CONSIDERATION OF STAKEHOLDER INTERESTS IN THE PLANNING OF SUSTAINABLE WASTE MANAGEMENT PROGRAMS

ABSTRACT

Those responsible for developing sustainable solid waste management programs must consider the impacts of program elements on everyone involved. This paper focuses on identifying the effects of waste management activities and assessing their overall impact on stakeholders. Collaborating with four focus groups and 36 experts, 19 effects were identified and 9 questionnaires were designed to evaluate them, one for each stakeholder group. All told, 1,805 people took part in the survey. The results show that the effects most important to the survey participants are (a) recycling solid urban waste, (b) pollution and (c) corporate social responsibility.

Key words: Sustainable Waste Management; stakeholders; Municipal solid waste; waste management effects; impact assessment.

1. INTRODUCTION

Waste Management Systems (henceforth WMS) have evolved towards models in which sustainability plays an increasingly important role (Morrissey and Browne, 2004). This is corroborated by research which has studied the factors influencing WMS (Abarca *et al*. 2013), with a greater focus being placed on the identification of stakeholders and the analysis of their influence (Heidrich *et al*. 2009). Freeman (1984) defined stakeholders as: "any group or individual who can affect or is affected by the achievement of the firm´s objective". Carroll and Buchholtz (2000) include actions, decisions, polices, practices, or goals of the organization. Although progress has been made in identifying and assessing the importance of stakeholders and a relative degree of consensus does exist (Rubio-Romero *et al*. 2014), there is still a need for research to identify the effects on stakeholders and particularly to assess the importance of these effects with a view to facilitating decision making. In this paper we aim to develop a WMS model to move in this direction.

The importance of the Municipal Solid Waste Management sector (henceforth MSWM) can be seen clearly in the increasing volume of its activity and growing workforce. In Europe waste managers deal with 254,389 tonnes of waste per day (Hoornweg and Bhada-Tata, 2012) and nearly two million workers are employed in this sector (Ecorys and IDEA,

2009). If not done right, the generation of municipal solid waste and its handling can have a negative impact on society and the environment in the form of water, soil and air pollution, thus contributing to climate change and affecting ecosystems and even human health. Clearly, this impact would be much greater if rudimentary efforts were not made to store, collect, process and dispose of MSW. At the other end of the spectrum, even where advanced MSWM systems exist, improvements are always possible. Furthermore, poorly operated MSWM systems, especially in developing countries with cultural and natural attractions, tend to dissuade tourism, thus negatively impacting local economies as well. However, if waste is dealt with properly it can have a positive impact on society by optimizing the use of raw materials and energy, protecting natural resources and the climate, respecting the health and safety of employees and their rights as workers, and contributing to economic growth and the creation of wealth. The social, economic and environmental impact of this activity will be affected by the perceptions of stakeholders and its interaction with them and their environment (Zurbrügg *et al*. 2012; Monteiro *et al*. 2010; Hassan *et al*. 2012; Allech and Brunner, 2014; Wilson, 2007). In this context, MSWM acquires even greater importance in connection with sustainable development (Pires *et al.* 2011). Accordingly, with a view to establishing objectives and monitoring

procedures, tools are needed that will help to forecast the impact of actions and thus make it possible to achieve a high level of government and corporate social responsibility (CSR).

The concept of sustainable waste management is becoming the main commitment in more recent models, which are focused around integrated waste management (Achillas *et al.* 2013). Accordingly, Integrated Sustainable Waste Management (henceforth ISWM) was developed as an approach that helps in the prevention, recycling and management of municipal solid waste in developing countries and as a form of protection against the impact and the effects on health and the environment of this essential activity (Van de Klundert and Anschütz, 2001). The approach is based on three main sustainability principles: 1) the elements of waste management, as a central process comprising basic activities that include generation, collection, treatment, recycling and final disposal, 2) stakeholders and 3) environmental aspects as sustainability factors (see Figure 1).

Figure 1. The Integrated Sustainable Waste Management Model

The model focuses not only on the negative effects but also on the positive effects of waste treatment (Van de Klundert and Anschütz, 2001; Muller and Hoffman, 2001). Abarca *et al*. (2013) use the model to analyse the factors and stakeholders that influence the financial viability of MSWM, distinguishing between management and environmental elements.

