The waste management situation of Pathein (Myanmar), Pereira (Colombia) and Sèmè-Podji (Benin): a technical and governance snapshot

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We believe it is the responsibility of all - government, business, academia and citizens - to strive for a healthy, inclusive and liveable world.

July 2022

Abstract

Waste management is a core human activity and if done properly contributes to quality of life and good health. In a broader sense, waste management plays a role in the achievement of all sustainable development goals. However, waste issues and challenges are influenced by their socioeconomic and geographic context. Therefore, solutions need to be tailored to the specific conditions of each area. In turn, sufficient and good quality data on the local waste context are required for the selection and design of appropriate waste management methods and solutions. This information is often scarce and scattered. This is the case of the cities of Pathein (Myanmar), Pereira (Colombia) and Sèmè-Podji (Benin), which have taken part in the international cooperation programme DEALS "Governance of Inclusive Green Growth in Cities" (2017 - 2022) implemented by VNG International and financed by the Netherlands government. In these cities the DEALS programme has partly aimed at closing this data gap and at providing decision-makers and key stakeholders with knowledge in order for them to improve the waste situation in their city. This paper summarizes the result of this effort by presenting a snapshot of the waste management situation in the three cities. The article presents technical indicators on waste generation, composition, collection and disposal. It also discusses waste governance and waste finance issues specific to each city. Furthermore, it compares the cities among themselves and against national and regional indicators, particularly those available in the World Bank's "What a Waste 2.0" report from 2018. Among others, we found that the three cities have a per-capita waste generation rate higher than their corresponding national average. On the contrary, recycling rates are below the averages for their respective countries. Informal recyclers - waste pickers - are common in the three cities. The paper also describes some activities undertaken in the cities in order to improve their waste management practice and make it more inclusive.

Contents

1 Introduction

Waste management is an issue that affects all aspects of sustainable development. Minimizing food waste can contribute to reduce hunger (SDG 2). Adequate waste handling is a requirement to guarantee good health (SDG 3) and clean water (SDG 6), to develop sustainable cities and communities (SDG 11), and to preserve life below water (SDG 14) and land (SDG 15). Minimizing waste generation relates to responsible consumption and production (SDG 12), which can also contribute to mitigate climate change (SDG 13). Alternatives like waste-to-energy can contribute to the provision of affordable and clean energy (SDG 7). And, finally, reusing and recycling waste is a key component of a transition towards a circular economy, which is linked to the creation of decent work and economic growth (SDG 8) and the reduction of inequalities (SDG 10).

Inarguably there is a need to properly manage and reduce our waste, as well as for decoupling economic and population growth from waste production. Currently, waste generation growth is about to outpace population growth with the continuously increasing rate of consumption, following the linear economic paradigm [1]. Low-income countries are expected to have a threefold increase in the amount of generated waste by 2050. In the same period, daily per capita waste generation in low and middle-income countries is anticipated to increase by approximately 40%. The projection for high-income countries in an increase of 19% [1].

Overall, societies are rapidly developing without adequate systems to manage the growing amount and changing composition of the waste generated [1]. While high-income countries have achieved high rates of waste collection (above 95%) and recycling (29%), in low-income countries collection and recycling rates are on average 39% and 3.7% respectively. Lower-middle and upper-middle income countries lie in between regarding collection, yet, recycling rates are still low - 6% and 4% respectively. In low-income countries, open dumping is still the predominant disposal method (93%) even though it is estimated that waste management on average accounts for 20% of municipal budgets. The situation gets exacerbated when considering that low-income countries exhibit rapid growth, intensifying the urgency for mechanisms and financial funds to improve waste management.

Proposing solutions to improve the waste management systems is not a simple task, even less with the pressing need to transit towards a circular economy. The solutions require an understanding of the local context, among others because waste composition, status of the system and its governance structure vary across municipalities, countries and regions. As stated by Kaza et al. [2] "*Waste management data are critical to creating policy and planning for the local context. Understanding how much waste is generated – especially with rapid urbanization and population growth – as well as the types of waste being generated, allows local governments to select appropriate management methods and plan for future demand. This knowledge allows governments to design systems with a suitable number of vehicles, establish efficient routes, set targets for diversion of waste, track progress, and adapt as waste generation patterns change. With accurate data, governments can realistically allocate budget and land, assess relevant technologies, and consider strategic partners, such as the private sector or nongovernmental organizations, for service provision.*" Nevertheless, it is common that cities lack adequate information - in quantity and quality - supporting waste management decision-making processes.

The DEALS programme "Governance of Inclusive Green Growth in Cities" supports integrated and inclusive multi-stakeholder governance processes in partner municipalities. Three different medium-sized and fast-growing cities of the global south were chosen: Pathein (Myanmar), Pereira (Colombia) and Sèmè-Podji (Benin). Specific focus of the cooperation was tailored to local priorities, yet having waste management challenges was something these three cities share. For each city, a study was done describing the waste management

system from a technical and governance perspective. Each paper consolidated available data and information and documented the existing data gaps. This article summarizes these three studies. The original papers were written in English for Pathein, Spanish for Pereira and French for Sèmè-Podji; the latter two were translated to English, and are all made available by VNG International.

With these studies DEALS seeks to contribute to filling the knowledge and data gap in order to support decision-makers and foster partnerships beneficial to the urban marginalized. The article follows a similar structure to the World Bank report "What a Waste 2.0" from 2018 in order to make the data as far as possible comparable and accessible to the international community, and to allow for a benchmark with the state-of-the-art information for the cities' countries, regions and income level. In line with the DEALS programme goal, the article aims to provide local, regional and national governments, academia, nongovernmental organizations and citizens with information that support decision-making processes, raise awareness, contribute to knowledge building and research, and help to focalize resources that promote a transition towards circularity.

In Pathein, open-dumping of waste is still a common practice. This contributes to aggravating the recurrent flooding situation in low-lying wards with poor inhabitants and informal settlers. The estimated 100 tons of waste that enter Myanmar's Ayeyarwady river every day make it one of the most polluted rivers in the world. The river discharges into the Andaman Sea and the pollution can therefore enter the food chain [3]. Furthermore, the existing landfill is considered to be already full and is leaking waste and leachate into the surrounding area.

In Pereira, though waste collection rates are high, recycling is low. Most of the waste is technically landfilled in a site which lifetime is projected to end in 2028 [4]. Furthermore, the financing system regulated at the national level encourages landfilling over recycling or composting. Recycling has traditionally been performed by informal waste pickers, who are currently undergoing a formalisation process to become competitive waste companies by 2024.

In Sèmè-Podji, after flooding, waste management ranks second among the sustainability problems [5]. Nevertheless, these two phenomena interact; waste obstructs run-off water from draining away, thus contributing to flooding. Furthermore, waste is used by citizens to fill in the marshy areas to build their homes. In 2013, 78.1% of households in the city threw their waste onto open spaces, illegal dumps or the street.

1.1 Notes on the Data

- The article mainly concerns municipal solid waste which comprises residential, commercial and institutional waste following the definition used in the "What a Waste 2.0" report. For the industry, only the waste resulting from their

institutional/office activities was considered. Special waste fractions – medical, hazardous, electronic and construction and demolition – are not covered in this article.
- In general, the data must be interpreted with caution since it could be influenced by inconsistencies in definitions and methodologies in the original sources or by the judgement of local experts. Also, data are not standardized to a single year.
- When presenting numbers from the "What a Waste 2.0" report and the year of the data is not clearly specified in this study, we have used the year 2018 (the publication year).
- When presenting distributions or compositions, these sometimes do not add up to 100% or exceed 100%. This is due to inconsistencies in the original sources or lack of data.
- In many cases we extracted direct texts from the cities' articles written during the DEALS programme with the intent of avoiding further interpretation of the original research.
- The data for Pathein was collected prior to the military coup in Myanmar on February 1st, 2021. Hence, this article does not reflect the changes in local government structures of Myanmar that have taken place since then.

