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Views, Opinions and Ideas of Citizens in Europe on Science

COUNTRY REPORT DENMARK

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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, analysing 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 Denmark, 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

DENMARK

3. Country relevant data - Denmark

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, Denmark is one of the smaller EU countries with over 5.5 million inhabitants. Most inhabitants are spread over rural areas (42%), urban areas (22%) and intermediate areas (36%).

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

		2011	
Population at 1 January		5 560 628	
Population as percentage of EU27		1.1%	
Gross Domestic Product (PPP)		31 500 Euro	
Population urban-rural typology	Urban	1 210 000	22%
	Intermediate	2 002 000	36%
	Rural	2 349 000	42%

3.2 Factsheet on waste

The amount of municipal waste generated and treated in Denmark is considerably higher than the average amount of waste treated in the EU27. Denmark ranks 7th on the EU27 ranking list on Municipal Solid Waste Recycling (MSW). Denmark was close to 50% recycling of MSW in 2009. However, the recycling percentage decreased from 2009 to 2010, because of which it will require an increased effort to reach the EU Waste Framework Directive's target to recycle 50% of MSW by 2020.[9]

Table 3.2 Municipal Waste[10,11]

		Denmark		EU27 average	
Municipal waste generated (kg per person)		673 kg		502 kg	
Municipal waste treated (kg per person)		673 kg		486 kg	
Municipal waste treated	Landfilled	20 kg	3%	185 kg	38%
	Incinerated	370 kg	55%	107 kg	22%
	Recycled (material recycling)	155 kg	23%	122 kg	25%
	Composted (organic recycling)	128 kg	19%	73 kg	15%

3.3 Composition of the focus groups

In Denmark three focus groups (FGs) took place in the weekend of 6th April 2013. They were held in Copenhagen at the science centre Experimentarium, moderated by Anette Nielsen, Learning Consultant.

In total, 30 people (14 male and 16 female) participated in the three FGs. The age of the participants ranged from 18 to 66 years. 10 participants were aged between 18 and 35, 10 between 36 and 50 and 10 were aged 51 or over. 23 participants had high levels of education, 3 middle level and 4 had low levels of education. 17 participants were working, while 2 were unemployed, 7 were retired and 2 were students. 13 participants live in a house and 17 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

		FG1	FG2	FG3	TOTAL
Participants	Total	10	10	10	30
Gender	Male	4	5	5	14
	Female	6	5	5	16
Age	18 - 35	10	0	0	10
	36 - 50	0	10	0	10
	50+	0	0	10	10
Education	High	6	9	8	23
	Medium	2	1	0	3
	Low	2	0	2	4
Employment	Unemployed	1	1	0	2
	Employed	5	9	3	17
	Retired	0	0	7	7
	Student	4	0	0	4
Housing	Flat	9	3	5	17
	House	1	7	5	13

[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)

4. Results

This chapter describes the overall results of all focus groups held in Denmark. 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 category, 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.[12]

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

All participants indicated they separate waste at household level. They described the following waste streams (a waste stream is defined as one type of waste that is collected separately covering the majority of their household waste): cardboard, paper, plastic, glass, metal, green waste and residual waste. Residual waste goes in the general bin, and includes waste that does not fall in any of the other waste streams mentioned above. In one focus group, the participants mentioned they put cans together with the residual waste in the general bin because there is no separate container for cans. The participants said they buy or receive bags from the town council to separate their waste. The waste bags are thrown in communal containers in the neighbourhood. The number of communal containers differs from one neighbourhood to the next. Some participants mentioned there are three containers for paper, organic waste and residual waste. Other participants explained they have containers for glass, cardboard and batteries too.

The housing situation of the participants influences their household waste management. Flats usually have communal containers or sheds on the ground floor that are only accessible to residents. The number of containers and sheds per flat differs according to the area.

> *"Yes, there are some electronic devices, which are put in a shed where I live, and then someone from the Municipality of Copenhagen comes, and collects it and leaves [...] I think someone comes every other month or something like that." (Denmark FG 1, P 7)*

Other participants who also live in flats mentioned that they have a rubbish chute for their residual waste. The

[12] 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.

caretaker places the waste bags from the rubbish chute in one big container which gets collected once a week. The participants who live in houses either bring their waste bags to the communal containers or to the recycling centre. In one focus group, the participants mentioned they place their bags with residual waste on the side of the road.

4.1.2 Waste collection

The participants separate their waste and throw it in communal containers which are often near their houses. The containers are emptied once a week or fortnightly by the town council. Glass without a deposit is thrown in bottle banks, while bottles with a deposit are brought to the shop in return for money. Garden waste can be placed on the side of the road and is collected once a month.

Some of the participants mentioned they take all their waste to the recycling centre and separate it there in communal containers. Clothes and shoes are either brought to the recycling centre or to containers of charity organisations. Garden waste can also be brought to the recycling centre as explained by the following participant:

> *"And the garden waste, we drive that out next to the recycling station and it gets unloaded and then it either gets composted or, on site where you can then pick it up again as compost." (Denmark FG2, P8)*

Some participants mentioned they only bring their bulky waste, electronic devices and furniture to the recycling centre. At the recycling centre, there is a special place where you can leave bulky waste, like furniture, that other citizens can take away and reuse. Other participants place their bulky waste on the side of the road where it gets collected. In other recycling centres, waste that can be reused is taken away by charity organisations or second-hand shops. The participants bring their medicines to the pharmacy.