Chung-Chiang (2010) refers to the model to evaluate the efficiency of each of the three elements in the ISWM and the overall efficiency using Data Envelopment Analysis (DEA) and the Analytic Hierarchy Process (AHP), while taking the different parties involved into account. Some studies look at the impacts and their evaluation by focusing on certain variables and dimensions related to corporate social responsibility and sustainability. This is the case of the economic effects of the transport of Municipal Solid Waste (Tin *et al*. 1995; McLeod y Cherrett, 2008); the effects on health of MSW treatment via incineration or landfill sites (Moy *et al.* 2008); biogas and energy benefits (Psomopoulos *et al.* 2009, Rubio *et al*. 2013), and the impact of hazardous and non-hazardous waste and its recycling (Pappua *et al.* 2007), among others. It is recognised that to be sustainable a MSWM model must take environmental, social and economic aspects into account (Morrissey *et al*. 2004). Although few studies exist that consider them all together we can cite examples such as Abarca *et al*. (2013) and Soltani *et al*. (2015).

Moreover, beyond current legislation, the balanced satisfaction of however many stakeholders can be identified (Porter and Kramer, 2002; Duhé, 2009) should be the long-term focus for CSR, with objectives and strategies designed to making the system profitable and sustainable on a long-term basis. Stakeholders are increasingly demanding that their needs and expectations should be met in equal measure (Cochran, 2007).

Some research has therefore emphasised the importance of stakeholder participation and communication for the correct functioning of MSWM (Abarca *et al*. 2013), as well as involving them in decision making. It has also been suggested that this area should be studied in greater depth in future research (Pires *et al.* 2011). In this respect, some studies show that decisive management by stakeholders has positive effects on the environment (Dowie *et al*. 1998; Kulkarni, 2000; Sharratt and Choong, 2002; Buysse and Verbeke, 2003; Delmas and Toffel, 2004; Argandoña, 2004). The positive effects do not only involve reduced disposal costs and lower levels of pollution, but also the redefinition of priorities and strategies, making it possible to anticipate errors and omissions that would lead to sustainability problems (Heidrich *et al*. 2009). Generally speaking, there is agreement that stakeholders should be taken into account in decision making more often than is current the case, especially where public services are involved (Bryson, 2004). Given that stakeholders affect and are affected by MSWM (Banville *et al*. 1998), not involving the public who produce waste and stakeholders in general can be considered a defect in MWSM models (Morrissey *et al*. 2004).

In this regard, the way in which the stakeholders in an organisation are identified and classified is a first step in evaluating the impact the organization will have on them (Freeman, 1984; Mitchell *et al*. 1997). The growing interest in analysing stakeholders

(Heidrich *et al*. 2009), through their identification, classification, analysis and management (Epstein and Roy, 2001; Hemmanti, 2002; Kasperson, 2006), shows the importance that some of them (such as governments, NGOs and consumers) may have in the management of organisations (Grolin, 1998; Zyglidopoulos, 2002). Although in recent years there has been a considerable increase in the number of studies taking a multistakeholder approach (Soltani *et al*. 2015), there is a need for papers dealing with the management of corporate social responsibility, and more specifically with the management of stakeholders (Epstein and Widener, 2011).

In view of the above, although WMS models emphasise the importance of examining economic, social and environmental aspects (Allech and Brunner, 2014) to determine their sustainability and effectiveness (Price el al., 2000), as well as seeking public acceptance and involving stakeholders in decisions (Nillsson-Djerf *et al*. 2000; Petts, 2000), these aspects are not considered jointly in most models (Morrissey *et al*. 2004). There is also a lack of studies that question the effects of MSWM activities and examine their impact on stakeholders. This study therefore aims to go one step further in analysing stakeholder management in MSWM by firstly determining the effects it has on stakeholders and secondly evaluating the impact of these effects on each stakeholder group.

2. MATERIAL, METHODS AND CALCULATIONS

This study was conducted in Andalusia, Spain, in 2012. Andalusia comprises eight provinces, with a total area of 87,268 km^2 and more than 8 million inhabitants (Instituto Nacional de Estadística, 2010). The area of Andalusia, consequently, is larger than that of countries such as Belgium, the Netherlands, Denmark, Austria or Switzerland, and almost equivalent to that of Portugal. In demographic terms, the Andalusian population is larger than that of Denmark or Switzerland and equal to that of Austria (European Union, 2010).

The methodology can be broken down into three stages, as can be seen in Figure 2. In the first stage four groups of experts were created to identify the effects (R_i) on the Stakeholders (GI_k) of the activities involved in the collection and treatment of MSW. To do this the focus groups identified 9 stakeholders and weighted (β_i) each of them in a MSWM (Rubio-Romero *et al*. 2014). In the second stage we determined the importance each stakeholder assigned to each effect (α_{ik}). And in the third stage we evaluated the importance (A_i) of each effect for the stakeholders as a whole.

