

# Promoting Sustainable Waste Prevention Strategy Activities and Planning in Relation to the Waste Framework Directive in Insular Communities

A. A. Zorpas<sup>1</sup> · K. Lasaridi<sup>2</sup> · I. Voukkali<sup>3</sup> · P. Loizia<sup>3</sup> · C. Chroni<sup>2</sup>

Received: 9 January 2015 / Accepted: 22 July 2015 / Published online: 14 August 2015  
© Springer International Publishing Switzerland 2015

**Abstract** Citizen's daily activities produce huge quantities of waste affecting the quality of life. On the other hand, citizens are attacked from the media regarding the new products entering the market. Moreover, waste management plans, are sometimes too complex as facilities, like separation and collection, become routine. The production of waste on daily basis is continually increasing; however, the main solution for treatment in insular communities is to send their waste to landfill. According to the Waste Framework Directive (2008/98/EC), prevention is in the top in waste hierarchy. In order to build up our strategy we must first find out what our waste consists of and then develop our waste prevention campaign and strategic plan.

**Keywords** Prevention · Waste management · Food waste · Composting · Public awareness

## 1 Introduction

While reducing waste at all levels is at the top of the waste hierarchy pyramid, there is no specific strategy and relation among the generation of waste and consumption

---

✉ A. A. Zorpas  
antonis.zorpas@ouc.ac.cy; antoniszorpas@yahoo.com

K. Lasaridi  
klasaridi@hua.gr

P. Loizia  
info@envitech.org

<sup>1</sup> Faculty of Pure and Applied Science, Environmental Conservation and Management, Cyprus Open University, P.O.Box 12794, 2252 Latsia, Nicosia, Cyprus

<sup>2</sup> Department of Geography, Harokopio University, 70 El. Venizelou Kallithea, 176 71 Athens, Greece

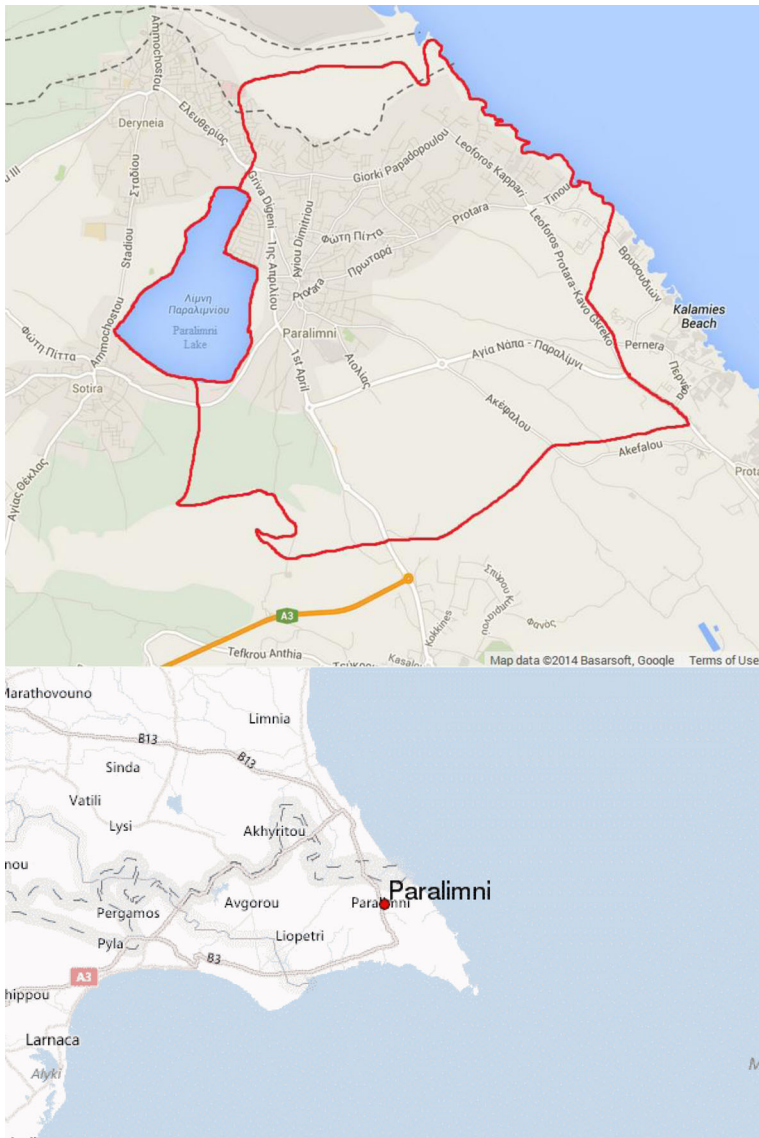
<sup>3</sup> Department of Research and Development, EnviTech - Institute of Environmental Technology and Sustainable Development (IETS), P.O.Box 34073, 5309 Paralimni, Cyprus