2 Geography and Socioeconomics

Each of the cities studied in this article is located in a different continent (Table 1). By 2020, according to the World Bank classification [6], two of the cities were in lower-middle-income countries[1] – Pathein and Sèmè-Podji – and the third one was located in an upper-middle-income country – Pereira.

Pereira and Sèmè-Podji exhibit high urbanization rates (above 65%) and it is very likely that Pathein has more than 50% of the population living in urban areas (Table 2). The three cities exhibit larger urbanization rates than their corresponding national averages.

Table 1. Geographical location of cities.

City	Country Region	Country	World Region	Income Level
Pathein	Ayeyarwady	Myanmar	East Asia and Pacific	Lower-middle income
Pereira	Risaralda	Colombia	Latin America and the Caribbean	Upper-middle income
Sèmè-Podji	Ouémé	Benin	Sub-Saharan Africa	Lower-middle income

1 Countries are classified each year on July 1, the start of the World Bank fiscal year, based on GNI per capita data (World Bank Atlas method) for the previous calendar year. For the Fiscal Year 2022 the classification uses GNI per capita for 2020.

Table 2. Population and urbanisation by city and country.

City/ Country	Population	Urban Population	Year	Source
Pathein	380,985	49.20%	2014	Census as reported by [3]
Pereira	467,269	82.60%	2018	National Census [7]
Sèmè-Podji	280,241	68.10%	2021, 2013	Population projections by DEALS Experts; Urban Population in 2013 as reported by [5]
Myanmar	54,410,000	31.0%	2020	United Nations, Population Division [8]
Colombia	48,258,494	77.1%	2018	National Census [9]
Benin	12,123,000	48.0%	2020	United Nations, Population Division [8]

Despite of Colombia being a country with higher income, almost threefold and fivefold with respect to Benin and Myanmar (Table 3 on Gross Nation Income), it is also a less egalitarian one (Table 4 on the Gini index[2]) [10], [11]. Out of the three countries, Myanmar stands as the more egalitarian one, and lies in between the other two regarding income.

There are no available data for Pathein and Sèmè-Podji for the Gini index. Pereira reports a Gini index of 41.6, which stands below the national level. Pereira is classified as the second least unequal city of Colombia.

Table 3. Gross National Income GNI* by country and region in 2019 (US$/cap).

Country / Region	GNI
Myanmar	5,210
Colombia	15,140
Benin	3,390
East Asia and Pacific	18,401
Latin America and the Caribbean	16,020
Sub-Saharan Africa	3,765

*Expressed in current international dollars converted by purchasing power parity (PPP) conversion factor.

Table 4. Gini index by country.

Country	Gini index	Year
Myanmar	30.7	2017
Colombia	51.3	2019
Benin	47.8	2015

2 A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

3 Waste Management Snapshots

3.1 Waste Generation

3.1.1 Key Insights

- Pathein and Sèmè-Podji with 0.66 kg/cap/day and 0.40 kg/cap/day respectively have a waste generation rate below the 0.79 kg/cap/day world's average [2]. Pereira's rate of 0.99 kg/cap/day is above this average.
- The three cities have a per-capita waste generation larger than their corresponding national average.
- Both Pathein and Sèmè-Podji are located in lower-middle income countries, yet the first one has a generation rate that corresponds to an upper-middle income country and the second one has a rate that matches the one of a low-income country.
- A higher level of urbanisation (Figure 1) or a larger level of inequality (Figure 2) do not necessarily lead to a larger rate of waste generation. However, there is a positive direct correlation between the Gross National Income and the waste generation rate (Figure 3), which is consistent with the findings from the World Bank [1].

3.1.2 Pathein

The waste generation of Pathein at the per capita level almost doubles (1.7 times) the average generation in the country (Table 5). This is consistent with the global trend towards a higher waste generation with higher levels of urbanization. The share of urban population in Pathein is almost 1.6 times larger than the national average. Furthermore, the generation of waste in the city is higher than the average of the East Asia and Pacific region. It stands closer to the average in upper-middle income countries rather than the one in lower-middle income countries where Myanmar is classified.

Table 5. Waste generation in Pathein and the region.

Location	Kg/cap/day	Year	Source	Observation
Pathein	0.66	2021	DEALS Programme [3]	Estimated by DEALS Experts
Myanmar*	0.38	2020	Jeske et al. [12]	
East Asia and Pacific	0.56	2016	What a Waste 2.0	
Lower-middle income countries	0.53	2016	What a Waste 2.0	

* For Myanmar, Jeske et al. [12] report an urban waste generation of 0.58 kg/capita/day in 2020, while the What a Waste 2.0 study reports a generation of 0.39 kg/capita/day in 2016 for the whole country (urban and rural).

Figure 1. Waste generation per capita with respect to the urban population, by city.

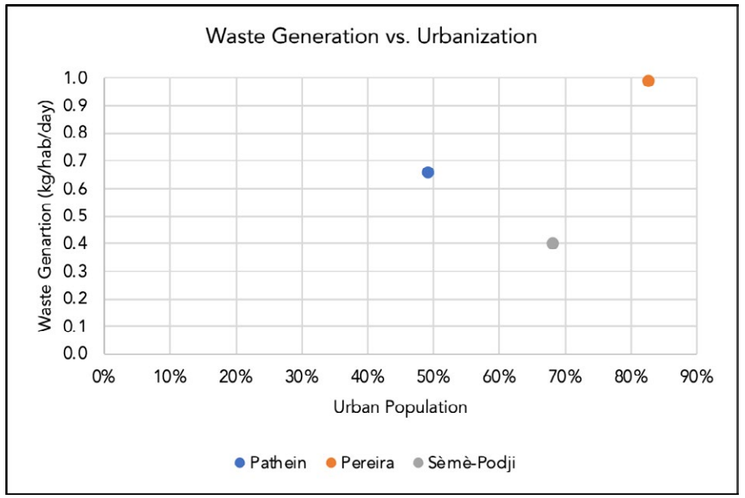


Figure 2. Waste generation per capita with respect to the Gini coefficient of the country, by city.

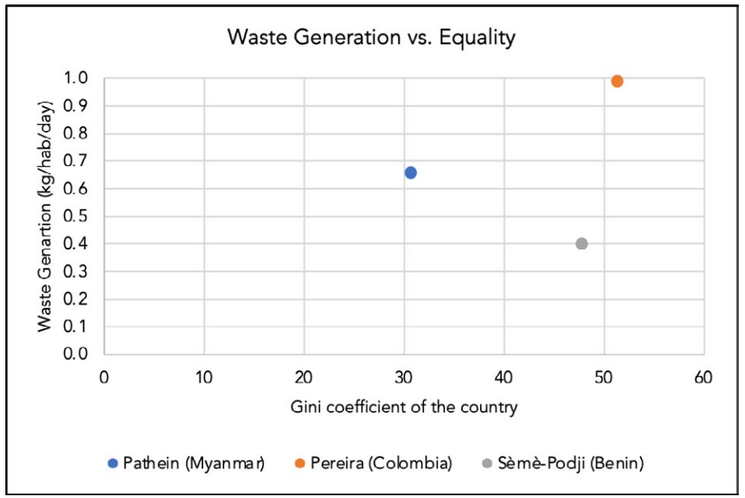
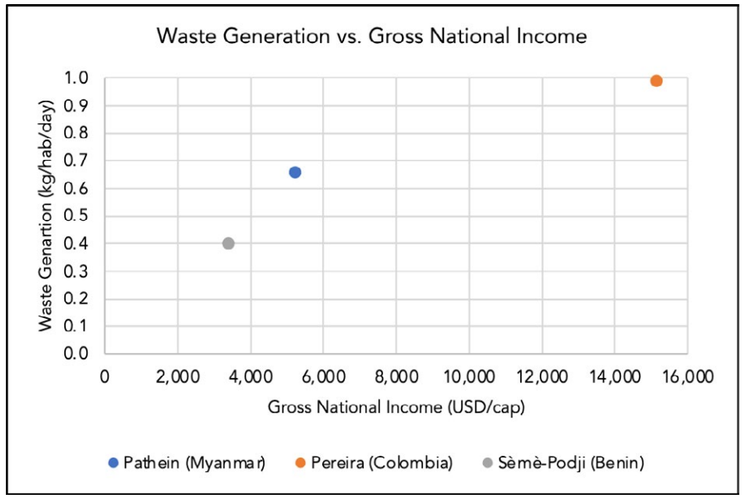


Figure 3. Waste generation per capita with respect to the Gross National Income of the country, by city.