4.1.3 Knowledge about waste pathways

The majority of the participants had no knowledge about the waste pathways after disposal. However, in several focus groups, the participants assumed residual and food waste is incinerated. Several older participants knew that incineration of residual waste produces energy which is used for heating. The participants thought paper, cardboard and glass are either recycled or reused. One of the participants believed some parts of electronic waste are recycled and some are destroyed. Another participant mentioned:

> *"Yes, batteries go to some place or other where they do no harm anyway. I don't think you can, I don't know if they can be recycled. I don't actually know." (Denmark FG3, P5)*

All participants were aware that garden waste can be turned into compost and used for the garden.

4.1.4 Waste management behaviour and convenience

The participants felt the waste management system was convenient and easy. A few participants expressed they are very pleased with the recycling centre.

> *"Yes, because we have only one kilometre [to go] to such a fine recycling centre. Now we have our holiday home where you can just drive around and then, like, come out and deliver things." (Denmark FG3, P9)*

One of the participants mentioned the local council of Copenhagen informs citizens quite well, distributing information and instructions on how to sort waste. Another participant explained they had some small boxes in the shed for separating waste which filled up quite quickly. When the waste management companies noticed this, they replaced the small boxes with large boxes. Quite a lot of participants said that they recycle and were of the opinion that other citizens use the waste management system as intended by the town council.

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

When talking about waste prevention and production, many barriers and concerns regarding overconsumption were mentioned. In all the three focus groups, the participants discussed their concerns regarding the increase in consumption that results in more waste:

> *"Our consumption is enormous and it's growing all the time. And it's as though, there isn't really anyone who considers, what are we going to do with the by-products?" (Denmark FG3, P2)*

In two focus groups, the participants explicitly discussed the current trend among consumers to own the newest mobile phones and televisions. According to the participants, this will lead to more waste because old mobile phones and televisions are thrown away and replaced by smart phones and flat screen televisions.

In another focus group, the emphasis was placed on overconsumption of food products. One of the participants blamed the supermarkets because they buy too many products which they cannot sell and have to throw the remainder away. The participants who lived alone also blamed supermarkets for overconsumption because products are cheaper if you bulk buy as illustrated in the following quote:

> *"[...] Because I live alone and that means that there are often those offers with ten bananas for 15 Kroner [1 Kroner is roughly equivalent to 0.13 Euro] but I can't manage to eat ten bananas, or buy 20 apples for ten Kroner. It's just because you can't buy one or two apples and get a discount on them. You have to buy ten or twelve or a big pack of something, which you then can't manage to use up." (Denmark FG2, P2)*

Some other participants agreed and mentioned that living alone and buying individual portions of food is very expensive. Therefore, they buy larger amounts of food which they eventually have to throw away because they cannot manage to eat it all. Two other participants believed it is not only the supermarkets who are to blame but also the consumers. For instance, consumers throw away leftovers and food products, even before the expiry date. Furthermore, consumers want to go to a supermarket where the shelves are full.

> *"You want to be able to choose whether to buy cutlets of one or another or a third kind or sausages or whatever, because you chose to come five minutes before closing time. So the shop has to have what you're going to choose. Otherwise we stop shopping there." (Denmark FG2, P8)*

Another concern which was raised in two focus groups was the amount of packaging material. The participants mentioned that food products are unnecessarily packed with plastic and paper.

> *"Well, if you are going to buy apples. More and more of it is packaged, pre-packed with ten apples in a plastic container or in a cardboard container covered in plastic instead of it laying in one big box where you could then take 10 apples and put them in a paper bag for example, you know?" (Denmark FG3, P8)*

4.2.2 Waste management in the household

Although many participants said they recycle at home, they still face some barriers and concerns with respect to disposing of their waste appropriately. One of the participants mentioned there is only one container in the courtyard. Even if he makes the effort to sort his waste correctly at home, it will end up in one container.

Another participant found the recycling of glass inconvenient, as illustrated by the following quote:

> *"But the recycling of cans and glass, I rebel a little against, as I waste way too much water and cleaning on them before I can put them in that recycling place because they have to be cleaned." (Denmark FG3, P3)*

Another barrier that was mentioned was related to packaging in the household. One of the participants considered that as soon as packaging becomes waste, it takes up an enormous amount of space in the house. According to him, the volume of packaging is hard to deal with at home.

An important barrier to separating waste is a lack of information among citizens. In all focus groups, the participants believed citizens have too little knowledge on how to sort their household waste properly. One of the participants experienced difficulties with getting rid of hazardous and chemical waste, like paint pots. He had to put a lot of effort in finding out what to do with this kind of waste and where to bring it. The consequence of this lack of knowledge is that citizens do not sort their household waste correctly, there is a higher risk that citizens will throw their waste in the general bin, as illustrated by the following quote:

> *"[...] But sometimes I think that waste is handled incorrectly because people don't know that they maybe should be handling it differently, that is tossing deodorant cans in the waste bin or not sorting the carton so that it ends up with the domestic trash and stuff, because people don't know." (Denmark FG 1, P 7)*

Another participant agreed and mentioned that, in his apartment complex, citizens throw batteries, cardboard, newspapers and food waste all in the same bin. Furthermore, the participants discussed the value of sorting waste when not everyone sorts.

> *"What good does it do then if I stand there sorting it all out and my neighbour just drives everything off to the incineration plant?" (Denmark FG2, P8)*

4.2.3 Waste disposal and pathways

Participants mentioned a number of flaws in the waste management system that keeps them from dealing with their waste properly. One of the participants experienced the distance to the recycling centre as a barrier. Citizens without a car, or who are unable to go to the recycling centre because of physical illness, have to keep their bulky waste inside the house until the waste management companies come to collect it. Bulky waste is picked up once a month, which means that some citizens have to keep their waste inside the house for a whole month. Another participant mentioned that containers for glass, paper and aluminium disposal are only to be found in the shops. After work, this participant goes directly to the shop to buy groceries but, at that moment, is not able to take his waste bags along. This often leads to putting glass, paper and aluminium in the general bin with the residual waste.