(Inglezakis and Zorpas 2012; Cecere et al. 2014). According to Eurostat (2010), the Municipal Solid Waste (MSW) volumes have been increased up to 15 % from 1995 to 2008 with the yearly average increasing index to be up to 1 %. Although, the European Commission has published the Waste Framework Directive (WFD) as well as several other regulations focusing on waste management (Inglezakis and Zorpas 2012), those directives and/or regulations have only brought limited changes within the key objective of reducing waste generation (EEA 2009, 2013). Mostly, the waste management plans are focusing on recycling and on waste disposal (Cecere et al. 2014). According to Zorpas and Lasaridi (2013), we have a continuous and alarming increase of waste volume in each country and per capita also. Through the WFD and other EU waste policies, emphasis is given on the reduction of waste through prevention (EEA 2013; Zorpas and Lasaridi 2013). There are several Countries and Environmental Authorities (Gentil et al. 2011) which have already prepared zero waste policy and strategies plan (Inglezakis et al. 2012) as well as strategy prevention plans aiming at the reduction of environmental impacts, including reduction of the total amounts of waste. Waste prevention has the highest priority in waste policy in the European Union according to WFD (Zorpas and Lasaridi 2013; Zorpas et al. 2015). As a definition (Zorpas and Lasaridi 2013; Zorpas and Lasaridi 2013, 2015), waste prevention includes all actions taken on the reduction of the produced waste, while at the same time reducing negative environmental impact issues. According to other researches (Gentil et al. 2011; Zorpas and Lasaridi 2013), waste generation prevention is a measurable indicator regarding the environment, human health, quality of life and society. However, there are limited data (mostly qualitative) which proves the benefits of the implementation of waste prevention activities, plans, policy and strategies. However, prevention includes several policy options and has several benefits; the most important ones are: (i) the reduction of toxicity before recycling; (ii) the implementation of home composting as a major activity on organic waste (food and green waste); (iii) the recovering and energy production; (iv) landfilling is not the only available option, (v) several actions are taken into consideration once a product reaches its end-of-life (reuse or repair or refurbishment) (Rappou 2012; EU 2012).

## 2 Materials and Methods

### 2.1 Area Description

Paralimni Municipality (Fig. 1) is located in the Eastern region of Cyprus closed to Famagusta. In this area, we may find the largest hotel resorts of the island and this Municipality is one of the main economic lungs of the island (Zorpas 2011). As a result of this, 25 % of the yearly tourists who visit Cyprus, stay in the area. The equivalent population is up to 75,000 during the tourist period (April–October) while the permanent population according to the last inventory report (November 2011) is equal to 18,000 (Zorpas et al. 2010, 2011; Zorpas 2011). The local inhabitants are mainly involved in tourist activities and services, and in agriculture. The area includes 4500–5500 houses, 100 hotels, schools, and small industries like confectioneries/bakeries, food suppliers, supermarkets, etc.



**Fig. 1** Area Map

## 2.2 Developing a Waste Prevention Management Plan

In order to develop the waste prevention plan for the Municipality, several meetings with the local Council took place during 2010, in order to explain the meaning of the prevention. Then, the main stakeholders were identified and the main waste producers as well as a waste compositional analysis were done using the standard EN 14899:2005. A complete state of art analysis took place using statistical data from the Municipality regarding waste production and existing management program. Through the plan, several awareness activities were developed in order to inform the citizens about waste prevention.

### 2.3 Proposed Prevention Activities Through the WASP Tool

Through the Web platform (<http://wasptool.hua.gr/>) that has been developed (Fig. 2) the Municipality council has the ability to decide which prevention activities will be first implemented. The WASP tool is based on both local and wider national or regional data on the composition of the waste and the demographic characteristics of the area in order to examine the effectiveness of various waste prevention strategies (like home composting, materials exchange, awareness activities, etc.). By using a suitable algorithm and weighting factors (which can be selected and justified) specified by the user, the tool estimates the benefit of the implementation of any strategy or combination of strategies under the given local conditions, with the ultimate aim of selecting the best solution. The proposed indicators used were defined both based on data from international experience (scientific literature and technical reports), and quantifiable results of the pilot project actions in Cyprus. In its final form the tool presents quantified measurable specific data.