3.1.3 Pereira

Pereira, which has a higher urbanisation level than Colombia's average, has a waste generation rate higher than the national average (Table 6). The city's rate corresponds to the average in the Latin America and the Caribbean region. Furthermore, it is above that of an upper-middle country but it does not reach the average for a high-income country.

Table 6. Waste generation in Pereira and the region.

Location	Kg/cap/day	Year	Source	Observation
Pereira	0.99	2019	DEALS Programme [4]	Estimated by DEALS Experts
Colombia	0.76	2016	What a Waste 2.0	
Latin America and the Caribbean	0.99	2016	What a Waste 2.0	
Upper-middle income countries	0.69	2016	What a Waste 2.0	

3.1.4 Sèmè-Podji

The city has a per-capita waste generation rate slightly above the country's average and similar to the one in the Sub-Saharan Africa region (Table 7). Furthermore, this generation rate corresponds to the one of a low-income country - 0.4 kg/cap/day [1] - rather than one of a lower-middle income country, which Benin is.

Table 7. Waste generation in Sèmè-Podji and the region.

Location	Kg/cap/day	Year	Source
Sèmè-Podji	0.40	2012	Carrefour Environment et GEO-Environnement in [5]
Benin	0.35	2016	What a Waste 2.0
Sub-Saharan Africa	0.46	2016	What a Waste 2.0
Lower-middle income countries	0.53	2016	What a Waste 2.0

3.2 Waste Composition

3.2.1 Key Insights

- The contribution of organic waste in Pathein (74.1%) is closer to the average of a low-income country rather than a lower-middle income country. On the contrary, for Pereira this contribution (33.1%) resembles the one of a high-income country rather than an upper-middle income country.
- There is no available information on waste composition for the city of Sèmè-Podji. At the country level the available data for Benin corresponds to the year 2008 and reports a share of recyclable and organic waste of 13.6% and 49.6% respectively.
- The organic share of the waste decreases at the same rate as urbanization (Figure 4) or the income level increases (Figure 5). On the other hand, the share of recyclable materials[3] increases at the same rate as urbanisation and income increase. These findings are consistent with those from the What a Waste 2.0 report [1].

3 Recyclables: glass, metal, paper, cardboard and plastic.

Figure 4. Share of organic and recyclable waste with respect to the urban population, by city.

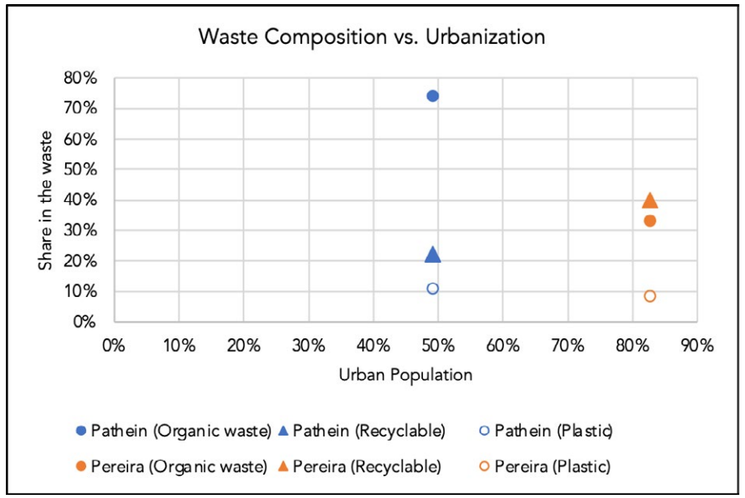
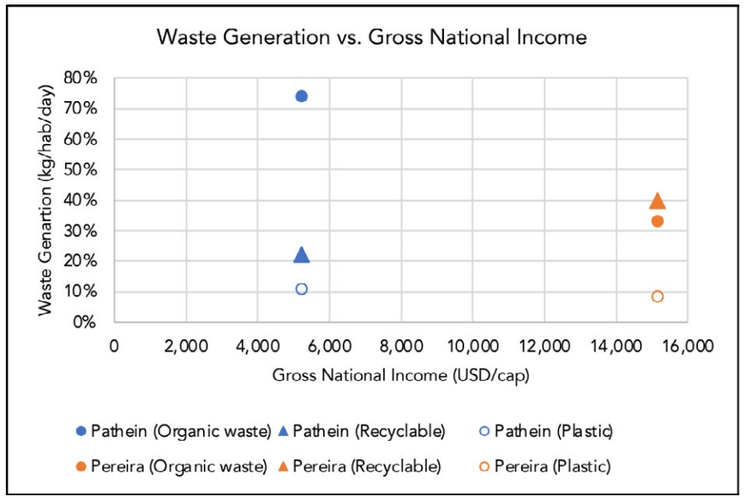


Figure 5. Share of organic and recyclable waste with respect to the country Gross National Income, by city.



3.2.2 Pathein

Organic waste – 62% garden waste and 12% food waste – dominates the composition of waste in Pathein and it is much higher than the average for the country, the region and countries in the lower-middle income (Table 8). In fact, the large amount of organic waste does not correspond to the averages of countries in any income level – being the highest share the one of low-income level countries (56%) [1].

The content of recyclable waste is low (22.3%). Plastic, paper and cardboard contributes altogether to almost 21% of the waste generated. The plastic content is about the same as the average in the East Asia and Pacific region and in lower-middle income countries.

Table 8. Waste composition in Pathein and the region.

Location	Organic (food and green)	Glass	Metal	Paper and cardboard	Plastic	Rubber and leather	Wood	Other	Year
Pathein*	74.1%	0.5%	1.2%	9.8%	10.8%	0.4%		3.2%	2019
Myanmar**	53.0%								2020
East Asia and Pacific***	53.0%	2.6%	3.0%	15.0%	12.0%	0.4%	2.0%	12.0%	2018
Lower-middle income countries***	53.0%	3.0%	2.0%	12.5%	11.0%	0.5%	1.0%	17.0%	2018

* From Thant Myanmar as report in by Kirstein Møller and Muller [3].
** From Jeske et al [12] as report in by Kirstein Møller and Muller [3].
*** What a Waste 2.0

3.2.3 Pereira

Pereira has a share of organic waste that is almost half the share of the national average; it is also below the average for the Latin America and the Caribbean region and for an upper-middle income country (Table 9). Its organic waste (33%) resembles that one of a high income country (32%) [1]. Regarding the recyclable waste, paper and carboard make the largest fraction (25.1%) and it is almost fourfold the national average and about twofold the average in the Latin America and the Caribbean region and upper-middle income countries. The content of plastic is lower than the national and the region averages; it stands between the averages of upper-middle income and low-income countries.

Table 9. Waste composition in Pereira and the region.

