Lisbon's socioeconomic baseline on waste for Large Waste Producers

Beatriz Bringsken, Álvaro Fernández Braña,

Catarina Sousa, Celia Dias-Ferreira

June 2020

Politécnico
de Coimbra

Title **Lisbon's socioeconomic baseline on waste for Large Waste Producers**

Authors Beatriz Bringsken, Álvaro Fernández Braña, Catarina Sousa, Celia Dias-Ferreira

Date June 2020

ISBN **978-989-8649-41-6**

Contents

Tables

1. Introduction

The objective of this baseline report is to monitor the impact of the project actions done within the framework of LIFE PAYT project, to establish a socioeconomic context as the base for the monitoring system in Lisbon. This document, prepared in June 2020, intends to provide information regarding the set-up of a baseline for the twelve socioeconomic indicators to establish a preliminary analysis.

As shown on Table 1, every indicator is identified by an assigned code, ranging from SE1 to SE12, and they were defined on the "*Report on the development of socioeconomic indicators*" (LIFEPAYT, 2017). For this report, the indicator SE3 presents a small difference, as it is focused only on the non-domestic sector.

Table 1: Set of environmental indicators for LIFE PAYT project; MSW: Municipal Solid Waste

	INDICATOR		UNITS	CALCULATION FORMULA
SE1	MSW management cost for municipality		€ / year	Cost in target zone per year
SE2	MSW management revenue from domestic and non-domestic sectors		€ / year	MSW tariff paid value in target zone per year
SE3	Individual cost of MSW management	Non-domestic	€	Hourly salary · Necessary hours
		Domestic	Degree of effort (mean score between 1–5)	$\dfrac{\sum individual\ scores}{\sum total\ answers}$
SE4	Coverage of MSW management costs		%	$\dfrac{MSW\ tariff\ revenue}{Cost\ of\ MSW\ management} \cdot 100$
SE5	Economic revenue due to increased recycling		€ / year	$\sum_{i}$ (Units of recovered MSW i fraction · Unitary price of MSW i fraction)
SE6	Potential employment creation		Nr. jobs	$\sum_{i} \left(\begin{array}{c} \text{Units of recovered MSW i fraction} \cdot \\ \text{Nr. jobs created by unit MSW i fraction} \end{array} \right)$
SE7	Satisfaction with MSW collection system		%	$\dfrac{\sum positive\ answers \cdot 100}{\sum total\ answers}$

	INDICATOR	UNITS	CALCULATION FORMULA
SE8	**Acceptance of MSW management pricing**	%	$$\frac{\sum positive\ answers \cdot 100}{\sum total\ answers}$$
SE9	**Population percentage who separates MSW at source**	%	$$\left(1 - \frac{\sum answers\ "I\ don't\ recycle"}{\sum total\ answers}\right) \cdot 100$$
SE10	**Population percentage practicing home composting**	%	$$\frac{\sum positive\ answers \cdot 100}{\sum total\ answers}$$
SE11	**Population perception on the importance of recycling**	Mean score between 1–5	$$\frac{\sum individual\ scores}{\sum total\ answers}$$
SE12	**Project visibility**	%	$$\frac{\sum positive\ answers \cdot 100}{\sum total\ answers}$$

The initial values calculated for the set-up of indicators defined in sub-action C2.1 constitute an assessment of the socioeconomic situation regarding MSW management in target zones prior to the implementation of the LIFE PAYT project. This initial assessment will be used as a baseline to evaluate the socioeconomic dimension progress achieved.

2. Methodology: Key Aspects and Limitations

This assessment focuses on social aspects and on economic implications, it requires primary and secondary sources of information. Regarding the social aspects, a survey as primary source was performed in the form of questionnaires answered by a sample of **15 respondents** among the 136 Large Producers (LP) of waste with a PAYT contract signed with the Municipal Council who were established as the target population affected by the project.