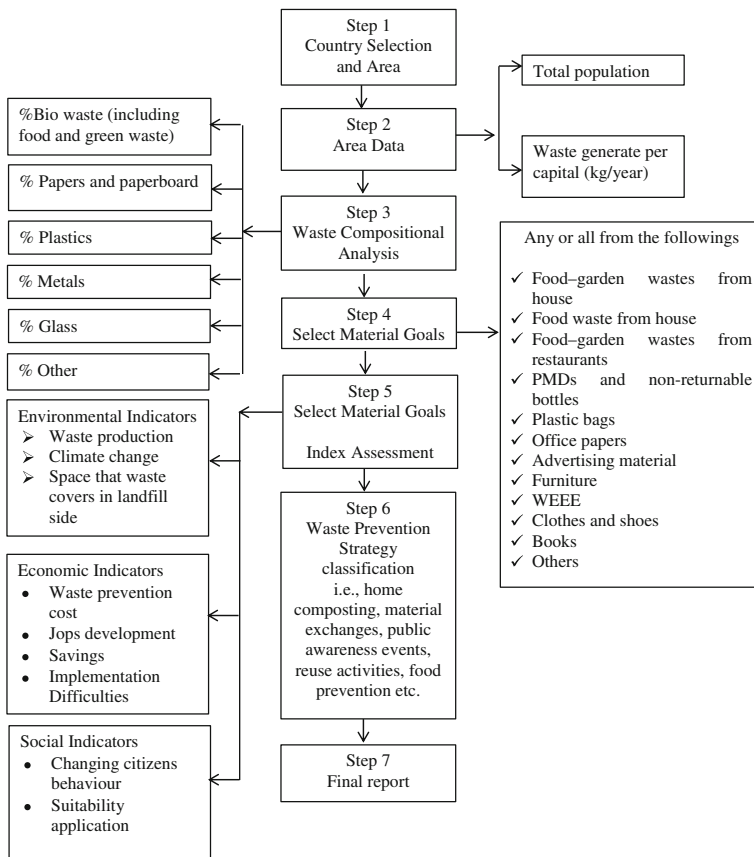


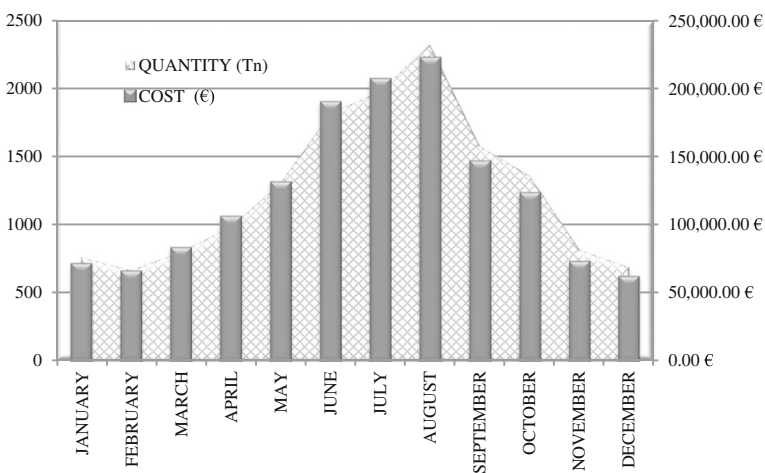
Fig. 2 WASP Tool steps for Local Authorities to chose their prevention activities

### 3 Municipality Waste Prevention Strategic Plan

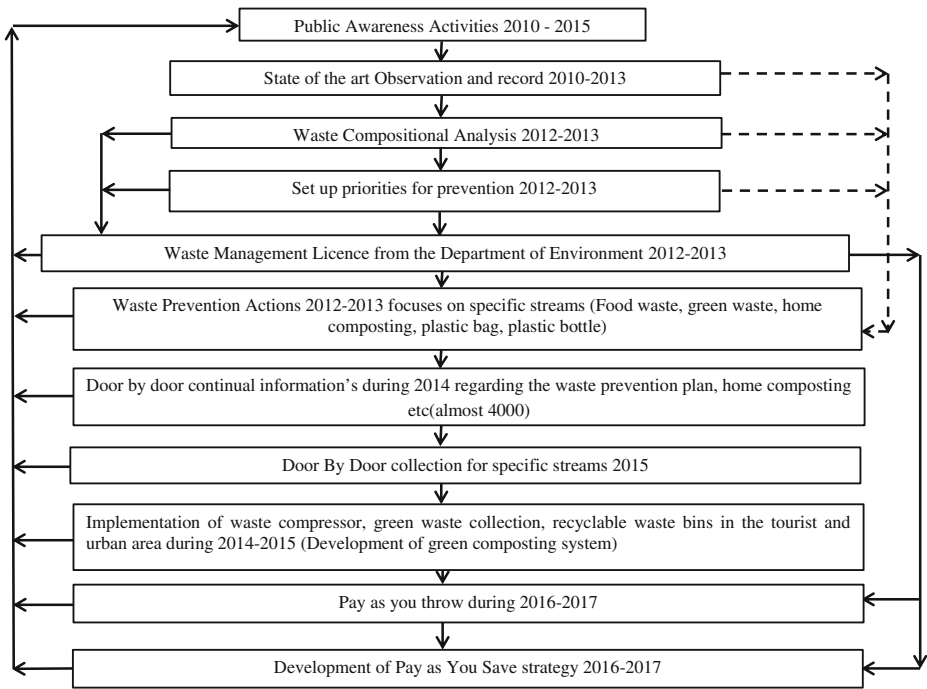
The main stakeholders involved in this plan were the citizens, the hospitality industry, the primary (elementary) and secondary (gymnasium) schools, and citizen groups. For 3 years (2010–2013) survey audits as well as data collection analysing the current state took place. The current state covers data about the generation of the waste (in several economic sectors, mainly the hospitality industry and at household level), per capita waste production, as well as the evaluation of the existing management system. The waste production was 14,000 t in 2010 and on an annual basis was increased by about 1000 t. At the end of 2013, the production was equal to 17,000 t. The existing waste management plant (WMP) of the municipality encompasses door to door collection and transportation to the Municipal Waste Treatment Plant in Koshis (KMWTP) which is about 55 km away. Moreover, the WMP comprises the participation of the Municipality in the Green Dot program. Green Dot collects recycling materials (PMD, papers and paperboards, glass, aluminium). In 2010, the council of the municipality signed a contract in order to transfer to the KMWTP all the produced waste for additional treatment. According to the statistics (Fig. 3), the amount of total waste that was transferred to the unit in 2011 was almost 15,000 t with a total gate fee to be almost 150,000 € (Zorpas et al. 2013a).