Location	Organic (food and green)	Glass	Metal	Paper and cardboard	Plastic	Rubber and leather	Wood	Other	Year
Pereira*	33.1%	5.9%	0.7%	25.1%	8.3%	10.0%	0.3%	16.7%	2014
Colombia**	61.5%	2.4%	1.0%	6.6%	10.8%	2.7%	0.5%	14.4%	2015
Latin America and the Caribbean***	52.0%	4.0%	3.0%	13.0%	12.0%	0.5%	0.5%	15.0%	2018
Upper-middle income countries ***	54.0%	4.0%	2.0%	12.0%	11.0%	1.0%	1.0%	15.0%	2018

* From the Municipal Solid Waste Management Plan as report by Jaramillo and Vásquez [4].
** From the Inter-American Development Bank (2015) as report by the National Council on Economic and Social Policies [13]. The numbers correspond to the average composition of the waste in the four largest cities of Colombia.
*** What a Waste 2.0

3.2.4 Sèmè-Podji

There are no data for the composition of the waste generated in the city. The available information corresponds to the country and dates back to 2008 (Table 10). By then, Benin had a participation of organic waste larger than the current one for the Sub-Saharan Africa region and slightly lower than the current one for a lower-middle income country. The content of recyclable material in the waste was very low except for plastic which corresponds to the present regional level.

Table 10. Waste composition in Sèmè-Podji and the region.

Location	Organic (food and green)	Glass	Metal	Paper and cardboard	Plastic	Rubber and leather	Wood	Other	Year
Benin*	49.6%	0.5%	1.4%	2.7%	9.0%	3.1%		33.7%	2008
Sub-Saharan Africa**	43.0%	3.0%	5.0%	10.0%	8.6%		0.4%	30.0%	2018
Lower-middle income countries**	53.0%	3.0%	2.0%	12.5%	11.0%	0.5%	1.0%	17.0%	2018

* From the National Waste Management Strategy as report by DEALS Experts [5].
** What a Waste 2.0

3.3 Waste Collection

3.3.1 Key Insights

- Pereira and Sèmè-Podji present high collection rates above the average of their respective countries, regions, and income levels.
- The collection frequency in Pathein ranges between one to three times per week. In Pereira the average frequency is two times per week.
- Higher levels of urbanisation positively correlate to higher collection rates (Figure 6). Nevertheless, a higher income level not necessarily yields a better collection rate (Figure 7). These findings must be interpreted with caution since some authors estimate Pathein's collection rate to be higher, while others estimate Sèmè-Podji's rate to be lower.
- In Pathein, the collection services are provided directly by the municipality. In Pereira, the service is provided door-to-door by several private companies in addition to waste picker organisations. In Sèmè-Podji the collection is performed by contractors of a state-owned company.

Figure 6. Waste collection rates with respect to the urban population, by city.

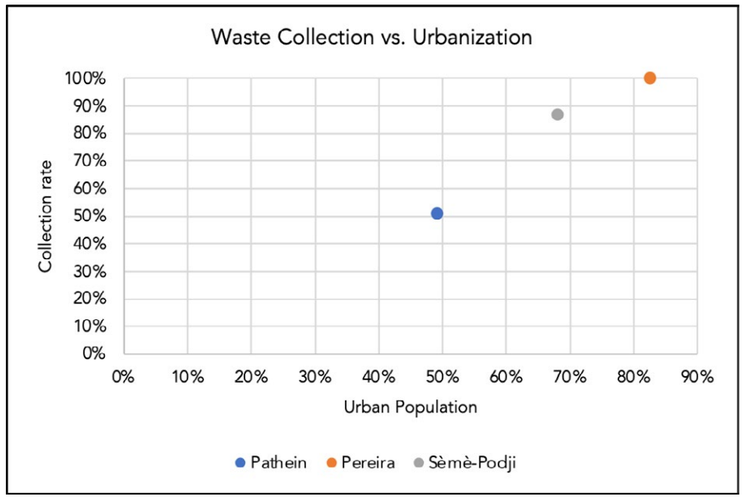
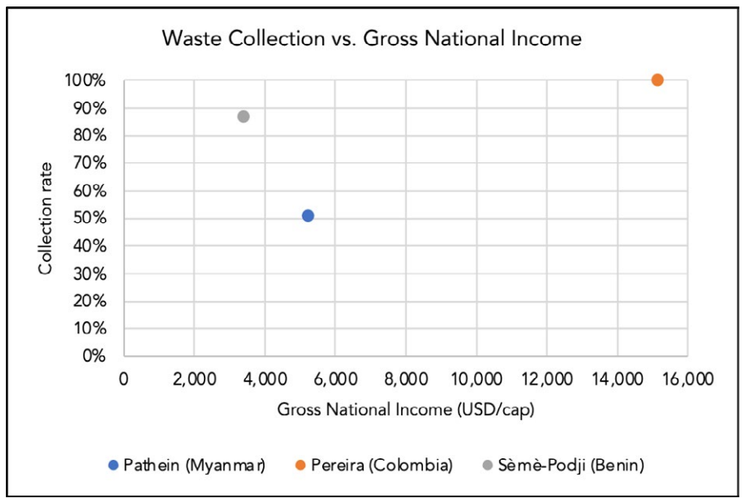


Figure 7. Waste collection with respect to the Gross National Income of the country, by city.



3.3.2 Pathein

The collection rate for Pathein corresponds to that of a lower-middle income country (Table 11). However, Kirstein Møller and Muller [3] state that "the actual collection rate is likely higher as the informal sector collects a significant part of the recyclable waste". Jeske and colleagues [12] estimated that 75% to 85% of waste is collected in Myanmar's secondary cities; 10-12% is done by the informal sector. In this case, the collection rate in Pathein would be closer to the average one in the East Asia and Pacific region. The average collection rate at national level is not available.

The collection frequency varies widely across areas in the city. The municipality provides direct collection services, ranging from one to three times a week. The city employs a fleet of 9 trucks, 13 three-wheelers, 4 hook-lift trucks - which empty twenty 22 m3 waste storage bins throughout the city each day - and has a network of 10 660-liter public waste bins [3].

Table 11. Collection rate in Pathein and the region.

Location	Collection Rate	Year	Source	Observation
Pathein	51%	2021	DEALS Programme [3]	Estimated by DEALS Experts averaging different metrics.
East Asia and Pacific	71%	2018	What a Waste 2.0	
Lower-middle income countries	51%	2018	What a Waste 2.0	

3.3.3 Pereira

The collection coverage of Pereira is estimated at 100% (Table 12), which is above the national average and similar to other Colombian cities. The What a Waste 2.0 study reports collection rates of 100%, 99% and 99% for the cities of Bogotá, Cali and Medellín respectively. Geographically, the city of Pereira is located in between these three cities.

Waste is collected by four different types of actors:

i. Four (4) large waste companies that collect mixed waste, typically in compactor trucks. The collection system is door to door with an average

frequency of two times per week. These companies dispose of the waste in the sanitary landfill of the city. One (1) of these companies also has a branch that only collects recyclable waste.

ii. Six (6) formalising waste picker organisations that compete for the recyclable waste fractions with the former waste companies. These organisations associate about 300 waste pickers who collect the waste by foot, using three-wheelers, pickup trucks and lorries.

iii. Two (2) private waste companies that only collect recyclable waste.

iv. Informal waste pickers who only collect recyclable waste. There are no clear statistics on this group.

Table 12. Collection rate in Pereira and the region.