Figure 2. Stages in the research.

In the first stage four Focus Groups (FG_j) were created with experts from different

backgrounds and locations in Andalusia. All of them had university qualifications and over five years' professional experience. All of the Focus Groups were led by a single facilitator to improve the consistency of their work (Jayasekara, 2012; Krueger *et al*. 2009).

When identifying the effects, specific ISWM waste management elements were used as a reference (Van de Klundert and Anschütz, 2001; Muller and Hoffman, 2001). These are "Generation and separation", which includes depositing municipal solid waste in different bins; "Collection, transfer and transport", which involves collecting waste from the bins and taking it to the municipal solid waste treatment plant; and "Treatment, final disposal and recycling", which covers the waste recycling and disposal stage. These elements were discussed by the groups, who finally considered it necessary to add one more activity or element, "Various cleaning", which includes other activities such as emptying litter bins, sweeping and washing down streets.

In the first stage the experts identified 19 different effects (Ri) that affect stakeholders during the 4 urban waste management activities or elements (Table 2). They then established a consensus regarding which ones affect which stakeholders.

Table 1. Characteristics of stakeholder samples

In the second stage the focus groups designed a survey for each of the 9 types of stakeholders. Using either interviews or questionnaires 1,805 people were asked to rate on a scale from 1 to 10 the importance of each of the effects identified in the first stage, to determine the average importance of each effect for each stakeholder (α_{ik}), Table 2.

In the third stage we constructed the "impact evaluation table" (Table 3) which shows the importance of each effect on stakeholders as a whole, i.e., the overall valuation of (A_i). To calculate this, we first standardised the values for (α_{ik}):

(1) $$d_{ik} = \alpha_{ik} / \sum_{\substack{i=1 \\ k=1}}^{\substack{i=19 \\ k=9}} \alpha_{ik}$$

When

(2) $$\sum_{\substack{i=1 \\ k=1}}^{\substack{i=19 \\ k=9}} d_{ik} = 1$$

Finally giving (A_i) as the sum of (d_{ik}) weighted for the relative importance of each of the stakeholders (β_k), as follows:

(3) $$A_i = \sum_{k=1}^{9} \beta_k * d_{ik}$$

3. RESULTS AND DISCUSSION

Below we present the main results obtained in the three stages of research: i) the effects identified, ii) the importance stakeholders assign to these effects and iii) the overall evaluation of the effects or the impact evaluation table.

3.1 Effects identified

Figure 3 shows the 19 effects (R_i) identified by the focus groups that affect stakeholders (Appendix B). According to Van de Klundert and Anschütz (2001) and the integrated sustainable waste management (ISWM) model, not only are technical and environmental aspects considered but also matters of social mobilisation and acceptance (social elements), stakeholders (institutional elements) and financial and operational requirements (economic elements) (UNEP and CalRecovery, 2005).

The social dimension is the largest group of effects and it can be divided into smaller groups. The first refers to effects directly related to the users of the service, such as the distance walked to deposit waste, the inconvenience of having public space occupied and whether bins are easy to use. Second are factors such as the effects of storing waste in bins and the way waste collection affects people. This includes, for example, the effects of

refuse collection vehicles on traffic, and the effect of waste collection and street cleaning on people's health and safety, ranging from traffic accidents and falls to the proliferation of insects and rodents and unsanitary conditions in general. A third sub-group refers directly to employees and reflects effects related to occupational health and safety and the creation and quality of employment. Finally, there is another sub-group of effects related to providing the service in general that shows how the quality of the service is perceived and how corporate social responsibility, sponsorship and respect for human rights affect the corporate image of the service.

Figure 3. Weighted effects (R_i) for stakeholders (GI_i) in municipal solid waste management.

In connection with environmental issues, we can distinguish between pollution that affects users directly and is perceived by the senses as a clear indication of environmental impact, i.e. what they see, hear and smell, on the one hand, and the pollution of the atmosphere, soil and aquifers, due to emissions by lorries that transport MSW, hazardous waste treatment, fires, etc., on the other. We can also include a third group which reflects the effect of waste management on finite resources such as water and fossil fuels, and the environmental benefits of selective waste collection and recycling.

On the economic level we have the effects of refuse collection charges and other profits not directly related to the activity, such as money generated by publicity. From the perspective of the stakeholders, most of the effects of waste Management have focused on health, environmental and aesthetic issues. This could be why the economic effects are less visible. Even so, there are effects that could be considered both economic and environmental, such as the treatment and recycling of waste and consumption of non-renewable resources. In addition, Andalusia has established a system of municipal taxes. With Pay as you throw Systems -based on the principle that the more waste you produce, the more you pay as an incentive for waste reduction, recycling and composting- it is possible that additional economic effects have emerged in the focus group.