The strategic plan regarding the waste prevention of the municipality started in 2010 (Fig. 4). The Public Awareness activities continue for 5 years, and then, periodically if necessary, encourage the citizens to continue participating in the waste prevention plan. The awareness campaign contains activities like conferences open to the public, training projects through seminar cycles, abstracts in newspapers and magazines, radio spots, interviews, and door to door information using specially designed leaflets. Moreover, a social media web page was developed on Facebook (WASP TOOL PARALIMNI) which promotes on a weekly basis several prevention events. Per week, this platform has 10 new followers accounting until now more than 1000 members.

The waste composition analysis (Zorpas et al. 2015) indicated that (Fig. 5) 26 % of the total wastes could be forwarded for composting since they were green and yard waste. Food waste

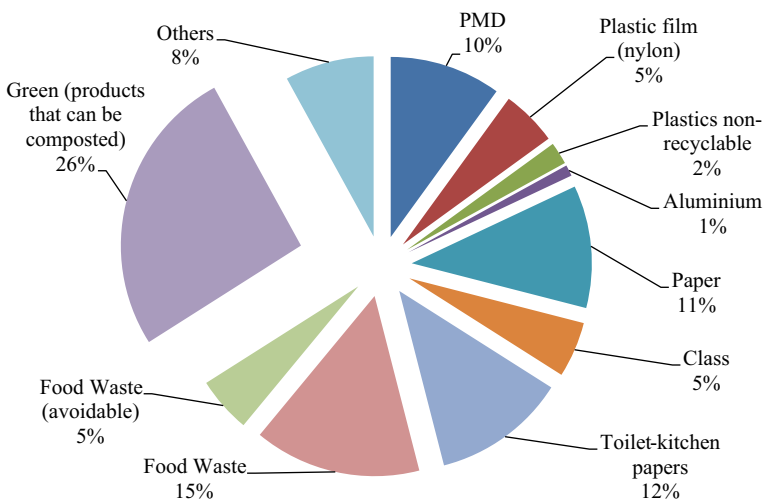


**Fig. 3** Waste production and gate fee per month during 2011



**Fig. 4** Municipality Waste prevention strategy plan (Zorpas et al. 2015)

was equal to 20 %, toilet and kitchen papers including sanitary were 12 %, papers was 11 %, PMDs up to 10 %, plastic films 5 % and glass 5 %, non-recyclable plastics were 2 %, aluminium was up to 1 % and other waste were 8 %. Impressive was the fact that 5 % of the total composition analysis consisted of food that was safe to be used like whole and high quality fruits, and vacuumed and packed foods which did not have expired (like pasta, cans,



**Fig. 5** Waste analysis

rise, frozen stuff, cakes etc.). Moreover, a significant result was the fact that 27 % of the total wastes were recyclable (PMD, papers, glass, aluminium). This detailed waste analysis was then updated in the following categories to be comparable with the WASP Tool (Fig. 2): Bio-waste (including food waste and green waste), papers and paperboard, plastics, metals, glass and others.

