THE WORLD BANK

Diagnosis of the Integrated Management of Urban Solid Waste in Argentina

Data collection, generation and analysis - Collection, sweeping, transfer, treatment and disposal of Municipal Solid Waste.

2015

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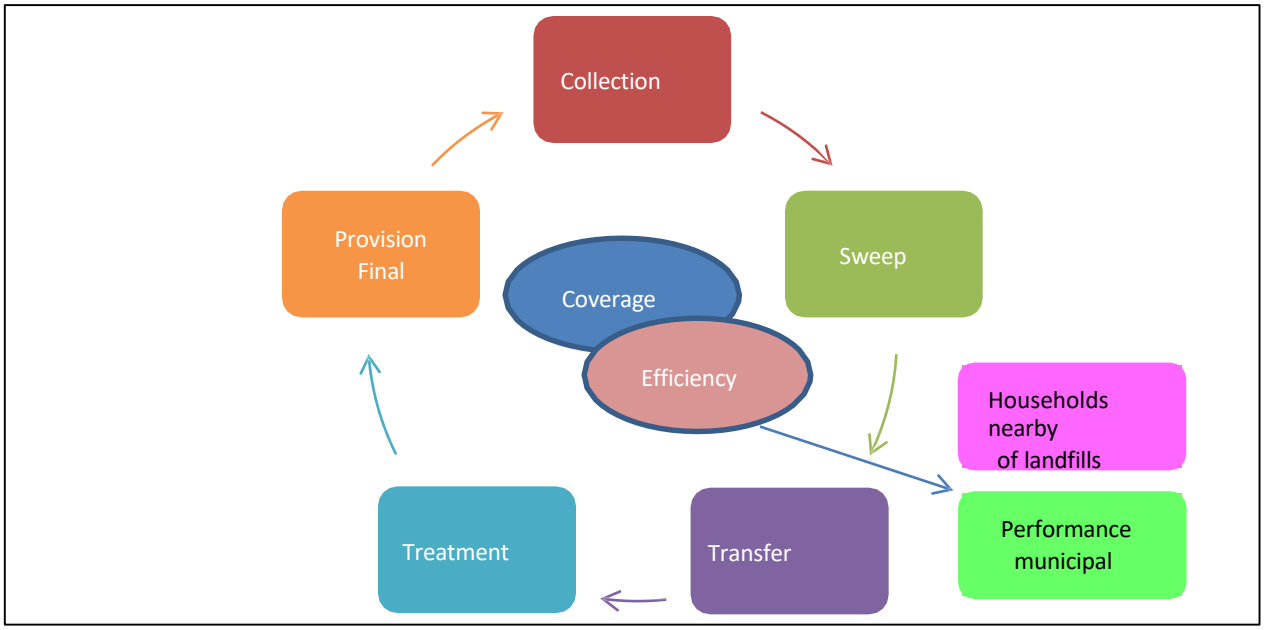
Diagnosis of Integrated Municipal Solid Waste Management in Argentina

Introduction

The following is a Diagnosis of the current situation of Municipal Solid Waste Management in Argentina. As summarised in Figure 1, waste management was analysed in an integrated manner, evaluating each of its phases: collection, sweeping, transfer, treatment and final disposal. For each of these stages, whenever information was available, service coverage and efficiency indicators were analysed. In addition, in order to assess the overall efficiency of management, the indicator "Households near landfills" was analysed and a Performance Analysis of Integrated Solid Urban Waste Management (ISWM) in a sample of municipalities published by the GIRSU Project of the National Secretariat of Environment and Sustainable Development (SAyDS) was included. Finally, an estimate of formal and informal jobs generated by the sector was made.

Figure N° 1. Conceptual framework used in the analysis.



Source: Own elaboration.

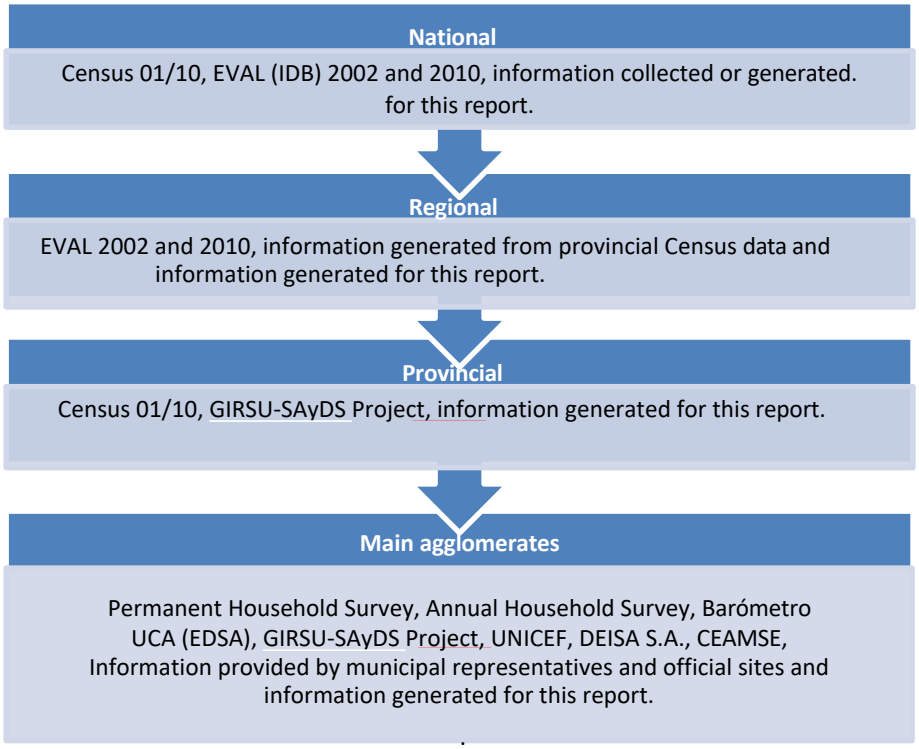
Indicators at the national, regional, provincial and municipal levels were included in this diagnosis. Figure 2 summarises the main sources of information used at the different levels of analysis. It should be clarified that, in the regional analysis, the three regions for which the Regional Evaluation of the Inter-American Development Bank (EVAL) presents data were used:

- Region I: North of the country (Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán),
- Region II: Cuyo and Mesopotamia (Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis),
- Region III: Central and Patagonia (Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and Buenos Aires City).

At the municipal level, the 31 agglomerates included in the Permanent Household Survey (Encuesta Permanente de Hogares - EPH) were analysed.

- INDEC), which include agglomerates with more than 100,000 inhabitants and provincial capitals.

Figure N° 2. Main sources of information, by level of analysis.



It should be clarified that, in addition to the sources of information summarised in Figure 2, new data were generated for this report, mainly regarding transfer, treatment, final disposal and jobs generated by the sector, as no data sources with updated aggregated information were found.

1. **Solid Waste Collection Municipal Waste Collection**

- The country has a high level of regular collection **coverage**. **94.82%** of urban households have this service at least twice a week. However, **1,868,411 people in urban areas are** still **not covered, 30%** of them **in Greater Buenos Aires (GBA) (**2010 Census).

- **According to national censuses, between 2001 and 2010 the coverage** of the collection service managed to **keep up with the population growth rate (10.6% inter-census) but did not experience a substantial increase**. The provinces with the lowest levels of coverage in 2001 achieved the most significant improvements (over 5%).

- **The Social Debt Barometer Survey (EDSA) shows significant improvements among the most vulnerable groups in urban areas between 2010 and 2013.** There was a decrease in the number of households not covered by the service: 20% in the "very low" socio-economic group, 9% in slums and 35% in Greater Buenos Aires (EDSA, 2010-2013).

- Collection coverage **decreases significantly in slums, provinces of the Northern Region and rural areas.** Among households located **in slums and** shantytowns, the lack of service reached **14.3%** in 2013 (EDSA). When considering **total** Argentine **households** (**urban plus rural**), total coverage decreases from 94.82% to **89.91%** (**4,004,221 people do not have** regular collection **service**), with northern provinces such as **Santiago del Estero and Formosa** showing coverage levels of **62.48% and 64.04%** respectively (Census 2010).

- There are also **differences between urban areas. The 31 main agglomerates of the country** (EPH) have a collection **coverage (95.39%) higher than the mentioned percentage for the total of urban households (94.82%).** Among the 31, Santa Rosa has the highest level (98.90%) and Gran Resistencia the lowest (98.90%), with **the northern agglomerates having the lowest coverage** (Census 2010).

- The service presents **opportunities for improvement in terms of equipment, mainly in the Northern region and in the smaller municipalities. 45% of collection vehicles are more than 10 years old** (85% in municipalities with less than 15,000 inhabitants). Waste from **29.5% of the population served is collected with vehicles without compactors** (45% in the northern region).

- **71.9% of the covered population has a collection frequency of at least 6 times per week, significantly higher than the Latin American average of 45.6%** (EVAL, 2010).

- **Few agglomerates still have extended containerisation and/or differentiated collection.**

- **There is no proportional relationship between population size and collection cost per tonne.** There is a significant variation in unit costs in small municipalities (GIRSU Project).

- **76%** of respondents in six agglomerates surveyed **said they were satisfied with the** waste collection **service** (Proyecto GIRSU-SAyDS, 2014).

1.1 National Censuses 2001 and 2010

The National Institute of Statistics and Census (INDEC) conducted the last two National Population, Household and Housing Censuses in 2001 and 2010. When analysing the coverage of public services, in both cases, the municipal solid waste collection service was evaluated considering that a household is covered when there is regular presence of the service in the segment at least twice a week. The household segment is a census survey unit, which represents the area assigned as workload to each enumerator on the day of the census. The presence of waste collection service is determined in relation to the segment, without considering the particular situation of each household. When the segment is heterogeneous, the predominant situation is recorded.

The 2010 Census presents results of inhabitants and households covered by collection services for the country as a whole, by province and by department (not by urban agglomerate or municipality), and disaggregates the results for urban and rural households/inhabitants. In order to meet the objectives of this report, coverage results for the 31 agglomerates included in the HBS were constructed from the results by department. To do this, we first assessed which department(s) made up each agglomerate, then summed the results of urban households/inhabitants covered for the departments in each agglomerate and divided by the total number of urban households/inhabitants in those departments.

The 2001 Census, but not the 2010 Census, also allowed cross-checking to assess coverage with regular collection service by type of household.

Coverage with regular municipal solid waste collection service, by province (National Censuses, 2001 and 2010).

Province	2010 Census				Census 2001	Inter-census change 2001-2010
	Total unserved population	Total households with service[1] (%)	Population in urban areas no service	Households in urban areas with service[1]	Total households served[1](%)	
Total Country	**4.004.221**	**89,91%**	**1.868.411**	**94,82%**	89,72%	0,19%
Pampas Region						
City of Buenos Aires	64.565	97,72%	64.565	97,72%	99,34%	-1,62%
24 districts of Greater Buenos Aires (GBA)	569.117	94,23%	564.144	94,27%	94,68%	-0,45%
Interior of the province of Buenos Aires	400.377	92,88%	198.918	96,17%	90,93%	1,95%
Cordoba	227.380	93,02%	76.356	97,37%	91,73%	1,29%
La Pampa	19.957	93,66%	4.064	98,46%	92,11%	1,55%
Santa Fe	238.471	92,47%	112.108	96,10%	91,15%	1,32%
Entre Rios	157.396	87,13%	47.242	95,49%	84,29%	2,83%
North West Region						
Jujuy	70.556	89,41%	26.903	95,37%	86,55%	2,86%
Salta	167.234	86,09%	64.036	93,88%	83,12%	2,97%
La Rioja	42.242	87,24%	22.214	92,24%	85,13%	2,11%
Catamarca	62.154	82,86%	20.017	92,89%	79,38%	3,48%
Santiago del Estero	325.823	62,48%	84.164	85,87%	58,81%	3,67%
Tucumán	284.256	80,27%	94.823	91,82%	78,50%	1,77%
Northeast Region						
Chaco	243.816	76,73%	109.536	87,64%	71,67%	5,06%
Currents	208.276	78,86%	69.783	91,45%	71,58%	7,29%
Missions	280.104	74,34%	51.806	93,55%	67,07%	7,27%
Formosa	189.513	64,04%	97.593	77,10%	57,18%	6,86%
Cuyo Region						
Mendoza	193.646	88,75%	44.190	96,82%	86,16%	2,58%
San Juan	67.551	89,97%	27.423	95,34%	85,52%	4,44%
San Luis	33.966	92,07%	11.413	96,98%	89,37%	2,70%
Patagonian Region						
Neuquén	46.002	91,51%	21.481	95,69%	91,51%	0,00%
Rio Negro	61.079	90,25%	22.257	95,92%	88,19%	2,05%
Chubut	32.883	93,40%	18.363	95,97%	93,80%	-0,40%
Santa Cruz	11.514	95,65%	8.929	96,53%	97,79%	-2,14%
Tierra del Fuego, Antarctica and islands	6.343	94,89%	6.083	95,06%	98,43%	-3,55%

[1] Refers to the existence of regular service in the segment at least twice a week. The household segment is a census unit that represents the area assigned as workload to each enumerator on the day of the census. The presence of waste collection service is determined in relation to the segment, without considering the particular situation of each household. Where the segment was heterogeneous, the predominant situation was recorded. Source: Own elaboration based on the National Population, Households and Housing Censuses 2001 and 2010.

Table N° 2. Coverage with regular collection of solid urban waste, by agglomerate (INDEC, 2010).

Urban agglomerate	Population[1]	Households below the poverty line (%)[2]	Households served (%) [3]	Departments considered in the calculation[3]	Total number of households[4]	Households with service[4]	Households without service[4]	Population served[5]	Unserved population[5]
Greater Buenos Aires		**3,7%**							
City of Buenos Aires	2.981.781	2,4%	98,07%	CABA	1.150.134	1.127.959	22.175	2.924.291	64.565
24 Districts of Greater Buenos Aires	10.796.415	4,2%	94,90%	24 GBA matches	2.930.381	2.780.826	149.555	10.245.409	569.117
Whose		**1,6%**							
Greater Mendoza	1.070.944	1,3%	97,24%	Capital, Guaymallén, Las Heras, Luján de Cuyo, Godoy Cruz and Maipú.	284.616	276.757	7.859	1.041.372	29.572
Greater San Juan	511.625	2,2%	96,47%	Capital, Rawson, Rivadavia, Chimbas, and Santa Lucia.	117.745	113.587	4.158	493.558	18.067
San Luis - El Chorrillo	215.487	1,4%	97,94%	The capital city	56.059	54.903	1.156	211.043	4.444
North East		**6,6%**							
Currents	379.696	6,9%	92,61%	Capital	96.993	89.824	7.169	351.632	28.064
Formosa	254.702	5,8%	89,01%	Formosa	60.193	53.577	6.616	226.707	27.995
Great Resistance	407.001	5,8%	88,70%	San Fernando	108.706	96.418	12.288	360.994	46.007
Posadas	350.913	8,0%	95,42%	La Capital	91.631	87.432	4.199	334.832	16.081
Northwest		**3,6%**							
Greater Catamarca	209.072	5,0%	94,33%	Capital, Valle Viajo and Fray Mamerto Esquiú	50.901	48.016	2.885	197.222	11.850
Greater Tucumán - Tafí Viejo	863.943	4,1%	92,38%	Capital, Cruz alta, Yerba Buena, Lules, Tafí Viejo	238.831	220.640	18.191	798.139	65.804
Jujuy - Palpalá	335.406	4,2%	95,54%	Dr. Manuel Belgrano and Palpalá	81.574	77.933	3.641	320.435	14.971
La Rioja	200.933	2,0%	91,81%	Capital	48.243	44.292	3.951	184.477	16.456
Salta	617.418	1,9%	96,80%	Capital, Cerrillos and La Caldera	144.393	139.777	4.616	597.680	19.738
Santiago del Estero - La Banda	401.924	4,2%	88,77%	Capital and Band	95.542	84.815	10.727	356.798	45.126
Pampeana		**3,7%**							

Bahía Blanca - Cerrito	305.962	5,6%	97,76%	Party of Bahia Blanca	104.839	102.490	2.349	299.107	6.855
Concordia	159.631	3,7%	95,40%	Concordia	43.565	41.559	2.006	152.281	7.350
Greater Cordoba	1.512.823	4,4%	97,42%	Capital and Colón	468.178	456.102	12.076	1.473.802	39.021
Greater La Plata	828.860	1,0%	95,01%	La Plata, Berisso and Ensenada	263.245	250.106	13.139	787.490	41.370
Greater Rosario	1.415.628	4,2%	96,05%	Rosario and San Lorenzo	433.984	416.826	17.158	1.359.660	55.968
Greater Parana	273.300	4,0%	96,03%	Parana	98.705	94.784	3.921	262.443	10.857
Greater Santa Fe	526.366	2,8%	96,19%	Santa Fe capital	162.045	155.879	6.166	506.337	20.029
Mar del Plata - Batán	631.322	4,8%	97,79%	Gral. Puayrredón	206.982	202.403	4.579	617.355	13.967
Río Cuarto	171.332	2,4%	98,07%	Río Cuarto	73.948	72.520	1.428	168.023	3.309
Santa Rosa - Toay	124.545	1,0%	98,90%	La Capital and Toay	38.293	37.872	421	123.176	1.369
San Nicolás - Villa Constitución	187.981	4,4%	96,71%	St. Nicholas and Constitution	67.409	65.192	2.217	181.799	6.182
Patagonia		**2,9%**							
Comodoro Rivadavia - Rada Tilly	210.875	1,5%	93,96%	Escalante	56.118	52.731	3.387	198.148	12.727
Neuquén - Plottier	304.572	4,8%	95,38%	Confluence	110.678	105.568	5.110	290.510	14.062
Rio Gallegos	108.693	1,8%	96,97%	Güer Aike	33.061	32.058	1.003	105.395	3.298
Ushuaia - Río Grande	143.471	2,4%	94,91%	Ushuaia and Río Grande	38.589	36.625	1.964	136.169	7.302
Rawson - Trelew	137.057	2,1%	97,76%	Rawson	40.439	39.535	904	133.993	3.064
Viedma - Carmen de Patagones	85.442	2,4%	98,17%	Patagones	24.990	24.532	458	83.876	1.566
TOTAL	**26.725.120**		95,69%[6]		**7.821.010**	**7.483.538**	**337.472**	**25.524.154**	**1.226.152**

[1]Data from the Encuesta Permanente de Hogares (EPH) (INDEC, fourth half of 2014).

[2]Data from the Encuesta Permanente de Hogares (EPH) (INDEC, first half of 2013).

[3]Data from the 2010 Census. Since the census does not present values by agglomerate, results by department were used by adding up the number of urban households covered for the department(s) that make up the agglomerate. A household is considered covered if, in the segment, there is regular collection service at least twice a week. A segment is a census unit that represents the area assigned as a workload for an enumerator on the census day. The coverage with collection service is determined in relation to the segment, irrespective of the particular situation of each household. If the segment is heterogeneous, the predominant situation is recorded.

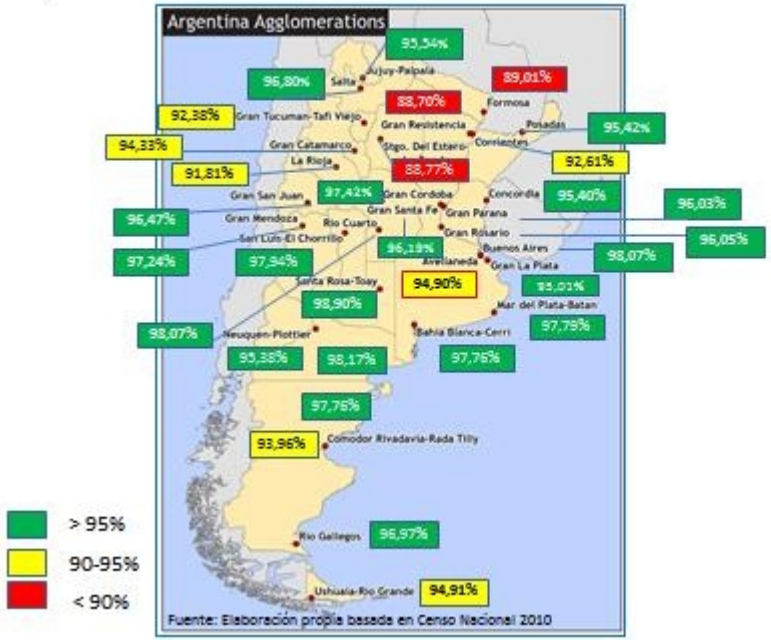
[4]Data from the 2010 Census (INDEC).

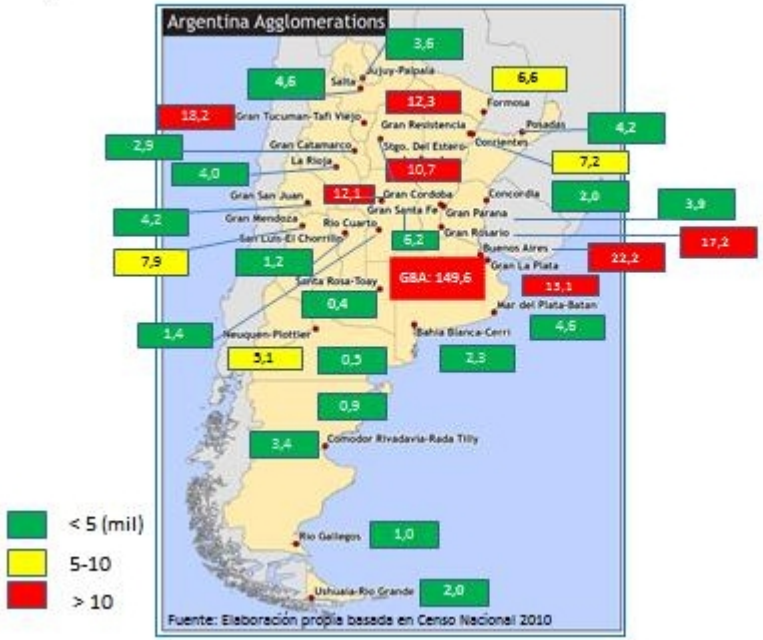
[5]Considers EPH data for the fourth half of 2014 [(1)]for Population and 2010 Census data for collection coverage [(3)]and multiplies them.

[6] Considers the total number of households covered in the 31 agglomerates divided by the total number of households in the 31 agglomerates.

Source: Own elaboration based on data from the 2010 Census and the EPH (INDEC).

Percentage of households covered by regular collection and number of households not covered (in thousands), by agglomerate (INDEC, 2010).





Coverage with regular collection of municipal solid waste, by type of household (National Census, 2001).

Indicator	House type A	House type B[1]	Ranch[2]	Box[2]	Depar-tment	Room in a tenement[4]	Room in a hotel or guesthouse	Premises not built for habitation	Mobile home	On the street
Households not covered	356.144	409.485	141.670	57.427	11.263	3.945	405	2.761	1.777	582
Households covered (%)	93,98%	72,18%	34,61%	78,29%	99,12%	94,35%	98,08%	86,02%	53,46%	72,36%

1 House that meets at least one of the following conditions: no piped water supply inside the dwelling; no flush toilet; earthen floor or other precarious material. The rest of the houses are considered as type A houses.

2 Typical of rural areas, it usually has adobe walls, earthen floor and thatched roof.

3 Typical of urban areas, it is usually built with low quality or waste materials.

4 A self-contained dwelling deliberately constructed or remodelled to have several rooms leading to one or more common spaces. Some forms are known as tenements. Each tenement house is a single dwelling within which the individual households living in it are recognisable.

Source: Own elaboration based on data from the 2001 National Census (INDEC).

Data analysis

- Table N° 1 shows that **the country has high levels of regular municipal solid waste collection coverage**, with **94.82% of households in urban areas** having this service at least twice a week. However, **when considering both urban and rural households, the coverage drops to 89.91%**.

- Although the level of coverage is high, when translating this percentage into the number of people not covered by the service, we find high numbers. In Argentina, **more than 4 million people do not have regular urban solid waste collection services**. Of these,
  1,868,411 people live **in urban households, 30%** of **which are concentrated in the 24 Buenos Aires districts of the Greater Buenos Aires agglomerate**.

- There are **significant differences in access to the service between and within provinces when comparing urban and rural areas.** Table 1 shows that coverage decreases in the northern provinces, with Formosa having the lowest percentage for urban areas (77.10%). On the other hand, Catamarca, Chaco, Corrientes, Formosa, Santiago del Estero and Tucumán (all provinces in the Northern region) show differences of more than 10% when comparing coverage in urban households and total coverage (which also considers rural households), reaching values of 62.48% (Santiago del Estero) for the second indicator.

- **In relation to the inter-census variation**, Table N° 1 shows that **there was no significant increase in the percentage of households covered by collection** (0.19%). However, we must take into consideration that the country had an inter-census population increase of 10.6%, so that coverage not only increased by 0.19% **but** also **managed to keep pace with population growth.** In 2001, the service was provided to 31,695,832 people while in 2010 coverage reached 35,668,299 inhabitants, representing an increase of 15.53% in the number of people covered.

- On average, provinces increased coverage levels by 2.27 per cent between 2001 and 2010, with **Misiones, Formosa, Corrientes and Chaco, all northeastern provinces, showing the highest increases (above 5 per cent).** The provinces that increased coverage the most are those that had the lowest levels in 2001.

- **The 0.45% decrease in regular waste collection coverage in Greater Buenos Aires is the most significant in terms of the number of people affected.** The population without coverage increased in absolute terms between 2001 and 2010, from 459,455 to 569,117 people. In the same period of time, in the interior of the province of Buenos Aires, the population without coverage decreased from 459,051 to 400,377. In this case, the inter-census population growth rate may have played an important role, since it was 10.5% for the interior of the province and 14.1% for the districts of Greater Buenos Aires (higher than the national average).

- **Coverage in the main urban agglomerates is higher than that found in smaller urban areas.** According to Table N° 2, in the 31 main urban agglomerates of the country, coverage with regular collection reaches **95.69% of households**, somewhat higher than the coverage found in smaller urban areas.

nationally for urban households (94.82%) which also considers smaller urban municipalities.

- Table N° 2 shows differences in access to the collection service among the 31 main urban agglomerates, with Santa Rosa-Toay having the highest level of coverage (98.90%) and Gran Resistencia more than 10% lower (88.70%). **The lack of collection coverage is concentrated in the north-eastern and north-western agglomerates, which** also have the highest percentage of households below the poverty line. Formosa, Gran Resistencia and Santiago del Estero-La Banda have the lowest levels of coverage, and the provinces in which they are located also coincide with those with the lowest levels of coverage when analysing values by province.
- Table N° 3 allows us to conclude that **there are** also **differences in the levels of coverage with collection services according to the type of household**, which can be associated with the level of income and the location of the household. While 93.98% of type "A" households are covered, this number decreases to 78.99% for "Casillas" (typical of slums and shantytowns), 72.18% for type "B" houses (associated with low-income households), and 34.61% for ranchos (a type of dwelling usually found in rural areas).

1.2 Regional Assessment of Municipal Solid Waste Management in Latin America and the Caribbean (EVAL)

In 2010, the Inter-American Development Bank (IDB), in conjunction with the Inter-American Association of Sanitary and Environmental Engineering (AIDIS), conducted a Regional Assessment of Municipal Solid Waste Management (EVAL 2010) based on information provided by municipal representatives. According to the report, stratified random sampling was used and the number of municipalities surveyed per country was the number needed to estimate each stratum with an error of less than 5% and a confidence level of 95% (the report does not clarify the exact number of localities sampled).

The evaluation analyses coverage, efficiency and management costs for the different stages of the GIRSU system (generation, collection, sweeping, treatment and final disposal) and presents average results for the Latin American region and by country. In addition, for each country EVAL estimated average results by region (in the case of Argentina it studied three regions) and by range of population size of the municipalities. It is important to note that in the case of Argentina, the three regions selected do not coincide with political or geographical regions normally used, but rather group one or more of them. In 2013, the IDB published a Technical Note on Integrated Urban Solid Waste Management in Argentina with information based on the EVAL but including specific indicators for Argentina that did not appear in the original EVAL 2010 report. This note was also used as a source of information in this report.

In 2002, there was also an IDB-sponsored Regional Assessment (EVAL 2002), developed jointly with the Pan American Health Organisation, with data collected in 2001 following the same methodology as EVAL 2010 and using similar indicators. Its

The results are also presented and considered in this report in order to analyse variations of the indicators over time.

Table N° 4. Regular collection coverage in Argentina in percentage of inhabitants covered, by municipal size and region (EVAL, 2010).

Phase of the GIRSU	Indicator	Region			Municipal size				Total Country	LAC average
		I	II	III	Micro	Small	Medium	Grande		
Collection	Coverage	99,7%	100%	99,8%	97,2%	100%	100%	99,8%	99,8%	93,4%
	Daily frequency	56,6%	59%	78,5%	-	-	-	-	71,9	45,4%
	Frequency 2 to 5 times per week	43,4%	39,6%	21,5%	-	-	-	-	27,9%	52,7%
	Weekly frequency	0%	1,4%	0%	-	-	-	-	0,2%	1,8%
	Rolling equipment per 10,000 inhab.	1	1	1,5	4,02	1,67	1,29	0,92	1,34	1,31
	Rolling stock< 10 years old	34%	55%	60%	15%	40%	52%	73%	55%	66%
	Rolling equipment with compactor	54,2%	65,8%	75,4%	-	-	-	-	70,5%	57,8%
	Municipalities with debris collection service	79,6%	67,6%	78,5%	-	-	-	-	76,7%	-
	Municipalities with market collection	79,6%	45,1%	56,8%	-	-	-	-	61%	-

Region I: Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán Region II:
Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis
Region III: Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and Buenos Aires city.

Large, between 300,001 and 5,000,000 inhabitants; Medium, between 50,001 and 300,000 inhabitants; Small, between 15,001 and 50,000 inhabitants; and Micro, municipalities with a population of less than 15,000 inhabitants.

Source: Own elaboration based on EVAL 2010 and IDB Technical Note 2013.