All these effects are related to the benefits associated with the ISWM approach (Van de Klundert and Anschütz, 2001), except job creation and the quality of employment, which would suggest that there is a greater concern in developed countries over this type of effect than in the developing countries to which the model is geared.

3.2 Evaluation of effects by stakeholders

Although the greatest number of effects is found in the social field, an analysis of Table 2, which indicates the importance of each one (α_{ik}) for each kind of stakeholders (GI_k), shows

that environmental effects are ranked highest. Among those with the highest ratings is waste treatment, which is especially important for (GI_1) citizens (8.63), (GI_5) special customers (8.23) and (GI_3) workers and unions (7.43). The consumption of finite resources**,** i.e. greater environmental impact because of the consumption of non-renewable energy, has high scores from (GI_7) public administration (8.4), (GI_5) special customers (7.68) and (GI_1) citizens (7.5). As does pollution (Cucek *et al*. 2012) for (GI_5) special customers (7.72), (GI_1) citizens (7.5) and (GI_7) public administration (7.1), being one of the impacts that most concern this last group (Caniato, 2014).

Tourists, included in (GI_5) special customers, constitute a special case. They are more important in tourist destinations, such as many of the municipalities on the coast in Andalusia. In such places tourists could be considered another type of stakeholder, like the residents, but differentiated from special customers (Zurbergg *et al*. 2012).

The second group of effects considered important relates to pollution perceived by users (Blanc *et al*. 2004), i.e. visual impact, smells and noise, which are especially emphasised by citizens (GI_1) and the media (GI_8) at the top of the ranking, followed by workers and unions (GI_3) and special customers (GI_5). Visual impact is especially important for (GI_1) citizens (8.31) and (GI_8) media (7.99). It is also important for (GI_5) special customers (7.69), as

tourists come to enjoy scenery and culture and do not want to be offended by the sight of rubbish (Zurbergg *et al*. 2012). Smells receive high scores from (GI_1) citizens (8.56) and (GI_8) the media (7.93), while noise is considered important by (GI_1) citizens (7.96) and (GI_8) the media (7.73). Stakeholders in general are increasingly aware of the impact on the environment of these factors (Abba *et al*. 2013).

Table 2. Importance of effects for stakeholders

Among economic impacts/effects we would also like to highlight profits and costs, which are the main focus of interest for (GI_2) shareholders/owners, at 8.625 and 8.438 respectively, and, to a significantly lower degree, for (GI_4) city governments, at 6.52 and 6.66.

Among the many social impacts, job creation is assigned a high level of importance by (GI_1) citizens (8.28), (GI_7) public administration (7.73) and (GI_3) workers and unions (7.52). Corporate image and social responsibility are emphasised by (GI_1) citizens (7.54) and (GI_5) special customers (6.9), and easy access to bins by (GI_1) citizens (7.7) and quality of employment by (GI_3) workers and unions (7.38).

3.3 Table of impact assessment.

The impact assessment (A_i) shown in Table 3 allows us to determine which impacts have the greatest importance for stakeholders overall. The results (Figure 3) reflect the fact that the social effects group is considered most important (50.7%), followed by environmental effects (40.6%), while less importance is given to economic effects (9.1%).

A more detailed analysis by effect and not by group shows that the individual effects with the highest scores are in the environmental group, i.e. waste treatment/recycling (8.2%) and pollution (7.7%). In third place we find improvements to corporate image and social responsibility (7.6%), an effect with an external social dimension. The first of these effects is related to the idea of the ISWM model, which does not consider waste as a problem but as a resource which can generate value (Van de Klundert and Anschütz, 2001). Moreover, reducing pollution and improving one's image are directly identified as benefits that the ISWM model can bring to a municipality (Van de Klundert and Anschütz, 2001).

The waste treatment/recycling effect is being seen as increasingly important (Abba *et al*. 2013) and refers to the number of bins for different types of waste (organic, glass, plastic and paper) and the environmental benefits of recycling them. Pollution refers to environmental hazards such as pollution of the air, soil and aquifers, and other hazards related to the activity, such as possible fires and the treatment of waste such as tyres, filters,

fluids, etc. The effect of corporate image and social responsibility includes sponsorship of events in the town, social projects, the corporate image projected via the media and through employees, and respect for human rights.

Public health and safety (6.1%) is important in developed countries, but it is even more so in developing countries (Zurbergg *et al*. 2012), where the issue is still pending.