Using the results of the composition analysis, the Council of the Municipality set specific targets and priorities by the end of 2014–2015 (Table 1). Regarding the WASP tool (Fig. 2), the municipality has the ability at any time to change or to add other prevention targets and decide what is better to focus on. For example (Table 2), as organic material (Bio-waste) is up to 46 %, the tool indicates that priority must be given in that direction. Typically, this means that the municipality must provide composting bins to all the houses that exist in the area, complete informative material about what can be composted and how, as well as about food waste minimization. As food waste and green waste counted to about 46 % of the total waste, the Strategic Waste Prevention Plan focused on the reduction of these two main waste streams. Home composting and food waste reduction information was included in the program. More specifically, information was given about the concept of expiration day written on the food label «Best before or Good before», demonstrations on how to use composting bins and what can be composted, conference presentations with emphasis on food reduction. A specific cook book was also prepared which promoted more than 50 local recipes which could use leftovers in food preparation, further minimizing this way the food waste ending to landfills. The key message during economic crisis, which would encourage the citizens to participate in these prevention events, was to realize that waste prevention results in money savings (Zorpas et al. 2013b). This book was distributed to the citizens and is free to be used by anyone. However, at this time there is not any specific evidence of how many they have really used this book to prepare meals using leftovers. It is only known that at least 50 % of the citizens have prepared one recipe from that book but it was not clear if that recipe was from leftovers or not. Also, regarding food wasting prevention, emphasis must be given on smart supermarket shopping lists in order to train the citizens to buy exactly what they daily need and what they generally need, and thus, avoid thrown away foods (like bananas when their skin became black). The Tool (Table 2) calculates through several algorithms estimation indicators on progress regarding prevention (Table 3). For example, the proposed action for the implementation of home composting (as a priority strategy) could prevent 556 t/y of food and green waste which is discharged to landfills, saving 742 m<sup>3</sup>/y in the landfill volume. Furthermore, the difficulty of implementing the specific proposed action seems to be low as the municipality has organized many awareness events. Moreover, the implementation of this action is estimated to develop 9 jobs. All the savings through the proposed implementation action, which are significant, could be used from the municipality to develop infrastructure in order to increase citizen's quality of life. This strategy is called “pay as you save”. “Pay as you Save” is an innovative investment solution that will give the opportunity to the Municipality Council to finance other projects focusing on quality of life (e.g., playground areas, parks, infrastructure like roads and bicycling roads, pavements, etc.). From all the proposed prevention activities, if the municipality implements all of them, this could save approximately 1,000,000 €/y from the gate fee.

In 2013, the Municipality has implemented a complete study according to the [National Law \(185\(I\)/2011\)](#) in order to receive the Licence to be an independent Waste Management Authority. In May 2013, the Minister of Environment has signed the 1st Licence that were given to Local Authorities in Cyprus. According to this Licence the Municipality has the

**Table 1** Proposed targets to minimized each waste stream

Main Categories	Sup categories	Proposed prevention Target % 2014–2015	Implemented plan to reach the target
PMD	Plastic bottles/pots, metal packages, tetra pack (like milk, juices)	50	Public awareness campaign regarding the recycling program
Plastic film (nylon)		–	
Plastics non-recyclable	Straws, yoghurts plastics, butter pots	–	
Aluminium	Aluminium papers, tins/cans	100	Public awareness campaign regarding the recycling program
Paper	Package, Newspapers, magazines, offices, advertised	20	Public awareness campaign
Class	Bottles, others	50	Public awareness campaign
Toilet-kitchen papers		–	
Food Waste (A)	Bakery's, confectionery, dairy-farming, meat, fish, cocked	10	Development of Cook book handbook using as raw materials left over
Food Waste (B Whole, ready to eat)	Yogurt, wine, cooking oil, olives, eggs, banana, apples, pears, peaches, pomegranates, grapes, watermelons, oranges, passion fruits, mandarins, potatoes, girasol, tomatoes, lemons, cucumber, carrots, onions, breads, pasta	25	Public awareness campaign to reuse those foods
Compost (products that can be composted)	Vegetables, skin fruits, green waste, dust, soil	50	Public awareness campaign Home composting
Others	Toys, textile, shoes, Pens, pencils medicines, syringe, spays, CDs, kitchen brush, lamps, polystyrene, batteries, chandlery, stones, metals (spoons, knives, pans, screws)	25	Exchanged materials Public awareness campaign



**Table 2** WASP Tool chosen scenarios and results

STEP 1		STEP 2 (data)		STEP 3 (chosen waste analysis %)	
Country	Cyprus	Population	18,000	Bio-waste	45.77
District	Famagusta	Waste per capital Kg/year	659	Papers – Paperboard	11.3
Municipality	Paralimni			Plastics	16.65
STEP 4 (Choosing Prevention Goals)		STEP 5 Index Assessment		Metals	1.29
Household Food waste		Environmental Indicators	50 %	Glass	4.98
Household Green waste		Economic Indicators	50 %	Others	20.01
Food waste from hospitality industry		Social Indicators	50 %		
Plastic bags		STEP 6 Waste prevention Strategy classification			
Office papers		Strategy	Action taken	Target	%
PMD and Non-returnable bottles		Composting	Household level	Food and green waste	100
		Food waste	Public awareness event	leftovers	76.5
		Material exchange	Exchange points	books	67.5
		Awareness activity	Collection system development	Non returnable items	67.5
		Reduce office papers	Awareness activity Use of electronic messages	Office papers	65.2

ability to design and establish a Complete Zero Waste Approach and Waste Prevention Plan for the next 6 years (until the end of 2018).