Two participants experienced some inconveniences regarding the waste management system. One of them explained the containers get full quite quickly.

In one focus group, the participants worried about the lack of a common deposit system on bottles and cans in the European Union. For example, when citizens buy bottles or cans in another country, they cannot get their deposit back in their own country. The risk is that these bottles are thrown in general waste bins. In addition, one participant believed all bottles and cans should have a deposit. Citizens are more likely to bring back their bottles and cans if they receive money in return.

Another concern raised by one of the participants was about the disposal of clothes. She has moved several

times and, in each town, the disposal of clothes was organised differently. In one town, there were only clothing containers, while in another town they had a lot of second-hand shops. She heard a lot of stories about communal containers that were broken open and the clothes were stolen. According to her, the system should be harmonised and there should be second-hand shops in every town. Another participant agreed and believed everyone should have access to the same facilities for sorting. In addition, the participants talked about the differences in waste management systems between provinces and countries. One of the participants explained that some provinces do not sort waste but put everything together in one container. According to another participant, Denmark has a fairly good waste management system where a minimum amount of waste is going to landfill. However, he worried about other countries where everything goes to landfill. He wondered what the value of sorting is if some countries are still bringing all their waste to the incinerator or to landfill.

In all focus groups, many concerns were raised about what happens to waste. Participants wondered if their actions really make a difference. They expressed the belief that even after they put all their effort into recycling, all the waste will end up together.

> *"In the municipality where I lived before, well things got sorted, but again there was only one truck to collect everything. And it didn't look as if it was compartmentalized which makes you think 'why sort, then?'" (Denmark FG 1, P 1)*

Participants often mentioned they put effort in sorting but hear stories about all waste being thrown together in the incinerator. One of the participants thought incinerators are able to separate metal from other sorts of waste. He would like to know how much it matters if other waste ends up in the general bin and goes to the incinerator:

> *"[...] Does it matter that the cans get mixed up with the residual waste?" (Denmark FG3, P 10)*

In one focus group, the participants elaborated on the fact that citizens are self-centred and do not pay attention to the disposal of waste. One of the participants believed waste is often thrown in the wrong bin because citizens live in a busy society where there is no time to sort. According to him, citizens often place their waste next to the container because they are in a hurry. Another participant noticed that citizens who live in cities have become too lazy; they often dump their waste on the street while there is a container just a few metres away.

There were some participants in different focus groups who expressed concerns about the polluting effects of waste. One participant mentioned that the population is growing and prosperity is increasing which will lead to more waste. He expressed his concern that consumers might use up all the resources because we do not recycle and reuse enough. At a certain point, the earth cannot contain all the waste we produce. Another participant was worried about the export of waste to Africa and Asia, where it pollutes. She explained an example of a landfill in Ghana where computers were found that came from Denmark. Another participant agreed and mentioned that we produce more waste in Western countries than in developing countries.

Another concern raised was the disintegration of plastic which causes pollution and harms the environment. The participants believed it is difficult to avoid plastic because it is used for everything. They believe plastic pollutes the atmosphere. Another participant was worried about the pollution of groundwater by pesticides. One of the participants explained that if landfills are not constructed properly, there is a risk of releasing methane gas which can cause an explosion. Another participant worried about the number of trucks that drive waste to landfills and thereby release CO_2. The CO_2 emission was also often mentioned in the context of incinerators. The participants believed the fumes produced by the incinerator contain pollutants and CO_2. These fumes are released into the atmosphere and affect the groundwater.

> *"And pollution is caused by incineration, even though you clean things to the best of your ability. So there will, if nothing else, be a CO_2 spill. And that is also a type of pollution." (Denmark FG3, P5)*

One of the participants believed incineration of waste also contributes to climate change.

Lastly, one of the participants worried about the lack of information labels on products like detergents. She would like to be able to control what kind of chemicals the product contains and whether they pollute the environment.

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

In general, technical innovations related to the effective management of waste in the household were mentioned quite often (see Table 4.3.1). Most of the proposed machines sort or compress waste.

In all focus groups, the participants proposed the development of machines to make more effective use of waste. One of the ideas that received high priority was a household machine in which waste can be inserted and something usable is produced. The participants did not elaborate on what kind of usable products they would like to get out of the machine. However, they were excited about this idea because they would not have to depend on waste collectors anymore.

Another idea which aimed to make more effective use of waste was discussed in one focus group. The participants proposed more research on how to make better use of waste:

> *"We know that it's possible to make biogas from some of the things we burn, but there must be lots of other possibilities that researchers haven't discovered." (Denmark FG3, P5)*

In addition, some of the participants mentioned that incineration of waste could also be used to produce heating or cooling.

Another idea was to use food waste as fuel for the car. However, the participants did not elaborate on this idea any further.

One of the ideas was aimed at using farm waste for other purposes, as explained in the following quote:

> *"Re-steam the water so it comes out as district heating and the dry materials can be used as fertiliser afterwards. Then you would be free from going out and buying all that expensive inorganic fertiliser." (Denmark FG3, P 1)*

The underlying reason for this idea was to make more effective use of waste and stop farmers buying inorganic fertiliser which pollutes the environment.