Location	Collection Rate	Year	Source	Observation
Pereira	100%	2021	DEALS Programme	Estimated by DEALS Experts to be nearly 100%
Colombia	> 95%	2018	What a Waste 2.0	The year of the data is not specified
Latin America and the Caribbean	84%	2018	What a Waste 2.0	
Upper-middle income countries	82%	2018	What a Waste 2.0	

3.3.4 Sèmè-Podji

Sèmè-Podji presents a high collection rate corresponding to the average of an upper-middle income country. The current rate is almost twofold the average in the Sub-Saharan Africa region (Table 13). This high rate (87%) must be interpreted with caution since it is based on estimates on the landfilling rate. The Communal Hygiene and Sanitation Plan, as cited in [5], estimated that 24% of households subscribed to the waste collection service in 2014. The World Bank [1] reports a collection rate of 50% for Cotonou and of 25% for Porto Novo, which are neighbouring municipalities.

The collection service is provided by a state-owned company (see Chapter 4.4). The city is equipped with Intermediate Collection Points (IWPs), tricycles, waste collection lorries and a transfer centre. The tricycles are not in use, and some of the IWCPs are not operational because they are not accessible due to the state of the access roads.

Table 13. Collection rate in Sèmè-Podji and the region.

Location	Collection Rate	Year	Source	Observation
Sèmè-Podji	87%	2021	DEALS Programme [5]	Based on the landfill rate reported by the Greater Nokoué Waste Management and Urban Health Company
Sub-Saharan Africa	44%	2018	What a Waste 2.0	
Lower-middle income countries	51%	2018	What a Waste 2.0	

3.4 Waste Disposal, Treatment and Recycling

3.4.1 Key Insights

- The three cities report landfilling practices which are better or above their respective national averages. Nevertheless, open-dumping of the waste is still a common practice in Pathein and Sèmè-Podji.
- The three cities report recycling practices. For Pathein and Sèmè-Podji these are mainly informal while Pereira presents a mix of formal and informal recycling. Pathein and Pereira have recycling rates that are below their respective national averages. For Sèmè-Podji there are no estimates on the recycling rate.
- The landfill in Pathein is considered full and mismanaged – waste and leachate leak into the surrounding area. Pereira deposits the waste in a technically managed sanitary landfill which lifetime is expected to end in 2028. Sèmè-Podji disposes its waste in a controlled landfill, which is being upgraded into a technical one.

3.4.2 Pathein

The city landfills around half of the waste, while it is estimated that 30% to 40% of the waste leaks into the surrounding area (Table 14). The landfilling rate is slightly above the average in the East Asia and Pacific region and much higher than in lower-middle income countries. Consequently, the fraction of open-dumped waste is below the average for lower-middle income countries but it is still higher than in upper-middle income countries.

Table 14. Waste treatment, disposal and recycling in Pathein and the region.

Location	Recycling	Composting	Incineration	Sanitary landfill	Controlled landfill	Landfill unspecified	Open dump	Year
Pathein*	12.0%					51.0%	40.0%	2021
Myanmar**	20.0%						30.0%	2021
East Asia and Pacific***	9.0%	2.0%	24.0%	0.5%	0.5%	46.0%	18.0%	2018
Lower-middle income countries***	6.0%	10.0%				18.0%	66.0%	2018

* Estimates by DEALS Experts. The study reports between 10-12% recycling and 30-40% of leakage. The leakage was classified as open dump in this article.

** From Jeske et al (2021) as report in by Kirstein Møller and Muller [3]. The recycling is reported as informal. The 30% is reported as leakage.

*** What a Waste 2.0

The recycling rates are below the national average but above the rates in the East Asia and Pacific region and lower-middle income countries. As reported by Kirstein Møller and Muller [3], it is estimated that around 1,000 tons per month were recycled in 2019 by a network of 17 legal “junk shops” spread throughout the city. These junk shops collect recyclable materials from informal waste pickers based in the city as well as in villages from around Ayeyarwady region. The junk shops, which act as low-level aggregators, send the recyclable materials to wholesalers in Yangon or to a small local recycling plant in Pathein that makes plastic pellets. Some junk shops clean and shred the materials.

The landfill is located at 2.55 km of the city centre. It was opened 50 years ago and is already considered to be full. Its lifespan is being extended by shovelling waste to the side. Kirstein Møller and Muller [3] reports that “the landfill is effectively unmanaged since there are no waste handling facilities such as leachate collection, weighbridges, or trenches with soil sealing… …with waste and leachate clearly leaking into the surrounding areas”.

3.4.3 Pereira

Pereira mainly disposes of its waste in a sanitary landfill. Pereira's landfilling rate is above the national average and the average for the Latin America and the Caribbean region as well as for upper-middle income countries (Table 15). The recycling rate is nearly 2%; far below the national average, and the average for the region and the upper-middle income countries. In comparison, the What a Waste 2.0 study mentions that Bogotá and Medellín present recycling rates over 15%. Despite the low rates of recycling, there was an increase of almost 600% in formal recycling since 2018. Because no data is available on informal recycling.

The recycling rate reported in Table 15 only accounts for the formal recycling performed by the six organisations of waste pickers mentioned in Chapter 3.3.3. The actual recycling rate is likely higher since there is a network of informal waste pickers and junk shops on which no data exist. As a result, the landfilling rate is expected to be lower.

The city's landfill is located at about 8 km from the city centre and it is expected to be full by 2028.

Table 15. **Waste treatment, disposal and recycling in Pereira and the region.**

Location	Recycling	Composting	Incineration	Sanitary landfill	Controlled landfill	Landfill unspecified	Open dump	Year
Pereira*	1.8%			98.2%				2021
Colombia**	17.2%			89.0%			4.0%	2011
Latin America and the Caribbean **	4.5%	0.2%		52.0%	15.0%	1.5%	26.8%	2018
Upper-middle income countries**	4.0%	2.0%	10.0%			54.0%	30.0%	2018

* Estimates by DEALS Experts using official national data.

** What a Waste 2.0. Numbers add up to more than 100%.

3.4.4 Sèmè-Podji

By 2021, it was estimated that Sèmè-Podji disposed about 87% of its waste in a controlled landfill (Table 16). However, by 2013, the National Institute of Statistics reported that 78.1% of the households threw their waste in open spaces, illegal dumps or on the street.

There are no data available on the amount of recycling for the city, yet it is known that a network exists for the recovery of plastic materials, bottles and scrap metal. There is also a small amount of production of agricultural fertilizers in the form of compost. The World Bank [1] reported that 25% of the waste was recycled in Benin in 2008.

Table 16. Waste treatment, disposal and recycling in Sèmè-Podji and the region.

Location	Recycling	Composting	Incineration	Sanitary landfill	Controlled landfill	Landfill unspecified	Open dump	Year
Sèmè-Podji *					87.0%			2021
Benin**	25.0%							2008
Sub-Saharan Africa **	6.6%	0.4%		1.0%	11.0%	12.0%	69.0%	2018
Lower-middle income countries**	6:0%	10.0%				18.0%	66.0%	2018

* From Greater Nokoué Waste Management and Urban Health Company as report by DEALS Experts [5].

** What a Waste 2.0

This landfill is being upgraded to a sanitary landfill.

4 Governance of the Waste System

4.1 Key Insights

- The three cities all fall under a national regulatory waste management framework of their country. In all three countries the local governments are responsible for the management of the waste – collection and treatment/ disposition of it while national institutes oversee these activities.
- Despite of the local government's responsibility for waste management, in practice, the provision of the service is done by several private companies in Pereira, following a free competition scheme. In Sèmè-Podji, a state-owned company which collaborates with and supports the local government conceded the service provision to local enterprises. Only in Pathein the municipality itself is fully in charge of the service.
- Colombia has specific regulations for the formalisation of recyclers. Informal waste pickers are encouraged to organize themselves and become waste companies dedicated to recycling.
- In planning the waste management activities, national, regional and local plans coexist. Myanmar has a National Waste Management Strategy and Action Plan, which the Ayeyarwady region, where Pathein is located, has adapted to the local context. In Colombia, every municipality must have its own Waste Management Plan; the one for Pereira covers the 2015-2027 period. In Benin, the current government formulated the Household Solid Waste Management Modernisation project as part of the Government Action Projects 2016-2021.