In the total area of the Municipality there are almost 100 recycle points (which include separated bins for PMD collection, paper and paperboard, as well as glass). Moreover, the Municipality is participating in a National Research program focusing on waste minimization in hotel industry which includes the establishment of Food Waste Compressor (of total volume 12 t each) and 20 skips (of 8 t each) for the green waste. Green waste will be forwarded for composting (the unit will be developed in 2015–2016) and food waste will be given to units to produce biogas. Those entire activities can reduce the total waste sent to the KMWTP in more than 50 %, reducing at the same time the total gate fees. For example, WASP Tool (Tables 2 and 3) indicated that with the implementation of prevention activities focussing on the collection of non-returnable items could prevent 85 t/y of waste and could save up to 4092 €/y creating at the same time 6 jobs. However, the social behaviour indicator is considered to be low, as it is up to the participant to decide if he/she want to participate in the waste prevention or not.

#### 4 Waste Prevention at the Household Level

The waste minimization prevention campaign includes several activities: (a) home composting (i.e., on-site or garden composting). Using organic materials, mainly yard waste (green waste) and leftovers (like: coffee, bread, fruit peels, egg shells, vegetables etc.), compost is produced, and the methods are called “On-Site Composting”; (b) development of traditional recipes using leftovers, that is food wastes that are ending to landfills are reduced; (c) materials-items exchange. The aim of this activity is to exchange things we do not need any more, for example books, clothes, toys etc. (Zorpas et al. 2013b). Table 1 presents the target regarding the waste minimization prevention campaign. The targets were set out after the composition analysis

**Table 3** WASP Tool report regarding indicators process

STEP 7 FINAL REPORT										
Environmental Indicators										
Strategy	Action Taken	Target	Estimation of waste before action (t/y)	Estimation of waste after the implementation of the action (t/y)	Waste prevention (t/y)	Estimation Space on Landfill side before the actions (m <sup>2</sup> /y)	Estimation Space on Landfill side (m <sup>2</sup> /y) after the actions			
Composting	Household level	Food and green waste	2172	1616	556	2896	2154			
	Food waste	Public awareness event	1629	1455	174	2172	1940			
	Material exchange	Exchange points	16	12	4	146	111			
	Awareness activity	Collection system development	249	164	85	996	655			
Reduce office papers	Awareness activity	Office papers	801	701	100	3813	3336			
Economic Indicators										
Strategy	Action Taken	Target	Estimation implementation cost -€	Estimation gate fee before actions - €	Estimation gate fee after actions - €	Estimation jobs development	Difficulty indicator			
Composting	Household level	Food and green waste	360,000	54,252	40,394	9	0.2 (low)			
	Food waste	Public awareness event	2700	40,719	36,370	5	0.2 (low)			
	Material exchange	Exchange points	3600	400	305	13	0.2 (low)			
	Awareness activity	Collection system development	5400	628	4092	6	0.55 (average)			
Reduce office papers	Awareness activity	Office papers	5400	20,017	17,515	6	0.55 (average)			
Social Indicators										
Strategy	Action Taken	Target		Estimation of social behaviour		Suitable to be implemented				
Composting	Household level	Food and green waste		0.55 (average)	0.85 (high)	Household level	Food and green waste			
	Food waste	Public awareness event		0.85 (high)	0.85 (high)	Public awareness event	leftovers			
	Material exchange	Exchange points		0.55 (average)	0.85 (high)	Exchange points	books			
	Awareness activity	Collection system development		0.2 (low)	0.55 (average)	Collection system development	Non-returnable items			

**Table 3** (continued)

STEP 7 FINAL REPORT					
Reduce office papers	Awareness activity Use of electronic messages	Office papers	0.85 (high)	0.85 (high)	Awareness activity Use of electronic messages Office papers

took place for a period of 12 months in the study area. Several actions must be taken into account in order to reach the proposed targets. These actions (Table 1) are strongly associated with prevention and more specifically under the concept of: avoidance, reduction, reuse with main emphasis on food prevention and home composting. At the local level, several actions were organized in order to reach the proposed targets set in Table 1, which totally aim to reduce the waste sent to landfills by 2018 up to 35 % v/v based on the waste production of year 2011 which was 15,000 t.

The secret behind any waste prevention plan is the social behaviour (Zorpas and Lasaridi 2013). Nevertheless, there is no standard set of behaviours which is widely accepted regarding household waste prevention (WR1204 2009). Generally, it may include activities focussing on the reduction of waste sent to landfill like making food using leftovers, using second hand clothes, making compost from yard waste etc.

## 5 Social Behaviour on Waste Prevention and Constraints

The United Nations Program on Environment and Development (UNED), which took place in Rio de Janeiro on 1992, proposed Agenda 21, which highlighted the potential role played by education in creating the awareness important to protect the environment and lead to sustainable development (Kanyimba et al. 2014; Voukkali et al. 2014). As indicated in chapter 36 of the Agenda 21 “education is critical for promoting sustainable development and achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision making” (Earth Summit 1992).

