekunda has less technical development is therefore not a reason on why waste management is far behind, as there are enough possible employees for waste management.

Environmental differences between Serekunda and Nijmegen are, as expected, big. The analysed indicators like air and water quality are opposites, but one part that is resembling in some way, is that dumpsites are influencing a place negatively. Nijmegen has chosen for solving the negative influence of dumpsites by locating them in places where little people suffer from them. Serekunda, on the other hand, is still struggling with the Bakoteh Dumpsite in the middle of the city.

The institutional differences are combined with financial differences, as they are similar. The most important institutional and financial aspect in Serekunda is corruption, whereas in Nijmegen the most important one is communication. This is a reason why waste management is efficient in Nijmegen. Dar and the municipality have lots of contact with each other, and with residents as well as other involved parties. This is due to their special partnership, and because of the idea that open communication and transparency are the most effective ways to create efficient policies. Man can speak of unplanned smart regulation in waste management in Nijmegen, with communication as the most important factor. In Serekunda, corruption is a form of lacking communication, as parties take money and communicate unclearly where this money goes. This behaviour creates not only poor productivity, but also distrust and inefficiency. In this aspect, a lot can be learned from practises in Nijmegen.

The most important socio-cultural difference is awareness and communication towards residents. Communication is also the observed main factor that causes more involvement among residents. This involvement creates feelings of responsibility and causes that residents practise separation, which stimulates waste management efficiency. In Serekunda, there is little awareness and communication about waste. People are unaware of consequences of dumping and burning, and also about the benefits of waste separation. More communication in this aspect is therefore important.

Another interesting socio-cultural difference is imaging by the media. In Nijmegen, the media pictures that waste management has problems, while in reality it’s rather successful (Marcel Peters, 2019). And in Serekunda the media depicts waste management as improving and developing while in reality nothing is really done (Dawda, 2019).
There are big legal differences between Serekunda and Nijmegen as well, mostly in the field of law implementation and execution. Laws in Serekunda are well written and environmental friendly, but in reality the laws are not clearly executed. In Nijmegen goals and laws are designed by the Dutch government, and executed by the municipality. The difference between the two is that Serekunda does not have a leading government, and Nijmegen does. Therefore it is seen that in Serekunda the community takes care of itself, in the shape of bottom-up initiatives like donkey men and scavengers. In Nijmegen this is unnecessary, because the government takes the lead in creating a clean environment, with clean waste processing.
5. Conclusion and recommendations

The objective of this research was to get more insights on how to improve waste management regulation in Serekunda, the Gambia. This objective was formulated in the main question as: How could waste management regulation in Serekunda be improved, by comparing waste management in Serekunda to waste management in Nijmegen? In this chapter the main question will be answered, by answering the sub questions from paragraph 1.4.:

Waste management in Serekunda is done by both official and unofficial parties. In waste collection, the official parties lack structure, initiative and workforces, causing lots of unofficial parties to take charge for themselves. This is a big obstacle, as a tangle of parties in waste management creates unclarity and chaos. In waste processing, more regulated practises are recently taking place, like recycle businesses and plans for waste to energy. But the government is slowing down these initiatives, because of slow negotiations as well as corruption. Furthermore, corruption is also the main reason why money for waste management is scarce. Tax money meant for maintaining public space disappears, and authorities leave the public space the way it is, while saying and promising improvement to the people.

If waste management in Nijmegen should be described with one word, the word would be: communication. As seen in the theoretical framework, communication is the most important principle in Smart Regulation. This can be confirmed, because the efficiency of waste management in Nijmegen is indeed mostly due to good communication. The municipality, Dar and ARN are very involved in waste- and public space management, and have much contact with residents and other stakeholders. What is interesting, is that Nijmegen practises Smart Regulation by accident. All 5 principles are visible in waste management, only Nijmegen did not really design regulations based on these principles. Next to Smart Regulation, circularity in Nijmegen is developing, mostly because of governmental influence. The government creates financial incentives, so that more people are stimulated to separate waste, which improves efficiency for recycling, and also to think about developing circular initiatives.

