



*Wastemanagement focussing on:
Knowledge and Integration to create
Transnational economic development*

Interregional waste management and recycling RTD and innovation and
network/cluster synergies (WP3)

<i>Publication Date</i>	October, 2010
<i>Responsible Partner</i>	Yorkshire Forward and CO2Sense Yorkshire
<i>Contributors</i>	Regional Cluster
<i>Prepared by</i>	James Richardson (CO2Sense Yorkshire) and Chunfei Wu (University of Leeds)
<i>Approved by:*</i>	Ashley Robb (CO2Sense Yorkshire)
<i>Revision</i>	1
<i>Total number of pages</i>	78
<i>Annexes</i>	-
<i>Notes</i>	<p>Important: All exchange rate taken from:</p> <p>http://ec.europa.eu/budget/inforeuro/index.cfm?fuseaction=currency_historique&currency=72&Language=en</p> <p>(Valid from 01/09/10)</p>

Executive Summary

This report provides a summary of the overview reports of wastes management from the four studied regions (Emilia-Romagna (Italy), Yorkshire and Humber (England), Sofia (Bulgaria) and Amsterdam (Netherlands)). As part of this study a meta-table has been produced and several league tables were generated to identify the potential synergies that will ultimately feed into the Joint Action Plans (JAPs) – Work Package 4. These will seek to expand ambitions of the involved regions with respect to regional economic development based on waste management Research and Technical Development (RTD), innovation and business creation. This report provides some context to each region's geographical and socio-demographic background and also the economic and waste-related policy context. It sets out the targets relating to sustainable waste management in each respective region. Where possible, the relative performances and advances being made in accordance with a number of thematic areas have been identified (e.g. waste prevention, recycling, composting, anaerobic digestion, mechanical biological treatment, incineration etc.).

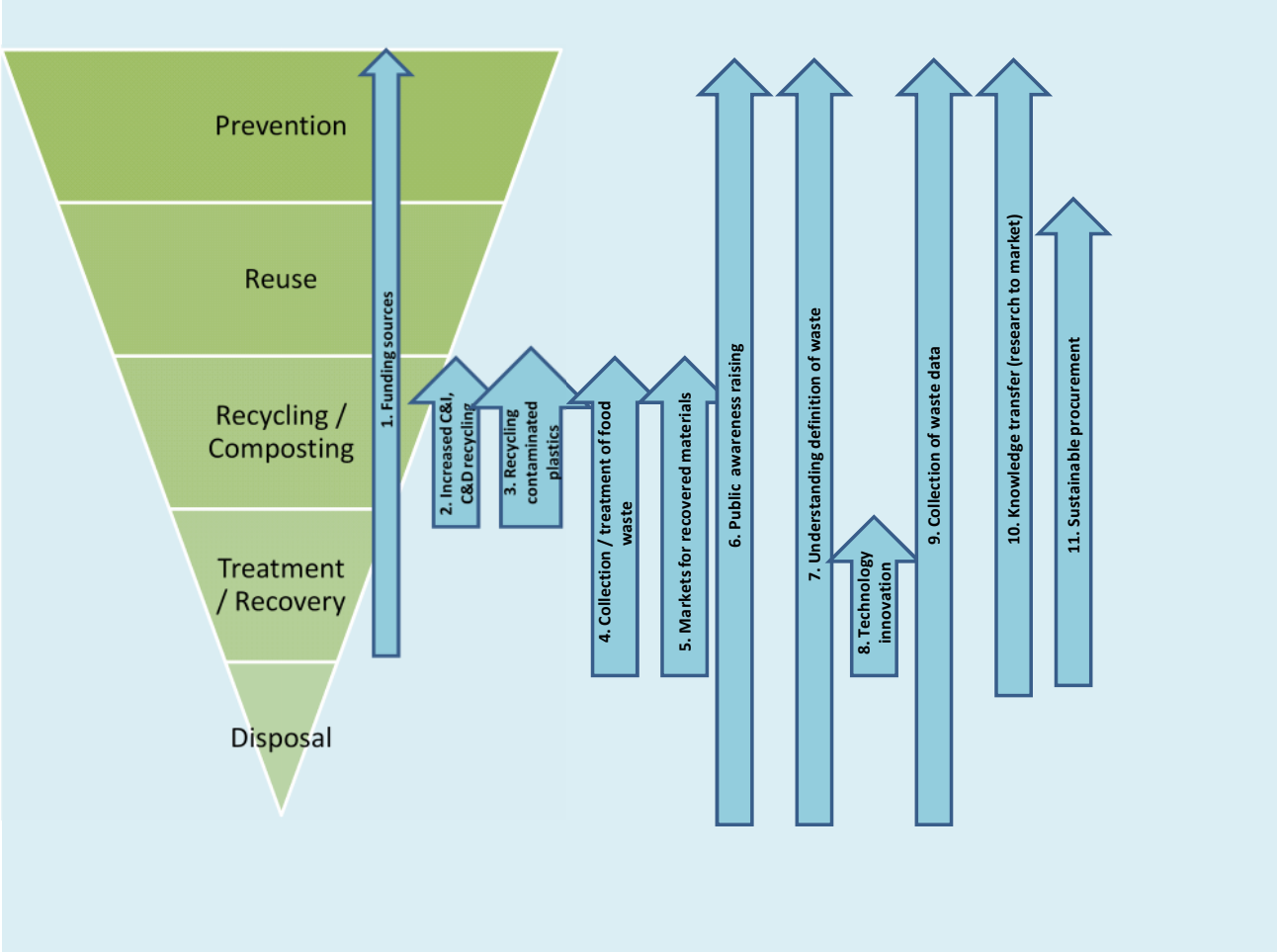
By analysing the Strengths, Weaknesses, Opportunities and Threats (SWOTs) from the MS2 reports, the meta-table and the league tables that were subsequently generated, 12 potential synergies have been identified for feeding into the JAPs (these are illustrated in Figure E.1 overleaf):

1. Identification of funding for sustainable waste management and technology development.
2. Increasing the levels of recycling of commercial and industrial, and construction and demolition waste.
3. Exploring the options for the recycling of contaminated plastics.
4. Enhanced source collection and treatment of food waste.
5. Market development for recycled / recovered materials.
6. Improvement of public perception of waste – linked specifically to increasing levels of re-use, recycling and preventing waste from occurring in the first place.
7. Understanding the definition of waste – is it a resource, fuel or waste? (In particular the associated implications for planning and permitting).
8. Technology innovation related to waste processing (pyrolysis, gasification / incineration efficiencies).
9. Collection of waste data (arising / feedstock vs regional capacity. Related implications for importing waste).
10. Knowledge transfer from research to market.
11. Sustainable procurement (green procurement).

The Amsterdam City Region, Sofia, Emilia-Romagna and Yorkshire and the Humber all possess a quality R&D community and are ideally placed to offer something tangible to the WasteKIT project. The Netherlands are recognised throughout Europe as an “advanced” country in terms of its waste management practice. As such, the Amsterdam City Region boasts the best overall performance in terms of sustainable wastes management, making the region ideally placed to tutor on all aspects of waste management practice. The Emilia-Romagna Region has a heavy and concentrated cluster of facilities and infrastructure processing bio-waste and agri-wastes; they have particular expertise in this field. The Yorkshire and Humber region has a well established waste materials market and has done for some time. The region provides a high level of business support. In contrast, the Sofia region is

uniquely placed to learn from the other regions. It has the greatest potential to innovate through business practice and RTD. Sofia also has the potential to attract inward investment as feedstock levels for waste processing sites is guaranteed and therefore holds security for investors.

Figure E.1: Synergy potentials and relationship with waste hierarchy



WP4 will see the creation of action groups to research in more detail the opportunities identified in this report. These expert groups may partly incorporate partners outside of the WasteKIT consortium whom have a vested interest in the synergy potential topics and recommendations. The expert groups will feed into the formation of JAPs around the synergy potential topics at a regional and interregional scale.

Contents

Executive Summary.....	3
Contents.....	5
1. Background	7
1.1. Geographical and socio-demographic background	8
1.2. Economic context.....	10
1.3. GDP and waste production.....	12
2. WP3 Methodology.....	14
3. Policy and legislative context.....	16
3.1. EU Directives relating to waste management	16
3.2. National and regional legislations and policies for waste management.....	17
3.3. Targets for waste prevention, recycling and diversion of landfill	21
4. Current wastes management infrastructure	23
4.2. Composting	30
4.3. Anaerobic digestion (AD)	31
4.4. Mechanical biological treatment (MBT)	32
4.5. Biomass.....	33
4.6. Incineration	33
4.7. Gasification / pyrolysis.....	34
5. Innovation.....	35
6. Inter-regional barriers	37
6.1. AD related barriers.....	37
6.2. Lack of environmental awareness from the public.....	37
6.3. Conflicts between planning authorities	38
6.4. Access to finance.....	39
7. Synergy potentials	39
7.1. Available funding for sustainable waste management and technology development	41
Nature of the problem.....	41
Regional performance and opportunities	42
Call for action.....	44
7.2. Recycling of commercial and industrial (C&I), and construction and demolition (C&D) waste	45
Nature of the problem.....	45
Regional performance and opportunities	45
Call for action.....	46
7.3. Recycling of contaminated plastics.....	48
Nature of the problem.....	48
Regional performance and opportunities	49
Call for action.....	50
7.4. Source collection and treatment of food waste.....	51
Nature of the problem.....	51
Regional performance and opportunities	52

Call for action.....	53
7.5. Market development for recycled / recovered materials.....	53
Nature of the problem.....	53
Regional performance and opportunities.....	54
Call for action.....	54
7.6. Improvement of public perception	55
Nature of the problem.....	55
Regional performance and opportunities	55
Call for action.....	56
7.7. Definition of waste – fuel or waste? (Associated implications for planning and permitting)	56
Nature of the problem.....	56
Regional performance and opportunities	56
Call for action.....	57
7.8. Technology innovation related to waste processing (pyrolysis, gasification/incineration efficiencies)	57
Nature of the problem.....	57
Regional performance and opportunities.....	58
Call for action.....	62
7.9. Data collection for waste management (arisings/feedstock vs regional capacity. Related implications for importing waste).....	64
Nature of the problem.....	64
Regional performance and opportunities.....	65
Call for action.....	66
7.10. Knowledge transfer from research to market.....	66
Nature of the problem.....	66
Regional performance and opportunities	66
Call for action.....	67
7.11. Sustainable Procurement (Green Procurement)	67
Nature of the problem.....	67
Regional performance and opportunities.....	68
Call for action.....	69
8. Recommendations for work package 4 (WP4) Joint Actions Plans (JAP's).....	70
9. D3.1 Work Package 3 Workshop	73
10. Appendices.....	80
Appendix 1: Meta-table	80
Appendix 2: Main waste management drivers from policies and directives.....	81
Appendix 3: Reducing the amount of waste disposed at landfill	82
Appendix 4: Waste prevention and recycling activity	83
Appendix 5: Innovation policy and activity	84
Appendix 6: Synergy tables according to the comments	85

1. Background

WasteKIT is a European waste research project focusing on Knowledge and Integration to create transnational economic development. This document lays out the outcomes from Work Package three (WP3). WP3 details the results from the previous Work Packages (1 and 2) and seeks to identify synergy potentials and R&D opportunities feeding into WP4 joint action plans (JAP's). The JAP's will structure the stimulation of innovation and research and technical development (RTD) opportunities within the waste management sector.

Project Objectives:

The involved regions share a common ambition to stimulate waste management-related RTD, innovation and business creation at a regional as well as European level. The WasteKIT project has the following 3 objectives:

1. **Expand ambitions of the involved regions with respect to regional economic development based on waste management RTD, innovation and business creation** by means of the following most important approaches: facilitate the creation of knowledge and new technologies, facilitate the creation of spin-off projects, involve SMEs, attract investors, offer investment-related support, develop and implement innovative concepts with the aid of (launching) customers, create and intensify the waste management cluster / network.
2. **Expand the international roles of the waste management-related actors of the involved regions via international collaborations in the field of waste management-related RTD, innovation and business creation projects and initiatives.** Expand the mentoring roles of the waste management-related actors in order to commercialise waste management-related knowledge, skills and technologies, exchange best practices and to support regions to upgrade their waste management infrastructures. This will lead to the development of more sustainable wastes management across the European partners.
3. **Create an international role as a European network of (regional) waste management-related clusters to optimize the usage of knowledge spillovers.** This network of networks (clusters) for mutual learning (via best practices) and exchange of knowledge, skills and technologies could lead to an optimisation of waste management-related innovation and competitiveness.

WasteKIT offers the involved regions additional opportunities to fulfill the above-mentioned objectives. This European network will create collaborations and linkages with relevant European initiatives, programmes and platforms (e.g. relevant European Technology Platforms; Enterprise Europe Network; European Topic Centre on Resource and Waste Management; INNO Europe actions and initiatives).

Whilst working through WP3 it has been necessary to consider WasteKIT's work plan and how WP3 integrates WP4 in the creation of joint action plans (JAPs).

WasteKIT's overall strategy and work plan

The project has three project phases:

1. Analysis Phase;
2. Synthesis Phase and;
3. Measures, Mentoring & Dissemination Phase.

The following work plan relevant to WP3 is defined by the WasteKIT Annex I – “Description of Work” below:

Synthesis Phase (WP3, WP4):

The results of WP2 are processed in WP3 and WP4. WP3 deals with integration of the results, mutual reflection on the results and definition of synergy potentials of the involved regions. Next, WP4 focuses on the actual definition of the JAP. With respect to regional opportunities, regional JAPs will be generated (one for each region).

The central JAP reflects on the overall consortium (and European) potentials for joined RTD, innovation, business creation and network of clusters actions for the coming years.

Objectives for WP3:

WP3 leader is Yorkshire (partner 15). This WP strengthens the interconnections between the regions via strong reflection on each of region's waste management sector (in terms of waste management RTD, innovation, infrastructure, actors) and mutual reflection on and analysis of synergy potentials. Based on the outcomes from this WP, the consortium will be able to identify a number of themes that offer RTD potential and thus feed into the regional and central JAPs (e.g. related funding strategies (see WP4)).

1.1. Geographical and socio-demographic background

Emilia Romagna (IT)

Emilia Romagna is located in the North-East (NE) of Italy, in the centre of Italy's most productive area, where it is possible to find a climate characterised by warm summers and cold winters, with frequently precipitation and a considerable moisture level, while the climate is milder along the Adriatic coast.

Covering an area of 22,132 square kilometres, approximately half the size of Denmark and the Netherlands, the region accounts for 7% of the geographical territory of Italy being one the largest regions in Italy. Emilia Romagna region has a population of approximately 4.3 million inhabitants, representing 7% of the national population. It has an average density of 196 inhabitants per square kilometre.

The region shows a degree of urbanization of 55%, higher than the national average and it exerts a significant attraction towards a foreign population. There are, in fact, 365,687 foreign residents with a continuous increase in recent decades.

The age make up of the Emilia Romagna region is shown in Table 1-1. From Table 1-1, about 55% of inhabitants are between the ages from 21-60.

Table 1-1: Age make up of the Emilia Romagna region

Age group	Population	Percentage (%)
0 - 20	773,499	18
21 - 40	1,148,170	27
41 - 60	1,234,370	28
61 - 80	918,597	21
81 and over	263,343	6
Total	4,337,979	100

Yorkshire and Humber region (UK)

The Yorkshire and The Humber region covers an area of 15,512km², 11.7% of England's land mass, making it the fifth largest region out of the nine English regions. It is divided into the four sub-regions of North Yorkshire, West Yorkshire, South Yorkshire and The Humber, comprising 21 local authority districts and 496 wards.

The region has a population of approximately five million, with nearly 20% of people living in rural areas. The majority of the population lives in West Yorkshire and South Yorkshire along with a strong ethnic minority presence in West Yorkshire.

Yorkshire and the Humber is one of the most diverse English regions. In the south west of the region, it is heavily urbanised and 75% of the region's population lives in the three cities of Leeds, Bradford and Sheffield. Conversely, to the north and east there is an extensive rural area which accounts for over 12% of England's agricultural land.

The age make up of the Yorkshire and Humber region is shown in Table 1-2. From Table 1-2, about 53% of inhabitants are between the ages from 20-59; proportionally slightly lower than the one in the Emilia-Romagna region.

Table 1-2: Age make up of the Yorkshire and Humber region

Age group	Population	Percentage (%)
0-19	1,262,500	24
20-39	1,436,900	27
40-59	1,392,000	26
60-79	933,200	18
80 over	235,500	4
Total	5,260,100	100

Sofia region (BG)

The Sofia district has an area of 1,342 km² and includes the same boundaries as the Sofia Municipality. The administratively complex urban area rests in the Sofia Basin at an average altitude of 550 metres and contains the following population clusters within the District's construction zone: four towns including the capital of Bulgaria – Sofia, Bankja, Novi Iskar, and Buhovo; four independent boroughs including Tchelopechene, Botunets, Kremikovsi, and Seslavtsi; and 34 villages.

As of the end of 2009, the population of Sofia Municipality is the largest in Bulgaria with 1,249,798 inhabitants or roughly 16.5 % of the country's population. Trends have shown this percentage has been growing, from 14.14% in 1994 to 15% in 2000. Sofia Municipality also has among the highest population densities in Bulgaria at 919.8

persons/km² (2007) as compared to the national average of 68.9 (2007) persons/km².

The age make up of the Sofia region could not found at the time. Instead, age make up of the Bulgaria was presented in Table 1-3 for an indication of the population construction.

Table 1-3: Age make up of the Bulgaria

Age group	Population	Percentage (%)
0-19	1,477,073	20
20-39	2,141,756	29
40-59	2,067,903	28
60-79	1,477,073	20
80 over	221,561	3
total	7,385,367	100

Amsterdam region (NI)

The Amsterdam Metropolitan Area is situated in the western part of the Netherlands known as the Randstad region. To enhance the potentials of this region, two provinces, one regional authority and 27 local authorities collaborate together under the name 'Amsterdam Metropolitan Area' on policy themes related to housing, employment, infrastructure and landscape (see Appendix 1). The population of the Amsterdam Metropolitan Area is approximately 2.2 million inhabitants. The total population in the Netherlands is approximately 16.6 million inhabitants (number of households: ~ 6.9 million).

The age make up of the Amsterdam Metropolitan region is shown in Table 1-4. From Table 1-4, about 57% of inhabitants are between the ages from 21-60; proportionally higher than both the Emilia-Romagna and Yorkshire and Humber region.

Table 1-4: Age make up of the Amsterdam region

Age group	Population	Percentage (%)
0-19	509,227	23%
20-39	619,471	28%
40-59	640,049	29%
60-79	342,256	16%
80 over	81,931	4%
total	2,192,934	100%

1.2. Economic context

Emilia Romagna (IT)

The region's GDP is equal to 139.529 Euro millions and accounts for nearly 9% of the national GDP. It is one of the highest in Italy and in Europe, and its employment rate is well above the European average.

Emilia-Romagna is home to more than 430,000 enterprises, about 1 per each 10 inhabitants, and it is the demonstration of a formidable entrepreneurial attitude. Most of them are small and medium sized business, with an average number of employees of 4.08 per company, spread all over the region and characterized by technological and product specialization. It is also signified by a micro-enterprise structure (about 145,000) where 97% of these businesses employ less than 20 workers. Essentially it is possible to say that more than 90% of businesses have fewer than 50 employees.

The most important industrial districts are located in the provinces of Bologna (automatic and packaging machinery, motorcycle and automotive industries), Parma (food industry and food processing machinery), Modena (automotive, textiles, ceramic tiles and bio-medical industries) and Reggio Emilia (agricultural machinery and mechatronics).

