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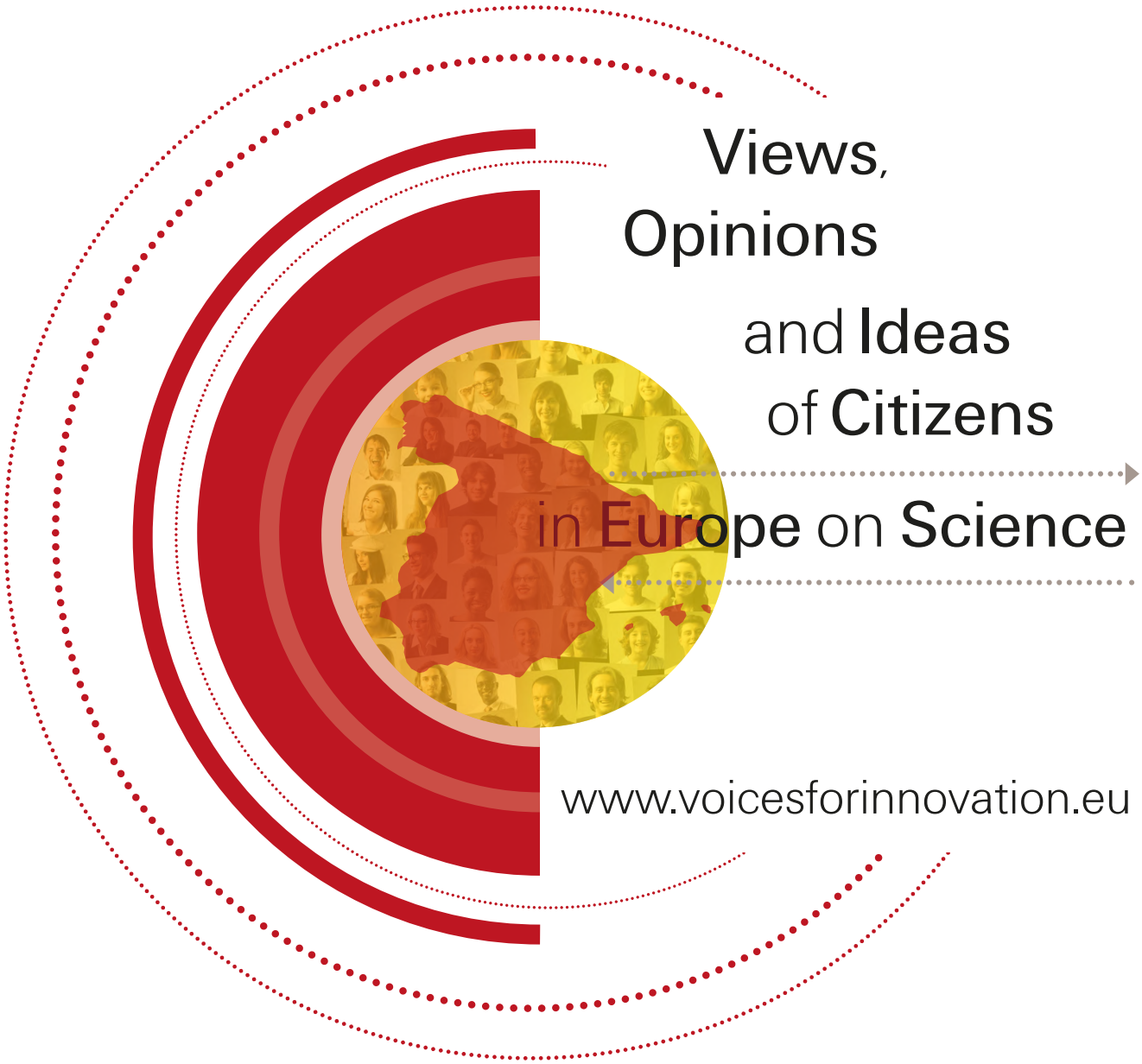

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- The Natural History Museum, London, UK
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Views, Opinions and Ideas of Citizens in Europe on Science

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For more information on the report, the results of the VOICES project, please contact Marzia Mazzonetto (mmazzonetto@ecsite.eu).

CONTENTS

1. Introduction

1.1 The VOICES project

VOICES (Views, Opinions and Ideas of Citizens in Europe on Science) is a year-long, Europe-wide citizen consultation exploring the concept of waste as a resource. It represents an innovative method of integrating public opinion into the 'Climate action, resource efficiency, raw materials' dimension of the Horizon 2020 Work Programmes beginning in 2014.

Funded by the European Commission and led by Ecsite, the European network of science centres and museums, the VOICES project is a response to the Science in Society 2013.1.2.1-1 call on citizen participation in science and technology policy. Citizens are invited to give input to the Consolidation Group that will define the priorities for the next work programme on 'Urban Waste' (call SiS.2013.1.2.1-2).

The main aim of VOICES is to yield valuable insight on methods and procedure for engaging citizen participation to help set the research agenda for Europe's Responsible Research and Innovation framework. The knowledge gained through VOICES will be put to use in similar participatory actions across Horizon 2020.

1.2 Citizen participation in social innovation

A national and European capacity-building initiative, VOICES unites science communication practitioners and academics, and, as such, will result in an effective method through which to consult the public on science and technology related issues.

Compared to many other consultation initiatives, VOICES represents a breakthrough because of its scale (covering all of Europe) and because of the methodological approach used on this wide scale: an approach which makes use of a qualitative methodology, which allows a harvesting and deep understanding of citizens' views, fostering real governance processes and social innovation.

VOICES is also very innovative in its commitment to formally include the results of the citizens' consultations in the main policy document that will shape the priorities of European research. Another unique element is that the knowledge gained with this pilot, in terms of methodology, infrastructure and results, can be used to organise similar participatory actions across Horizon 2020.

1.3 The process

One thousand European citizens participated in focus group discussions about 'Waste as a resource' using a structured VOICES methodology which spans training, implementation and analysis. The methods, infrastructure and results of VOICES are fully documented on an open access portal (www.voicesforinnovation.eu) designed for similar participatory actions occurring throughout Horizon 2020.

VOICES engaged citizens in 33 locations covering 27 EU countries. 28 Ecsite network institutions make up the Third Party task force which organised the 100 focus groups, with approximately ten citizens each, in their respective countries.

Ecsite Project Managers and researchers from the Athena Institute, VU University Amsterdam, were responsible for conducting the focus groups, analyzing public consultations, writing the country and synthesis reports and disseminating their outcomes at public events.

1.4 Structure of the report

In this country report on the VOICES outcomes from Spain, the VOICES research methodology is further detailed in the following chapter. In Chapter 3, some specific data is provided on the country's population, on national urban waste figures and on specificities of the participants of the focus groups. Chapter 4 presents the results of the citizens' consultation on waste management at household level, barriers and concerns experienced in prevention and management of waste, and ideas for research and innovation, policy, management and communication. The report ends with a summary and discussion of the findings.

2. Methodology

This section provides general information about the focus group method, and in particular about the VOICES approach. It also describes the structure of the VOICES focus groups and the process of data analysis.

As a qualitative research method, the focus group is increasingly used in political and social sciences, and can be defined as "a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment".[1] An important advantage of focus groups in comparison to other research methods is that participants can respond to and build on the views expressed by the other participants. Because of this interaction, focus groups generate a large variety of opinions and ideas which provide insightful information, while maintaining a specific focus during the discussion. The method provides the opportunity to gain in-depth insight into ideas, values, wishes and concerns of participants and stimulates shared creative thinking. A specific characteristic of the focus group method is that it seeks understanding of a research topic from a particular perspective; in the case of the VOICES project, the perspective of European citizens.

2.1 The VOICES focus group approach

In the VOICES project, a total of 100 focus groups were held, each of them with approximately 10 citizens. Participants were selected by local recruitment agencies, according to predefined selection criteria. The selection criteria were applied in order to obtain diversity in focus group participants, and to represent society at large. General selection criteria with respect to demographic information included: sex (50% men and 50% women), education (low, medium and high levels of education)[2] and employment (employed, unemployed, retired and student). The focus groups were stratified by age using the following categories: 18 to 35 years of age, 36 to 50 years of age and 50+. Other criteria addressed elements relevant to the VOICES project's specific topic, including: participants from urban and non-urban areas[3], diversity of types of municipality (at least five different municipalities, including bigger towns and smaller villages), and diversity of housing situation (flat or house). These selection criteria were applied in all EU member states. Because of the local context and the availability of participants there are minor differences between member states in the resulting composition of focus groups.

In most EU member states, three focus groups were conducted, all in one location. However, all member states with a population of above 25 million (Germany, France, Spain, Poland, Italy and the UK) had two sets of three focus groups each in two different locations, resulting in six focus groups in total in these countries.

The focus groups lasted 3 hours and followed a semi-structured script consisting of an introduction, four main exercises and an evaluation part (see box 2.1). During the focus groups, specific attention was paid to keeping the environment noise-free and providing enough space to relax, walk around and engage in the conversation. Each focus group was led by a moderator, who was in charge of stimulating and guiding the discussion. The moderator's role was also to maintain the focus of the discussion by ensuring that key themes were covered, while managing group dynamics.

Moderators facilitated the discussion by following the focus group script, which was provided to them in advance and contained questions and exercises to guide their work and ensure equal individual input as well as group discussion. Because of their crucial role in the focus groups, all moderators involved in the VOICES project followed a specific 2.5 day training course. The training focused on specificities of the VOICES focus group script as well as on refining important competencies of the moderators' role, including interpersonal communication, process management and understanding of the topic addressed.

In order to capture the data generated during the process, audio and/or video recordings were made of all focus groups. A note taker was also required to be present for the entire duration of the focus groups, in order to record additional data and to assist the moderator. All visual data generated by the participants, for example, individual drawings or collective mind maps, were collected at the end of each focus group and photographed.

BOX 2.1 SUMMARY OF VOICES FOCUS GROUP SCRIPT

INTRODUCTION

The moderator introduces himself/herself, the note taker and any observers and asks the participants to introduce themselves. The moderator then explains the aims and topic of the focus group using a PowerPoint presentation.

EXERCISE 1

The goal of Exercise 1 is to raise the focus group participants' awareness of household waste and related waste management systems. It also identifies what people know and do with respect to their household waste. Participants are asked to draw on an A3 sheet of white paper how they think the waste streams are managed around their house. When they have finished, the papers are collected and taped to the wall. The moderator then asks the participants to explain their drawings and encourages them to elaborate.

EXERCISE 2
Exercise 2 aims to identify barriers and concerns of the participants with respect to current urban waste pathways (including prevention) and to go into more depth on the causes and underlying reasons for the reported barriers and concerns. The moderator shows the participants PowerPoint slides about the four most common pathways of waste and prevention. After this, participants are asked to think about barriers and concerns they experience regarding waste, waste management and prevention of waste and to write two examples of these barriers or concerns down on Post-Its. The Post-Its are collected and for each, the moderator asks the participants to explain what they wrote down and why.

EXERCISE 3
The objective of Exercise 3 is to stimulate creative ideas for improvement and solutions for problems and possibly to translate ideas and solutions into research topics or questions. The moderator introduces the concept of a 'zero waste society' to the participants using PowerPoint slides. The participants are then asked to work in groups and brainstorm about ideas for achieving the aims of a 'zero waste society', focusing especially on what research and innovation would be needed for this. Participants are then asked to present their ideas to the entire group, while the moderator uses a flip chart to list all concrete ideas for research and innovation suggested by the participants. The moderator then asks the participants to reflect further on possible futuristic technical solutions and 'wild' ideas regarding waste management and prevention.

EXERCISE 4
The aim of Exercise 4 is to attribute a level of priority to the research topics formulated in Exercise 3.
Participants are given three stickers, which represent money (1 million each) that they can spend on ideas written down during Exercise 3. They are asked to assign one or more stickers to the ideas that they feel should be prioritised because of the importance of the problem it addresses and/or the quality of the solution it provides. Once the participants have assigned their stickers, a plenary discussion is held to talk about which ideas got the most stickers and why.

EVALUATION
The moderator ends the sessions and asks the participants to share feedback on their experience taking part in the VOICES focus group. Participants are also asked to fill in an evaluation questionnaire.