As seen in Smart Regulation and in the case of Nijmegen, communication is really important in efficiency of waste management. But due to institutionalized corruption in Serekunda, aiming for better communication between the KMC and residents can be an impossible task. Therefore, a new waste collection business should arise as an intermediary between the KMC and the community, just like Dar in Nijmegen. Informal waste collectors and processors should be hired by this new business, as these workers are experts in their field and deserve to get a fixed income and more appreciation.
Furthermore, this business should use the district approach that Dar uses. The district approach focuses separately on every district in the city and customizes policies to make them suitable for different districts. This approach is context specific and can therefore be adopted in Serekunda. Also, if waste processing- and recycle businesses in The Gambia keep on growing, the new waste collection business could cooperate with those businesses for more efficient transportation of waste. And Serekunda should look into finding a new location for a dumpsite, where the new waste business could transport collected waste to. Public private cooperation between the government and a waste collection business that practises integrated sustainable waste management could be what is missing in the city of Serekunda. Such a business could not only attack waste issues, but also create jobs, more structure and more circularity. With a structured plan, proper management and some patience, wasting waste in Serekunda can finally become history.
6. Bibliography


Inberg, P. (2019, May). Head advisor and relations manager of Dar. (I. Bertens, Interviewer)


Jallow, D. N. (2019, April). Environmental health student, member of Follow the Money. (I. Bertens, Interviewer)


7. Appendix

Process waste management explanation of figure 8.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Actors</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>Material Supplier</td>
<td>Raw material, energy</td>
</tr>
<tr>
<td>Production</td>
<td>Manufacturer</td>
<td>Supply, capital, knowledge</td>
</tr>
<tr>
<td>Retail</td>
<td>Retailer</td>
<td>Product, marketing</td>
</tr>
<tr>
<td>Use</td>
<td>Consumer</td>
<td>Product</td>
</tr>
<tr>
<td>Re-use</td>
<td>Consumer</td>
<td>Product</td>
</tr>
<tr>
<td>Recover and re-use</td>
<td>Manufacturer, Consumer</td>
<td>Product, recovery equipment</td>
</tr>
<tr>
<td>Dismantle and recycle of product → new production</td>
<td>Manufacturer</td>
<td>Supply, capital, knowledge</td>
</tr>
<tr>
<td>Fuel generation (Bio-gasses, heat, electricity, compost)</td>
<td>Waste companies</td>
<td>Non-recyclables, e.g. food waste or out-used products</td>
</tr>
<tr>
<td>Landfilling</td>
<td>Waste companies</td>
<td>Products that cannot be reused or burned</td>
</tr>
</tbody>
</table>

Table: ISWM part 2 (WASTE, 2001)

The first step in production is to supply raw materials and energy to make a certain product. When this raw material and energy is supplied, a manufacturer with enough capital and knowledge can start making a product. Then, the product can be sold to consumers, who use the product. When this consumer is done with usage, the product can be reused, either by the same consumer for another purpose, or by another consumer. After re-usage, if the product is damaged or broken, the product can be repaired by the manufacturer and then again be reused.

When it’s not possible to repair the product, it can be dismantled and parts can be recycled for new production. Parts or products that can’t be used for new production can be incinerated, and out of incineration energy or heat can be gained. The final step that can be taken is landfilling or dumping, and can be done when incineration of products is ineffective.
Summary call Dawda

In the interview with Dawda we spoke about a new plastic recycling company. Dawda said that he was planning on visiting this company to see what it’s about, and I asked him to update his findings to me. Before he went to this site, he sent me an article from Het Financieele Dagblad about Han Stiphout and a new recycling business in the Gambia (Hueck, 2019). Later, it turned out that the site he was visiting was actually started by Han Stiphout. A young Gambian man called Ali Wazza Sow is the owner of this recycling company and works together with Stiphout. The concept of this business is that people collect plastics and bring it to this site, where they get paid some Dalasi for the certain amount of plastic they give. The company has mostly female employees that clean these plastics, and after cleaning, the plastic get shredded and put into bags for transportation to companies that need plastics as a resource. The business therefore attacks two problems: poverty and plastic waste nuisance. Dawda told me that the government is kind of thwarting this new business. Every now and then people from the government come by the recycling plant and ask for money to Ali Wazza Sow. The government says this is tax money, but there are no documents or receipts to prove so. After calling Dawda I made a summary of the most important thing of our call and asked Dawda to confirm, and he did:

“So once again: there is a great plastic recycle business starting up where local and very poor people benefit + it helps the Gambia get rid of waste issues, and yet the government is discouraging this by UNOFFICIAL random fees without receipts
They say they are helping and “wanting to save the environment” but when someone is actually doing this himself, they want to stop it instead of helping to move forward”
So once again there is a great plastic recycle business starting up where local and very poor people benefit – it helps the Gambia get rid of waste issues, and yet the government is discouraging this by UNOFFICIAL random fees without receipts.

They say they are helping and “wanting to save the environment” but when someone is actually doing this himself, they want to stop it instead of helping to move forward.

Can you confirm this?