These large producers of waste were distinguished by sector to have a relevant representation of the main categories of activity. The Municipal Council of Lisbon adapted the content of the questions, and also the format of the survey, from a printed version to an internal digital platform; They were also responsible to select 15 Large Producers, by preference the most recent ones to sign a contract, and send to a contact person related to waste management activity an e-mail with the questionnaire. The 15 digital questionnaires were sent in the end of February and a deadline of about 2 weeks was

given to send back the filled in survey. A preliminary analysis with automatic results was generated by the survey application developed by the Lisbon's partner, after that an in-depth analysis was done by the LIFE PAYT monitoring team.

Table 2. Representative by category of target population (139 LP) and survey participants (15)

Description by typology	(15) Nº survey	% survey	(136) Nº contracts	% contracts
Hotels	4	27	67	49
Offices/ Services	2	13	14	10
Public administration and defence	1	6	11	8
Education	2	13	9	7
Restaurants	3	20	9	7
Sport/Gym	0	0	6	4
Wholesale / retail trade	1	7	6	4
Other Healthcare sector	1	7	6	4
Cultural activities	1	7	4	3
Hospitals	0	0	3	3
Other (Prison)	1	7	1	0.7

The survey had some limitations concerning severe non-responses bias from two of the participants, and due to the lack of accurate answers in some other random questions, it indicates that about 3 other respondents had difficulties to know the answers. The number of achieved interviews was 15, which gives a 95% confidence interval and 24% margin of error. The survey version issued in Lisbon is herewith this report (Annex 1.).

Regarding the economic implications, the values of the economic indicators, as for instance, the information related to costs and revenues were obtained from the municipal authorities responsible for the MSW management, as a secondary source. The information was found on official documents provided by the municipality.

As a baseline process, this same survey - performed before the implementation of the project - will be conducted as well after the implementation, to check the possible improvement comparing it with the initial situation.

3. Results and discussion

This section shows the initial values of the socioeconomic indicators, which form the baseline for the project area. The data presented on Table 3 will be used as reference in the end of the project, when the final situation in each target area will be compared with this baseline previously established.

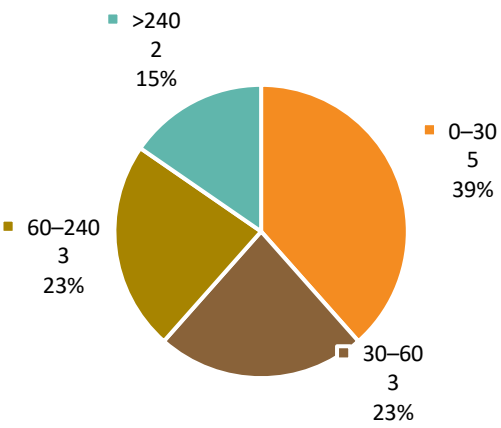Table 3: Results of the 12 socioeconomic indicators

INDICATOR		RESULTS Lisbon
SE1	MSW management cost for municipality	10 586 220€/year
SE2	MSW management revenue from non-domestic sectors	605 466.79€/year
SE3	Individual cost of MSW management / Commercials (16 min) Min. hourly salary 3,62€/hour	0.98 €/week
SE4	Coverage of MSW management costs	5.7%
SE5	Economic revenue due to increased recycling	4 733 452 €/year
SE6	Potential employment creation due to recycling	137 jobs
SE7	Satisfaction with MSW collection system	76.9%
SE8	Acceptance of MSW management pricing	61.5%
SE9	Population percentage who separates MSW at source	86.6%
SE10	Population percentage practicing home composting	14%
SE11	Population perception on the importance of recycling	4.9 (0 to 5)
SE12	Project visibility	Non applicable

3.1. Economic Indicators

As shown on Table 3, the economic indicators for the baseline assessment focuses on: costs, revenues, tariffs, degree of efforts, economic profits, and employment creation. These financial indicators are important for PAYT systems, since the large producer of waste that correctly separates their waste expects a reduction of the tariff.