2.2 The VOICES approach to urban waste

In the focus groups, citizens of Europe were consulted on the topic 'Waste as a resource'. Urban waste is defined as solid waste collected by or on behalf of municipal authorities and disposed of through the waste management system. Most of this waste is produced by households, although similar waste from sources such as commerce, offices and public institutions are included. Consumer products disposed of by citizens, like clothes, electronics and furniture etcetera, are also considered urban waste. Industrial waste is not considered urban waste and is outside the scope of this project. On average, each of the 500 million people living in the EU throws away around half a tonne of household rubbish every year.[4] This amounts to 70 million truckloads of household rubbish for the EU as a whole every year (one truckload is considered to be 3500 kg, the maximum weight for a truck). All this waste has a huge impact on the environment, resulting in pollution and greenhouse gas emissions that contribute to climate change, as well as significant loss of materials - a particular problem for the EU, which is highly dependent on imported raw materials. Current EU policy aims to reduce both the environmental impact of waste and the use of raw materials needed for production processes. Nowadays, the challenge of urban waste is approached from two perspectives; the waste hierarchy and the life-cycle approach. These combined approaches are the building blocks of the current thematic strategy on waste.[5]

In order for the results of the focus groups to be translated into outcomes which are relevant and beneficial for European research, the VOICES focus group design explicitly uses these same two approaches in presenting the topic of urban waste and in structuring the exercises. The vision of a 'zero waste society' is used as a

focus for the participants while thinking about possible innovations and the techniques and knowledge necessary to develop them.

The waste hierarchy is initially depicted as a pyramid with a wide base representing disposal in a landfill, a second layer representing recovery of energy through incineration, a third layer representing recycling, a fourth representing reuse and the top (and smallest one) representing prevention. This reflects the current situation of waste management in Europe. In order to achieve a 'zero waste society', this pyramid should be turned around and its top, prevention, should become very wide while its base, landfill, very narrow.

The five-step waste hierarchy can be used as a rule of thumb when choosing between options of waste management, with prevention as the most preferred and disposal in landfill as a last resort. However, all products and services have environmental impacts in various stages of their existence. To avoid shifting negative impact from one stage to another, the life-cycle approach is also considered. Life-cycle thinking involves looking at all stages of a product's life - from the extraction of raw materials for their production to their manufacture, distribution, use and disposal - to find out where improvements can be made to reduce environmental impacts and use of resources.

2.3 Analysis of the focus groups

After each focus group, a summary report was written by the moderators based on the note taker's notes and the information on the flip charts. A draft of this summary report was sent to the focus group participants who were asked to comment on it. Moderators collected any feedback and included it in the final version of the summary report as an annex. The audio recording of each focus group was transcribed word-for-word and translated into English for analysis. The translated transcripts were coded and analysed using MaxQDA, a programme for qualitative data analysis. For the analysis of the data, both structured analysis as well as open coding were used. Structured analysis was carried out by using a predesigned coding sheet based on preliminary research. This type of analysis allows for all relevant outcomes to be extracted from the raw data. Open coding runs parallel to the structured analysis and allows for insights unforeseen by preliminary research to emerge. The summary reports of the individual focus groups have been used to validate and complement the analysis.

2.4 Ethical issues

At the beginning of the focus groups, all participants were asked to sign an informed consent form providing information on the topic and aims of the focus group. It was explained that participation was voluntary and participants were free to withdraw at any time, without giving reason. The form obtained participants' approval for audio and video-recording of the focus group, for the use of the resulting data for research purposes, including the use of anonymous quotes, and for data storage for five years. All data were processed anonymously.

[1] Krueger R.A. (1994). Focus Groups: A Practical Guide for Applied Research. Sage: Thousand Oaks, California

[2] The typology of low, medium and high education level is based on the International Standard Classification of Education (http://en.wikipedia.org/wiki/International_Standard_Classification_of_Education)

[3] The urban-rural typology is based on the new urban/rural typology developed by the European Commission (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Urban-rural_typology)

[4] Questions and Answers, Thematic Strategy on the prevention and recycling of waste and the proposal for the revision of the Waste Framework Directive (Available at: http://ec.europa.eu/environment/waste/pdf/faq.pdf)

[5] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions on the Thematic Strategy on the Prevention and Recycling of Waste, Brussels, 19.1.2011, COM (2011) 13 final; EU Waste Policy - The Story behind the strategy, 2006

SPAIN

3. Country relevant data - Spain

This chapter of the report presents relevant data about the country and local focus groups. This includes demographic data, data related specifically to local waste management and information concerning the setting of the local focus groups.

3.1 Demographic country data

In terms of population, Spain is one of the largest EU countries with more than 45 million inhabitants. Most inhabitants live in urban areas (49%) or intermediate areas (38%), with the remainder living in rural areas (13%).

Table. 3.1 Population Data[6,7,8]

		2011	
Population at 1 January		46 152 926	
Population as percentage of EU27		9.2%	
Gross Domestic Product (PPP)		24 700 Euro	
Population urban-rural typology	Urban	22 305 000	49%
	Intermediate	17 616 000	38%
	Rural	6 069 000	13%

3.2 Factsheet on waste

The amount of municipal waste generated and treated in Spain is higher than the average amount of waste treated in the EU27. Spain ranks 12th on the EU27 ranking list on Municipal Solid Waste Recycling (MSW). Recycling has improved in the last 10 years showing an increase from 21% in 2001 to 33% in 2010. Despite this progress, an extraordinary effort is still required if Spain is to meet the 50% recycling target of the Waste Framework Directive by 2020. The Landfill Tax, adopted by the most highly populated regions of Spain, has contributed to the diversion of MSW from landfills and the valorisation of material resources through recycling.

Table 3.2 Municipal Waste[10,11]

		Spain		EU27 average	
Municipal waste generated (kg per person)		535 kg		502 kg	
Municipal waste treated (kg per person)		535 kg		486 kg	
	Landfilled	310 kg	58%	185 kg	38%
	Incinerated	48 kg	9%	107 kg	22%
	Recycled (material recycling)	80 kg	15%	122 kg	25%
	Composted (organic recycling)	96 kg	18%	73 kg	15%

3.3 Composition of the focus groups

In Spain, three focus groups (FGs) took place on the weekend of 16th March and three more on the weekend of 23rd March 2013: three of them in Barcelona, at the CosmoCaixa science centre of the 'la Caixa' Foundation, moderated by Guillermo Santamaría, Science Outreach Coordinator; and three in Granada at the Parque de las Ciencias science centre, moderated by Carmen Guerra, Program Coordinator and Education Specialist.

In total, 60 people (31 male and 29 female) participated in the six FGs. The age of the participants ranged from 19 to 73: 20 participants were aged between 18 and 35; 20 between 36 and 50 and 20 were aged 51 or over. Most participants had a high level of education (n = 24), or a middle level (n = 25), while 11 had a low level of education. Some 36 participants were working, while 15 were unemployed, 4 were students and 5 were retired. 30 participants live in a house and 30 in a flat. Details of the composition of these focus groups are presented in the table below.

Table 3.3 Composition of the Focus Groups[12]

		B FG1	B FG2	B FG3	G FG1	G FG2	G FG3	TOTAL
Participants	Total	10	10	10	10	10	10	60
Gender	Male	4	6	6	5	5	5	31
	Female	6	4	4	5	5	5	29
Age	18 - 35	0	10	0	0	0	10	20
	36 - 50	0	0	10	0	10	0	20
	50+	10	0	0	10	0	0	20
Education	High	7	4	3	4	4	2	24
	Medium	3	6	7	3	2	4	25
	Low	0	0	0	3	4	4	11
Employment	Unemployed	2	1	3	1	4	4	15
	Employed	4	5	7	8	6	6	36
	Retired	4	0	0	1	0	0	5
	Student	0	4	0	0	0	0	4
Housing	Flat	5	5	5	5	5	5	30
	House	5	5	5	5	5	5	30

[6] Eurostat Statistics Database Online (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)
[7] Eurostat Newsrelease (http://europa.eu/rapid/press-release_STAT-12-51_en.pdf)
[8] The urban-rural typology is based on the new urban/rural typology developed by the European Commission (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Urban-rural_typology)
[9] European Environment Agency (2013). "Managing municipal solid waste - a review of achievements in 32 European countries" EEA Report No 2/2013 (http://www.eea.europa.eu/publications/managing-municipal-solid-waste)
[10] Eurostat Newsrelease (http://europa.eu/rapid/press-release_STAT-12-48_en.pdf)
[11] The reported quantities of waste *generated* and *treated* do not always match exactly due to one (or more) of the following reasons: Estimates for the population not covered by collection schemes; Weight losses due to dehydration; Double counts of waste undergoing two or more treatment steps; Exports and imports of waste; Time lags between generation and treatment (temporary storage)
[12] B = Barcelona; G = Granada; FG = focus groups

4. Results

This chapter describes the overall results of all focus groups held in Spain. The chapter includes three sections, which are structured according to the exercises of the focus groups. The first section provides insight into what people think and do with respect to waste management at the household level. The second section provides an overview of barriers and concerns of the participants about current urban waste prevention and management, and identifies underlying reasons for the reported barriers and concerns. The third section presents participants' ideas for research and innovation needed in order to achieve a 'zero waste society' including concrete information on the research directions, the aim of the research, the proposed target group and the perceived priority of the research idea. Participants' ideas for policy, management and communication are included as well. Throughout the results, quotes of focus group participants are provided for illustrative purposes.[13]

4.1 How is waste managed at household level?

This section describes what people know and do with respect to household waste. It includes four parts. First, an overview is given of the types of waste that are generally collected separately and those that go in the general bin. The second part provides insight into how the waste is collected, while the third part describes what participants think happens to the waste after it is collected. The fourth part describes whether people deal with waste as they are supposed to and to what extent they think waste management is conveniently organised.

4.1.1 Waste separation

In Spain, at least one third of the participants of the focus groups claimed that they do not separate their waste at household level. Participants, especially those from focus groups in the Granada area, considered that most of the people they know do not recycle because of lack of motivation. Several participants also declared that they do not have the space, time or energy to recycle, throwing all their waste in one general bin.

> *"I'm going to tell you the truth, we are Spanish, after all... [...] everything goes in one bag. At first they drove me mad, they told us that in the house we had to have one for glass, another for rubbish, another for food, another for batteries, another for tins, and no-one does that..." (Granada FG2, P10)*

The participants who do sort their waste at home generally claim to have several waste bins with different colours for separate collection of organic waste, paper and cardboard, plastic and glass, as well as a general bin for residual waste. The number of waste bins in the house and their colour varies according to the municipality. In addition to the main waste streams mentioned above, some of the participants also separate oil, batteries, clothes, medicines, electronics and bulky waste like furniture.

Several participants explained that they only separate or recycle certain items:

"I've got two bags where I throw out the normal food, and the glass things, tins go... I simply can't have any more." (Granada FG2, P10).

[13] Abbreviations used in quotes: FG# = number of focus group, P# = number of specific focus group participant, PX = number of focus group participant unknown, M = Moderator.

"Where I live, for example, they provide us with all the bins, the one for batteries... The truth is, all of them. At home we don't do it a little bit out of laziness... OK? What we do... is put all the food together, some things we leave, for example glass, and some other things, but plastic stuff we do separate. Clothes we do put to one side, batteries to one side, too, any medicines we take to the chemist [...]. And the rest of the things, yes, the truth is that it all goes into one, at least in our house, yes." (Granada FG2, P4)

"Me too, to tell the truth, me too. We also separate glass, paper and cardboard... And we leave everything else together." (Barcelona FG2, P5)

4.1.2 Waste collection

In most cases, participants have to bring their waste to collective bins for separate collection. These bins are located in the streets, are of different colours and follow the same main waste streams mentioned above. Participants indicated that the bins are regularly emptied by garbage trucks, although the frequency appears to vary between municipalities.

In very few locations, there are bins on the street for separate collection of oil, electrical appliances and batteries. In most cases, participants claimed that they have to bring these items to specific places for separate collection. In some cases, old batteries and expired drugs are taken to specific shops, like pharmacies or supermarkets. Some participants take items such as batteries, light bulbs and oil to schools, supermarkets, hospitals or churches which, they trust, will dispose of them correctly. One participant from Granada works in a hospital and takes batteries there for recycling.

Used clothes and old furniture are normally donated to either family or friends, associations which provide separate bins for collection in some locations such as Cáritas (the Catholic Church's official organisation in Spain for charity and social relief), or the local church. Some participants from smaller towns and villages recycle oil themselves to make soap, or bring it to someone who knows how to do this. A small number of participants mentioned that, in some cases, oil is collected through specific collection campaigns organised by the local council.