Effects which are assigned less importance include quality of employment (2%), which covers aspects related to working conditions, i.e. the number of employees with permanent contracts, working hours and shifts, non-discrimination, etc. Pedestrian access (2.3%) includes interference with the passage of pedestrians because of the presence of bins and other equipment, or because streets are being hosed down. The third smallest figure is for improved perception of service quality (3%), which includes complaints. It is interesting to note that the two effects scoring least could be classified as cosmetic, which suggests that, once an acceptable standard has been reached, they cease to be seen as significant by stakeholders.

Table 3. Overall impact assessment table

CONCLUSIONS

This study examines the effects of waste management activities on stakeholders, evaluates the importance of their impact, and puts forward a MSWM model that takes stakeholders into account when making decisions. Although developing a sustainable integrated waste management system will also vary in each local situation (Wilson, 2007), these representative effects should be the focus of attention for MSWM so that the interests of stakeholders can be managed adequately, taking their opinions into account when decisions are made (Morrissey *et al*. 2004) and making waste management more sustainable.

The ISWM approach (Van de Klundert and Anschütz, 2001) used here as a reference, allows us to identify more fully and more holistically the effects that basic waste management activities have on stakeholders. Thus, the variables related to the location can be taken into account and they can be dealt with in the model's sustainability. It also considers the participation of stakeholders as an important factor in the sustainability of WM (Abarca *et al*. 2013).

At 50.3%, social effects are deemed to be most important to the survey participants; this reflects the importance of these effects for SWM in the real world. Although environmental factors come in second (40.6%) as a group, individually they are assigned the highest levels of importance, namely waste treatment/recycling and pollution. Thus, MSWM should pay

special attention to this when defining goals. In the social area the most highly rated aspect is corporate image and social responsibility, which underlines the growing importance of CSR management in SWM.

Although the results cannot be directly extrapolated to other locations, they can serve as a useful reference and can be used for comparison with the same activities in other regions, sectors and types of company. Furthermore, applying the results in the same location at different times would make it possible to make comparisons and could be of great value for MWSM and its management strategies.

Professionals in the sector can use the impact assessment table for support and guidance when taking strategic or operational decisions. For future research it would be interesting, taking the impact assessment table as a starting point, to develop software to facilitate decision making in MSWM by way of a simulation that could assess the impact and effect of decisions on different stakeholders.

ACKNOWLEDGEMENTS

The authors would like to thank the reviewers for their valuable comments, which have significantly improved the quality of the manuscript.

This study is part of the *Proyecto de Investigación de Excelencia* financed by the Ministry of Economy, Innovation, Science and Employment (Junta de Andalucía). P10-RNM-6906 "Modelo para la evaluación y optimización del impacto de los stakeholders de las decisiones de gestión en las empresas de recogidas y tratamiento de Residuos Sólidos Urbanos".

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TABLES

ID	Stakeholder	Universe	Sample size	Confidence level	Margin of error	Sources
GI_1	Citizens	8,424,102	385	95%	5%	National Statistics Institute data for 2011: population in Andalusia by province (without Ceuta and Melilla)
GI_2	Shareholders/owners	20	20	95%	5%	Data: ANEPMA
GI_3	Workers and Unions	4,566	355	95%	5%	Data: ANEPMA
GI_4	City Halls	771	257	95%	5%	National Statistics Institute data for 2011: local councils in Andalusia (without Ceuta and Melilla)
GI_5	Special customers	8,440,261	271	---	---	See Appendix A
GI_6	Partners/associations	64,185	270	90%	5%	Data: Junta de Andalucía, 2011
GI_7	Public Administration	16	16	95%	5%	Junta de Andalucía websites - 8 regional delegations and 8 regional centres belonging to the Environment and Water Agency - 2012
GI_8	Media	369	157	90%	5%	Data: Junta de Andalucia, 2012

ID	Stakeholder	Universe	Sample size	Confidence level	Margin of error	Sources
GI_9	Suppliers	100	74	90%	5%	Data: ANEPMA
		TOTAL	1,805			