Table 4 : Economic Indicators for the baseline

Economic Indicators	Lisbon Baseline Summary
SE1. MSW management cost for target population (2018)	
$$\frac{\text{TC} + \text{LT} + \text{AD (€)}}{\text{Yearly ton waste produced}} = \frac{34\ 021\ 223€}{302\ 653\ t} = 128.34\ €/ton$$ 18 274 t x 128.34 €/t = **2 345 210 €/year** AD: administrative costs (includes all collection costs – CC) TC: treatment costs LT: landfill tax	To calculate this indicator, all the costs associated to the MSW management (mixed and recyclables) in the target area were considered. As the Lisbon Municipal Council does not need to outsource the MSW collection, the collection cost (CC) is built-in the other values as the administrative costs (AD*), as they are fully responsible for the collection service. To determine the cost per tonne, the quantity of MSW produced in 2018 by the population considered the mixed waste and the recyclables. This was necessary to distinguish the total costs between mixed and recyclable waste, as this indicator focuses only on mixed waste. The MSW cost per ton (2018) is 128 €/t and for target population is 2 345 210 €.

Economic Indicators	Lisbon **Baseline Summary**
SE2. MSW management revenues for non-domestic sectors	
2 054 181 € in the target area (2017)	Although the municipal revenue with the MSW tariffs should cover the costs, a possible reduction of mixed MSW fraction due to PAYT, hopes to reduce even more the price paid for treatment costs and landfill tax. On the other hand, if recyclables increase, part of this revenue could increase. For instance, in 2018 the revenues obtained with recyclables was € 4 733 452.57. The expected variations in the MSW revenues allows us to understand the influence of the LIFE PAYT project.
SE3. Individual cost of MSW management	
Considering the minimum hourly salary of 4.15 €, the proportional salary is **8.67 €**.	Based on question 7 of the survey, this indicator aims to understand the evolution of the cost/effort bear by target population in MSW management. It is expected that throughout the project, participants will increase their time in MSW management, by separating, composting, etc., to produce less undifferentiated waste. On the survey (question 2), the answers related to the employee responsible for the waste management were, namely: 9 specific persons; 4 with shared responsibility for the task (non-related to cleaning tasks); Supposing that the employee responsible for the waste receives the minimum salary of 557 € - 40h/week, the hourly salary is equivalent to 4.15 €. The average time spent per week on waste management is 2 hours (median is 50 min).
SE4. Coverage of MSW management costs (only for the area of the project)	
$$\frac{SE2}{SE1} \cdot 100 = \frac{2\ 054\ 181}{2\ 345\ 210} \cdot 100 = 87.6\%$$	This indicator represents the percentage of MSW management cost covered by the charged waste tariffs. Considering only the mixed waste revenues, the municipality would not cover all the costs and would still lack 94.3% of coverage. In this case, however, the municipality can take advantage of the revenue from the of recyclable material. Hopefully, the new tariff induced by PAYT adoption could correct the balance between costs and revenues, as it is expected to have less mixed MSW production and an increase of recyclable material
SE5. Economic revenue due to increased recycling	
394 492 €	The purpose of this indicator is to understand if there are economic benefits derived from PAYT, because of increased recycling. If waste separation increases, the revenues associated to the sale of recovered materials for recycling has a potential to increase. The value of the three streams of recyclable materials were obtained by Dispatch nº 14202-C/2016, and the quantity of collected recyclables in 2018 in target area was 3011 28 148 tonnes according to the Municipal Council of Lisbon.

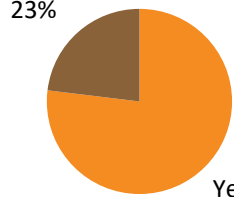| Economic Indicators	Lisbon **Baseline Summary**
SE6. Potential employment creation	
The target group generated 11171 tonnes of recyclables in 2018, which implies: **6.01 direct jobs**	Literature review pointed that job creation is greater than the potential decrease resulting from employment loss in alternative MSW treatments (e.g. landfills) and in the production of new raw materials. According to the report "More jobs, less waste" (Friends of the Earth, 2009), estimations of potential job creation by recycling show that for every 204 tonnes of recyclable waste 1 direct job is created, while specific factors were applied for each separated material.