For old furniture and large electrical appliances, some participants have to call a specific department of the local council to have them picked up from their houses at a fixed date and time. This service often costs money and some participants, especially those living in large cities, dump these objects on the street where they are soon picked up by other people or illegal collectors. In some cases, large electrical appliances are removed by the same company that delivers a new appliance, although the consumer has to pay for the service. Lastly, some participants (in the Barcelona area) take their bulky waste, clothes and batteries to a collection point or recycle centre:

"What there is in Motril, we don't have a problem. Near the street where we live, we have separate bins. At the school, for batteries, clothing and even for oil, and we often make soap for the children. And there's a council service to collect furniture. When you're going to throw out some furniture or something, we give them a phone call and they collect it." (Granada FG2, P8)

In a few cases (in the Barcelona area), participants have separate household bins which they leave on the doorstep on specific days for collection by trucks directly from their houses:

"P 10: Yes. They come to fetch, garbage trucks come by every day... One day [it's] paper, another day plastic, another day organic [waste]... And [they collect] nappies every day, I think... for older people. And we have three bins at home. Well, four.
M: So the collection is... every day they collect one type of waste.
P 10: One thing, yes.
M: And... is it collected in collective bins or do you leave it...?
P 10: On the doorstep, on the doorstep." (Barcelona FG2)

4.1.3 Knowledge about waste pathways

Most of the participants had no knowledge of what happens to their waste after disposal:

"At home we sort... Mainly paper. And we take it to the collective paper bin, I don't know what happens to it later, I suppose they recycle it... but I'm not 100% sure what happens." (Barcelona FG2, P2)

"Yes... I've put a question mark over everything because in reality...mmm, I don't know where [the waste] goes anyway, nor what they do [with it], nor if it's actually recycled or... [...] I think that if people were certain that their recycling efforts, which save other organisations work, really made [a difference]... I think they would recycle a lot more, because lots of people recycle bottle tops and it's because they think there is a point to it..." (Barcelona FG3, P3)

Some of them are aware of incineration facilities in their area. They assume that at least part of the waste is taken there for incineration:

"That's our idea, that there's an incinerator facility here in Armilla, isn't there? [...] It is... yes, waste treatment. Everything's taken there and processed..." (Granada FG 1, P 1)

One participant in the Barcelona area was aware that part of the energy generated by the incinerator was used to warm up the water of the local public swimming pool:

"In Mataró we even have the... it's called the green tube, which is through the energy created by the incinerator... there's the swimming pool...eh, which is... is managed by the council [...] All the water is hot, and all the heat that is generated eh... the plant... it ends up all there..." (Barcelona FG 1, P 10)

In few cases, participants reported that separated refuse from different streams was collected by the same truck, which made them think that it might not be properly recycled or reused.

"And we [dispose of] it together at home because my parents think that when they do the selective collection in summer, they collect the two bags theoretically at the same time, the, the food and the packaging, and they throw it all into the same [refuse] truck." (Barcelona FG2, P2)

One participant who lives live in Granada in an estate of five blocks of flats takes a lot of trouble to separate waste at home but the caretaker, who collects separated waste from doorways and is supposed to dispose of it separately in the appropriate bins, throws everything in the same bin:

"[...] We start off sorting and all that and he ends up throwing everything in the same place. So it's pretty disorganised and we're now a bit fed up with this business, so we end up throwing everything in the bag and that's the end of it. It's very bad!" (Granada FG 1, P 10)

4.1.4 Waste management behaviour and convenience

Most of the participants were aware that waste is collected separately, either in their local area or in neighbouring areas. They were also aware of how separate collection normally works, with bins of different colours and 'green points' for collection managed by local councils. Nevertheless, some participants mentioned issues which prevent them recycling at home, such as the lack of separate bins nearby.

"Yes, well, in my house we don't normally recycle, well, due to lack of space, because the kitchen is small. Besides, we don't have bins nearby. There is only one, the standard usual one, for organic waste. [...] and well, finally, on the issue of domestic appliances, as you were saying... Well usually I, perhaps I'm hopeless, but I throw them in the bin. If one is in good condition, I try to sell it, I try to get some profit from it, but if not... And medicines, the other day I threw a pile of medicines into the bin, so ... [I don't dispose of them properly] either because of lack of time. I work a lot, I don't... recycle much either, to be honest..." (Granada FG3, P6)

In fewer cases, people do not separate waste because of a complete absence of separate bins or separate collection, or because they do not know where some items should be taken for recycling.

"The electrical appliances... well, to tell you the truth, I don't know where to take them... I put them next to the rubbish, so that they can be taken away. And [I don't know] much better [what to do with] the batteries..." (Granada FG2, P9)

Some participants were satisfied with how waste collection works in their area, stressing some positive aspects. One participant was very satisfied with how the system works locally: the council rewards citizens for recycling and there is also a 'reuse market' for objects left at the local tip which can be collected by others:

"Tiana, was one of the first towns in Spain to start recycling. [...] So this is something widely... widely accepted. We have a sort of stand with a lock [and key] for the collection of the organic waste. They go by us a couple of times a week. [...] Our town has been awarded for... for recycling and other things. [...] We also have the tip, for which they score you as well... they give you points, then, well, you get a discount on the water bill... They give you points if you take it for recycling... they come to collect at your house when you ask... [...] and then when you go to the rubbish tip [...] you can take [objects left by others] without any fuss..." (Barcelona FG 1, P 7)

"I live in Huétor, and the truth is that Huétor, yes, they do make things very easy for you. It has its local waste facility for furniture, electrical appliances, paint and all that... It's a bit isolated, but OK, that [type of waste] isn't generated every day, either. [...] In my own street, I've got something so that I can recycle. Batteries, well in some Mercadona [supermarket] or other, I always take the opportunity... Oil is more work for me, because that's in the centre of the village. The oil always goes down the sink [LAUGHTER]." (Granada FG2, P 7)

For some participants in the Barcelona area, people do not separate waste at home because they do not have confidence in the waste management system. As mentioned earlier, several of them think that even if they did separate their waste, it would probably end up together when it is collected by garbage trucks.

Some of the participants also explained that they live in a recent 'urbanización' (housing development) where there are no bins nearby for separate collection in the street, as yet. One participant takes sorted waste to Barcelona every day on the way to work because there are no available bins for recycling in the neighbouring towns.

4.2 Barriers and concerns regarding urban waste

This section provides an overview of the participants' barriers and concerns with respect to current urban waste and identifies underlying reasons for the reported barriers and concerns. The section consists of three parts. The first part, 'Waste prevention and production', focuses on barriers and concerns related to goods in the phase before they enter the household including both waste prevention and production. The second part, 'Waste management in the household', addresses goods and waste in the phase while they are in the household. The third part, 'Waste disposal and pathways', describes barriers and concerns related to the phase in which waste is disposed.

4.2.1 Waste prevention and production

In all focus groups, participants talked about the excessive use of plastic (for packaging, bags, etc.) as well as cardboard and glass (also for packaging) as barriers or concerns.

Many participants said products are over-packaged with plastic and cardboard and that complex packaging is often difficult to recycle. Participants laid the blame for this mainly with manufacturers who they felt should be more aware of pollution caused by packaging.

"Why are all cleaning products in plastic containers? The time will come when we will not be able to cope with so much plastic. Everything is plastic, and that's what, in my opinion, is very difficult to recycle, isn't it? Or to eliminate entirely, since plastic is a toxic product and it can't be incinerated." (Granada FG 1, P4)

"I think it's important that the manufacturer himself... [that] the product should be simplified for the consumer, in terms of the complexity of the packaging and the materials used... because of the complexity, when it comes to throwing things away, you wonder, where does this go?" (Barcelona FG3, P5)

Moreover, a general concern mentioned by several participants is 'the lack of choice'. In certain supermarkets, citizens are obliged to buy products with a lot of packaging (i.e. lettuce wrapped in plastic, packaged cereals etc.) because they are given no alternative. This causes frustration, especially among participants who are concerned about environmental issues. Other participants noted that even when they do have a choice, they sometimes still go for the over-packaged option as it is the most convenient.

Another common concern regarding waste prevention and production, which emerged in several focus groups, was the lack of consumer product information. Participants argued that not knowing which chemical materials are used in products, and especially packaging, makes them afraid that these might be particularly dangerous, not only for the environment but also for consumers.

> *"What concerns me a lot are chemical substances. Products that we don't know what they contain, by disinformation, because at the source it's not done properly. The product should carry information on it for the consumer to know what it is. This information should already be displayed on the product, it should be a requirement for the manufacturer." (Granada FG 1, P 1)*

Some participants were also concerned about the 'planned obsolescence' of certain items with some producers creating products with a very short use-by date (including food). Participants wonder whether, in fact, these products could be used or consumed for a longer period.

Some participants were worried about consumer habits. For example, since certain products are nowadays very cheap, such as containers or jars, it is often easier to buy something new than clean and reuse.

4.2.2 Waste management in the household

A significant concern which emerged during the discussion of waste management in the household was the level of complexity of packaging which means citizens do not know how to recycle or sort the separate parts in domestic waste bins. A second barrier, mentioned by several participants, relates to the excessive accumulation of different bags in the house and of large quantities of waste, depending on collection types. This was emphasised by participants who live in small flats where there is not enough space to keep several bins for waste sorting.

> *"Sundays and rubbish! This excessive number of bags, above all organic, as they don't fit in the bin any more, although there are two bins for organic waste. There are always bags spilling out everywhere. Especially now that summer is coming. That creates a lot of flies, mosquitoes, lots of insects." (Granada FG 1, P4)*
>
> *"I bought a flat recently and there's something I don't understand. If in new houses there is a space for the dishwasher, the space for the fridge, why is there still no space for multi-use containers?" (Barcelona FG3, P2)*

Some participants mentioned waste disposal in the house can cause inconveniences which constitute a barrier to recycling. For example, not all participants were willing to accept the foul smell coming from organic waste bins, especially in the summer. This is particularly a problem in municipalities where waste is collected only once a week and where there are no bins in the streets for organic waste.

> *"If you have [bins] by the door they annoy you [with the smell], but if they put them further away from you, now that's a long way away, and we have to become socially aware of the fact that no matter what, sometimes you have to make a little effort and other times put up with having it by the door." (Granada FG 1, P8)*

In most focus groups, participants discussed the issue of not receiving clear information about how to sort waste in the house. This makes it difficult for them to comply with the system, sorting and disposing of waste as required by their municipalities. It was not always clear what day and time rubbish should be taken out for collection, what should be put in each bin, how certain items should be disposed of and where to find collective bins. In all focus groups held in Barcelona, participants mentioned a recent campaign by the city council called

'Envàs, on vas?' ('Where does the packaging go?') which explained how citizens should separate waste in the household, but this did not have a positive impact. The campaign included several TV and video spots and provided specific instructions on how to use the coloured collective bins available in the city for recycling, and which type of plastic or cardboard should go into each. According to participants, the campaign led citizens to start questioning why, if until that moment they had always thrown all plastics in one specific bin, they should now start throwing one type of plastic in the plastic bin and another type of plastic in the cardboard bin. The campaign generated mistrust and confusion, and demotivated people. According to the participants, it resulted in a loss of confidence in the system and several people stopped recycling.

"I think that the 'Envàs, on vas?' ('Where does the packaging go?') campaign has also been proven that there has been a lot of speculation, [it has created] a before and an after, isn't there? This campaign rather providing information, rather than giving support for recycling, this campaign has caused a lot of controversy... I mean before ... things were very clear..." (Barcelona FG3, P6)

In a few cases, participants were concerned about human habits. On one hand, participants mentioned that it is often laziness, combined with modern lifestyles, which leaves no time for proper waste management in the household.

"They offer me everything. I don't have any barriers, there's a [recycling] park just opposite my house, but really, because of lack of time, no, because of work, because of whatever... And it really concerns me, because I could do it really, really I've got a bit of awareness, right? The rush for, I don't know what, I don't know when...really everything, everything, I don't do it, for speed, for this and that..." (Granada FG2, P4)

On the other hand, some participants felt frustrated by the fact that even if they spend time recycling, there are others who do not, both in their households and in others':

"The problem in my house, is that my wife and my daughter, and my mother, don't do it, and so they put everything together for me and I have to separate [items] at home, and I'm really annoyed about that... I mean, I get quite upset..." (Barcelona FG 1, P 10)

"Well, I'm concerned about people who do not care about recycling." (Barcelona FG 1, P5)

4.2.3 Waste disposal and pathways

A number of common barriers to waste management were identified by several participants of all focus groups. The first one, mentioned by most participants, is the lack of collective bins for some separated waste. This problem was mainly found in villages but also in larger cities. Several participants mentioned that there are either not enough or no bins, especially for items such as batteries, oil, light bulbs, clothing, etc. As a result, participants end up putting these items in the general waste bin, despite knowing that some of them cause pollution (i.e. batteries).

"One of the biggest problems we have is precisely that in many places there are not enough bins for these things. [...] The problem with this is that normally in small boroughs, bins for certain things, clothing etc. you can find maximum two in different places, so it's too far, to be frank, it's too far and what you often do is to also throw it out in the rubbish." (Granada FG 1, P3)

"Almost none of my neighbours recycle. Well we recycle, including myself, because sometimes you separate a lot of bottles, a lot of paper and you say... I'm taking it today, but I can't be taking the car just to go 20 streets further down to throw it away every time." (Barcelona FG3, P 1)

In Barcelona, participants living in new housing developments, spreading throughout the Barcelona region, struggle to recycle because no bins are available for separate collection.