Table 1. Characteristics of stakeholder samples

Stakeholders (GI) / Effects/Results (R_i)		GI_1 Citizens	GI_2 Shareholders/Owners	GI_3 Workers and Unions	GI_4 City Halls	GI_5 Special customers	GI_6 Associations	GI_7 Public Administration	GI_8 Media	GI_9 Suppliers
R_1	Smells	8.564	0.000	7.270	5.554	7.099	6.244	0.000	7.930	0.000
R_2	Noise	7.964	0.000	7.466	6.347	6.408	5.850	0.000	7.732	0.000
R_3	Visual impact	8.312	0.000	0.000	6.490	7.695	5.512	0.000	7.987	0.000
R_4	Proximity of bins	7.704	0.000	0.000	6.466	6.548	5.252	0.000	6.994	0.000
R_5	Occupation of public spaces	6.956	0.000	0.000	6.293	6.070	4.654	5.667	0.000	0.000
R_6	Accessibility of bins	7.764	0.000	7.193	6.673	6.511	5.087	0.000	0.000	0.000
R_7	User health and safety	6.940	0.000	6.391	6.306	7.314	4.205	6.267	0.000	3.622
R_8	Job creation	8.283	7.438	7.518	6.503	0.000	3.315	7.733	0.000	3.388
R_9	Quality of employment	0.000	0.000	7.386	0.000	0.000	0.000	7.000	0.000	0.000
R_{10}	Worker health and safety	0.000	0.000	6.570	0.000	0.000	5.181	6.867	0.000	0.000
R_{11}	Impact on finite resources	7.545	6.313	0.000	6.442	7.680	4.134	8.400	0.000	3.531
R_{12}	Pollution	7.494	5.906	4.526	6.311	7.722	4.476	7.100	6.669	3.276
R_{13}	Traffic	6.104	0.000	6.135	6.425	5.063	3.661	0.000	0.000	3.102
R_{14}	Waste treatment	8.629	6.813	7.433	5.704	8.235	5.024	6.000	0.000	5.878
R_{15}	Pedestrian access	6.268	0.000	0.000	5.510	0.000	0.000	0.000	0.000	0.000
R_{16}	Corporate Image and social responsibility	7.542	6.219	4.974	5.539	6.913	5.118	4.633	6.323	6.482
R_{17}	Costs	6.411	8.438	0.000	6.663	4.915	0.000	0.000	6.433	0.000
R_{18}	Profits	0.000	8.625	0.000	6.520	0.000	3.118	0.000	5.522	4.939

R_{19}	Perception of service quality	0.000	**6.750**	0.000	**6.503**	0.000	0.000	0.000	**6.185**	**2.857**

Table 2. Importance of effects for stakeholders

	Stakeholders (GI)	GI_1 Citizens	GI_2 Shareholders/Owners	GI_3 Workers and Unions	GI_4 City Halls	GI_5 Special customers	GI_6 Associations	GI_7 Public Administrations	GI_8 Media	GI_9 Suppliers		
	Effects/Results (R_i)											
	Stakeholder weighting (β_k)	0.18	0.14	0.14	0.12	0.11	0.10	0.08	0.07	0.06	(A_i)	(%)
R_1	Smells	0.0129	0.0000	0.0109	0.0083	0.0107	0.0094	0.0000	0.0119	0.0000	0.0078	6.53%
R_2	Noise	0.0120	0.0000	0.0112	0.0095	0.0096	0.0088	0.0000	0.0116	0.0000	0.0076	6.39%
R_3	Visual impact	0.0125	0.0000	0.0000	0.0098	0.0116	0.0083	0.0000	0.0120	0.0000	0.0063	5.32%
R_4	Proximity of bins	0.0116	0.0000	0.0000	0.0097	0.0098	0.0079	0.0000	0.0105	0.0000	0.0058	4.91%
R_5	Occupation of public spaces	0.0105	0.0000	0.0000	0.0095	0.0091	0.0070	0.0085	0.0000	0.0000	0.0054	4.54%
R_6	Accessibility of bins	0.0117	0.0000	0.0108	0.0100	0.0098	0.0076	0.0000	0.0000	0.0000	0.0067	5.60%
R_7	User health and safety	0.0104	0.0000	0.0096	0.0095	0.0110	0.0063	0.0094	0.0000	0.0054	0.0073	6.10%
R_8	Job creation	0.0124	0.0112	0.0113	0.0098	0.0000	0.0050	0.0116	0.0000	0.0051	0.0083	7.00%
R_9	Quality of employment	0.0000	0.0000	0.0111	0.0000	0.0000	0.0000	0.0105	0.0000	0.0000	0.0024	2.00%
R_{10}	Worker health and safety	0.0000	0.0000	0.0099	0.0000	0.0000	0.0078	0.0103	0.0000	0.0000	0.0030	2.51%
R_{11}	Impact on finite resources	0.0113	0.0095	0.0000	0.0097	0.0115	0.0062	0.0126	0.0000	0.0053	0.0077	6.51%
R_{12}	Pollution	0.0113	0.0089	0.0068	0.0095	0.0116	0.0067	0.0107	0.0100	0.0049	0.0091	7.67%
R_{13}	Traffic	0.0092	0.0000	0.0092	0.0097	0.0076	0.0055	0.0000	0.0000	0.0047	0.0058	4.85%
R_{14}	Waste treatment	0.0130	0.0102	0.0112	0.0086	0.0124	0.0075	0.0090	0.0000	0.0088	0.0097	8.17%
R_{15}	Pedestrian access	0.0094	0.0000	0.0000	0.0083	0.0000	0.0000	0.0000	0.0000	0.0000	0.0027	2.28%
R_{16}	Corporate Image and social responsibility	0.0113	0.0093	0.0075	0.0083	0.0104	0.0077	0.0070	0.0095	0.0097	0.0091	7.64%

