The EU-project WASTECOSMART - Optimisation of Integrated Solid Waste Management Strategies for the Maximisation of Resource Efficiency

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Abstract: Resource efficiency is an emerging priority at the European Union (EU) level and has over the years advanced on the European Agenda. The on-going EU-financed WASTECOSMART-project intends to optimize and integrate waste management strategies for maximizing resource efficiency in priority areas of a "Resource Efficient Europe". This will be implemented by promoting innovation based on research and technology development in the field of integrated waste management.

Through cross-border and international cooperation as well as collaborative research activities between six regions across Europe and three international partners, the project aims to strengthen regional capacities for investment, research, and technological development. The core goal is to help introduce innovation to the market in this sector, and as a consequence, support economic growth and regional development. This paper explains the scientific approach and the work done so far in the project, the planning and conducting of a pilot in the waste management sector, the formulation and implementation of the JAP, and overall, portraits the benefits from cross-regional, and European, collaboration. In addition, the paper includes case studies of good examples of work in the regions in many parts of the EU Waste Hierarchy.

Keywords: EU-project, Regions of Knowledge, Resource Efficiency, Innovation, Strategies, Waste Management

1 INTRODUCTION

Trends, such as world population growth, global energy demand and increased urbanization, have strong negative impacts on the quality of vital ecological services and the availability of natural resources [1]. Increased demand and use of materials in Europe makes the continent approaching a lack of important raw materials. Today, Europe imports six times more resources than what is exported. A combination of high levels of import and increased use of material affects the amount of waste. The European Union (EU) produces about 3 billion tons of waste each year that is mainly generated from household and activities, such as, manufacturing and construction. Produced waste has a great impact on the environment through pollution, greenhouse gas emissions, and large losses of important materials. Loss of materials is a particular problem for Europe since the continent is highly dependent on imports of raw materials.

By taking the above into account, resource efficiency has been more intensively discussed in the European Union during the recent years. It has lately become a growing priority issue and moved high on the European agenda. Resource efficiency means using the Earth's limited resources in a sustainable manner while keeping environmental impact as low as possible. It allows us to create more with less and deliver higher value with less input. These resources include materials such as fuel, minerals, metals, food, water, etc. In 2011, WWF published a short article entitled "Resource efficiency is the key to exiting economic crisis" in order to underline the fact that existing world's production and consumption patterns cannot continue on their current path, indefinitely. These inefficient patterns put limits on sustainable economic growth and social development. Globally, more resources to produce goods and services are extracted than our planet can replenish. At the same time, a large share of an increasing urban population is still struggling to meet basic needs [2].

By using natural resources more efficiently, companies can obtain more economic benefits, such as, improved productivity, lower costs and increased competitiveness. It also creates a more attractive and healthier living environment for regions and municipalities. Resource efficiency can also generate innovation and growth by encouraging the emergence of new technologies and create new jobs. [3]

The WASTECOSMART-project aims to tackle the increased amount of waste in Europe and finding strategies to maximize resource efficiency. The overall project objective is to strengthen and enhance the innovation capacity of regional research-driven clusters in resource efficiency. To achieve this, it requires collaboration, research and technology development in the waste sector. A total of six research-driven triple-helix regions (representatives from the scientific world, businesses, and public authorities) across Europe participate in the WASTECOSMART-project: Paphos region (Cyprus), Budapest region (Hungary), Piedmont region (Italy), Liverpool region, (UK), Amsterdam region (Netherlands), and Stockholm region (Sweden). The regions can be seen in Figure 1.

The 36-month long WASTECOSMART-project is carried out mainly to promote transnational cooperation of research-driven regions in waste management, but also to assess regional needs in the waste sector, formulate waste management strategies, develop an action plan to reduce waste, support the less developed regions in waste management and unlock business opportunities in international markets. Each participating region has carefully crafted a triple-helix cluster with a strong interest in boosting research and innovation in resource efficiency and particularly the waste management sector.