Through the WASP Tool (Tables 2 and 3) an estimation of the social behaviour was measured according to the proposed prevention activity. It was estimated that the implementation of home composting could be accepted by 55 % of households (0.55 indicated that is average acceptance), while for the reduction of food waste and the reuse of leftovers this indicator was up to 85 % (0.85 indicated that is highly accepted by the citizens). However, low acceptance presents the awareness activity focusing on the collection of non-returnable items (0.2, very low) while the book exchange presents acceptability up to 0.55 (average).

The impact and control of waste prevention awareness campaigns, and methods to evaluate, monitor and measure waste prevention through mass reduction and behavioural studies have been presented by several authors in the past (Sharp et al. 2010; Zorpas and Lasaridi 2013; Zorpas et al. 2015). Several authors have used behaviour change concepts to explain or to predict waste prevention behaviour (Tonglet et al. 2004; Gray and Toleman 2006). Personal behaviour is considered to be one of the main barriers to achieve waste prevention (WR0117 2008). Without any specific awareness activities it is almost impossible to build or to change citizen’s daily habits. The most common awareness activities which took place in order to achieve prevention in the selected area include: (i) spots on the local radio station, (ii) monthly abstracts in local magazines, (iii) conferences at least once a year, (iv) demonstration for composted bins (v) door to door information materials regarding what can be recycled and what can be discharged to landfills, (vi) about food waste (avoidable, unavoidable), (vii) survey audit etc.

There are several motivations regarding waste prevention; some of them have qualitative and some quantitative results. Quantitative and obvious to the participants is that with

prevention (especially food waste prevention) they earn money; while qualitative, which is not directly visible, is that the quality of life in the long-term increases (for example if they participate to home composting or to recycling). According to Graham-Rowe et al. (2014), one of the main motivations to achieve waste prevention for the participants is to believe that it is not “waste of money”. A research conducted by Barr (2007) indicated that waste prevention behaviours are poorly associated and connected with recycling, and are sometimes even negatively correlated such that recycling may become a reason for not doing more to reduce waste (DEFRA 2011). Moreover, according to the same researcher (Barr 2007), 70 % to 85 % of the variation in behaviours could not be explained (why or why they are not preventing). Difficulty in explaining waste prevention behaviour may be due to the fact that it is not that of a single (one person’s) behaviour but that of many (holistic as the model is chaotic) (WRAP 2007). According to several reports (WR0114 2008; WR0116 2008; WR0117 2008), the main constraints faced about behaviour changes include: (a) “Values-universalism and moral motivations”, especially when citizens are engaged in recycling they are often influenced and affected by external circumstances such as those for waste prevention, and highlight personal and ethical values; (b) “Personal responsibility” is mainly reported as a “direct” requirement for prevention behaviour and may be presented as personal satisfaction or pleasure; and (c) “Self-efficacy” which generally describes the knowledge, know how, personal experience and confidence.

## 6 Conclusions

Generally, waste prevention programs and strategy plans focus on: resource savings, reduction of the amount of material being disposed off to landfills, protection of human health and the environment, minimization of the negative impacts on society, support of sustainability through economic development, support of business offering occasions to develop new products. The proposed prevention campaign is a priority in order to achieve all the targets set out from the Municipality aiming to reduce-minimize the production of the waste. The Municipality council must promote specific motivations for citizens in order to achieve and implement a complete waste prevention program, which must focus on reduced taxes on the collection of the waste or other activities. However, to achieve waste prevention is everybody’s responsibility. It is clear and obvious that, citizens are not able to understand something that is not there as prevention are all the activities, motivation, barriers etc. taken before an item becomes waste.

**Acknowledgments** The Project WASP TOOL focuses on the Development and Demonstration of a Waste Prevention Support Tool for Local Authorities and was co-funded from EU (Project LIFE10 ENV/GR/000622).

## References

- Barr S (2007) Factors influencing environmental attitudes and behaviors. A UK case study of household waste management. *Environ Behav* 39(4):435–473
- Cecere G, Mancinelli S, Mazzanti M (2014) Waste prevention and social preferences: the role of intrinsic and extrinsic motivations. *Ecol Econ* 107:163–176