3.2. Social Indicators
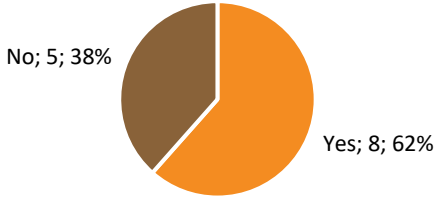
To monitor the outcomes and acceptance of the project, it was necessary to develop and establish indicators for the social aspects.
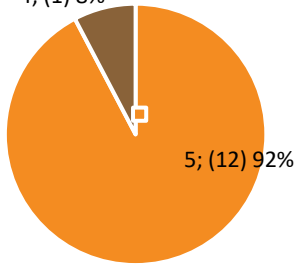
3.2.1 Social indicators SE7 to SE 12

The pre-established social indicators for the baseline assessment, shown below on Table 4, focuses on satisfaction with collection system, management pricing, separation at source, practicing composting, importance of recycling and project visibility.

Table 5: Social Indicators for the baseline

Social Indicators	Lisbon **Baseline Summary**
SE7. Satisfaction with MSW collection system	
Satisfaction with the system**: 76.9%** **Is the current waste collection system working properly??** No; 3; 23% Yes; 10; 77%	Based on question 8 (see Annex for Questionnaire), this indicator measures the percentage of participants who are satisfied with the MSW service provided. However, two participants of the survey did not answer this question, so only the 13 valid answers were considered. Results showed that the Large Producers of Waste are satisfied (76.9%) with the waste collection system.

SE8. Acceptance of MSW management pricing	
Acceptance: **61.5%** **Do you consider the current tariff fair?** No; 5; 38% Yes; 8; 62%	Based on question 10.2, this indicator aims to measure the acceptance of the price paid for the MSW management tariff. However, not all the 15 respondents answered about the amount paid for the tariff, as 2 of the answers were not presented. This indicator is based on the 13 valid answers of participants about the tariff they currently pay. In this case, 61.5% (n=8) evaluated the tariff as fair, opposite to 38.4% (n=5).

SE9. Population percentage who separates MSW at source	
100% (any kind of separation)	Based on question 5, the objective of this indicator is to establish the population percentage that separates waste at source at the beginning of the project. The separation at source is a fundamental parameter in the behavioural change of the population. confirmed Only one participant declared that there was any kind of separation, while a second participant did not answer the question. All the other 13 participants were positive about separation at source, as all of them separate paper & cardboard and plastic & metal. However, if we disaggregate the number of fractions that are separated, we have: 7 respondents that are not fully separating their waste; 6 respondents separating all the recyclable materials available and 2 without answers.

SE10. Population percentage practicing home composting	
14% composting	Based on question 6.2, organic waste is the main component of urban waste, so composting is a strong factor to be raised by identifying the branch of target population that already practices composting. The two participants (14%) among target population that already practice composting will function as a control population, establishing the base level for this indicator. Other participants declared that they practice organic waste valorisation by separating oil (n=10). The majority of 73% (n=11) develops no good practice for organic waste.

10

SE11. Population perception on the importance of recycling	
Likert scale with five levels: **4,92** **From 1 to 5, How important is recycling for you?** 4; (1) 8% 5; (12) 92%	Based on question 4, the perception of the importance of recycling is an indicator that points also to the commitment of the population to give the correct destination to waste. Although, 80% (n=12) respondents gave the highest scores (5) for importance of recycling, and only 7% (n=1) a lower one (4), these results in practice are not aligned with the results shown on SE 9 about separation at source.
SE12. Project visibility	
Non-applicable	The preliminary questionnaire and set of indicators established question 15 as indicator to evaluate the progress on the knowledge of the population regarding LIFEPAYT visibility, to verify if the means of dissemination of the project fulfil their function. Awareness raising is a key element for effective PAYT implementation, but the Municipal Council of Lisbon has been doing this action without mentioning the name LIFE PAYT for the project to avoid confusion and overcommunication with the target population. So, this indicator was not measured.

3.2.2 Extra data extracted from the questionnaires

- Question 1: A representative of the target population throws away on average 4538 litres of waste per week.

- Question 5: As 86.6% declared on the survey to practice waste separation at source, the most separated material among the target population is Paper & Cardboard, as well as Plastic & Metal – as 86.6% separates it.