"Well, theoretically... Years ago [the council] brought some little different coloured bins so that [you could] recycle [waste] and then take it to the collective bins to throw it away. But these bins no longer have any use, we have them in the house because.... They took our collective bins away, they even took away the garden waste bin, when you [have waste from] pruning trees or anything... you don't have anywhere to throw it. You throw rubbish in the bin and, garden waste, you're going to leave it

wherever you have to […]. People used to recycle more, [but] none of the neighbours do anymore. Before, some of them did." (Barcelona FG2, P8)

In several focus groups, the participants shared their concerns regarding the complete lack of information on what happens to waste once it is collected: whether it is kept separate and recycled, where it goes and what is done with it. This lack of information and transparency leaves citizens distrustful of the waste management system and, subsequently, they commonly stop following the suggested methods for waste management.

"I saw that when the lorry came, paper was taken away along with the organic, and the waste... the waste collection lorry mixes it all together and you hear the 'crunch, crunch, crunch' of shredding... the normal sound of a rubbish lorry." (Barcelona FG3, P9)

"It is about informing people. I think that if people were confident that it was at all useful this process would go well..." (Barcelona FG3, P3)

Some focus group participants mentioned more practical issues as barriers or concerns. For example, the foul smell coming from waste bins in the streets, especially in the summer and in municipalities where waste is collected less frequently. In some cases, participants complained that collective bins are poorly placed, that there are not enough of them and that they are not well maintained.

A considerable part of the conversation on barriers and concerns focused on the need for more awareness and individual responsibility, as well as more effective action from public authorities. Participants complained that when waste is disposed of incorrectly, the authorities' response does not improve future waste disposal.

"There is rubbish that's left in the street, which isn't collected. Because people do it wrong. [We have] coloured bags [for separate collection]. What happens is that on the recycling day, you throw out an organic [waste] bag and they put a label on it saying that it's not the day [for that type of waste]. So the bag gets left in the street and the cats... open the bags and the whole town [ends up] full of... rubbish." (Barcelona FG2, P 7)

In all six focus groups, participants were concerned that waste management companies make profit from waste disposal, while citizens themselves do not benefit. Participants are aware that there are others who benefit from waste. The most quoted examples are people who go and pick up used things at the tip in order to resell them, although this practice is illegal. In some cases, the participants criticised their local councils, who they believed benefit from recycling and other processes linked with waste management. Participants consider this to be an unfair way of making money from citizens' efforts to separate and recycle waste when there is no economic advantage for the citizens themselves.

"There are 'unofficial' trucks that come to pick it up the separate collection... that was beneficial for the council... because it reduces work... and there were people [who were making money from] taking out the cardboard from the containers." (Barcelona FG 1, P 10)

"There are people who go [to the tip] every day... and they pick stuff up and get a lot of business from that. But I'm really happy, I'm not going to say anything... but I want to say... that it's not fair, that the fact of whether or not you are allowed to pick things from the tip it depends on whether you are more or less friends with the person who works there and is responsible for it. So there is an issue of personal relationships in waste treatment. And it all depends on the goodwill of the person in charge there." (Barcelona FG 1, P2)

Two participants mentioned specific concerns regarding family, neighbours or caretakers not doing their tasks properly, particularly when they are responsible for the management of resources and waste:

"What makes me really angry is that, at night, everyone comes from the neighbourhood... and you make the effort of putting everything in its place [when you put out garbage for separate collection] and [neighbours] come with tools, and pick up the rubbish, pick up whatever food they like, and the rest all goes on the floor." (Barcelona FG 1, P3)

Finally, one participant living in the Barcelona area mentioned being highly concerned by some illegal and inconvenient practices in her neighbourhood:

"[In our area we have to take waste] to a waste ground, where there are children playing... It's illegal... [...] you pass by the road and you see the heap there and it's not ethical. And on this waste ground you find other rubbish [...] that has been dumped there, there's iron that you put in the container or the usual wheels that people leave... all of that is there." (Barcelona FG3, P9)

4.3 Citizens' ideas on how to realise a 'zero waste society'

This section presents participants' ideas for achieving a 'zero waste society'. A distinction is made between ideas related to environmental sciences and technology, and ideas related to policy, management and communication. Below, these ideas are described separately in tables. For each idea in the table, the research category is mentioned as well as the aim of the research and the proposed target group. In addition, the priority of the research idea as perceived by the participants is indicated in the tables, using stars to indicate the number of stickers assigned to a specific idea by the participants. Only ideas that were prioritised by the participants are described in this section. Ideas that were not prioritised are included in the full list of research ideas which is provided in Annex 1.

4.3.1 Environmental sciences and technology

TECHNICAL, PHYSICAL, CHEMICAL, ENGINEERING

Of the 16 ideas put forward regarding 'technical, physical, chemical and engineering' innovations by all focus groups, eight of them were assigned stickers, which denoted priority. Among the ideas, which received stickers, those that focused on the practical reuse of waste were ranked with the highest priority (see table 4.3.1).

The idea in this category that was ranked highest priority was the creation of a waste-transforming machine ('waste digester') at a community level which could transform waste into energy for households and supply energy for the entire neighbourhood or town. Participants prioritised this idea because it was advantageous for citizens, rewarding their efforts to separate and recycle waste, and it would also reduce the amount of waste put in landfill.

"In your house you separate food waste, packaging, assuming that you have a single container that could be either biodegradable, or reusable, or whatever, and the 'digester machine' in your neighbourhood community or in your town, or I don't know, well you would convert the things into fertilisers or into energy, for example, for the community's electricity, for heating, for hot water. [...] To make use of all the waste that you create in your home, well, being able to get energy as a result of that machine." (Granada FG3, P5)

The second idea in this category received almost as many priority stickers as the first. It focuses on a similar concept but at the household, rather than the community, level. Several participants mentioned they would want an affordable domestic recycling machine, which can transform waste into energy and new materials. Several different creative names were assigned to this machine, such as 'general waste unit', 'waste processor', 'Recycler Manufacturer' or 'Recycler 3000'. In some cases, the participants discussed the marketing possibilities of such an invention.

"[P8] More efficient recycling machines on a domestic level, that's to say, the same as the glass ones are on a city level, then on a domestic level, that the glass that you generate then that it will be for energy, the organic stuff for your vegetable garden, or energy, but that will be on a domestic level.
[M] Recycling machines on a domestic level, so that in addition, as a by-product, we'll be able to get energy.
[P8] More efficient than what there is right now, what there is already now, compost for the vegetable

garden, there's nothing else that occurs to me..." (Granada FG2)

"A domestic recycling machine for plastic... because it would motivate you to see the direct use of this recycling, you wouldn't have the problem of space, because the machine should be tiny, and we've put as an example, I don't know, a machine that you feed bottles into and they come out in the form of a glass for a party or Tupperware or..." (Barcelona FG2, P 1)

In order to provide an example of something already in existence which could be compared to this machine, participants sometimes referred to the 3D printer which they see as a technical object where a certain material is put in and 'it directly produces an object for you.'

A similar idea was proposed by participants in one of the focus groups in Granada but was also mentioned in other focus groups using different wording. According to the Granada group, a 'mechanical pig' should be invented, involving a rubbish-eating robot, which converts waste into energy. The robot would 'eat' waste to produce fertiliser and energy (for example, fuel) for cars and machinery.

"P 10: This kind of robot pig ... It would convert organic material into fertiliser.

P9: A robotic machine.

M: A series of robots, machines, whatever we want... What is the robot going to do?

P 10: It would convert organic material into fertiliser. [...] Then it would produce gas, to produce fertiliser and energy...

P8: Fertiliser and energy.

P 10: In order to make use of it in domestic use: for heat, electricity... for example, you plug the pig in somewhere...

M: The pig takes my rubbish away and supplies me with energy.

P 10: And it would produce a combustible product for the functioning of machinery and cars." (Granada FG 1)

One more idea to reuse waste intelligently at household level is to create a new generation of 3D printers which produce new products from a standardised material obtained from waste products. Participants also considered that waste should not always be used to generate new products because this implies a consumer-oriented approach. Participants agreed that when no new products are needed, the printer should be used to simply create ingots of raw material which could be sold to other users.

Another idea prioritised by participants was to create intelligent buildings which automatically sort waste into different bins for recycling.

"Well in a building you've got... like a kind of tube and you throw everything away down there, and it's automatically sorted for recycling." (Barcelona FG3, P4)

One idea which received two stickers from participants is to improve existing electrical household appliances so that they last longer and, most importantly, are easier to repair (e.g. modular appliances so that people can repair each broken part separately).

"[P 10] We thought that if electrical household appliances could be disassembled, if one part broke, you could change just that part and you wouldn't have to throw the whole thing out and buy a new one... And that [would] also [mean that] you could [avoid] generating so much waste. [...]

[P9] And if, for example, there was a generic electrical household appliance, or a fridge, let's say, that you only needed to change the motor and the parts in, [the same thing] for each brand, you know? Let's say that this would generate employment, you know? People who, if you break the motor, they change it and... [it would] generate less plastic... generate less, less waste." (Barcelona FG 1)

The last two ideas received one priority sticker each. The first idea is to recover energy from incineration through a 'green pipe' system, providing electricity or heating to sport centres, companies, etc. This idea is consistent with other ideas to develop technologies which allow citizens to benefit from their recycling efforts. The second idea, which was not described in detail, was to create less polluting or non-polluting ways to incinerate waste.

Table 4.3.1 Ideas within the category 'technical, physics, chemical, engineering' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Technical/ Physics/ Chemical/ Engineering	Affordable domestic recycling machine which can compress/transform waste into energy and new materials for domestic use	Convenience in the home/ Effective use of waste	Consumers	☆☆☆☆☆☆☆☆☆☆
	A waste-transforming machine on a community level which transforms waste into energy for households	Effective use of waste	Waste management companies	☆☆☆☆☆☆☆☆☆☆
	A 'mechanical pig'. A rubbish-eating robot, which converts waste into energy, fertiliser or fuel for cars and machinery	Effective use of waste/ Eliminate waste	Consumers/Waste management companies	☆☆☆☆☆☆☆☆
	Intelligent house/building which automatically sorts and recycles waste	Improve recycling/ Convenience in the home	Waste management companies	☆☆☆☆☆☆
	3D printers which consume a standardised material obtained from waste products and produce new products	Effective use of waste	Consumers/ Producers/ Waste management companies	☆☆☆☆
	Electrical household appliances which last longer and are easier to repair	Less waste production	Producers/ Consumers	☆☆
	Recover energy coming from incineration, through a 'green pipe', to be used in sport centres, companies, etc.	Effective use of waste	Waste management companies/ Others	☆
	Less polluting or non-polluting forms of incineration of waste	Effect on planet	Waste management companies	☆

MATERIALS

A second category related to the domain of 'environmental sciences and technology' contains ideas that focus on the 'material' dimension. These ideas generally involve research into, or development of, new materials with certain characteristics that are thought to reduce waste. Reduction of packaging was one of the main objectives, under the aim of reducing waste production.
The most highly prioritised idea, which emerged in this category, is concerned with the creation of a process that converts organic waste into biodegradable, reusable building materials for construction. This idea was raised in two different focus groups.

"Elimination of organic waste converting it into, as we've already said, fertiliser, biomass to obtain this new construction material that would be biodegradable and re-usable and that would be the basis for the new one (for) building withstanding all sorts of natural assaults: fires, earthquakes, hurricanes, affecting natural cycles." (Granada FG 1, P4)

Another highly prioritised idea involves the development of functional or intelligent packaging, such as completely biodegradable containers and wrapping materials, bags and envelopes made of self-degradable materials, which disintegrate after or during use. An example of such materials is the packaging of washing powder tablets that dissolves in washing machines on use.

"P 10: New chemical products in powder but they should come in that little bag the same as it's thrown into the washing machine with the plastic and the bag disintegrates. [...] A little bag that you throw somewhere... [...]. They should be sold in a paper bag and that full of little bags of bleach, of something else or whatever... which self-destructs.
M: Or rather, inside environmentally-friendly packaging and wrappings, packaging that is food... oh... and this concept of packaging would be functional packaging, for example, right?
P2: Yes, it would eliminate a lot of... plastic." (Granada FG 1)
"Basically if the product has an expiry date [the packaging] will be biodegradable, it will expire based on the expiry of the product. A biodegradable box of milk, totally biodegradable, the milk expires on 13th July, the box expires on 13th July. Everything can biodegrade. I use the box for my vegetable garden on my patio." (Granada FG2, P3)

Another related idea also received a high level of priority. According to participants, one single type of material, 100% recyclable, should be created and used for all packaging, standardising materials and products to make waste management and recycling easier.

"P 1: The first idea is... to make a single type of packaging for... for all products. Um... of the same material, and that... can be recycled.
M: One single material and that can be recycled for any product. [...]
P2: It would have the properties of glass, of Tetra Brik [packaging produced by the Swedish packaging company Tetra Pak], of plastic... They have to invent one unique (material) which can be [...]
P9: [...] of everything, is that right? For example, if it's... perishable food then [the packaging should all be the same]... Consequently... you would recycle because you'd know that it would be reused properly. The same with mobile phone chargers, now they're made the same...
P3: All the [packaging] would be the same [...] and then you know it's recyclable. Everything. It would be simple." (Barcelona FG3)

A fourth idea in this category which received high priority, and which also aims to reduce waste production, is to create materials for packaging which could be recycled more easily and efficiently.