Data analysis

- Although both the EVAL Report and the National Census were conducted in 2010, collection coverage levels are significantly higher in the former source of information. Because the EVAL only considers a sample of municipalities and is based on information provided by municipal representatives, we consider that, in terms of collection service coverage, **the results presented in the EVAL are less accurate than those of the 2010 National Census.**

- However, **EVAL provides interesting information on collection efficiency in** terms of frequency, available equipment and special services provided. In addition, **EVAL has an important added value by presenting results by population size and region of the country. Also**, and thanks to the fact that the assessment is carried out in different Latin American countries following the same methodology, **it is possible to compare the results found for Argentina with regional averages.**

- According to Table N° 4, **in terms of collection frequency and equipment, in general, Argentina performs better than the average of Latin American countries.** The results also show **differences between regions and by population size of the municipality**. In terms of frequency, all three regions show better results than the average for Latin America, but in terms of equipment, region I (North) shows clearly lower results than those found for Latin America.

- **Region III includes the main urban agglomerates of the country and, with almost 27.5 million inhabitants, is much more populous than Regions I and II (with 6.5 and 6 million respectively). Therefore, it is worth noting that the results found at the national level are strongly influenced by the performance of this region, which in general has better coverage and efficiency rates than the other two regions in all phases of ISWM.**

- **The percentage of inhabitants served in Argentina with collection frequency 6 or 7 (71.9%) is much higher than the regional average (45.4%).** However, **in line with what was concluded in the previous point, these values are largely explained by the high frequency found in the main urban agglomerates located in Region III (Buenos Aires metropolitan area, Greater Rosario, Greater Cordoba).** In fact, we can see in Table N°4 that the other regions present significantly lower collection frequency values, which are similar to the regional average.

- In terms of equipment, EVAL 2010 estimated that **the country has 1.34 vehicles per 10,000 inhabitants**, a number only slightly higher than the regional value (1.31). In terms of equipment, once again, EVAL reveals differences between regions and, especially, by municipal size. **The lower the population range, the higher the number of vehicles per 10,000 inhabitants** found, which may indicate problems of inefficiency. Smaller localities **are also less likely to have compactor vehicles** (so we need more vehicles to provide the same service) **and more likely to find trucks more than 10 years old.** In terms of regional differences, it is worth noting that **the region that includes the Buenos Aires metropolitan area (III) has a higher number of vehicles per 10,000 inhabitants.**

Inhabitants (1.5), a more modern vehicle fleet (60% less than 10 years old) and a higher proportion of compactor vehicles (75.4%).

- The indicator "percentage of trucks less than 10 years old" is an exception where the region shows better average values than Argentina. **With 45% of vehicles more than 10 years old, the age of the fleet may be generating inefficiencies in the service. The problem is most acute in region I (66% for the above indicator), and in municipalities with less than 15,000 inhabitants (85%)**. Trucks older than 10 years significantly increase the probability of technical problems. Especially in small municipalities, this may lead to the inability to provide the service or the need to reduce the frequency in some areas until the truck is repaired.
- **29.5% of the country's population has a collection service with a truck without a compactor, which may also indicate inefficiencies in the service.** This percentage includes non-conventional vehicles such as motorbike or animal-drawn vehicles. Region I has 45.8% of collection vehicles without compactors.
- According to the EVAL results, **the country has made progress in the provision of special collection services such as aggregate collection or market collection**. In both cases, Region II has the lowest levels of coverage.

1.3 Argentine Social Debt Barometer Survey of the Argentine Catholic University (EDSA)

The Argentine Social Debt Survey (EDSA) is conducted by the "Argentine Social Debt Observatory" Programme, an institutional research department of the Argentine Catholic University. The observatory, which has been conducting surveys in urban agglomerates since 2004, in its latest survey included the Buenos Aires metropolitan area and 16 other Argentine agglomerates with a sample size of 5,700 cases.

The section of the survey that assesses public services takes into consideration the collection of Municipal Solid Waste (MSW). Specifically, the survey asks: "In the block where your house is located, are there collection services at least every other day? Therefore, the response is based on information provided by the respondent, unlike the National Census where the enumerator was in charge of assessing the existence of collection service in his or her segment. The survey assesses access to the service for different socio-economic levels and for different agglomerations and, specifically, to know the coverage among households located in slums and shantytowns.

Table N° 5. Urban households without regular municipal solid waste collection coverage (EDSA, 2010-2013).

Urban households without collection service	2010	2011	2012	2013
Total urban households	3,3%	4,7%	4,2%	3,0%
Urban households located in slums	15,7%	16,2%	15,1%	14,3%

Source: Own elaboration based on EDSA data.

Table N° 6. Urban households without regular MSW collection coverage, by agglomerate, social stratum and residential status (EDSA, 2010).

Urban Agglomerate					Social Stratum				Residential status		
Total Urban	City of Buenos Aires	Greater Buenos Aires	Other agglomerates	Other urban areas	Very low	Under	Medium	Medium -high	Villa	Low SE urban layout	Urban layout of medium SE level
3%	1,4%	5,1%	0,7%	1,9%	7,1%	3,5%	1%	0,5%	15,7%	3,6%	0,6%

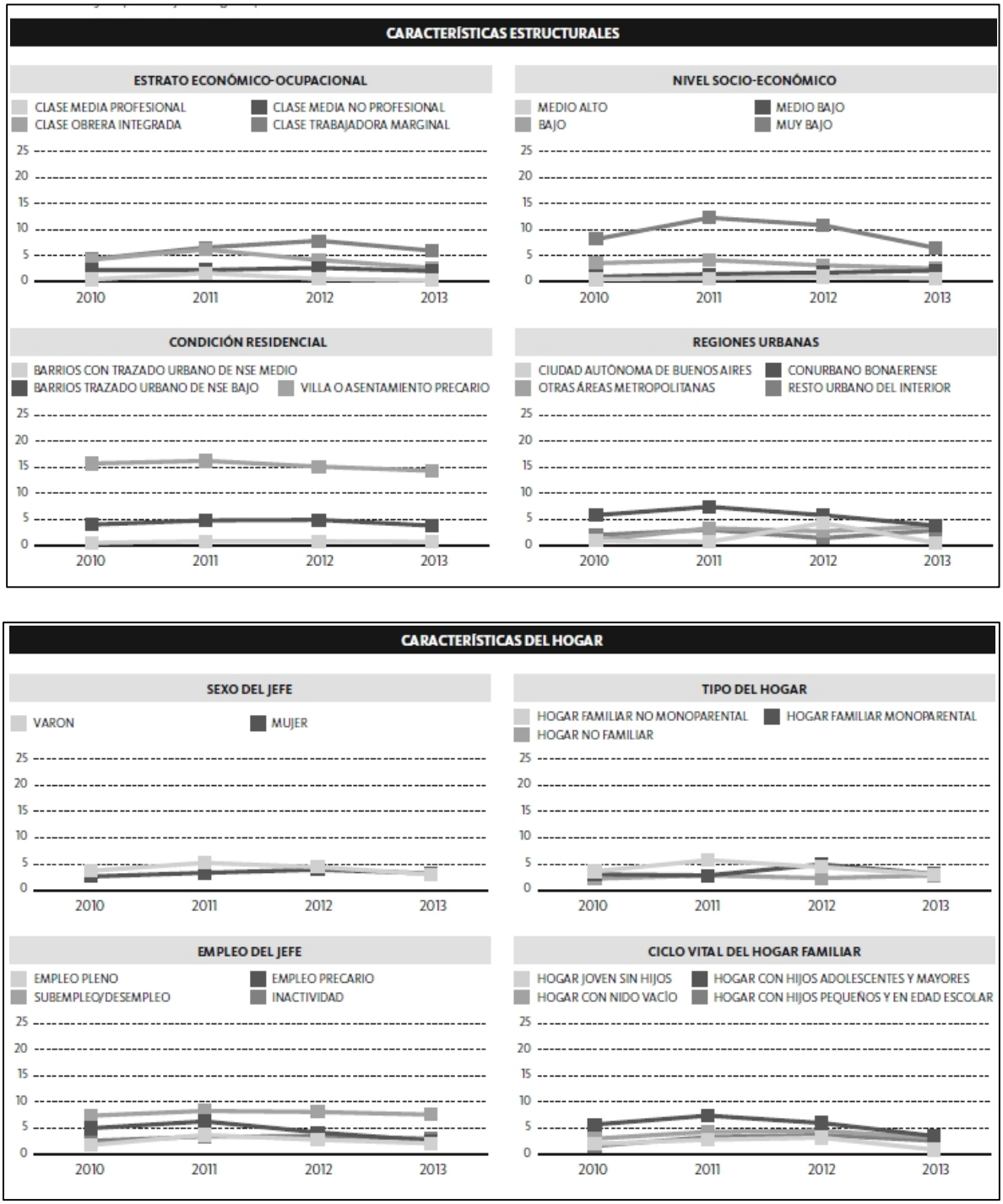
Source: Own elaboration based on EDSA data. SE: Socio-economic. Greater Buenos Aires: does not include the city of Buenos Aires.

Table N° 7. Urban households without regular MSW collection coverage, comparison of different sources of information.

Source	Criterion	Households not covered
Barometer (EDSA)	Collection every other day	4,7%
Census 2010 (urban areas)	At least twice a week	4,51%
Census 2010 (31 agglomerates EPH)		4,31%
EVAL 2010		0,2%

Source: Own elaboration based on data from EDSA and INDEC.

Figure N° 4. Collection coverage by household characteristic as a percentage of private households (EDSA, 2010-2013).



Source: EDSA - Bicentenario, Observatorio de la Deuda Social Argentina - UCA (2013).

Data analysis:

- The survey shows **coverage levels with regular collection service very similar (95.30% in 2011) to the results of the 2010 National Census for the main urban agglomerates** (95.69%).
- In relation to the differences between agglomerates, **according to EDSA**, **Greater Buenos Aires has the highest percentage of uncovered households among the agglomerates analysed (5.1%)**, a value, in fact, very similar to that reported by the 2010 Census (5.73%).
- **Table N° 6 and Figure N° 4 allow us to conclude that access to the service is affected by socio-economic variables.** The percentage of households not covered increases significantly in the "very low" socio-economic level (7.1%), in households with an unemployed or underemployed head of household (7.5%) and in households belonging to the "marginal working class" (6%). The values of non-coverage in the middle socio-economic level and in households with a professional head of household are practically nil.
- **Table N° 5 shows that the lack of service is particularly important in households located in slums and shantytowns (14.3% of households were not covered in 2013).** There, the probability of not having a collection service is four times higher than in households with a low socio-economic level but with an urban layout. This is largely due to logistical difficulties in providing the service due to lack of accessibility.
- **According to EDSA, between 2010 and 2013, improvements in service accessibility were most significant in the most vulnerable groups.** For example, the deficit was reduced by 20% in the "very low" socio-economic level and by 9% in households located in slums. **Also noteworthy is the 35% reduction in the deficit that took place in Greater Buenos Aires over the same time period**. This improvement is particularly important considering that, according to the results of the 2010 Census, this area had the highest number of uncovered inhabitants (171,730 households).
- **According to Figure 4, there are no statistically significant differences in access to the service according to the gender of the head of household or the structure of the household.**

1.4 Socio-economic assessment carried out by the GIRSU Project (SAyDS)

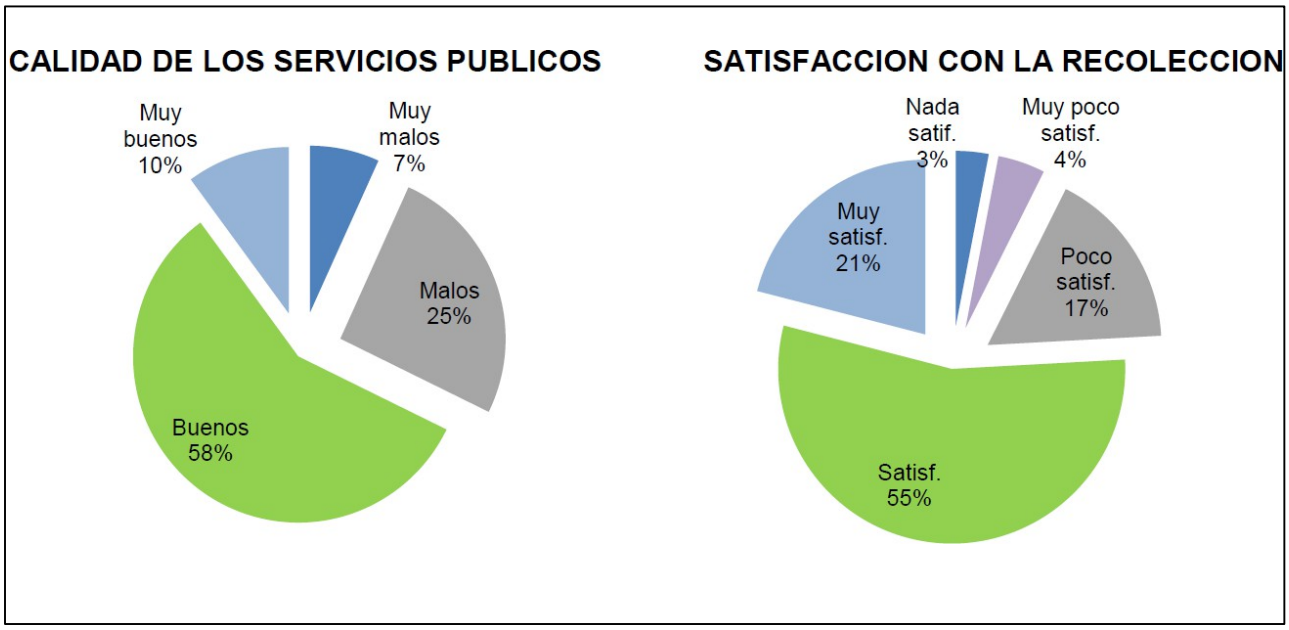
It is not only important to achieve high levels of coverage with regular collection services, but also to provide an efficient and good quality service. However, no systematic analysis of the quality of collection services takes place at the national level and the national data sources presented above limit their assessment to coverage levels.

The National Project for the Integrated Management of Urban Solid Waste (Proyecto GIRSU) of the National Secretariat of Environment and Sustainable Development (SAyDS) conducted a socio-economic survey in 2014 with 3,600 respondents from 6 Argentine urban agglomerates (error of 3.27%). The survey included, among other aspects, questions on the level of satisfaction with the waste collection system.

waste in particular and with public services in general. The selected agglomerates were Gran Mendoza, Gran Buenos Aires (La Matanza and Berazategui) and Rosario, where collection frequency is on average 6 times per week, Resistencia with an average frequency of 4 times per week and San Salvador de Jujuy with a weekly frequency of three times.

The quality of public services was described as "Good" or "Very Good" by 68% of respondents (see Figure N° 5)**. As far as waste collection is concerned, the results showed that 76% are satisfied or very satisfied with the service**, numbers which, although high, leave room for improvement. The survey also shows that, according to respondents' perceptions, municipalities perform better in the provision of waste collection services than in other municipal public services. On the one hand, **17% of respondents were satisfied with the collection service but considered the rest of the public services to be bad or very bad**. On the other hand, only 8.9% said they were dissatisfied, very dissatisfied or dissatisfied with the collection service and rated the public services as good or very good. This may imply that municipalities put more effort into waste collection than into other services, for example, due to the visibility of the service and public pressure.

Figure N° 5. Assessment of the quality of waste collection and other public services (GIRSU Project, 2014).



Source: Socio-Economic Assessment - Final Report (GIRSU Project, 2014).

These indicators are based on the respondent's perception of public services, which is subjective. Interestingly, **1492 respondents (41.6%) said they were satisfied or very satisfied with the collection service and, at the same time, responded that waste accumulation was a problem in their city**. This may imply that people are satisfied with the collection service even when it is deficient, or that waste accumulation is not associated with a collection deficiency and is, for example, attributed to bad habits of the population.

In relation to citizens' habits, it is interesting that 93% of respondents said that they would properly dispose of waste on the pavement or in the appropriate container (if available). In addition, 68% said they would keep waste inside their home if the truck did not pass by for a week. This number rises to 83% in San Salvador de Jujuy and decreases to 49% in Villa Gobernador Galvez.

1.5 GIRSU Cost Matrix by the GIRSU Project (SAyDS)

Another useful indicator to assess collection efficiency is the cost per tonne collected. The GIRSU Project (SAyDS) developed an Excel tool for municipalities to calculate the costs of the different phases of their waste management and, since 2012, has held three-day workshops in 14 Argentine provinces to teach the tool and collect data. At the end of the workshop, municipal representatives are, often for the first time, able to estimate their ISWM costs. Below are results aggregated by population size from the above-mentioned database, based on information provided by municipal representatives.

Cost of waste collection, by population size (Cost Matrix).

Municipal size (inhabitants)	Average collection cost per tonne collected (U$D/tonne)*.
Less than 9,999	61,7
10.000 - 49.999	39,4
50.000 - 99.999	41,1
100.000 - 199.999	79,6
200.000 - 499.999	51,6
500.000 - 999.999	58,9
More than 1,000,000	42,1

Source: Workshops developed by the GIRSU Project (SAYDS) between March 2010 and October 2014, data based on information provided by municipal representatives.

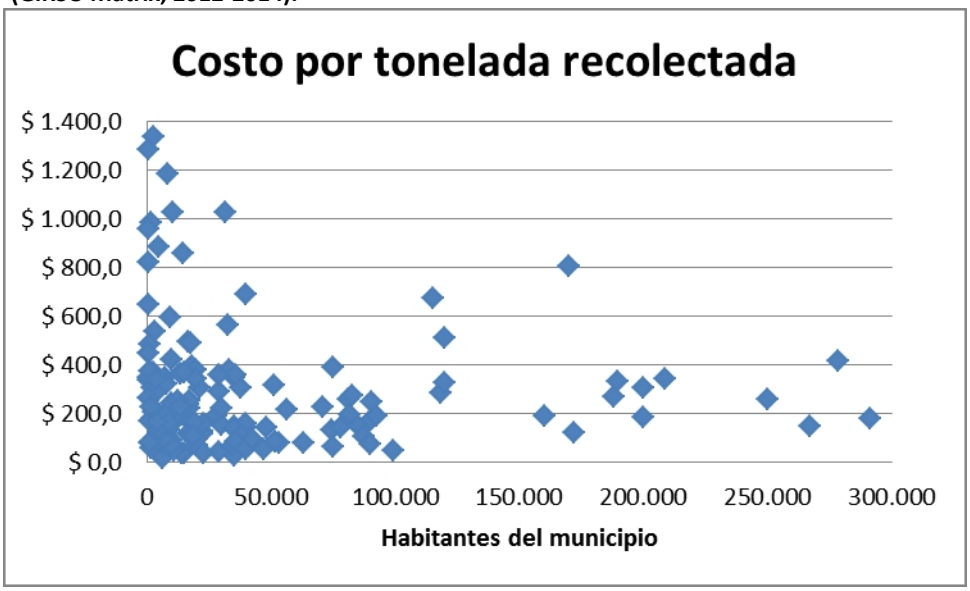
* Note: The exchange rate used was the exchange rate on the day of the workshop.

In the following figures, the collection cost per tonne collected for different localities is presented as a function of the number of inhabitants in order to assess whether there is a direct relationship. Figure 6 considers 149 municipalities with populations ranging from 290,000 to 350 (average: 42,493 and median: 18,454), the average cost per tonne collected was 277 pesos, the maximum value was 1336.9 pesos and the minimum 17.7 pesos. In Figure 7, only municipalities with less than 100,000 inhabitants were included.

According to Figures 6 and 7 and Table 8, there is no clear relationship between population size and collection cost per tonne collected, and there is significant variation in unit costs, especially in smaller municipalities. Such variation may indicate inefficiencies in the service in some municipalities and/or lack of accuracy in the information provided. This last point is in line with the lessons learnt by the GIRSU Project during the implementation of the

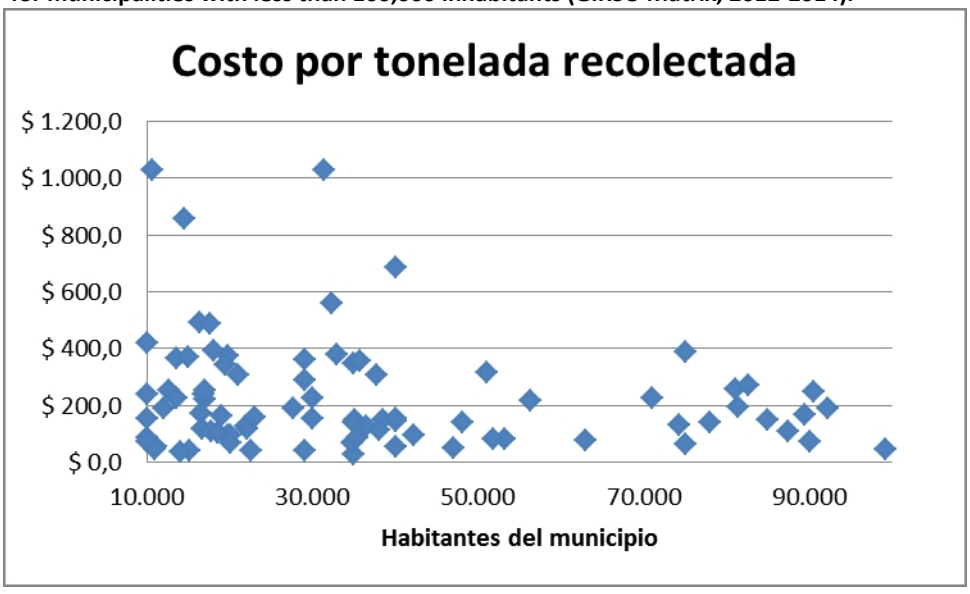
workshops, according to which **most municipalities do not know exactly how much they spend on the ISWM system and its different phases (Mosteirin et.al, 2014)**.

Figure N° 6. Cost per tonne collected as a function of the number of inhabitants (GIRSU Matrix, 2012-2014).



Source: Own elaboration based on the results of the Cost Matrix.

Figure N° 7. Cost per tonne collected as a function of the number of inhabitants for municipalities with less than 100,000 inhabitants (GIRSU Matrix, 2012-2014).



Source: Own elaboration based on the results of the Cost Matrix.

1.6 Containerisation and Differentiated Collection

The presence and extension of containerisation and/or separate collection systems are important indicators of the quality of the collection service. Containerisation helps to reduce collection times, improve hygiene and safety conditions, and keep streets cleaner. The existence of differentiated collection, on the other hand, directly influences the recovery rates of separation programmes and greatly facilitates the task of urban waste pickers.

There is no aggregated information for Argentina on either the extent of containerisation or the existence of differentiated collection systems, but there is disaggregated information on some municipalities that have started to work on the issue. The quantitative and qualitative information presented below is based on provincial diagnoses developed by the GIRSU Project (SAyDS) in Formosa, Catamarca, Río Negro and Entre Ríos during 2014 as well as public information published by various municipalities and data provided by municipal representatives.

During the aforementioned provincial assessments, **although many municipalities reported having containers for municipal waste disposal, when asked about the extent of containerisation, the vast majority reported having small numbers of containers located mainly in schools, squares, public buildings or in the city centre.** In the aforementioned provinces, municipalities with **extended containerisation**, generally covering the city centre and peripheral neighbourhoods, **include Paraná (Entre Ríos), San Fernando del Valle de Catamarca (Catamarca), and Viedma (Río Negro)**, all of which are provincial capitals.

Not only in the four provinces evaluated by the GIRSU Project through provincial diagnostics, but in Argentina in general, examples of high levels of containerisation and differentiated collection are scarce, even among the main agglomerations. **Rosario** (907,718 inhabitants, belonging to the province of Santa Fe) **is one of the most advanced localities in this area**, with **7,000 rear-loading plastic containers and 3,500 side-loading metal containers** benefiting more than 800,000 inhabitants. The city implemented containerisation in the centre and main avenues using metal container islands for differentiated disposal, and in the south and north of the city using plastic containers. It also installed 410 reception centres for recyclable materials in different institutions. The municipality expects to migrate all its plastic containers to metal side-loading containers. Today, 90% of the city is covered by differentiated collection through door-to-door collection systems, container islands or reception centres.

In terms of technology used, Argentine municipalities, in general, started by acquiring 1.2 m^3rear-loading plastic containers, with the advantage that these do not involve changing the fleet of trucks but only adapting them. Then, they started to migrate to 3.2 m^3side-loading metal containers which, although they imply a change of the fleet, are more robust and allow a faster and more efficient collection, most municipalities are now opting for this technology. **The most modern technology to arrive in the country is the Single Operator Collection System** which allows, by changing only the rear part of the truck, the same vehicle to be used to collect ordinary and underground containers as well as to clean them. These containers are unloaded from underneath, so they cannot be easily opened making them more resistant to

vandalism but also making it more difficult for informal collectors to search for material. They are not produced in the country and are therefore more expensive to purchase.

On the other hand, **the city of Buenos Aires (**2,776,138 inhabitants) **has also expanded containerisation substantially**, and today has the largest side-loading collection system in the country. It has **14,700 3.2m^{3}metal containers covering 65% of the city,** the vast majority of which are side-loading but the city has also made inroads into single-operator containers, **another 20% is covered by 1.2m^{3}containers**. The city of Buenos Aires plans to achieve 100% containerisation of the city, so it will have 26,000 3.2m containers^3. It also incorporated underground containers in the microcentre, 52 containers from 2.5 m^{3}to 5 m^{3}in 18 locations as of December 2014.

In the City of Buenos Aires, **differentiated collection is carried out by formalised urban waste collectors (4,526 collectors). They have 2312 green bins with a capacity of 120 kg each, covering 31.5% of the city** (data as of April 2015) **and 8 green centres** (sorting sheds with a low to medium level of mechanisation). The city also has **18 green points located in squares and small squares** where they receive recyclable materials. It is worth noting that an estimated 5,000 other informal waste pickers roam the streets of the city and collect separated or unseparated material from bells, containers and establishments.

The city of San Juan has the highest containerisation that could be recorded for this report in the single-operator system (**300** 3m^{3}containers and two underground containers). **Localities with extended containerisation coverage experience, in general, high levels of citizen participation and improvements in collection service. However, container vandalism is recurrent and it is common to see breakages or micro-dumps around containers due to waste pickers looking for recyclable materials.**

In relation to the experiences of extended differentiated collection, in addition to San Juan, Rosario and Buenos Aires, among the main agglomerations with this service we can mention Gualeguaychú, Bahía Blanca, Bariloche, Santa Fe City, Concordia, Mar del Plata and Viedma. **Some of them have special containers in the streets where recyclable materials can be deposited** (Viedma) **while others base their programmes on green points** (Concordia and Bahía Blanca) where there are people who receive the materials. In the case of Mar del Plata, Gualeguaychú, Bariloche and Santa Fe, most citizens are covered by differentiated collection whereby **separated material is placed in special bags on the street to be collected by collection vehicles on special days.** The city of Salta also has a separate collection programme with a high level of participation based on the use of orange bags and door-to-door neighbour awareness-raising, covering 10% of the city and with special trucks that pass through on specific days of the week. It should be noted that one of the problems with separate collection programmes is that, in some cases, they do not replace wet collection services with dry collection services, but rather add extra services to existing ones, which results in a considerable increase in service costs.

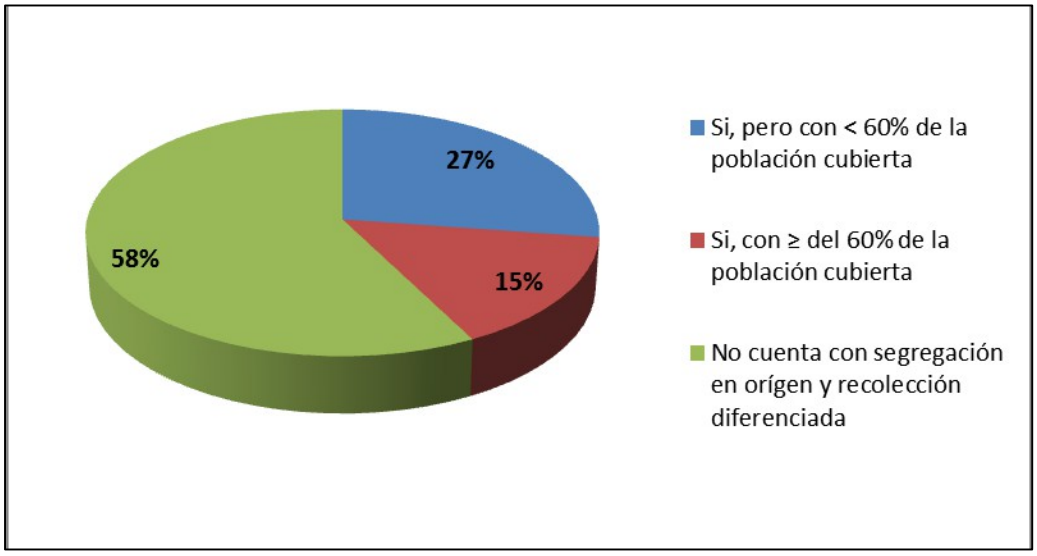
Participation levels in such programmes vary significantly, and localities do not always have reliable data on sorting levels and quantities recovered. However, it is generally observed that, if awareness programmes are sustained over time, participation tends to increase. In the case of the city of Santa Fe, for example, in May 2010

started with separate collection in 4,800 blocks and, according to municipal reports, one year later achieved an 86% participation rate and increased the quantities recovered by 20%. Consequently, in August 2011, separate collection was extended to the whole city (4 days for wet waste and 2 days for dry waste).