The sectors showing the highest degrees of specialisation in the region are food processing (especially meat, fruit and vegetables processing), machine and equipment manufacturing and ceramic tiles production.

Several enterprises are present in the regional area, and even if some activities are decentralized at national and international level, their centre of gravity remain in the high concentration areas of the region, whose excellence is based on a local system of knowledge and skills.

Yorkshire and Humber region (UK)

The Yorkshire and Humber regional Gross Value Added (GVA) was £89.1 billion (€109.9bn) in 2008. In the same year, the region was responsible for 7 per cent of the UK's gross value added (GVA). GVA per head in 2008 was £17,100 this was the second lowest among the English regions, 17 per cent below the UK figure. The latest sub-regional data (2007) shows that nearly half of the region's GVA was produced in West Yorkshire.

The Office for National Statistics (ONS) Economic Regional Profile¹ explains productivity in Yorkshire and the Humber was second lowest of all English regions. However, notably, it has the largest amount of electricity generation capacity from power stations in the UK. There was a capacity of 14,400 MegaWatts in Yorkshire and Humber power stations operational at the end of May 2009. This was more than any other region at 18 per cent of the UK total.

Regional manufacturing accounted for 17 per cent of Yorkshire and Humber GVA in 2007, compared with only 13 per cent for the UK. The largest contributing sub-sectors of manufacturing were food, beverages & tobacco; and basic metals & fabricated metal products. In the north and east of the Yorkshire and Humber region there is an extensive rural area which accounts for over 12% of England's agricultural land.

Yorkshire & Humber is at the cutting edge of the UK's clean technologies sector. The environmental technologies sector is strong, well established and diverse in Yorkshire & Humber. It employs 14,000 people in 500 companies. Over 70% of them have their head office here, and more than 64% are already over 10 years old. Between them, they generate sales of over £2bn and help the region to play a major role in emerging domestic markets (worth an estimated £18 billion by 2010).

¹ Office for National Statistics (ONS) Yorkshire and the Humber Economic Regional Profile:

<http://www.statistics.gov.uk/cci/nugget.asp?id=2281>

Meeting the region's national targets for renewables is expected to stimulate up to £20bn of new investment, and to install 2,000MW of new generating capacity in Yorkshire & Humber alone. The largest sub-sector is waste management, followed by environmental consultancy, then water and waste-water treatment.

Sofia region (BG)

Sofia generates about 30% of Bulgaria's GDP and displays economic growth rates above the national average. Sofia's GDP per capita during 2002-2005 was about two times higher than the national average. Enterprises within Sofia Municipality also produce higher gross added value (GVA) and higher growth rates than the national average.

The structure of GVA shows economic development is concentrated in high-tech and services including trade, transport, communications, financial and intermediation services. This has come at the expense of dwindling industry, agriculture, and forestry. GAV growth in services was recorded at 44%; while for industry it was only 2%; and the percentage dropped in agriculture as well as nationally by 29%.

Amsterdam region (NI)

The Dutch economy grew substantially over the last decades. The Randstad region is the motor of the Dutch economy. Over half of the Netherlands' GDP is generated in this region. The gross regional product of the Amsterdam Metropolitan Area is between 63 billion euro and 80 billion euro depending on the geographical definition of the area (2007; PRES, 2009; CBS, 2010).

Approximately half of the economic growth in the Netherlands between 1995 and 2008 was due to investments in innovation and knowledge. The international position of the Netherlands in the field of productivity and competitiveness is reasonable. Nevertheless, action is needed to enhance its international position (Innovation Platform, 2010). In the Global Competitiveness Index of the World Economic Forum, Netherlands is positioned at number 10 (2009-2010; World Economic Forum, 2009) and has the 11th position on European Innovation Scoreboard. According to the European Innovation Scoreboard: "Netherlands is one of the innovation followers. Its innovation performance is just above the EU27 average, but the rate of improvement is below that of the EU27." (European Commission, 2009a). The Netherlands and France are labelled as 'slow growers' within the group of 'innovation followers'.

1.3. GDP and waste production

Due to the lack of data available at each regional level, national data has been used to obtain basic information about the relationship between waste production and the economic standing for each region. As shown in the Figure 1-1, the Netherlands produced the largest amount of municipal solid waste (MSW) when compared with the other Wastekit partners. Conversely the Netherlands landfills the lowest amount of waste; Bulgaria, on the other hand, landfills the largest proportion of municipal waste (Figure 1-1 (b)). As illustrated in Figure 1-1 (c), there are no incineration facilities in Bulgaria; Italy and UK have similar waste incineration capacity, while the Netherlands relies very heavily on waste incineration as a form of disposal. Approximately 80% of MSW in Bulgaria was disposed of to landfill. The purchasing power standards (Euro per inhabitant) shows an increasing trend for all the countries from 2000 to 2008 (Figure 1-1 (d)). As shown in Figure 1-1 (a) and Figure 1-1 (d), the MSW production seems to closely correlate with economic wealth; the Netherlands has the highest MSW production corresponding to the highest purchasing power standards, while the Bulgaria, on the hand, has the lowest MSW production and the lowest

purchasing power standards.

Figure 1-2 illustrates an obvious decreasing trend for MSW production against the purchasing power standards in Bulgaria. Although the trend is decreasing (in comparison to the other Countries) Bulgaria still has the highest MSW production against the purchasing power standards, while the other three countries show a similar level (see Figure 1-2). From Figure 1-2, a slight decrease is observed for the MSW production against the purchasing power standards in Netherlands and UK; however, a stable trend was obtained for Italy. Even with various changes in the strength of the Netherlands and UK economies (purchasing power) the relationship with the production of MSW still sees a decline. This suggests that much more effective instruments might have been applied in both the Netherlands and UK.

N.B. The purchasing power standard (PPS) is an artificial currency unit. PPS is the technical term used by Eurostat for the common currency in which national accounts aggregates are expressed when adjusted for price level differences using PPPs. PPPs can therefore, be interpreted as the exchange rate of the PPS against the euro. Theoretically, one PPS can buy the same amount of goods and services in each country. However, price differences across borders mean that different amounts of national currency units are needed for the same goods and services depending on the country. PPS are derived by dividing any economic aggregate of a country in national currency by its respective purchasing power parities.

Figure 1-1: Waste production and purchasing power standards for each country; (a) MSW production, (b) waste disposed to landfill, (c) waste incinerated, (d) purchasing power standards

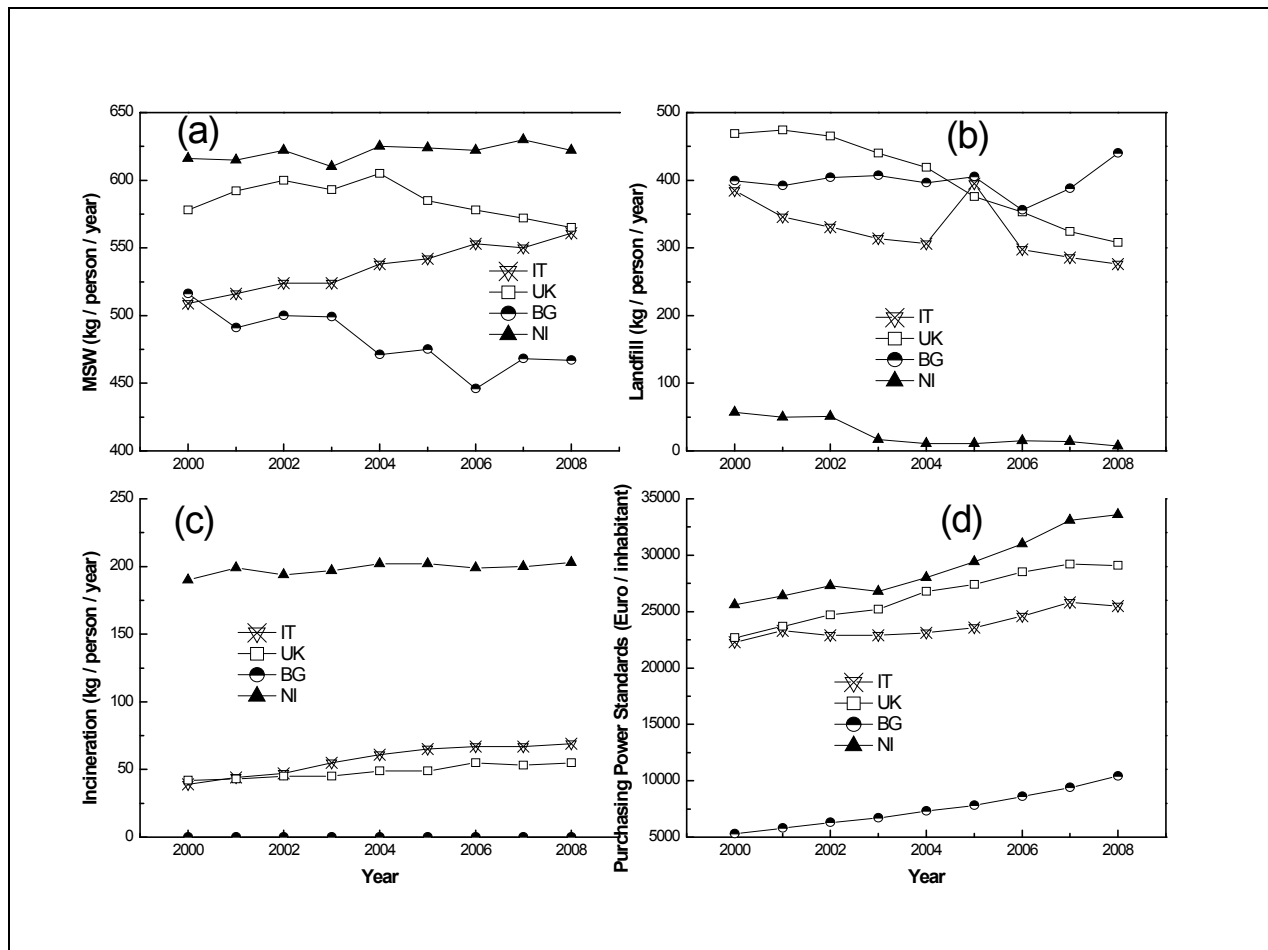
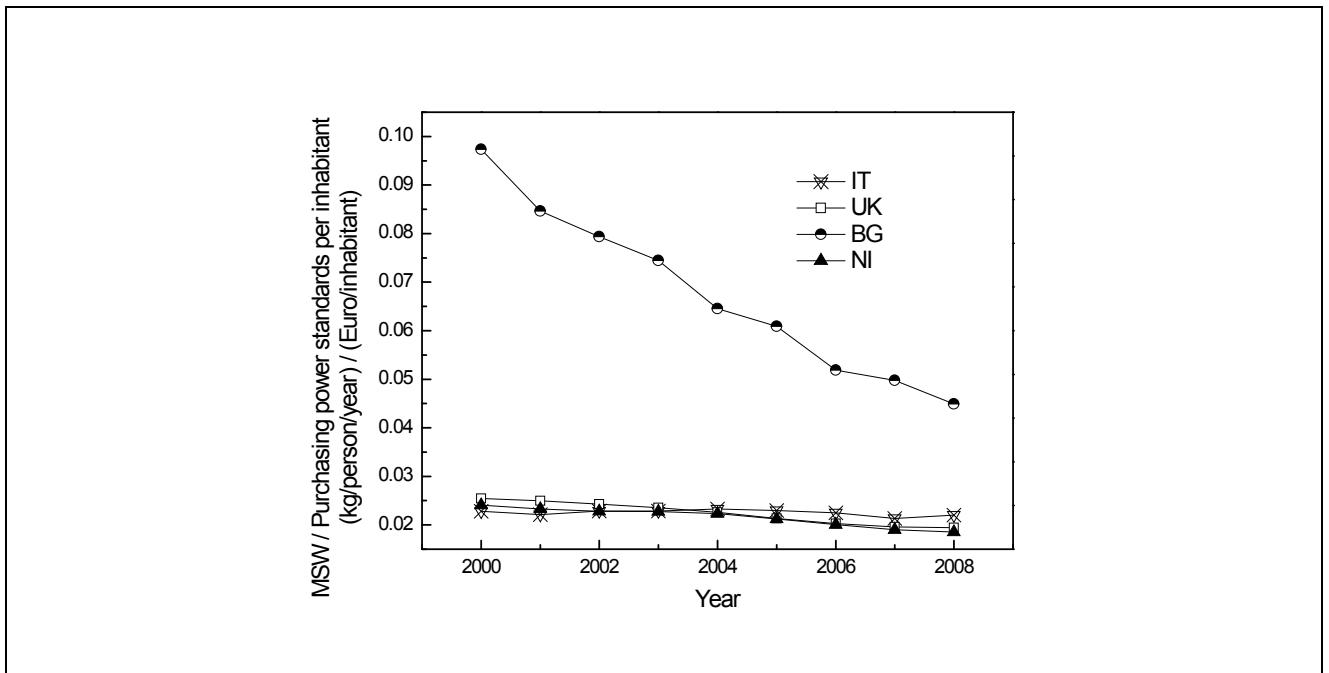


Figure 1-2: Waste production according to the purchasing power standards



2. WP3 Methodology

During the course of this work package many of the participating regions have been on holiday across the summer months with many organisations shutting down completely. This has made hosting a “workshop” event impossible. In future, other follow-on projects should seek to accommodate the summer close down of organisations in specific European Countries into the project time allocations.

It has been necessary as a starting point to create and populate a metadata table with all the headline findings from all participant regions. The metadata table will act to consolidate all of the key findings from each of the regions, derived from the case studies and the regional overview reports, which were the main deliverables from WP2. From assessing the key findings it has been possible to highlight key topics that pose a challenge for all of the Wastekit partners, these are also known as synergy potentials.

These synergy potentials have been analysed using a two prong approach:

- A. A Literature Review
- B. A Synergy Analysis

The two stages are detailed below:

Literature Review:

1. A comprehensive literature review of WP2 submitted documents (regional overview report, case studies and SWOT analyses) was undertaken to highlight key areas of interest. To assist in this

process a metadata table has been created and maintained throughout the course of WP3. This table illustrates synergies between the regions, and more importantly synergies between waste management practice, barriers, innovation and RTD in the waste management sectors of participating regions.

2. The key areas of interest and synergy potentials uncovered at the early stage of WP3 directly fed into a series of questionnaires. These questionnaires essentially substituted the workshop that was proposed in the original project brief. The key areas of interest aimed to inform topic discussion points and brainstorming sessions for WP4 – Joint Actions Plans (JAP's).
3. A secondary heavier analysis followed the questionnaires as further information uncovered new synergy potentials.

Synergy Analysis

1. The second stage to WP3 focused on specific synergy analysis. This stage identified, considered and explored synergy potentials through targeted focused topics. These topics included both the barriers and the solutions (as illustrated below), technologies and practices available associated with the waste management sector within each region.
2. A secondary heavier analysis followed as further information may develop a topic specific synergy potential.

This report allows:

- Participating regions the opportunity to provide context and share their individual expertise.
- The identification of regional barriers to RTD. For example, regional RTD knowledge and expertise. Perhaps a region may lack a specific skill set or struggle to develop partnerships between higher education institutions and businesses within the region.
- The identification of regional opportunities to overcome these barriers:
 - Can the regions find internal solutions and share these examples of best practice?
 - Are there further research opportunities to identify a new solution/more effective way of working on a regional level? For example, country specific funding incentives.
- The identification of common regional and interregional barriers to innovation that will be solved by knowledge/skill transfer and mentoring programmes.
- The identification of regional and Interregional barrier to RTD.
Interregional opportunities to overcome these barriers – identification of suggested knowledge transfer opportunities. These may be mentoring schemes.

All of the participating regions may have common barriers to overcome. It may not be possible to identify solutions to all of the common problems experienced by involved regions through knowledge transfer of best practice. This report draws reference to these highlighted areas.

3. Policy and legislative context

3.1. EU Directives relating to waste management

EU Directive, 2008/98/EC, establishes a legal framework for the treatment of waste; including definition of waste, prevention of waste, recovery, reuse and recycling, disposal, responsibility for waste management, control of hazardous waste, permits and registrations, plans and programmes and inspections and records etc. Several key and related Directives are summarized in the following table.

Table 3-1: EU Directive for the specialist waste

Directive	Type of waste	Content
94/62/EC	Packaging	This Directive enables the Member States to introduce systems for return and/or collection of used packaging. This Directive has been amended with Directive 2004/12/EC, Directive 2005/20/EC and Regulation (EC) No 219/2009.
Directive 2002/96/EC Directive 2002/95/EC	Waste electrical and electronic equipment (WEEE)	Directive 2002/96/EC enables to prevent the generation of electrical and electronic waste and to promote reuse, recycling and other forms of recovery in order to reduce the quantity of such waste to be eliminated. Directive 2002/95/EC enables the EU to take measures to restrict the use of hazardous substances in this type of equipment.
Directive 2000/53/EC	End-of-life vehicles (ELV)	The Directive 2000/53/EC enables to limit the production of waste arising from end-of-life vehicles and to increase re-use, recycling and other forms of recovery of end-of-life vehicles and their components.
Directive 2006/66/EC	Batteries	This Directive enables rules for the collection, recycling, treatment and disposal of batteries and accumulators.
Directive 2005/64/EC	Motor vehicles	This Directive enables vehicle manufactures to comply with minimum thresholds for the re-use, recycling and recovery of the component parts and materials of new vehicles. End of life vehicles (National target for 2015: 85% of the average vehicle weight to be recycled or recovered)
Directive 2008/98/EC (Article 11.2)	Construction and demolition waste	“by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70% by weight.”
Directive 2008/98/EC (Article 11.2)	Household waste	“by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households shall be increased to a minimum of overall 50% by weight.”
Council Directive 99/31/EC	Landfill of waste	The objective of the Directive is to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, by introducing stringent technical requirements for waste and landfills,

Others relevant policies operating into the waste sector are briefly listed below:

- Directive 1975/439/CE – exhausted oils
- Directive 1986/278/CE – waste water sludge
- Directive 1994/62/CE – packaging
- Directive 1996/59/CE – PBC and PCT
- Directive 2000/59/CE – ship wastes
- Directive 2006/21/CE – mining wastes
- Directive 1999/31/CE – waste disposals
- Directive 2000/76/CE – incinerators
- Regulation 2006/1013 – waste transport and shipping

Each European member state (including each of the Wastekit partners) is under a duty to enact each of these directives through member state legislation. Based on the information provided as part of WP2, the following section provides some context to the national and regional legislative drivers that have helped each partner comply with these EU Directives. Where possible, some examples have been provided indicating some novel approaches that have been adopted to aid compliance.

3.2. National and regional legislations and policies for waste management

Emilia Romagna (IT) waste management policy/regulations

The most important Directive for the waste sector is the EU Directive 2008/98/CE DM 15 February 2010. In particular, two instruments are already available at national level to help the directive application:

- *Garwer – Italian waste exchange* – The Italian B2B stock exchange for waste recycling. The place where waste producers can be matched with waste recyclers.
- *Sistri – Register for the electronic tracking of hazardous waste* – SISTRI, an innovative procedure based on computer technology, is an electronic system for checking the traceability of waste (hazardous and non hazardous waste). This revolutionary system simplifies procedures and formalities and reduces business costs. It undoubtedly guarantees greater transparency, knowledge and prevention of lawlessness.