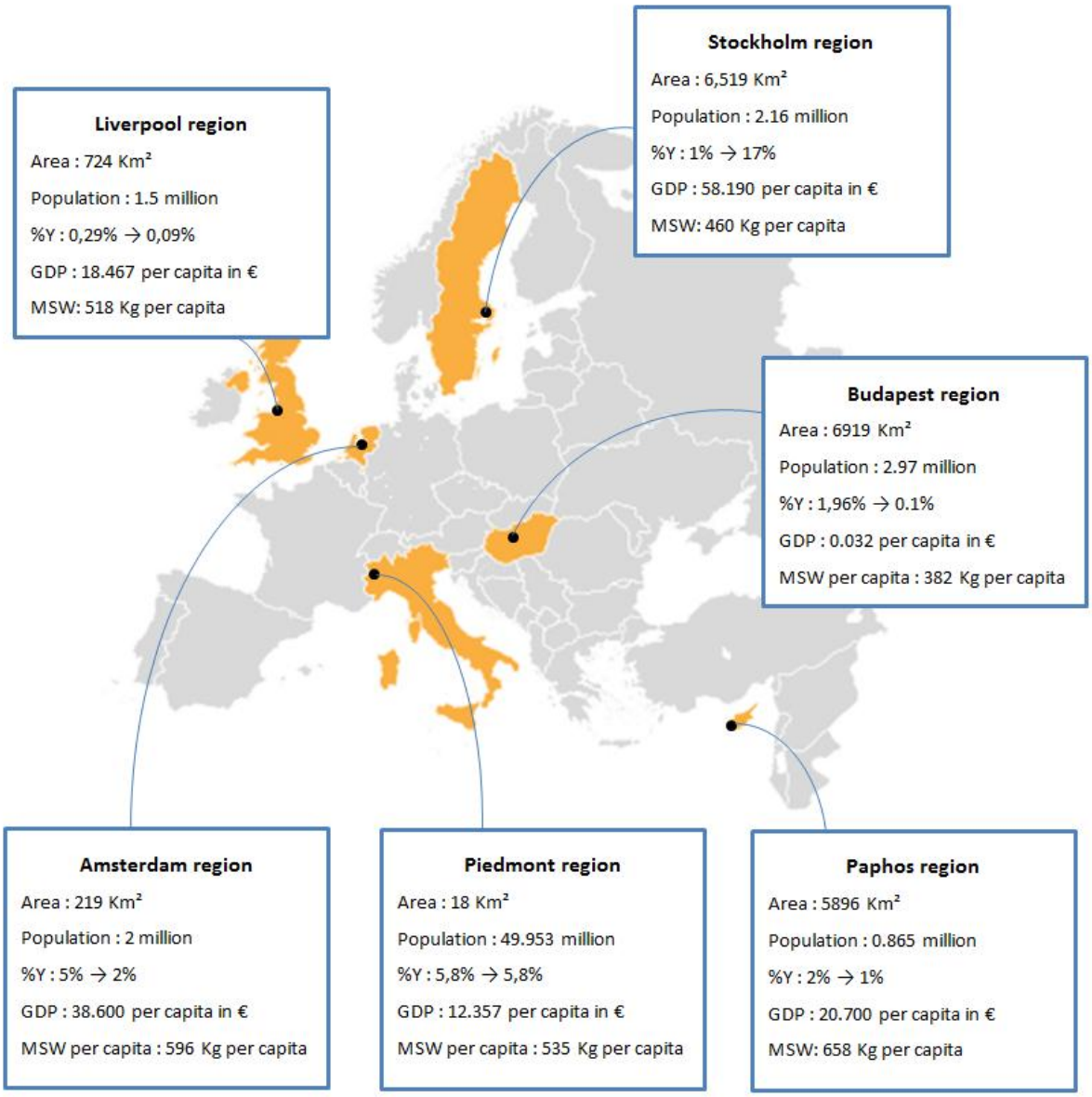

Figure 1: A map of the six regions across Europe involved in the project, including information about the region's area, population growth (%Y), Gross Domestic Product (GDP), and Municipal Solid Waste (MSW). More detailed information about the regions can be found on the project website, www.wastecosmart.eu.