According to the diagnostics carried out by the GIRSU Project (SAyDS) in 2014, **the percentage of municipalities with some type of differentiated collection in Formosa, Entre Ríos and Río Negro reached 19% in 2014, increasing to 50% in municipalities with more than 50,000 inhabitants, 24% in municipalities with between 10,000 and 50,000 inhabitants and decreasing to 6% in municipalities with less than 10,000 inhabitants.**

Entre Ríos, one of the provinces analysed, is **one of the Argentine provinces where most progress has been made in terms of waste recycling**. Most of its municipalities have separation plans and awareness-raising campaigns and have 29 separation plants installed (reported during the diagnosis) that recover approximately 14% of the waste generated. As shown in Figure N° 8, **58% of the municipalities surveyed during the diagnosis still do not have separation at source and differentiated collection, and 15.1%, although they do, reach less than 60% of the population.**

Figure N° 8. Municipalities with separation at origin and differentiated collection in Entre Ríos.



Source: Own elaboration based on data from the Entre Ríos provincial GIRSU Diagnosis (GIRSU Project - SAyDS, 2014).

2. Sweeping of Municipal Solid Waste

- The country has **high levels of** sweeping **coverage (81.6%**, EVAL 2010), a value very close to the regional average (82.3%). However, **comparing** this value **with** the 91% coverage obtained in the IDB evaluation carried out in **2002** (EVAL 2002), **a decrease of 10% is observed.**

- Disaggregating this 81.6% coverage, we see that 62.7% of the population is covered by manual sweeping and **18.9% by mechanical sweeping**, the latter being significantly higher than the average for Latin America (7.1%) (EVAL 2010). In large agglomerates the mechanised service is 18.1%; an increase in this percentage could contribute to the efficiency of the service.

- The use of **mechanised services differs by municipal size, but the results show neither a directly proportional relationship nor drastic differences** (12.9% for municipalities with less than 15,000 inhabitants, 9.3% for those with between 15,001 and 50,000, 22.6% for those with between 15,001 and 50,000 inhabitants, 22.6% for those with between 15,000 and 50,000 inhabitants, and 22.6% for those with between 15,000 and 50,000 inhabitants).
  50,001 to 300,000 and 18.1% for those from 300,001 to 5,000,000).

- Sweeping services **vary significantly between regions in Argentina**, with Region II (Cuyo and Mesopotamia) having the lowest coverage (64.3%) and Region III (Pampeana and Patagonia) having the highest percentage of mechanised service (22.7%).

- **The average number of vehicles per 10,000 inhabitants covered also varies significantly between regions and by municipal size.** The highest value found is for the average of localities with less than 15,000 inhabitants (0.96) and for the Northern Region (0.9).

- The **average number of vehicles** per 10,000 inhabitants covered (0.44) **and the** percentage in **good operating condition** (87%) is higher than the values found by EVAL for Latin America **(**0.17 and 81% respectively).

- The country **has made progress in** the provision of **special sweeping services,** such as the maintenance of parks, fairs and exhibitions.

2.1 Regional Assessment of Municipal Solid Waste Management in Latin America and the Caribbean (EVAL)

Table N° 9. Sweeping coverage in percentage of inhabitants covered and service efficiency indicators (EVAL, 2002 and 2010).

ISWM Phase	Indicator	Region			Municipal size				Total Country	LAC Average	EVAL 2002
		I	II	III	Micro	Small	Medium	Grande			
Sweeping and cleaning	Coverage with manual sweeping	76,90%	49,80%	62,20%	67,60%	67%	62,90%	60,20%	62,70%	75,20%	74,30%
	Coverage with mechanical sweeping	6,90%	14,50%	22,70%	12,90%	9,30%	22,60%	18,10%	18,90%	7,10%	17,40%
	Total coverage	83,90%	64,30%	84,90%	80,60%	76,30%	85,40%	78,30%	81,60%	82,30%	91,70%
	Sweepers per 10,000 inhabitants in municipalities attended	0,9	0,1	0,39	0,96	0,61	0,61	0,07	0,44	0,17	0,1
	Percentage of equipment in operation	100%	100%	84%	100%	100%	87%	85%	87%	81%	/
Special services	Municipalities that have parks and gardens maintenance service gardens	78,60%	100%	91,50%	/	/	/	/	89,50%	/	/
	Municipalities that have Cleanup of fairs and exhibitions	79,60%	45,10%	58,40%	/	/	/	/	61,80%	/	/

Region I: Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán Region II:

Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis

Region III: Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and the Autonomous City of Buenos Aires.

Large, between 300,001 and 5,000,000 inhabitants; Medium, between 50,001 and 300,000 inhabitants; Small, between 15,001 and 50,000 inhabitants; and Micro to municipalities with a population of less than 15,000 inhabitants.

Source: Own elaboration based on EVAL (2010).

3 Transfer of Municipal Solid Waste

- **Coverage with transfer stations is still low in the country.** EVAL estimated in 2010 that 16.9% of the inhabitants had this service, while the information collected for the present diagnosis (2015) estimates that **20% of the waste generated is transferred.**

- Comparing the results of EVAL 2010 and those generated for this report, we found that there was an **increase in transfer capacity between 2010 and 2015 but it was not significant.**

- **The low coverage with transfer stations is partly explained by the low number of existing regionalisations. For the present report, 8 regionalisations were counted among the 31 main agglomerations.** On the other hand, transfer stations were detected **in 9 of the 24 Argentinean provinces**.

- According to EVAL 2010, coverage with transfer stations **varies significantly with the population size of the municipality.** EVAL estimated that **in municipalities with more than 300,000 inhabitants, 42% of the inhabitants were covered,** while coverage was zero among those with less than 15,000 inhabitants (EVAL 2010)**.**

- **30% of the Municipal Solid Waste generated in the 31 main agglomerates of the country is transferred**.

- The transfer stations located in the **Buenos Aires Metropolitan Area** (7,300 tonnes/day transferred) are responsible for **76.3% of the total MSW that is transferred.**

- It is possible to differentiate **three** main **groups** of transfer stations: i) large stations **in populous urban agglomerations, ii)** small and medium-sized stations **in tourist locations, and iii) stations within regionalisations promoted by the provincial government.**

3.1 Regional Assessment of Municipal Solid Waste Management in Latin America and the Caribbean (EVAL)

Table N° 10. Percentage of inhabitants covered by transfer service for collected municipal waste, by municipal size.

GIRSU Phase	Indicator	Micro	small	Medium	Grande	Total Country	LAC Average
Transfer	Coverage	0%	7,60%	2,80%	42%	16,90%	28,20%

Large, between 300,001 and 5,000,000 inhabitants; Medium, between 50,001 and 300,000 inhabitants; Small, between 15,001 and 50,000 inhabitants; and Micro to municipalities with a population of less than 15,000 inhabitants.
Source: Own elaboration based on EVAL (2010).

Data analysis

- According to Table N° 10, **in 2010 the use of transfer stations was not widespread in the country (16.9%), presenting significantly lower levels than the average for Latin America (28.20%).** This may be associated with the fact that regional solutions for final disposal were not and are not extensively used either.
- The EVAL reveals differences in coverage with transfer stations by municipal size. **Municipalities with less than 300,000 inhabitants have significantly lower coverage levels, which allows us to conclude that they are mainly used in large agglomerations.**
- **No municipality with less than 15,000 inhabitants surveyed by EVAL uses transfer stations.** This value may be influenced by the fact that, in general, low amounts of waste generation make transfer stations a costly alternative that is only cost-effective in regionalisation projects which, as already mentioned, are not common in the country.
- **Since 2010 new transfer stations have come into operation**, which is why the current coverage levels exceed those surveyed by EVAL in 2010.

3.2 Analysis of existing transfer stations

The results of the EVAL in terms of transfer station coverage have become outdated due to the fact that new transfer stations have been in operation since 2010. Therefore, for the purposes of this study, a compilation of existing transfer stations and an estimation of the total tonnes of municipal solid waste transferred in them on a daily basis was carried out. The data presented in Table N° 11 comes from information provided by the GIRSU Project (SAyDS), direct consultations with municipal managers or operators of the stations and information available on official websites.

Table N° 11. Existing Transfer Stations in Argentina, by province (2015).

Province	Transfer station	Municipalities using it	Tonnes transferred per day
City of Buenos Aires	Colegiales	City of Buenos Aires and some districts of Greater Buenos Aires (operated by CEAMSE).	1750
	Pompeii		2100
	Flowers		2000
	Zavaleta (only receives pruning waste and debris)		500
Buenos Aires (24 districts of Greater Buenos Aires)	Almirante Brown		950
Missions	The entire province is regionalised and has 25 transfer stations and two landfills operated by the private company Aesa.	The whole province	475
Chubut	Puerto Madryn	Puerto Madryn (operated by URBASER, the inter-municipal consortium Virch-Valdez controls its operation).	50
	Trelew	Trelew and Rawson (operated by the private company URBASER, the inter-municipal consortium Virch-Valdez controls the work of URBASER).	
	Rawson	Rawson (has a transfer station from where waste is transferred to the Trelew transfer station to go to the ex-Omega tower landfill).	
	Los Cipreses	Trevelin	5
	Lake Rosario		
Santa Fe	Bella Vista	Rosario	680
Tucumán	San Felipe	Greater San Miguel de Tucumán (operated by the private company Los Mallines, the inter-municipal consortium controls its operation).	900

La Rioja	Guadacol-Pagancillo	Guadacol and Pagancillo	2,5
Cordoba	Villa Carlos Paz	Villa Carlos Paz	50
	Unquillo	Unquillo	10
	La Falda	La Falda	10
Neuquén	San Martín de los Andes	San Martín de los Andes	20
TOTAL municipal solid waste transferred (Tons/day)			**9.567,50**
Estimated TOTAL municipal solid waste generation[1]			**49.070**
Municipal solid waste transfer capacity as a proportion of total waste generation			**19,50%**
Transfer capacity explained by the plants operated by CEAMSE			**76,30%**

[1]Considers 1.15 kg/person*day of municipal solid waste generation (EVAL 2010) and 42,669,500 inhabitants (2014 projection, Census 2010).

Source: Own elaboration based on data provided by the GIRSU Project (SAyDS) and municipal representatives (2015).

Existing transfer stations in the 31 main agglomerates of Argentina, by agglomerate (2015).

Agglomerate	Transfer station	Municipalities using it	Tonnes transferred per day
Greater Buenos Aires			
	Colegiales		1750

City of Buenos Aires	Pompeii	City of Buenos Aires and some districts of Greater Buenos Aires (operated by CEAMSE).	2100
	Flowers		2000
	Zavaleta (only receives pruning waste and debris)		500
24 parties in Greater Buenos Aires	Almirante Brown		950
North East			
Posadas	Posadas	Posadas and other nearby municipalities (the whole province is regionalised and has 25 transfer stations and two landfills operated by the private company Aesa).	160
Northwest			
Greater San Miguel de Tucumán	San Felipe	Greater San Miguel de Tucumán (operated by the private company Los Mallines)	900
Pampeana			
Greater Rosario	Bella Vista	Rosario and other municipalities in Greater Rosario	680
Greater Cordoba	Unquillo	Unquillo	10
Patagonia			
Rawson-Trelew	Trelew	Trelew and Rawson (operated by the private company URBASER, there is an inter-municipal consortium that controls the work of URBASER).	65
	Rawson	Rawson (has a transfer station from where waste is transferred to the Trelew transfer station to go to the ex-Omega tower landfill).	
MSW transferred in the 31 main agglomerates (Tons/day)			9.115
MSW transferred in Greater Buenos Aires (Tons/day)			7.300
Total MSW generated in the 31 agglomerates (Tons)[1]			31.046
Percentage of total MSW generated in the 31 agglomerates that are transferred			**29,36%**
Percentage of total MSW generated in the 31 agglomerates that are transferred in the transfer stations operated by CEAMSE			**80,09%**

[1]Considers 0.90 kg/person*day of municipal solid waste generation for Region I (Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán), 0.98 for Region II (Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis), and 1.23 for Region III (Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and the City of Buenos Aires) (EVAL 2010) and 26.725,120 inhabitants (EPH, fourth semester 2014).

Source: Own elaboration based on data provided by the GIRSU Project (SAyDS) and municipal representatives (2015).

Data analysis

- EVAL 2010 estimated that 16.9% of the country's inhabitants were covered by transfer stations. **Table N° 11 presents an estimate of the percentage of municipal solid waste generated that is transferred (19.5%)**. Assuming that both indicators are equivalent, but stressing that they are not necessarily so, we can conclude that **there was an increase in transfer capacity in the country.**
- **The expansion in coverage, however, was not substantial, representing a 15.4% increase in estimated capacity in 2010.** We must also take into account the population increase that took place in that period (1.18% per year according to the 2001-2010 inter-census increase).
- Table N° 11 sheds light on the fact that the percentage of coverage found by EVAL at the country level (16.9%) and for large cities (42%) is mainly due **to the transfer stations located in the Buenos Aires metropolitan area, which account for 76.3% of the total tonnes of municipal waste transferred in the country.**
- Table N° 11 shows **three main groups of transfer stations. On the one hand, stations in large urban agglomerates (Buenos Aires metropolitan area, Greater San Miguel de Tucumán, Rosario). On the other hand, small and medium-sized tourist municipalities (Pagancillo, Trevelin, San Martín de los Andes, Puerto Madryn),** financed mainly by multilateral lending agencies. And finally**, we find the cases of Cordoba and Misiones where regionalisations promoted by the province gave rise to regional transfer stations**.
- The transfer stations in the provinces of Tucumán, La Rioja, Chubut and Neuquén were developed to implement **regionalisations driven by IDB or World Bank programmes.**
- **According to the information gathered for this report, most of the Argentinean provinces do not play an active role in promoting the regionalisation of wastewater management, which could partly explain the low number of transfer stations.** The lack of transfer stations **may also be due to a lack of planning and analysis of such solutions at both municipal and provincial levels.** As a result, the economies of scale that regional solutions provide are not considered or encouraged.
- **During this research, we found transfer stations in only 9 of the 24 Argentinean provinces** (37.5%). The province with the highest number of transfer stations is

Misiones since the whole province is regionalised and its service is based on 25 transfer stations.

- **For the present report, transfer stations were reported in only 7 of the 31 main agglomerates of the country** (city of Buenos Aires and districts of Greater Buenos Aires, Greater San Miguel, Greater Rosario, Greater Cordoba, Posadas and Rawson-Trelew).
- **Coverage with a transfer station increases in the 31 main agglomerates, where 29.36% of the waste generated is transferred,** higher than the 19.5% found for the country as a whole.
- **Of the 9,115 tonnes of waste transferred daily in the 31 main agglomerates of the country, 80% is transferred in transfer stations operated by CEAMSE.** As explained above, CEAMSE is a company created by the states of the Province of Buenos Aires and the City of Buenos Aires more than 30 years ago.
- Outside CEAMSE's area of influence, **most of the transfer stations are operated by private companies**, usually the same companies that operate the landfills where waste is transferred.

4. Treatment of Municipal Solid Waste

- According to the information gathered for this report, **there are 150 mechanised Municipal Solid Waste Treatment Plants in the country.** Adding their installed operational capacity, **17.7% of the total MSW generated (8,665 tonnes/day) could be treated in them.**

- In 2002, EVAL estimated that 5.6% of households in the country were covered by an inorganic waste treatment system and 1.05% by an organic waste treatment system. This leads to the conclusion that **there has been a substantial increase in installed treatment capacity over the last decade.**

- During the collection of information for this report, it became clear that **most of the plants are working below their installed capacity.** Cases were also reported of plants that never started operating, as well as others that were closed due to lack of maintenance or fire.

- **Recovery rates** of plants separating inorganic waste **are typically less than 10%.** Rates drop **due to: lack of source separation programmes, insufficient or inefficient awareness campaigns, operational problems and lack of maintenance.**

- The total installed treatment capacity is concentrated in a few plants. Out of the 150 plants reported, **141 have a processing capacity of less than 100 tonnes/day**. **Forty-four percent of the total installed treatment capacity in the country is accounted for by plants in** the city of **Buenos Aires. Aggregates treatment plants in Rosario and Buenos Aires alone account for 28% of the total installed treatment capacity.**

- **The aggregates treatment plant of the City of Buenos Aires has a high recovery rate (90%) and a treatment capacity of 2,400 tonnes/day.** Efficient management of this waste stream can significantly reduce the amount of waste to be disposed of.

- In terms of mechanical-biological treatment technologies **(MBT), Norte III-CEAMSE (a plant that treats waste from the city of Buenos Aires) is the largest MBT plant in the country with a capacity of 1,000 tonnes/day and an efficiency of 50%.**

- Separation in mechanised plants is not the only alternative for the recovery of inorganic waste. **Manual sorting is in fact carried out in the country by thousands of formal and informal workers every day in the streets, disposal sites or sheds (see chapter 8).**

- **Argentine municipalities are much more advanced in the treatment of the inorganic fraction than the organic fraction of municipal solid waste.** Biostabilised material from the treatment of the organic fraction of municipal solid waste cannot currently be marketed in the country (SENASA regulation). This creates a significant disincentive, especially for large-scale organic management projects which, after covering all the municipality's needs, do not find a destination for all the material generated.

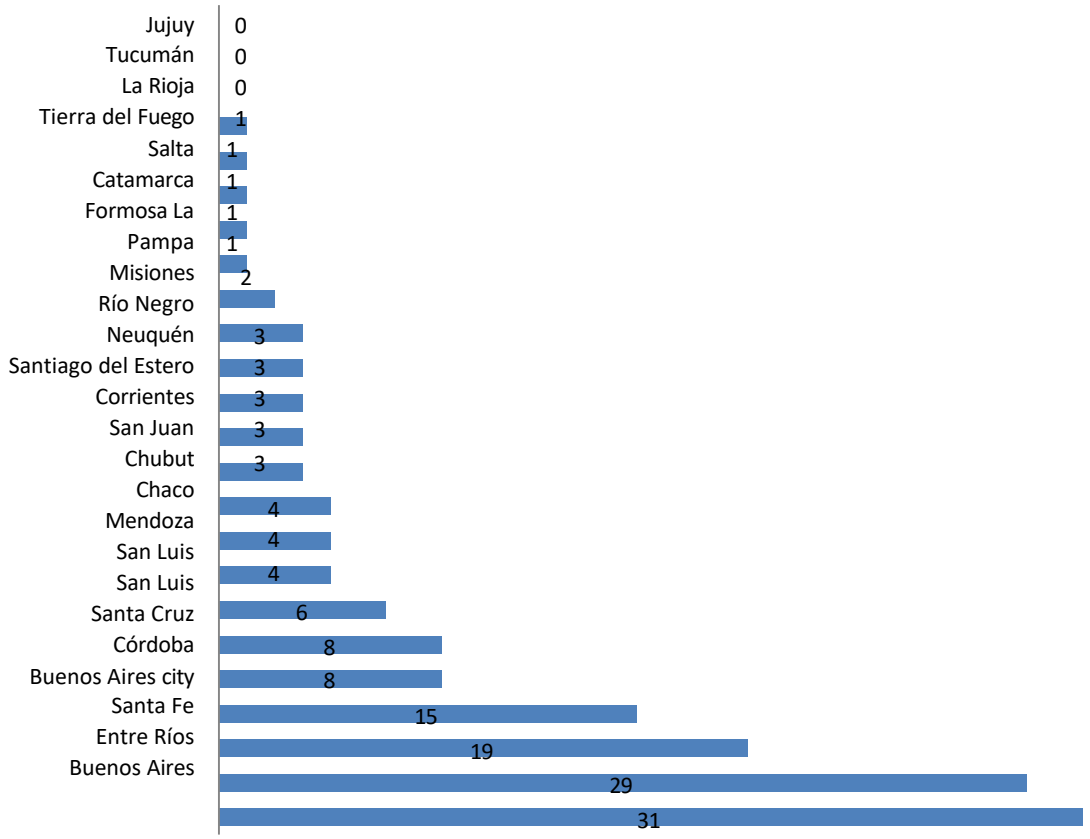
The qualitative and quantitative information presented below is based on publicly available official data, data provided by municipal representatives, data provided by treatment plant machinery suppliers and data generated in the GIRSU Provincial Diagnoses carried out by the GIRSU Project (SAyDS) in 2014 in the provinces of Formosa, Catamarca, Río Negro and Entre Ríos.

4.1 Analysis of Municipal Solid Waste Treatment Plants and existing recycling companies by province.

For the purposes of this Report, and using the sources of information listed in the previous paragraph, a list was made of all the municipal solid waste treatment plants detected in the country. Figures N° 9 to 13 and Table N° 13 summarise the aggregated information. The complete list including the municipality/municipalities using the plant, the type of plant, and the estimated installed capacity can be found in Annex N° 1.

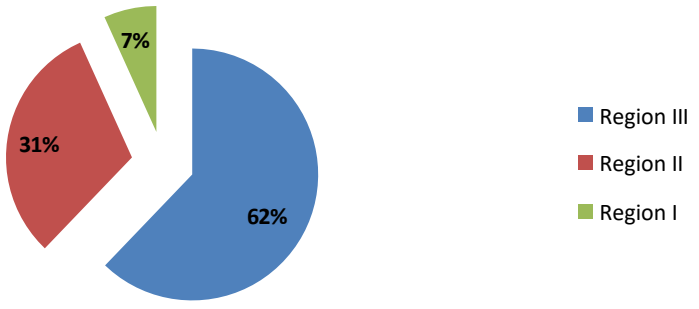
It is important to note that, although this section discusses existing treatment plants, there are many municipalities that do not have a mechanical separation plant but still have MSW treatment systems, e.g. based on green points and manual segregation. A mechanised plant is only one tool in a municipal treatment system. It should also be emphasised that waste pickers, both formal and informal, play a very important role in waste treatment and recycle significant amounts of waste on a daily basis (see chapter 8 for more information).

Figure N° 9 . Number of mechanised MSW treatment plants, by province (2015).



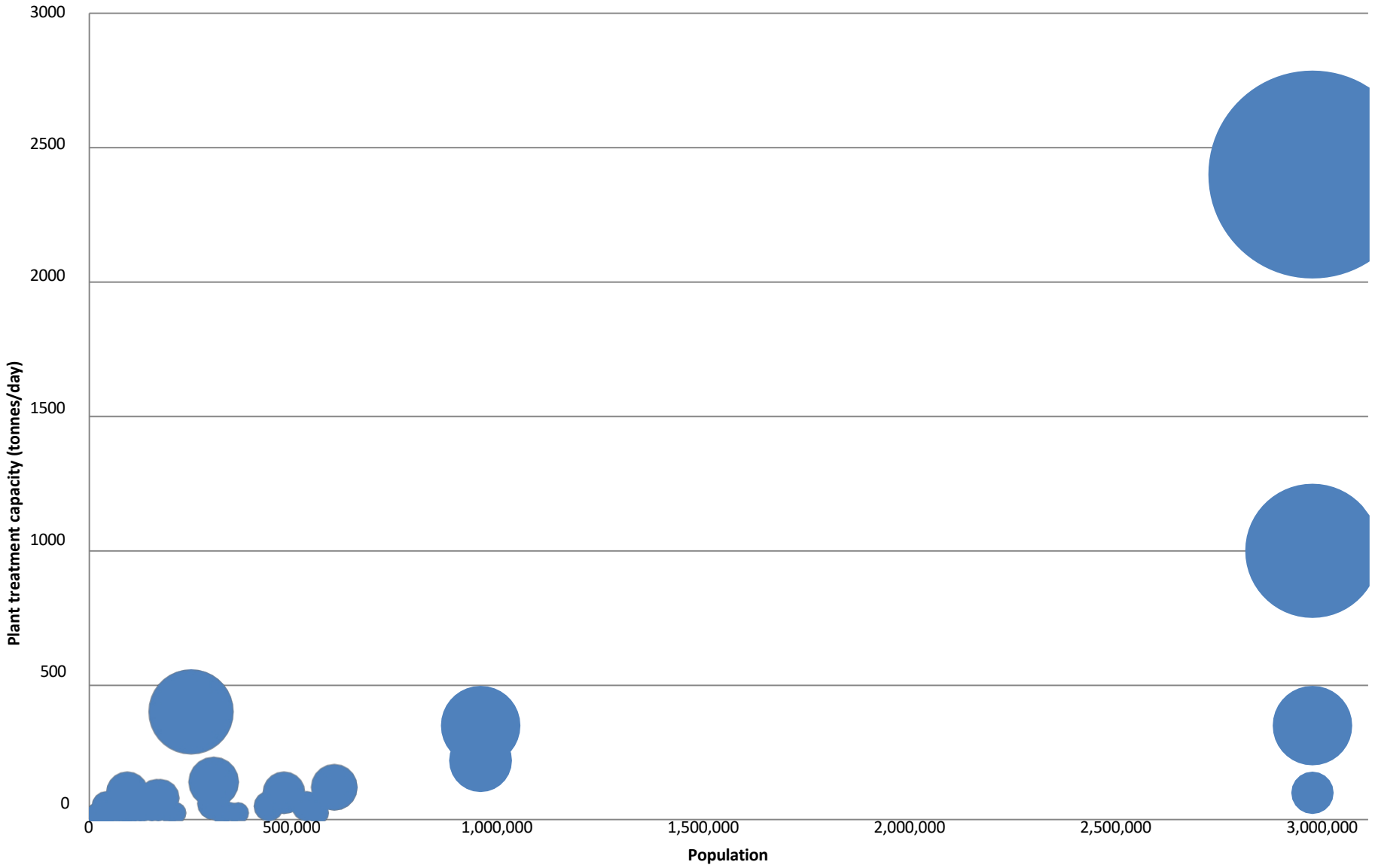
Source: Own elaboration (2015). The plants have different degrees of mechanisation.

Figure N° 10. Percentage of the total number of plants which is found in each region.



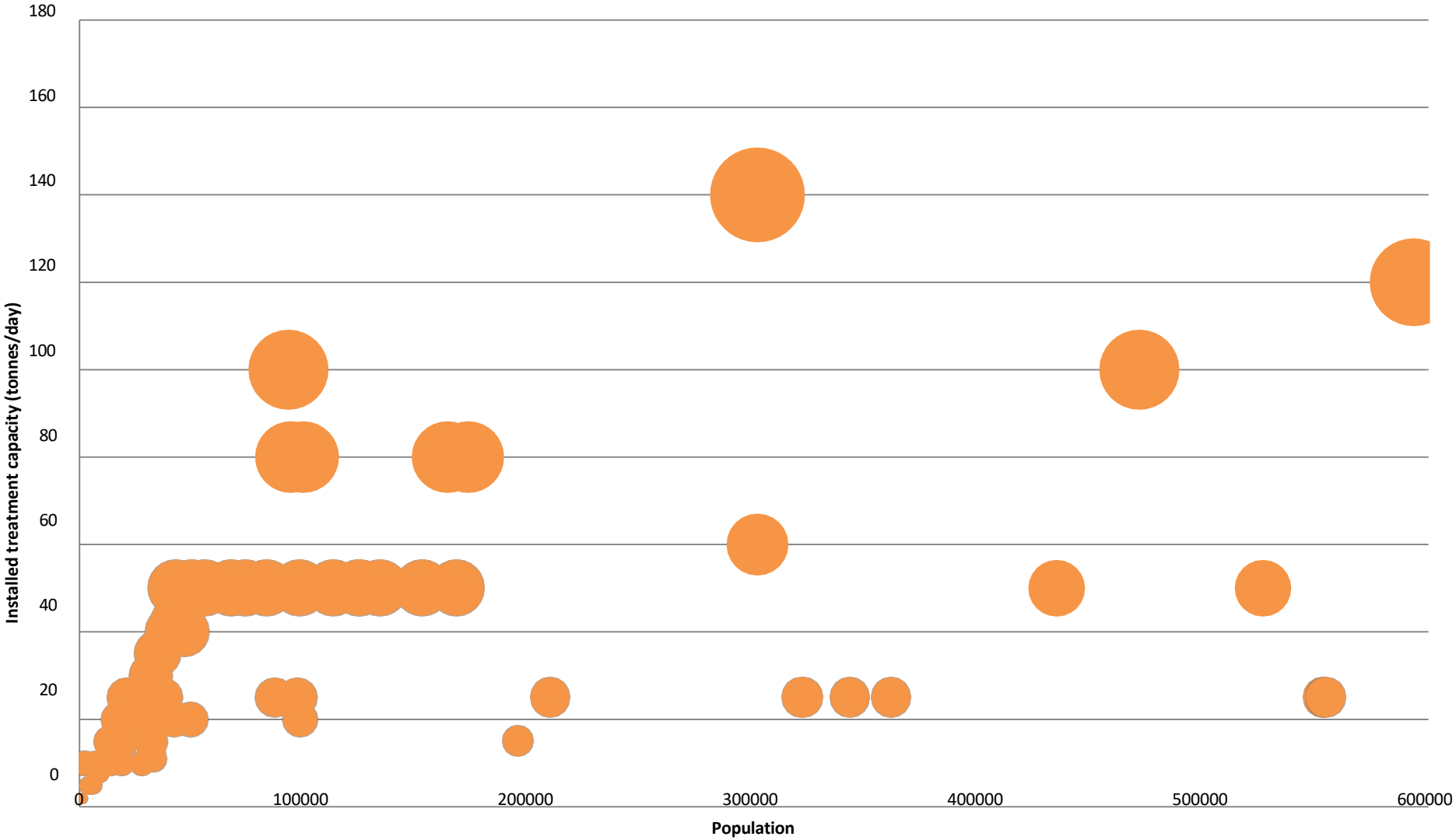
Region I: Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán Region II: Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis
Region III: Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and Buenos Aires city.
Source: Own elaboration (2015).

Figure N° 11. Installed treatment capacity by municipal size.



Source: Own elaboration (2015).

Figure 12. Installed treatment capacity as a function of municipal size, for municipalities with less than 600,000 inhabitants.



Source: Own elaboration (2015).

Table N° 13. Installed MSW Treatment Capacity in Argentina (2015).