R_{17}	Costs	0.0096	0.0127	0.0000	0.0100	0.0074	0.0000	0.0000	0.0097	0.0000	0.0062	5.21%
R_{18}	Profits	0.0000	0.0130	0.0000	0.0098	0.0000	0.0047	0.0000	0.0083	0.0074	0.0045	3.81%
R_{19}	Perception of service quality	0.0000	0.0101	0.0000	0.0098	0.0000	0.0000	0.0000	0.0093	0.0043	0.0035	2.96%

Table 3. Overall impact assessment table

FIGURES

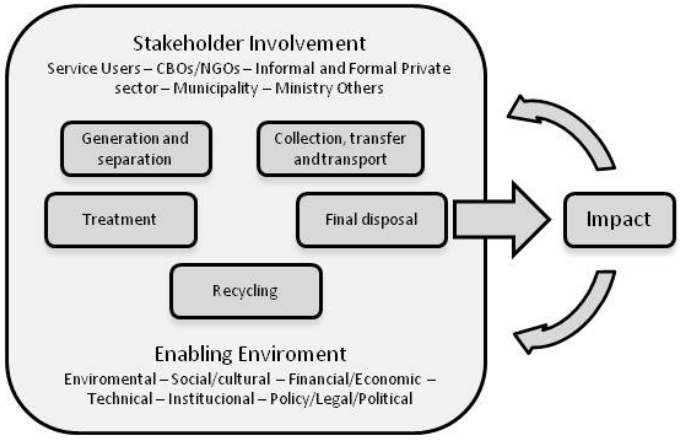

Figure 1. The Integrated Sustainable Waste Management Model

Source: adapted from Van de Klundert and Anschütz, 2001.

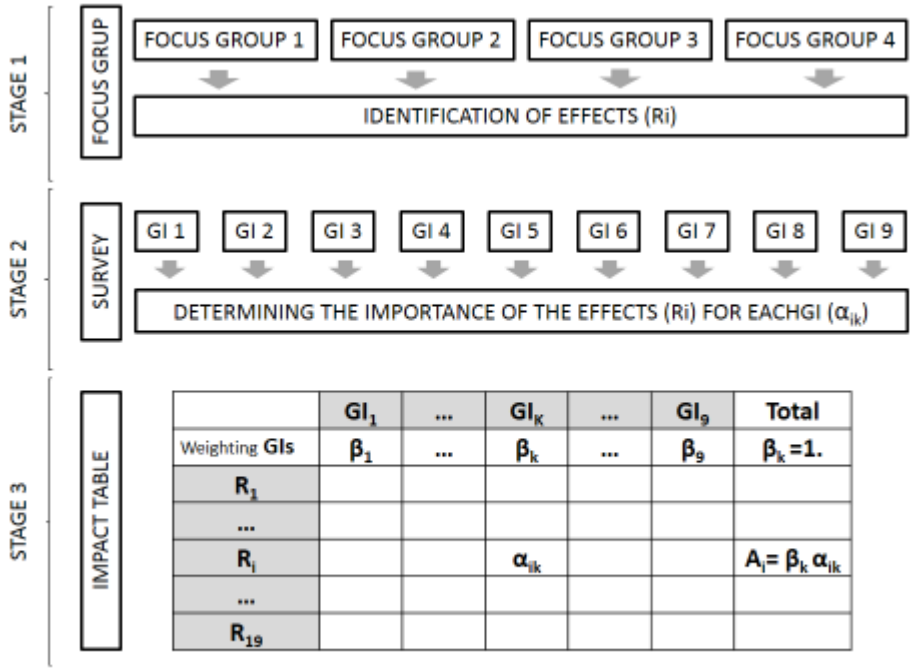

Figure 2. Stages in the research.