"P5: Invent another type of material which... I don't know... which, for example, is disposed of in water...
P6: And there's no need to process it so much in order to be able to use it, which for example, I don't know, is easier to turn into another plastic bottle. You don't need to melt the plastic again, make the bottle again, put the label on it... so we'd save energy and the process would be easier." (Barcelona FG2)

The last two ideas prioritised in this category received one sticker each. One idea aims to create an everlasting material which is constantly recycled and recyclable and, therefore, does not produce waste. Secondly, par-

ticipants of one of the focus groups would like producers to create and make use of non-breakable glass for packaging which could be reused indefinitely.

Table 4.3.2 Ideas within the category 'material' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Material	Conversion of organic waste into biodegradable, reusable building materials for construction	Effective use of waste/ Less use of resources	Waste management companies/ Producers	☆☆☆☆☆☆☆☆☆
	Functional/intelligent packaging, such as completely biodegradable containers and wrapping materials, or bags/ envelopes made of self-degradable materials	Less packaging/ Less plastic/ Less waste production	Consumers/ Producers	☆☆☆☆☆☆☆☆☆
	One single type of material for all packaging, recyclable. Standardisation of materials and products, make waste management and recycling easier	Less packaging/ Improve recycling	Producers/ Consumers	☆☆☆☆☆☆☆☆
	Create better recyclable materials for packaging, with less effort and more efficient	Less waste production/ Less plastic	Producers	☆☆☆☆☆☆☆
	Everlasting material (recycled and recyclable)	Less waste production	Producers	☆
	Create unbreakable glass for packaging, which can be reused forever	Less use of resources/ Less waste production	Producers	☆

BIO(TECHNO)LOGY

The category 'bio(techno)logy' groups ideas that would require some research or development in the fields of biology or biotechnology. Four ideas emerged in this category, but only one received a high number of stickers (see table 4.3.3).

Several participants in two different focus groups in Barcelona would like energy to be produced from waste in different forms and under different processes. Some of the examples provided in the discussion refer to making use of bacteria or 'nanorobots' to break down waste (e.g., plastic) and turn it into petrol, as well as turning rubbish into fuel for the car.

> *"P2: For example, instead of incinerating things, create a bacteria or something, you know? To turn plastic back into oil, you know? Or something so that it can be reused... I don't, I don't know...something that [hasn't been] invented [yet], but I don't know for...*
> *P1: To turn into energy..." (Barcelona FG2)*

Table 4.3.3 Ideas within the category 'bio(techno)logical' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Bio(techno)-logical	Generating energy from waste, by making use of bacteria or nanorobots that break down waste and turn it into petrol, or rubbish into fuel for the car	Less waste production/ Eliminate waste	Waste management companies	☆☆☆☆☆☆☆☆ ☆☆☆☆☆☆

ICT

The category 'ICT' contains ideas related to information and communication technologies. The ideas which emerged in this category have been assigned high priority by focus group participants. Ideas aim to improve recycling and encourage behaviour change in consumers (see table 4.3.4).

The first idea, assigned highest priority, is to create an electronic chip to be installed in rubbish bags and collection bins. The chips would monitor waste disposal and reward citizens who recycle properly.

"P8: To pay depending on the rubbish, if you recycle or don't recycle.
M: Great! What would this waste monitoring involve? What would we need from science and technology to monitor the waste?
P8: On a government level, that this quantity is monitored, or on a chip level. [...]
P8: The number of bags of rubbish people bring...
M: A series of chips that we put in the waste...
P 10: On the bag.
M: On the bag, right? Some chips that we put on the bags, and these chips, theoretically, what information would they have to have?
P 10: It would go with your number and where you live, and then they would know when the rubbish arrives, that this rubbish comes from a certain place.
M: Monitoring the rubbish, and why all this monitoring of the rubbish? For a reward, a punishment, a...?
P2: A sanction." (Granada FG2)

A similar idea, prioritised in focus groups in both Granada and Barcelona, concerns the creation of intelligent waste collection containers. These bins should either be connected to the tax authorities to reward citizens who properly recycle, or be able to detect the type of waste being thrown away and reject it if it is not properly sorted.

"[P6] If maybe you have a machine into which you put cardboard, you have a card, like your identity card, I don't know, we're in the future, so it's telling you the kilos that you've put in, and so on. [...] I'm talking kind of generally, but yes it's true that it would be a good option and a good initiative for recycling [...] Nobody has a reason to find out whether you're recycling more or less, only that your taxes will go down as a result of [the city council] seeing that you're recycling. You're contributing to the improvement of your town.
[M] So, [...] it would have to have something to identify you and give you a discount on your taxes.
[P6] Each bin goes electronically and you have a personal card, where it shows the amount of rubbish that you're bringing, maybe glass, maybe cardboard..." (Granada FG3)
"[P7] Intelligent containers.
[M] The containers would be able to distinguish different kinds of rubbish...
[P7] You arrive with your bag, you throw the bag away and it rejects it... well no, but it's a kind of scanner, a kind of chip... you throw the waste away... and it won't allow you to..." (Barcelona FG3)

In a slightly different variation, participants in two of the focus groups held in Barcelona suggested 'digitising waste', creating a system of digital monitoring of the balance between purchase volume (waste that will be

generated) and volume of recycled waste (waste that each citizen throws away, properly sorted) for each household, linked to incentives and penalties.

"P2: We wanted to invent a new [...] way of digitising waste. So, um... when you go to the supermarket to buy, whenever you buy, um... as well as the price of what you've bought, it should calculate the volume of waste it contains. [...] And you will have a digital balance that is individual to you... And when you go to... recycle, for each container there should be a system for monitoring what you recycle and that measures the volume that you're recycling. And at the end... of a year or whatever it gives you a final amount... of waste that you've bought and waste that you've... recycled. Regarding this final amount... we've mentioned that there might be economic compensation... Personally, I think the areas that recycle the most should receive more attention from the government, in terms of urban and social projects... to encourage other areas that don't recycle as much to do so.
P10: We've put deductions for. So... a system that rewards, that gives you discounts." (Barcelona FG3)

Table 4.3.4 Ideas within the category 'ICT' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
ICT	'Chips' in the rubbish bags to be able to monitor a reward system for citizens who recycle	Behaviour change/ Improve recycling	Government/ Consumers	☆☆☆☆☆☆
	Intelligent waste collection containers/bins connected to the tax authorities (reward system to citizens who properly recycle), or capable of scaning/detecting the type of waste you throw away and 'reject' it if it is not properly sorted	Behaviour change/ Improve recycling	Government/ Consumers	☆☆☆☆☆☆
	Digitalising waste: a system of (digital) individual monitoring of the balance between purchase volume and the volume of recycled waste, linked to incentives and penalties	Improve recycling/ Behaviour change	Consumers	☆☆☆☆

4.3.2 Policy, management and communication

POLICY

The category of 'policy' deals mainly with ideas that involve financial incentives and disincentives or installing mandatory procedures for certain practices. In this category, 11 ideas were proposed, of which only two were assigned priority (see table 4.3.5).

The idea that was ranked as highest priority and was discussed in all six focus groups involves implementing forms of reward for citizens who recycle properly. Participants in all focus groups mentioned that they would

like to receive some form of compensation for recycling. For example, they suggest a system of tax discounts depending on how much each individual or household recycles. In the discussion, participants mentioned that such incentives should be introduced for both producers and consumers and that, in general, financial incentives would be one of the most effective ways of increasing motivation for recycling. An example which often came up is the refund that is given when returning glass and plastic bottles to supermarkets, as happens in countries such as Germany.

"I feel I'm the materialist of this group, but... Basically, this has a simple solution. If you pay me to recycle, I'm not talking about paying... If there were a physical reward for recycling, everybody would recycle, not a moral reward, not a political reward: a monetary or non-monetary reward. [...] I know how I've got to recycle, how I've got to separate it and where I've got to take it. Now, the time it takes me, it has to be worth my effort in some way. [...] But if I had a reward, that I could touch, which was tangible, and I'm not talking to you about money, I'm talking to you about compensation of some other sort of issues...everyone, everyone would recycle. I guarantee you, everyone, every Spanish person I know." (Granada FG2)

"P4: I know in Castellón they pay for recycling, then they give you the money back in tax, what... the citizen, you're paid back.

P9: In Germany, for example, they pay for bottles. You take the glass and they pay you for it, and they recycle it, and..." (Granada FG3)

"P2: Incentives for people to recycle... be it tax relief or something similar... so that people, well, recycle more." (Barcelona FG2)

The second idea, which emerged in one of the focus groups and received one sticker, is partially linked to a similar one in the 'material' category but, in the discussion, participants focused on the legal and policy aspects. According to participants, a standardised rule for packaging materials or one unique material for all packaging should be imposed. Packaging and manufacturing materials would become more uniform, facilitating reuse and recycling (i.e., all similar products should have the same type of material for packaging).

Table 4.3.5 Ideas within the category 'policy' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Policy	Implement forms of reward for citizens who properly recycle, both for producers and for consumers. Financial incentives to increase motivation for recycling	Improve recycling/ Behaviour change	Consumers/ Producers	☆☆☆☆☆☆☆☆☆☆☆
	A standardised rule for packaging materials or one unique material for all packaging. Uniformity of packaging and manufacturing materials	Improve recycling/ Less packaging	Producers	☆

MANAGEMENT AND LOGISTICS

'Management and logistics' is another category in the domain of 'policy, management and communication'. It comprises ideas which not only require a certain number of managerial or logistical changes, but have this as their primary focus (see table 4.3.6). Six ideas were assigned priority in this category.

The idea assigned highest priority, mentioned in several focus groups, aims to increase local production and reduce the use of resources. The idea is to create a sustainable, ecological system to distribute products. The participants did not explain how they would like to put this idea into practice.

Another idea, mentioned in one focus group, was the use of more functional design in order to prevent consumerism. For example, minimising the superfluous components (casings, packaging, etc.) of computers, and electronics in general, and making the essential components changeable.

"Less and plain, without embellishments, eliminating advertisements, and only changing the interior on the basis of the technology. For example, I have a mobile, I use it and I buy myself another. No, the mobile is always going to be the same, because it's already been optimised, and what would change depending on the technology, we change the chip, which, that... we change the interior, but outside it continues to be the same, eliminate the advertising and only use the advertising for all that to promote it." (Granada FG2, P1)

Four ideas emerged in individual focus groups, and were each assigned one sticker. Some of these ideas were not further developed in terms of how they would be put into practice, but were considered to be general priorities by some of the participants.

One of the ideas proposed changes to consumer activities. Participants would like to implement new practices aimed at reducing packaging and plastic bags (e.g. by bringing reusable containers when grocery shopping) and involving more reuse.

"P7: Well it's about each bottle being of the same material... products should be standardised... to make it easier to reuse them... For example regarding the most expensive, which are electronic products, every time you change your mobile phone you create a lot more waste because it's incompatible with... with the environment. Well across all industries... including the car industry, products should be standardised because the...
M: Recycle and standardise [products] so it's easier...
P7: Some products should be reused." (Barcelona FG3)

A second idea aimed at more frequent use of materials that do not damage the environment. The third idea focused on local commerce, proposing adjustments to better fit supply with demand which could prevent food being thrown away.

"P3: I think that the best way of not generating waste, in a hypothetical future, is an area distribution, an area distribution of food. I don't have to stock up, I don't need packaging for it.
P1: Taking advantage of the new technologies, by WhatsApp... [LAUGHTER]
P3: A daily teleprocessing function. [...]
P3: No, not to pass on to the small shopkeeper, but to pass on to daily distribution which doesn't generate packaging. In [the supermarket] Carrefour, I've seen two-kilo packets, but we're talking about a hypothetical future. Why do I have to buy two kilos of meat, to not go to Carrefour every day?" (Granada FG2)

The fourth idea refers to selling products in individual or exact doses, rather than in large packages. For example, one participant proposed making it possible to buy single tablets so that you are not obliged to buy a box of tablets every time.

Table 4.3.6 Ideas within the category 'management and logistics' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Management/ Logistics	Ecological and sustainable products distribution system	Local production/ Less packaging	Producers/ Consumers	☆☆
	Use more functional design in order to prevent consumerism	Less use of resources/ Behaviour change	Producers/ Consumers	☆☆

Changes in commercialisation: reduce packaging, ban plastic bags, reuse more	Less packaging/ Less plastic	Consumers/ Producers	☆
Use more often materials that are not damaging to the environment	Effect on planet	Producers	☆
Increase local commerce, adjustments in order to better fit supply with demand	Less waste production/ Less use of resources/ Local production	Producers	☆
Selling products in individual/exact doses	Less waste production	Producers	☆

COMMUNICATION AND EDUCATION

The category of 'communication and education' deals with ideas to inform the public, educate people and raise awareness. In this category, nine ideas were put forward and six of them received priority stickers (see table 4.3.7). Participants in all focus groups believed that information and education play a fundamental role in raising awareness about waste among citizens and could eventually change their behaviour.