The European Directive on packaging and packaging waste (CE/62/94, amended by 04/12/CE) was later acknowledged by Italian law in 1997 with Decree 22/97, amended in 2006 by Decree 152/06. With the aim of achieving the recovery and recycling targets set by the directive, Italian law set up CONAI, the national packaging consortium, with obligation of adhesion on the part of all packaging Producers and Users.

Biodegradable waste

Emilia-Romagna has been able to achieve high levels of source separated collection of biodegradable waste thanks to adequate planning of the various activities and an appropriate recovery policy:

- The implementation of green waste collection in 310 municipalities out of 341, mainly through the appropriately equipped “ecological collection points”;
- The collection of organic domestic waste in 204 municipalities out of 341 through a “door-to-door” collection system.

Yorkshire and Humber region (UK) waste management policy/regulations

The Waste Strategy for England (2007) sets the national policy context for waste management including revised targets for household waste recycling, household residual waste, municipal waste recovery and commercial and industrial waste disposal. The Yorkshire and Humber Regional Waste Strategy (2003) has a priority to improve the long term environment of the region through the reduction of the amount of waste produced and improving levels of recycling across the region. This was due to be superseded by the Integrated Regional Strategy – however this has been stopped due to the change in government which has adopted a more localized approach to strategy as opposed to a regional focus.

The fore mentioned waste management policy and strategies have acted as drivers to the Y&H region achieving a 30.5% recycling/composting rate in 2007/2008 from the figure below you can see the steady rise in this rate over a ten year period. Table 3.2 gives a flavour for the number of household collections at local authority level that receive a paper, card, plastic, can and garden waste collection.

Figure 3-1 Yorkshire and Humber Recycling/Composting Rates

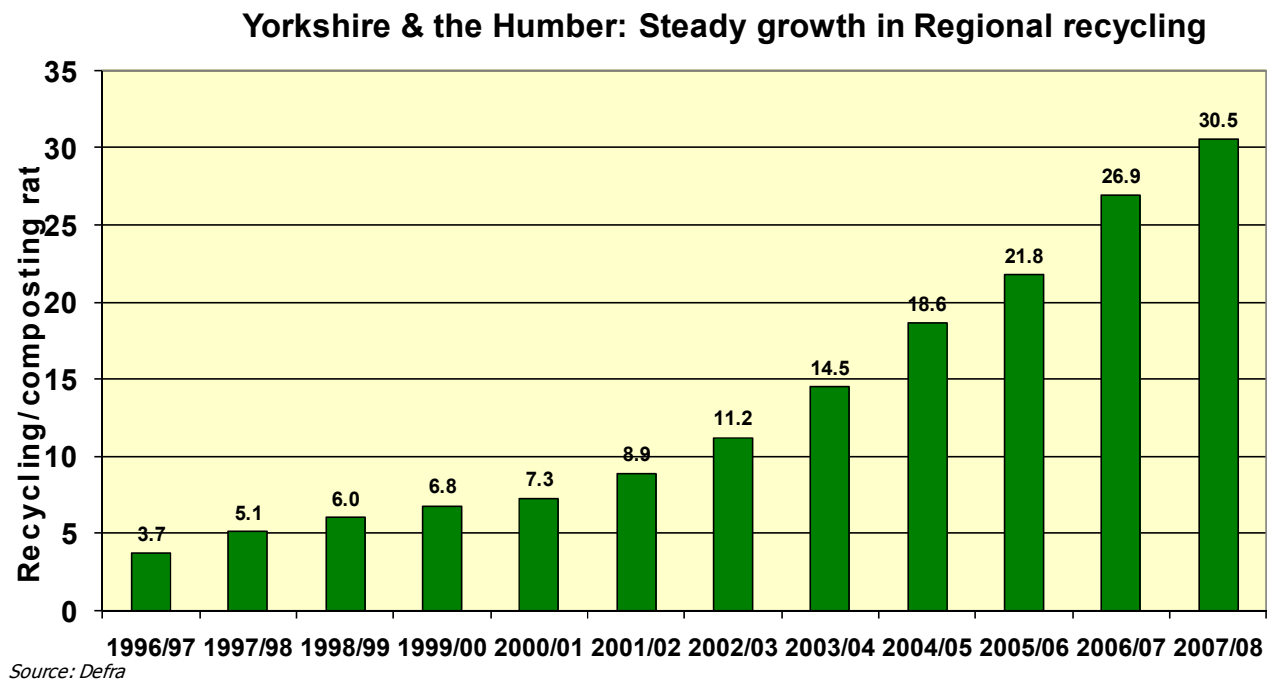


Table 3-2 Local Authorities with recycling and green waste collections (kerbside coverage by material)

LA	Total households from the Valuation Office end March 2008	Households receiving a kerbside collection				Garden waste
		Paper	Glass	Cans	Plastic	
Barnsley MBC	102,942	102,651	102,651	102,651	0	77,207
Bradford MBC	205,031	140,000	140,000	140,000	1,000	12,000
Calderdale MBC	91,459	90,000	90,000	90,000	90,000	0
City of York Council	83,983	71,735	71,735	71,735	71,735	57,571
Craven District Council	25,718	25,922	9,825	9,825	0	10,950
Doncaster MBC	129,687	127,856	127,856	127,856	127,856	127,093
East Riding of Yorkshire Council	147,929	148,901	0	148,901	148,901	21,120
Hambleton District Council	38,602	34,270	34,270	34,270	34,270	38,000
Harrogate Borough Council	69,027	69,000	69,000	69,000	0	20,000
Kingston-upon-Hull City Council	116,223	116,712	116,712	116,712	116,712	10,500
Kirklees MBC	175,400	160,000	94,000	160,000	160,000	577
Leeds City Council MBC	328,528	306,426	0	306,426	306,426	20,000
North East Lincolnshire Council	70,890	70,967	70,967	70,967	0	42,534
North Lincolnshire Council	71,488	70,718	70,718	70,718	70,718	66,000
Richmondshire District Council	21,810	22,249	22,249	22,249	22,249	12,500
Rotherham MBC	110,770	110,954	110,954	110,954	0	52,000
Ryedale District Council	23,653	23,837	23,837	23,837	0	23,553
Scarborough Borough Council	54,807	55,309	0	55,309	55,309	54,807
Selby District Council	35,116	35,476	35,476	35,476	0	30,000
Sheffield City Council	233,123	223,996	0	12,000	0	46,000
Wakefield MDC	144,299	143,696	143,696	143,696	143,696	90,806

The primary regulatory driver both in England and Wales is the Landfill (England and Wales) Regulations 2002, namely the scaling down of the amount and type of waste that we can continue to send to landfill. The primary tool for achieving landfill diversion has been through the introduction of the LATS (Landfill Allowance Trading Scheme) targets. There are 22 local authorities in the region all of whom have their own bespoke challenges; however the main challenge for the waste disposal / unitary authorities is to achieve the landfill diversion targets set for 2010, 2013 and 2020. Within the region there is 1 WDA and 14 unitary authorities.

Others relevant policies operating into the waste sector are briefly listed below:

- *Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 SI 1624* Introduces a registration system for carriers of controlled waste.

- *End-of-Life Vehicles (Producer Responsibility) Regulations 2005 SI 263*: Requires vehicle producers to register and declare responsibility for vehicles they place on the market and apply for approval of their system of collecting vehicles.
- *Hazardous Waste (England and Wales) Regulations 2005 SI 894*: Details requirements for controlling and tracking the movement of hazardous waste and bans mixing different types of hazardous waste.
- *List of Wastes (England) Regulations 2005 SI 895*: Provides the European Waste Catalogue list of codes used to classify wastes.
- *NEW Packaging (Essential Requirements) (Amendment) Regulations 2009 SI 1504*: Amends 2003/1941 by removing 4th March 2009 expiry date for the derogation (permission to carry out an otherwise banned activity) on maximum heavy metal concentration levels for plastic crates or pallets.
- *Producer Responsibility Obligations (Packaging Waste) Regulations 2007 SI 871*: Requires producers to recover and recycle packaging waste to achieve EU targets.
- *Site Waste Management Plans Regulations 2008 SI 314*: Requires the preparation of a site waste management plan for any construction projects with an estimated cost of over £300,000.
- *Guidance on Transfrontier Shipment of Waste Regulations 2007*: Transfrontier Shipment of Waste (Amendment) Regulations 2008 SI 9
- *Waste Batteries and Accumulators Regulations 2009 SI 890 (Adobe PDF - 276KB)*: Establishes a legal framework and schemes for collecting, treating and recycling portable, industrial and vehicle batteries. Applies to all types of batteries except when used for military and space equipment.
- *NEW Waste Electrical and Electronic Equipment (Amendment) Regulations 2009 SI 2957*: Amends 2006/3289 by improving the Producer Compliance Scheme approval process and reducing the administrative burden on business by simplifying the data reporting requirements and the evidence system.

Sofia (BG) waste management policy/regulations

The long-term strategy on MSW management in the Sofia Municipality was published in March 2007: To assist the Sofia Municipality in determining the steps necessary for long-term sustainable MSW management, a future investment project "Waste management in Sofia", was presented for funding from the EU structural funds.

A revised programme for waste management in the Sofia Municipality has been introduced which includes the main measures and activities that have been and will be undertaken in the period 2009-2011. Measures are added for specific technological proposals for building an integrated waste management system.

The main goals of the program are the activities centred on the collection, transport and treatment of the MSW, packaging wastes, demolition, health-care, industrial and dangerous wastes, carcasses and slaughterhouse wastes, green wastes, sludge; the control of these activities and to propose waste management measures for the period of the program.

- Up to 19,500 t/a of recyclables materials, green waste and food waste will be reused and recycled in 2013, which represents approximately 35% of total MSW in that year.
- Reduce the amount of waste going to landfill by 52% in comparison to the 2008 quantities of 425,000 t/a.

The collection of compostable / green waste has already been introduced in the region to recover higher levels of

household waste. A non-hazardous waste landfill will be constructed to receive pre-treated and stabilized MSW.

Amsterdam region (NL) waste management policy/regulations

The so-called Waste Management Council drew up the 'Stimulation Programme on Separation & Prevention of Household Waste' (A00 2001b). The programme includes a large number of projects for encouraging waste segregation and waste prevention.

One of the great success stories of waste management in the last decade has been the separate collection and composting of household bio waste. Another success is recycling. In the period 1985-2000, the recycling of waste increased from approximately 50% to more than 77% in 2000.

In 2003, the so-called National Waste Management Plan - Landelijk afvalbeheerplan (LAP) was activated. In a recent update (2010), the plan - called LAP2 - broadened its scope to policies focusing on entire materials chains. The LAP consists of a policy framework, sector plans and capacity plans.

In July 2004, the Netherlands implemented the WEEE Directive in the so-called BEA Decree (Besluit Beheer Elektrische en elektronische Apparatuur) and the so-called RoHS Directive in the REA Regulation (Regeling beheer elektrische en elektronische apparatuur).

The European directive 2000/53/EC was implemented in Dutch law by the "Besluit beheer autowrakken" (Decree on car wreck management) and was enforced in 2002. The Netherlands achieved 85.3 % recycling of ELV (cars) in 2005 of which 82.5% of the material was actually reused. The targets were 85% and 80%, respectively, which targets were already reached as early as 1997.

3.3. Targets for waste prevention, recycling and diversion of landfill

In order to comply with the EU Directive and national regulations of waste management, each region/nation has set up the targets for waste prevention, recycling and the diversion of waste from landfill.

Emilia Romagna (IT)

The WP3 Emilia Romagna region questionnaire indicates the landfill diversion target for the Emilia-Romagna region in 2020 is: 50% of the MSW to be recovered or recycled. The regulatory targets set for diverting waste from Landfill at a national level are 60% recovery; 55% recycling.

Yorkshire and Humber region (UK)

Under the Waste Framework Directive, each local authority in the UK will be expected to achieve a minimum recycling rate of 50% by weight by 2020 from domestic (and other similar types of waste) sources of plastic, paper, metal and glass.

There are 22 local authorities in the region all of whom have their own bespoke challenges; however the main challenge for the waste disposal / unitary authorities is to achieve the landfill diversion targets set for 2010, 2013 and 2020 (Landfill Allowance Trading Scheme). Within the region there is 1 Waste Disposal Authority (WDA) and 14 unitary authorities. The challenging targets are the ones set for 2013 and 2020:

- By 2013 to reduce the amount of BMW going to landfill to 50% of that produced in 1995

- By 2020 to reduce the amount of BMW going to landfill to 35% of that produced in 1995

Some piecemeal activity has occurred across the region to date but a strategy has now been devised which provide a more structured approach to regional waste prevention. However it largely remains unfunded and requires further finance to get it off the ground. Waste prevention is at the heart of the EU Waste Framework Directive. By the 12th December 2013 each member state will be expected to have the outline of a waste prevention programme developed.

Based on the results so far, the region's local authorities should meet the obligations for 2010, but the second target year (2013) is only three years away. It is obtainable, but, it is essential that the authorities continue to divert their waste away from landfill.

Within the region there are 3 authorities that exceeded their 2008/09 allocation (Bradford, East Riding and Hull). These authorities face challenges in achieving the targets set out in the forthcoming target years.

Failure to achieve these targets will result in £150 (€185.1) fines for each tonne of waste landfilled over the permissible levels, and a share of the national daily fine levied by the European Union if the national target is not met. The achievement of these targets across the region will be dependent on the commissioning of plants that are currently or are in the process of being commissioned to treat residual

Sofia region (BG)

Program for waste management in the territory of Sofia Municipality (expanded and revised edition), 2006 – 2010 has set targets for the waste recycling and diversion of landfill in 2013.

- Up to 19,500 t/a of recyclables materials, green waste and food waste will be reused and recycled in 2013, which represents approximately 35% of total MSW in that year.
- Reduce by about 52% the total landfill waste in comparison to the 2008 quantities of 425,000 t/a.

Amsterdam region (NL)

The National Waste Management Plan (Landelijk afvalbeheerplan; LAP) has set up the following targets for the waste management:

- Encourage prevention of waste such that the total waste generation does not exceed 73 million tonnes in 2021.
- Increase recovery of total waste from 83% in 2006 to 85% in 2015. Increase the recovery of total household waste 51% in 2006 to 60% in 2015. Increase the recovery of the total so-called HDO waste (waste from the sectors trade, services and government) 46% in 2006 to 60% in 2015. In 2006, the Netherlands had already achieved 95% recovery of construction and demolition waste and 90% recovery of industrial waste.
- Reduce land filling of combustible residues from 1.7 million tonnes (2007) to zero tonnes (2012).
- Maximise energy recovery of waste that cannot be reused. Use heat from waste incineration.
- Achieve a European level playing field for waste management..

- Promote the public responsibility for waste disposal.
- Use the cradle-to-cradle (C2C) concept as inspiration for waste management and waste / materials chains.
- Deliver support for the integral approach on sustainability: in 2020, the CO² emissions are reduced by 30% compared to 1990; in 2020, there is no danger to humans and environment by the spread of hazardous substances; in 2010, the loss of biodiversity stopped.

4. Current wastes management infrastructure

This section provides some context to the current waste infrastructure within each of the respective regions.

Emilia-Romagna (IT)

Local administrations have shown an interest in Sustainable Development policies and related energetic systems. Various programs and schemes are carried out; for example, the Region is committed to the establishment of the “Action Plan for the energetic valorisation of the endogen biomasses”. The Plan will promote the establishment of agro-environmental sustainable projects presenting a clear local interest, aiming to create the necessary conditions for the proper commitment of the agro-industry, the economical development of the bio-fuels and, more generally, the production of thermal and/or electric energy by the operation of small-sized plants.

Table 4-1 Cooperation programmes related to the Emilia-Romagna region

Program	Web link	Focal elements
<i>Spinner International</i>	http://www.aster.it/modules.php?op=modload&name=Sections&file=index&req=viewarticle&artid=44&menucor=0&menusx=2	SPINNER (European Social Funds 2000-2006/2007-2013) is the programme for human resources qualification in the research, technological transfer and innovation sectors. The main objectives are the qualification of human capital for the development of new innovative entrepreneurship, industrial research/technology transfer and organizational and managerial innovation in SMEs. SPINNER represents the first case of the application of a Global Grant to the European Social Fund.
<i>Climate-KIC Pioneer into Practice</i>	http://www.climate-kic-proposal.org/	Pioneers in Practice will offer entrepreneurial individuals the opportunity to tackle some of the key challenges posed by climate change. It will support two specific strands: a placement programme – enabling participants to be placed (3 month placements over a 12 month) in a range of real-world demonstration projects – and intensive workshops by three two-days.
<i>Innovation festival</i>	http://www.climate-kic-proposal.org/	Hungarian International ExpoForum on Industrial Innovation will be held in 2011
<i>Research to Business</i>	http://www.rtob.it/en/	International ExpoForum on Industrial Innovation. R2B Days addresses the current business sector needs for growth and development connecting companies to the most important

		international research centers. Technological innovation and its practical applications are illustrated during the event through a series of initiatives involving companies, research centers, new spin-off and start-up companies: the International Forum on Project Development, Workshops, One-to-One meetings, Round tables and special Events.
<i>Ecomondo</i>	http://en.ecomondo.com/	The biggest expo of green technologies and new lifestyles, a special forum where businesses in the environmental and sustainability sectors can meet institutional stakeholders, trade associations, local/central governments, NGOs and all types of industries and goods manufacturers, to discuss new models of economic growth driven by a focus on innovation, clean technologies and a new approach to urbanization and social contexts.
<i>Agrofer</i>	http://www.expoagrofer.it/	Local expo dedicated to food and agrofood industries, including renewable energies.
<i>EEN - Simpler</i>	http://www.aster.it/simpler.html?newlang=eng&menucor=0&menusx=999	Support Services to IMProve innovation and competitiveness of businesses in Lombardia and Emilia-Romagna. Simpler act under the framework of the Enterprise Europe Network (EEN). EEN is the largest network of contact points providing information and advice on EU matters in more than 40 countries, including the 27 EU member states, three EU candidate countries (Croatia, the former Yugoslav Republic of Macedonia and Turkey), members of the European Economic Area (EEA) and other participating third countries.
<i>EEN - Euresp</i>	http://www.aster.it/simpler.html?newlang=eng&menucor=0&menusx=999	European Regional Environmental Services Platform aims to expand the “green business” and to use the potential of products and services given in the regions. The economy should profit from a better access of SMEs to highly developed environmental services. Activities of EURES P are: provide environmental services to SMEs, carry out of workshops and seminars, that inform the users about technologies that increase the environmental performance and competitiveness.
<i>Italian Biofuel Technology Platform</i>	http://www.unibo.it/Portale/Ricerca/Servizi+Docenti+Ricercatori/finanzeuropei/biofuelsitalia.htm	The Mission is to contribute to: development of cost-competitive world-class biofuels value chains; creation of a healthy biofuels industry; accelerate the sustainable deployment of biofuels in the EU through a process of guidance, prioritisation and promotion of research, technology development and demonstration.

According to the activities performed by the “Regional Energy Observatory”, the Region takes care of data collection/up-dating, as well as of all the needed information about production, transformation and rational agro-energy use, the register of the biomass fed plants included.

Yorkshire and Humber (UK)

The list below provides a summary of the key over-arching issues and challenges facing the region’s waste management industry:

- *Waste management policy:* Until recently the government was considering banning certain materials from

landfill (e.g. food waste and aluminium) which in turn would hugely stimulate the industry reprocessing these materials. However, due to the economic downturn and the pressure facing local authorities to reduce budgets, this plan has been abandoned. There are also conflicting policies which contradict most practical environmental options. As way of example, Councils want to use their own wood waste for biomass (following push from Government on biomass in general); however it is uncertain at the moment whether this conflicts with their recycling targets – we need a definition of “recycling” under (NI192). Also the feedback CO2Sense has received from local authorities and businesses is that many are becoming increasingly concerned about the unpredictability associated with export markets for recyclables and their duty of care obligations.