4.2 Pathein

4.2.1 Solid Waste Regulations

Kirstein Møller and Muller [3] concluded that "*Myanmar's national waste management governance is weak. Although there is a patchwork of relevant environmental legislations, including the National Environmental Conservation Law of 2012, there is a near-total lack of monitoring and enforcement mechanisms*". At the national level, safe management of solid waste is overseen by the Environmental Control Division (ECD) of the Ministry of Natural Resources and Environmental Conservation.

The country has a National Waste Management Strategy and Action Plan (NSWMSAP), described by Kirstein Møller and Muller [3] to set "*ambitious targets for improving the collection, treatment and disposal of waste from 2018 to 2030. The ECD has reportedly committed to hire up to 20,000 environmental officers over the next five years to monitor environmental pollution across the country, but their exact role and responsibilities – including potential supervision of solid waste management – remain unclear.*"

4.2.2 Solid Waste Planning

In line with the recommendations of the NSWMAP, the Ayeyarwady region, where Pathein is located, in 2020 developed a Waste Management Plan with short-, medium- and long-term targets up to 2030. However, the regional government is largely hands-off and the responsibility for waste management falls on the Township Development Affairs Offices (TDAOs). The Ayeyarwady government has also encouraged TDAOs to develop their own waste management plan.

On the regional solid waste management action plan Kirstein Møller and Muller [3] reflect that "*…it reads more like a situational analysis identifying high-level policy concerns such as operational deficits, future landfill needs and the need for water drainage infrastructure. However, the plan does not include any concrete policy proposals, Key Performance Indicators (KPIs) or detailed cost estimates. It also fails to mention plastic leakage and water pollution, in spite of these being a key environmental & health concern for the delta region, whose abundant freshwater resources are vital for rice and livestock farmers*".

4.2.3 Institutions and Coordination

TDAOs are in charge of collecting and disposing of solid waste, and in towns that have them, collecting waste collection fees. TDAOs are the only local government body in Myanmar that is fully decentralised: they largely raise their own funds. Unfortunately, they are chronically underfunded. This usually leaves them (including Pathein) struggling to provide adequate waste collection coverage.

The lowest level of local urban government in Myanmar is an Urban Ward. Ward administrators are the main point of contact with formal government for most urban residents, typically for mediating civil issues but they also assist other local government institutions with executing their duties including tax collection and voter registration. However, the TDAO does not have direct authority over ward administrators. The strength and efficacy of the working relationship between TDAOs and ward administrators varies widely across the country and usually comes down to personal relationships. Underneath ward administrators, there are voluntary heads-of-ten-households and heads-of-hundred-households, who are selected by the community and assist with information dissemination and occasionally with fee collection.

Each ward in Pathein has a so-called "Ward Cleaning and Support Group"; a 15-member committee made up of local community members and ward administrative staff charged with an increasing number of waste management oversight and awareness raising issues. However, the committees have no formal responsibilities and primarily report instances of littering to the TDAO (which the TDAO is under no obligation to follow up on).

4.2.4 Waste Management Operations

Although the regional SWM Plan commits the Ayeyarwady Regional government to supporting the work of TDAOs and upgrading their capacity, this has chiefly come as in-kind support with the donation of trucks for waste collection. Pathein has 15 urban wards of which 13 receive some form of formal waste collection service. Although Pathein TDAO has taken steps to increase waste collection rates in recent years, 45% of respondents in a DEALS baseline survey (2019) reported "poor" or "very poor" satisfaction with waste collection services in their city.

The TDAO is responsible for all urban solid waste management in Pathein, chiefly, the collection and transportation of garbage to the municipality. This includes household waste, business waste, industrial waste, specialised (hospital) waste, and waste from wet markets and public bins. The TDAO employs 147 employees of which 47 work in the Cleaning Department.

4.3 Pereira

4.3.1 Solid Waste Regulations

Colombia has a complex yet robust regulatory framework for waste. Management of ordinary solid waste is considered a public service. The national constitution assigns responsibility to the president for ensuring good administration and efficiency of public utilities through control, inspection, and surveillance. Law 142 from 1992 allows municipal governments to recover the costs of local urban services/utilities and makes them responsible for the provision of the services to all citizens.

Despite of the responsibility of the local government in ensuring service provision, there is a scheme of free competition that allows any private or public waste company to provide the service without the need of an approval from the local government. Ultimately, the citizens – households, and commercial, industrial and institutional establishments – are considered clients (or users/ subscribers) of the service. These users are charged a monthly fee, which maximum value is calculated through a methodology defined by the Regulatory Commission for Drinking Water and Basic Sanitation. In summary, the companies compete for clients with the price for the service. The Superintendency for Public Utilities is the national body in charge of overseeing and controlling the waste companies. Thus, the role of the local governments becomes one of coordination as they cannot decide on service fees or control the waste companies, except in cases where the municipality owns the company.

In 2016, the Decree 596 regulated the recycling activities within the waste management service and established a transitory regime for the formalization of wate pickers. This regime defined a period of 5 year (later extended to 8) for informal waste pickers to form an organisation and comply with all the requirements of a formal waste company. Through this mechanism waste pickers can get access to the fee charged to the users of the waste service.

More recently, since 2018, a new tax on landfilling is paid by all users (citizens) as part of the waste service's monthly fee. The tax is estimated per ton of waste that is landfilled in the city, and it is intended to finance projects that promote recycling. It is expected that the first projects will be funded in 2022.

4.3.2 Solid Waste Planning

Every municipality in Colombia, by law, must have its own Waste Management Plan. Pereira's plan was formulated for the 2015-2027 period. It has a set of programs and goals that cover not only the collection, transport, and disposal (recycling and landfilling) of the waste but also other issues like cleaning and sweeping streets and public spaces, grass cutting and tree pruning, and handling of construction and demolition waste and special wastes. There is also a program dedicated to the inclusion and formalisation of waste pickers.

The Municipal Urban Plan is another long-term instrument that affects the waste system. This defines the areas and sites that can be used for waste storage, collection, recycling, transfer and/or landfilling, as well as the infrastructure requirements for these practices.

Finally, the Municipal Development Plan, formulated by each mayor every four years, includes the projects and targets considered in the Waste Management Plan. The current development plan, formulated for the period 2020-2023 aims to promote the correct sorting and handling of the waste by the citizens and to increase the recycling rate to 4% by the end of the period.

4.3.3 Institutions and Coordination

The local government is responsible for coordinating the provision of the waste management service while preserving the free competition scheme. This is done through a coordination group for the waste management plan. This group is constituted by representatives of local and regional stakeholders from the public and private sectors, including the Mayor's office, the environmental authority,

businesses, NGOs and the waste companies. There is a technical group assisting the coordinating group consisting of personnel from the local government with knowledge and skills on urban planning, public services, economy, finance and environment.

4.3.4 Waste Management Operations

As mentioned in Chapter 3.2.3 on waste collection, 12 waste companies coexist in the city. Four of them collect and landfill mixed-waste from about 180,000 users of the service (including households and institutions). The largest of these companies (91% of users) is supervised by a decentralized municipal institution which was the former public waste company of the city that conceded the service provision.

Six of these companies are waste picker organisations in the process of formalization, and two are private companies that collect recyclable waste. It is estimated that altogether reach out to about 16% of the waste service users in the city.