The most prioritised idea of all categories focuses on this issue. Participants want more education and more information for families and students about how and why to recycle properly. This should be taught in schools and elsewhere. New campaigns to raise people's awareness on the importance of proper separate collection and recycling were also mentioned. In all discussions, participants agreed that special attention should be dedicated to educational programs, especially for children.

"I think that the main solution is education, but not that they go to college for a day, but rather in the day-to-day. And a campaign, but it's day-to-day. Because if after a campaign, you then go to school and see the children throwing everything into one bucket, it's no use. We have to incorporate it in the day-to-day from when they are very small..." (Granada FG2, P5)

The second idea, mentioned in one of the Granada focus groups, is closely linked to the first, and proposes education and prevention should be undertaken in a format which is fun and aimed at all ages. Examples include visits to recycling plants learn about how recycling works.

"P2: I would add a play element there. So that it isn't such a pain like 'Now you're going to come and have to do recycling like in the 'hazards in the workplace' thing.'
P3: Yes, maybe you could take children to a recycling plant...
P4: They already take them. My daughter was taken...
M: Environmental education campaigns, at all levels, for the whole population and with a playful format, right?" (Granada FG3)

The third idea also provides specific suggestions on how education and communication should be put into place. According to participants of one focus group in Barcelona, information should take appealing formats such as that of a TV series, which participants would like to call 'Save me from Plastic' (inspired by the name of a popular TV series in Spain). Such television programmes would promote behaviour change.

"P5: Umm... Well, with respect to... to... promoting the culture [of recycling] on a large scale, not so much prevention.... A very silly idea, but that may have a big impact... would be educating... sorry, educating people through... a small television series. The main theme would be... recycling or incinerating and it would have a plot with characters or... a series could be created.
P6: Instead of a 'Sálvame' [Spanish television series, 'Save me'] [incomprehensible]...

P5: Whatever...
P6: A plastic Sálvame.
P8: Plastic Sálvame... [laughs]
P9: A fairy tale... with a recycling theme.
P5: In short, a... a subliminal idea of dealing with the problem of everyday waste and reuse... that is made attractive and widely publicised.
P6: And with prime time programmes in order to be able to convey... the information that you want to convey. [...]
P6: So use programmes that people will watch in order to instil this idea." (Barcelona FG3)

The fourth idea was aimed at changing people's habits, such as reducing excessive consumption and raising awareness of environmental issues. It was pointed out that parents play an important role in educating their children; they should show how it is done properly.

"The most important thing is... [to] educate from when they are children so that they grow up forming the habit, in education, of respecting everything. I, maybe, I am, in inverted commas 'young', but I... at home they taught me to reuse everything. When I say everything, I mean everything. I mean I, now, when, for example, I've painted and the pots, paint pots, right? I pick them up, I make some holes in the bottom, I take out the paper from inside, and I sow seeds." (Barcelona FG 1, P7)

Two further ideas emerged, each in a different focus group, and received one sticker each. According to one participant, parents should be encouraged to change behaviour through their children. Parents and children should attend educational sessions on recycling together so that parents will be reminded by children when they do not separate properly. The participants referred to this as using 'emotional blackmail'.

"The following day you then explain that... If parents were to go to these meetings where teachers explain these things [to do with recycling]... We're trapped. If I go with my child to a half-hour meeting in school, if the teacher explains things to me while I'm standing next to my child, I then wouldn't have an excuse at home, and although it doesn't seem it, that's really important." (Barcelona FG3, P7)

In another focus group, the participants mentioned that they would like to have more accessible and transparent information on whether products and packaging can be recycled. Information should also be available on which companies and producers are actively trying to reduce their carbon footprint.

Table 4.3.7 Ideas within the category 'communication and education' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Communication and education	Education and more information for families and students about how and why to properly recycle. New educational and prevention campaigns to raise people's awareness on the importance of proper separate collection/ recycling	Awareness	Consumers	☆☆☆☆☆☆☆☆☆☆☆☆ ☆☆☆☆☆☆☆☆☆☆☆
	Education and prevention in a fun format aimed at all levels, e.g., visits to a recycling plant to see and learn how it works	Awareness/ Behaviour change	Consumers	☆☆☆☆☆☆☆☆☆☆

Educating/informing through a TV series - 'Save me from Plastic'	Awareness/ Behaviour change	Consumers	☆☆☆☆☆
Change of habits, i.e. reducing excessive consumption, raise awareness of environmental issues	Behaviour change/ Awareness	Consumers	☆☆☆
Influencing parents through their children, attending together sessions on recycling education	Awareness of possibilities and values/ Behaviour change	Consumers	☆
Accessible and transparent information on recyclability of products and packaging. Information on which companies reduce their carbon 'footprint'	Awareness of possibilities	Producers/ Consumers	☆

LOCAL INITIATIVES

The category of 'local initiatives' groups ideas that focus on a specific community, neighbourhood or region, and most often involve some sharing of knowledge, resources or produce. In this category, five ideas were proposed and two were assigned priority (see table 4.3.8).

The first idea focuses on the importance of sharing goods. Participants wanted to encourage more sharing in order to use less resources and reduce waste. One example was the use of a communal refrigerator, shared among flats.

"P2: Go to the library every day to read the newspaper. You save... 30 newspapers a month.
M: Um... communal newspapers? Do you think there's something that...
P 10: Well, internet...
M: We could pass the communal paper to... goods in common? Shared goods, for example?
P2: Cooperative.
P9: That you leave at a bank and you can... and another person goes and says 'oh, look' and they take it away..." (Barcelona FG 1)

Another prioritised idea emerged from one focus group. The participants considered that they would like to see more family and urban vegetable gardens in cities and towns. A similar idea was mentioned by one of the participants in another focus group who proposed that restaurants should have roof gardens to provide some of the products they use.

Table 4.3.8 Ideas within the category 'local initiatives' that received priority, ranked accordingly

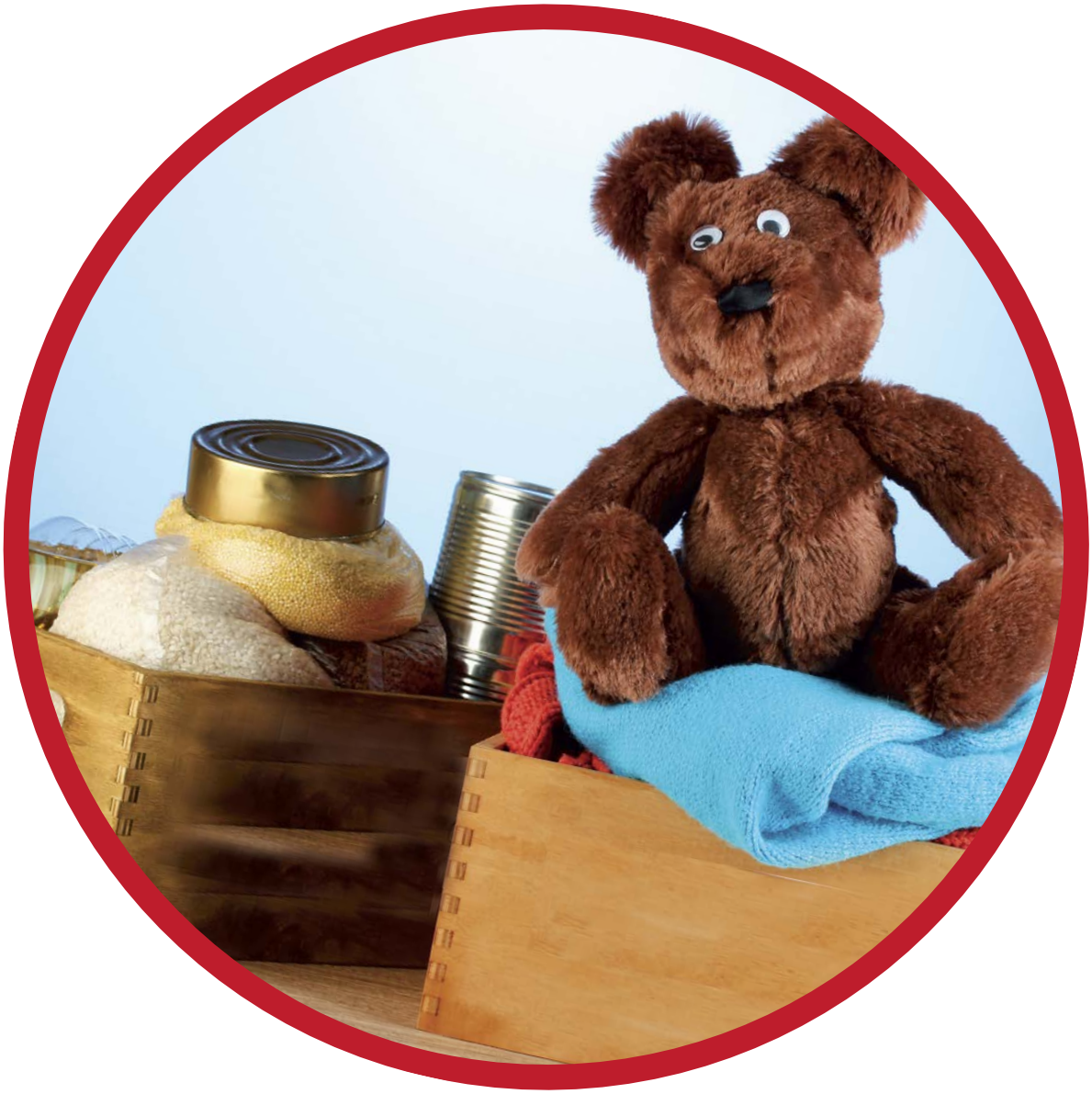
Category	Idea	Aim	Target Group	Priority
Local initiatives	Sharing goods. Behavioural change, encouraging sharing in order to use less resources and produce less waste	Less use of resources/ Behaviour change	Consumers	☆☆☆☆☆
	Family and urban vegetable gardens	Local production	Consumers	☆☆

OTHER

One of the prioritised ideas which emerged in the focus groups does not belong to any of the aforementioned categories. This idea, mentioned by one participant in Granada, refers to the importance of financing research into more efficient alternative sources of energy. The participant mentioned 'atomic cars' as an example of possible applications of new energy sources.

Table 4.3.9 Ideas within the category 'other' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Other	Research into new/more alternative sources of energy (i.e. 'atomic car')	Effect on planet	Other	☆☆



5. Conclusion, discussion and evaluation

This country report presents country-specific findings from citizen focus groups in Spain. It is part of a wider consultation process called VOICES, which involves almost one thousand European citizens across 27 EU member states in discussing the European research priorities for the theme 'Waste as a resource'. In most member states, three focus groups were conducted. The bigger member states had six focus groups in two different locations, as in Spain, where six focus groups were held.

The overall aim of the VOICES project is to identify citizens' preferences, values, needs and expectations with respect to research priorities for the theme 'Waste as a resource'. This provides input for the Consolidation Group that will define the actual priorities for the next work programme on 'Urban Waste' (call SiS.2013.1.2.1-2). In addition, it provides the methodology, the tools, the know-how and recommendations that can be adapted and used in coming years for similar initiatives.

Below, we present the main findings of the focus groups in Spain. First, we focus on waste management, barriers and concerns. Next, we go into the ideas identified and prioritised by the focus group participants. We close with a short reflection on the methodology of the study.

5.1 Waste management, barriers and concerns

Spain ranks 12th on the EU27 ranking list on Municipal Solid Waste Recycling (MSW).

In December 2008, the Ministers' Council of Spain approved the Integrated National Waste Plan for the period 2008-2015 (Justice and Environment, 2011).[14] This plan provided an analysis of the waste management situation, and aims at incorporating new waste streams into the regional waste plans for all seventeen autonomous regions. According to estimates, Spain should be able to fulfil the target of 50% recycling of MSW by 2020 if the annual increase rate follows its development pattern in the period 2001-2005, although an extraordinary effort would be necessary. Recycling has increased from 20% in 2001 to 33% in 2010, with a peak of nearly 40% in 2008.[15]

Although trends show that recycling in Spain is becoming more widespread, some problems still remain in the management of waste at household level, as described by the participants of the focus groups. Not all participants have access to the facilities needed for disposing of waste according to the regulations. This is consistent with findings from the Flash Eurobarometer survey 'Attitudes of Europeans towards resource efficiency'[16] in which 12% of all respondents from Spain stated they still do not separate any waste for recycling or composting at home (see Annex 2).

Most of the VOICES focus groups participants are aware of what is expected from them in terms of recycling at household level. However, almost one third of the participants claimed they do not separate waste properly due to lack of motivation, lack of clear instructions or because recycling facilities are hard to access. Most of the participants have no knowledge of what happens to their waste after disposal. Some of them are aware of incineration facilities in their area and assume that at least part of the waste is taken there for incineration. In few cases, participants reported that separated refuse from different streams was collected by the same truck. According to them, this, along with the lack of knowledge on what happens to waste, contributes to a lack of confidence and awareness among citizens.