2 SCIENTIFIC APPROACH AND WORK PACKAGE ACTIVITIES

WASTECOSMART is divided into several work packages (WPs) that together will fulfil the overall objectives. Aside from the work packages responsible for project management (WP1) and dissemination (WP2), the project has four main areas and work packages, all summarizing in common activities for the regions. WP3 included a structured analysis of the research capacities and research needs of each of the regions. These results were input for developing the Decision Support Framework in WP4 and to formulate the Joint Action Plan in WP6.

Work packages

WP3 – Identification and assessment of research capacities and technological capacity building needs
WP4 – Preparation of a Decision Support Framework for the design of Resource Efficiency Management Plans
WP5 – Pilot implementation to prepare end-users specific resource efficiency plans
WP6 – Developing Regional Research Agendas and a Joint Action Plan (JAP)
WP7 – Actions towards the implementation of the Joint Action Plan (JAP).

2.1 Work package 3

In this work package, each region identified the current situation regarding waste management and resource efficiency status, including current legislation in the region as well as condition and capacity for innovation. The base for the analysis has been the innovation system perspective and the framework used is the Technological Innovation System (TIS) framework. TIS encompass all actors, institutions and physical parts that influence the development, diffusion and use of a technology or a technological field. Among these structural elements, a defined set of processes occur which create the dynamics of the innovation system. These processes are called innovation functions and by analysing the occurrence of these processes it is possible to draw conclusions on what actions are needed in order to develop the innovation system further. Within the WASTECOSMART-project, the studied subject is defined regionally and concerns the goals and visions of each region as well as their technological and organizational strategies for reaching them. By applying the TIS-approach, it is not only possible to better understand the innovation processes as they take place, it is also possible to act on and influence the direction and speed of the innovation processes.

Several interviews have been held with national stakeholders and experts from each region. A prepared and structured template was used as a basis for interview questions in order to facilitate comparison of results between regions. The purpose of these interviews was to obtain information related to the socio-political, legal and regulatory framework for waste management in each region and their current trends. This information, structured in six dynamic innovation functions (Policies and regulation, Knowledge development, Entrepreneurial experimentation, Resource mobilization and market formation, and Creation of Legitimacy), were collected and analysed through the interview process. The methodology and interview templates were constructed in a way that information from each of the six functions could be summoned in a SWOT matrix in order to prepare for taking actions to utilize the strengths/opportunities in the regions and counteract the weaknesses/threats. Thereby, waste management strategies can be developed and resource efficiency in each region can be maximized

To collect the results from the TIS-analyses in an understandable table and communicate them as input to the Joint Action Plan, a SWOT analysis tool was used. The idea behind the SWOT analysis is to evaluate the **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats involved in a project or in a business venture. With this information, it is possible to uncover opportunities to exploit, and threats can be managed and eliminated. By looking internally and externally, a strategy that can help to improve the current status of the organization can be crafted, so that ultimate goals can be achieved. Thus the SWOT Analysis is a useful resource which may be incorporated into an organizations strategic planning model. The SWOT analysis matrix is illustrated in Figure 2.

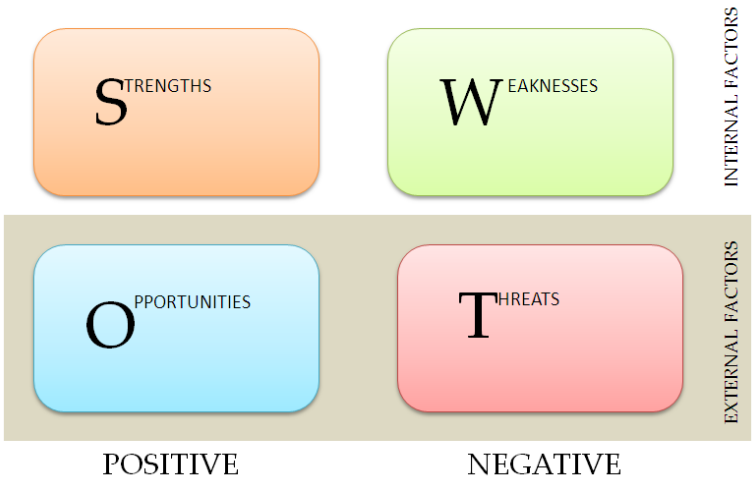

Figure 2: SWOT analysis matrix.