4.4 Sèmè-Podji

4.4.1 Solid Waste Regulations

Benin has a solid regulatory framework for environmental and waste management in place. Since 1987 open dumping, illegal burial or incineration of any kind of waste is prohibited (Law 87-015). In 1999 the country made the local governments (communes) responsible for the collection and treatment of solid waste other than industrial waste (Law 97-02). In 2003 a specific decree on solid waste management was issued (Decree 2003-332), which among others, promoted reuse, recycling and energy recovery practices, regulated waste transfer and disposal, and organised waste planning.

4.4.2 Solid Waste Planning

The activities for improving the waste management situation in Sèmè-Podji began in the period 2012-2019 with the Emergency Urban Environment Management Project (PUGEMU) financed by the World Bank [5]. The project "*…helped the city's attempt to restructure the waste management sector. This project covered the Greater Nokoué towns subject to flooding and aimed to strengthen their resilience to climate change with sanitation, solid waste management and capacity building of actors. It funded waste collection equipment, the creation of intermediate waste collection points (IWCPs) and a transfer centre…*" [5].

In 2018, the national government created "*the Greater Nokoué Waste Management and Urban Health Company (SGDS-GN), as part of the of Household Solid Waste Management Modernisation project, one of the flagship projects of the Government Action Projects 2016-2021*" [5]. The company oversees the collection, sorting, recycling, treatment and recycling of waste in the five communes of Greater Nokoué: Cotonou, Porto-Novo, Ouidah, Abomey-Calavi and Sèmè-Podji. The project also aims to make the achievements of the PUGEMU project permanent.

Finally, in its Commune Development Plan 2018-2022, Sèmè-Podji reaffirmed its commitment to ensure accessible urban services.

4.4.3 Institutions and Coordination

The SGDS-GN's mission goes beyond managing the waste by supporting the local governments' strategy for cleaning up urban areas and by assisting the local authorities to implement better waste management and environmental conservation solutions, including urban road maintenance, sweeping and signing public highways and other public places, and cleaning gutters. The SGDS-GN is governed by a Board with representatives from the president, 5 ministries, and the 5 communes that the company serves.

4.4.4 Waste Management Operations

Since 2019, the SGDS-GN is exclusively responsible for waste management in Sèmè-Podji. It is supported by the Benin subsidiary of the French group COVED/ PAPREC, which provides expertise, advice and support to SGDS-GN and companies providing waste management services.

The enterprises who won contracts from SGDS-GN divide the area into seven zones, ensuring complete coverage, and provide a free service to households. However, the SGDS-GN states that the free service is in effect for Stage 1 of the project and the introduction of a financial model is being studied.

Despite improvements some difficulties remain. "*The public complains that some collectors do not come to their homes to pick up their waste because of the difficulties of access for vehicles. It is reported that the household collection enterprises do not fulfil their contract to provide two weekly collections. Households end up cluttered by their waste and have no other option but to resort to informal means to get rid of the waste for a fee.*" [5].

Furthermore, the "*SGDS-GN has 50 ampliroll lorries but finds it difficult to find qualified drivers to put them into service... …Waste bins are left full at the IWCPs for a long time… …The company has therefore installed mobile improvised IWCPs to allow them to continue their activities.*" [5].

5 Finances and Costs of the Waste Systems

5.1 Key Insights

- For Pathein and Sèmè-Podji there are no data on the costs of the waste management activities (collection, transport, recycling or landfilling). For Pereira the collection of a ton of waste averaged USD 25 while the landfilling of a ton averaged USD 8.
- Pathein finances the service provision from the property tax, littering fines, some ad-hoc waste collection fees, and other general budget.
- In Pereira, the capital investment and operational costs for the waste management service are covered by a fee charged to the users by the waste companies. The fee or tariff is regulated by a national institution. Depending on the socioeconomic conditions of the users these can receive a subsidy or pay an additional contribution to the fee.
- In Sèmè-Podji, households are provided with a free waste management service. The system is currently wholly financed by the public Greater Nokoué Waste Management and Urban Health Company, which is funded by the national government. Nevertheless, a new financial model is being studied in which households are expected to be charged with a fee.

5.2 Pathein

Pathein's TDAOs cleaning department has three revenue streams: (i) the cleaning component of the municipal property tax (the main one), (ii) a minor income from littering fines, and (iii) from ad-hoc waste collection fees paid by businesses, hospitals etc. However, departmental revenue represents only a fraction of its expenses, and the Pathein TDAO cleaning department has a chronic operational deficit of 85-97%. The annual deficit ("losses") is effectively cross-subsidized by the DAO's general budget.

DAOs in Myanmar are almost entirely financially self-reliant, with only limited funding from the Regional government (both cash and in-kind, such as the donation of waste collection trucks). Their primary sources of revenues are monopoly license auctions (chiefly slaughterhouses), business permits, property taxes, and a 5% share of income tax, which is collected by the Internal Revenue Department (IRD). The property tax system in Myanmar is widely considered outdated and property values are chronically under-estimated. The property tax generally includes a cleaning/sanitation tax fee which therefore represents the "revenue" that cleaning departments receive. In Pathein's TDAO, the "garbage and sanitation tax" represents about 35% of property tax income, which – in FY 2018-19 – represented just 15% of the municipal revenues.

5.3 Pereira

As mentioned in chapter 4.3.1 on waste regulations, it is the national Regulatory Commission for Drinking Water and Basic Sanitation the institution that defines the maximum fee that a waste company can charge to a user of the service. As summarized in the What a Waste 2.0 study from Correal (2016), "*in 2016, the commission developed a formula that accounts for all costs in every step of the solid waste management system, including urban cleaning and sweeping, collection and transfer, final disposal, leachate management, and recycling.*"

Depending on the socioeconomic conditions of households these can receive subsidies (or pay an additional contribution) on the waste management fee.

The subsidies or additional contribution rates are established by the municipal council. In case of a deficit, this can be offset with either municipal or national resources.

The cost for the collection (and transport) of one ton of waste averaged COP 100.000 (USD 25) in 2021. In the same year, the cost for landfilling one ton of waste averaged COP 32.000 (USD 8). In the case of collection, the price lay in the lower end of the range for low-income countries - USD 20-50 as reported by the World Bank [1]. For the case of landfilling the price was even lower than the average for low-income countries - USD 10-20 [1].

5.4 Sèmè-Podji

As previously mentioned, households are currently provided with a free service as the waste management system is now wholly funded by the SGDS-GN. The company has a share capital of one hundred million (100,000,000) CFA francs (circa USD 160,000). The only shareholder is the Benin State. The SMEs that hold contracts for household waste collection are paid a fixed price per kilo of waste collected. The principle of paying collectors by the kilo or the tonne is a strategy welcomed by all actors because it encourages them to collect as much waste as possible. The SGDS-GN again equipped each waste collection provider with six tricycles, the cost of which is gradually deducted from payments made to them for their services.

The household solid waste management modernisation project in Greater Nokoué has a provisional budget of CFA 57 billion (projected CFA 93 billion) – about USD 90 million and USD 146 million respectively. It will deploy close to 1,000 light and 80 heavy collecting vehicles, support infrastructure (IWCPs, transfer centre, two landfill sites) and aim at a collection rate of 90% within seven years, so, by 2025. About 60% of waste will be recycled. It is envisaged that the programme will create about 3,000 direct jobs.

6 Waste and Society: Case Studies on Transition Efforts

6.1 Key Insights

- Pathein has performed some waste activities in some of the wards. Community groups were provided with three-wheelers and fees were charged to the citizens. The pilot failed in low-income neighbourhoods where the fees were insufficient to self-sustain the system, and the project faced resistance from the community to pay.
- In Pereira, the formalisation of waste pickers supported by the local government, and continuous awareness campaigns and recycling contests have led to an increase in the amount of recycled material and the improvement of the working conditions and income of the waste pickers.
- Sèmè-Podji is working on upgrading its landfill to a technical one where in a second phase a sorting and recycling unit will also be developed. This is accompanied by the development of an economic model to make the system self-sustainable.