- *Data collection / reporting:* Data collection and reporting is still an issue for the industry. Outturn data for the municipal sector has improved dramatically since the introduction of Wastedataflow² in 2005. For the commercial and industrial sector, data is less reliable. In fact there is no definitive data available that provides a comprehensive illustration of the size of the commercial and industrial (C&I) waste stream. This is likely to change in the future as waste consignments will be better logged and Defra embark on a nationwide study into the size of the C&I waste stream.
- *Licensing and permitting:* Amendments to the Environmental Permitting Regulations are due to come into force on 6th April 2010, which may affect any business that recycles, re-uses or disposes of any kind of waste. This will be particularly pertinent to the organics sector. Any organic waste processors operating under exemption will need to have applied for and achieved an environmental permit by October 2011. This affects 38 processors with 90,000tpa capacity in Yorkshire & Humber. Estimates of the cost of achieving an environmental permit, including consultancy fees, range around the £20,000 (€24,679.2³) mark per site.
- *Collection / sourcing of material:* The capacity within the region to reprocess materials is not so much of a problem now, however sourcing and collecting material is. Obtaining feedstock to satisfy these plants is considered to be an issue of paramount importance. To date, for example, only Calderdale, Hull and Leeds have introduced / are introducing kerbside collections of food waste, yet we have some significant AD/IVC capacity coming on stream in the very near future. In order to achieve challenging recycling and composting targets, the collection of the material is key to its success. The move to Alternate Weekly Collections, ban on side wastes, restricted bin sizes, trade waste bans at household waste recycling centres (out with the impact of the economic downturn) have all collectively contributed to a reduction in overall household waste arisings. Free and unrestricted garden waste collections however openly increase household waste arisings. Interestingly there has been very little take-up of source separated food waste collections. To date, only Calderdale, Hull and Leeds have introduced / are introducing kerbside collections of food waste. Under the Waste Framework Directive, each local authority in the UK will be expected to achieve a minimum recycling rate of 50% by weight by 2020 from domestic (and other similar types of waste) sources of plastic, paper, metal and glass.
- *Waste prevention:* The carbon savings through waste prevention far exceed those through recycling. However, there is a huge job to be done in raising awareness of the merits of waste prevention. The move to Alternate Weekly Collections, ban on side wastes, restricted bin sizes, trade waste bans at household waste recycling

² WasteDataFlow is the web based system for municipal waste data reporting by UK local authorities to government.

³ Exchange rate taken from: http://ec.europa.eu/budget/inforeuro/index.cfm?fuseaction=currency_historique¤cy=72&Language=en

centres (out with the impact of the economic downturn) have all collectively contributed to a reduction in overall household waste arisings. The region already has a waste prevention plan which is awaiting funding; although some work is already underway at a sub regional level to address household food waste minimization ('love Food Hate Waste') and the reuse of clothing ('Choose to Reuse'). Waste prevention is at the heart of the EU Waste Framework Directive. By the 12th December 2013 each member state will be expected to have the outline of a waste prevention programme developed.

- *Sourcing of high quality materials with minimal contamination:* This is a key issue for all sectors of the waste management industry. In the case of the paper industry, contamination of feedstock and improved collection, storage and transportation methods would ensure a better quality material for all players in the supply chain. For plastics, the nature of post-use material means a large proportion is often contaminated with by-products, process materials or other waste streams. This "harder to access" material is now becoming more of a target for regional reprocessors as they expand their businesses. Food waste from retail and hospitality businesses remains the largest waste material still going to landfill, either as packaged out of date food, or collected as mixed waste from business premises. Very few local authorities in the region work closely with social enterprises to reuse household furniture and white goods. Indeed there is a need to strengthen the capacity of the third sector to be able to accept and distribute such items to voluntary organisations or individual in need. A key challenge for the glass industry is the processing of comingled material from kerbside collections; Material Recovery Facility (MRF) output is too heavily contaminated to be economically processed to meet closed loop furnace specifications.
- *Anaerobic digestion:* The primary concern for the development of this sector is the need to ensure increasing levels of source segregated food wastes to divert waste suitable for AD. This is waste currently disposed of as a component of mixed wastes, generally to landfill. Financial support for AD technology through renewable energy policies nationally is likely to continue to stimulate interest in investment in the sector, provided the availability of suitable feedstock expands in line with increasing capacity.
- *Education / awareness raising:* This is an essential component of progress in all spectrums of the waste management industry. This covers the whole supply chain from producer to consumer. There is a need for improved education of waste paper producers regarding realisation of higher income streams. We need to know more about what good practice has been established in mainland Europe on recycling contaminated/low-grade plastics. A further challenge we face is to raise awareness of the value of high quality compost in the agriculture market whilst raising awareness amongst the general public to reuse / recycle Waste Electrical and Electronic Equipment (WEEE) has been very piecemeal to date.
- *Access to finance:* Currently businesses in all sectors face difficulty raising finance due to the "credit crunch". Bank funding is made easier where companies can offer collateral as security, which is good for existing businesses but not always possible for startup companies. For private investors their concerns will be about key risks that they face relating to planning consents and uncertainty around regulatory changes. Investors will also want assurance that adequate feedstock is available for any plants and that there is a ready market for outputs. Further assessment of the throughput and capacity of facilities within the region is needed to provide a higher level of confidence when advising potential investors to the region.
- *Procurement of products:* Promotion of Key Performance Indicators to organisations, to illustrate the environmental benefits of buying recycled is required. The use of recycled paper, for example, in business is not yet mainstream across the board and more advocacy work needs to be done to promote the benefits of this. An increased focus is required on projects that can deliver the most opportunities for recycled content procurement, such as large scale, high value construction projects.

Sofia (BG)

In May 2005 the Municipality awarded public tenders for separation, baling, and packaging of the domestic waste to MiKS – PS, Ecoel 6, and Chistota Iskar. In 2008, Sofia Municipality signed manual municipal waste sorting contracts with separation plants in order to further reduce quantities transferred to landfills and increase recycling rates.

Long-Term Municipal Waste Management Strategy was produced in 2006 with the objective to identify the most realistic waste management concept for Sofia over the next 24 years. In August 2009, the Council of Ministers approved EUR 131 million funding from the Operational Program – “Environment 2007-2013” for the construction of an integrated waste management system of household waste of Sofia Municipality consisting of:

- Mechanical-biological waste treatment plant in the area of Sadinata in Yana village with a capacity of 410,000 t/a;
- Composting installations for green waste and bio-waste on the Han Bogrov site;
- Landfill on the Sadinata site;
- Waste water treatment plant on the Sadinata site;
- Supporting infrastructure.

As a significant component of its integrated management system for MSW, the Municipality negotiated with the European Investment Bank for the remaining balance of EUR 52 million. Completion of the facilities is due in 2012.

The public tender for the collection of municipal solid waste and street sweeping for 20 out of 24 districts of Sofia Municipality' was opened in February 2010.

Several national and regional programmes are currently carried out in the region to improve waste management.

Table 4-2: Cooperation programmes related to the Sofia region

Program	Field of intervention	Main targets topic
<i>Long-term strategy on MSW management of Sofia Municipality, March 2007</i>	To assist Sofia Municipality in determination of steps necessary for long-term solving of the MSW problem. Preparation of a future investment project “Waste management in Sofia”, which to be presented for funding from the EU structural funds.	To be Prepared two single documents, as follows: 1. Long-term strategy for management of the MSW of Sofia Municipality and Action plan, on the recommendations of the JASPERS instrument and based on the sites and MSW treatment methods proposed for Sofia Municipality. 2. Scoping report and documentation for organizing a tender for assigning a public procurement on “Preparation of feasibility study and supporting documents for the project

		“Management of Household Waste of Sofia Municipality” for Financing by the EU Funds
<i>Communication strategy on the management of the MSW of Sofia Municipality for the period 2009 – 2013 (project)</i>	Making clear to the population the MSW problems and closely analyzing them before indicating particular communication measures for overcoming the so called “communication public unconcern”.	Understanding of the interaction between the population and the environment and building a consciousness of personal responsibility. To be impressed the idea that with simple and responsible activities everyone can contribute to turning the wastes into a resource and to be created a behavior which does not create pollution problems, but solves them.
<i>Revised program on waste management of Sofia Municipality, 2009 – 2011</i>	Includes the main measures and activities that should be performed in the period 2009-2011, according to the program. Measures are added for specific technological proposals for building an integrated waste management system.	To be achieved an optimal balance between the different legislation, institutional, economic and technical measures and applied an integrated waste management approach. To be determined the responsibilities related to realization of the foreseen measures and activities, the expected expenditures and expected sources for their funding.
<i>Program for waste management on the territory of Sofia Municipality (expanded and revised edition), 2006 – 2010</i>	Expanded and revised edition of the “Program for waste management on the territory of Sofia Municipality” from 2005. The main goals of the program are the activities of collection, transport and treatment of the MSW, packaging wastes, demolition, health-care, industrial and dangerous wastes, carcasses and slaughterhouse wastes, green wastes, sludge WWTP; the control of these activities and to propose waste management measures for the period of the program.	Reduction or minimization of waste generation, environmentally-friendly treatment of wastes, increase of the recycling rates, overcoming of old contaminations and restriction of new ones, development and maintenance of full database for the wastes of Sofia Municipality, development of local normative documents, optimization of wastes collection and transportation, public participation and responsibilities decentralization.

For most of 2009 and until the contracts expire at the end of August 2010, MSW is managed by eight private contractors serving from three to eight districts each as well as the Municipality’s Chistota Iskar, which serves three districts.

The introduction of the broad usage of biodegradable plastics for packaging to replace non-degradable polyethylene bags and folio. Polymers (poly-hydroxy-butyric acid, poly-lactic acid, some co-polymers, etc.) based on renewable raw materials are easily degradable by soil bacteria through composting. This could be introduced through a pilot project involving waste packaging collection in limited areas or through major commercial chains.

A communication strategy on the management of MSW in the Sofia Municipality for the period 2009 – 2013 has been published. It is making clear to the population, the MSW problems and closely analyzing them before indicating particular communication measures for overcoming the so called “communication public unconcern”. It

aims to enhance the understanding the interaction between the population and the environment through building a consciousness of personal responsibility.

In an effort to increase recycling rates and in accordance with the Waste Management Act and the Ordinance on Packaging and Packaging Waste, which implement Packaging Directive 94/62/EC; Packaging Recovery Organisations (PROs) were established and delegated the responsibility to collect packaging waste. Sofia Municipality contracted four PROs to collect separated packaging waste following a study, which aimed to effectively assign areas.

Amsterdam (NL)

“Proposal for modernising waste materials policy” (1989) led to the appointment of the AOO (Waste Management Council) in which the three governmental authorities (local, provincial en national government) decided together on the policies of Dutch waste management. This approach was the key for successful development of waste management in the Netherlands between 1990 and 2005. In 1996, a parliamentary commission observed problems in waste management: administrative and management loads hindering technical and economic developments; an inefficient and expensive structure; and problems of enforcement. It was decided to further centralize the responsibility for waste control to the national level. This centralisation is regulated in the last amendment of the Environmental Management Act (May 2002).

In 2003, the so-called National Waste Management Plan (Landelijk afvalbeheerplan; LAP) was activated. In a recent update (2010), the plan - called LAP2 - broadened its scope to (policies focusing on) entire materials chains. The LAP consists of a policy framework, sector plans and capacity plans.

The policy framework sets out the main points of waste policy. For example, it covers the national objectives for the separate collection of waste and general principles for the use of instruments such as licensing and enforcement. The policy framework also describes international aspects of waste policy and the Netherlands' position in international discussions on waste.

The local authorities are still a major player in the area of the collection of household and hazardous waste. Privatisation and sub-contracting of waste services is taking up substantially.

Some key strategies regarding waste management:

- Stringent environmental standards for waste recovery and disposal activities. Examples are: air emissions decree (waste incineration), landfill decree (soil protection), building materials decree, and other organic fertilisers decree (quality and use).
- Adequate monitoring, registration and enforcement practice. The implementation of the waste policies and plans are monitored continuously and annual reports are produced about implementation and progress. The Waste Management Council has been given a central co-ordinating role in monitoring. With respect to the municipal waste management setting, there is a national bench mark on municipal waste management. Goal: looking for good / best practices to learn from each other in those waste management areas with no competition (municipal services) within the “triangle” of services, costs and environment. The Waste Management Department (WMD) of the Dutch agency “AgencyNL” (formally

known as SenterNovem) has a leading role to monitor waste flows and waste management activities in the Netherlands and abroad.

- Minimum standard for permit procedures. Wastes can be processed in various ways. In order to keep waste management up to the highest possible standards, minimum standards are set for the processing of all the waste streams. The standards are formulated as much as possible as targets.

Municipal publicity campaigns have been implemented for many years to increase people's awareness as far as waste is concerned. E.g., they are encouraging residents to sort their waste before disposal. In addition, instruments to enhance public participation have been performed in the Amsterdam region to improve the prevention of waste. These instruments include: promotion and education campaigns (waste is everyone's responsibility), communicate (positive) results and regular consultation.

A number of facilities were also built to reduce, reuse and recycle the generated waste: recycling centers, underground containers (This makes it significantly easier for people to sort valuable glass and paper for recycling), municipal depots (bulky domestic waste), banks for bottles/paper, refund systems, sweeping/cleaning. The enforcements performed in the waste management in the Amsterdam region include inspections, tagging, warning letters, penalize and reward and face-to-face contact.

The earlier mentioned Waste Management Council drew up the 'Stimulation Programme on Separation & Prevention of Household Waste' (A00 2001b). The program includes a large number of projects for encouraging waste segregation and waste prevention. One of the great success stories of waste management in the last decade is the separate collection and composting of household bio waste. Another success is recycling. In the period 1985-2000, the recycling of waste increased from approximately 50% to more than 77% in 2000.

Additional, it has to be mentioned that the density of glass and paper containers is one per 1000 residents. This means that every resident lives within 100 to 150 meters of a glass or paper container.

4.2. Composting

This section provides an indication of the current and proposed infrastructure for composting in each of the respective regions.

Emilia-Romagna (IT)

There are 19 composting plants running the region with a total capacity of 626,085 tonnes/year. A total of 412,615 t of organic waste were treated by composting in 2009 in the region. The most common technique both in Italy and Emilia-Romagna is treatment in static and aerated bio-cells for a period of between 15 to 28 days (active phase), followed by the "curing phase" of between 45 to 60 days in a pile which is periodically turned over by a special shovel or machine.

Yorkshire and Humber (UK)

The large scale of the food processing industry in the Y&H Region has resulted in significant merchant capacity in the private sector, typically in on-farm operations to process these wastes for application to land. Processing capacity is relatively high, and prices for this treatment are competitive.

With current capacity, and developments currently under construction, most parts of the region will have adequate capacity for processing the currently available organic wastes. As increasing source segregation develops however, especially given drivers such as the Landfill Directive and associated UK legislation, greater capacity may be needed in the medium term.

CO2Sense Yorkshire estimates there is approximately 100,000 tonnes composted at exempted windrow sites, 250,000 tonnes through permitted windrow sites and 100,000 tonnes are processed through In Vessel Composting (IVC).

Sofia (BG)

Composting households/restaurants (~24000 t/a) and garden waste (~20,000 t/a) is planned in order to reduce the volume of MSW. The process is designed as wise pile composting in sufficiently thin layers to allow for natural aeration. Enhancements will be required in future for increasing the amount of waste to be treated.

Amsterdam (NL)

There is a national policy regarding the bio-based economy – with no specific targets mentioned. A large and new business initiative in the Amsterdam Metropolitan Area is the construction of Greenmills (see AD section below).

4.3. Anaerobic digestion (AD)

Anaerobic Digestion (AD) – The supply of technologies and services for the generation, collection or transmission of energy from biogas that is derived principally from the anaerobic fermentation of biomass and solid wastes and combusted to produce heat and/or power. Included in this category are landfill gas and sludge gas (sewage gas and gas from animal slurries) and other biogas. Liquid biomass, which includes bio-additives such as ethanol, is also included in this category.

Emilia-Romagna (IT)

Following a recent study intended to provide a better definition of the “biogas” sector, it has emerged that, as confirmed by the strong growth in plant numbers, anaerobic digestion is becoming increasingly common in the agricultural sector, applied to livestock effluent in co-digestion with other biomass produced for the purpose (maize, sorghum and tritical) and by-products from the agro-industrial sector, particularly of vegetable origin.

The dominant technology is wet digestion (with dry matter representing less than 10% of the whole) in Continuously Stirred Reactors (CSTRs) both in the case of agricultural and agro-industrial plant. At a national level, a very recent example of dry digestion (dry matter more than 25% of the whole) using a non-continuous cycle biocell or batches has been constructed in Cesena.

Currently there are 86 AD plants either in operation or under construction in the region.

Yorkshire and Humber (UK)

The primary concern for the development of this sector is the need to ensure increasing levels of source segregated food wastes to divert waste suitable for AD. This is waste currently disposed of as a component of mixed wastes, generally to landfill. Financial support for AD technology through renewable energy policies nationally is likely to continue to stimulate interest in investment in the sector, provided the availability of suitable feedstock expands in line with increasing capacity.

There are several AD projects in the planning stages in the Y&H Region, of which 3-4 with a combined capacity of around 100,000 tonnes are thought likely to proceed in the next 6-12 months. None are currently operational, and all are mainly based on provision of merchant capacity to cater for C&I food waste from large producers. It is unknown at this stage as to how much extra capacity for AD will be procured for the purposes of MSW.

Due to strong governmental incentives (such as the Renewable Obligation and more recently the Feed-In-Tariff) most new AD facilities are for the purposes of grid connected electricity generation. AD technology receives the highest revenue incentive under the Renewables Obligation (RO). From April 2010 AD plants less than 5MW in scale are able to choose whether they trade in ROCs or participate in the Feed in Tariff (FIT). The FIT guarantees a set price for electricity generated from 25 years. AD technology is flexible and can offer much more than renewable electricity, such as biomethane for road transport or for heating purposes. These applications are likely to emerge in the coming years as government policy and incentives change.

Sofia (BG)

Currently, there is no AD facility operating in the region of Sofia.

Amsterdam (NL)

At the moment, no specific information can be given about policies related to organic waste. However, a large and new business initiative in the Amsterdam Metropolitan Area is the construction of Greenmills, a project that involves organic waste streams being processed for the production of bio-fuels, electricity, as well as heat and fertilizer products, is currently in full swing in the Port of Amsterdam.

4.4. Mechanical biological treatment (MBT)

MBT technology is used to process waste by combining a sorting facility with a form of biological treatment. A MBT is planned for treating residual waste in which the mechanical stage involves removing non-biodegradables and recyclables. The amount of general plastics (not collected prior to MBT, together with other resistant organic materials, like rubber, tyres, textile, etc.) will form refuse derived fuel (RDF). Currently this fuel is designated for energy recovery via combustion in cement kilns.

Emilia-Romagna (IT)

In Emilia Romagna region there are 12 MBT plants with a treatment capacity of 1,323,000 Tonnes/year; 734,721 t of MSW had been processed through MBT in 2008.

Yorkshire and Humber (UK)

There are currently no MBT plants operational in the Y&H region, and those plants which seek to recover value

from mixed waste streams are based on thermal rather than biological processes. There is a possibility of some MBT capacity emerging in the medium term as a result of large scale Local Authority PFI contracts, but the procurement processes are not technology-specific, and until they reach financial close the disposal/treatment methods cannot be confirmed.