2.2 Work package 4

Improving or optimizing resource efficiency with focus on waste management is an ill-structured and complex problem that depends on many variables. An evaluation framework must acknowledge this complexity and must also take as many variables as possible into account. This work package included making a typology of problems. Based on the institutional setting (e.g. decision makers, position of the institutions, regulations, time horizon), social and geographic conditions (e.g. amount of waste, its composition, demographic features, population density, transport distances), cultural factors (e.g. participation in recycling programmes, disposal habits), technical options (e.g. incineration with energy recovery, recycling, digestion) and economic conditions (e.g. willingness to pay for resource efficiency, scales, markets for recovered materials, labour costs, unit pricing), 'typical' waste management problems were identified (for example, by SWOT analyses conducted in WP3).

The typology of problems was based on the results from WP3, an additional literature survey, a questionnaire distributed among the key informants in the consortium and their networks, and a Framing Workshop with consortium experts. The workshop started with the presentation of the results of WP3, the central findings from the meta-analysis cluster report, and the draft internationalisation strategy based on identified synergies. Also, presentations of main findings of regional (TIS) analyses were given, to enable joint, cross sectional learning. The cluster partners had moderated workshops for discussion and definition of topics along with possible activities to achieve the objectives.

The developed Decision Support Framework (DSF) is built on a previous FP7-project called WasteKIT [4]. The developed mentoring guide framework, which enhances regional visions and system approach on waste management, was in WP4 to be developed for politicians and policymakers. The DSF in the WASTECOSMART-project is based on a multi-criteria analysis (MCA), where alternatives and criteria are pre-defined. There are many choices for MCA-programmes, in WASTECOSMART, for example, the tool DEFINITE was used [5]. This toolbox includes the possibility to visualize and analyse results and to support problem definition. To process different types of information, DEFINITE includes various MCA-methods, as well as Cost-Benefit and Cost-Effectiveness analysis. Related procedures such as weight assessment, standardization, discounting and a large variety of methods for sensitivity analysis are also available.

2.3 Work package 5

This work package aimed to determine appropriate strategies for developing resource efficiency actions within the waste management strategies of each end-user and to identify research needs and innovation potentials. Included in work package 5 is also the planning and initiation of pilot studies in the regions. As the project is on-going, only one example will be described in this paper.

The material gathered during the TIS-analyses and SWOT-analyses were in this work package evaluated from a complete system perspective. Based on available information, *visions, goals, and tools* for the regions were evaluated project using the criteria:

- Are the goals supporting the vision?
- Are the goals formulated SMART (Specific, Measurable, Attainable, Realistic, Timely)?
- Are the goals communicated and anchored among the stakeholders?

Policies and legitimacy are used to force changes towards an overall vision in the region or goal. The policy of using Innovative procurement can, for example, be seen as a strategic tool used in different degrees to drive innovation and market formations at different levels in the system. *Policy* has been evaluated from the following criteria:

- Are there policies and processes/initiatives for legitimisation in place?
- Are they corresponding to the visions and specific goals?
- Are they communicated and anchored?
- Do they have impact?

Collaboration can be initiated by different tools and methods for changed behaviours and development. There are a vast variety of design based models, cooperative processes tools and other methods supported by consultancies. The material has no information of such ongoing processes in the different regions. *Collaboration* has thus been evaluated from the following criteria:

- Are there active arenas and processes (organisational platforms, funding, methods, etc) for establishing or leveraging collaborations?
- Which are the actors?
- What processes or methods are used (if mentioned)?
- Are all relevant stakeholders represented in the region?

Innovation support activities can be used to stimulate change at different levels in the system, by established companies or for creating new markets or new companies. Innovation support activities can be connected to technology or knowledge transfer from academia or other public research. It can also be branch specific support or have a SME/larger companies focus. It can also include formation of platforms for collaborations, IP related issues, research and development or growth etc. The criteria used for *innovation* support are:

- Are the support activities aligned with the goals and visions?
- Are the support activities well used?
- What are the outputs of the support activities?
- And are they supporting the regional vision?