- DEFRA (2011) Exploring catalyst behaviours, executive summary a research report completed for the Department for Environment, Food and Rural Affairs by Brook Lyndhurst November 2011 Queen's Printer and Controller of HMSO 2007, <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16324> access on April 2014
- EN 14899:2005 Characterization of waste - Sampling of waste materials - Framework for the preparation and application of a Sampling Plan
- EEA (2009) Diverting Waste from Landfill—effectiveness of Waste-management policies in the European Union. European Environmental Agency, Copenhagen
- EEA (2013) Managing municipal Solid Waste—a review of achievements in 32 European Countries. 2 2013. European Environmental Agency, Copenhagen
- EU (2012) Preparing a waste reduction programme; Guidance Document. Director General Research
- Eurostat (2010) Municipal waste generated, 1000 tonnes, 1995–2008 (update 11/03/ 2010). Environmental Data Centre on Waste [WWW Document]. URL [http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/Municipal\\_%20waste\\_%20generated\\_1000t\\_%20update\\_%20website180112.mht](http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/Municipal_%20waste_%20generated_1000t_%20update_%20website180112.mht). (access on April 2015)
- Earth Summit (1992), In: the United Nations Conference on Environment and Development, Rio De Janeiro. International Institute for Environment and Development, London
- Graham-Rowe E, Jessop CD, Sparks P (2014) Identifying motivations and barriers to minimising household food waste. *Resour Conserv Recycl* 84:15–23
- Gray S, Toleman I (2006) National home composting survey results 1997–2005. Sustainable Waste & Resource Management Conference Proceedings, 19–21 September, Marwick University, UK. pp. 775–786
- Gentil CE, Gallo D, Christensen HT (2011) Environmental evaluation of municipal waste prevention. *Waste Manag* 31:2371–2379
- Inglezakis JV, Zorpas AA (2012) Household hazardous waste management in the European Union. *Int J Chem Environ Eng* 3(3):40–48
- Inglezakis JV, Dvorsak S, Varga J, Venetis C, Zorpas A, Elaiopoulos K, Ardeleanu N, Ilieva L, Moustakas K, Loizidou M, Cobzaru C (2012) Municipal solid waste experimental studies in Romania and Bulgaria. *Int J Chem Environ Eng* 3(3):64–73
- Kanyimba TA, Richter WB, Raath PS (2014) The effectiveness of an environmental management system in selected South African primary schools. *J Clean Prod* 66:479–488
- National Law (185(1)/2011) Waste framework law on waste
- Rappou D (2012) North London waste prevention plan. North London Waste Authority
- Sharp V, Giorgi S, Wilson DC (2010) Methods to monitor and evaluate household waste prevention. *Waste Manag Res* 28:269–280
- Tonglet M, Phillips PS, Bates MP (2004) Determining the drivers for householder pro environmental behaviour: waste minimisation compared to recycling. *Resour Conserv Recycl* 42:27–48
- Voukalli I, Loizia P, Zorpas AA (2014) In: Zorpas AA (ed) Definitions of sustainability. Inc sustainability behind sustainability. Nova Science Publisher, New York, pp 1–7
- WRAP (2007) Understanding food waste - research summary
- WR0114 (2008) Global action plan, Nye, M. and Burgess, J. (School of Environmental Sciences, University of East Anglia) Promoting durable change in household waste and energy use behaviour
- WR0116 (2008) Dorset County Council, AEA, The Social Marketing Practice, Mike Read Associates, & The University of Northampton. Household Waste Prevention Activity in Dorset. Summary report, technical annexes
- WR1204 (2009) Household waste prevention evidence review: L1 m1 – executive report, a report for Defra's Waste and Resources Evidence Programme, Brook Lyndhurst October
- WR0117 (2008) Brook Lyndhurst for Hampshire county council small changes big difference towards a materials resource authority: promoting practical waste prevention and exploring options for resource management. Summary report, technical report and annexes
- Zorpas A, Lasaridi K (2013) Measuring waste prevention. *Waste Manag* 33:1047–1056
- Zorpas AA, Drtil M, Koumi C, Voukali I, Samaras P (2010) Operation description and physicochemical characteristics of influent, effluent and the tertiary treatment from a sewage treatment plant of the Eastern Region of Cyprus under warm climates conditions. A seven year project. *Desalin Water Treat* 22:244–257
- Zorpas AA, Coumi C, Drtil M, Voukali I (2011) Municipal sewage sludge characteristics and waste water treatment plant effectiveness under warm climate conditions. *Desalin Water Treat* 36:1–15
- Zorpas A (2011) Alternative treatment of urban wastewater using electrochemical oxidation. *Desalin Water Treat* 27:268–276
- Zorpas AA, Lasaridi K, Voukalli I, Loizia P, Fitiri L, Trisokka V, Chroni C, Fanou K, Pyrilli D, Goumenou P, Georgiou A (2013) Development of waste prevention campaign in the Waste Framework Directive from

- Paralimni Municipality which based in the Eastern Region of Cyprus. 13th International Conference on Environmental Science and Technology, Athens from 5 – 7 of September, Greece.
- Zorpas AA, Lasaridi K, Abeliotis K, Voukkali I, Loizia P, Fitiri L, Trisokka V, Chroni C, Fanou K, Pyrilli D, Goumenou P, Georgiou A (2013) Municipal solid waste compositional analysis from a municipality in Cyprus regarding the waste framework directive; development of a waste minimization plan. 13th International Conference on Environmental Science and Technology, Athens from 5–7 of September, Greece
- Zorpas AA, Lasaridi K, Voukkali I, Loizia P, Chroni C (2015) Household waste compositional analysis variation from insular communities in the framework of waste prevention strategy plans. *Waste Manag* 38:3–11