The focus groups highlighted some significant clusters of barriers and concerns for managing waste appropriately. With respect to production and prevention, all focus groups repeatedly expressed concerns about the excessive use of plastic as well as cardboard and glass (for packaging, bags, etc.). Many participants said products are over-packaged. They laid the blame for this mainly with manufacturers who they felt should be more aware of pollution caused by packaging. Another common concern was the lack of consumer product information. Participants argued that not knowing which chemical materials are used in products makes them afraid that these might be particularly dangerous. Finally, some participants were also concerned about the 'planned obsolescence' of certain items.

With respect to dealing with waste in the household, a significant concern which emerged was the level of complexity of packaging. Participants said this makes it difficult for citizens to know how to recycle or sort the separate parts in domestic waste bins. A second barrier, mentioned by several participants, is the excessive accumulation of various bags in the house and of large quantities of waste. This is especially problematic for participants who live in small flats. The foul smell coming from organic waste bins was another concern, especially in municipalities where waste is collected only once a week. Concerns and barriers were also raised regarding the issue of not receiving clear information about how to sort waste in the house, which makes it difficult for participants to dispose of waste as required by their municipalities.

[14] Justice and Environment, 2011, 'Waste Management Planning: Spain. Legal Analysis'. Available at: http://www.justiceandenvironment.org/_files/file/2011%20waste%20plan%20ES.pdf

[15] European Environment Agency (2013). "Managing municipal solid waste - a review of achievements in 32 European countries" EEA Report No 2/2013

[16] Flash Eurobarometer No. 316 – The Gallup Organization (2011)

The disposal of waste also faces some relevant challenges. The lack of separate bins nearby was often seen as problematic, along with the lack of knowledge on where some items should be taken for recycling. When referring to the waste management in their local municipality, only in two cases were participants satisfied with how waste collection works in their area, stressing some positive aspects. This relates to findings from the Flash Eurobarometer survey showing that 87% of Spanish respondents think that more and better drop-off points for recyclable and compostable waste would convince them to separate more. A considerable part of the conversation on barriers and concerns focused on the need for more awareness and individual responsibility, as well as more effective action from public authorities. Finally, in all six focus groups, participants were concerned that waste management companies make profit from waste disposal, while citizens themselves do not benefit at all from waste, despite making great efforts to dispose of waste properly.

5.2 Ideas for achieving a 'zero waste society'

The results are divided into two main research domains, 'environmental sciences and technology' and 'policy, management and communication', which are each further divided into four categories.

In the first domain, ideas focus mainly on technologies for the effective use of waste and the increase of recyclable or 100% biodegradable packaging, in order to reduce the use of new resources. Consumers were the most prominent target group, along with waste management companies. In this domain, many ideas relate directly to the use which is made of waste, and they often refer to the possibility of generating energy (or fuel, or building materials) out of it. The proposed (bio)technologies in this direction, to help to sort and process waste mainly at the household level. Other ideas which were assigned priority relate to the creation of ICT technologies ('intelligent bins') capable of scanning or detecting the type of waste which is thrown away. These bins could be connected to the tax authorities to allow the implementation of a reward system for citizens who recycle.

Ideas in the second domain 'policy, management and communication' focused mainly on the introduction of regulations to reward producers and consumers who properly recycle. Another highly prioritised cluster of ideas in the domain concerns the introduction of standardised rules for packaging materials, obliging manufacturers to use more materials which are not damaging to the environment and which in general reduce packaging. Producers were perceived as a very important actor in achieving a 'zero waste society'. According to participants, they should be encouraged to use more functional design in order to prevent consumerism. As in the first domain, the main aims of these prioritised ideas were to foster behaviour change both in consumers and in producers.

More education and information for families and students about how to properly recycle, and why, was the most highly prioritised idea in the domain. According to participants, education on waste management should be delivered in a fun format and should be aimed at all levels (students but also adults). In some cases, the production of a TV series on the topic was proposed as an effective idea for raising awareness on waste management. Several participants also underlined sharing goods as an idea for local initiatives leading to behavioural change. Encouraging sharing would use fewer resources and produce less waste.

Of the three most highly prioritised ideas of all domains, the first by far is an increase in education and information for families and students about how and why to properly recycle (23 stickers). The second most highly prioritised idea comes under the category of bio(techno)logical ideas and is to generate energy from waste, by making use of bacteria or nanorobots that break waste down and turn it into petrol, for example (14 stickers). Two ideas share the third position (11 stickers): an affordable domestic recycling machine which can compress or transform waste into energy and new materials for domestic use; and financial incentives for producers and consumers to increase motivation for recycling.

5.3 Reflection

Most of the participants affirmed that they enjoyed participating in the focus groups and many thought they had learned something new. Unexpectedly, several of them claimed that discussing waste management and listening to other participants' ideas and opinions had made them aware that they should put more effort into properly separating waste at home. Participants felt that they had been able to express themselves and that their voices had been heard. Some of the participants were very interested in knowing how their input would be used by the European Commission and they explicitly referred to this during the discussions.

Annex

Annex 1: Full list of ideas for research and innovation, policy, management and communication

This table includes all ideas for research and innovation, policy, management and communication that emerged from the focus groups. For each research idea the research direction is mentioned, as well as the aim of the research and the proposed target group. In addition, the priority of the research idea as perceived by the participants is indicated in the tables, using stars to indicate the number of stickers assigned to a specific idea by the participants.

ENVIRONMENTAL SCIENCES AND TECHNOLOGY

Category	Idea	Aim	Target Group	Priority
Technical/ Physics/ Chemical/ Engineering	Affordable domestic recycling machine which can compress/transform waste into energy and new materials for domestic use	Convenience in the home/ Effective use of waste	Consumers	☆☆☆☆☆ ☆☆☆☆☆ ☆
	A waste-transforming machine on a community level which transforms waste into energy for households	Effective use of waste	Waste management companies	☆☆☆☆☆ ☆☆☆☆☆
	A 'mechanical pig'. A rubbish-eating robot, which converts waste into energy, fertiliser or fuel for cars and machinery	Effective use of waste/ Eliminate waste	Consumers/Waste management companies	☆☆☆☆☆ ☆☆☆
	Intelligent house/building which automatically sorts and recycles waste	Improve recycling/ Convenience in the home	Waste management companies	☆☆☆☆☆ ☆
	3D printers which consume a standardised material obtained from waste products and produce new products	Effective use of waste	Consumers/ Producers/ Waste management companies	☆☆☆☆
	Electrical household appliances which last longer and are easier to repair	Less waste production	Producers/ Consumers	☆☆
	Rubbish-eating robots, which are auto-alimented by the energy they produce from 'eating' waste	Effective use of waste/ Eliminate waste	Waste management companies	☆
	Recover energy coming from incineration, through a 'green pipe', to be used in sport centres, companies, etc.	Effective use of waste	Waste management companies/ Others	☆
	Less polluting or non-polluting forms of incineration of waste	Effect on planet	Waste management companies	☆
	Create a domestic black-hole (waste disappears into it)	Eliminate waste	Consumers	
	Create a self-sufficient house (which automatically manages waste, produces new items/energy out of it, etc.)	Improve recycling/ Convenience in the home	Consumers	
	Send waste (which can't be recycled/reused) to space	Eliminate waste	Waste management companies	
	A 'molecular splitter' to eliminate waste, which decomposes matter into atoms	Eliminate waste	Waste management companies	

	Teleportation of matter, from the point of production to the point of consumption, avoiding the distribution chain	Less waste production/ Less packaging	Consumers	
	Transformation of glass into jewellery and building materials	Effective use of waste	Waste management companies/ Producers	
	(Re)converting plastic into oil, to be reused	Effective use of waste	Waste management companies/ Producers	
	Creating a machine which transforms organic waste into animal food	Effective use of waste	Consumers/ Producers	
Material	Conversion of organic waste into biodegradable, reusable and building materials for construction	Effective use of waste/ Less use of resources	Waste management companies/ Producers	☆☆☆☆☆ ☆☆☆☆
	Functional/intelligent packaging, such as completely biodegradable containers and wrapping materials, or bags/envelopes made of self-degradable materials	Less packaging/ Less plastic/ Less waste production	Consumers/ Producers	☆☆☆☆☆ ☆☆☆☆
	One single type of material for all packaging, recyclable. Standardisation of materials and products, make waste management and recycling easier	Less packaging/ Improve recycling	Producers/ Consumers	☆☆☆☆☆ ☆☆☆
	Create better recyclable materials for packaging, with less effort and more efficient	Less waste production/ Less plastic	Producers	☆☆☆☆☆ ☆☆
	Everlasting material (recycled and recyclable)	Less waste production	Producers	☆
	Create unbreakable glass for packaging, which can be reused forever	Less use of resources/ Less waste production	Producers	☆
	Create material for packaging which 'magically' disappears after use	Eliminate waste/ Less waste production	Producers/ Consumers	
	More efficient materials for packaging, which require less packaging but provide the same features as actual packaging	Less packaging	Producers	
	Reusing/recycling tyres, by producing new materials which can be used in parks, roads, etc.	Effective use of waste	Waste management companies/ Producers	
	Edible packaging	Effective use of waste/ Less waste production	Producers/ Consumers	
Bio(techno)-logical	Generating energy from waste, by making use of bacteria or nanorobots that break down waste and turn it into petrol, or rubbish into fuel for the car	Less waste production/ Eliminate waste	Waste management companies	☆☆☆☆☆ ☆☆☆☆☆ ☆☆☆☆
	Bio-imitation (use organic waste to make biomass)	Effective use of waste	Waste management companies	

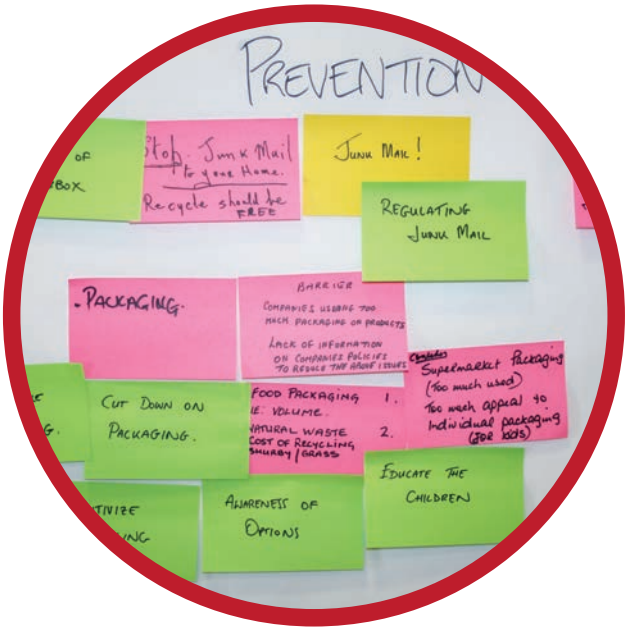
Bio(techno)-logical	Containers/bins that have bacteria inside, which do the job of breaking down rubbish	Effective use of waste/ Eliminate waste	Waste management companies/ Consumers	
	New materials which can replace normal food (e.g. pills), hyper-nutritious products	Less waste production	Producers/ Consumers	
ICT	'Chips' in the rubbish bags to be able to monitor a reward system for citizens who recycle	Behaviour change/ Improve recycling	Government/ Consumers	☆☆☆☆☆ ☆
	Intelligent waste collection containers/bins connected to the tax authorities (reward system to citizens who properly recycle), or capable of scaning/detecting the type of waste you throw away and 'reject' it if it is not properly sorted	Behaviour change/ Improve recycling	Government/ Consumers	☆☆☆☆☆ ☆
	Digitalising waste: a system of (digital) individual monitoring of the balance between purchase volume and the volume of recycled waste, linked to incentives and penalties	Improve recycling/ Behaviour change	Consumers	☆☆☆☆

POLICY, MANAGEMENT AND COMMUNICATION

Category	Idea	Aim	Target Group	Priority
Policy	Implement forms of reward for citizens who properly recycle, both for producers and for consumers. Financial incentives to increase motivation for recycling	Improve recycling/ Behaviour change	Consumers/ Producers	☆☆☆☆☆ ☆☆☆☆☆ ☆
	A standardised rule for packaging materials or one unique material for all packaging. Uniformity of packaging and manufacturing materials	Improve recycling/ Less packaging	Producers	☆
	Eliminating disposable products (glasses, plates, cutlery...)	Less waste production	Consumers/ Producers	
	Act on obsolescence of products: provide more information and transparency on the products lifespan, elimination of programmed obsolescence	Less use of resources	Producers	
	Governments should encourage research in order to optimise containers placement/waste management point in all towns	Improve recycling	Waste management companies	
	Promote ecological consumption, where packaging is completely removed/avoided	Eliminate waste	Government	
	Make outcomes of recycling more visible to improve motivation	Improve recycling/ Behaviour change	Government	
	Implement fines, i.e.: monitoring of rubbish for sanctioning citizens who don't recycle	Behaviour change/ Improve recycling	Producers/ Consumers	