Sofia (BG)

An MBT plant is planned for treating residual waste in which the mechanical stage involves removing non-biodegradables and recyclables.

Amsterdam (NL)

Currently, there are no specific MBT facilities in the Amsterdam region.

4.5. Biomass

Biomass, a renewable energy source is biological material from living, or recently living organisms,^[1] such as wood, waste, (hydrogen) gas, and alcohol fuels. Biomass is commonly plant matter grown to generate electricity or produce heat.

Emilia-Romagna (IT)

The Region is committed to the establishment of the “Action Plan for the energetic valorisation of the endogen biomasses”. The Plan will promote the establishment of agro-environmental sustainable projects presenting a clear local interest, aiming to create the necessary conditions for the proper commitment of the agro-industry, the economical development of the bio-fuels and, more generally, the production of thermal and/or electric energy by the operation of small-sized plants.

Biomass is mostly processed through AD technology to produce electrical energy. Currently, about 7 AD plants that use Argo-industrial waste as raw materials are under operation or construction in the region.

Yorkshire and Humber (UK)

The use of woodfuel for heating in the region is increasing rapidly, and is reflected by a number of new woodfuel suppliers entering the market recently. However, there are still a number of obstacles the industry faces namely: financial (fuel cost), financial (boiler & ancillaries), educating users of the merits of biomass, confidence in technology, competition from other technologies (incl. gas boilers) and fuel quality.

Sofia (BG)

At the time of writing there is no indication that any such plants are operating or proposed in this region.

Amsterdam (NL)

At the time of writing there is no indication that any such plants are operating or proposed in this region.

4.6. Incineration

The supply of technologies and services for the generation, collection or transmission of energy from incineration

in which evolving thermal energy is used for the production of steam, hot water or electric energy. Energy from waste is considered separately from the other energy recovery technologies as it is regarded as mature while the others are classed as emerging advanced conversion technologies.

Emilia-Romagna (IT)

Regarding energetic valorisation of wastes, the region has 9 combustion plants with 17 different processes. The total incineration capacity is 821,860 tonnes / year. According to 2005 data, the energy recovery from 718,385 tonnes / year was of 314,791 MWe / h and 72,521 MWt / h.

Yorkshire and Humber (UK)

Incineration has long been a tried and tested method for waste disposal; however technology has moved on significantly over recent years, both the abatement and energy recovery technologies have transformed incineration into a viable proposition for waste treatment.

Within the Yorkshire and Humber region there are 2 Energy from Waste (EfW) facilities currently operational with electricity generating capacity of 9.6 MW. Two further plants totaling 32 MW capacity have been approved and are either under or awaiting construction and 1 further plant of 20 MW is currently under planning consideration.

The most efficient incinerators are those that recover all the available energy. All the regions municipal waste incinerators (or Energy Recovery Facilities) recovery energy from capturing the heat in the incineration process and via a boiler raise steam for electricity generation. A great deal of energy is lost (usually in the form of heat) when recovering heat for electricity, in many ways this is a lost opportunity. Only one municipal incinerator (Sheffield) has improved their energy efficiency through utilising this heat in form of a city wide district heating scheme. This heating scheme is made up of 44km of pipework and covers most of Sheffield, supplying over 120,000 kWh of heat and saving 21,000 tCO₂ per annum.

Sofia (BG)

Approximately 16,000 - 20,000 kJ / kg of RDF from MBT will be processed through co-incineration in cement factories.

Amsterdam (NL)

Amsterdam plays host to the AEB waste-to-energy plant – one of the largest waste-to-energy plants in the world. Two paths are focused to increase energy efficiency of household waste incineration: an increase in electricity generation and the use of residual heat in district heating.

4.7. Gasification / pyrolysis

The supply of technologies and services for the generation, collection or transmission of energy from a means of recovering energy from waste, known as advanced thermal treatment. Waste is heated at very high temperatures and a useable gas is produced. This includes the manufacture of equipment, design, construction, installation, management and operation of gasification and pyrolysis facilities. Gasification and Pyrolysis are considered advanced conversion technologies (ACT) with the potential to increase the efficiency of energy conversion over standard EfW technologies.

Emilia-Romagna (IT)

At the moment, there is no gasification / pyrolysis facility dealing with waste in the Emilia-Romagna region.

Yorkshire and Humber (UK)

Two gasification plants have come online in the UK in the last few months with others, including a 9.5 MW plant in Tockwith, North Yorkshire, planned. Similarly there are 2 pyrolysis plants operating in the UK one of which is a 2MW facility operated by Yorwaste at Seamer Carr in North Yorkshire. In addition to the small scale pyrolysis facility at Seamer Carr a much larger facility is under construction by Inetec near Immingham on the Humber estuary. The 180,000-tonne capacity pyrolysis plant will produce about 66MW of heat and 24MW electricity, which will be fed into the grid, it timetabled for completion sometime in 2010.

Sofia (BG)

At the time of writing there is no indication that any such plants are operating or proposed in this region.

Amsterdam (NL)

In the Netherlands there is knowledge about pyrolysis-gasification technology used for biomass and silt. The company Splainex (The Hague) is able to process biomass and silt and household waste. Additionally, Shell company claims to have coal gasification technology that also can be used for the gasification of biomass and sludge. At the moment, no information is available regarding facilities operational in the Amsterdam region.

5. Innovation

In each studied region, innovative policies, programmes and technologies have been launched to promote the efficient management of the waste in a sustainable, economic socially acceptable way. The following summarizes the innovative issues related to waste management in each region.

Emilia-Romagna (IT)

With regard to specific policy relating to Innovation that could be easily applied to the waste sector, the main innovation policies still operating in the Emilia-Romagna Region are indicated in the regional MS2 report. For example, Regional Programme for Industrial Research Innovation and Technology Transfer (PRRIITT) is an implementing programme of the regional policy for R&D and innovation. It is focused on the promotion of industrial research, technological development and the transfer of new technologies from knowledge production centres to the regional industrial system. The regional policy for research and innovation is aimed at the promotion of closer interactions between businesses, research institutes, the university and the centres for technology transfer operating in the region.

Yorkshire and Humber (UK)

Recent research and survey shows that the innovation activity in the renewable energies and energy recovery sub-categories is high. Knowledge Transfer Partnerships (KTP) help businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills and are funded by the Technology Strategy Board (TSB) with 17 other funding organisations. It is a UK-wide programme and has worked with over 3,000 organisations, more than 400 within the Yorkshire and Humber region. KTPs involve a partnership between a company and an academic institute (knowledge base partner) to harness research expertise and develop

commercial experience.

Sofia (BG)

The key driving force of the innovation policy of the region is to drastically divert the MSW waste from the landfill. The innovations in the Sofia region are focused in the fields including: minimisation of waste, composting of biodegradable waste, MBT plant construction, and construction of a non-hazardous waste landfill.

One of the innovations for Bulgaria will be the introduction of the broad usage of biodegradable plastics for packaging to replace non-degradable polyethylene bags and folio. Polymers (poly-hydroxy-butyric acid, poly-lactic acid, some co-polymers, etc.) based on renewable raw materials are easily degradable by soil bacteria through composting. This could be introduced through a pilot project involving waste packaging collection in limited areas or through major commercial chains. This measure is reasonable when waste is designated for disposal via landfill or composting.

Innovation is also sought for enhancing the rate of MSW separation, which typically involves factory style conveyors, industrial magnets, eddy current separators, trommels, shredders, and other tailor made systems.

Amsterdam (NL)

It seems that specific innovation policies and actions explicitly dealing with or focusing on waste are not present in The Netherlands and in the Randstad region for the moment. Nevertheless, general RTD and innovation stimulating instruments are available that could have a stimulating role in waste management related knowledge and innovation creation.

So-called “national innovation programmes” are strategic innovation programs based on partnerships of companies and research institutes in areas where the Netherlands, in an international perspective, excels or wants to excel. Areas are high-tech systems and materials, chemistry, water technology and flowers. Within the national innovation programmes, R&D and innovation is stimulated by leading (national) research institutes and/or via subsidies (for institutes, universities and companies). For the moment, waste RTD and innovation are no explicit themes in the national innovation programs. Nevertheless, waste is related to the areas of chemistry and water technology.

Current national innovation actions and arrangements for companies to facilitate RTD and innovation are: Innovation Performance Contracts (IPC) for clusters of collaborating companies (and other organisations) focusing on specific innovations; R&D tax facilities; Small Business Innovation Research (SBIR) programme; Innovation Vouchers; SME loan guarantees; and so-called “Technopartner arrangements”⁴. Besides, grants for feasibility studies and demonstration projects in the area of environmental technologies (including energy, waste etc) and support for supply chain approaches in certain waste streams are available⁵. Waste related RTD & innovation activities can be facilitated by these actions.

⁴ See: Division ‘Innovation’ of Agentschap NL.

⁵ See: Division ‘Milieu en Leefomgeving’ of Agentschap NL. See: <http://www.nlmilieuenleefomgeving.nl/afval>. See also project ‘Naar een ketenaanpak in het afvalbeleid’.

6. Inter-regional barriers

6.1. AD related barriers

In both the regions of Emilia-Romagna (IT) and Yorkshire and Humber (UK), AD facilities are proving to be major technologies to treat the bio-degradable waste and significantly contribute to the diversion of waste from landfill. With respect to AD technology, *the source collection and pre-treatment upstream of the process and the use of the digestate downstream represent the critical points of greatest difficulty.*

Collecting green waste through a “door to door” system has been carried out in Emilia-Romagna region to improve the source collection for AD facilities. In addition, parts of the Yorkshire and Humber region have introduced kerbside collection of the food waste from households and commercial businesses.

Due to the lack of facilities of AD in the Sofia (BG) and Amsterdam (IT) regions, more studies (policy and technology RTD and economic drivers) are needed for the efficient collection of bio-degradable waste.

6.2. Lack of environmental awareness from the public

The lack of public awareness has been a common weakness for each region, especially, it would seem, in the Emilia-Romagna (IT), Yorkshire and Humber (UK) and Sofia (BG) regions. The “NIMBY” (not in my back yard) attitude from residents has led to significant delays in the construction of AD projects in the Emilia-Romagna region.

Campaigns relating to improving public awareness for waste reuse, recycling and recovery have been and will still need to be carried out in the studied four regions. Several attempts have been carried out to improve the public awareness and the resultant outcomes have been presented in Table 6-1.

Table 6-1: Performance and outcome for targeting to increase public awareness and perception of waste prevention, recycling and reuse

Region	Performance	Outcome
Emilia-Romagna (IT)	N/A	N/A
Yorkshire and Humber (UK)	Some piecemeal activity has occurred across the region to date but a strategy has now been devised which provide a more structured approach to regional waste prevention. However it largely remains unfunded and requires further funding to get it off the ground.	There is a huge job to be done in raising awareness of the merits of waste prevention
Sofia (BG)	Communication strategy on the management of the MSW of Sofia Municipality for the period 2009 - 2013 (project): Understanding of the interaction between the population and the environment and building a consciousness of personal responsibility.	Many training courses conducted in the past have led to little success because integrating the training was not followed by the implementation of practical enforcement measures.
Amsterdam (NL)	Instruments to enhance public participation: publicity, promotion and education campaigns (waste is everyone's responsibility), communicate (positive) results, regular consultation, waste calendar. Municipal publicity campaigns have been implemented for many years to increase people's awareness as far as waste is concerned. E.g., they are encouraging residents to sort their waste before disposal.	High recycling rates of waste and the poor public perception of waste prevention is no longer a weakness for the region.

6.3. Conflicts between planning authorities

In the Yorkshire and Humber region, a planning application regarding energy generation from gasification of waste has been submitted to a district council (case study in Y&H region). The issue has arisen whether the application in fact relates to a county matter and hence should have been made to the County Council as the appropriate authority to determine it. The key issue is whether the application is *related to processing of waste or the production of energy*. In the Emilia-Romagna (IT) region, there are still gaps in law and procedure leaving room for different interpretations and local variations in the grant of authorization for such plants. In addition, fragmentation of authorization procedure and regulation is also regarded as a barrier to the development of waste management in the Emilia-Romagna region.

Possible solutions to improve the efficiency of government-related works to the waste management and treatment facilities could be harnessed from the Amsterdam region where most waste management authorities have been centralized to the national level.

6.4. Access to finance

Across all of the partners, access to finance for the planning, design and construction waste treatment and processing facilities is a challenge. In the Yorkshire and Humber region, because of current financial pressures and public sector cuts, there is a significant constraint on the ability of local authorities to trial new systems and invest in relatively risky technologies. In the Sofia region, although possible funding could be provided from EU, funding is still an important barrier for waste management RTD in the Sofia region.

7. Synergy potentials

This section of the report provides an indication of the potential areas for further focus within the Wastekit project, essentially laying down the foundations for the Joint Action Plans (JAPs) – Work Package 4. The synergy potentials outlined below are a direct result of the analysis of the SWOTs from MS2 reports, the metadata table and league tables produced as part of this work package. The opportunities themselves are quite broad ranging but aim to mutually benefit all of the Wastekit partners. Clearly, there are some areas where some partners are stronger than others and conversely some areas where one or more partner(s) would significantly benefit from further intervention. There are examples of good practice that can be offered by one region to the benefit of another. The JAPs will help uncover this evidence and inform the need for further R&D.

A league table has been generated after the reflection and analysis of the MS2 reports as part of WP3. The WP3 league table is designed to draw key “headline” indicators out of the metadata table and compare the four regions performance. All rankings, are therefore, directly based on data collated within the WP3 metadata table provided originally by the regions in the WP2 Regional Overview Reports. For simplicity MSW production per capita per year has been ranked from 4-1, 4 indicating the highest performance and 1 the lowest. Other waste management related topics are also covered – total recycling, diversion from landfill, composting and energy from waste. Ranking the regions in terms of (MSW) waste management performance illustrates the potential for regions to mentor others in improving their overall waste management sector. This league table also allows for some clever thinking over how the top have managed achieving that position.

As indicated in Table 7-1, the Amsterdam region shows a comparatively strong management of waste. Amsterdam is ranked the highest across all categories, including achieving the lowest level of MSW production per capita per year. Amsterdam and Emilia-Romagna regions clearly hold the most potential for mentoring in a number of areas where they out-perform the other two regions. However, this does not reflect the reality for innovation and RTD. Each region is an exemplar of innovation and RTD in different ways and fields. Each region has specific drivers forcing the development, direction, innovation and RTD of its waste management sector. It is this innovation and RTD that is considered in the analysis of synergy potentials in chapter 7.1.

Table 7-1: League Table for the four studied regions

Region	GDP/ capita	MSW production/ capita/ year	Waste management			
			Total Recycling	Diversion from landfill	Composting	EfW
Amsterdam (NL)	4	1	4	4	4	4
Emilia-Romagna (IT)	3	3	3	3	2	3
Yorkshire and Humber(UK)	2	2	2	2	3	2
Sofia (BG)	1	4	1	1	1	1

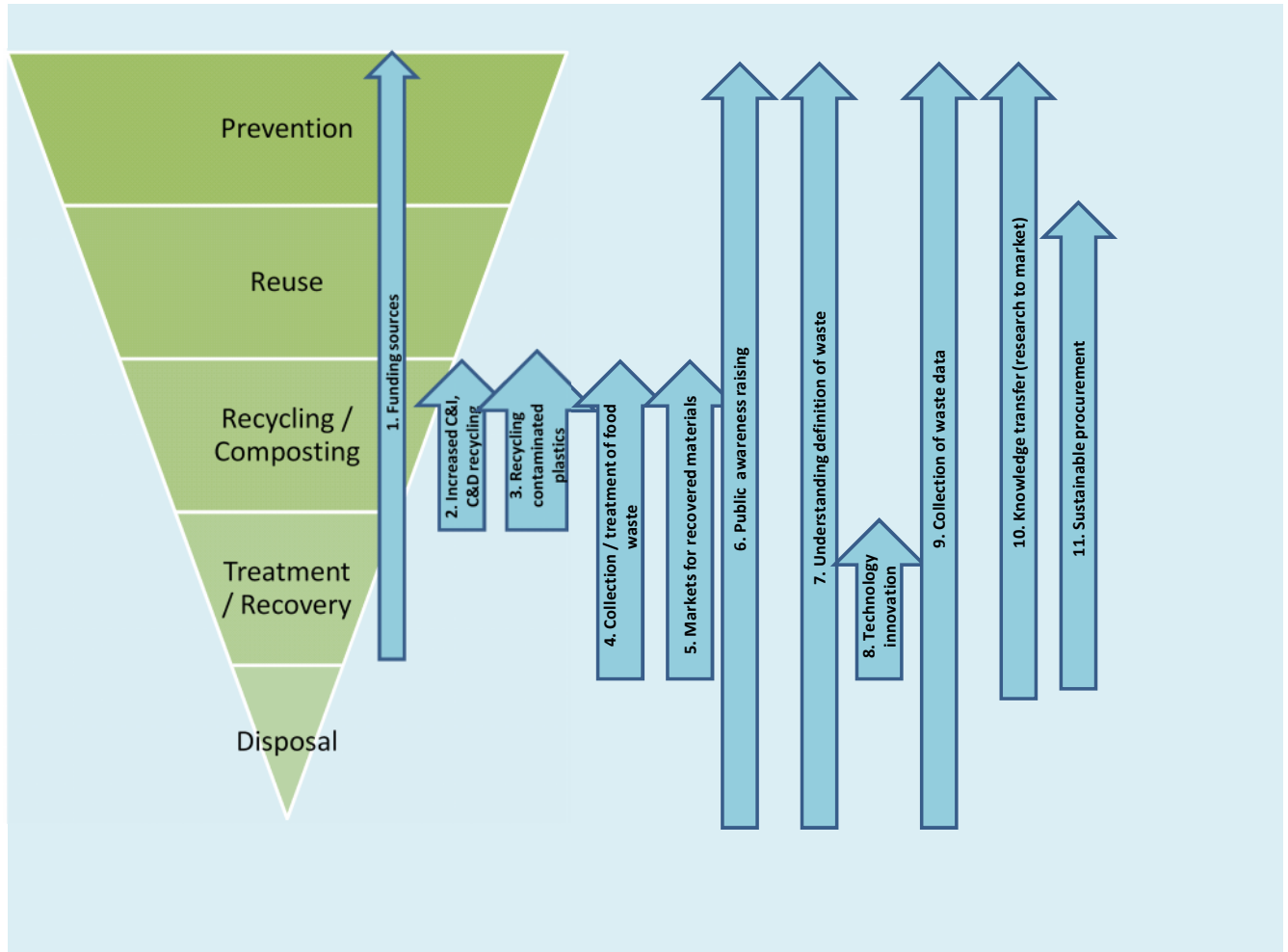
Key: 1 to 4 indicates from low to high

By analysing the SWOT from MS2 reports, meta-table and the above league table, 12 potential synergies have been identified for feeding into the Regional and Central JAPs. Through all synergy potential topics, WP4 action/work groups should explore the opportunity to establish networks or clusters, developing sustained links between academic institutions, government and business. These clusters hold the opportunity to explore to research potential, new business opportunities and strengthen the local, regional and national economy. These are outlined below:

1. Identification of funding for sustainable waste management and technology development.
2. Increasing the levels of recycling of commercial and industrial, and construction and demolition waste.
3. Exploring the options for the recycling of contaminated plastics.
4. Enhanced source separated collection and treatment of food waste.
5. Market development for recycled / recovered materials.
6. Improvement of public perception of waste – linked specifically to increasing levels of re-use, recycling and preventing waste from occurring in the first place.
7. Understanding the definition of waste – is it a resource, fuel or waste? (In particular the associated implications for planning and permitting).
8. Technology innovation related to waste processing (pyrolysis, gasification / incineration efficiencies).
9. Collection of waste data (arising / feedstock vs regional capacity. Related implications for importing waste).
10. Knowledge transfer from research to market.
11. Sustainable procurement (green procurement).