2.3.1 Pilot study in Stockholm, Sweden

This pilot study investigated if it would be possible to collect sorted food waste from households in the Rissne district in Sundbyberg (Stockholm). Rissne's household waste is today collected by a 30-years old underground vacuum transport system, which is built to collect one fraction of waste. The town of Sundbyberg wanted to find out if it is possible to collect the food waste separately by

- persuading the residents to make an extra effort for environmental reasons
- using optical sorting within the vacuum systems terminal building

The aim of the study was to see if the conditions for an installation of an optical sorting device, for food waste at a later state, were at hand as all inhabitants in the town of Sundbyberg are, by a political statement, obliged to sort out food waste. The food waste should be collected separately, because its potential products (biogas and bio-fertilizer) are coveted.

The main challenge identified that motivated this pilot study was that the old waste collecting system only allows one fraction of waste. To manage two or more fractions, the system would have to be expanded with twice as many refuse chutes, a larger terminal building and new automatic control systems. This would require a major investment. Instead, we wanted to investigate whether it was possible to automatically sort out bags with food waste by only making minor changes to the vacuum system. Other identified challenges:

- To find out if the food waste can be separated by an optical technology, installed in the terminal building
- To measure weather strength and qualities of the bags were adequate enough for the transport
- To find a method to communicate with the residents in order to procure a new behaviour

In the pilot, plastic bags were used for the sorted food waste. Green plastic bags were chosen as the colour seem to be associated with good environment. Out of 2900 families living in apartment buildings on various distances to the terminal building, 230 were chosen to participate in the study. The experiment required that the participants were willing to make an effort and behaviour was tried to be influenced through information and more intense communication. The methods used were appropriations in the entrances, door-knocking with one-to-one communication, printed matter, and a dedicated web-page.

The conclusions from the study showed that only about 30 percent of the participants were active source sorters, but the number decreased by time. It was also concluded that not all sorting was done properly, and that sometimes the bags were not even closed properly. It is not clear if the decreasing over time was caused by the fact that there were not enough plastic bags delivered (25 per household for six weeks of test), if the communication was not efficient, or why not more participated owing to other circumstances. However, in the whole series of tests, it can be stated that to achieve a good collection result it is most important to obtain a change in the behaviour of the residents. First they must learn what food waste is. Then they must learn how to tie the bags properly, so that the waste remains in there and do not fall out during transport to the terminal. It could also be concluded that the plant wears relatively hard on the bags, even on the bags of food waste and other plastic bags of good quality.

A phase 2 is planned, outside of the WASTECOSMART-project, with the aims to:

- Find a communications strategy that improves the amount of sorted and collected food waste
- Optimize operation of the vacuum system plant with regard to wear on garbage bags and food waste bags
- Get a basis for assessing the feasibility of building on an existing facility to the sorting of several waste fractions, primarily residual and food waste
- Evaluate the results of the use of bioplastic bags, to minimize any problems of plastic residues in bio-fertilizers obtained from the anaerobic digestion of food waste.

2.4 Work package 6

All previous work within the work packages was used as basis to formulate a Joint Action Plan (JAP) [6]. Aside from explaining the project and describing the approach to reaching the goals, the JAP also identifies three priority areas based on the analysis of the regions research and innovation capacities with regard to waste management and the identified gaps:

1. *Waste minimisation*
2. *Maximisation of value from waste*
3. *Knowledge transfer*

See Figure 3 for a more comprehensive understanding of the overall process for the development of the Joint Action Plan.

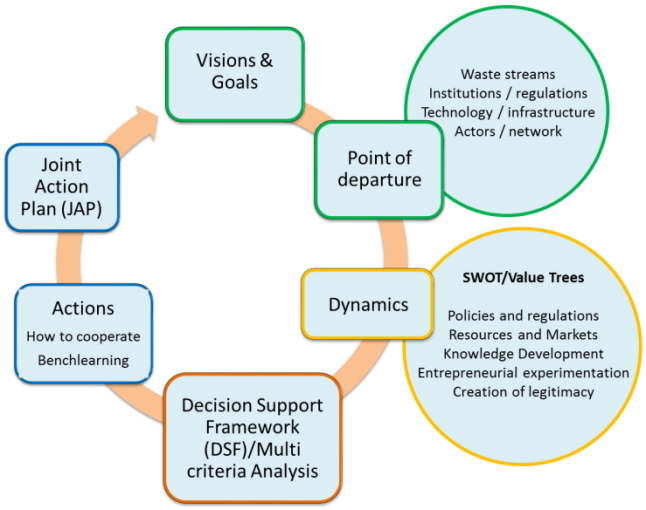

Figure 3: The process of generating the Joint Action Plan.