TOTAL installed treatment capacity[13](tonnes/day)	8.665
Treatment capacity due to aggregates treatment plants in Buenos Aires and Rosario (% of total)	28%
Treatment capacity due to plants in the city of Buenos Aires (% of total)	44%
Municipal solid waste generation TOTAL[1]	49.070
Treatment capacity over total generation[1]	**17,7%**

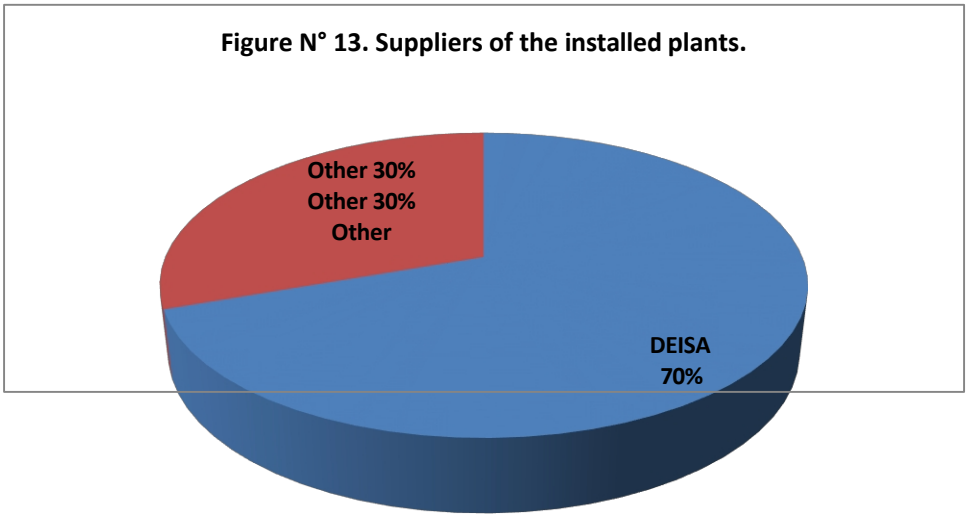
[1]Considers 1.15 kg/person*day of municipal solid waste generation (EVAL 2010) and 42,669,500 inhabitants (2014 projection, Census 2010).

[2]Where capacity was given in tonnes/hour, 10 working hours were assumed. The plants included in the calculation have different degrees of mechanisation. All plants that were detected are reported, not necessarily all existing plants.

[3]MBT plants in the City of Buenos Aires in the tendering process were not included.

Source: Own elaboration based on information provided by the GIRSU Project (SAyDS), DEISA, official websites and municipal representatives (2015).

Figure N° 13. Suppliers of the installed plants.



Source: Own elaboration (2015)

Recycling companies, by province (CEAMSE-INCOCIV, 2014).

Companies	Buenos Aires	City of Buenos Aires Aires	Santa Fe	Entre Rios	Other provinces	Total
Number of companies	110	30	50	6	47	250
% of total registered recycling companies in the country	44,0%	12,0%	20,0%	2,4%	18,8%	100,0%

Source: Own elaboration based on information presented by CEAMSE-INCOCIV in the GIRSU Provincial Plan for Entre Ríos (2014).

Data analysis

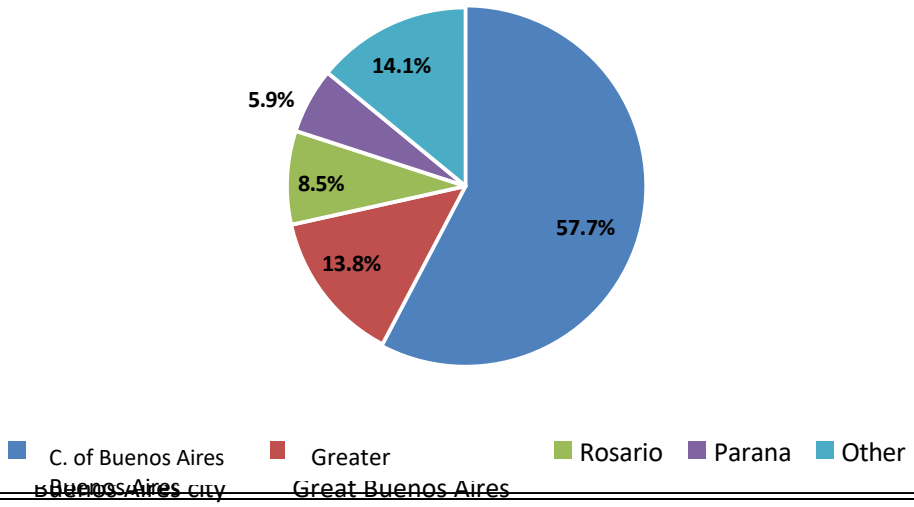
- In terms of number of plants, according to the sources consulted, **there are 150 mechanised municipal solid waste treatment plants in the country. 21 of the 24 provinces have at least one MSW treatment plant**, with **Entre Ríos, Buenos Aires, Buenos Aires city and Santa Fe** at the top of the list with **more than 15 plants each.**
- Most of the plants are located in region III (62%) followed by region II (31%). **Region I (North of the country) has only 7% of the existing plants and 3 of its provinces have no plants at all.**
- In terms of treatment capacity, it is estimated that **17.7% of the total municipal solid waste generated in the country can be treated in the plants already installed**.
- Figure N° 11 shows that **the city of Buenos Aires, with 3,380 tonnes/day of treatment capacity, has the highest installed capacity and the largest plants in the country**. The city of Buenos Aires is responsible for **44% of the total installed treatment capacity.**
- **The city of Buenos Aires and Rosario have aggregate waste treatment plants that account for 28% of the installed treatment capacity.** It is important to note that these plants have a recovery rate of approximately 90%, which demonstrates the potential impact of efficient management of this waste stream.
- **Most of the installed treatment plants are small or medium-sized** (141 of the 150 plants surveyed have a capacity of less than 100 tonnes/day). In addition to the plants in the city of Buenos Aires, **the largest installed treatment capacity is found in Greater Buenos Aires (CEAMSE has 9 plants with a total capacity of 650 tonnes/day), Rosario (570 tonnes/day), Paraná (400 tonnes/day, although at the time of the survey the capacity of these plants was less than 100 tonnes/day), Paraná (400 tonnes/day, although at the moment of**

At the time of writing this report it is not operational), Bahía-Blanca (200 tonnes/day) and Mar del Plata (120 tonnes/day).

- **Separation plants that recover inorganic materials are more widespread than organic waste treatment plants.** However, municipalities are increasingly considering the treatment of organic waste as fundamental, mainly because it can help to reduce a large amount of waste sent to final disposal.
- Among the municipalities surveyed in Annex N° 1, **one of the most diversified MSW treatment systems we found is that of the city of Buenos Aires.** It includes the treatment of mixed waste in a mechanical biological treatment plant (MBT Norte III), the treatment of aggregate waste, a plant for forestry and pruning waste, a plant for the recycling of plastic bottles and a composting plant for food waste (Hot-Rot technology, 10 tonnes/day capacity).
- According to the list presented in Annex N° 1, **many plants have a capacity equal to or higher than the total generation,** which reveals inefficiencies in infrastructure investment.
- **Many municipalities that have a sorting plant with some degree of mechanisation do not yet have a landfill**.
- **There are small municipalities, such as Rauch, Laprida, Maipú and Bragado that have had separation programmes for more than 15 years and today manage to treat almost 100% of their waste**, achieving high levels of recovery and participation. These municipalities are known as examples of "best practice" in the country.
- According to Figure N° 13, **70% of the plants have equipment from DEISA**, an Argentinean company based in the province of Santa Fe. This probably explains, in part, the great similarity of the existing plants in terms of equipment.

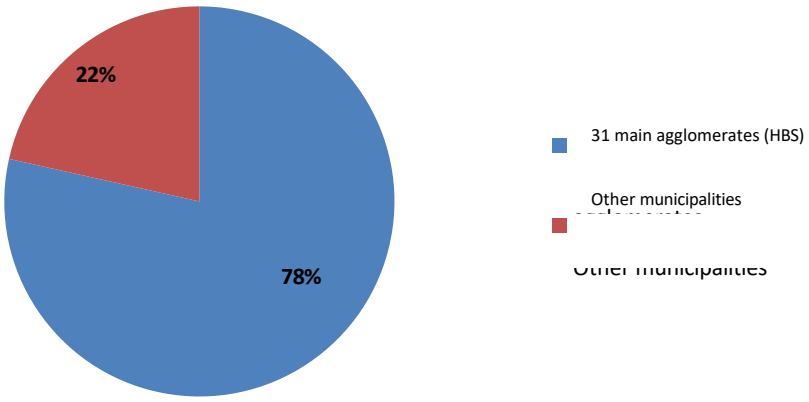
4.2 Analysis of the Municipal Solid Waste Treatment Plants existing in the 31 main agglomerates of the country.

Figure N° 14. Distribution of treatment capacity installed in the 31 main agglomerates.



Source: Own elaboration (2015).

Figure N° 15. Installed treatment capacity.



Source: Own elaboration (2015).

Treatment plants and estimated installed capacity, by agglomerate (2015).

Province	Agglomerate	Population	Type of treatment plant	Capacity[2] (ton/day)
City of Buenos Aires		2.965.000	Demolition and construction waste treatment plant (2,400 tonnes/day capacity, 90% recovery rate, 70 direct jobs generated, operated by the private company EVA SA).	2400
		2.965.000	Mechanical Biological Treatment Plant North III (1,000 tons/day capacity, 50% recovery rate, 120 jobs)	1000
		2.965.000	Mechanical biological treatment plant for the north of the city (1,000 tonnes/day capacity, 60% recovery rate). In process tendering	1000
		2.965.000	Mechanical biological treatment plant for the south of the city (1,000 tonnes/day capacity, 60% recovery rate). Tendering process underway	1000
		2.965.000	8 Green Centres which are sheds with elements such as presses and sorting belts (400 tonnes/day capacity, 4,200 formalised urban waste pickers collect material from the streets and treat part of it in the Green Centres).	350
		2.965.000	Composting plant, hot-rot technology (treats 5 tonnes per day of pure organic waste from restaurants and supermarkets and 5 tonnes of stabilising material from pruning).	10

		2.965.000	Plant for the recycling of plastic bottles (treatment capacity of 2 tonnes per hour). Under construction.	20
		2.965.000	Plant for the treatment of forestry and pruning waste (100 tonnes/day, 17 jobs).	100
Buenos Aires	Malvinas Argentinas (Greater Buenos Aires)	321833	Separation plant	25
	Morón (Greater Buenos Aires)	321109	Separation plant	25
	Berazategui (Greater Buenos Aires)	167498	Separation plant	50
	Moreno (Greater Buenos Aires)	434572	Separation plant	50
	Almirante Brown (Greater Buenos Aires)	552902	Separation plant	25
	Avellaneda (Greater Buenos Aires)	342677	Separation plant	25
	Ezeiza (Greater Buenos Aires)	163722	Separation and composting plant	80
	Greater Buenos Aires	10796415	CEAMSE separation plants (9 plants, 8% recovery rate)	650
	Bahia-Blanca	301531	Composting plant	140
	Bahia-Blanca/Cerri	301531	Separation plant in Daniel Cerri	60
	Mar del Plata	593337	Separation plant	120
	St. Nicholas	133602	Separation plant	50
Santa Fe	Rosario	948312	Bella vista - Separation and composting plant	220
		948312	Bella Vista - Aggregate treatment plant	350
	Santa Fe	526.366	Separation and composting plant	50
	Granadero Baigorria (Greater Rosario)	37333	Separation plant	25
La Pampa	Santa Rosa	124.545	Separation plant	50
Mendoza	Maipú (Greater Mendoza)	172861	Separation and composting plant	80
San Luis	San Luis capital	209414	Separation plant	25

San Juan	Greater San Juan	471389	Separation and composting plant	100
Entre Rios	Parana	247000	Separation plant	400
	Concordia	152.282	Separation plant	50
	Oro Verde (Greater Parana)	4333	Separation plant	5
Santiago del Estero	La Banda (burnt)	360923	Separation plant	25
Chaco	Fontana - Fiduciaria del Norte (Gran Resistencia)	32027	Separation plant	25
Catamarca	San Fernando del Valle de Catamarca	195055	Separation plant	15
Salta	Salta (Fundación capacitar del NOA)	554125	Separation plant	25
Neuquén	Neuquén-Plottier	304.572	Separation and composting plant	50
Chubut	Trelew	99430	Separation plant	80
Tierra del Fuego	Ushuaia	56825	Separation plant	-
Treatment capacity installed in the 31 agglomerates TOTAL[(3)] (tonnes/day)				6.755
Percentage of total treatment capacity accounted for by aggregates plants in the City of Buenos Aires and Rosario				41%
Percentage of total treatment capacity explained by treatment plants in the City of Buenos Aires (plants under construction or tender were not included).				57%
Total estimated MSW generation for the 31 agglomerates (Tons)1				31.046
Installed treatment capacity over TOTAL MSW generation[1]				**21,8%**

[1]Considers 0.90 kg/person*day of municipal solid waste generation for Region I (Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán), 0.98 for Region II (Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis), and 1.23 for Region III (Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and the City of Buenos Aires) (EVAL 2010) and 26.725,120 inhabitants (EPH, fourth semester 2014).

[2]Where capacity was supplied in tonnes/hour, 10 working hours were assumed.

[3]MBT plants in the City of Buenos Aires in tender process were not included.

Source: Own elaboration based on information provided by the GIRSU Project (SAyDS), DEISA, official websites and municipal representatives (2015).

Data analysis

- **The installed treatment capacity in the 31 main agglomerates of the country** is estimated at **6,755 tonnes per day**. If fully utilised, this would allow 21.8% of the waste generated in the 31 agglomerates to be treated.
- **9** of the 31 main agglomerates in the country **do not have an MSW treatment plant**, 6 of them are in the north of the country.
- **The city of Buenos Aires** is responsible for **44% of the total installed treatment capacity in the country and 57% of the installed capacity in the 31 agglomerates.**
- **Aggregate waste treatment plants in the cities of Rosario and Buenos Aires account for 31% of the MSW treatment capacity installed in the country's 31 main agglomerates.**
- A significant percentage of municipal solid waste is treated by **informal waste pickers** by hand (**their work is considered under chapter 8**).

4.3 Municipal Solid Waste Treatment in the province of Entre Ríos

There is no systematic and widespread analysis of the efficiency of municipal solid waste treatment systems in Argentina, despite the fact that many municipalities invest considerable human and financial resources in them. In the following paragraphs, we will present data corresponding to the province of Entre Ríos, since this is the province from which we were able to gather the most information on the subject. As already mentioned, **Entre Ríos is the second largest province in Argentina in terms of the number of waste separation plants installed (29), and most of its municipalities have had waste separation programmes in place, many of them for more than 10 years.** This is why the situation described there should not be understood as representative of all provinces in the country.

During the aforementioned GIRSU Diagnosis of the province of Entre Ríos (GIRSU Project - SAyDS, 2014), an evaluation of existing treatment plants was carried out. According to it, on average, the municipalities surveyed with a separation plant recover 33.59% of the waste generated. This represents about 14% of the total municipal solid waste generated in the province (CEAMSE-INCOCIV, 2014).

Recovery rates in Entre Ríos, by municipality (2014).

Municipality	Recovery rate over total generation (%)	% of treated waste that was separated into Origin
Concordia	5,38	5
Gualeguaychú	13,01	100
Chajarí	90	60
Villaguay	28,57	30
Victoria	16,67	-
La Paz	4,05	20
Colón	1,82	-
Crespo	57,69	100
Diamond	35	50
San José	4,12	30
Federal	97,37	100
Federation	15	-
Rosario del Tala	80	-
San Salvador	42,86	-
San José de Feliciano	41,67	-
Villa Elisa	5	-
Basavilbaso	25	70
Viale	34,78	100
Green Gold	80	65
Villa Paranacito	5	20
Ceibas	3	-
Villa del Rosario	52,94	100
Average	**33,59**	**60**

Source: Plan provincial GIRSU Entre Ríos (Proyecto GIRSU, 2014).

As can be seen in Table 16, recovery rates vary significantly. This shows that **having a sorting plant is not a sufficient or necessary condition for having a good waste treatment system in place** and also demonstrates the importance of the non-structural measures that need to be implemented together with the selected waste treatment infrastructure.

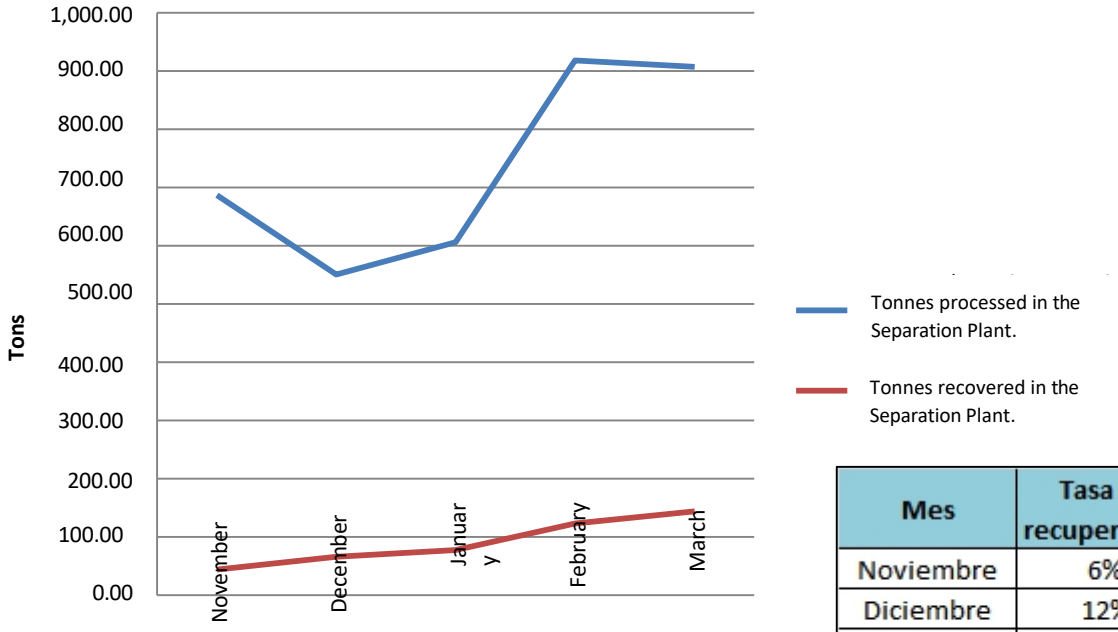
One cause of inefficiencies in recovery rates is the lack of source segregation. As can be seen in Table N° 16, **not all waste processed in the plants comes from a stream that is segregated at source and collected in a differentiated manner**. The quantities recovered are also influenced by the installed capacity that is actually used. In this regard, it is important to note that **during the assessment, both municipalities were found to have a capacity of**

treatment capacity less than the total generation as well as others with a higher capacity than necessary which is therefore underutilised.

The operation and maintenance of sorting plants, another cause of inefficiencies, was also analysed in the GIRSU diagnosis carried out in Entre Ríos (Proyecto GIRSU - SAyDS, 2014)**.** The analysis considered the percentage of treatment capacity that is effectively used, the recovery rate of the waste processed, the available equipment, the number of operators at the plant, the state of the infrastructure, cleanliness and hygiene and safety conditions. **As a result of the analysis, 11 plants were assessed as "fair" and 7 as "good"**, showing that there is room for improvement.

In Entre Ríos, as in other Argentine provinces, there are examples of abandoned, underutilised plants, and others where the infrastructure is not accompanied by awareness campaigns, separation at source plans or differentiated collection. However, many others can be considered as "best practices" and examples to follow. **Figure 16 shows the evolution in the quantities of materials processed and the recovery rate after the inauguration of a plant in a municipality where the plant is based on a solid and comprehensive plan, separation at source and sustained awareness programmes.**

Figure N° 16. Evolution of the quantity processed and rates of recovery at the Gualeguaychú plant.



Mes	Tasa de recuperación
Noviembre	6%
Diciembre	12%
Enero	13%
Febrero	13%
Marzo	16%

Source: Own elaboration based on data provided by the GIRSU Project - SAyDS (2014).

Figure N° 1s6 also shows that **the recovery rate increased steadily over time,** and that it takes time to adjust the quantities processed and the recovery efficiency. In 5 months, the Gualeguaychu separation plant shows higher recovery rates than the average of the medium and small plants installed. It is worth noting that in the design of projects of this type, a recovery of 10% is usually assumed.

5. Final Disposal of Municipal Solid Waste

- The IDB Regional Assessment estimated in 2010 that **64.7% of the country's inhabitants were covered by adequate landfill disposal, a higher** percentage **than the average found for the region (54.4%).**

- According to the data collected for this report (**2015**), 51.25% of the total municipal solid waste generated is disposed of in landfills and **55.2% of the population is covered by this service.**

- Coverage **increases significantly in the 31 main agglomerations of the country where 81.1% of the population has landfill disposal services (76.18% of the waste generated there is disposed of in landfills). However, 13 of them still do not have sanitary landfills.**

- **Some agglomerates have a sanitary landfill but it is not used by all municipalities.** In other cases, regionalisation of final disposal takes place informally.

- **In terms of landfill disposal coverage, there are notable differences between regions and by population size of localities.** In Region III (including the metropolitan area of Buenos Aires) it reaches 79.4% while in Region II it decreases to 15.2% (EVAL 2010). In relation to population size, we found 89.4% coverage in cities with more than 300,000 inhabitants, 62.7% in medium-sized cities, 24.5% in small cities and 9.4% in cities with less than 15,000 inhabitants (EVAL 2010).

5.1 Regional Assessment of Municipal Solid Waste Management in Latin America and the Caribbean (EVAL)

Table N° 17. Type of final disposal in landfill as a percentage of inhabitants covered and available equipment (EVAL 2010).

Phase of the GIRSU	Indicator	Region			Municipal size				Total Country	LAC Average
		I	II	III	Micro	Small	Medium	Grande		
Final provision	Landfill Disposal	50,10%	15,20%	79,40%	9,40%	24,50%	62,70%	89,40%	64,70%	54,40%
	Disposal in controlled landfill	21,40%	38,90%	0,60%	/	/	/	/	9,90%	18,50%
	Landfill disposal open	25,50%	44,90%	19,70%	75,40%	57,80%	25%	5,20%	24,60%	23,30%
	Open burning	3%	1%	0,30%	/	/	/	/	0,80%	2%
	Compaction equipment (per 10,000 inhab. served)	0,37	0,14	0,24	/	/	/	/	0,25	/
	Equipment for coverage (per 10,000 inhabitants served)	0,51	0,19	0,45	/	/	/	/	0,42	/
	Equipment for other activities (per 10,000 inhab. served)	0,23	0,25	0,46	/	/	/	/	0,4	/

Region I: Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán. Region II: Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis.

Region III: Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and the Autonomous City of Buenos Aires.

Large, between 300,001 and 5,000,000 inhabitants; Medium, between 50,001 and 300,000 inhabitants; Small, between 15,001 and 50,000 inhabitants; and Micro to municipalities with a population of less than 15,000 inhabitants.

Source: Own elaboration based on EVAL 2010 and IDB Technical Note 2013.

Data analysis:

- Despite the fact that according to the EVAL 2010 **the country has higher levels of adequate final disposal (64.7%) than the average of Latin American countries (54.4%),** the waste produced by 35.3% of the population is still not disposed of in sanitary landfills. **In the EVAL 2002, 60.69% of Argentina's population was already covered** by sanitary landfills and 5.6% by controlled landfills, **so the improvement found between 2002 and 2010 was not substantial**.
- There are significant differences between regions and by municipal size in terms of access to adequate disposal. Region III, which includes the Buenos Aires metropolitan area, has the highest landfill coverage (79.4% of its inhabitants) while **region II has only 15.2%.** Furthermore, **municipalities with less than 15,000 inhabitants only adequately dispose of the waste produced by 9.4% of their population**, and localities with **15,000 to 50,000 inhabitants only 24.5%**.
- The results found in the EVAL 2002 in terms of equipment (the number of equipment for compaction was 0.054 per 10,000 inhabitants, for coverage 0.064 and for other activities 0.091), allow us to conclude that **there was a substantial improvement in the equipment available at the disposal sites.** However**,** it is still necessary to continue to improve the operation of disposal sites through improvements in equipment.

5.2 Existing landfills by province

Table N° 18. Existing landfills in Argentina, by province (2015).

Province	Landfill[1]	Municipalities	Tonnes disposed per day[2]
City of Buenos Aires	CEAMSE - North III	City of Buenos Aires and 34 districts of the Province of Buenos Aires	13.942
Buenos Aires	CEAMSE - Gonzales Catán		
	CEAMSE - Ensenada		628
	Bahia Blanca	Bahia Blanca	230
	Mar del Plata	Gral. Pueyrredón	1.100
	Olavarría (first landfill gas capture CDM project in Argentina)	Olavarría	100
	Tandil	Tandil	100
	Laprida	Laprida	2,5
	St. Nicholas	St. Nicholas	120
Santa Fe	Ricardone	10 municipalities of Greater Rosario	1.500
	Rafaela	Rafaela	120

	Santa Fe	Santa Fe capital and small municipalities (San José del Rincón, Arroyo Leyes and Santa Rosa de Calchines).	500
Cordoba	6 landfills	Including Greater Cordoba (Cordoba city and 17 other municipalities), Villa Dolores and Cruz del eje.	2.030
La Pampa	Santa Rosa	Santa Rosa	140
Entre Rios	Gualeguaychu	Gualeguaychú	104
Mendoza	Malargue	Malargue	22
	Alvear	Alvear	42
	East Zone	Rivadavia, San Martín, Santa Rosa and Junín	180
San Luis	San Luis capital	San Luis capital	20
	Donovan	The metropolitan area of the capital and small localities located in the mountain area (Juana Koslay, Potrero, La Punta, San Gerónimo, Balde, El Volcán, Estancia Grande, Trapiche, Nogolí, Villa de la Quebrada).	32
	Villa Mercedes	Villa Mercedes, Justo Darac, Juan Jorba y Fraga	120
	Carpentry	Villa de Merlo, Carpintería, Los Molles, Cortaderas, Villa Larca, Villa del Carmen, Papagayos, Concarán, Naschel, San Pablo, Santa Rosa de la Conlara, Renca and La Punilla.	50
	La Toma	La Toma, Juana Llerena, Paso Grande, El Morro, Saladillo.	9
San Juan	San Juan	Capital, Rawson, Rivadavia, Chimbas, Santa Lucia, Pocito, Ullum, Zonda and Albardón.	550
	Jachal	San José de Jáchal, Niquivil, San Roque, Villa Mercedes and Pampa Vieja	12
Tucumán	San Felipe	Municipalities of Greater San Miguel de Tucumán	900

Salta	San Javier	Salta capital city and municipalities of Greater Salta	750
	Manual Landfills	The province worked on the installation of manual landfills with several small and medium-sized localities, including: Tolar Grande, la Puna, Valles Calchaquíes, Iruya and Coronel Moldes.	10
La Rioja	Villa Union	Villa Union	15
Santiago del Estero	Rio Hondo	Rio Hondo	33
Missions	The entire province is regionalised and has 25 transfer stations and two privately operated landfills. Aesa	The whole province	800
Neuquén	Neuquén	Neuquén	300
	Junin de los Andes	Junín de los Andes and San Martín de los Andes	58
Rio Negro	El Bolson	El Bolsón	25
	General Roca	General Roca	80
Chubut	Former Omega Tower	Puerto Madryn, Trelew, Dolavon, Gaiman and Rawson	350
	Esquel- Trevelin	Esquel and Trevelin	55
Tierra del Fuego	Ushuaia	Ushuaia	120
TOTAL municipal waste disposed of in landfill (tonnes/day)			25.150
Municipal waste generation TOTAL (tonnes/day)[3]			49.070
Landfill disposal capacity over Municipal Solid Waste generation TOTAL[2]			**51,25%**
Percentage of disposal capacity in sanitary landfill over total MSW generation (not considering CEAMSE landfills)			**30,67%**

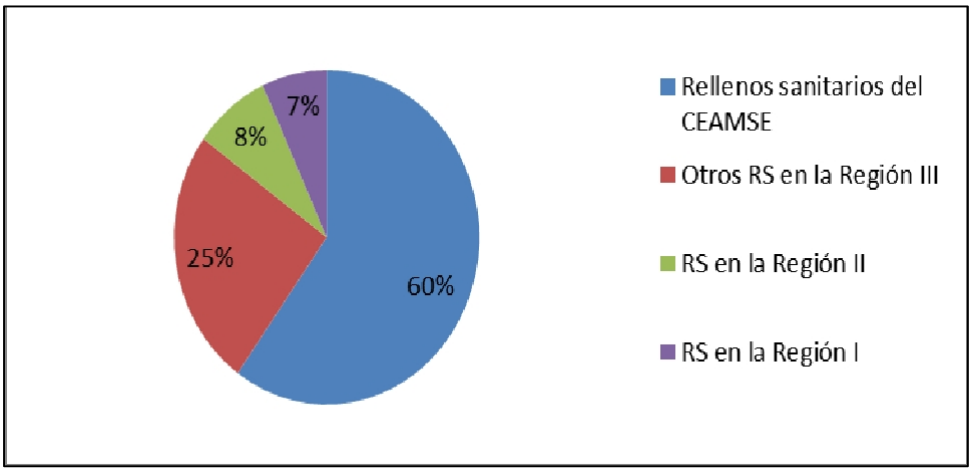
[1]The disposal site is considered to be a landfill if the gases and leachate generated are properly managed and regular compaction and covering (preferably on a daily basis) is carried out.

[2]Information obtained from landfill managers or official websites, based on records of the disposal site.

[3]Considers 1.15 kg/person*day of municipal solid waste generation (EVAL 2010) and 42,669,500 inhabitants (2014 projection, Census 2010).

Source: Own elaboration based on data provided by the GIRSU Project (SAyDS) and municipal representatives (2015). The list presented includes all landfills that could be counted for this report.

Figure N° 17. Distribution among regions of the total disposal capacity in existing Landfills (2015).



Source: Own elaboration.