Figure 7.1 below attempts to illustrate how the identified synergy potentials (1 to 11) sit within the waste hierarchy and how the majority of them are cross cutting one or more parts of the hierarchy. The following sub-sections take each synergy potential and examines them in more detail.

Figure 7-1: Synergy potentials and relationship with the Waste Hierarchy



Key: C&D (Construction and Demolition); C&I (Commercial and Industrial)

7.1. Available funding for sustainable waste management and technology development

Nature of the problem

Available funding is a key issue and threat for the development of waste management for all the regions. Currently businesses in all sectors face difficulty raising finance due to the “credit crunch”. Bank funding is made easier where companies can offer collateral as security, which is good for existing businesses but not always possible for startup companies. For private investors their concerns will be about key risks that they face relating to planning consents and uncertainty around regulatory changes. Investors will also want assurance that adequate feedstock is available for any plants and that there is a ready market for outputs. Delivering certainty has perhaps been the key success factor in those Member States which are most advanced in their development of infrastructure, and

this is even more important with regard to financing new waste treatment facilities. Analysing what financial approaches are taken within these countries gives the less advanced countries clear considerations on how they may amend their approach to avoid risk and create a greater stability.

Regional performance and opportunities

The most common approach taken by some countries (Austria, Denmark, Germany, Sweden and the Netherlands) is to share risk between the municipality and the main contractor so that the incentives for both sides to deliver is matched. A key and clear success of these countries is the certainty or predictability of the planning systems and policy mechanisms in these Member States, notably risk is viewed as far less of an issue than in the UK, for example. This is possibly attributed to the “communal ownership” and improved public perception to such developments. As long as a technology delivers, there is no reliance upon variable markets that might threaten the financial viability of a facility. It is common practice in these five countries for the municipality and the contractor to set up a special purpose vehicle (SPV). A SPV is a legal entity that is created solely to serve a particular function, in this case to deliver and operate the plant, and this will usually be facilitated by a prudential type style of borrowing by the municipality as part of the SPV.

Direct, local taxation for waste management has been common-place across the Netherlands since the late 1980s. Taxes have increased from €100 per household per year in 1990 to €245 per household per year in 2004. Taxes are separately and transparently identified to householders. Taxes are ring-fenced and paid to each municipality to fully fund waste operations. This includes development of waste collection, treatment and disposal infrastructure and as the Amsterdam Regional Report draws reference to, assists in guaranteeing environmental protection. As a result, public ownership of landfill, incineration and composting infrastructure is extremely high as is shown in Table 7.2 below. It is this public ownership that in turn, intrinsically promotes a sense of communal ownership and works to improve public understanding and ultimately perception of the collection, treatment and disposal of wastes. As a further consequence there is a reduced risk (in comparison to less advanced countries) securing planning approval for new facilities. ⁶

Table 7-2: public ownership of landfill, incineration and composting infrastructure

Description	Number of Sites	Public Stakeholder Ownership	Investment (billion €)	Gate Fee Range (€/t)
Incineration	11	99%	4	75-145
Landfilling	28	75%	1.5	45-135
Composting	27	80%	0.8	15-80

Netherlands – Current (2005) public investment and ownership (Delivering Key Waste Management Infrastructure: Lessons Learned from Europe, SLR, CIWM, 2005)

The ability to secure private finance often rests upon the direct control of municipalities of local taxation for waste management, which appears as a distinct charge on community tax bills. Not only does this mean that the public

⁶ Delivering Key Waste Management Infrastructure: Lessons Learned from Europe (CIWM/SLR, November 2005)

are aware of the costs of different approaches to waste management, but it allows the municipality to vary the rate according to its own requirements and to directly show the benefits of certain approaches. This can be especially effective when contracts for non-MSW streams are secured and can be treated at integrated facilities. As a result of the higher gates fees associated with such streams, or sometimes as a result of sheer economies of scale, local taxes can be reduced to benefit both the local community and local politicians.

Reducing long-term financial risk is also addressed with Inter-regional municipal projects. Such projects are common throughout the Netherlands this is often a way of generating the necessary economies of scale to negate financial risk. These multi-municipal owned projects are generally established as not-for-profit entities, from which fiscal mechanisms are developed that lead to a benefit for the local tax payer. Long term contracts of 15 to 25 years have been central to the development of waste infrastructure within the Netherlands in reducing financial risk. There has been a trend now that the majority of infrastructures are in place, that shorter term contracts (typically 1 to 10 years) are awarded to create more competition and thus lower gate fees. Since the report “Delivering Key Waste Management Infrastructure: Lessons Learned from Europe” (CIWM/SLR, November 2005) there has arguably been fundamental changes in the “ownership” from public to private sector. Amsterdam has seen a growth of its international market which may have attributed to the change in sector ownership.

Businesses across the UK have recently been invited to compete for support to develop innovative technologies that could create new growth areas for the UK economy. The Government-backed Technology Strategy Board (TSB) competition will seek to identify and award up to £18m funding to the most innovative businesses. Collaborative applications are sought from organisations operating in a range of technology areas where the UK has considerable strengths.

Examples include:

- Development and application of advanced materials for:
 - Secure, clean and affordable energy supply, distribution and use.
 - Sustainability in relation to transport, construction and the reduce, reuse and recycle agenda
 - Healthcare technologies, defence and security.
- Control systems and power engineering, lighting, photovoltaics and power conversion.
- **Improved performance, functionality, reliability, service life and environmental impact.**
- **Processes for environmental sustainability and greater product customisation.**
- Service solutions that add value before, during and after manufacture.

A summary of relevant criteria:

- Primarily looking to fund applied research attracting 50% public funding.
- They expect to invest £250k - £500k in each project.
- Projects normally last 2-3 years.
- Must contain a significant element of technology innovation.
- The competition will focus on projects where recent technological discoveries have inspired people to innovate in a context of significant technology risk, demanding highly skilled, multi-disciplinary resources, working in a collaborative project team.
- Can include taking known technology into new applications where significant technical challenges present themselves.

- Categories of project under the heading 'Advanced Materials' include: development of secure, clean and affordable energy supply, distribution and use; sustainable transport; construction and the reduce, reuse, recycle agenda including packaging and materials for carbon capture.

Interestingly, this call to compete to develop innovative technologies aims to support mostly projects to be starting from around the 'proof of concept' maturity level and be developing towards demonstrator' level.

Call for action

Whilst analysing the opportunities for funding resources it is necessary to consider the synergy potential across the waste hierarchy. As illustrated in Figure 7.1 the security of funding affects all aspects of the waste hierarchy

The Amsterdam Regional Report says "Let the market do the work", explaining, the national waste management policy aims to increase the influence of market forces in waste management. This will "constitute a step in the direction of an efficient and financially healthy economic sector that works within the environmental conditions to be set by government."

Interestingly the largest driver for the Sofia region appears to be available finance. Recycling levels of higher value end of life vehicles and waste electronic and electrical equipment (WEEE) are high even though recycling rates of MSW are low⁷. This also is illustrated in the Sofia Regional Overview Report detailing the scavenging of high value waste materials. The more the market opportunity develops, the greater the ease to access finances as stability rises. The Sofia Regional Overview Report does not provide any further information on funding sources.

There is an opportunity for a focus group to study available funding for sustainable waste management and technology development. This group should span all four regions, with perhaps a mentor at each level. In essence, Amsterdam could coach/support/advise the Emilia-Romagna Region; they in turn Yorkshire and Humber and in turn Sofia.

Inward investment is a huge opportunity that must be explored further across the regions. This focus group should look at inward investment and how best to encourage it to each region. It is likely that each region will need to tailor their approach linking in with regional agencies or national policies and incentives. Regions or local authorities need to be in a position to accurately demonstrate to interested investment parties the current and potential processing capacity; waste arisings and processing data is key in demonstrating the market opportunity for the investor.

The focus group possesses the opportunity to bring together national, regional and local players in order to consider innovation opportunities and the required funding to bring about this fundamental change. A framework and network for associated local, regional, national and European RTD funding pots could be designed around a directory indentifying local, regional, national and European RTD funding pots.

⁷ Europe as a Recycling Society – The European Recycling Map (ETC/SCP working paper 5/2010)

7.2. Recycling of commercial and industrial (C&I), and construction and demolition (C&D) waste

Nature of the problem

Development of any recycling sector will inevitably create jobs for the region boosting the economy. More than 50,000 new recycling jobs would be created across the country if the UK set more ambitious recycling targets according to a new report launched by Friends of the Earth. WasteKIT offers the opportunity through WP5&6 to transfer the knowledge/know how/skills from experienced regions to less experienced regions. This will be vital for Bulgaria across all elements of the waste management sector. The comparative size of C&I and C&D waste streams over MSW highlight the importance and opportunity attached to addressing these waste streams.

Regional performance and opportunities

Drawing reference to the Amsterdam Regional Report, sustainable management of all waste streams is at a relatively advanced level in the Netherlands in comparison to the other WasteKIT countries. However, there are still opportunities for the waste sector from a RTD, innovation and business perspective: improvement of recycling rates in C&D waste; expansion of recycling in those waste streams that are directly linked to the principle of 'producers' responsibility. C&D waste is highlighted as a key topic as it represents a third of all waste produced within the Netherlands. There may be potential aggregate applications that an expert group could consider. Processed C&D waste may also be desirable to surrounding countries, perhaps in road construction for example. Bulgaria and the Netherlands have that geographical advantage over the UK and Italy.

In excess of 90% of C&D, and C&I waste has been recycled in the Amsterdam region to date regulated by the Dutch decree "Besluit bodemkwaliteit"⁸. Whilst in Yorkshire and Humber, or indeed across the UK, there are no headline targets/incentives (other than EU directives) for commercial and industrial businesses to reduce their waste largely because of an absence of a comprehensive baseline.

The recycling rate for C&D, and C&I waste seems to be also very low for the Emilia-Romagna and Sofia regions. Experiences from sustainably managing waste from C&D, and C&I sectors in the Amsterdam region might have the potential to improve the performance in other regions.

In 2006, Sofia Municipality prepared a Long-Term Municipal Waste Management Strategy that includes an action plan for developing and implementing an integrated waste treatment system. The strategy and the action plan were adopted by Sofia's Municipal Council (SMC). A feasibility study for the future waste management system has been completed. The objective of the feasibility study was to identify the most realistic waste management concept for Sofia over the next 24 years. It was conducted to ensure compliance with national and European objectives. It also aims to integrate modern municipal waste management practices such as waste prevention, reuse, recycling, composting, and other forms of treatment with final disposal options in order to decrease the total volume of residual waste. The study analysed the existing waste management practices in Sofia Municipality

⁸ Recycling of Construction & Demolition Waste (2003), <http://www.iscowa.org/members/recon03.pdf>. Besluit bodemkwaliteit (2007), http://www.vrom.nl/Docs/milieu/200712_Besluitbodemkwaliteit.pdf.

spanning the supply chain: waste collection, transportation, storage, recycling, and disposal of mixed municipal waste as well as some specific waste streams such as packaging waste, WEEE, household hazardous waste, and construction/demolition waste. There is, therefore, a previous study to benchmark the efficiency of the existing waste management practices of C&D waste from. This information has not been provided for consideration in this report, but would be crucial for an expert group to reflect upon.

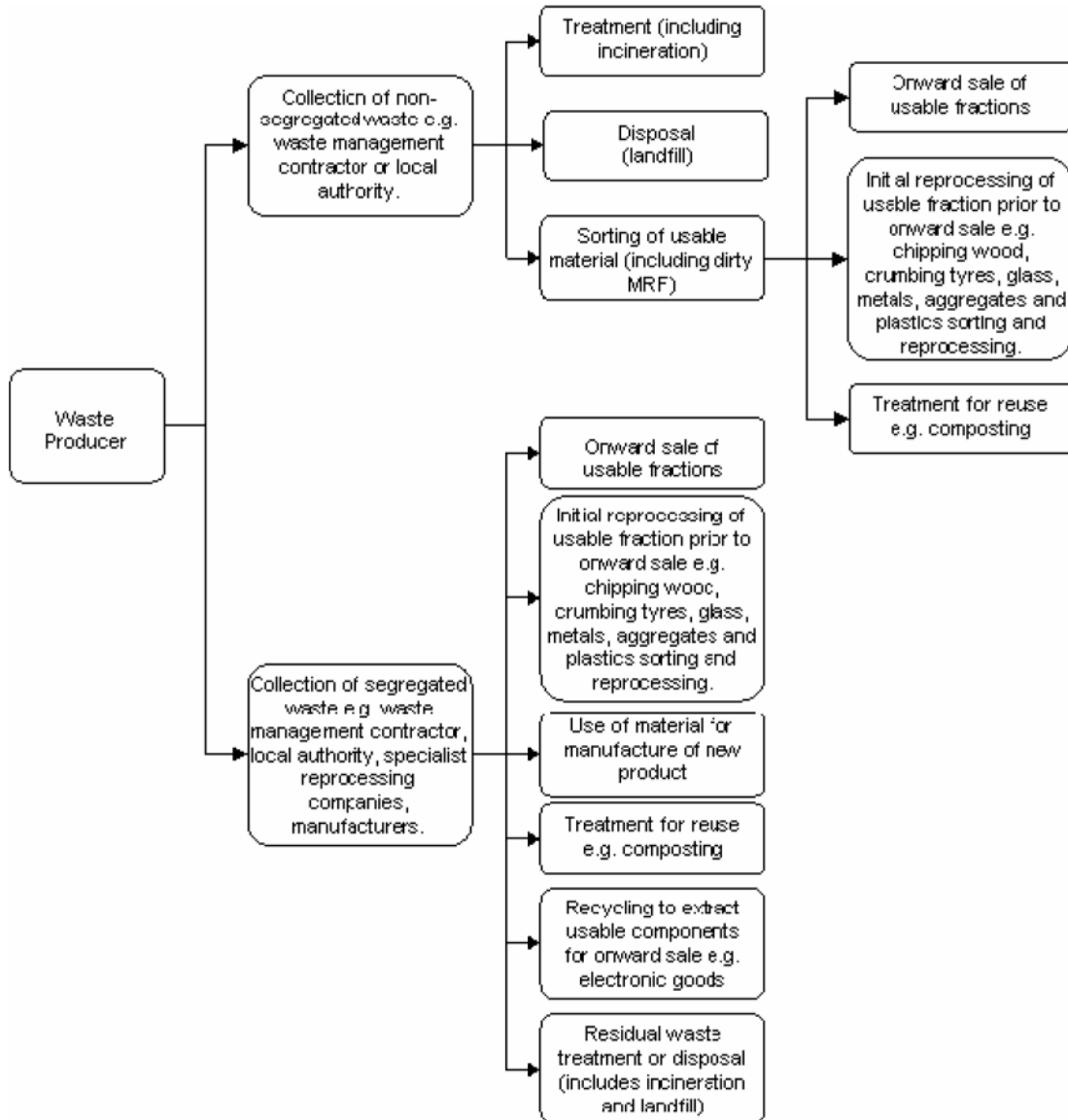
The Y&H commercial and industrial waste sector does not have the same level of regulatory compliance as the municipal waste sector. There are no headline targets / incentives (out with financial ones) for businesses to reduce their waste. The pre-treatment requirement of the Landfill Regulations 2006 in the UK requires businesses to prove that they have pre-treated their waste. 'Pre-treatment' means that the waste must undergo a weight reduction or a change in its nature. In England, Wales and Northern Ireland, this generally means removal of a proportion of the waste for recycling that would have gone to landfill.

Call for action

An expert group is required to assess:

- Recycling systems and the infrastructure required to process commercial and industrial, and construction and demolition waste in greater detail – as seen in Figure 7.2 below. Given the size, scale or scope of this synergy potential both the C&I and C&D waste streams should be broke down at a “macro”, “meso” and “micro” scale in order to obtain realistic targeted interventions that JAP’s can make.

Figure 7.2 Waste and recycling category overview



Source: Environmental Technologies Sector Mapping Exercise, Ecotec (2009)

- When commencing this task, at a meso scale, it is worth noting the role that impartial public sector bodies, such as CO2Sense Yorkshire, play. Through funded projects and a range of expert partners (built up through a series of valuable networks) CO2Sense helps businesses to implement waste prevention, re-use, recycling, energy and water efficiency, green design and market development. There may be an opportunity to set up similar support organisations through EU/EC and government funded programmes to assist businesses by providing support, technical advice and investment on a specific project basis addressing market failure. As a result, a region would witness a reduction in waste to landfill, a reduction in associated carbon emissions, an increase in the generation of low carbon and renewable energy, an increase in sales of green energy and heat, and a growth in resource efficiency sector business.
- Identify RTD best practice sites in both C&D and C&I waste streams for joint site visits to view the proven technology(s).
- Identify business and public organisation innovation examples that can be applied to businesses and public bodies across the countries involved in the WasteKIT project and further afield. This should include

examples (case studies) from national, regional, local and company/organisational/institutional scales. All case studies must be relevant and applicable to the various scales across the WasteKIT participating regions.

- Further interrogate RTD and innovative best practice examples in both C&D and C&I waste streams that can be tailored to be beneficial to each region of the WasteKIT project with the potential for European wide uptake. This will deliver a regional based action plan in C&D/C&I wastes.
- At all stages examine the potential for the academic institutions to push boundaries of research. New opportunities and funding should be highlighted for heavy RTD research to be undertaken across a network of the WasteKIT university partners.
- Further examine the role of third sector waste management organisations. There are also 50+ third sector or community sector organisations involved in waste handling in Yorkshire and Humber⁹. These organisations undertake a range of activities such as community composting, initiatives to encourage community recycling and, in many cases, provide employment to those with special needs. There are some examples of particularly innovative organisations involved in the third sector which are focusing on working with industry to identify opportunities to reduce waste or divert it from landfill. The work of these organisations is extremely valuable to the process of finding alternative uses for waste but it is not contributing significantly to regional economic growth in this sub-sector.

7.3. Recycling of contaminated plastics

Nature of the problem

For plastics, the nature of post-use material means a large proportion is often contaminated with by-products, process materials or other waste materials. Because of the variety of plastic types and the associated cost of recycling them, many authorities have been slow to introduce comprehensive plastics recycling schemes. Plastics, in comparison to other waste materials, are by their nature bulky lightweight objects therefore bulking is an essential extra step to ensuring economic viability. This “harder to access” material is now becoming more of a target for regional reprocessors as they expand their businesses. Experiences of recycling the contaminated plastics from other regions especially Emilia-Romagna and Amsterdam region could be obtained for the Yorkshire and Humber and Sofia regions. Potentials could also be explored for the development of economics related to recycling of contaminated plastics.

As more European regions seek to separate more material from waste streams more separation technologies are being implemented. Regions will need to find an economic and sustainable option for the treatment and/or disposal of sorted plastic material. Regions, such as Sofia, will need to have a treatment or disposal route in place for plastic output for planned Mechanical Biological Treatment (MBT) facilities.