	Economic incentives by making less contaminating products less expensive or by adding surcharges onto the products that do not use recycled/recyclable materials	Less waste production/ Less packaging	Government	
	Oblige companies not to bring out new products every few months, in order to reduce consumerism	Less use of resources	Producers	
	Legislation to oblige companies to produce less packaging and/or which incentivises them to use intelligent packaging	Less packaging	Producers	
Management/ Logistics	Ecological and sustainable products distribution system	Local production/ Less packaging	Producers/ Consumers	☆☆
	Use more functional design in order to prevent consumerism	Less use of resources/ Behaviour change	Producers/ Consumers	☆☆
	Changes in commercialisation: reduce packaging, ban plastic bags, reuse more	Less packaging/ Less plastic	Consumers/ Producers	☆
	Use more often materials that are not damaging to the environment	Effect on planet	Producers	☆
	Increase local commerce, adjustments in order to better fit supply with demand	Less waste production/ Less use of resources/ Local production	Producers	☆
	Selling products in individual/exact doses	Less waste production	Producers	☆
	More reuse of glass jars	Less waste production	Consumers/ Producers	
	Placing more resources for recycling nearby, not having to accumulate a lot of waste in the house	Improve recycling/ Convenience in the home	Waste management companies	
	Facilitate and increase recycling, increase and create new methods of recycling	Improve recycling	Waste management companies	
	A commitment from companies/producers to reuse packaging for different products	Improve recycling/ Less waste production	Producers	
Communication and education	Education and more information for families and students about how and why to properly recycle. New educational and prevention campaigns to raise people's awareness on the importance of proper separate collection/recycling	Awareness	Consumers	☆☆☆☆☆ ☆☆☆☆☆ ☆☆☆☆☆ ☆☆☆☆☆ ☆☆☆
	Education and prevention in a fun format aimed at all levels, e.g., visits to a recycling plant to see and learn how it works	Awareness/ Behaviour change	Consumers	☆☆☆☆☆ ☆☆☆☆☆
	Educating/informing through a TV series - 'Save me from Plastic'	Awareness/ Behaviour change	Consumers	☆☆☆☆☆
	Change of habits, i.e. reducing excessive consumption, raise awareness of environmental issues	Behaviour change Awareness	Consumers	☆☆☆

Communication and education	Influencing parents through their children, attending together sessions on recycling education	Awareness of possibilities and values/ Behaviour change	Consumers	☆
	Accessible and transparent information on recyclability of products and packaging. Information on which companies reduce their carbon 'footprint'	Awareness of possibilities	Producers/ Consumers	☆
	Informing citizens of what happens with what is recycled - examples of good practises	Awareness of possibilities	Waste management companies/ Consumers	
	Adapting habits from the past to fit our present life	Behaviour change/ Less packaging	Consumers	
	Provide more information about recycling, especially in villages	Awareness of possibilities	Consumers	
Local initiatives	Sharing goods. Behavioural change, encouraging sharing in order to use less resources and produce less waste	Less use of resources/ Behaviour change	Consumers	☆☆☆☆☆ ☆
	Family and urban vegetable gardens	Local production	Consumers	☆☆
	Making food at home (e.g. yoghurt)	Local production	Consumers	
	Encourage reuse, through, for example, local 'reuse shops'	Less use of resources	Consumers	
	More local production (e.g. roof gardens, less intermediaries, etc.)	Local production	Producers/ Consumers	
Other	Research into new/more alternative sources of energy (i.e. 'atomic car')	Effect on planet	Other	☆
	A group of experts to establish new legislation more respectful of natural cycles	Effect on planet	Government	



Annex 2: Attitudes of citizens from Spain towards resource efficiency

The data in this annex is based on the Flash Eurobarometer No. 316 - The Gallup Organisation (2011). The primary objective of the Flash Eurobarometer survey 'Attitudes of Europeans towards resource efficiency' (Flash No. 316) was to gauge EU citizens' perceptions, attitudes and practices concerning resource efficiency, waste management and recycling. In detail, the survey examined:

- citizens' perceptions of Europe's efficiency in its use of natural resources
- the amount of waste EU households produce and whether they separate that waste for recycling or composting
- preferred actions to improve EU households' and communities' waste management
- citizens' views on how to pay for waste management
- EU households' food waste production and preferred ways of decreasing that waste
- citizens' perceptions of the importance of a product's environmental impact when making purchasing decisions
- citizens' willingness to buy second-hand products and products that are made of recycled materials.

The survey obtained interviews - fixed-line, mobile phone and face-to-face - with nationally representative samples of EU citizens (aged 15 and older) living in 27 Member States. The target sample size in all countries was 1,000 interviews. Below we give the results from Spain.

Question	Answer	%	EU27 Average
Do you think Europe could be more efficient in its use of natural resources?	Yes	93%	87%
	No	3%	5%
	DK/NA*	4%	8%
Do you think that your household is producing too much waste or not?	Yes	52%	41%
	No	47%	58%
	DK/NA*	1%	1%
Do you separate at least some of your waste for recycling or composting?	Yes	88%	89%
	No	12%	11%
	DK/NA*	0%	0%
What initiatives would convince you to separate (more) waste?	More and better drop-off points for recyclable and compostable waste	87%	76%
	Improve separate waste collection at your home	75%	67%
	More information on how and where to separate waste	73%	65%
	Legal obligation to separate waste	60%	59%
	Taxes for waste management	29%	39%
What initiatives would improve waste management in your community?	Better waste collection services	82%	70%
	Stronger law enforcement on waste management	70%	65%
	Make producers pay for collection and recycling of waste	60%	63%
	Make households pay for the waste they produce	26%	38%
Which one would you prefer: to pay taxes for waste management or to pay an amount related to the quantity of waste your household generates?	To pay taxes for waste management	15%	14%
	To pay proportionally to the quantity of waste you generate	73%	75%
	DK/NA*	12%	11%

Which one would you prefer: to pay taxes for waste management or to include the cost of waste management in the price of the products you buy?	To pay taxes for waste management	19%	25%
	Include the cost of waste management in the price of the products you buy	63%	59%
	DK/NA*	18%	16%
Can you estimate what percentage of the food you buy goes to waste?	None	12%	11%
	15% or less	69%	71%
	16% to 30%	13%	13%
	More than 30%	5%	4%
	DK/NA*	1%	1%
What would help you to waste less food?	Better estimate portion sizes (how much food you cook) to avoid excess food	71%	62%
	Better information on food product labels, e.g. how to interpret "best before" dates, information on storage and preparation	69%	61%
	Better shopping planning by my household	70%	58%
	Smaller portion sizes available in shops	69%	58%
How important for you is a product's environmental impact - e.g. whether the product is reusable or recyclable - when making a decision on what products to buy?	Very important	47%	39%
	Rather important	38%	41%
	Rather not important	11%	12%
	Not at all important	3%	6%
	DK/NA*	1%	2%
Are you willing to buy second-hand products?	Yes	68%	68%
Base: all respondents, % of yes			
Would you buy the following products second hand?	Furniture	59%	56%
Base: all respondents, % of yes	Electronic equipment	53%	45%
	Textiles (clothing, bedding, curtains, etc)	29%	36%
What reasons prevent you from buying second-hand products?	Quality/usability of the product	50%	58%
	Health and safety concerns	54%	50%
	Less appealing look of the product	14%	25%
	Afraid of what others might think	2%	5%
Would you buy products made of recycled materials?	Yes	87%	86%
	No	10%	11%
	DK/NA*	3%	3%
What would be the most important factors in your decision to buy products made of recycled materials?	Quality/usability of the product	51%	51%
	Environmental impact of the product	28%	26%
	Price of the product	18%	18%
	Brand/brand name of the product	1%	2%
	DK/NA*	2%	3%
What prevents you from buying recycled products or products containing recycled materials?	Health and safety concerns	29%	44%
	Quality/usability of the product	57%	42%
	No clear consumer information on the recycled product	33%	32%
	Less appealing look of the product	5%	17%
	Afraid of what others might think	0%	5%

*Abbreviation DK/NA = Don't know / No Answer

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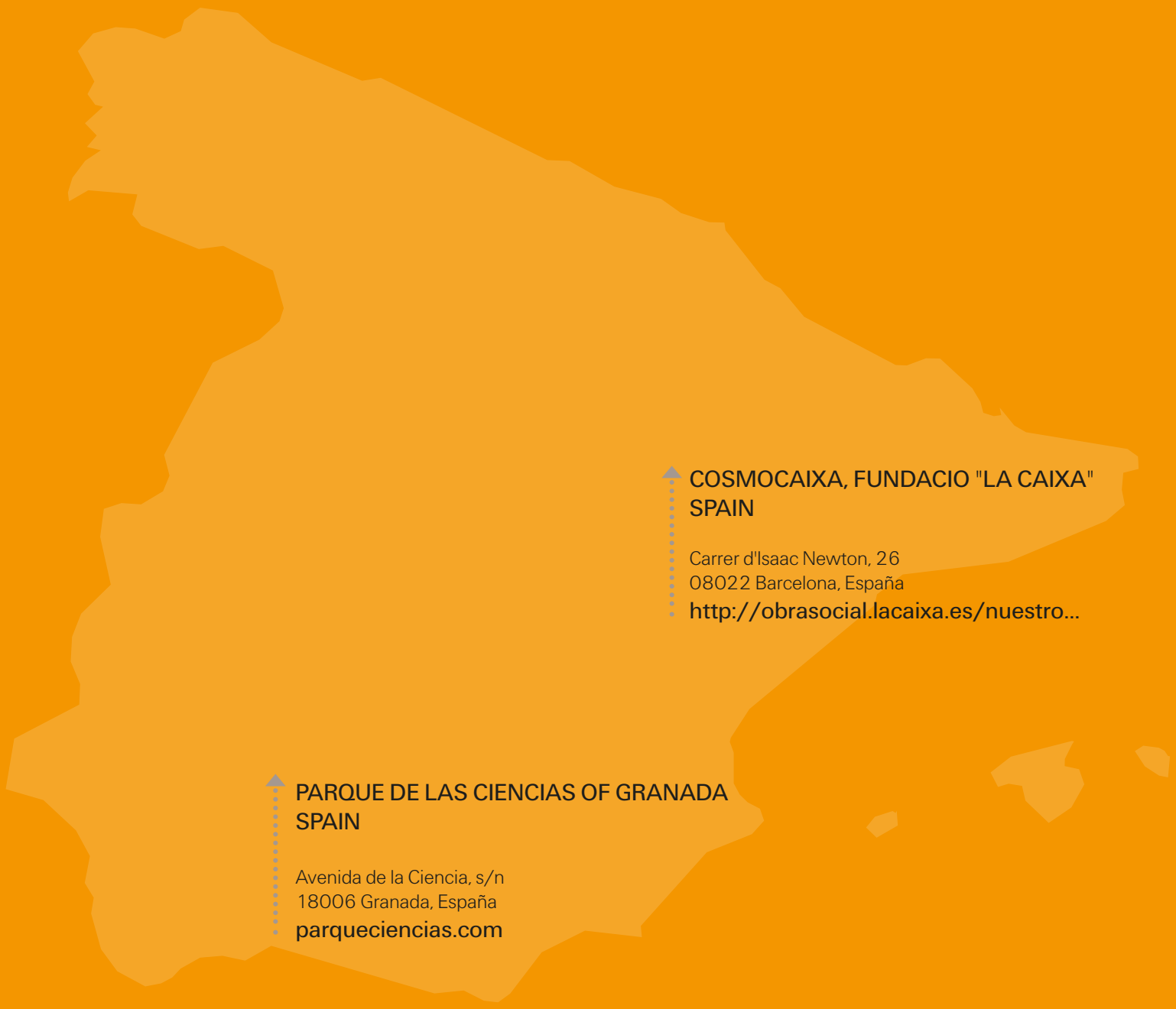

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VOICES, CITIZEN PARTICIPATION IN SOCIAL INNOVATION

VOICES is a Europe-wide citizen consultation process, led by Ecsite, the European network of science centres and museums, which helps set the agenda for the environmental research dimension of Horizon 2020 - the European Union's strategy to advance research and innovation.

VOICES represents a valuable insight on methods and procedure for engaging citizen participation to inform Europe's Responsible Research and Innovation framework. Focus groups, academic analyses of public consultations and dissemination of results will lead to an effective method through which to consult the public on science and technology related issues.

VOICES is engaging citizens in 27 EU countries through science centres and museums - all of which are expert, impartial and powerful partners in public engagement with science as members of Ecsite.

One thousand European citizens have joined VOICES focus group discussions on innovative uses and solutions for urban waste. The outcomes of this European consultation process are presented in the VOICES Reports Collection.

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