In one of the focus groups, the participants came up with an idea about cordless power. They would like to have devices which are able to recharge without wires and batteries. According to the participants, this idea is feasible and would lead to less waste production.

In one focus group, the participants came up with two ideas about household machines. The first idea was developed with the aim to make more effective use of household waste. The participants imagined that all organic waste could be ground in a machine and the remnants could be used as compost for the garden. Another group of participants had the same idea. However, they would like the machine to be able to crush non-organic waste, and flush it away into the sewage system. In another focus group, the participants also came up with the idea of developing a system to flush waste into the sewage system. After the waste has gone through the sewage system, it should be recycled or turned into biogas. The participants perceived this idea

as convenient because they could throw all their waste down the sink and would not have to worry about waste separation or collection.

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	Develop a household machine that turns waste into something usable	Effective use of waste	Consumers	☆☆☆☆
	Research to find out how incinerated waste can be utilised more effectively	Effective use of waste	Consumers/ Waste management companies	☆☆☆☆
	Devices that can be recharged without wires and batteries	Less waste production	Producers/ Consumers	☆☆☆
	Use food waste as fuel for the car	Effective use of waste	Consumers	☆☆
	Develop a system where waste can be flushed with water in the sewage system and be recycled into biogas	Effective use of waste/ Convenience in the home	Consumers/ Waste management companies	☆
	Develop a household machine to grind organic waste and turn it into compost for the garden	Effective use of waste/ Convenience in the home	Consumers	☆
	Develop a household machine to grind waste so it can be flushed away into the sewage system	Convenience in the home	Consumers	☆
	Develop a technology so farmers can transform their waste into biogas instead of buying inorganic fertiliser	Effective use of waste/ Effect on planet	Consumers	☆

MATERIALS

A second category related to the domain of 'environmental sciences and technology' contains ideas that focus especially on the 'material' dimension (see Table 4.3.2). These ideas generally involve research into or development of new materials with certain characteristics that are thought to reduce waste. Reducing use of plastic is an important aim, often associated with effective use of waste.

In two focus groups, ideas were mentioned that focused on the development of new packaging material. The participants would like to reduce the amount of plastic by developing packaging that is organic and biodegradable. Organic materials are favoured by the participants because they decompose in nature.

Biodegradable packaging could be used for cigarette packets and pizza boxes, as illustrated by the following quote:

"[...] And then there is a pizzeria which for example has biodegradable pizza boxes because they often get left behind in parks." (Denmark FG 1, P8)

The participants believe that it is important that manufacturers are motivated to develop biodegradable packaging and that consumers receive more information about the value of biodegradable packaging.

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

Category	Idea	Aim	Target Group	Priority
Material	Develop organic packaging	Less plastic/ Effect on planet	Producers/ Consumers	☆☆☆☆
	Develop biodegradable packaging	Less plastic	Producers/ Consumers	☆☆

BIO(TECHNO)LOGY

The third category in the domain of 'environmental sciences and technology' is concerned with bio(techno)logical ideas (see Table 4.3.3). These ideas focus on biological processes and organisms. One idea was mentioned and prioritised in this category with the aim of making more effective use of waste. In one focus group, the participants discussed the possibility of creating bacteria that break down non-organic material to yield oxygen and hydrogen. One of the participants prioritised this idea because of the long-term consequences of waste disposal:

"Well, right now it doesn't make a big difference, but we have to begin somewhere, in order to get to the point where we no longer have waste, [...] so I was thinking that it actually sounded like a good idea, if one could make a bacteria parasite or whatever to do it." (Denmark FG 1, P9)

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	Create bacteria that break down non-organic material and provide oxygen and hydrogen in return	Effective use of waste	Producers	☆☆☆☆

4.3.2 Policy, management and communication

POLICY

Ideas related to legislation and financial incentives were abundant in all focus groups. These are grouped in the category 'policy' (see Table 4.3.4) and were generally aimed at improving recycling. The target group mentioned by the participants was the government who had to develop appropriate legislation for consumers and producers.

One of the ideas that received highest priority, and was elaborated upon in three focus groups, was to introduce one common European deposit system to improve recycling.

"For example, when we're talking about deposit systems, I mean, if I buy a can in Germany, France, Sweden, Italy or for some reason or other it wanders back to Denmark, I should be able to dispose of it in Denmark." (Denmark FG2, P4)

The participants were annoyed that they could not return bottles from other countries in Denmark and receive a deposit in return. They believed that a Europe-wide deposit system could be the solution. The participants discussed the feasibility of this idea and believed some differences between countries have to be solved before this idea can be implemented:

"Because it presupposes that other countries will have similar bottles and same fabulous barcode system, and machines in the supermarkets [...]." (Denmark FG 1, P8)

The participants discussed the main foreseen difficulties in achieving a Europe-wide deposit system. For instance, once a bottle is bought across the border and returned in Denmark, the store in Denmark has to return the deposit while the deposit was paid in another country. One of the proposed solutions was to link the deposit to the barcodes and connect the barcodes to stores. The deposit paid by the consumer would then be transferred to the store where the deposit is returned. One of the participants mentioned he does not foresee any problems with a European system because it is already possible to buy clothes from H&M, an international clothing retailer, in one country and return them in another country. The participants believed the system should be easy to use or bottles will be thrown away on the street. They believed this idea would be very effective because citizens already use the deposit system. Furthermore, the participants in two focus group discussed the possibility of expanding the European deposit system so that not only glass and bottles can be returned but also jars, plastic and packages.