Data analysis

- **The percentage of total municipal solid waste generated that can be disposed of, at the time of this report, in landfills is 51.25%.** This means that **half of the total municipal solid waste produced in the country is disposed of in landfills, the rest is recovered or disposed of inappropriately.** To arrive at this value, a list was compiled of all existing landfills in the country including the tonnes disposed of daily in each of them. Total municipal solid waste generation was calculated using the per capita generation estimated by EVAL 2010.
- To estimate the population covered, we used the percentage of collection coverage in municipalities with landfill (municipalities without landfill were assigned 0% coverage). Dividing the population covered with landfill by the total population (Census 2010 projected to 2014), we found that **55.2% of the population is covered.**
- **In EVAL 2010 the percentage of inhabitants covered reached 64.7%** (it should be noted that EVAL used a different methodology based on surveys of a representative sample of municipalities). Possible causes for the difference in coverage found include: i) population increase in uncovered areas, and/or ii) methodological differences.
- **Interestingly, when we do not consider the area covered by CEAMSE, the coverage with landfill disposal is reduced to 34.1% of the population**, which is significantly lower than the percentage found by EVAL 2010 for the region (54.4%).
- In the country, **existing landfills are mainly located in the main urban agglomerations and in tourist localities.** In the latter group, the Inter-American Development Bank's loan for ISWRM in tourist localities (OC-AR 1868) was a key source of financing. For its part, the IBRD loan for ISWM accounts for part of the financing.

The loan also encouraged the development of several of the few examples of regional consortia in the country (Gran Tucumán and Virch-Valdez in Chubut). This loan also encouraged the development of several of the few examples of regional consortia in the country (Gran Tucumán and Virch-Valdez in Chubut).

- **Existing landfills in the main conurbations are generally operated by private companies** (Mar del Plata, Gran Tucumán, Gran Córdoba, Rosario, are some examples) **while small or medium-sized landfills are generally operated by the municipalities themselves** (Malargue, Alvear, El Bolson, etc.). Field visits demonstrate a significantly lower quality of operation in the second group.

- **18 of Argentina's 24 provinces have at least one operating landfill.** The exceptions are: Santa Cruz, Corrientes, Catamarca, Jujuy, Chaco and Formosa (the last five belonging to the northern region).

- According to Table N° 18, **51.25% of the waste generated is disposed of in landfills**. Assuming that another 5% is recovered for recycling, about 22,000 tonnes/day are disposed of inappropriately.

- **Some provinces have advanced in regionalisations encouraged by the provincial governments. Misiones**, for example, developed a system based on 25 transfer stations and 2 regional landfills that covers practically the whole province. **San Luis** also developed a Plan based on 6 regions with one regional landfill and separation plant each (not fully implemented at the moment). **Cordoba** developed a regionalisation plan that has been partially implemented so far.

- **In addition, we find the examples of Virch-Valdez (Rawson-Trelew-Puerto Madryn) and Gran Tucumán, where a consortium was formed in charge of the supervision of the operation carried out by a private company. In the case of CEAMSE, we find a state company** in charge of the operation.

- **Table N° 18 shows that manual landfills for small localities, although characterised by their cost efficiency and their feasibility of implementation and operation, are not widespread in the country** (this explains the low levels of coverage found by EVAL in localities with less than 15,000 inhabitants). Salta has a programme to promote this solution, which is an interesting example that should be replicated by other provinces, especially where there are many small or rural localities. In general, municipalities are eager to have a mechanised landfill but this is not always the most cost-efficient alternative.

5.3 Landfills in the 31 main agglomerates of the country

Table N° 19. Existing sanitary landfills, by urban agglomerate (2015).

Urban Agglomerate	Population[1]	Landfill[2]	Comments	Percentage of households covered by sanitary landfill[3]	Population covered by landfill	Households not covered by landfill[3]	Population not covered by landfill[3]	MSW disposed in landfills (tonnes/d
Greater Buenos Aires								
City of Buenos Aires	2.981.781	Yes	Regional landfills operated by CEAMSE. CEAMSE is currently in charge of three Environmental Complexes in activity: North III Environmental Complex, Ensenada Environmental Complex and González Catán Environmental Complex, and one in the post-closure stage (Villa Domínico Environmental Complex).	98,07%	2.924.291	22.175	64.565	13.942
Districts of Greater Buenos Aires (Province)	10.796.415	Yes		94,90%	10.245.409	149.555	569.117	
Whose								
Greater Mendoza	1.070.944	Maipú only. Some municipalities have a controlled site.	Some 1,358 tonnes/day of MSW are generated in the agglomerate. Capital, Las Heras and Lavalle dispose 427 tonnes/day in a controlled site operated by the private company LIME (not a sanitary landfill but compacted and covered daily). Guaymallén, Godoy Cruz and Luján de Cuyo dispose in open dumps (731 t/day). Maipú has a separation and controlled disposal plant (200 tons/day).	12%	128.300	253.022	942.644	200
Greater San Juan	511.625	Yes	It is a regional landfill operated by the province and serves 500,000 residents in Capital, Rawson, Rivadavia, Chimbas, Santa Lucia, Pocito, Ullum, Zonda and Albardón. The environmental complex also has organic treatment by composting (from special streams such as pruning waste) and sorting plant.	96,47%	493.558	4.158	18.067	550

St. Louis - The Chorrillo	215.487	Yes	It is a regional filler.	97,94%	211.043	1.156	4.444	20
North East								
Currents	379.696	No		0%	0	96.993	379.696	0
Formosa	254.702	No		0%	0	60.193	254.702	0
G. Resistance	407.001	No		0%	0	108.706	407.001	0
Posadas	350.913	Yes	Fachinal regional landfill, operated by the private company AESA.	95,42%	334.832	4.199	16.081	160
Northwest								
G. Catamarca	209.072	No, but it is a controlled site	The site is fenced, has scales and security at the access. The waste is regularly compacted with machines, but there is no daily covering or waterproofing with membranes. Workers are present at the unloading front.	0%	0	50.901	209.072	0
Greater Tucumán - Tafí Viejo	863.943	Yes	Overo Pozo Regional Landfill, managed by an inter-municipal consortium that has the operation of the landfill outsourced to the private company "Los Mallines".	92,38%	798.139	18.191	65.804	900
Jujuy - Palpalá	335.406	No, the site is semi-controlled	The site is located at the "Finca El Pongo" and is used by several municipalities in the agglomerate. The waste is accommodated and compacted with machines on a regular basis but is not carried out daily coverage, no waterproofing membrane and no leachate management. There are reclaimers at the discharge face.	0%	0	81.574	335.406	0
La Rioja	200.933	No		0%	0	48.243	200.933	0

Salta	617.418 Yes		It is a landfill owned by the municipality of the city of Salta, the operation of which is outsourced to the company "Fueguina". Other municipalities of the agglomerate also dispose of their waste there without paying any fees or having any kind of formal regionalisation. Currently, t h e San Javier III landfill is used; in San Javier II, methane gas is captured and burned.	96,80%	597.680	4.616	19.738	750
Sgo. del Estero - La Banda	401.924	No		0%	0	95.542	401.924	0
Pampeana								
Bahia Blanca - Cerrito	305.962	Yes	The landfill is operated by the private company EVA SA.	97,76%	299.107	2.349	6.855	230
Concordia	159.631	No		0%	0	43.565	159.631	0
Greater Cordoba	1.512.823	Yes	A regional consortium (Cormecor) was formed and is implementing a regionalisation project.	97,42%	1.473.802	12.076	39.021	1.960
Greater La Plata	828.860	Yes	The Ensenada environmental complex is operated by CEAMSE and manages about 628 tonnes/day. Ricardone is a private regional RS that receives MSW from 9 municipalities, there is no inter-municipal consortium or formal regionalisation but each municipality has a separate contract with the operator. It is not used by all the municipalities of the agglomerate, Pérez and Villa Gobernador Galvez have open dumps (representing 8% of the total).	95,01%	787.490	13.139	41.370	628
Greater Rosario	1.415.628 Yes		the population of the agglomerate). Rosario has 22,500 tonnes/month of inert and hazardous waste pruning at the Bella Vista landfill and a further 20,500 tonnes/month of MSW are sent to the station. transfer station in Bella Vista and then to the Ricardone landfill.	89,19%	1.262.642	50.504	152.986	1.500
Greater Parana	273.300	No		0,00%	0	98.705	273.300	0

Greater Santa Fe	526.366	Yes	Operated by the private company Milicic.	96,33%	507.071	6.166	19.295	500
Mar del Plata - Batán	631.322	Yes	Operated by the private company TECSAN.	97,84%	617.658	4.579	13.664	1.100
Río Cuarto	171.332	Yes		98,11%	168.086	1.428	3.246	180
Santa Rosa - Toay	124.545	Yes	Operated by the municipality	98,91%	123.191	421	1.354	140
San Nicolás - Villa Constitution	187.981	Yes	Operated by the private company ENTRE.	96,82%	181.995	2.217	5.986	120
Patagonia								
Comodoro Rivadavia - Rada Tilly	210.875	No		0%	0	56.118	210.875	0
Neuquén - Plottier	304.572	Yes	The landfill is only used by the municipality del Neuquén and is operated by the private company TECSAN. It has a project to generate energy from landfill gas.	88,12%	268.392	12.950	36.180	300
Rio Gallegos	108.693	No		0%	0	33.061	108.693	0
Ushuaia - Río Grande	143.471	Yes		94,91%	136.169	1.964	7.302	120
Rawson - Trelew	137.057	Yes	The landfill is in charge of the inter-municipal consortium Virch-Valdez and its operation is outsourced to the private company URBASER. The landfill was built to be used also by Puerto Madryn, Gaiman and Dolavon.	97,76%	133.993	904	3.064	350
Viedma - Carmen de Patagones	85.442	No	The site used by Viedma is semi-controlled.	0%	0	24.990	85.442	0

TOTAL municipal waste disposed of in landfill (tonnes/day)	23.650
Municipal waste generation TOTAL (tonnes/day)	31.046
Landfill disposal capacity over MSW generation TOTAL[5]	76,18%
Population covered by the landfill service	81,08%

Landfill disposal capacity over TOTAL MSW generation[5] (not considering the area covered by CEAMSE)	69,42%
Population covered by the landfill service (excluding the area covered by CEAMSE)	63,84%
Estimated waste recovery rate	0,1
Percentage of MSW generated that is not properly disposed of (assumes 10% recovery)	13,82%
Percentage of MSW generated that is not properly disposed of explained by Gran Mendoza (assumes 10% recovery).	26,96%
Percentage of MSW generated that is not properly disposed of accounted for by Northern provinces (assumes 10% recovery)	45,90%

[1]Data from the Permanent Household Survey (INDEC, fourth quarter of 2014).

[2]The disposal site is considered to be a landfill if the gases and leachate generated are properly managed and regular compaction and covering (preferably on a daily basis) is carried out.

[3]If no sanitary landfill has been identified in the agglomerate, it is assumed that all households are not covered by this service (the number of households used is surveyed in the 2010 Census). If a sanitary landfill exists, we first analyse which localities use it and for those that do, we assume that all households covered with regular collection are also covered with sanitary landfill (the number of households with regular collection is the number surveyed in the 2010 Census).

[4]Information based on official records of the disposal site.

[5]Considers 0.90 kg/person*day of municipal solid waste generation for Region I (Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán), 0.98 for Region II (Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis), and 1.23 for Region III (Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tier del Fuego and City of Buenos Aires) (EVAL 2010) and 26.725,120 inhabitants (EPH, fourth semester 2014).

Source: Own elaboration based on information provided by the GIRSU Project (SAyDS), official websites and municipal representatives (2015).

Figure N° 18. Percentage of households covered by landfill and number of households not covered (in thousands), by agglomerate (2015).

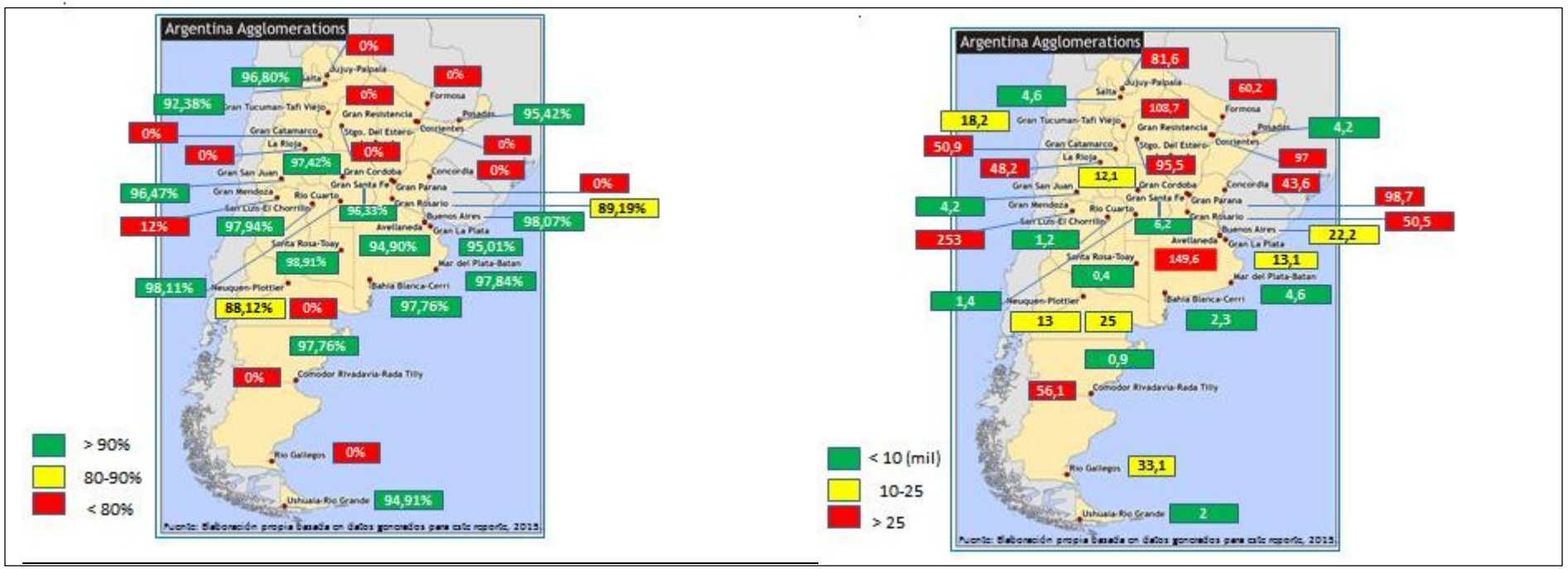
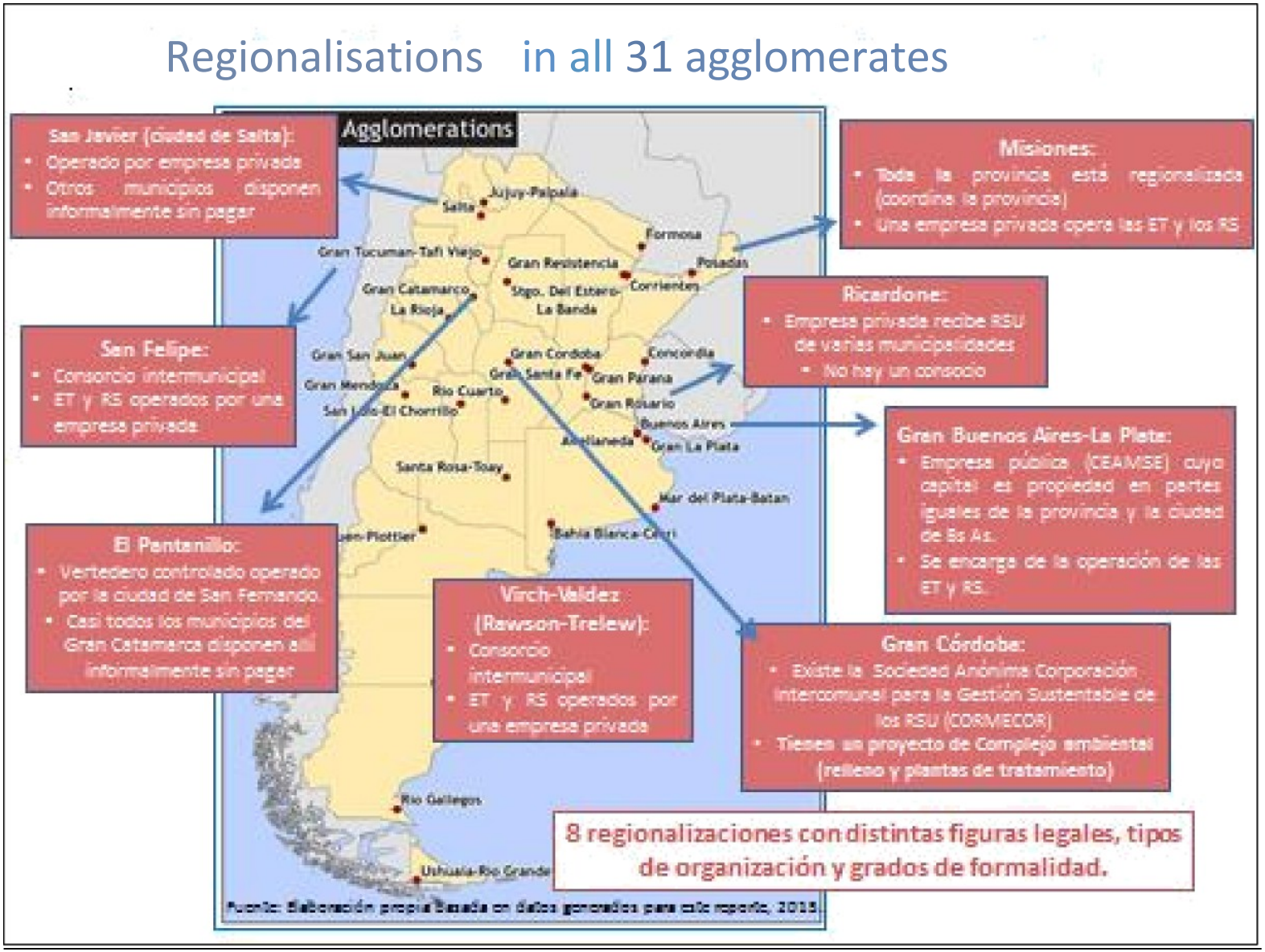


Figure N° 19. Existing regionalisations in the 31 main agglomerates.



Data analysis

- In the 31 main urban agglomerates of the country, **76.18% of the total municipal solid waste generated is disposed of in sanitary landfills**, a percentage significantly higher than that found for the country (50.23%), showing that existing sanitary landfills are mainly located in the larger urban agglomerates.
- In relation to the **coverage of inhabitants** with this service, we find that it **reaches 81.1%**, also a much higher value than the one surveyed by EVAL 2010 (64.7%).
- According to Table N° 19, **if we do not take into consideration the area covered by CEAMSE, the population covered by landfill drops to 63.84%, which shows that the level of coverage is highly influenced by the high values found in the most populous agglomerate in the country.**
- It should be noted that **some agglomerates have a sanitary landfill but it is not used by all municipalities** (for example, in Gran Rosario, Villa Gobernador Galvez uses an open dump).
- Assuming that 10% of the waste generated is recovered (by formal or informal manual or mechanical waste pickers), **4,430 tonnes/day** (14% of the waste generated) **would be inappropriately disposed of in the 31 main urban agglomerates.**
- **The most populous agglomerate that still lacks a sanitary landfill for all its municipalities is Gran Mendoza (**currently only Maipú has adequate final disposal). Gran Mendoza accounts for 27.6% of the total waste generated that is disposed of inappropriately.
- In addition to Gran Mendoza, **we found that the problem of lack of coverage with adequate final disposal is concentrated in the northern provinces of the country.** Gran Resistencia, Corrientes, Gran Jujuy, Formosa, Gran Catamarca, La Rioja and Santiago-La Banda lack adequate final disposal and account for 45.4% of the total amount of inappropriately disposed waste in the country's main agglomerates.
- **Most of the landfills located in the 31 main agglomerates are operated by private companies, the exceptions include CEAMSE.** This is a company created by the Province of Buenos Aires and the Autonomous City of Buenos Aires for the integrated management of municipal waste in the metropolitan area. Today, its work focuses on the transfer and final disposal phases. In the North Landfill III, there is also an MBT plant which is operated by a private company and processes waste from the City of Buenos Aires.

5.4 Cost Matrix GIRSU

Table N° 20. Cost of final disposal per tonne, by municipal size.

Municipal size (inhabitants)	Average disposal cost per tonne disposed of (U$D/tonne)[1]	Average cost per tonne of wastewater management (U$D/tonne)[1]	% of total cost GIRSU for final disposal
Less than 9,999	14,8	**135,99**	**10,9%**
10.000 - 49.999	8,8	107,19	8,2%
50.000 - 99.999	15,1	86,88	17,4%
100.000 - 199.999	7,4	127,44	5,8%
200.000 - 499.999	8,0	118,45	6,8%
500.000 - 999.999	14,9	133,30	11,2%
More than 1,000,000	13,7	128,12	10,7%
Overall average	**10,9**	118,18	9,2%
Municipalities with Landfill	**20,29**	136,27	14,9%

[1]The exchange rate corresponds to the official rate on the day of the workshop.
Source: Data generated by the GIRSU Project (SAyDS) during the GIRSU Economic Matrix Workshops between March 2012 and October 2014.

Table N° 21. Economic and financial indicators of wastewater and waste management.

Indicator	National Average
Share of total municipal expenditure on wastewater and wastewater treatment and disposal	13% (ditto for municipalities with backfilling) sanitary)
Sustainability GIRSU	
Income from GIRSU Fees */Total Municipal Income	20%
Income from GIRSU Fees */ Total cost of GIRSU	30%
Collectability - Households	49%
Share of total cost of GIRSU	
Collection	34%
Sweep	26%
Final provision	12%
The above three items	71%

* This revenue does not necessarily come from a specific ISWM levy but from a levy that, in whole or in part, is used to cover the costs of ISWM.

Source: Data from the GIRSU Cost Matrix included in Campos and Pierrestegui's paper presented at the ISWA Congress 2014.

Data analysis

- According to Tables N° 20 and 21, **municipalities spend** significantly more **on collection and sweeping** than on disposal. **More than 60% of** municipal waste **management costs** are spent on the first two categories.
- Municipalities using landfills have higher costs per tonne disposed (due to the necessary infrastructure investments and higher operating costs). This is why **securing resources for the operation and maintenance of landfills is crucial** for their sustainability over time.
- Table N° 21 reveals the importance of ISWM in the municipal budget, concluding that, **on average, 13% of total municipal expenditure is allocated** to it.
- According to the ISWMWM Cost Matrix, municipal waste management systems **have problems of economic and financial sustainability since the fees from which resources are obtained cover, on average, less than 30% of the total costs and collectability is less than 50%.**

6 Households in the vicinity of landfills

- **In the country's 31 main urban agglomerates, 7.59% of households are located three blocks or less from a rubbish dump** (EPH, fourth quarter 2014).
- **If a person lives in a slum or shantytown, the probability of living near a rubbish dump increases 5 times** (EPH, fourth quarter 2014).
- **18% of respondents** from urban households **consider landfills and micro-landfills to be a problem in the neighbourhood where they live** (2013, EDSA). This value rises significantly to **63.4% among urban households located in slums and shantytowns**.
- **In terms of the probability of living near a rubbish dump, there are inequalities between social classes and educational attainment.** 9.8% of urban households with a medium socio-economic level are near a rubbish dump, while this value rises to 34.7% for the "very low" socio-economic level. 28.3% of households with a head of household without completed secondary education are located near landfills, but this percentage decreases to 13.5% for households whose head of household has attained at least this level of education (EDSA, 2012).
- According to EDSA results, between 2010 and 2013, **there was no significant variation in the percentage of households located near rubbish dumps.** However, there **was an increase specifically for households located in slums and shantytowns** (from 59.3% to 63.4%).
- In Greater Buenos Aires alone, 335,462 children live three blocks or less from a rubbish dump or micro-garbage dump (EPH, 2014).

6.1 Argentine Social Debt Barometer Survey of the Argentine Catholic University (EDSA)

The Argentine Social Debt Barometer (EDSA) survey is carried out by the programme "Observatorio de la Deuda Social Argentina", an institutional research department of the Argentine Catholic University. The Observatory has been conducting surveys in urban agglomerates in Argentina since 2004. The latest survey included the Buenos Aires metropolitan area and 16 other agglomerates with a sample size of 5,700 cases.

The section of the survey that analyses the quality of life of the population from a comprehensive perspective takes into consideration the proximity of the respondent's dwelling to dumps and micro-dumps by asking the following question: "In the area where you live, do you have a problem with dumps? It should be noted that, unlike the Permanent Household Survey and the Annual Household Survey (INDEC), the results are based on the perception of the respondent rather than the opinion of the interviewer. The survey allows for cross-checking and for finding out how specific groups respond to the question, such as slum and emergency settlement dwellers, respondents from different socio-economic groups and levels of education, etc.

Table N° 22. Urban households located near landfills, by household characteristics (EDSA).

Type of Urban Households	2010	2011	2012	2013
Total	18,7%	20,0%	20,7%	18,0%
Urban households located in slums and settlements of emergency	59,3%	59,1%	62,1%	63,4%
Households with low socio-economic status located in areas with an urban layout	25,7%	27,1%	27,3%	/
Households of socio-economic level medium-economic located in areas with an urban layout	9,2%	7,6%	7,6%	/

Source: Own elaboration based on information from EDSA.

Table N° 23. Urban households located near landfills, by agglomerate, educational level and socio-economic stratum (EDSA).

Indicator	2010	2011	2012
Urban Agglomerate			
City of Buenos Aires	7,5	7,2	9,9
Greater Buenos Aires	19,6	23	22,8
Greater Rosario	22,7	25,8	22,3
Greater Cordoba	23,3	22,5	23,4
Greater Mendoza	13,4	12	12,5
Greater Tucumán	34,7	34,7	34,6
Other urban agglomerates	22,8	24,3	25,1
Head of Household Education			
With secondary school	13,4	12,6	13,5
No secondary school	24,1	27,2	28,3
Presence of children in the Home			
With children	15,7	17,3	17,8
Without children	21,9	22,9	23,9
Socio-economic stratum			
Medium high	7,7	8,2	9,8
Low medium	14,7	16,9	15
Under	21,1	22,6	23,4
Very low	31,2	28,9	34,7

Source: Own elaboration based on EDSA data.

Data analysis:

- According to Table 22, **the existence of dwellings close to rubbish dumps and micro-garbage dumps is a relevant problem in urban areas in Argentina, which is significantly increased in slums and shantytowns**. In 2013, **18% of respondents** from urban households **said that rubbish dumps were a problem in the neighbourhood where they live**, **increasing this percentage to 63.4% when considering only households located in slums.**

- **According to Tables 22 and 23, there has been no significant improvement in this indicator in recent years**. Between 2010 and 2013, **the overall results do not show a decrease in the percentage of households that consider landfills to be a problem in their neighbourhood**. The average found is 19.35% and the variation is less than the survey error.

- Moreover, **between 2010 and 2013**, Table 22 shows **an increase in the percentage of households located in slums that consider rubbish dumps a problem in their neighbourhood, from 59.3% to 63.4%**, a variation that exceeds the survey error.

- Interestingly, Tables 22 and 23 show that **if we only consider households of low socio-economic status but located in areas with urban layout (not in villas), the percentage of households close to rubbish dumps is higher than the average for all households (27.3% versus 20.7% in 2012) but much lower than the result found for households in villas and slums (62.1%).** This reveals the existence of a much stronger relationship between villas, as a type of urban settlement, and rubbish dumps than between lower class households and rubbish dumps.

- The results mentioned in the previous point can help us to understand the **causes of the existence of settlements near rubbish dumps**. Firstly, we can conclude that when a group of people start an informal and precarious settlement, the existence of **a landfill nearby can be seen as a potential source of income and, therefore, could encourage the start of a settlement there**. In addition to this, **there may be a feedback dynamic whereby the settlement dwellers themselves encourage the development, expansion or permanence of dumpsites and micro-dumps in order to access a source of income**. To do this, in many settlements residents bring waste from middle or high socio-economic neighbourhoods in hand or animal-drawn carts and/or arrange with collection truck drivers to illegally dispose of their waste at the dump. **The aforementioned actions are easier to carry out in slum areas where, in general: i) there are vacant lots conducive to the generation of rubbish dumps, ii) waste collection or sweeping is often non-existent or deficient (see Chapter 1), and iii) police presence may be limited.**

- There are significant differences between urban agglomerates. **Gran Tucumán has the highest percentage of households that consider landfills a problem in their neighbourhood (34.6% in 2012).** Interestingly, this agglomerate does have a regional sanitary landfill, but the problem of dumps and micro-dumps generated by the dynamics described above is widespread. With the lowest percentages, we find the city of Buenos Aires with 9.9% and Gran Mendoza with 12.5%.

- In general, the agglomerates assessed in the EDSA survey **do not show significant variations between 2010 and 2012.**

- There are inequalities in terms of access to living in a neighbourhood where landfills are not a problem. People with lower educational attainment and belonging to lower socio-economic levels are more likely to live close to a rubbish dump. 28.3% of households with a head of household with no secondary schooling

The percentage drops to 13.5% if the head of household has completed at least secondary education. In relation to socio-economic status, 8% of medium to high socio-economic households live near dumpsites, but among very low socio-economic households, the percentage increases to 34.7%. On the other hand, the percentage decreases significantly to 7.6% (2012) when considering medium-level households located in urban layout, a value much lower than that found for households in urban layout but of low socio-economic status (27.3%, 2012).

6.2 Permanent Household Survey (EPH)

The National Institute of Statistics and Census (INDEC) conducts surveys in 31 urban agglomerates every three months. The survey takes into consideration all provincial capitals and agglomerates with more than 100,000 inhabitants, which represents 70% of Argentina's total population. The EPH, among its questions, evaluates whether there is a rubbish dump three blocks or less from the home, and also allows cross-checking with households located in slums and precarious settlements.

Table N° 24. Urban households located near landfills (INDEC).

Year	Urban households near landfills[1]	
	Urban households	Urban households located in villas
2014	8,76%	39,51%
2013	7,23%	37,16%
2012	6,79%	40,55%
2011	7,84%	38,17%
2010	7,99%	25,36%
2009	7,48%	28,82%
2008	7,65%	42,68%
2007	8,43%	44,96%
2006	8,79%	39,78%
2005	9,72%	39,92%
2004	10,84%	42,24%
2003	9,50%	47,40%

[1]Three blocks or less.
Source: Own elaboration based on EPH - INDEC data.