- Question 9: 77% is satisfied with the MSW collection system, but when asked what could be improved in the MSW system, there were 8 complaints concerning: Collection capacity should be improved (2), Calendar should include holidays (3), extra awareness activities (2), and asking for extra care on the handling and maintenance of equipment and material (1).

- Question Q10.1: The majority of 77% (n=10) were aware of the amount paid for the municipal waste tariff. As those positive respondents were also asked to inform the regular price paid for the tariff, on average this amount was 263€.

- Question 11: 92% (n=12) knew that the waste tariff is based on volume/quantity.

- Question13: 92% (n=12) knows that the recyclable waste material when separated properly requires no tariff to be paid. Only one person (7%) was informed about this free service.
- Question 14: 85% (n=11) agrees that companies separating their waste should be benefited, another one (n=1) thinks the benefit is not necessary.

4. Conclusions

The main problem faced during the online survey among the Large Producers of Waste was the lack of commitment of two participants. The project in Lisbon is a unique case as the target group already pays for a different set of tariffs, performing a very different situation from the other LIFE PAYT projects. That is why the 15 selected respondents were the last ones to sign a contract with Lisbon Municipal Council and to experience the PAYT system.

Although there is a great satisfaction with the MSW system, there are some minor complaints faced by the target population in Lisbon. The waste collection service in Lisbon is another differentiating aspect from other projects who are outsourcing this service, while it is the Lisbon municipal council the one responsible for the collection of mixed and recyclable materials of the sector. The advantage was that it was much easier to identify the economic indicators, as well as the impact of the separation at source among this group.

Out of these preliminary results, it was possible to identify:

The interviewed representatives of the non-domestic sector in Lisbon seems to be consistent in their positive characteristics, with a high score for importance of recycling (SE11) - 4.9/5, as well as for the satisfaction (SE7) with the MSW system – 77%, as well as for the perception of separation at source (SE9) – 86.6%. The reason might be because the municipality carries with a lot of responsibility campaigns and activities among the target population to bring more attention to good practices for the waste management.

The acceptance of the MSW management price (SE8) was low, about 33% (n=5) were not satisfied with the tariff. On the other hand, the coverage of the MSWM costs (SE4) has an optimum balance due to the revenues with the recyclable materials. These results indicate a need of improving good business strategies to financially attract the large producers of waste in Lisbon.

5. Annexes

Annex 1: Model of the questionnaire issued for the Lisbon survey among the commercial sector.

Projeto LIFE PAYT e Câmara Municipal de Lisboa - gostaríamos que nos respondesse a umas perguntas simples, que demoram apenas alguns minutos.

RESÍDUOS E RECICLAGEM

1. Qual a quantidade de resíduos indiferenciados que a sua empresa produz semanalmente? Nº de sacos/volume _____ /_____ Nº de contentores/volume _____ /_____					
2. No seu estabelecimento, qual o cargo/função da pessoa que coloca os resíduos no contentor? _____					
3. Diga, numa escala de 1 a 5, se concorda com a seguinte frase: *"A gestão de resíduos é uma responsabilidade social de todos e, enquanto empresa, somos também responsáveis".* (1 significa "discordo em absoluto" e 5 significa "concordo em absoluto")	**1**	**2**	**3**	**4**	**5**
4. Numa escala de 1 a 5, na sua opinião, como classifica a importância da separação de resíduos e reciclagem? (1 - nada importante e 5 - muito importante)	**1**	**2**	**3**	**4**	**5**

5. Que materiais recicla? (assinalar com X)		**6.** Relativamente aos <u>resíduos orgânicos</u> (caso seja aplicável ao seu estabelecimento):	
Papel e Cartão		**6.1.** Valoriza os bioresíduos produzidos no estabelecimento?	Sim / Não
Vidro			
Plástico e Metal		**6.2.** Se sim:	
Resíduos orgânicos e resíduos verdes		Quais resíduos valoriza?	Que tipo de valorização?
Equipamento elétrico e eletrónico		( ) Restos alimentares	( ) Compostagem
Pilhas		( ) Óleos alimentares	( ) Restos alimentares p/ a
Óleos alimentares usados		( ) Borras de café	( ) Outros _____
Outros		( ) Outros _____	
Não faço qualquer reciclagem			