2.4.1 Waste minimisation

Waste minimisation is the reduction of waste produced in all parts of society and the waste management chain. Waste minimisation can be achieved through waste recovery, recycling, reuse and or prevention, i.e. re-designing of products, changing social patterns and behaviour, waste-to-resource and innovative waste handling processes The most favoured option is prevention. Policy and regulatory requirements have a crucial role to play in stimulating demand for waste minimisation through all sectors of society. In addition, technological feasibility and economic viability are important factors, although many waste minimisation measures are no-cost or low-cost. However, the most important influence on waste minimisation is probably the attitude off all actors' throughout society. Waste minimisation is a corner stone of resource efficiency and contributes widely to the circular economy concept.

Main challenges for waste minimisation measures identified by the WASTECOSMART partners are:

- Lack of cooperation between different stakeholders of the waste management chain
- Lack of clear visions and goals for waste minimisation
- Engagement and involvement of general public
- Dissemination of best practice examples

2.4.2 Maximisation of value from waste

Maximisation of value from waste is the increased usage of waste as resource and efficient use of materials, a key component of a circular economy and innovative waste management. One of the biggest challenges is to create value from waste in a sustainable manner. To do so, one has to extract valuable materials from municipal solid waste streams with sufficient purity for recovery, recycling and/or reuse. The common vision for a circular economy is that products and goods remain within an economy for as long as possible. Within a circular economy there is still the need for waste management to facilitate the recovery of final value from products and materials. This can only be achieved i.e. by an efficient and innovative collection, recovery, and recycling system. To create efficient models and management for the maximisation of value from waste, various actors in the waste chain need to act together and at the next level up decision and policy makers need to take their responsibility.

Maximising value from waste is aimed at interactions that take place around all consumers and the waste collection management to act to increase resource efficiency by retaining value in the waste stream after use. Maximizing value from waste is directly linked to collection sites that allow multiple functions. Positive or

negative values of waste streams can be categorised into the following: monetary, environmental, and societal value.

Main challenges for efficient recovery of value from waste identified by the WASTECOSMART partners are:

- Lack of efficient and innovative separation and collection models
- Lack off (innovative) business models, as for example, long term contracts to ensure economic viability
- Capital investment in waste handling facilities
- Lack of efficient cooperation between different organisations contracted for the collection of different waste streams
- Changing of composition of the waste streams may lead to removing potential value in a final waste stream.

Regulation and legislation is inconsistent when it comes to economic incentives. The overall objective of this priority area is to link the consumer behaviour with a sophisticated and innovative separation and collection system focusing on: data gathering and compositional analysis, innovative separation and treatment, consumer engagement and involvement, and linking long term contracts with short term variations.

2.4.3 Transfer of knowledge

Resource efficiency is highlighted as being the key for addressing the world's climate, environment, energy, and materials independency challenges. Innovative waste management plays a key role within resource efficiency; however, increased knowledge transfer is needed to accelerate the speed and direction. Innovation can be defined as transformation of knowledge to money, going from i.e. idea to product, from researcher to entrepreneur, and laboratory to market.

Knowledge transfer can be facilitated between a large number of different actors along the waste chain but also in a large number of different ways. For example, transfer of expertise from research actors or expert stakeholders, exchange of best practices between stakeholders of different or within the same part of the waste management chain, and information campaigns as well as involvement of the general public. Knowledge transfer is key component to transform the waste management sector into a resource efficient and innovative sector.
WASTECOSMART proposes to boost knowledge transfer by:

- Enable and enhancing dialogue between different stakeholders of the waste management chain and between regions
- Supporting the visibility and access of best practice examples for resource efficient and innovative waste management
- Increasing cooperation between triple helix actors
- Increasing involvement and engagement of the general public.