Table N° 25. Children living near dumps (INDEC).

Place	Age			Total	% of Total children
	0 a 4	5 a 9	10 a 14		
In urban agglomerates	209.108	237.366	201.616	**648.090**	9,86%
In Greater Buenos Aires	111.460	128.815	95.187	**335.462**	11,93%
% of the total living in Greater Buenos Aires	53,30%	54,27%	47,21%	**51,76%**	

Source: Own elaboration based on EPH-INDEC data, fourth quarter of 2014.

Table N° 26. Percentage of households within three blocks or less of a rubbish dump, by urban agglomerate.

Urban agglomerate	Population1	Percentage of households near landfills[2]	Number of households near landfills[2]	Number of people living near landfills[2]	Percentage of households located in slums[3]	Percentage of households located in slums and near dumps[3]	Percentage of households not located in slums that are close to landfills[3]
Greater Buenos Aires							
City of Buenos Aires	2.981.781	4,11%	48.693	122.551	0,50%	52,16%	8,16%
24 GBA matches	10.796.415	12,33%	379.946	1.331.198	1,02%	22,83%	12,22%
Whose							
Greater Mendoza	1.070.944	3,42%	10.705	36.626	0,94%	77,13%	2,72%
Greater San Juan	511.625	4,65%	6.243	23.791	1,33%	100,00%	5,04%
San Luis - El Chorrillo	215.487	0,08%	49	172	0,08%	100,00%	0,00%
North East							
Currents	379.696	42,34%	47.414	160.763	0,92%	100,00%	41,80%
Formosa	254.702	9,10%	5.787	23.178	0,94%	75,75%	8,47%
Great Resistance	407.001	0,56%	619	2.279	3,06%	0,00%	0,56%
Posadas	350.913	0,09%	93	316	2,40%	0,00%	0,09%
Northwest							
Greater Catamarca	209.072	19,12%	10.979	39.975	0,18%	100,00%	11,83%
G. Tucumán - Tafí Viejo	863.943	8,03%	18.737	69.375	0,62%	61,68%	10,21%

Jujuy - Palpalá	335.406	11,97%	9.866	40.148	0,30%	100,00%	11,70%
La Rioja	200.933	15,35%	8.553	30.843	0,58%	100,00%	19,02%
Salta	617.418	29,20%	45.965	180.286	1,64%	56,17%	27,40%
Sgo. del Estero - La Band	401.924	7,14%	7.578	28.697	0,32%	100,00%	26,37%
Pampeana							
Bahia Blanca - Cerri	305.962	0,00%	0	0	0,21%	100,00%	1,44%
Concordia	159.631	0,28%	138	447	0,70%	0,00%	3,97%
Greater Cordoba	1.512.823	8,67%	41.260	131.162	1,34%	50,18%	8,10%
Greater La Plata	828.860	9,91%	28.731	82.140	0,36%	100,00%	9,59%
Greater Rosario	1.415.628	3,86%	18.466	54.643	2,79%	73,76%	1,86%
Greater Parana	273.300	15,04%	13.361	41.104	0,83%	100,00%	14,33%
Greater Santa Fe	526.366	0,38%	611	2.000	0,31%	0,00%	0,38%
Mar del Plata - Batán	631.322	1,28%	2.943	8.081	0%	0,00%	1,30%
Río Cuarto	171.332	5,98%	3.616	10.246	3,55%	74,29%	3,46%
S. Rosa - Toay	124.545	2,52%	1.156	3.139	0%	0,00%	2,58%
S. Nicolás - V. Constitution	187.981	0,45%	262	846	1,14%	21,45%	0,21%
Patagonia							

C. Rivadavia - Rada Tilly	210.875	4,18%	2.756	8.815	0,25%	0,00%	4,19%
Neuquén - Plottier	304.572	1,12%	1.074	3.411	0,38%	0,00%	1,12%
Rio Gallegos	108.693	3,12%	1.021	3.391	0,62%	100,00%	0,74%
Ushuaia - Río Grande	143.471	1,67%	744	2.396	1,24%	100,00%	0,44%
Rawson - Trelew	137.057	5,66%	2.553	7.757	0%	0,00%	5,66%
Viedma - C. de Patagones	85.442	1,64%	475	1.401	0%	0,00%	1,64%
TOTAL AGGLOMERATES	**26.725.120**	**7,59%**	**720.394**	**2.451.178**	1,19%	36,89%	7,24%

[1] Data from the Permanent Household Survey (INDEC, fourth quarter of 2014).

[2] Data from the Encuesta Permanente de Hogares - EPH (INDEC, second quarter of 2014). A household is considered to be near a rubbish dump if it is located three blocks or less from it. The assessment is based on the enumerator's observation.

[3] For some agglomerates the percentage of households located in slums was zero in the second quarter of 2014. For these, information from other quarters of 2013 or 2014 was used to estimate households in slums near landfills.

Source: Own elaboration based on data from the 2010 Census and EPH (INDEC).

Figure N° 20. Percentage and number (in thousands) of households located three blocks or less from a rubbish dump, by agglomerate (EPH, 2014).

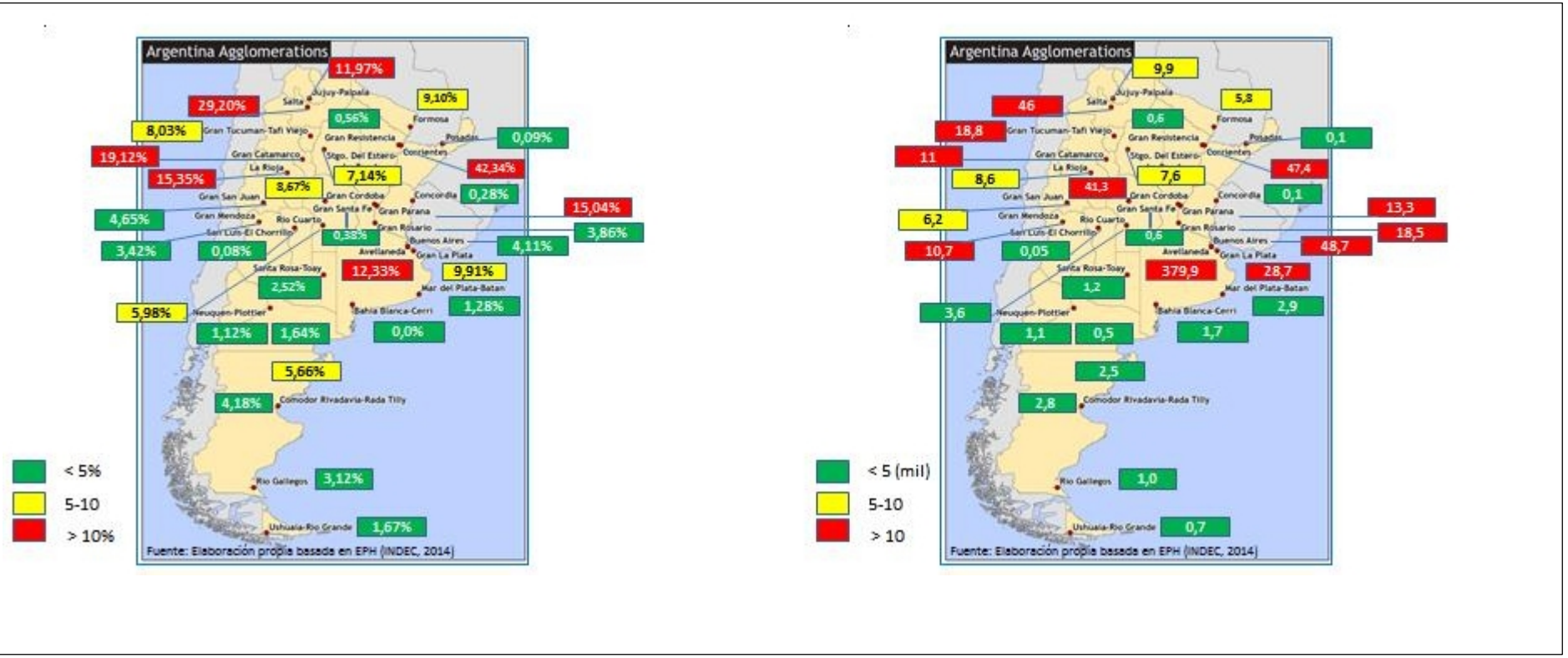


Figure N° 21. Evolution of the percentage of dwellings located near rubbish dumps in Rawson-Trelew (EPH).

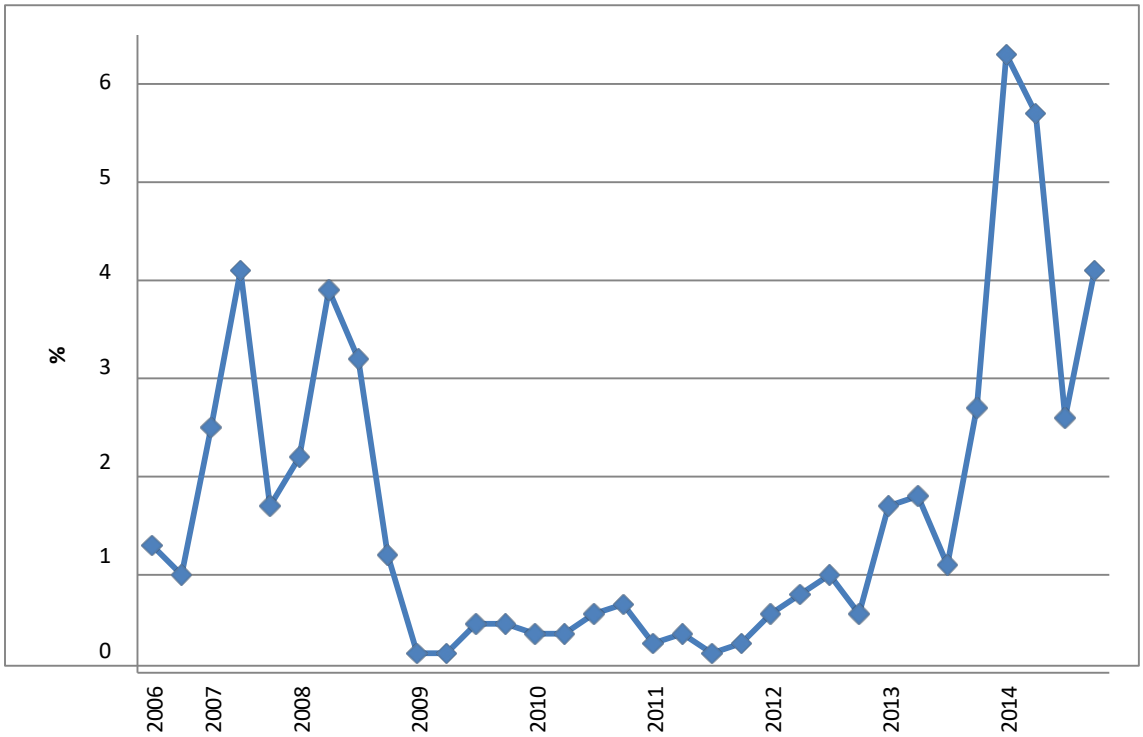


Figure N° 22. Evolution of the percentage of dwellings located near dumps in Mar del Plata (EPH).

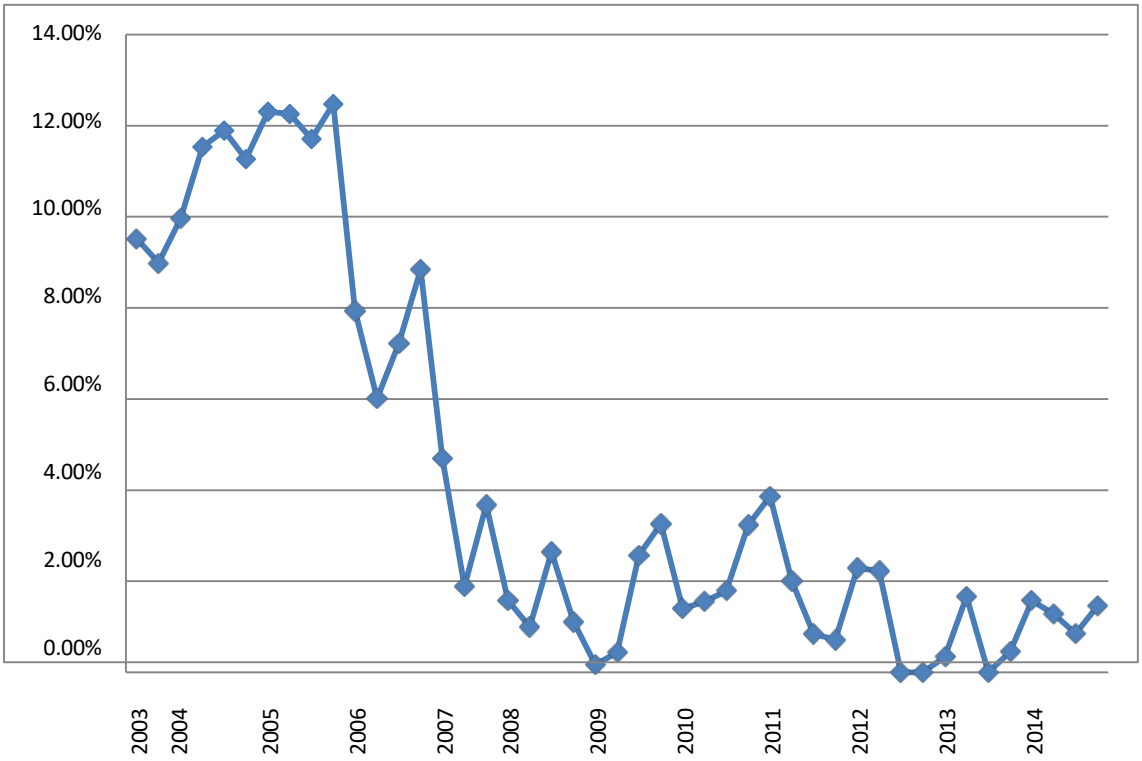


Figure N° 23. Evolution of the percentage of dwellings located near dumps in Gran San Miguel de Tucumán (EPH).

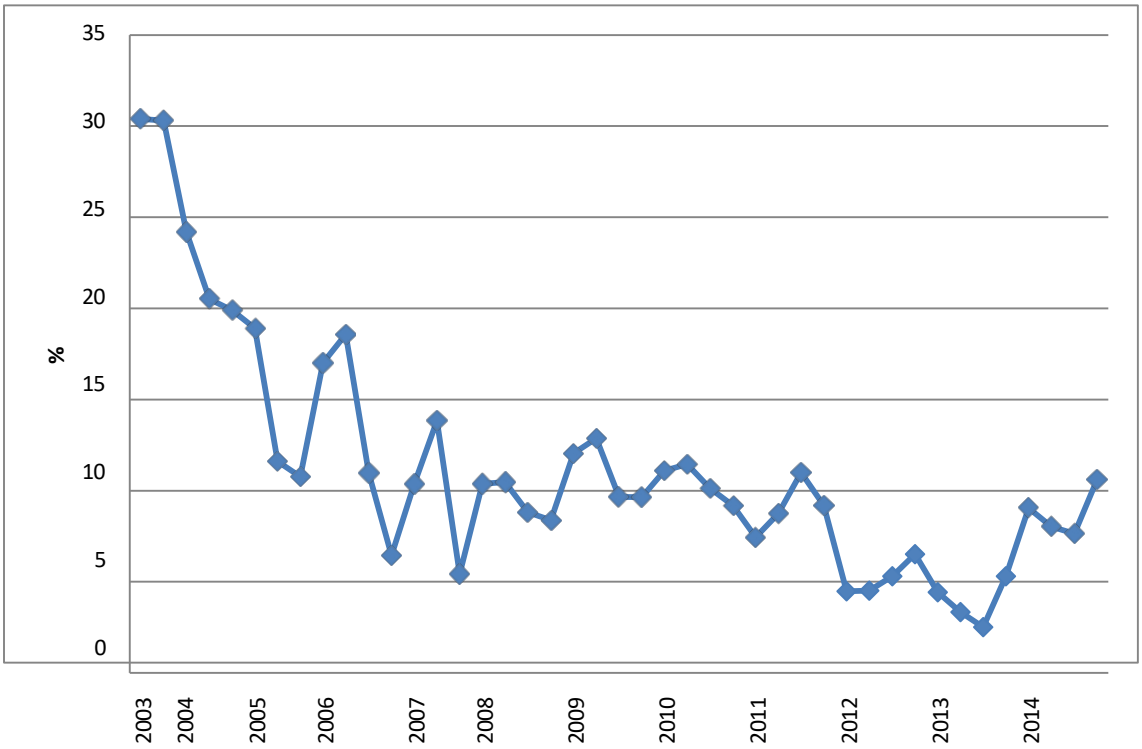
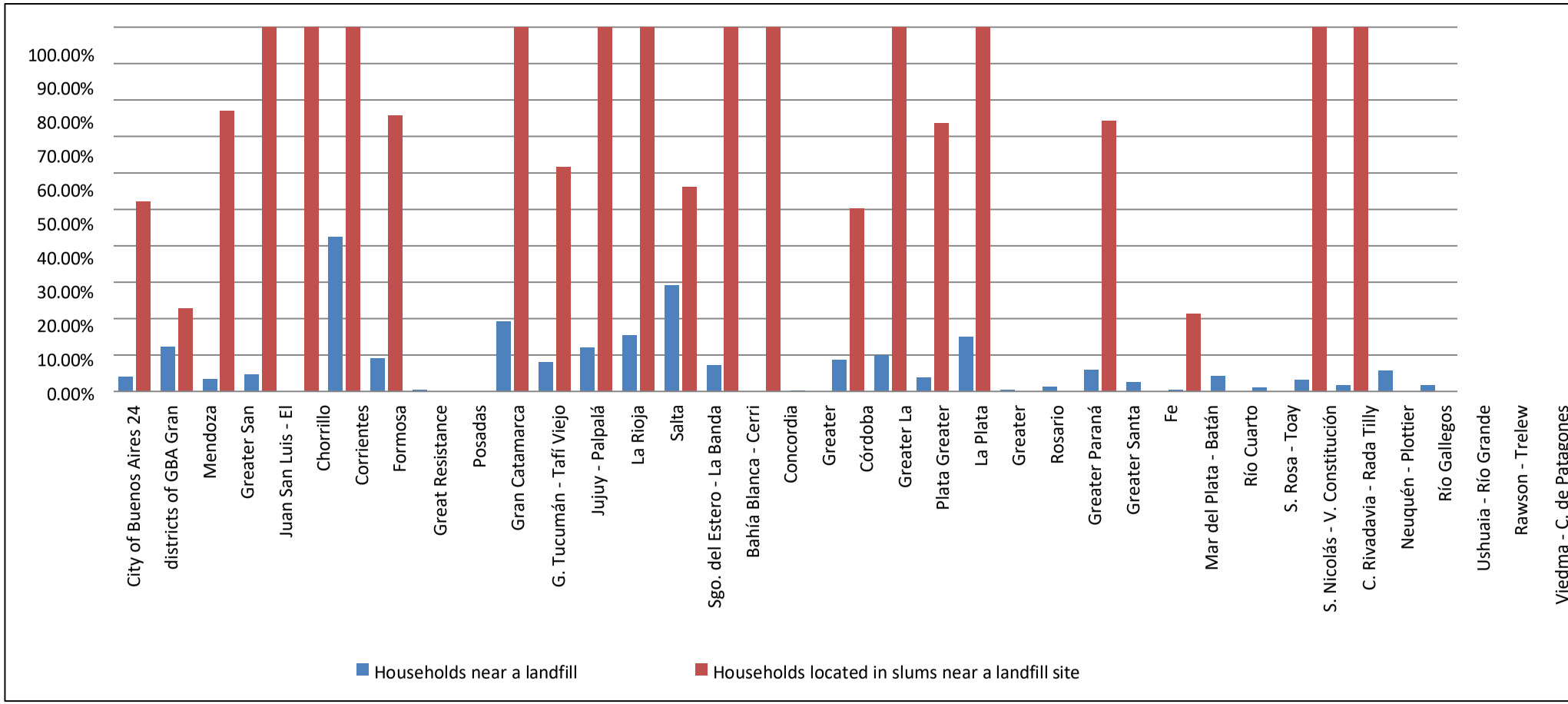


Figure N° 24. Percentage of households located three blocks or less from a rubbish dump, by agglomerate (EPH, 2014).



Data analysis:

- According to the EPH results, **the percentage of urban households located near rubbish dumps is high (8.76%, 2014)**. As in the EDSA analysis, **when we only consider households located in slums and shantytowns, the percentage rises sharply to 39.51%** (2014).
- During the period analysed (2003-2014), **there was no significant and sustained reduction in the total percentage of households living near dumpsites**. We see a peak in 2004 (10.84%), then a decrease to 6.79% in 2012 and finally an increase again.
- **Between 2003 and 2014, there was a reduction in the percentage of households located in slums that are close to rubbish dumps.** This reduction is almost 8%, from 47.40% in 2003 to 39.51% in 2014. However, this decrease was not sustained; on the contrary, we find fluctuations with the lowest values in 2009/2010 and 2005/2006. The variation in this indicator is greater than the indicator that considers all urban households, which may be due to the size of the sample that is substantially reduced when we only consider housing in slums. It is important to highlight that the percentage of urban households located in slums was 1.19% in 2014 according to the EPH, with some agglomerates presenting zero values.
- **9.86% of children between 0 and 14 years of age in the 31 agglomerates analysed live near a rubbish dump**. 51.76% of them are concentrated **in Greater Buenos Aires, where an estimated 335,462 children live three blocks or less from a rubbish dump.**
- **There are significant differences between urban agglomerates** in the percentage of households located near dumps. **The highest percentages were found in the northern agglomerates**: Corrientes (42.34%), La Rioja (19.5%), Salta (27.88%) and Santiago-La Banda (26.6%).
- In **Greater Buenos Aires**, the percentage of households located near rubbish dumps is only slightly above average (12.33%). However, this agglomerate **is very relevant due to the number of people who live in it** (10,796,415 inhabitants) and therefore concentrates an important part of the problem.
- Looking at the results by agglomerate we again find that the probability of living near a rubbish dump increases dramatically when living in a slum or shantytown.
- The results also allow us to conclude that **having a sanitary landfill does not necessarily solve the problem of housing near dumpsites**. This is due to the fact that in many cases, old landfills are not properly closed, and there are illegal dumps and/or micro-dumps.
- Plotting in Figures 21, 22 and 23 the evolution over time of the indicator "percentage of households near landfills" in three different agglomerates (all of them with landfills), we see **different patterns**:
    - In Rawson-Trelew, a regional landfill has been in operation since 2012 but old landfills were not closed. In the graph we can see that the percentage of households near landfills increases even after the construction of the landfill.
    - In Gran San Miguel de Tucumán, we observe a clear decline in the indicator since 2004 but with subsequent fluctuations and still high levels of households in the vicinity of landfills. In this case, it is important to say that the agglomerate substantially improved final disposal during the period analysed.

But even so, a major problem persists with micro-dumps generated in large part by urban waste pickers from slums and emergency settlements, who generate them by taking waste from medium and high socio-economic neighbourhoods to vacant lots near the slums where they live in blood-drawn carts. In 2010 the "Pacará Pintado" landfill, which was located in the middle of a neighbourhood, stopped operating but was not properly closed. Since then, waste has been sent to the "Overo Pozo" landfill, located 44 km from the city.

- Mar del Plata also improved disposal and has had a sanitary landfill since 2012. However, there is a large former landfill that has not been closed. The graph shows a significant improvement since 2004, albeit with fluctuations. It is worth noting that the percentage of people living near landfills is one of the lowest among the 31 agglomerates.

6.3 Annual Household Survey (HHS) - INDEC

In addition to carrying out the EPH, the INDEC once a year expands the sample universe of the EPH and carries out surveys in urban agglomerates with more than 2,000 inhabitants (we recall that the EPH included provincial capitals and agglomerates with more than 100,000 inhabitants). The questionnaire is very similar to that used in the EPH, and as in the latter, the surveyor assesses whether the dwelling is located three blocks or less from a rubbish dump.

Table N° 27. Households located near dumps, comparison between the HBS and the HEA.

Year	Annual Household Survey - HEA	Permanent survey of Households - EPH
2013	6,42%	7,23%
2012	6,65%	6,79%
2011	6,61%	7,84%
2010	6,56%	7,99%

Data analysis:

- **The percentage of households located near rubbish dumps decreases in the HEA compared to the HBS.** As mentioned above, the HEA considers a larger number of municipalities including smaller ones. In these smaller localities, in general, it is easier to find sites further away from inhabited areas to dispose of waste, thus reducing the number of households close to landfills.
- **As in the HBS, the percentage of households living near dumps did not show significant variations between 2010 and 2013.**

6.4 Comparison between the results of HBS, HEA and EDSA

Table N° 28. Comparison between surveys on household proximity to landfills.

Survey (2013)	Indicator	Urban households near landfills	Urban households located in slums near landfills
Barometer	The respondent is asked if he/she considers that in his/her neighbourhood "the rubbish dumps are a problem".	18,0%	63,4%
EPH	Dwelling located three blocks or less from a rubbish dump	7,23%	37,2%
EAH		6,42%	51,06%

Source: Own elaboration based on information provided by EAH, EPH and EDSA (2013).

Data analysis

- **EDSA has higher values than EPH and EAH.** This is logical if we consider that EPH and EAH assess whether the dwelling is located three blocks or less from a rubbish dump, while EDSA asks the respondent whether rubbish dumps are a problem in his or her neighbourhood, a question that can be answered in the affirmative by someone who lives more than three blocks from a rubbish dump.
- **All three data sources show that the percentage of households living near dumps increases dramatically when considering only households in slums or shantytowns.**
- It is interesting to note that **the percentage of households located in slums or shantytowns and near rubbish dumps is much higher in the HEA than in the HBS.**

7 Performance in Integrated Municipal Solid Waste Management

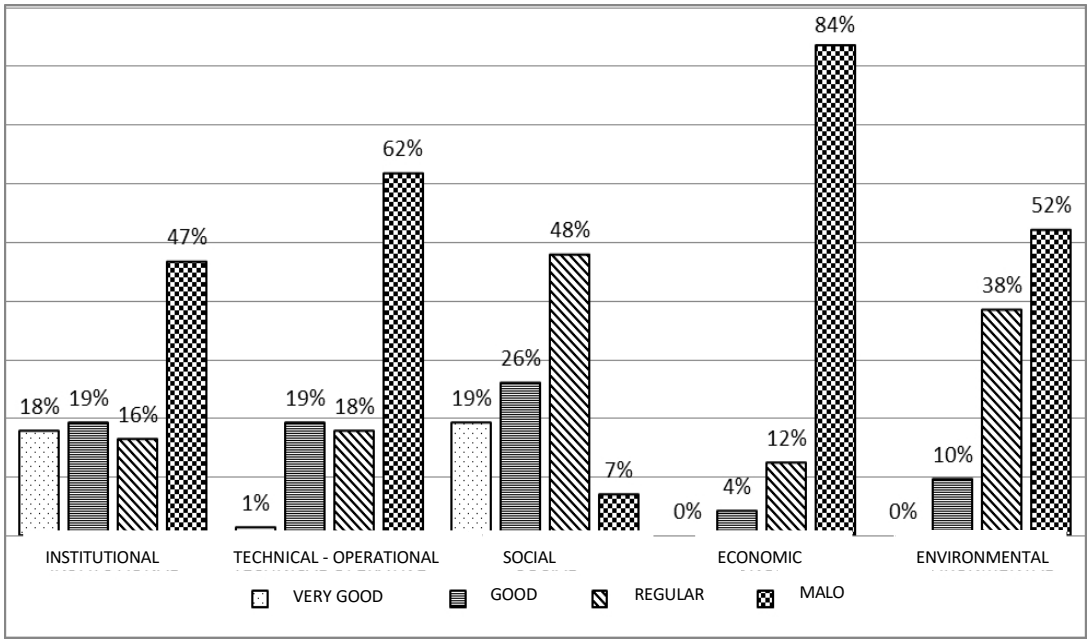
It is not only important to analyse the level of coverage in the different phases of municipal solid waste management, it is also important to evaluate the performance of municipal management in this sector in a comprehensive manner considering the different aspects that influence it (environmental, social, economic and regulatory). In this sense, the GIRSU Project (SAyDS) has a database generated from the analysis of the performance of 73 municipal GIRSU systems in three Argentinean provinces. The objective was to evaluate and quantify the performance of each of these municipalities. To do so, management was divided into five aspects (institutional-regulatory, technical, social, environmental, economic-financial) and, for each aspect, between four (economic) and fourteen indicators (environmental) were analysed. The 40 selected indicators, which are answered with YES/NO, constitute a checklist of the characteristics that a good ISWM system should comply with, and thus describe how well municipalities manage each aspect. The higher the number of indicators to which a municipality answers yes, the better the system is. The data were collected during fieldwork by contracted consultants and are based on information provided by municipal representatives and visual inspections by the consultants. The selection of municipalities followed the following criteria: i) the provincial capital was always included, ii) all localities with more than 10,000 inhabitants were visited, iii) at least 70% of municipalities with less than 10,000 inhabitants were included in the sample (for this purpose a random selection was made in each district). The sample is considered representative of all Argentinean municipalities with less than 300,000 inhabitants.

Table No. 29. Level of compliance with the performance indicators for the whole sample and by municipal size range.