7. Por semana, quanto tempo gasta na gestão dos resíduos? _____ horas
(do momento em que foram produzidos até que foram colocados no contentor ou ecoponto, …)

SISTEMA DE GESTÃO DE RESÍDUOS

	Sim	Não
8. Considera que o sistema de recolha de resíduos funciona bem?		
9. Há alguma coisa que gostasse de ver melhorada no sistema atual de recolha de resíduos? _____ _____		

TARIFA

			Sim	Não
10. Sabe que existe uma tarifa municipal destinada a cobrir os custos de gestão dos resíduos?			Sim	Não
10.1. Sabe quanto paga mensalmente pelos resíduos que produz?	Sim	Não	Quanto? _____ (€/mês)	
10.2. Considera que a tarifa que paga atualmente é justa?	Sim	Não	Sem opinião	
11. Sabe que essa tarifa depende da quantidade de resíduos produzidos? (maior separação de resíduos menor tarifa)			Sim	Não
12. É de opinião que as empresas que fazem separação dos resíduos deveriam ser beneficiadas?			Sim	Não

A. Tipo de atividade do setor não doméstico (assinalar com X)							
Hotelaria		Restauração e similares		Comércio		Indústria	
Serviços		IPSS/adm. central e local		Saúde		Agrícola/ Pecuária	
Outra, qual?							

Annex 2: Excel with the data collected from the questionnaire

Questão	1. Quantidade de RU indif. Volume/sacos/litros	
Média de litros		4538
Mediana de litros		4500

Questão	2. Cargo de quem despeja os resíduos	
Específico		9
Todos		4

Questão	3. Escala de 1 a 5 "gestão de resíduos é uma responsabilidade"..	
Mediana Likert		5
Média Likert		4,8
Valor 5		11
Valor 4		2

Questão	4. Escala de 1 a 5, como classifica a importância da separação de resíduos e reciclagem?	
Mediana Likert		5
Média Likert		4,9
Nº 5		12
Nº 4		1

Questão	5. Que materiais recicla?	
Papel e cartão		13
Plástico e Metal		13
Vidro		11
Pilhas		10
Óleos alimentares		10
Não faço qualquer reciclagem		0
Outros		3
Equip. Elétrico e Eletrónico		9
Resíduos Orgânicos (compostagem)		12

Questão	6.1. Valoriza os bioresíduos produzidos no estabelecimento?	
Sim		2
Não		11

Questão	6.3. Que tipo de valorização?	
Restos alimentares (compostagem)		2
Óleos alimentares		1
Borras de café		2

Questão	7. Por semana, quanto tempo (em minutos) gasta na gestão dos resíduos?	
Média de tempo		16,4
Mediana de tempo		10

Questão	8. Considera que o sistema de recolha de lixo funciona bem?	
Sim		10
Não		3

Questão	9. Há alguma coisa que gostasse de ver melhorada no sistema atual de gestão de resíduos?	
Capacidade da recolha		2
Calendário		3
Sensibilização		2
Mais cuidado no tratamento do materi		1

Questão	10. Conhecimento da tarifa mensal de RU produzidos	
Não		6
Sim		7

Questão	10.1. Sabe quanto paga atualmente pelos resíduos que produz?	
Sim		10
Não		3

Questão	10.1.1. Se respondeu "sim" à questão anterior, qual o valor que paga, em €/mês?	
Mediana		263

Questão	10.2. Considera que a tarifa que paga atualmente é justa?	
Sim		8
Não		5

Questão	11. Conhecimento de maior separação de resíduos menor tarifa	
Sim		12
Não		1

Questão	12. Beneficios para entidades que separam	
Sim		11
Não		2

Questão	A. Tipo de atividade comercial	
Hotelaria		4
Restauração		2
Comércio por grosso/retalho		1
Administração Pública e defesa		2
Ensino/Educação (A17)		3
Estabelecimento Prisional		1
Ns/Nr		1

Tool to reduce waste in South Europe