2.5 Work package 7

The last work package focuses on the implementation of the JAP. The project partners work to promote the JAP and to increase the innovation capacities of the project partners and additional stakeholders. For example, to promote the strategic approach of evaluation of the regions, an online e-learning tool was developed to present an overview of how workshops can be a useful format to initiate self-assessment. Furthermore, each region is responsible to organise seven workshops with the special focus on:

- Implementation of the JAP
- Consulting with stakeholders about the project proceedings (identified technology and research needs, existing waste management technologies, assessment variables, the DSF and its scope of applicability, waste management – relevant policies as well as plans, methods for monitoring, green public procurement criteria, etc
- Identifying the gaps in end-users' organisations which are hindering any innovation adaptation and thus the optimisation of waste management systems. Gaps can be socio-economic ones (e.g. local

inhabitants' negative attitude to cooperation with public companies in establishing waste management collection systems) or organisational ones (e.g. lack of a waste management unit in municipalities).

In addition, WP7 includes three international missions, to obtain a better understanding of three key international markets for waste management as well as the related opportunities for business development and research collaboration in these markets. The chosen countries were: Brazil, India, and South Africa. Each site visit was combined with specific introductory seminars presenting the local market and business conditions. They also included site visits to, for example, waste dumps, recycling facilities, relevant research institutes, etc. The missions also aimed at creating match-making and networking events to promote the JAP for WASTECOSMART. The international cooperation partners in Brazil, India and South Africa helped to establish a programme for the site visits and on-location seminars.

3 CASE STUDIES FROM THE WASTECOSMART REGIONS

In the self-assessing part of WASTECOSMART, the regions located good examples already in place and made short case studies. Here is one example from each region:

3.1 Paphos region (Cyprus)

Cyprus produces about 570,000 tons of waste annually, 88 % of which goes to landfill due to limited recycling facilities on the island. At an individual level, 468 kg of solid waste is produced per person in residential areas and 679 kg per person in tourist areas indicating that tourists increase the amount of waste. Much of the waste from tourism is generated within the hotel sector where tourists spend the bulk of their holiday time.

In 2010, three hotels and five self-catering properties in the Paphos area of Cyprus started a pilot project to reduce their plastic waste, and owing to the success the project was extended in 2011 to larger number of hotels. In collaboration with Thomas Cook, hotels within the resorts of Paphos and Ayia Napa/Protaras were identified to be part of the project where the objective was to reduce the amount of plastic waste generated without reducing the quality of the guest experience. The set target was to reduce the generated plastic waste by 10 % across all participating hotels. This was based on the preliminary results from the original project in Paphos.

To minimise plastic waste, the hotels replaced their disposable plastic cups with durable reusable cups, and replaced bottled water by drinking water dispensers. They also educated the hotel employees, and minimised the use of plastic bags by only changing them when soiled. Other initiatives, such as, providing straws only when requested from hotel guests or purchasing cleaning materials in bulk, using refillable dispensers rather than individual packaging also limited the amount of plastic waste.

The evaluation showed that the hotels saved 19 %, corresponding to 27.5 tons of plastic, on the total number of plastic items from the previous season. The hotels achieved a total cost saving of €111,000, and survey's showed that 98 % of the customers would like to see similar projects implemented in other destinations.

3.2 Budapest region (Hungary)

Aluminium cans and PET plastic bottles are two of the most popular forms of beverage packaging in Hungary. The aluminium and plastic waste contain valuable materials and could be recycled to save energy and preserve the world's scarce resources of virgin raw materials. However, without a place to deposit them, it is challenging to recollect beverage packaging.

To address this environmental challenge, Returpack, a packaging recycling operator based in Budapest, together with Sealorient introduced the "Reverse Vending Machine" (RVM) in 2009. The RVM is a standalone recycling collection point located at retail stores, where consumers can deposit their used aluminium cans and PET bottles. The RVM is able to identify can types and reject non-recyclable materials. In return, the RVM users receive an incentive coupon, without introducing a deposit scheme.