ASPECT	INDICATOR	Municipal size (Inhabitants)			
		> 50.000	10.000-50.000	< 10.000	All s
INSTITUTIONAL - REGULATORY	GIRSU Ordinance	80%	48%	26%	42%
	Institutional area GIRSU coverage	90%	52%	6%	35%
	Institutional area to deal with complaints POT approved	70%	7%	11%	18%
	Ownership of the property	40%	31%	11%	23%
		100%	93%	77%	86%
	PERFORMANCE	**76%**	**46%**	**27%**	**50%**
TECHNICAL - OPERATIONAL	Waste characterisation and/or waste generation studies Separation at source	40%	10%	0%	9%
	Collection service with 100% coverage Differentiated collection systems	50%	31%	6%	22%
	Sweeping service	80%	83%	91%	86%
	Separation plants Landfill	50%	24%	6%	19%
	Landfill Access control to SDF	100%	100%	77%	89%
	MSW disposal register Absence of micro-landfills	30%	52%	9%	28%
	Recyclable materials recovery programmes	10%	7%	0%	4%
		70%	52%	14%	36%
		30%	7%	3%	8%
		0%	34%	23%	24%
		80%	59%	20%	43%
	PERFORMANCE	**49%**	**42%**	**23%**	**38%**
SOCIAL	Provision of PPE to staff	50%	31%	40%	38%
	Absence of informal workers in the SDF	10%	24%	34%	27%
	Absence of informal workers' housing on the SDF site Absence of informal workers on the streets	80%	90%	89%	88%
	Absence of dwellings adjoining the SDF site	60%	69%	51%	59%
	Waste awareness programmes	80%	90%	71%	80%
		70%	66%	20%	45%
	PERFORMANCE	**58%**	**61%**	**52%**	**57%**

ECONOMIC - FINANCIAL	Include in the budget planning the differentiated costs of ISWM in a differentiated way	50%	14%	0%	12%
	Specific MSW management fees	20%	3%	11%	9%
	Application of differential rates to large generators	70%	10%	17%	22%
	Municipal fees collected cover 50% of MSW management costs	50%	14%	3%	14%
	PERFORMANCE	**48%**	**12%**	**8%**	**22%**
ENVIRONMENTAL	EIA approved	20%	3%	0%	4%
	Soil quality monitoring	20%	3%	3%	5%
	Water quality monitoring	20%	7%	3%	7%
	Air quality monitoring	20%	3%	3%	5%
	Vector control	0%	10%	0%	4%
	Leachate collection and treatment system	0%	3%	0%	1%
	Distance from SDF to watercourses and water bodies> 2 km	30%	52%	29%	38%
	Distance from SDF to ANP> 10 km	80%	83%	77%	80%
	Distance from SDF to Areas of Tourist or Scenic Interest> 2 km	90%	79%	74%	78%
	Distance SDF to airports/aerodromes operating turbine-powered aircraft> 3 km or piston/turboprop> 1.5 km	100%	100%	97%	99%
	No burning of MSW	40%	34%	14%	26%
	Absence of waste outside the SDF	10%	38%	6%	19%
	Absence of domestic and native fauna within the SDF property.	10%	34%	6%	18%
	PERFORMANCE	**34%**	**35%**	**25%**	**31%**
OVERALL PERFORMANCE		**53%**	**39%**	**27%**	**35%**
GENERAL PERFORMANCE FOR MUNICIPALITIES WITH GIRSU ORDINANCE AND AREA INSTITUTIONALLY SPECIFIC					**52%**

Figure N° 25. ISWM performance by analysed aspect.



Data analysis

- **The results clearly show that there is room for improvement in municipal waste management with a holistic approach in all aspects analysed** (economic, environmental, social, institutional, etc.). The overall average performance for the whole sample was only 35% (100% being the maximum performance that could have been achieved by the municipality that complied with all indicators).
- Looking at each aspect individually, we realise that there are significant differences, but **low performance results are a shared characteristic**. Municipalities, in general, were better evaluated in the social (57%) and institutional-regulatory (50%) aspects while the lowest level of compliance with the indicators was observed for the economic (22%) and environmental (31%) aspects.
- In each aspect analysed separately (Figure 25), **more than 55% of the municipalities had a poor performance** (between 0 and 30% of the indicators met) **or a fair performance** (between 31 and 50% of the indicators met). This shows that the performance of Argentinean municipalities needs to be improved in the five aspects mentioned above.
- As far as environmental indicators are concerned, we found that some indicators are fulfilled by less than 5% of the localities, among which we can mention: To have an approved environmental impact assessment, to carry out soil and air monitoring, to have leachate collection and treatment system, and to carry out vector control. On the other hand, we found that **74% of the municipalities carry out burning practices.**

at the disposal site, either by municipal workers or by informal waste collectors. Other worrying indicators are that **82% of municipalities have pets on site and 81% have waste outside the site.**

- The indicators selected to describe the management of the social aspect of ISWM show that **the vast majority of municipalities have informal waste pickers on the streets and/or at the disposal site**. On the other hand, we see that the use of personal protective equipment by the operators is low (38%). It is also worth mentioning that only 45% of the municipalities have implemented awareness programmes on municipal solid waste management.

- Within the institutional aspect, there are two very important indicators that influence the entire waste management system and that are not fulfilled by many municipalities: having an ISWM ordinance (42% of the municipalities in the sample) and having a specific area for integrated waste management (35% compliance). However, **when we analyse the overall assessment of municipalities that have an ordinance and a specific area for integrated waste management, we see that the average for this subgroup (52%) is clearly above the average for the whole sample, which underpins the importance of both indicators (35%).**

- As far as economic management is concerned, the evaluation allows us to conclude that **revenue collection is generally not enough to cover expenditure.** In line with this, we see that the municipalities do not have an adequate fiscal policy, only 9% have a specific waste management tax, and 22% use differential rates for large generators.

- Analysing the average performance for each province, we find that **the province with the most unfavourable socio-economic indicators (Formosa) has a significantly lower evaluation than the other two** (24%) compared to an average of 44% for Entre Ríos and 38% for Río Negro.

- The evaluation also shows that **there are significant differences in performance by population size, with performance increasing with population size**. Particularly, in the economic and institutional aspects we observe that larger municipalities are achieving better performances. For example, in terms of complaint management, only 18% of the municipalities analysed have a specific area to manage complaints, but this value rises to 70% among municipalities with more than 50,000 inhabitants, and drops to 7% among medium-sized municipalities and 11% among small municipalities.

8. Jobs generated by the Municipal Solid Waste Management sector

- **The municipal solid waste management sector is an important source of both formal and informal employment in Argentina, generating more than 320,000 jobs, the dynamics of which are strongly affected by the particular context of each municipality.** However, no systematic and periodic source of information has been found that generates quantitative data by locality in this regard.
- According to the IDB's regional assessment (EVAL 2010), **there are, on average, 20.31 formal workers per 10,000 inhabitants dedicated to waste management in the country**, a number similar to the average found for the Latin American region (21.7). EVAL found important regional differences within Argentina, with Region II presenting a value more than double the national average (43.67 workers/10,000 inhabitants).
- According to a database of the GIRSU Project (SAyDS), **the number of formal workers each year is 10,000 inhabitants is influenced by the size of the locality.** This base shows average values of 105.7 workers/10,000 inhabitants for localities with less than 15,000 inhabitants, 32.4 workers/10,000 inhabitants in municipalities with between 15,001 and 50,000 inhabitants and 22.6 workers/10,000 inhabitants for those with between 50,001 and 300,000 inhabitants.
- **In terms of informal workers, EVAL (2010) found an average of 20.49 workers/10,000 inhabitants** for Argentina. On the other hand, the compilation of different sources of information carried out for **this report found a value of 15.73 when averaging over 60 localities and 23.19 workers/10,000 inhabitants when considering only the main agglomerates (data were obtained for 19 of the 31).**
- **The ratio of formal versus informal workers is reversed when analysing separately the 31 agglomerates from the rest of the municipalities.** In the first case, 60% of workers in the sector are informal, while in the second this percentage drops to 25%.

8.1 Jobs formal

8.1.1 Regional Assessment of Municipal Solid Waste Management in Latin America and the Caribbean (EVAL)

The Inter-American Development Bank conducted a regional assessment of the municipal solid waste sector in Latin America and the Caribbean in 2010. The assessment was based on information provided by municipal representatives from a representative sample of localities. The assessment included an analysis of the number of employees affected in the management. The following results are disaggregated by region (since the analysis in Argentina was divided into three regions) and management phase, and also differentiate between formal municipal and contracted employees. As the assessment is carried out in the entire Latin American region, it is possible to compare the country results with regional averages.

Table N° 30. Formal workers in municipalities with direct municipal service, by region (EVAL, 2010).

Human resources per 10,000 inhab.	Region I	Region II	Region III	Total Argentina	LAC
Manual sweeping	10,24	5,56	4,83	5,83	5,56
Mechanical sweeping	0,08	0,45	0,66	0,58	0,37
Collection	5,41	7,59	5,56	5,85	4,69
Transfer	/	0,45	0,6	0,58	1,48
Treatment	/	2,56	2,49	2,51	2,69
Final provision	3,76	2,33	1,57	1,91	1,54
Maintenance	/	16,67	0,53	0.84	0,96
Special services	1,75	7,3	1,44	2,39	3,1
Administrative	0,75	0,76	0,62	0,66	1,33
TOTAL	**21,99**	**43,67**	**18,3**	**20,31**	**21,72**

Region I: Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán Region II: Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis
Region III: Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and Buenos Aires city.
Source: Own elaboration based on EVAL 2010 and IDB Technical Note 2013.

Table N° 31. Municipal and contracted employees working in the GIRSU, by phase of management (EVAL, 2010).

Indicator	Manual Sweeping	Mechanical sweeping	Collection	Transfer	Treatment	Final provision	Maintenance	Special services	Administrative staff	Total
Total Argentina	5,84	0,58	5,85	0,58	2,51	1,91	0,84	2,39	0,66	21,15
ARG- Employees municipal	3,01	0,48	3,32	0,28	1,72	1,35	0,49	1,87	0,52	13,04
ARG - Employees hired Average	2,82	0,1	2,53	0,3	0,79	0,56	0,35	0,52	0.14	8,12
Latin-America	5,56	0,37	4,69	1,48	2,69	1,54	0,96	3,1	1,33	21,72

Source: Own elaboration based on EVAL 2010 and IDB Technical Note 2013.

Data analysis

- According to the IDB regional assessment, **there are, on average, 20.31 formal workers dedicated to solid waste management per 10,000 inhabitants in the country**, a number similar to the average for the region (21.7).
- The human resources used are distributed as follows: **manual street sweeping (5.83), waste collection (5.85), treatment (2.51), special services (2.39) and final disposal (1.91)** (EVAL, 2010).
- **Argentina uses more employees in sweeping, collection and disposal** (14.2 employees per 10,000 inhabitants) **than the regional average, but fewer administrative and maintenance staff** (1.5 versus 2.32).
- In almost all phases of management, with the exception of transfer, **the number of municipal employees is higher than the number of contracted personnel**. On average, out of the 21 workers per 10,000 inhabitants working in the country in ISWM, **13 are municipal employees and 8.1 are contracted** (EVAL 2010).
- The results reveal **regional differences within Argentina. The number of employees per 10,000 inhabitants is markedly higher in Region II (43.67)**, being twice as high as in the other two regions.
- In addition, **Regions I and II have services provided mainly by municipalities** while in **Region III**, which includes Buenos Aires and the main agglomerates of the country, **70.1% of the employees are contracted**.

8.1.2 Database generated by the GIRSU Cost Matrix of the GIRSU Project (SAyDS)

As mentioned earlier in this report, the GIRSU National Project (SAyDS) developed an Excel tool (GIRSU Cost Matrix) to help localities calculate the costs of their municipal waste management. In order to teach the tool to municipal decision-makers, three-day workshops were held in different provinces of the country. During these workshops, a database was generated with information from more than 85 municipalities from 11 different provinces. The information collected includes the number of formal workers involved in wastewater management as well as the percentage of time spent by each of them on wastewater management specifically (since in small municipalities it is common for the same worker to carry out different tasks).

Table N° 32 presents the average number of workers per 10,000 inhabitants for different population size ranges. The table shows that the larger the municipality the larger the average number of formal waste management workers per 10,000 inhabitants decreases.

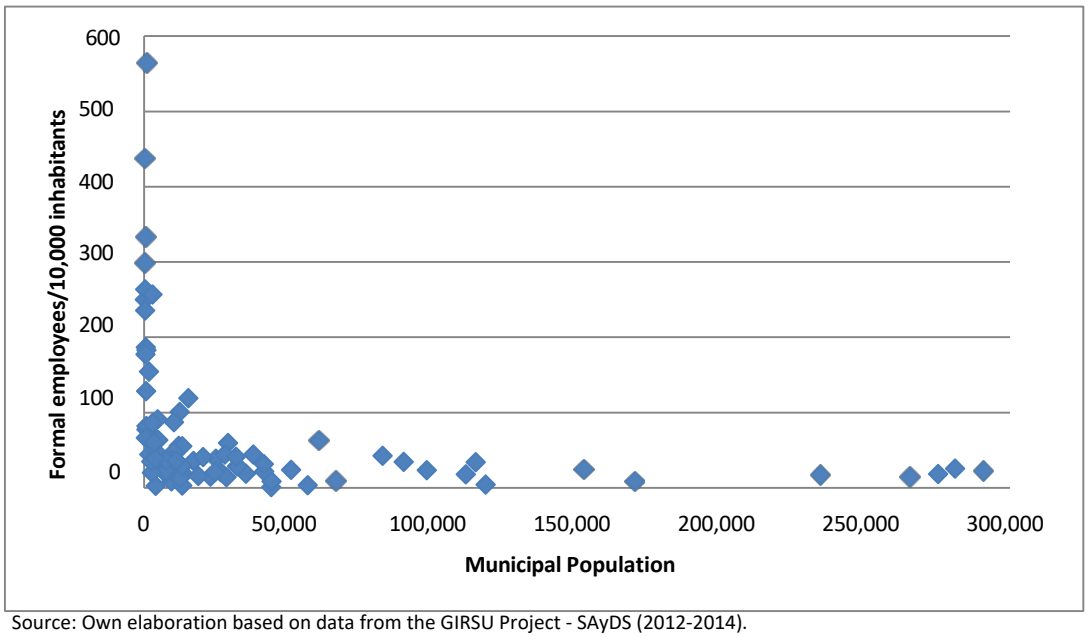
Table N° 32. Average number of employees each 10,000 inhabitants, by municipal size.

Municipal size	Average of employees every 10,000 inhabitants
0 - 15.000	105,71
15.001 - 50.000	34,01
50.001 - 300.000	22,60

Source: Own elaboration based on data from the GIRSU Project - SAyDS (2012-2014).

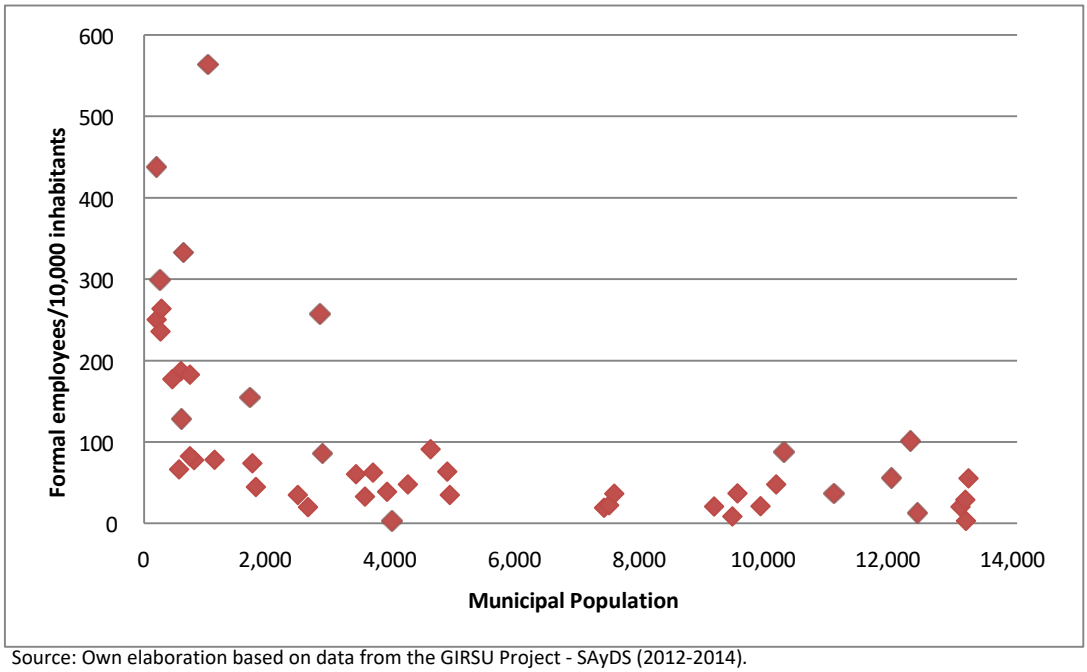
By plotting in Figures N° 26 and 27 the number of workers per 10,000 inhabitants versus population for each of the municipalities in the sample, we can assess the dispersion of the results. We see that the greatest dispersion is found among the smaller municipalities, particularly those with less than 3,000 inhabitants. Localities with more than
50,000 inhabitants are typically kept below 50 employees per 10,000 inhabitants.

Figure N° 26. Formal employees per 10,000 inhabitants working in Municipal Solid Waste Management versus municipal size.



Source: Own elaboration based on data from the GIRSU Project - SAyDS (2012-2014).

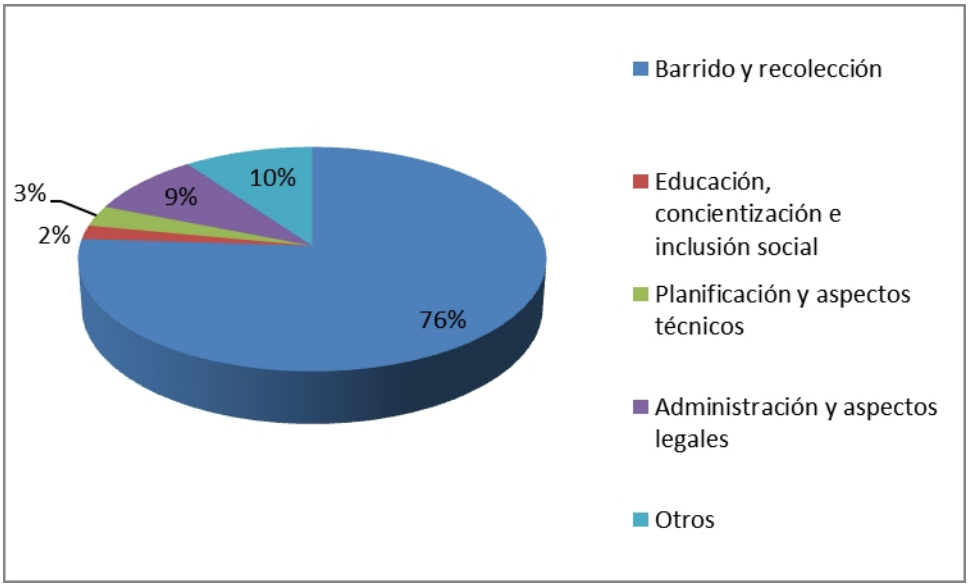
Figure N° 27. Formal employees per 10,000 inhabitants working in Municipal Solid Waste Management versus municipal size, for municipalities up to 15,000 inhabitants.



Source: Own elaboration based on data from the GIRSU Project - SAyDS (2012-2014).

Figure N° 28 shows the distribution of employees involved in wastewater and wastewater management in the different tasks involved in wastewater and wastewater treatment.

Figure N° 28. Percentage of formal employees disaggregated by task.



Source: Own elaboration based on data from the GIRSU Project - SAyDS (2012-2014).

Data analysis

- Table N° 30 shows that **in larger population size ranges, the average number of formal workers working in waste management decreases**. The value is particularly high in municipalities with less than 15,000 inhabitants (105.71 employees/10,000 inhabitants). This may be due to the fact that municipalities with more inhabitants may start to benefit from economies of scale. It is worth mentioning that this group presents a large dispersion of results, as can be seen in the Figures above, particularly among localities with less than 3,000 inhabitants which are increasing the average.
- Figures N° 26 and 27 show that the **"number of employees per 10,000 inhabitants" does not have an inverse relationship with the number of inhabitants**. In fact, in Figure N° 18 it can be clearly seen that **very small municipalities show much higher averages and a large variation** while municipalities with more than 3,000 inhabitants always show results below 100 employees/10,000 inhabitants.
- **Municipal solid waste management is an important source of formal employment**. The **relevance increases in smaller municipalities**, where typically in Argentina a large percentage of people work in the public sector and where waste management accounts for a significant proportion of municipal employment. According to the results of the GIRSU Cost Matrix database, on average, municipalities spend 13% of their budget on waste management.

- In relation to how human resources are used, Figure N° 28 shows that the **majority of employees dedicated to ISWM are engaged in sweeping and collection tasks (76%)**. This also shows that the sector generates a significant number of jobs that require low skills or education.
- Soft" tasks related to waste management such as **planning and awareness-raising employ a very low percentage of workers in the sector**.

8.2 Informal Employment

8.2.1 Regional Assessment of Municipal Solid Waste Management in Latin America and the Caribbean (EVAL)

Table N° 33. Informal waste pickers per 10,000 inhabitants, by region and place of work.

Recovered per 10,000 inhabitants	Region I	Region II	Region III	Urban waste pickers in Argentina every 10,000 inhabitants	Number of urban waste pickers in Argentina	Urban Recovered in LAC every 10,000 inhabitants	Number of urban reclaimers in LAC
In plants of separation	0,07	7,11	1,79	1,91	7.176	1,47	68.907
On the streets	0,47	1,89	22,82	14,68	55.156	2,74	128.439
At sites of final disposition	5,7	4,62	1,73	3,19	11.985	1,82	85.314
Other sites	0	0,57	1,94	0,71	2.668	2,54	119.064
Total	**6,24**	**14,19**	**28,28**	**20,49**	**76.985**	**8,57**	**401.725**

Region I: Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán Region II: Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis
Region III: Buenos Aires, Córdoba, Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and Buenos Aires city.
Source: Own elaboration based on EVAL 2010 and IDB Technical Note 2013.

Data analysis

- According to Table N° 33, the **average number of waste pickers per 10,000 inhabitants found by EVAL in 2010 for Argentina (20.49) is significantly higher than the regional average (8.57)**.
- When we look at the values disaggregated by place of work, we realise that the big difference between Argentina and the average for Latin America is in the category of waste pickers working on the streets. **The number of waste pickers per 10,000 inhabitants working on the streets in Argentina is five times higher than that found for the region (2.74 versus 14.68).**
- Within Argentina, EVAL shows the existence of significant differences between regions with **the lowest value found for Region I (6.24) and the highest for Region III (28.28)**. It is worth noting that **Region III includes the most populous urban agglomerates with the highest per capita incomes, and it is there where**

The main recycling industries are located here, which largely explains the differences found.

- As far as workplaces are concerned, the results show that the majority of waste pickers in Argentina **carry out their tasks on the streets**. This is in line with the fact that the main conurbations have landfills where informal waste pickers are not allowed access. On the other hand, the low number of waste pickers working in sorting plants is consistent with the low installed capacity described in chapter 4.
- **EVAL estimated that there are a total of 77,000 waste pickers in the country** and that 19% of them work as part of some kind of organisation (mainly cooperatives).

8.2.2 Child and Adolescent Labour in Municipal Solid Waste Recovery and Recycling IOM-UNICEF, 2006

In 2006 UNICEF presented a report on child labour in the municipal waste recovery and recycling sector. The report is based on empirical work carried out in the city of Buenos Aires, Moreno (Greater Buenos Aires), and Posadas (province of Misiones). The numbers of child and adolescent workers represent a minimum estimate because they only considered the number of cases that could be counted by observation during the survey period.

According to the report (See Table N° 32), in the city of Buenos Aires in 2004 there were 8,762 informal workers and 4,223 of them were children and adolescents. In Moreno, they found that 368 people worked within that locality as informal waste pickers (148 of them children and adolescents) while another 582 (264 of them under 18) collected material in the streets of the city of Buenos Aires. Finally, in Posadas, the study found a minimum of 1,570 people working as informal waste pickers in 2004, 1,061 of whom were children or adolescents.

Table N° 34. Child labour among municipal waste collectors.

Municipality	Population (Census 2010)	Total number of urban waste pickers	Number of urban waste pickers under 18 years of age	Percentage of children and adolescents among recovery workers urban	Urban waste pickers per 10,000 inhabitants
Buenos Aires city	2.981.781	8.762	4.223	48%	29,4
Moreno (Great Buenos Aires)	462.242	950	412	43%	20,6
Posadas	323.739	1.570	1.061	68%	48,5

Source: Own elaboration based on information from IOM-UNICEF 2006.

Data analysis:

- For the cases of **the city of Buenos Aires and Moreno**, the findings of this study are **in line with the EVAL results**. However, **Posadas has a significantly higher number of waste pickers per 10,000 inhabitants**. This reveals that **the average value of waste pickers per 10,000 inhabitants is an indicator that cannot be easily extrapolated as it is largely influenced by the dynamics of each agglomerate.**
- **The proportion of children and adolescents in the year of the study (2006) was very high**, reaching 68% in Posadas.
- It is worth noting that **the aforementioned results of children and adolescents working as urban waste pickers have probably changed substantially**. This assumption is based on the fact that **in October 2009 the "universal child allowance" was implemented in the country**. This cash transfer for each child under the age of 18 is given to unemployed people, people working in the informal sector, or people earning less than the minimum wage and currently covers some 3,500,000 children and adolescents. The transfer is conditional on the presentation of a certificate of regular school attendance and completion of medical check-ups. No specific official information was found on the impact of this social transfer on child labour as an urban recuperator, but it has been proven that educational enrolment increased and child labour in general as well as poverty have been reduced thanks to the universal child allowance. According to the Argentine Social Debt Barometer survey (EDSA, Universidad Católica Argentina), between 2010 and 2012, this allowance reduced the risk of child labour among beneficiaries by 14 per cent.

8.2.3 Compilation of different sources of information on formal and informal workers in different municipalities in the country.

Unfortunately, there is no systematic source of information at the national level on the informal work generated by the municipal solid waste sector. In order to estimate the importance of the sector as a source of employment, a compilation of all available information that could be collected on the number of workers (formal and informal) in the municipal solid waste management sector in different municipalities was carried out for this report. The numbers presented below come from urban waste pickers' censuses carried out by the GIRSU Project (SAyDS), by municipal governments, in the framework of provincial diagnoses, or by international organisations. It is important to highlight that this type of information compilation has three important disadvantages: the results were not found with a uniform methodology, they correspond to different dates, and they do not necessarily respond to the same definition of the activity being evaluated.

In 2012 the study "Review and update of the National Strategy for the Integrated Management of Urban Solid Waste - Social Component, Consultant Dr. Francisco M. Suárez" also developed a compilation of information from different sources on the number of waste pickers and was therefore also used as a relevant source of information to develop Table N° 33.

Table N° 35. Formal workers and urban waste pickers in the GIRSU sector, by municipality.

Province	Municipality	Inhabitants (Census 2010)	Number of urban waste collectors[1]	Number of formal workers	Retrievers per 10,000 inhabitants	Formal workers per 10,000 inhabitants[1]	Reclaimers versus formal workers	Source and year of data collection
City of Buenos Aires		2.981.781	9456	5750	31,71	19,28	1,64	Municipal representatives of the ENOSUR (Ente de Obras y Servicios Urban), 2015.
Buenos Aires	Moreno (Greater Buenos Aires)	462.242	368		7,96			IOM-UNICEF, 2006.
	José C. Paz (Greater Buenos Aires)	263.094	522		19,84			Suárez, 2001 (cited in "Revision and update of the National Strategy for the Integrated Management of Urban Solid Waste Social Component", 2012).
	Malvinas Argentinas (Greater Buenos Aires)	321.833	552		17,15			
	San Martín (Greater Buenos Aires)	422.830	1.100		26,02			Álvarez, 2010 (cited in "Review and update ofthe National Strategy for the Integrated Management of Urban Solid Waste Social Component", 2012).
	Mar del Plata	614.350	1835	830	29,87	13,51	2,21	ENOSUR (Ente de Obras y Servicios Urbanos), 2015. Waste pickers include 40 working in a cooperative manner (CURA) at the municipal sorting plant. Formal workers include 110 employees of ENOSUR, some of them only

								work part of the time on the GIRSU.
Entre Rios	Parana	247.863	1454	0	58,66			Plan Provincial GIRSU de Entre Ríos (Contracted by the GIRSU Project of the SAyDS and carried out by CEAMSE-INCOCIV, 2014). Based on observations by CEAMSE-INCOCIV consultants during fieldwork in the municipalities and on information provided by representatives of the municipalities. municipalities.
	Concordia	152.282	800	116	52,53	7,62	6,90	
Santa Fe	Rosario	948.312	2000	1700	21,09	17,93	1,18	Municipal representatives of the Directorate General for the Management of Waste, 2015.
	City of San Fe	415.000	1.500		36,14			Municipal representatives, 2012 (cited in "Review and update of the National Strategy for the Integrated Management of Municipal Solid Waste - National Strategy for the Integrated Management of Municipal Solid Waste - National Strategy for the Integrated Management of Municipal Solid Waste - National Strategy for the Integrated Management of Municipal Solid Waste", 2012).