6.2 Pathein

6.2.1 Experiments with Ward-based Waste Collection Solutions

Pathein has experimented with ward-based collection systems [3]. This can either be by the local ward administrator or the community itself… …four wards were provided with small three-wheelers by the TDAO, which were independently managed by so-called "Ward Welfare Groups" who also collect fees. The experiment was considered successful in Ward 3, a relatively wealthier neighbourhood where the waste collection fee was fixed at MMK 1,000 (USD 0.54) per household per month for bi-weekly collection, which was sufficient to meet the cost of labour, fuel and repairs. In Wards 1, 5 and 9, the same initiative generally failed, chiefly because household collection fees were too low for the system to be sustainable, reportedly as little as MMK 200 per month. When some wards tried to increase the collection fee, it was met with resistance by the local community and Wards 1, 5 and 9 have struggled to sustain their collection services. Ward-based collection services have several potential advantages:

- It is often easier to collect fees from households because the ward administrators and heads-of-households know the community members personally (which avoids free-riding).
- Operational costs can be kept low.
- The ward can focus on primary collection and thus expand coverage and/or frequency.

However, there are also several potential disadvantages:

- Poor households may not be able to afford a sustainable collection fee.
- It puts extra administrative burdens on ward administrators, who may be unable or unwilling to take on the extra responsibility of managing the system.
- Without secondary collection provided by the municipality, the system is inefficient to scale up.

6.2.2 Conflicts of Interest

The only active conflict of interest is between the municipality and informal waste pickers. It has been reported that Pathein's TDAO is "unhappy" with waste pickers because they supposedly litter while going through waste bins. This fits a general pattern of informal waste pickers being denigrated (and occasionally fined) in spite of the valuable service they provide. There is a potential of a stronger conflict of interest that would threaten their livelihoods if the TDAO in future decides to formalise the recycling value stream (or otherwise side-line informal waste pickers).

Anecdotal evidence also suggests that there is a bias in favour of wealthier citizens by the municipality, given that wealthier wards generally have better and more waste collection coverage. This is problematic because it treats residents more akin to consumers and not as equal citizens.

Any interventions at the ward-level should be closely coordinated with the township General Administration Department (GAD). Any larger interventions have a risk of creating a conflict of interest between the TDAO and township GAD office.

6.3 Pereira

6.3.1 Formalization of Waste Pickers

Since 2016 with the beginning of the formalization process of waste pickers' organizations as companies providing the public service of waste management, slow but continuous progress has been observed both in the amount of recycled materials and the working conditions of the waste pickers. Two factors contributed to this. On the one hand, the organisations are now receiving the fee for the collection service; giving the pickers an income additional to the traditional one for selling the recyclable waste. On the other hand, the Decree 596 mandated the local governments to strengthen and promote the formalization of the waste pickers. In compliance with this, and within the framework of the DEALS programme, the local government has partnered with CEMPRE Colombia, a nation-wide NGO, to provide the organisations of waste pickers with administrative support, and personal protection and technical equipment in the period 2019 - 2021.

In 2018 it was estimated that 117 waste pickers were in process of formalizing through an organisation. By 2021 this number had increased to about 300 people.

6.3.2 Public Awareness on Recycling

Several initiatives have taken place in Pereira since the beginning of the DEALS programme. The local government initiated a campaign named "Smart Citizen, Separate at Source" in 2019, which encourages citizens to sort their waste into recyclable and non-recyclable, and to hand in the recyclable waste to the organisations of waste pickers. The campaign has been implemented in partnership with CEMPRE Colombia. The partnership with CEMPRE also led to the implementation of a website for the waste management plan[4] and a map-based mobile app named "Donde Reciclo"[5], where the population can search for the nearest place to hand in their recyclable and special waste fractions.

This was complemented by a recycling contest among neighbourhoods. In the competition, citizens partner with a waste pickers' organisation to collect the biggest amount of recyclable waste, properly sorted. The winning neighbourhood is awarded with some infrastructure improvement for their community. In 2020, 110 neighbourhoods participated in the contest and 50 ton of recyclable waste were collected. In 2021 the numbers increased to 117 neighbourhoods and 174 tons.

6.4 Sèmè-Podji

6.4.1 Working Towards Recycling and Safe Landfilling

As previously mentioned, the current landfill site is being upgraded to a sanitary landfill. This is part of the Greater Nokoué household solid waste management modernisation project. The project will also include, in a second phase, a Sorting and Recycling Unit next to the landfill, once an economic model adapted to the operation of this chain is developed.

"In Greater Nokoué, 15 IWCPs will sort and recycle plastic waste. The SGDS-GN envisages partnership with the Valdéra Centre at Abomey-Calavi University and the Gbogbètô Association, which specialise in waste-to-energy and recycling to produce construction materials. The Sèmè-Podji City DEALS Project proposed working with the Valdéra Centre to develop the recycling component.

The Gbogbètô Association (litter-pickers in Goun), founded in 2018, is a new actor in the waste management sector. Its main objective is to undertake permanent and inclusive recycling initiatives. In partnership with the SGDS-GN, Gbobètô is establishing Recycling Centres at the IWCPs. The aim is to create adequate material and health conditions for safe sorting without hindering household waste unloading and transfer operations. It also aimed at formalizing the employment status of precarious workers involved in the sorting and reselling of recyclable materials, making them into professional and efficient sorting operators. Gbobètô organises technical and health and safety training activities, and also helps workers enrol in the social security system."

6.4.2 Awareness Raising and the Zero Waste Week

The DEALS programme supported the installation of two temporary waste collection sites equipped by the SGDS-GN with skips to make them operational. Awareness raising activities were conducted with the SMEs and residents regarding the use of skips for collection before their transfer for final disposal.

The DEALS programme also promoted the Zero Waste Week public education campaign to ensure behavioural changes of the different stakeholders in the household solid waste management in Sèmè-Podji. A focus team has also been put in place to coordinate the synergy of actors around waste management.

4 www.pgirspereira.com
5 www.dondereciclo.co

7 Conclusion

The data quality, quantity and availability varied across the three cities. Pereira and Pathein have better and more recent technical information than Sèmè-Podji. Nevertheless, for the three cities most of the basic waste data were collected regarding waste generation, collection and disposal rates. Information on the finances of waste management was the scarcest. For none of the cities was it possible to establish the share of the municipal expenses allocated to waste management. Yet, the financing system was described from which could be concluded that it differs across cities.

Pathein, located in a lower-middle income country, presents a waste generation rate and a landfilling rate similar or close to an upper-middle income country. However, the waste composition resembles that of a low-income country. The collection rate is according to the average for its level of income. The municipality is in charge of the waste service and is highly underfunded.

In Pereira, the waste generation rate, waste composition, and waste collection rate are consistent with or closer to those of a high-income country rather than an upper-middle country (which Colombia is). Yet, the recycling rates are even lower than the average in low-income countries. A rigid national waste tariff system, which local governments cannot influence, encourages landfilling over recycling and composting; hence most of the waste ends up in the landfill. The waste service is provided by private companies, and the fee paid by the citizens covers the capital investment and operational costs of the system.

Sèmè-Podji, located in a lower-middle income country, presents a waste generation rate similar to a low-income country but a collection rate that resembles that of an upper-middle income country. Most of the collected waste is landfilled. There are no data about the waste composition in the city. The waste service is provided by local small entrepreneurs with concessions from a state-owned waste company. Currently, the service is free for the citizens.

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Layout and design
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Illustrations
VNG International

Publication date: 2022
www.vng-international.nl