Since 2010 the number of stores which have created recycling programmes and are operating the RVMs has increased from 24 to close to 200 across Hungary. Thanks to the RVM technology, seven tons of aluminium cans and twenty tons of plastic bottles can be recycled every year. The introduction of Returpack's RVM and recycling collection system have been important initiatives in supporting Budapest regions and the rest of the country to increase its separate collection of aluminium and PET plastic waste.

3.3 Piedmont region (Italy)

One of the main challenges for Valmora, a mineral water company with a daily production of more than one and a half million bottles, was to convert its production chain in order to obtain a greener and more eco-friendly process. In order to both reduce plastic waste, and to counter the high impact that the transportation of bottles has on the environment, a 20 % decrease in the use of plastics in the bottles was established. They also made a reduction in the distances covered by road for delivery, and over 70 % of the bottled water is now transported and distributed locally in the production region, Piedmont. Furthermore, the energy used at the production site is derived to 100 % from renewable sources.

3.4 Liverpool region, (UK)

The company Halen Môn (Anglesey Sea Salt Company Ltd) used to package their salt and pepper range in foil lined cardboard tubes with metal or plastic ends. By support through the Waste and Resources Action Programme (WRAP) innovation voucher scheme Halen Môn, and the WASTECOSMART partner C-Tech Innovation, made a thorough analysis of their requirements and the potential options, using an approach informed by life-cycle thinking. Through this, the team identified a solution based on re-sealable pouches with distinctive cardboard headers that are both powerful on the shelves and use 50 % less material. By reducing food packaging by over 50 %, they prevent material fated for waste from entering the value chain.

3.5 Amsterdam region (Netherlands)

The non-profit organisation Repair Café, originating from Amsterdam, advocates repairing our every-day item that today is discarded. Repair Café was founded in 2010, and today there is more than 1000 cafés worldwide.

These are free meeting places with tools and materials available to help people make any repairs they need, by the guidance of volunteer "specialists". Visitors bring their broken items from home, and together with the specialists they start making their repairs in the Repair Café. The popularity is constantly growing and volunteer repair experts now prevent more than 200 tons of waste per year. In addition, the social factor motivates people who might otherwise be side-lined are getting involved in the society again and valuable practical knowledge is being passed on.

3.6 Stockholm region (Sweden)

As in many other countries, in Sweden it is forbidden to put Waste Electrical and Electronic Equipment (WEEE) in the garbage. For this reason, people should be provided with an easy option to dispose of their WEEE near their homes. Previously, the Municipality of Sundbyberg only had one collection site and thus needed some more, in more accessible places, to facilitate and encourage the residents.

Sundbyberg Municipality located a Swedish invention called "Samlaren" (freely translated: The Collector). The system consists of a cabinet which can easily fit in an indoor public area, for example, a shopping centre. Anyone can leave small electronic products, light bulbs, and batteries in it and be sure it is discarded in a safe way. This provides the habitants of Sundbyberg with an easier way to dispose of their small WEEE. In 2014, the Municipality of Sundbyberg collected 630 kg of WEEE from their five collection points.

4 SUMMARY

The on-going "Regions of Knowledge"-project, WASTECOSMART, is in its final months and the partners are focusing on work with implementation of the JAP formulated in the project. This plan is based on results from an extensive self-assessment and SWOT-analysis performed by the triple-helix constellations in each of the ingoing regions (Paphos region, Cyprus; Budapest region, Hungary; Piedmont region, Italy; Liverpool region, UK; Amsterdam region, Netherlands; and Stockholm region, Sweden). The JAP identified three priority areas where the regions have recognised the need of joint research and see how collaboration is not only valuable but also necessary. The three priority areas are; *Waste minimisation, Maximisation of value from waste, and Knowledge transfer*. Together, the regions and international partners identified through international missions, are targeting suitable calls for common research and development to maximise resource efficiency. The overall aim is to strengthen regional capacities for investment, research, and technological development. The core goal is to help introduce innovation to the market in this sector and as a consequence support economic growth and regional development.

5 ACKNOWLEDGEMENTS

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