"So that it's not just about bottles and cans but actually, everything. If you wrap some plastic around a joint of beef, well that plastic has to be disposed of somehow or the other and you should actually have to pay a deposit for that." (Denmark FG3, P 1)

Other participants agreed and mentioned that televisions, mobile phones and other products should also have a deposit. They believed this will increase the motivation to recycle products, instead of disposing of them. However, the consumers should receive an incentive which is significant enough to motivate them to bring back the packages and products to the shop.

"[P 1] The deposit should not just be 50 pence [half a Kroner]. It should be something you can feel.
[M] Do we agree about that? That you should be able to feel it?
[P 1] Yes.
[P4] I think that one Kroner for a bottle, it doesn't mean anything." (Denmark FG3)

The participants in one focus group discussed that research should be focused on the development of environmentally friendly and sustainable technologies for waste disposal. One of the participants believed that if these technologies are developed, they might not be used because they are too expensive. Another participant agreed and came up with the following idea:

"The EU must create some kind of incentive structure that makes it worthwhile [...] to develop them and to use them." (Denmark FG2, P5)

The participants believed that making these technologies cheaper or providing financial incentives will increase the use of environmentally friendly and sustainable technologies.

The participants in another focus group emphasised the focus of manufacturing products should shift towards recycling and reusing products:

"From our point of view, what once has been waste must be cheaper to use in the new products." (Denmark FG 1, P 1)

The participants suggested that a minimum percentage of the product should contain recycled material. The aim of this idea was to make less use of resources and improve recycling. They indicated government or EU subsidies are necessary for implementing this idea. However, one participant believed researchers should receive money upfront to find out how to make reuse and recycling of material less expensive. To motivate the use of recycled products, consumers and manufacturers should receive a financial incentive. It should be less expensive for manufactures to use recycled material than to buy new material. In addition, consumers should also be motivated to buy products which are made of recycled material, as illustrated by the following quote.

"When you buy something that has been properly manufactured, and something that has been eco-friendly produced. So there should be a carrot in the shape of that could be cheaper." (Denmark FG3, P2)

The participants believed that consumers will be more likely to buy these products if they are less expensive.

In this focus group, the participants came up with the idea of developing biodegradable packaging. In order to achieve this idea, manufacturers should receive a financial incentive. The financial incentive will motivate manufacturers to use biodegradable packaging material instead of using packaging material that pollutes the environment.

"Well, there is no doubt that people, or not people, let me say the manufacturers, are dependent on finances. We are a society where, unfortunately, finances play a greater role than nature." (Denmark FG 1, P8)

Another idea, aimed at improving recycling and behaviour change among consumers, was to provide financial incentives for sorting waste and delivering it to the recycling centre.

"We would like people to get paid when they come and deliver their rubbish, actually." (Denmark FG3, P2)

The participants believed that when citizens are paid for bringing their waste to the recycling centre, they will not throw their rubbish on the streets or in the woods anymore.

One final idea that came up in one focus group was to develop a European law on how products should be packaged. The aim of this idea was to reduce plastic and over-packaging.

"[...] It should just be a common EU law on what our packaging should look like, for example, that, you don't pack them in both a bag and a cardboard box, or that you don't use a cardboard box, a plastic box and then seven plastic bags." (Denmark FG2, P2)

The participants would like to avoid unnecessary packaging and believed a law could be the solution. European standards on packaging should be developed and implemented.

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

Category	Idea	Aim	Target Group	Priority
Policy	Legislate a common European deposit system and expand it with other products, like jars, plastic and packaging	Improve recycling	Government/ Consumers/ Producers	☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆
	Environmentally friendly and sustainable technologies should be less expensive	Effect on planet/ Improve recycling	Government/ Producers/ Consumers	☆☆☆☆☆☆☆
	It should be less expensive for manufacturers to use recycled material instead of buying new material	Less use of resources	Government/ Producers	☆☆☆☆☆☆
	Products produced in an eco-friendly way should be less expensive	Behaviour change	Government/ Consumers/ Producers	☆☆
	Provide a financial incentive to manufacturers who use biodegradable packages	Less plastic	Government/ Producers/ Consumers	☆☆

Develop European standards on how products should be packaged	Improve recycling/ Less plastic	Government/ Producers/ Consumers	☆☆
Provide a financial incentive to consumers for sorting waste and bringing it to the recycling centre	Improve recycling/ Behaviour change	Government/ Consumers	☆

MANAGEMENT AND LOGISTICS

'Management and logistics' is another category in the domain of 'policy, management and communication' (see Table 4.3.5). Many of the aforementioned ideas require a certain number of managerial and/or logistical changes, and some ideas have this as their primary focus.

One of the ideas discussed in all focus groups was to organise production processes so it is practical and economically feasible to reuse all components of a product.

> *"But if you can organise the production itself so that everything can be dismantled, stripped down and recycled." (Denmark FG3, P 10)*

Examples like dismantling clothes and reusing the fibres were mentioned. According to the participants, manufacturers should be held accountable. One of the participants mentioned that reusing and recycling all components of a product is better than sending all the waste to developing countries. The participants believed that more research is necessary to find out how all components of a product can be recycled.

Another idea was aimed at reusing products instead of recycling. According to the participants, there are many products that cannot be recycled but can still be reused.

> *"We can reuse more than we can recycle [...] take a beetroot jar, we don't recycle them, we reuse them." (Denmark FG2, P8)*

According to the participants, society should work towards more opportunities and alternative methods for reusing products, instead of recycling them.

A final prioritised idea in this category was to create a rubbish sorting system under the sink in every house. One of the participants knew that this under-the-sink sorting system has already been invented in Sweden. Therefore, he suggested it should be implemented in Denmark. According to the participants, this system would lead to more convenience in the house.