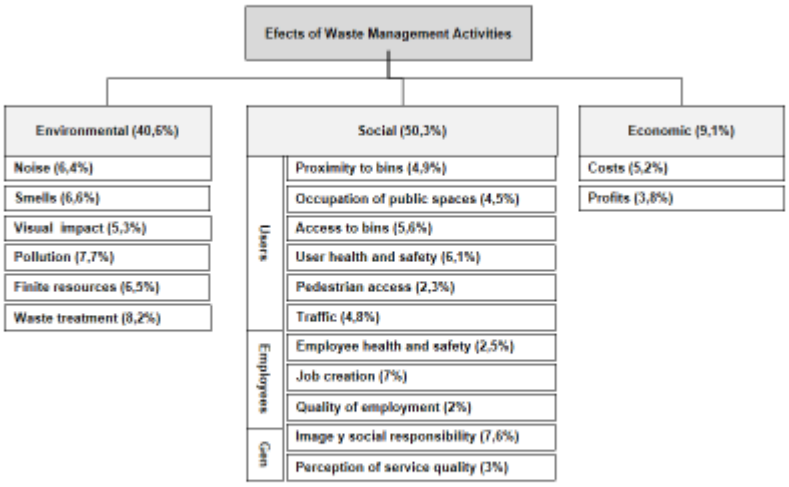

Figure 3. Weighted effects (R_i) for stakeholders (GI_i) in municipal solid waste management.

Appendix A

Special customers	Universe	%	Breakdown by numbers	Sources
Tourists	7,884,875	93.42	120	Instituto de Estadística y Cartografía de Andalucía- Data for 2011: http://www.juntadeandalucia.es/institutodeestadisticaycartografia/iea/detalleDatosDia.jsp?cod=1791&ram=D
Businesses	550,875	6.53	100	Instituto de Estadística y Cartografía de Andalucía- Data for 2011: http://www.juntadeandalucia.es/institutodeestadisticaycartografia/direst/
Schools	2,044	0.02	20	Data: Junta de Andalucía, Education:http://www.juntadeandalucia.es/educacion/vscripts/centros/index.asp
Airports Andalusia	7	0.00	7	Data from AENA
Hospitals/Health centres	1,561	0.02	16	Data from Junta de Andalucía Andalusian Health Service: http://www.juntadeandalucia.es/servicioandaluzdesalud/centros/default.asp
Industrial complexes	899	0.01	10	Data from Coordinadora Española de Polígonos Empresariales: http://www.sueloindustrial.net/Poligonos/ListaPoligonosAvan.aspx
Total	**8,440,261**	**100 %**	**273**	

Table A.1. Special customers

APPENDIX B

Code	Effects/Impacts (R_i)	Brief description
1	Smells	Nuisance and unsanitary conditions caused by smells
2	Noise	Inconvenience because of noise
3	Visual impact	Visual impact (bins, rubbish, refuse collection lorries, various types of cleaning, uniformed staff or otherwise, etc.)
4	Proximity of bins	Inconvenience caused by the distance users have to cover to reach bins
5	Occupation of public spaces	Occupation of public space (inconvenience caused by reduction in parking space, obstacles on pavements and/or in the road, presence of landfill sites, etc.)
6	Accessibility of bins	Ease of use of bins, easy opening
7	User health and safety	User health and safety (traffic accidents, falls, proliferation of insects and rodents, unsanitary conditions, etc.)
8	Job creation	Jobs generated by MSW management companies
9	Quality of employment	Quality and conditions of employment (permanent contracts, working hours, shifts, etc.)
10	Worker health and safety	Protection of employees' health and safety, occupational hazards
11	Impact on finite resources	Impact on the environment of the consumption of finite resources (water, fuel, electricity, etc.)
12	Pollution	Impact on the environment of pollution of air, soil and aquifers (discharges, pollution by lorries, hazardous waste, etc.)
13	Traffic	Effects on traffic of refuse collection (collection, lorries driving to landfill sites, etc.)
14	Treatment/recycling of waste	Recycling waste, environmental benefits from recycling, number of different bins for separating waste
15	Pedestrian access	Impact on the passage of pedestrians of activities related to cleaning and hosing down streets
16	Corporate image and social responsibility	Impact of corporate social responsibility and related activities (sponsorship of events, social programme, corporate image, etc.) and respect for human rights
17	Costs	Effect of the cost of the service via refuse collection charges
18	Profits	Impact of the profits generated by payments for publicity to suppliers or the company itself
19	Perception of service quality	Perception of overall service quality (complaints)

Table B.1. Effect (R_i) on stakeholders (GI_i) of municipal solid waste management.