⁹ Source: Community Recycling Network at http://www.crn.org.uk/region/yorkshire_and_the_humber

Regional performance and opportunities

Sofia Municipality are seeking to innovate through the introduction of the broad usage of biodegradable plastics for packaging to replace non-degradable polyethylene bags and films. Specific polymers (poly-hydroxy-butyric acid, poly-lactic acid, some co-polymers, etc.) based on renewable raw materials are degradable by soil bacteria through composting. The Sofia region may be introducing a pilot project involving waste packaging collection in limited areas or through major commercial chains, like Billa, Metro, etc. This measure is reasonable when waste is designated for disposal via landfill or composting. Sofia Municipality have the opportunity to probe advice from experienced companies. Multi-national companies such as Novamont, a world leader in bioplastics from biodegradable, renewable and compostable sources hosts a wealth of information which may add further to an evidence base upon which usage of biodegradable plastics decisions are made.

There are several considerations to make. Essentially, if a region is seeking to use the waste hierarchy as a guide to prioritising waste management practices then working with companies to reduce packaging and production of plastic bags has more environmental benefit to promoting a throw away alternative. There is also a market opportunity, strengthening regional economy, running alongside waste prevention/minimisation in the collection, consolidation, treatment, reprocessing and production of a potentially closed loop (non-biodegradable) recycled product. This material is diverted away from landfill and prevents the extraction of the raw materials required to make the product initially. Once a region has achieved an adequate waste management infrastructure biodegradable plastics pose a threat as a contaminant for the reprocessing of non-biodegradable plastics. The difference in chemical composition and the fact that the material breaks-down rapidly means that biodegradable plastics cannot be combined with traditional non-biodegradable polymers in recycling schemes. Recyclers and reprocessors reject any batches of plastic material that potentially contain bio-degradable plastic as this contamination can have a detrimental impact upon the manufacture of new recycled plastic products.

As such, further innovation could be driven through increased separation of plastics (PVC, polystyrene, polyethylene, etc.). The MBT plant that is planned for the Sofia region will assist in increasing the tonnage of this separated material importantly in combination with complementary technology facilities. As indicated in the Sofia Regional Report the plant will treat residual waste, in which, the mechanical stage involves removing non-biodegradable material and recyclables. The amount of general plastics (not collected prior to MBT, together with other resistant organic materials, like rubber, tyres, textile, etc.) will form refuse derived fuel (RDF). Currently this fuel is designated for energy recovery via combustion in cement kilns. There is no mention of proposed incineration/EFW facilities.

A WP4 action group could focus on RTD by analysing MBT efficiencies considering enhancing the rate of MSW separation, which currently typically involves factory style conveyors, industrial magnets, eddy current separators, trommels, shredders, and other tailor made systems. The biological stage of MBT results in the extensive biological stabilization of the waste. The waste is exposed to atmospheric oxygen to induce aerobic decomposition and results in MBT compost. The residual waste is inert and the volume is reduced by at least half (density > 1.3 t/m³), resulting in a twofold increase in the life of the landfill. The leachate produced in the process is recycled for wetting the treated waste and the formation of landfill gas is practically removed. The facility is in modular format and as such it is feasible in the future to extend the facility to meet the increased amounts of waste to be treated.

Alternative innovation options for waste treatment with energy recovery could be considered: anaerobic digestion, pyrolysis or gasification to produce high quality fuel gas and liquid fuels, or construction of municipal waste to energy plants. This can be lucrative depending on waste morphology and volume. For example, plasma incineration with synthesis gas formation becomes efficient when the daily amount of MSW exceeds 15 tonnes. All innovations should first consider the principal technological scheme to enhance it, but not to alter the general technological scheme considerably.

The City of Amsterdam Area currently has no MBT plants. It is not explained whether there are any separation technologies or complimentary facilities such as wash plants.

There are currently no MBT plants operational in the Yorkshire and Humber region, and those plants which seek to recover value from mixed waste streams are based on thermal rather than biological processes. There is a possibility of some MBT capacity emerging in the medium term as a result of large scale Local Authority Private Finance Initiatives (PFI) contracts, but the procurement processes are not technology-specific, and until they reach financial close the disposal/treatment methods cannot be confirmed.

In the Yorkshire and Humber region one solution to the packaging barrier is to install depackaging and wash plants at new and existing facilities within the region. Depackaging facilities separate the various contaminants; plastics, glass, paper, card and metal above from the food waste, allowing recovery of any recyclable packaging, leaving the food waste ready for processing in an Anaerobic Digestion (AD) or In Vessel Composting (IVC) facility. Some depackaging plants can reduce the amount of food waste going to landfill by up to 95%. However, the presence of packaging in food waste processing is recognised as one of the key barriers to the efficiency of the process.

Autoclaving, incineration and mechanical biological treatment (MBT) are alternatives for a packaged food waste feedstock, but there is not the capacity of these processing technologies in Yorkshire and Humber to match the waste arisings. For example, the region's incineration capacity for mixed municipal solid waste (MSW) is currently 431,000tpa, which equates to 289,000tpa BMW capacity assuming 67% of MSW is biodegradable, and biodegradable waste is not separated from waste reaching the incinerator. Recently in the UK government has reassured the packaging recycling sector that recycling targets for businesses will be set for next year and that proposals are currently being finalised by ministers. This is an example of a macro scale innovation and will add to the driver for packaging recycling.

Call for action

The first opportunity is to guide Sofia in establishing its first MBT plant. In August 2009, the Council of Ministers approved €131m funding from the Operational Program "Environment 2007-2013" for the construction of an integrated waste management system to separate household waste of Sofia municipality. The mechanical-biological waste treatment plant will be located in the area of Sadinata in Yana village.

This project consists of:

- A facility able to process 410,000 t/a;
- Composting installations for green waste and bio-waste on the Han Bogrov site;
- Landfill on the Sadinata site;

- Waste water treatment plant on the Sadinata site;
- Supporting infrastructure.

As a significant component of its integrated management system for MSW, the Municipality negotiated with the European Investment Bank for the remaining balance of €52m. The completion of the facilities is due in 2012 coinciding with the end of the WasteKIT project.

An action group should consider:

- Lessons learned from Emilia-Romagna's MBT plant. Sofia Municipality should visit this facility to get incite to barriers they may face.
- Alternative technologies. Would a depackaging and wash plant prove more beneficial to Sofia?
- At all stages examine the potential for the academic institutions to push boundaries of research. New opportunities and funding should be highlighted for heavy RTD research to be undertaken across a network of the WasteKIT university partners.
- Technology transfer from WasteKIT region to WasteKIT region. Are there businesses willing to invest in projects across Europe? These projects may be reprocessing/treatment/recycling facilities or schemes/programmes designed to educate or raise public or industry awareness to the benefits of working towards a sustainable waste management sector.
- New technology applications - further studies identifying new RTD projects for recycling contaminated mixed plastics. This may include site visits to plants at the forefront of sorting/processing that may not necessarily be located in regions or nations of the WasteKIT partners. For example, JayPlas has a unique bottle sorting plant in Derby, and is the only plastic sorting facility in the UK capable of separating all polymers within a plastic bottle grade (by type and colour). The facility has a capacity of 78,000 tonnes - recycling HDPE, PET, polypropylene (PP), polystyrene (PS) and PVC waste collected from local authorities, large national supermarkets and small industrial businesses. For more information click [here](#).

7.4. Source collection and treatment of food waste

Nature of the problem

Europe is a particularly efficient food production continent. Infrastructure is well established to supply its nations with food. The result has been comparatively low food prices and a perception that food is a cheap commodity. Jeffrey D Sach's "Common Wealth Economics for a Crowded Planet" sites two-thirds of food produced across the world is wasted before it is purchased. Food and drink waste accounts for a significant proportion of waste sent to landfill across Europe each year.

The main threat from this biowaste is the production of methane in landfills, which makes a contribution to the emissions of greenhouse gas. The Landfill Directive 1999/31/EC requires Member States to reduce the amount of the biodegradable waste from the landfill. Food waste from household and industry is a big part of the biowaste. Proper management to the biowaste can contribute in many ways to deal with the environmentally challenging problems such as climate change; in addition, renewable energy and resources could be produced by proper process of the biowaste such as composting and anaerobic digestion.

Regional performance and opportunities

Up to 75% of bio-degradable wastes were collected in the Emilia-Romagna region. The successful collection of food waste from households could be rolled out and trialed in other regions. In the Emilia-Romagna region, the need to quantify “biomass” waste produced by industrial activities to estimate its energy potential has led to a number of different bodies (the Ministry of Agriculture, the regions and ISPRA) to commission a series of studies intended to establish the size and specific characteristics of the sector. These studies may assist other regions, perhaps providing a template research study.

The large quantity of livestock effluent is striking as compared with the other related produced wastes (animal by-products, vegetable residues and whey and butter milk). The Emilia-Romagna region is effectively exploiting this waste in energy production and/or the use of the related materials will minimise the related negative environmental impact (smells, leaching, methane emissions, CO² and ammonia nitrogen) and maximise the regions energy and/or fertiliser potential.

Attention has been concentrated, so far as the industrial conversion of vegetal products is concerned, on those productive sectors generating significant quantities of high quality by-products which only rarely are considered “waste” by national law, because of the different recovery solutions available. In the fruit and vegetable conservation industry indeed, the same type of “organic by-products” may leave the producing business as “waste” or may be variously exploited for its “recovery”. An example of this would be the wide variety of vegetal residues (e.g. tomato skins, olive residue, residue from sweet maize) either used in the livestock as “raw materials for feed” (there is specific legislation sanctioning this) or used as “waste” in composting plants when not of sufficient quality for animal feed.

The animal product processing industry (abattoirs in particular) also generate important amounts of by-products (blood, fleshing, fat etc.) which is still sent to the “rendering plant” for the production of animal flours. The recovery of Category 3 animal by-products (low health risk) through different channels (composting and/or anaerobic digestion) is still limited to small quantities. This is in spite of the hopes of change expressed by sector experts who consider the rendering to be so intensive and costly that it should be reserved to Category 1 and 2 by-products alone (greater health hazards). Whey is also an animal by-product, produced in great quantities by the milk processing industry. It is still mainly used in livestock feed (pigs) and its use in anaerobic digestion is only occasional and linked to the local context.

To date, in the Yorkshire and Humber region, only 3 out of 21 local authorities (Calderdale, Hull and Leeds) have introduced / are introducing kerbside collections of food waste. The move to Alternate Weekly Collections, ban on side wastes, restricted bin sizes, trade waste bans at household waste recycling centres (out with the impact of the economic downturn) have all collectively contributed to a reduction in overall household waste arisings. Free and unrestricted garden waste collections however openly increase household waste arisings. Interestingly there has been very little take-up of source separated food waste collections.

The current primary concern for the development of this sector is the need to ensure increasing levels of source segregated food wastes to divert waste suitable for AD. This is waste currently disposed of as a component of mixed wastes, generally to landfill. Financial support for AD technology through renewable energy policies nationally is likely to continue to stimulate interest in investment in the sector, provided the availability of suitable

feedstock expands in line with increasing capacity.

There are no specific targets and related policies about the management of food waste in the Amsterdam region. However, a project, Greenmills, that involves organic waste streams being processed for the production of bio-fuels, electricity, as well as heat and fertilizer products, is currently in full swing in the Port of Amsterdam. Five companies are involved: Rotie Vetveredeling BV, Noba BV, Biodiesel Amsterdam BV, Tankstorage Amsterdam BV (all part of the Simadan Group) and Orgaworld BV (part of the Shanks Group). NOBA trades in oil, grease and fatty acids in the animal feed industry and energy sector. Rotie collects oils and fats that have been used in the catering and food industry, while Orgaworld processes organic waste streams, such as source-separated organics (in Dutch: GFT) and waste streams from the food processing industry. This case study is a good example of finding the potential links across the supply chain.

There are no specific policies and actions related to the management of food waste in the Sofia region.

Call for action

Further details of food waste collection best practice from households in the Emilia-Romagna region is required. The region is clearly collecting, transporting and processing bio-wastes and agri-wastes to produce energy or fertilizers far better than any other partner in the WasteKIT project.

The action group for this synergy potential must consider:

- Integrated recycling systems for (municipal and commercial) food waste including collection, transport and processing.
- How food waste collections can become economic to operate.
- Business innovation best practice. Northern Foods, a food manufacturing company – for example – in the Yorkshire and Humber region aims across its 17 sites to achieve zero waste to landfill.
- The potential of education (Corporate Social Responsibility) within food production and manufacturing companies. Studies have shown staff education will lead to huge waste prevention.
- Public awareness campaigns. Examples are not provided in regional reports but the UK has a “Love Food, Hate Waste” campaign, raising awareness of the environmental impacts of food waste and economic benefits associated with its reduction.
- At all stages examine the potential for the academic institutions to push boundaries of research. New opportunities and funding should be highlighted for heavy RTD research to be undertaken across a network of the WasteKIT university partners.

7.5. Market development for recycled / recovered materials

Nature of the problem

Finding sustainable markets for collected and recovered materials is a key obstacle that all regions face. Some materials offer higher value end markets while others attract a gate fee – essentially the collector paying for it to be reprocessed. Understanding industrial symbiosis is a complex matter – one man’s waste can become another man’s resource. A waste exchange is an operation that enables materials discarded by one sector to be re-used by

another sector from household and/or industry. Performances of production and utilization of waste usually happens in different industrial sectors. Clearly information of the requirement of the certain type of waste will encourage the separation of the waste from the sources. In addition, the downstream waste processing industries need clear information of the waste from the sources for securing the development. For example, fly ash is a waste from coal fired electric producing power plants; however, the fly ash might be used by a catalyst production company. In addition, used but in good condition electric equipments such as TV and computing keyboard could be discarded as electric waste; however, some communities might need these second-hand equipments.

Regional performance and opportunities

In the Emilia-Romagna region, there is a waste exchange platform – the Italian B2B stock exchange for waste recycling, where waste producers can be matched with waste recyclers. The waste exchange platform is believed to help the application of Legislative Decree 152/2006 in Italy.

In the Amsterdam region, adequate monitoring of the waste has been carried out by the Waste Management Council, which has been given a central coordinating role in monitoring. The Waste Management Department (WMD) of the Dutch agency “AgencyNL” (formally known as SenterNovem) has a leading role to monitor waste flows and waste management activities in the Netherlands and abroad. A national benchmark is also presented on municipal waste management, in order to look for good and best practices to learn from each other in those waste management areas with no competition for the municipal services. Therefore, waste recycling and utilization is well integrated and managed by monitoring the waste including sharing the information of waste production and utilisation.

The Sofia report does not draw reference to the market for recovered / recycled materials.

The Yorkshire and Humber region has a developed and well established market for recycled/recovered materials. There are a variety of UK wide websites, magazines and trade associates with a host of information on trade prices and in-depth information on materials. CO2Sense has gathered material specific information for the region see Appendices. Each WasteKIT region has the opportunity to do the same and feed this into the action group for this synergy potential for consideration on market development for recycled / recovered materials.

The topic of market development for recovered / recycled materials has a certain level of cross-over with synergy potential 7.11 (sustainable procurement) and the two actions group could be brought together to consider market development and procurement in its entirety.

Call for action

It is noted that changes in product prices are dictated solely by market fluctuations. Recent downturns in the world-wide economy have greatly influenced the export of plastic material to China. However, a detailed understanding would be beneficial to the Sofia region as their market develops, for example.

A waste exchange market will provide accurate information on the needs for recycling information (type of materials, quantity of materials and details of involved companies). Therefore, recycling of waste could be stimulated by the market itself. The government organisations or the NGO could play an important role in the managing of the waste recycling market. A website to detail material specific information for the Sofia region could be designed and built to strengthen and cement understanding.

Experiences for the waste exchange market could be facilitated among the involved regions; knowledge for the each region might be important for the waste management and stimulation of waste related economics.

7.6. Improvement of public perception

Nature of the problem

Improved public perception of sustainable wastes management will lead to significant improvements across the whole of the waste hierarchy. Enhanced public understanding of the need for waste treatment and recovery is paramount to the success of the achievement of targets set down in EU Directives from waste prevention to producer responsibility.

Regional performance and opportunities

Many instruments to enhance public participation have been applied in the Amsterdam region which has been instrumental in the low production of waste per capital in the region. Experience for enhancing public perception of waste prevention in Amsterdam region might have the potential to enhance the public level of understanding in other regions.

In the UK many Government Bodies have sought to address waste prevention and minimisation and increase source separated material explaining the benefits of recycling / recovery through waste campaigns, “Love Food, Hate Waste”, being an example of one of them. At regional levels different public engagements exist, with local promotion being assisted through some voluntary third sector organisations. Businesses have a huge role to play in educating their staff. Notably in manufacturing, waste arisings can be high across a production chain – food manufacturing is a good example to highlight this point.

More information is required from the Emilia- Romagna region and Sofia region on public/business sector engagement across the waste sector. The Sofia region, especially, have been challenged with the perception local inhabitants had of existing landfill sites which ultimately led to site closure.

Call for action

The action group for this synergy potential must consider:

- Further analysis of public engagement campaigns and case studies from the regions.
- For the WasteKIT regions transparent reporting - waste reported as a separate element on local authority tax bills (i.e. council tax) and often ring fenced for reinvestment into more sustainable waste management practices.
- Clear compensation mechanisms for communities in which waste treatment plants are sited. Amsterdam may be able to provide examples.
- Planning work groups to engage with public and private companies to engage the local residential and business community re-emphasising the benefits of sustainable waste management to their communities.
- Funding opportunities to take public perception campaigns or projects further than the life of the WasteKIT project.

7.7. Definition of waste – fuel or waste? (Associated implications for planning and permitting)

Nature of the problem

Wastes – Substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provision of national law
--

The definition of “Waste” hugely affects waste management across Europe. More specifically there is an issue of when waste ceases to be a waste. How waste is defined and how the definition is interpreted greatly affects permitting and planning of waste management sites. Working on a clear and universal definition and comprehension of that definition is a large opportunity for the waste management sector in European Member States.

Waste is defined by the European Court of Justice (ECJ) and national court rulings. The definition was originally laid out in the EU Waste Framework Directive in 1991.

The major underlying issue has been when waste ceases to be a waste and becomes a product. This classification has huge implications for businesses handling waste/or arguably products, as they then require a waste management licence. Applying for such a permit can be costly especially for small to medium sized enterprises. Within the UK there have been instances of companies choosing to import material from countries such as the Netherlands as a “product”, when the exact same material is produced locally and described as a “waste”.

Regional performance and opportunities

This year (18th January 2010) in the UK, Defra launched a consultation on draft guidance which aims to outline exactly how recent legal rulings and legislation such as the revised Waste Framework Directive relate to the legal definition of what is and is not waste in the UK. In the 'Consultation on the legal definition of waste and its

application' document the Government department details the factors that businesses, councils and other bodies should take into account when deciding whether or not a substance is a waste, including guidance to when a waste ceases to be a waste. In particular, it examines how ECJ and national court rulings have related to defining both end-of-waste and the substances produced unintentionally during the production process for a substance, more commonly known as by-products.

Not enough is known to comment on how the definition of waste affects the Amsterdam, Emilia-Romagna and Sofia regions. This should be considered initially at the formation of the WP work group.

Call for action

An action group must consider the following:

- On a local level engaging with local planning authorities and local offices of national regulatory bodies is essential.
- Is there the potential for groups to lobby a review of the definition of waste? From the Regional Overview Reports it is hard to comment.