Table 4.3.5 Ideas within the category 'management and logistics' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Management/ Logistics	The production process should be organised in a way that all components from a product can be recycled	Improve recycling	Producers	☆☆☆
	Work towards alternative opportunities for reusing products instead of recycling them	Less use of resources	Consumers/ Producers	☆☆
	Locate an under-the-sink rubbish sorting system in every house	Convenience in the home	Consumers	☆

COMMUNICATION AND EDUCATION

In two focus groups, the participants came up with ideas that were focused on education and information. These ideas have been grouped in the category 'communication and education' (see Table 4.3.6). Raising awareness and bringing about behavioural change are the most common aims in this category. The participants felt that motivation for waste management is achieved via information and education.

Education should be focused on how to sort waste. One of the participants specifically mentioned that education should start at an early age to achieve long-term effects. The participants in another focus group were also of the opinion that education should be aimed at children.

> *"I'm thinking to get this all started much earlier and focus on it, because it's important that the next generations know how to sort their trash." (Denmark FG 1, P8)*

A remark was made by one of the participants that information and education are not enough. Citizens also need to be motivated to change their behaviour regarding waste management.

The second idea prioritised in this category was discussed in one focus group. The participants indicated that education in schools should be focused on reusing waste. Ideas included taking school children to recycling centres and making effective use of waste during craft lessons, as illustrated by the following quote.

> *"You might as well go to the school with old fabric for the crafts classes and things you don't need anymore." (Denmark FG 1, P8)*

The participants believed this idea is feasible and easy to implement.

In one focus group, the participants would like to have labels on each product that indicate how it should be sorted for recycling. They considered that this would lead to an increase in recycling behaviour.

> *"I mean, so sorting becomes easier, that you can immediately see on things where they ought to go." (Denmark FG2, P8)*

Table 4.3.6 Ideas within the category 'communication and education' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Communication and education	Provide information and education on waste management	Awareness/ Behaviour change	Consumers	☆☆☆☆☆☆
	Education in schools should be focused on reusing products	Awareness of possibilities	Consumers	☆☆☆☆
	Provide a label on each product that indicates how it should be sorted	Improve recycling	Consumers/ Producers	☆☆☆

OTHER

Some ideas that were put forward in the focus groups did not fall in any of the categories mentioned above (see Table 4.3.7). These ideas were developed with the aim to reduce pollution of the environment.

One of the ideas that was prioritised was to do more research on renewable forms of energy, like solar power or fusion energy. Another idea that was mentioned in one focus group was to make more use of carpooling to reduce the amount of CO_2 emission. In addition, the participants noticed that a lot of small trucks are being used for the transport of goods. They suggested to make more use of larger trucks to reduce CO_2 emissions.

Table 4.3.7 Ideas within the category 'others' that received priority, ranked accordingly

Category	Idea	Aim	Target Group	Priority
Other	Research on renewable energy	Effect on planet	Consumers	☆☆☆☆
	Use larger trucks to transport goods to stores, make more use of carpooling	Effect on planet	Consumers/ Producers	☆

5. Conclusion, discussion and evaluation

This country report presents country-specific findings from citizen focus groups in Denmark. 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. In Denmark three 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 Denmark. 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

Denmark ranks 7th on the EU27 ranking list on Municipal Solid Waste Recycling (MSW). The country had almost achieved 50% recycling of MSW in 2009. However, the recycling percentage decreased over the 2009-2010 period. The main reason for this seems to be the change in scope of municipal waste, due to new regulations on recyclable waste from enterprises. It will require an effort to reach the 50% recycling level by 2020. Prior to 2001, Denmark took several initiatives to increase recycling, including a landfill ban, a landfill and incineration tax and separate collection schemes. The effectiveness of these initiatives is clearly visible in the management of waste at household level as described by the participants. Many participants indicated that they separate their waste at home and bring it to the recycling centre or to communal containers.
This is in line with findings from the Flash Eurobarometer survey 'Attitudes of Europeans towards resource efficiency'[13] in which almost all respondents from Denmark indicated that they separate at least some waste (see Annex 2). The focus groups results showed that the majority of the participants know what is expected of them at the household level. However, knowledge about what happens to waste after collection is very limited. Some assume residual and food waste is incinerated, while paper and glass is thought to be recycled. The results showed that the participants are aware that Denmark is doing quite well regarding the recycling of waste, but they were concerned about other countries that are still bringing all their waste to landfill.

During the focus groups, large clusters of barriers and concerns for handling waste appropriately could be distinguished. When talking about production and prevention, the participants in all focus groups expressed their concerns regarding the increase in consumption that results in more waste. The increase in consumption was related to buying new devices, like mobile phones and flat screen televisions. The participants were specifically worried about the amount of food that is thrown away by individual households, a trend encouraged by bulk buying of food because large amounts are less expensive than smaller portions. This is in line with the results from the Flash Eurobarometer survey where more than half of the respondents indicated they would prefer to have smaller portions available in the supermarket.

Concerning waste disposal and separation in the house, the participants experienced only a few barriers. Not knowing where to bring chemical waste and dealing with the large amount of packaging in the household were mentioned. In addition, the participants considered that some citizens do not sort their waste, largely because of a lack of knowledge.