								Social Component", 2012).
Tucumán	San Miguel de Tucumán	470.809	2500		53,10			Municipal representatives, 2014 (Minutes of fieldwork carried out by the Project. GIRSU of the SAyDS).
Salta	Salta capital	535.303	166	580	3,10	10,83	0,29	Municipal representatives of the Sub-Secretariat of Public Services and Control environmental, 2015.
Catamarca	San Fernando del Valle de Catamarca*.	109.882	66	0	6,01			GIRSU Provincial Plan of Catamarca (Contracted by SAyDS GIRSU Project and carried out by HYTSA, 2014). Based on observations of HYTSA consultants during fieldwork in municipalities and information provided by representatives of the municipalities. municipalities.
Chaco	Resistance	386.000	300		7,77			Subsecretaría provincial de Medio Ambiente, 2011 (cited in "Revisión y actualización de la Estrategia Nacional para la Gestión Integral de Residuos Sólidos Urbanos - Revisión y actualización de la Estrategia Nacional para la Gestión Integral de Residuos Sólidos

								Urbanos Social Component", 2012).
Missions	Posadas	323.739	1570		48,50			IOM-UNICEF, 2006.
Mendoza	Mendoza Metropolitan Area	1.086.066	750		6,91			Iatasa, 2010 (cited in "Review and update ofthe National Strategy for the Integrated Management of Urban Solid Waste Social Component", 2012).
Chubut	Trelew	99.430	22	0	2,21			GIRSU Project of the SAyDS, 2012. Census
	Rawson	31.787	17	0	5,35			by provincial representatives in order to implement the Social Inclusion Plan for the works financed by IBRD loan.
	Comodoro Rivadavia	173.266	116	392	6,69	22,60	0,30	Iatasa, 2011 (cited in "Revision and update of the National Strategy for the Integrated Management of Urban Solid Waste - Iatasa, 2011 (cited in "Revision and update of the National Strategy for the Integrated Management of Urban Solid Waste - Iatasa, 2011"). Social Component", 2012).
	Average of the main agglomerates (EPH)				23,19	15,30	1,52	
	Rivadavia (Mendoza East Zone)*.	31.038	57	106	18,36	34,01	0,54	GIRSU Project of the SAyDS, 2014. Census carried out by provincial representatives in

Mendoza	San Martín (Mendoza East Zone)*.	79.662	82	180	10,29	22,6	0,46	order to implement the Social Inclusion Plan of the works financed by the SAyDS. IBRD loan.
Chubut	Puerto Madryn	81.995	27	185	3,29	22,60	0,15	GIRSU Project of the SAyDS, 2012. Census carried out by provincial representatives in order to implement the Social Inclusion Plan of the works financed by the SAyDS. IBRD loan.
Buenos Aires	Zárate-Campana*.	185.382	120	419	6,47	22,6	0,29	Executive Project for the execution of GIRSU works (contracted by the GIRSU Project of SAyDS and conducted by HytSA, 2010).
	Lujan	106.899	400	242	37,42	22,6	1,66	Municipal representatives, 2012 (cited in "Review and update of the National Strategy for the Integrated Management of Municipal Solid Waste - National Strategy for the Integrated Management of Municipal Solid Waste - National Strategy for the Integrated Management of Municipal Solid Waste - National Strategy for the Integrated Management of Municipal Solid Waste", 2012). Social Component", 2012).
Santa Fe	St. Jerome	66.702	131	151	19,64	22,6	0,87	Hytsa, 2011 (cited in "Review and update ofthe National Strategy for the Integrated Management of Urban Solid Waste Social Component", 2012).
	Humbolt	4.783	3		6,27			
	Firmat	19.917	20	68	10,04	34,01	0,30	
	Cafayate	3.583	20		55,82			Plan Provincial GIRSU de Salta

Salta	Oran	34.465	30	117	8,70	34,01	0,26	(Contracted by the GIRSU Project of the SAyDS and carried out by IATASA, 2010).
	Tartagal	79.900	35	272	4,38	34,01	0,13	
Entre Rios	Gualeguaychú	97.839	95	189	9,71	19,32	0,50	GIRSU Project of the SAyDS, 2014. Census carried out by municipal representatives to implement the Social Inclusion Plan of the works financed by the SAyDS. IDB loan.
	Gualeguay	43.009	280	35	65,10	8,14	8,00	Plan Provincial GIRSU de Entre Ríos (Contracted by the GIRSU Project of the SAyDS and carried out by CEAMSE-INCOCIV, 2014). Based on observations by CEAMSE-INCOCIV consultants during fieldwork in the municipalities and on information provided by
	Chajarí	34.848	0	75	0,00	21,52	0,00	
	Villaguay	34.637	2	107	0,58	30,89	0,02	
	Victoria	31.842	5	90	1,57	28,26	0,06	
	La Paz	25.808	50	84	19,37	32,40	0,60	
	Nogoyá*.	23.702	40	77	16,88	32,40	0,52	
	Crespo	20.203	0	53	0,00	26,23	0,00	
	Diamond	19.930	12	65	6,02	32,61	0,18	
	San José	18.178	8	62	4,40	34,01	0,13	
	Federal	18.015	0	52	0,00	28,86	0,00	
	St Helena	17.883	35	6	19,57	3,36	5,83	municipal representatives.
	Federation	17.547	30	60	17,10	34,01	0,50	
	Rosario Del Tala	13.723	31	58	22,59	42,26	0,53	
	San Salvador	13.228	10	21	7,56	15,88	0,48	
	San José De Feliciano	12.084	25	33	20,69	27,31	0,76	
	Villa Elisa	11.117	10	7	9,00	6,30	1,43	
	Basavilbaso	9.742	20	19	20,53	19,50	1,05	
	Viale	9.641	11	55	11,41	57,05	0,20	
	San Benito	9.324	25	16	26,81	17,16	1,56	
	General Ramirez	9.222	40	30	43,37	32,53	1,33	
	Ibicuy	4.900	10	12	20,41	24,49	0,83	
	Green Gold	4.333	0	18	0,00	41,54	0,00	
	Villa Paranacito	4.215	5	7	11,86	16,61	0,71	

	Ubajay	3.507	0	13	0,00	37,07	0,00	
	General Campos	3.149	0	15	0,00	47,63	0,00	
	Colonia Avellaneda	3.084	34	16	110,25	51,88	2,13	
	Ceibas	1.773	0	3	0,00	16,92	0,00	
	Villa del Rosario	3.973	0	18	0,00	45,31	0,00	
	Average for the province of Entre Ríos				18,58	27,97	0,66	
	Average Entre Ríos without considering Concordia and Paraná (EPH)				16,03	**28,56**	0,56	
Catamarca	Aconquija	3.045	0	25	0,00	82,10	0,00	GIRSU Provincial Plan of Catamarca (Contracted by SAyDS GIRSU Project and carried out by HYTSA, 2014). Based on observations of HYTSA consultants during fieldwork in municipalities and information provided by municipal representatives.
	Andalgalá*.	15.087	120	51	79,54	34,01	2,34	
	Belén	13.524	8	42	5,92	31,06	0,19	
	Capayán	6.760	0	18	0,00	26,63	0,00	
	Fiambalá	7.994	0	40	0,00	50,04	0,00	
	Huillapima	9.325	0	22	0,00	23,59	0,00	
	Icaño	7.043	0	23	0,00	32,66	0,00	
	Las Juntas	412	0	23	0,00	558,25	0,00	
	London	2.909	0	14	0,00	48,13	0,00	
	Los Altos	7.878	8	5	10,15	6,35	1,60	
	The Varela family	1.985	0	6	0,00	30,23	0,00	
	Recreation	15.595	6	63	3,85	40,40	0,10	
	San José	5.518	3	6	5,44	10,87	0,50	
	Santa Maria	17.030	7	69	4,11	40,52	0,10	
	Saujil	5.572	0	15	0,00	26,92	0,00	
	Tinogasta	14.366	0	24	0,00	16,71	0,00	
	Valle Viejo	27.242	2	74	0,73	27,16	0,03	
	Average Catamarca				6,46	**63,76**	0,10	
Average of municipalities outside the 31 agglomerates EPH					13,25	**39,18**	0,34	
Average considering all municipalities assessed					**15,73**	**37,01**	0,43	

* For municipalities with more than 15,000 inhabitants and less than 300,000 without specific data on formal workers, averages estimated from the GIRSU Matrix database of the GIRSU Project (SAyDS) were used.

[1]Urban waste pickers are mostly, but not all, informal workers. In municipalities where the number of formalised waste pickers is known, it is clarified in comments. Both formal and informal waste pickers are counted in the column "Waste pickers" but not under "Formal workers".

Source: Own elaboration based on the sources mentioned in the table.

Table N° 36. Formal workers and urban waste pickers in the GIRSU sector, summary.

Municipality	Reclaimers per 10,000 inhabitants	Formal workers per 10,000 inhabitants	Reclaimers versus formal workers
City of Buenos Aires	31,71	19,28	1,64
Mar del Plata	29,87	13,51	2,21
Concordia	52,53	7,62	6,90
Rosario	21,09	17,93	1,18
Salta	3,10	10,83	0,29
Average of the main agglomerates (EPH)	**23,19**	**15,30**	**1,52**
Average for the province of Entre Ríos	18,58	27,97	0,66
Average for the province of Catamarca	6,46	63,76	0,10
Average of other municipalities	13,25	39,18	0,34
Average of all municipalities	**15,73**	**37,01**	**0,43**

Figure N° 29. Formal and informal workers working in the municipal solid waste sector per 10,000 inhabitants, by agglomerate.

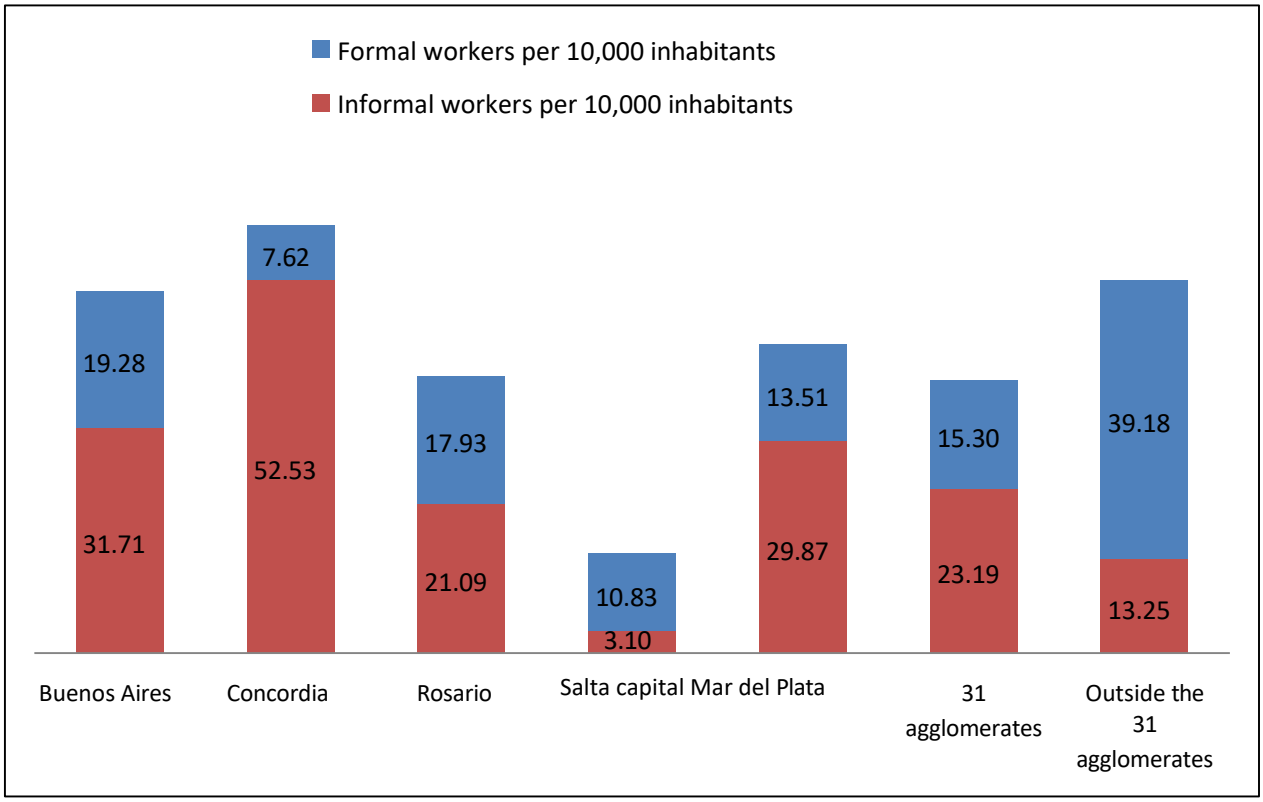
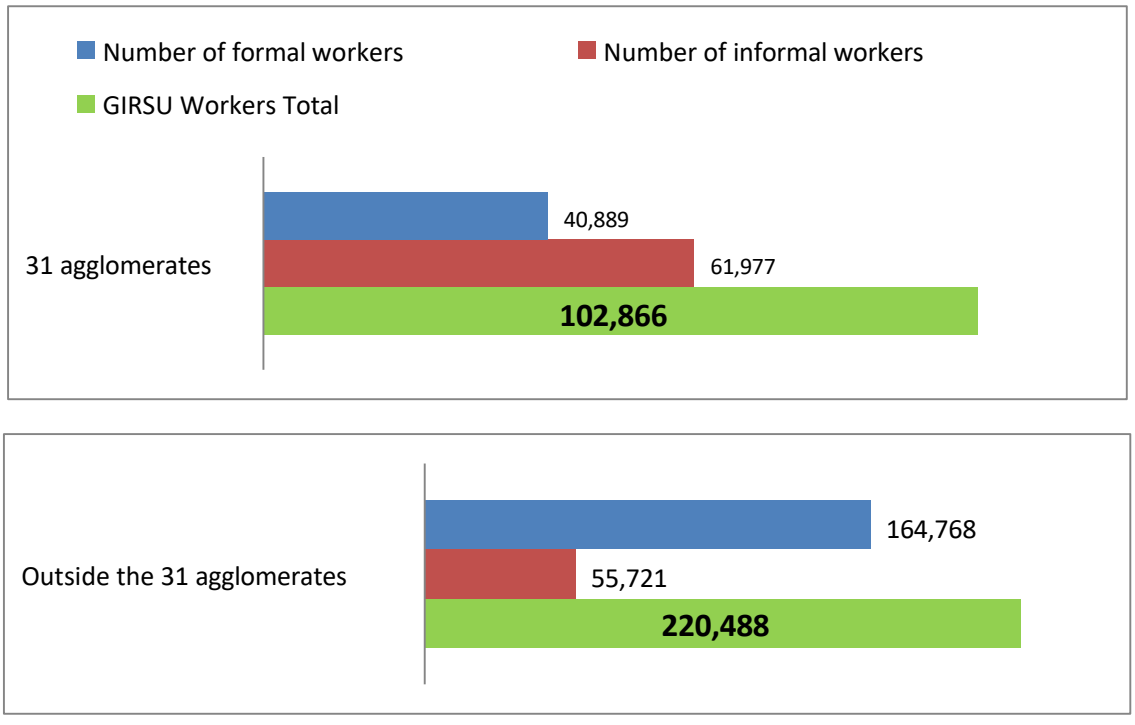


Figure N° 30. Estimated total formal and informal workers working in the municipal solid waste sector.



Source: Own elaboration based on the averages of workers per 10,000 inhabitants presented in Table N° 34.

Data analysis

- **According to the database collected, on average, the number of informal waste pickers per 10,000 inhabitants amounts to 23.19 in the main agglomerates. A value very close to that found in the IDB regional assessment mentioned above.**
- Table N° 35 shows **differences in the number of waste pickers per 10,000 inhabitants by municipal size,** which could not be identified in the EVAL 2010 results.
- Tables N° 35 and 36 show that **the specific dynamics of each municipality, agglomerate or province influences the number of waste pickers per 10,000 inhabitants**. We see, for example, that a province such as Catamarca has a much lower average than the province of Entre Ríos. This can be explained, in large part, by the following particularities of the former compared to the latter: it is very far from the commercialisation centres for separated materials for recycling, the generation of waste per inhabitant is lower and the proportion of recyclable components is also lower, it has a higher proportion of rural inhabitants and, in general, smaller municipalities at a greater distance in hours of travel to the main agglomerate (San Fernando del Valle de Catamarca).
- **The ratio of informal to formal workers is higher in the main agglomerates**, where it is generally higher than 1. In the main agglomerates, the sector generates proportionally more informal jobs than formal jobs.
- In **municipalities that do not belong to the group of the 31 main EPH agglomerates** (in this chapter referred to as "other municipalities") the relationship is reversed, and we find that **formal jobs outnumber informal jobs**.
- In terms of **the number of jobs generated**, we can say that both formal and informal jobs are
  The **number of** people who have been affected **is very significant**, **estimated at more than 320,000 at the national level**.

9. Policy Recommendations public

- **It is recommended to prioritise intervention in the northern region of the country and in Greater Buenos Aires.**

According to the results of coverage and efficiency for the different phases of ISWM presented in this report, the northern region presents the lowest indicators in relation to efficiency and the percentage of inhabitants covered (89.6% covered by collection and 29.1% by landfill), while Greater Buenos Aires concentrates the largest number of inhabitants affected by different problems associated with waste management (633,682 without collection or landfill coverage, 1.5 million living three blocks or less from a landfill).

- **It is considered a priority to design and implement specific urban solid waste management models for slums and emergency settlements.**

The results presented in this report show that those who suffer most from the deficiencies of MSW management systems are the inhabitants of slums and emergency settlements (according to EPH in 2014, 39.51% of households in slums were located three blocks or less from a rubbish dump and according to EDSA in 2013, 14.3% had no rubbish collection service).

In these vulnerable areas there are three interrelated factors: lack of urban layout, economic vulnerability and poor waste management services. The lack of urbanisation makes it more difficult to provide services such as collection and sweeping and, together with the existence of vacant land, facilitates the formation of rubbish dumps. At the same time, the economic situation of the inhabitants of these settlements means that they find in waste a resource to increase their income. This explains why we find many emergency settlements close to landfills, and we even discover that in some cases their inhabitants encourage the creation or expansion of landfills, for example by bringing in waste from other areas. This dynamic requires specific and innovative solutions. In this regard, it is recommended that:

  - Develop specific programmes and methodologies to ensure waste collection coverage in slums and settlements.
  - Include waste management as a key element of urbanisation programmes in slums.
  - Develop new strategies for the eradication of rubbish dumps and micro-dumps that are not limited to the periodic cleaning of spaces where they are generated, but that include the inhabitants of nearby settlements as key actors and address the social and economic aspects behind the formation of rubbish dumps.

- **Encourage or strengthen regionalisation in urban agglomerates that already have a sanitary landfill but not used by all municipalities.**

Urban agglomerates have been identified where there is a sanitary landfill in operation but it is not used by all nearby municipalities and/or there is no formalisation of this practice. If the number of municipalities that use it is increased, without building infrastructure, the percentage of municipalities that do not use it will increase.

tonnes could be increased. If this practice is formalised or institutionally strengthened, it contributes to guaranteeing its sustainability over time. In this sense, conditional financing is suggested. For example, new modules or improvements in the operation could be financed under the condition of expanding the number of municipalities that use it and/or formalising this practice.

The transfer stations in the provinces of Tucumán, La Rioja, Chubut and Neuquén were developed to implement regionalisations driven by IDB and World Bank programmes. The fact that there has not been a similar push from many provinces may be due to a **lack of interest, political decision or financial resources to implement such solutions**. The lack of transfer stations **may also be due to a lack of planning and analysis of such solutions at the municipal and provincial level.** Most municipalities and provinces lack Integrated Municipal Solid Waste Management Plans or such plans are outdated. As a result, economies of scale for regional solutions are not considered or encouraged, and municipalities look at individual parts of their management system (collection, disposal, etc.) rather than taking a comprehensive approach at both the municipal and regional levels.

- **Encourage planning, clarification and coverage of management costs, and implementation of policy and institutional improvements.**

The implementation of non-structural measures is essential to achieve good waste management systems. However, many municipalities focus their efforts on the improvement of the ISWM infrastructure. Therefore, it is suggested to emphasise the implementation of non-structural measures, which are generally low cost and have a high impact on waste management. For example:

- To have a specific GIRSU ordinance,
- To have an area in charge of the GIRSU,
- Know the costs of management by phase,
- Ensure cost coverage, include a budget line for ISWM, develop specific fees for ISWM and differentiated fees for large generators.

- **Promote planning at provincial and national level.**

While the provision of municipal solid waste management services is the responsibility of municipalities, their effective implementation requires provincial and national planning, intervention and support.

At the national level, it is a priority to update the national strategy (ENGIRSU), guarantee compliance with the law of minimum budgets and its principles, promote the implementation of the non-structural measures mentioned in the previous point and contribute with financing for the GIRSU infrastructure. As far as the provinces are concerned, it is suggested to advance the design or update of provincial ISWM Plans aligned with the national strategy that allow its application in the particular context of each province. The plans should, among other things, evaluate and promote regionalisation where feasible and cost-effective.

effective. It is suggested to evaluate the possibility of designing financing instruments that contemplate direct transfers at the provincial level subject to the achievement of goals aligned with the provincial ISWM Plans.

Annex 1 - List of Municipal Solid Waste Treatment Plants in Argentina (2015)

Treatment plants and estimated installed capacity, by agglomerate (2015)

Province	Agglomerate	Inhabitants	Type of treatment plant	Capacity[2] (tonnes/day)
City of Buenos Aires		2.965.000	Demolition and construction waste treatment plant (2,400 tonnes/day capacity, 90% recovery rate, 70 direct jobs generated, operated by the private company EVA SA).	2400
		2.965.000	North Mechanical Biological Treatment Plant III (1,000 tons/day capacity, 50% recovery rate, 120 jobs)	1000
		2.965.000	Mechanical biological treatment plant for the north of the city (1,000 tonnes/day capacity, 60% recovery rate). Tendering process underway	1000
		2.965.000	Mechanical biological treatment plant for the south of the city (1,000 tonnes/day capacity, 60% recovery rate). Tendering process underway	1000
		2.965.000	8 Green Centres which are sheds with elements such as presses and sorting belts (400 tonnes/day capacity, 4,200 formalised urban waste pickers collect material from the streets and treat part of it in the green centres).	350

		2.965.000	Composting plant, hot-rot technology (treats 5 tonnes per day of pure organic waste from restaurants and supermarkets and 5 tonnes of mulching material from pruning).	10
		2.965.000	Plant for the recycling of plastic bottles (treatment capacity of 2 tonnes per hour). Under construction.	20
		2.965.000	Plant for the treatment of forestry and pruning waste (100 tonnes/day, 17 jobs).	100
Buenos Aires	Malvinas Argentinas	321833	Separation Plant	25
	Morón	321109	Separation Plant	25
	Berazategui	167498	Separation Plant	50
	Moreno	434572	Separation Plant	50
	Almirante Brown	552902	Separation Plant	25
	Avellaneda	342677	Separation Plant	25
	Ezeiza	163722	Separation and composting plant	80
	Campana (Tenaris)	86860	Separation and composting plant	25
	San Andrés de Giles	16243	Separation Plant	15
	Blue	55728	Separation Plant	50
	Rojas	19766	Separation Plant	15
	Bahia-Blanca	301531	Composting plant	140
	Bahia-Blanca/Cerri	301531	Daniel Cerri Separation Plant	60
	Mar del Plata	593337	Separation Plant	120
	St. Nicholas	133602	Separation Plant	50
	Rauch	13316	Separation and composting plant	15
	Bragado	33222	Separation Plant	11
	Laprida	8840	Separation plant (the municipality disposes of only 25% of its waste)	10
	25 May	23408	Separation Plant	20
	Roque Perez	10358	Separation Plant	10
	Lincoln	40355	Separation Plant	40

	Coronel Pringles	20263	Separation Plant	20
	Greater Buenos Aires	10796415	CEAMSE social plants (there are 9 plants with an average recovery rate of 8%).	650
Santa Fe	Rosario	948312	Bella Vista Separation and Composting Plant	220
		948312	Bella Vista aggregates treatment plant	350
	Rafaela	92945	Separation and composting plant. Aggregate treatment plant.	100
	Santa Fe	526.366	Separation and composting plant	50
	St George's	18056	Separation and composting plant	18
	San Justo	21078	Separation Plant	20
	Hope	42082	Separation Plant	20
	Franck	5505	Separation Plant	5
	Fighiera	5028	Separation Plant	5
	San Genaro	8731	Separation Plant	8
	Tailor	5717	Separation Plant	5
	Pilar	4959	Separation Plant	5
	San Carlos Centre	13157	Separation Plant	10
	Casilda	35058	Separation Plant	20
	Recreation	14205	Separation Plant	15
	Granadero Baigorria	37333	Separation Plant	25
	Venado Tuerto	83263	Separation Plant	50
	El Trébol	11523	Separation Plant	10
	Ceres	14499	Separation Plant	15
	Avellaneda	25995	Separation Plant	25
Cordoba	Rio Primero	46675	Separation Plant	40
	Villa Maria	98169	Separation Plant	20
	Cruz del Eje	30680	Separation Plant	25
	Jesus Maria	31602	Separation Plant	25
	Santa Rosa de Calamuchita	12395	Separation Plant	10
	Villa Dolores (caught fire)	31853	Separation Plant	25
	Bishop Trejo	1919	Separation Plant	10

	Las Higueras	6038	Separation Plant	5
La Pampa	Santa Rosa	124.545	Separation Plant	50
Mendoza	Maipú	172861	Separation and composting plant	80
	San Carlos	32683	Separation Plant	15
	Malargue	2887	Separation and composting plant	10
	General Alvear	49499	Separation and composting plant	20
San Luis	Carpentry (floor regional)	50000	El Jote separation and composting plant	50
	Tilisarao (regional plant for the Department of Chacabuco)	20744	Separation Plant	20
	La Toma (regional plant for Coronel Pringles department)	13157	Separation Plant	12
	San Luis capital city	209414	Separation Plant	25
	Junín department	28933	Separation Plant	20
	Ayacucho department	18927	Separation Plant	15
San Juan	San Juan capital	471389	Separation and composting plant	100
	Churches	9099	Separation Plant	10
	Jachal	14749	Separation Plant	12
Entre Rios	Gualeguaychú	97839	Separation Plant	50
	Parana	247000	Separation Plant	400
	Concordia	152.282	Separation Plant	50
	Gualeguay	43009	Separation and composting plant	50
	Urdinarrain	8956	Separation Plant	10
	Colón	24835	Separation Plant	25
	Federal	18.015	Separation Plant	20
	Follow	4800	Separation Plant	5
	Diamond	19.930	Separation Plant	20
	Concepción del Uruguay	73.729	Separation Plant	50
	Villaguay	34.637	Separation Plant	20
	General Galarza	4896	Separation Plant	5
	Bovril	8790	Separation Plant	10

	Chajarí	34848	Separation Plant	35
	Victoria	31848	Separation Plant	30
	Peace	25808	Separation Plant	25
	Crespo	20.203	Separation Plant	20
	San jose	18178	Separation Plant	20
	Federation	17547	Separation Plant	20
	Rosario del tala	13.723	Separation Plant	15
	San Salvador	13228	Separation Plant	15
	San José Feliciano	12084	Separation Plant	10
	Villa Elisa	11.117	Separation Plant	10
	Basavilbaso	9742	Separation Plant	10
	Viale	9641	Separation Plant	10
	Green Gold	4333	Separation Plant	5
	Villa Paranacito	4215	Separation Plant	5
	Ceibas	1405	Separation Plant	2
	Villa del Rosario	3973	Separation Plant	5
Currents	Curuzú Cuatiá	34470	Separation Plant	20
	Bella Vista	29071	Separation Plant	25
	Paso de la Patria	5598	Separation Plant	5
Missions	Puerto Iguazú	42849	Separation Plant	42
	Monte Carlo	24338	Separation Plant	25
Santiago del Estero	Termas de Rio Hondo	32166	Separation Plant	13
	Ojo de agua	14008	Separation Plant	15
	The Band (burned)	360923	Separation Plant	25
Chaco	Makalle	3812	Separation Plant	5
	Fontana - Fiduciaria del Norte	32027	Separation Plant	25
	Cerrito Island	1624	Separation Plant	2
	Presidencia Roque Saenz Peña	96944	Separation Plant	25
Formosa	White Lagoon	7411	Separation Plant	10
Catamarca	San Fernando del Valle de Catamarca	195055	Separation Plant	15

Salta	Salta capital	554125	Separation Plant (only has shed, press and balers, no mechanical belt).	25
Neuquén	Villa la Angostura	11063	Separation Plant	10
	San Martín de los Andes	27956	Separation Plant	10
	Junin de los Andes	14220	Separation Plant	10
Rio Negro	Bariloche	112887	Separation Plant	50
	El Bolsón	19009	Separation Plant	10
	Choele Choel	10146	Separation and composting plant	10
Chubut	Puerto Madryn	93995	Separation Plant	80
	Trelew	99430	Separation Plant	80
	Comodoro Rivadavia	124104	Separation Plant	50
	Esquel	32343	Separation and composting plant	20
Santa Cruz	Luis Piedrabuena	6405	Separation and composting plant	5
	Puerto San Julián	7894	Separation and composting plant	10
	Caleta Olivia (YPF)	67493	Separation and composting plant	50
	Las Heras	17821	Separation and composting plant	15
	Truncated Peak	20889	Separation and composting plant	20
	Río Turbio	8847	Separation Plant	10
	Puerto Deseado	14587	Separation and composting plant	15
	Calafate	21132	Separation and composting plant	25
Tierra del Fuego	Ushuaia	56825	Separation plant	
Installed municipal solid waste treatment capacity TOTAL[3](tonnes/day)				**8.665**
Percentage of total installed treatment capacity accounted for by aggregates plants in the City of Buenos Aires				**28%**
Percentage of total installed treatment capacity explained by treatment plants in the City of Buenos Aires (plants under construction or tender were not included).				**44%**
Estimated TOTAL municipal solid waste generation[1]				**49.070**
Percentage of treatment capacity over total USW generation[1]				**17,70%**

[1]Considers 0.90 kg/person*day of municipal solid waste management for Region I (Catamarca, Chaco, Formosa, Jujuy, La Rioja, Salta, Santiago del Estero and Tucumán), 0.98 for Region II (Corrientes, Entre Ríos, Mendoza, Misiones, San Juan and San Luis), and 1.23 for Region III (Buenos Aires, Cordoba and San Luis),

Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, Santa Fe, Tierra del Fuego and Buenos Aires city) (EVAL 2010) and 26,725,120 inhabitants (EPH, fourth semester 2014).

[2]Where capacity was given in tonnes/hour, 10 working hours were assumed. Plants have different degrees of mechanisation. All plants that were detected are reported, not necessarily all existing plants.

Source: Own elaboration based on information provided by the GIRSU Project (SAyDS), DEISA, official websites and municipal representatives (2015).