Many concerns regarding the disposal of waste were expressed. The distance to the recycling centre or communal containers was mentioned as a barrier, especially for people without a car. The participants considered that the lack of a common deposit system in Europe was a barrier to waste disposal. Another concern that was discussed by the participants was the difference between waste management systems of cities and the countryside. In addition, they questioned the value of sorting when not everyone sorts their waste correctly. They were concerned that all waste still goes to landfill, even when it has been separated. The participants in all focus groups were concerned about the long-term polluting effects of waste and incineration on the environment.

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 both further divided into four categories. In the first domain, ideas focused mainly on technology (machines and processes) to improve the management of waste in the household and to use waste more effectively. Consumers and producers are the most prominent target groups, followed by waste management companies.

[13] Flash Eurobarometer No. 316 – The Gallup Organisation (2011)

The proposed ideas in the domain 'environmental sciences and technology' focus on the development of machines to make more effective use of waste. For instance, a car engine that runs on waste, household machines that grind waste and turn it into compost or a system to flush waste into the sewage system. The main motivation for these ideas was more convenience in the house. The possibilities of creating other materials for packaging, instead of plastic, were discussed with the aim of reducing the amount of plastic packaging. New packaging material should be developed that is organic and biodegradable. Furthermore, the participants proposed creating bacteria that break down non-organic material to yield oxygen and hydrogen.

Ideas in the second domain 'policy, management and communication' were mainly concerned with regulations, financial incentives and communication to improve recycling and change behaviour. Government was the main target group in this domain, closely followed by consumers and producers. More attention for recycling and reusing products was a recurring theme in all focus groups. By far the highest ranked idea proposed by the participants is a Europe-wide deposit system to improve recycling. Furthermore, regulations are needed to attain environment-friendly and sustainable manufacturing processes. Financial incentives should be provided to motivate manufacturers to use recycled material. The results of the Flash Eurobarometer Survey showed that 96% of the Danish respondents indicated they would buy products made from recycled material. The results from the focus groups confirm these findings. In addition, participants considered that products containing recycled material should be less expensive to motivate consumers to buy these products. Participants were of the opinion that citizens are often not aware of the value of separating waste. According to the participants, educational programmes in schools and information labels on how to recycle and reuse products would increase awareness and change behaviour among citizens. Education in schools should be focused on reusing waste to make children aware of the possibilities.

Of the three most highly prioritised ideas, the first is to legislate a common European deposit system and expand it with other products, like jars, plastic and packaging. The second entails making environmental friendly and sustainable technologies less expensive, followed by providing information and education on waste management.

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 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.

ENVIRONMENTAL SCIENCES AND TECHNOLOGY

Category	Idea	Aim	Target Group	Priority
Technical/ Physics/ Chemical/ Engineering	Develop a household machine that turns waste into something usable	Effective use of waste	Consumers	☆☆☆☆
	Research to find out how incinerated waste can be used more effectively	Effective use of waste	Consumers/ Waste management companies	☆☆☆☆
	Devices that can be recharged without wires and batteries	Less waste production	Producers/ Consumers	☆☆☆
	Use food waste as fuel for the car	Effective use of waste	Consumers	☆☆
	Develop a system where waste can be flushed with water in the sewage system and be recycled in biogas	Effective use of waste/ Convenience in the home	Consumers/ Waste management companies	☆
	Develop a household machine to grind organic waste and turn it into compost for the garden	Effective use of waste/ Convenience in the home	Consumers	☆
	Develop a household machine to grind waste so it can be flushed away into the sewage system	Convenience in the home	Consumers	☆
	Develop a technology so farmers can transform their waste into biogas instead of buying inorganic fertiliser	Effective use of waste/ Effect on planet	Consumers	☆
	Develop environmentally friendly deodorant spray cans	Effect on planet	Producers	
	Research on alternative methods of reusing products	Less use of resources	Producers/ Consumers	
	Develop environmentally friendly and sustainable technologies for waste disposal	Effect on planet	Waste management companies	
	Develop one charger which fits every telephone	Less waste production	Consumers/ Producers	
	Develop a household machine that will sort waste by itself	Convenience in the home	Consumers	

Material	Develop organic packaging	Less plastic/ Effect on planet	Consumers	☆☆☆☆
	Develop biodegradable packaging	Less plastic	Producers/ Consumers	☆☆
	Develop packaging which dissolves into water after a couple of days	Effective use of waste	Consumers/ Producers	
Bio(techno)-logical	Create bacteria that break down non-organic material and provide oxygen and hydrogen in return	Effective use of waste	Producers	☆☆☆☆
ICT	Develop an app that will inform citizens what food items are still left in the fridge	Less waste production	Consumers	
	Locate a microchip on waste so that it will sort itself	Improve recycling	Consumers	
	Develop containers which can alert the town council when they are full and need to be emptied	Other	Waste management companies/ Consumers	

POLICY, MANAGEMENT AND COMMUNICATION

Category	Idea	Aim	Target Group	Priority
Policy	Legislate a common European deposit system and expand it with other products, like jars, plastic and packaging	Improve recycling	Government/ Consumers/ Producers	☆☆☆☆☆ ☆☆☆☆☆ ☆☆☆☆☆ ☆☆☆
	Environmentally friendly and sustainable technologies should be less expensive	Effect on planet/ Improve recycling	Government/ Producers/ Consumers	☆☆☆☆☆ ☆☆
	It should be less expensive for manufacturers to use recycled material instead of buying new material	Less use of resources	Government/ Producers	☆☆☆☆☆ ☆
	Products produced in an eco-friendly way should be less expensive	Behaviour change	Government/ Consumers/ Producers	☆☆
	Provide a financial incentive to manufacturers who use biodegradable packages	Less plastic	Government/ Producers/ Consumers	☆☆
	Develop European standards on how products should be packaged	Improve recycling/ Less plastic	Government/ Producers/ Consumers	☆☆
	Provide a financial incentive to consumers for sorting waste and bringing it to the recycling centre	Improve recycling/ Behaviour change	Government/ Consumers	☆
	A certain percentage of the product must contain recycled materials	Improve recycling	Government/ Producers	
	Introduce a policy so that manufactures outside the EU are forced to produce environmentally friendly products	Effect on planet	Government/ Producers	
	A tax system for the use of resources. For instance the manufacturer should pay for the waste produced	Other	Producers	
Management/ Logistics	The production process should be organised in a way that all components from a product can be recycled	Improve recycling	Producers	☆☆☆
	Work towards alternative opportunities for reusing products instead of recycling them	Less use of resources	Consumers/ Producers	☆☆
	Locate an under-the-sink rubbish sorting system in every house	Convenience in the home	Consumers	☆
	A common waste area in residential areas so that garbage trucks do not have to make so many stops	Effect on planet	Waste management companies/ Consumers	
	Use containers with deposit to buy milk at the supermarket	Less packaging	Consumers	

	Standardise and expand sorting for other material, like trays	Improve recycling	Consumers/ Waste management companies	
	Manufacturers should adjust supply according to demand	Less use of resources	Producers	
	Dispose of the packaging in the shop instead of taking it home	Convenience in the home	Consumers	
	Produce more products in Denmark instead of importing from China	Effect on planet	Producers/ Consumers	
Communication and education	Provide information and education on waste management	Awareness/ Behaviour change	Consumers	☆☆☆☆☆ ☆
	Education in schools should be focused on reusing products	Awareness of possibilities	Consumers	☆☆☆☆
	Provide a label on each product that indicates how it should be sorted	Improve recycling	Consumers/ Producers	☆☆☆
	Provide labels on products to show that biodegradable material is used	Awareness of possibilities	Producers/ Consumers	
	Show people the value of recycling	Awareness of values	Consumers	
	A campaign to make the public aware of unnecessary packaging	Awareness of negative effects/ Behaviour change	Consumers	
Local initiatives	Schools could use waste during craft lessons	Effective use of waste	Consumers	
	Local composting areas in cities to fertilise the ground in parks	Effective use of waste	Consumers	
Other	Research on renewable energy	Effective use of waste	Consumers	☆☆☆☆
	Use larger trucks to transport goods to stores, make more use of carpooling	Effect on planet	Consumers/ Producers	☆

Annex 2: Attitudes of citizens from Denmark 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 Denmark.

Question	Answer	%	EU27 Average
Do you think Europe could be more efficient in its use of natural resources?	Yes	87%	87%
	No	8%	5%
	DK/NA*	5%	8%
Do you think that your household is producing too much waste or not?	Yes	49%	41%
	No	50%	58%
	DK/NA*	1%	1%
Do you separate at least some of your waste for recycling or composting?	Yes	87%	89%
	No	13%	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	63%	76%
	Improve separate waste collection at your home	69%	67%
	More information on how and where to separate waste	56%	65%
	Legal obligation to separate waste	56%	59%
	Taxes for waste management	39%	39%
What initiatives would improve waste management in your community?	Better waste collection services	64%	70%
	Stronger law enforcement on waste management	43%	65%
	Make producers pay for collection and recycling of waste	48%	63%
	Make households pay for the waste they produce	38%	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	23%	14%
	To pay proportionally to the quantity of waste you generate	69%	75%
	DK/NA*	8%	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	39%	25%
	Include the cost of waste management in the price of the products you buy	50%	59%
	DK/NA*	11%	16%
Can you estimate what percentage of the food you buy goes to waste?	None	72%	11%
	15% or less	23%	71%
	16% to 30%	3%	13%
	More than 30%	2%	4%
	DK/NA*	0%	1%
What would help you to waste less food?	Better estimate portion sizes (how much food you cook) to avoid excess food	49%	62%
	Better information on food product labels, e.g. how to interpret "best before" dates, information on storage and preparation	32%	61%
	Better shopping planning by my household	53%	58%
	Smaller portion sizes available in shops	54%	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	27%	39%
	Rather important	38%	41%
	Rather not important	29%	12%
	Not at all important	5%	6%
	DK/NA*	1%	2%
Are you willing to buy second-hand products?	Yes	83%	68%
Base: all respondents, % of yes			
Would you buy the following products second hand?	Furniture	72%	56%
Base: all respondents, % of yes	Electronic equipment	52%	45%
	Textiles (clothing, bedding, curtains, etc)	49%	36%
What reasons prevent you from buying second-hand products?	Quality/usability of the product	59%	58%
	Health and safety concerns	25%	50%
	Less appealing look of the product	33%	25%
	Afraid of what others might think	3%	5%
Would you buy products made of recycled materials?	Yes	96%	86%
	No	2%	11%
	DK/NA*	2%	3%
What would be the most important factors in your decision to buy products made of recycled materials?	Quality/usability of the product	47%	51%
	Environmental impact of the product	30%	26%
	Price of the product	19%	18%
	Brand/brand name of the product	1%	2%
	DK/NA*	3%	3%
What prevents you from buying recycled products or products containing recycled materials?	Health and safety concerns	21%	44%
	Quality/usability of the product	49%	42%
	No clear consumer information on the recycled product	11%	32%
	Less appealing look of the product	12%	17%
	Afraid of what others might think	11%	5%

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

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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.

VOICES for innovation

ecsite
EUROPEAN NETWORK
SCIENCE CENTRES & MUSEUMS

European Commission

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