The WasteKIT project should encourage partnership working in waste management planning between the three “tiers” or levels of Government - local, regional and central Government. Each tier may have different drivers and objectives causing conflicts of interest at the various stages of the planning process. The project has the opportunity to introduce follow-up projects working with Government or Government waste management bodies in areas to:

- Create stronger regional tiers with transparent responsibility for the planning of future waste capacity needs, eradicating conflicts at a local planning and regional planning level.
- Establish routine liaison between regional and local (municipal) tiers to update data identified at local levels. An example within the Y&H region is the Regional Technology Advisory Body (RTAB). The RTAB is predominantly regional and local waste management related planners from differing authorities meeting together to share data and intelligence with each other and with the local government office responsible for waste management strategy. If such support networks are not well established in partner countries there is an opportunity at hand here.
- Encourage and support multi-municipal implementation of waste management plans and cooperation between municipalities on shared infrastructure (for example collections or facilities).

7.8. Technology innovation related to waste processing (pyrolysis, gasification/incineration efficiencies)

Nature of the problem

Innovation is a necessary, although not the only sufficient condition, for economic success. It is globally recognised as an important driver of productivity. Innovation comprises, among others, the development of new technologies that increase efficiency and the introduction of new, more valuable goods and services. It also includes intangibles such as new methods of working and improvements to services.

R&D represents one of the determinants to the innovation process and is defined by the Organisation for

Economic Cooperation and Development (OECD) in its Frascati Manual, which proposes a standard practice for surveys on R&D, as 'creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to create new applications'. The OECD definition of R&D covers the following:

- Basic research – experimental and theoretical work to obtain new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- Applied research – work undertaken to acquire new knowledge, which is directed primarily towards a specific practical aim.
- Experimental development – systematic work, drawing on existing knowledge, which is directed at producing new materials, products or devices, installing new processes, systems and services, or at improving substantially those already produced or installed.

The OECD definition excludes education, training and any other related scientific, technological, industrial, administrative or supporting activities. However, innovation depends on a wider set of inputs than R&D, including skills training, design, software and organisational investment by firms.

In each related region, the numbers of universities and research institutes are presented. Innovative projects and programmes (pyrolysis, gasification/incineration efficiencies etc.) are being carried out across all these research centres. The technology input from these research centres will be central to the development of waste management infrastructure by improving the efficiency of current treatment facilities and introducing new technologies.

Regional performance and opportunities

According to the Amsterdam Regional Overview Report "it seems that specific RTD and innovation policies and actions explicitly dealing with or focusing on waste are not present in The Netherlands and in the Randstad region for the moment." The report goes on to explain that general RTD and innovation stimulating instruments are available that could have a stimulating role in waste management related knowledge and innovation creation. It would seem that over the last decade the Dutch national government has implemented staggering policies over the stimulation of R&D and innovation. However, even though the Innovation Platform has been successful at putting critical topics on the policy agenda and has stimulated actions, the Dutch innovation performance is still lagging.

Dutch Public investments in R&D are increasing slightly, but the size of the investment in relation to the gross national product (GNP) has fallen to 0.67%. Over the years, the private investments remain approximately the same at 1.03% GNP (N.B. One of the Lisbon objectives is to achieve a total R&D investment of 3% GNP). The relatively low investments in R&D in combination with virtually no growth in the R&D field means that the Netherlands will find moving towards the European "leading countries in the field of innovation" a huge challenge.

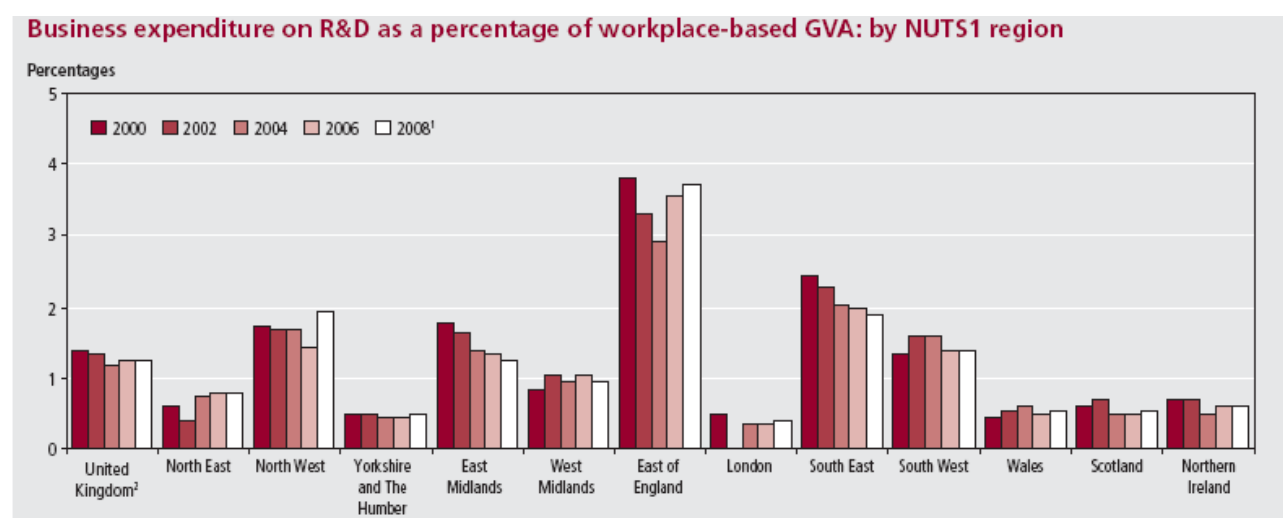
The UK is in a similar position to Amsterdam. Importantly, more work is needed to measure effectively at regional level. Figure 7.2 presents statistics on Business Enterprise Research and Development (BERD). Figures for 2008 published on 11 December 2009 show business expenditure on R&D as a percentage of workplace-based GVA in 2000, 2002, 2004, 2006 and 2008. This is a measure commonly used in regional comparisons as it takes

account of the size of regional economies. The figure shows that, since 2000, the East of England has been the region with by far the highest percentage of R&D expenditure in terms of GVA, with 3.7 per cent in 2008. The North West and the South East regions had the second highest percentage (1.9 per cent) which has, however, been declining in the South East since 2000. These three regions together also accounted for 62 per cent of the total expenditure on R&D in 2008. London had the lowest R&D expenditure as a share of its regional GVA in 2008 (0.4 per cent). Yorkshire and the Humber, Wales and Scotland had the second lowest shares in the UK in 2008, at 0.5 per cent each. London's very low share of expenditure on R&D does not necessarily suggest low levels of innovation but may be due to it having a large concentration of service industries, which may be less R&D intensive (within the OECD definition) if, for example, they rely heavily on human capital. It may also reflect the choice businesses make over locating their R&D activities.

Approximately three-quarters of the R&D expenditure in the UK was made in the manufacturing sector in 2008. Figure 7.3 shows that in most regions except in the Greater South East the share of the R&D expenditure on manufacturing was over 80 per cent of their respective expenditure. The figure also shows that East of England accounted for 26 per cent of the total R&D expenditure in the UK in 2008 and had the highest level of R&D expenditure on both manufacturing and services. This may suggest that some London R&D occurs in the surrounding regions such as Cambridge technology start-ups. .

Enterprise is another driver of productivity. It is defined as the seizing of new business opportunities by both start-ups and existing firms. New enterprises can bring innovative processes and technologies to the market, forcing existing ones to improve their productivity in order to remain competitive. A relatively large proportion of enterprises joining and leaving the stock can be seen as desirable, as new enterprises entering the market are considered to bring innovative processes and technologies that drive up productivity and force unproductive enterprises to leave the market.

Figure 7.2. Business expenditure on R&D as a percentage of workplace-based GVA: by Government Office Region (ONS, Economic & Labour Market Review, Vol. 4, No. 8, August 2010)

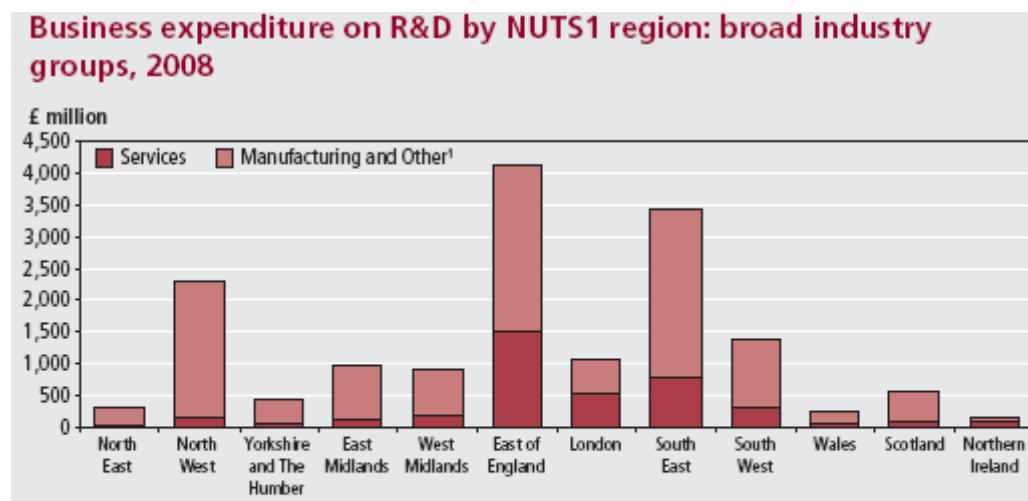


Notes:

- 1 Provisional.
- 2 UK less Extra-regio and statistical discrepancy.

Source: *Regional Accounts and Business Enterprise Research & Development*, Office for National Statistics

Figure 7.3: Business expenditure on R&D by Government Office Region by broad industry group (ONS, Economic & Labour Market Review, Vol. 4, No. 8, August 2010)



Note:

1 Other includes agriculture, hunting and forestry, fishing, extractive industries, electricity, gas and water supply and construction. The expenditure on other industries across the UK was less than 2 per cent of the total expenditure.

Source: Business Enterprise Research & Development, Office for National Statistics

Strong relationships exist in the Y&H region between the research institutes and environmental businesses. Yorkshire Forward has also set up the Environmental Technologies CIC (Centre of Industrial Collaboration) to foster partnership working between industry and the region's universities.

The University of Leeds is the UK's second largest university with 30,500 students from over 130 countries (<http://www.leeds.ac.uk/>). The University is a member of the UK Russell Group of research-intensive Universities and the Worldwide Universities Network (WUN). The University leads the White Rose Innovation Partnership involving over 290 companies and organisations with White Rose Universities and the University of Bradford, along with university and medical partners in the USA. With an annual research income of £113m, the University was ranked 99th in the THES-QS world rankings in October 2009 - one of only 17 UK universities in the top 100. Since 2006, the University has:

- Filed more than 85 patents.
- Developed 28 Knowledge Transfer Partnerships with local companies.
- Incubated 63 companies founded by undergraduates.
- Has 45 active spin-out companies valued at an estimated £150m.

The research sector in Emilia-Romagna relies on a wide range of technical and scientific resources and competencies well known both nationally and internationally. The region counts six universities (with more than 150,000 students) including the public Universities of:

- Bologna (including branches in Ravenna, Forlì-Cesena and Rimini).
- Ferrara.
- Modena and Reggio Emilia.
- Parma.

- Milan Polytechnic Unit in Piacenza.
- University Cattolica del Sacro Cuore, branch in Piacenza.

The Emilia-Romagna region has 2 national research centres:

- CNR – National Research Council - is the public national institute for scientific and technological research. In Emilia-Romagna, CNR is characterised by a strong specialisation in technologies related to Environment, Chemistry, Microelectronics, Materials and Nanotechnologies. Its 13 Institutes in the region employ more than 800 technicians and researchers, spread through numerous laboratories and research centres in the region.
- ENEA – The National Agency for New Technologies, Energy and Environment – works on renewable energies, facing energetic issues in the broader context of research and innovation for sustainable development. ENEA promotes and develops research activities and technological innovation also through prototyping and industrialization of productions, favouring their exploitation in the productive sectors. The Centre also supplies public and private bodies with services and researches related to energy, environment and technological innovation.

In addition, other significant organisations are mentioned in the Regional Overview Report, such as:

- CINETECA – the Inter-University Consortium for Automatic Computing of NE Italy.
- CNIT – the National Inter- University Consortium for Telecommunications.
- CCMC – the Bologna location of the Euro-Mediterranean Centre for Climate Change.
- INGV – the Bologna branch of the National Institute of Geophysics and Vulcanology.
- IOR – Rizzoli Orthopaedic medical and Technology research.
- CMR – Centre for Regenerative Medicine “Stefano Ferrari”.

According to OECD statistics, the Emilia-Romagna research system absorbs 5,9% of the national resources dedicated to finance research, but produces as much as 15% of the total national research output. Combining the figures of both university and other research institutes, over 8,000 researchers are employed in the region with an overall number of researchers reaching 17,500 units (corresponding to 10% of the national R&D employment) also considering the R&D personnel employed in private companies. In terms of investments, the amount of R&D activities carried out by regional enterprises has more than doubled between 1997 e 2002 and has increased by 72% in terms of dedicated human resources. In general, the main R&D indicators show a better performance of Emilia-Romagna compared to the country taken as a whole: R&D expenditure is 9,3% of the total national R&D expenditure (ranking fourth in Italy); R&D expenditure is equal to 1.18% of the GDP (1,10 at national level), with a 60,8% contribution by the private sector (50,4% at national level) and with 34% of university students graduating in technical-scientific disciplines (against 29% in Italy).

Emilia-Romagna High Technology Network for industrial research, technology transfer and innovation
Emilia-Romagna Region has implemented an innovation policy based on the Regional Law no.7/2002 and its related Regional Programme for Industrial Research Innovation and Technology Transfer (PRRIITT). In the framework of the PRRIITT Programme early actions were undertaken to promote and strengthen a new favourable context to fuel investments in research and development to support technological innovation in Emilia-Romagna. The Region on one hand has supported industrial research within enterprises by funding collaboration projects with Universities and research centres and, on the other, it has set up a network of industrial research and

technology transfer facilities, i.e. the Emilia-Romagna High Technology Network, organised in 6 technological thematic Platforms:

- Agri-food Platform
- Construction Platform
- Energy and Environment Platform
- ICT and Design Platform
- Mechanics and Materials Platform
- Life Science Platform

The Emilia-Romagna High Technology Network includes networked industrial research and TT laboratories (net labs) and innovation centres, focusing on research activities and innovation topics of enterprises interest. The thematic Platforms gather the industrial research knowledge available in the region, resulting from the matching between the expertise of the Emilia-Romagna High Technology Network laboratories and the enterprises needs. They focus on strategic themes whose technological progress will influence future regional growth, competitiveness and sustainability. They set medium and long-term technological development and research objectives and embrace the whole value chain, ensuring that knowledge generated by research is first converted into technologies and processes and then into marketable products and services. They foster co-operation within and among them to develop new projects and collaboration relationships also at international level, and promote the access to European innovation, research and development funds.

The technological thematic platforms aim at generating added value for the regional economic development and are designed to:

- Identify the most promising technological trajectories to set out the priorities of research programmes and up-to-date enabling technologies needed by the various industrial districts.
- Define a common activity programme, identifying the joint High Technology Network actions.
- Outline marketing and product development tools to foster the establishment of research and service contracts.
- Transfer knowledge to regional enterprises and valorise the outcomes achieved by the individual laboratories.
- Develop connections and collaborations with European and international actors, e.g. European Technological Platforms, and participate at international cooperation projects.

Further information is required from Sofia.

Call for action

A new study shows that meeting the Europe 2020 target of increasing R&D investment to 3 percent of GDP could create 3.7 million jobs and increase annual GDP by up to €795 billion by 2025. One million extra researchers will be needed.

The European Commission's 'Innovation Union' sets out a strategic approach to innovation, driven by the highest political level. The Innovation Union will focus Europe's efforts - and co-operation with third countries - on challenges like climate change, energy and food security, health and an ageing population. It will use public sector intervention to stimulate the private sector and to remove bottlenecks which stop ideas reaching the market.

These include lack of finance, fragmented research systems and markets, under-use of public procurement for innovation and slow standard setting. The Innovation Union is a "flagship" in the Europe 2020 Strategy.

Ten key elements in the Innovation Union:

- **European Innovation Partnerships will mobilise stakeholders** - European, national and regional, public and private - behind well-defined goals in areas which combine tackling societal challenges with potential for Europe to become a world leader. The Partnerships will step up R&D, coordinate investment, speed up standards and mobilise demand. The Commission will provide "seed corn" funds to attract stakeholder funding. A pilot Partnership on active and healthy ageing will be launched by early 2011, aiming to extend by two years by 2020 the proportion of our lives in which we enjoy good health. More partnerships will follow on areas such as energy, "smart" cities and mobility, water efficiency, non-energy raw materials and sustainable and productive agriculture.
- **The Commission has assembled 25 indicators in an 'Innovation Union Scoreboard'**, and a checklist of the features of successful innovation systems. A new indicator will be developed on the share of fast-growing innovative companies in the economy. The Commission will support an independent ranking system for universities.
- **The Commission will bring forward measures to improve access to finance.** It will propose a cross-border venture capital regime, work with the European Investment Bank to scale up EU schemes like the Risk-Sharing Finance Facility and appoint a leading figure to strengthen cross-border matching of innovative firms with investors.
- **Existing research initiatives will be stepped up.** The Commission will propose measures to complete the European Research Area - a legal requirement under the Lisbon Treaty - by 2014. This means more coherence between European and national research policies, cutting red tape and removing obstacles to researchers' mobility, such as the lack of transferability of pension rights. It also means maximising open access to results of publicly-funded research. FP8 will be designed to support Europe 2020. The European Research Council and the European Institute of Innovation and Technology will be further developed. The Commission will reinforce the scientific base for policy making through its Joint Research Centre.
- **The Commission will set up in 2011 a European Design Leadership Board and a European Design Excellence Label.**
- **The Commission will launch in 2011 a major research programme on public sector and social innovation and pilot a European Public Sector Innovation Scoreboard.** It will launch a European Social Innovation Pilot to provide expertise for social innovators and propose social innovation as a focus of European Social Fund programmes. It will consult social partners on spreading the innovation economy to all occupational levels.
- **The Commission proposes that governments set aside dedicated budgets for public procurement of innovative products and services.** This should create a procurement market worth at least €10 billion a year for innovations that improve public services. The Commission will offer guidance on joint procurements between contracting entities from different Member States.

- **In early 2011, the Commission will make a legislative proposal to speed up and modernise standard-setting** to enable interoperability and foster innovation.
- **Europe's intellectual property regime needs to be modernised.** Agreement on the EU Patent would save business €250 million a year. The Commission will in 2011 make proposals for a European knowledge market for patents and licensing.
- **Structural funding and state aid frameworks will be reviewed to boost innovation.** The Commission will assist Member States to use better the €86 billion of structural funds programmed for research and innovation for 2007-13. It will propose a framework for post 2013 Structural Funds with more focus on innovation. In 2011 it will review the state aid framework.

A WP4 action group is required to consider:

- Alternative waste treatment technologies.
- At all stages examine the potential for the academic institutions to push boundaries of research. New opportunities and funding should be highlighted for heavy RTD research to be undertaken across a network of the WasteKIT university partners.
- WasteKIT University Partners stand the most to gain from this Synergy and it is suggested they lead this element of the project. Perhaps an establishment of a network to take this forward and increase communication links.
- Formation of links (cluster opportunities) between AEB, ITI Energy, Yorwaste and Universities associated with pyrolysis, gasification/incineration efficiencies. Perhaps the establishment of work placements.
- Technology transfer from WasteKIT region to WasteKIT region. Are there businesses willing to invest in projects across Europe? These projects may be reprocessing/treatment/recycling facilities or schemes/programmes designed to educate or raise public or industry awareness to the benefits of working towards a sustainable waste management sector.
- New technology applications – further studies identifying new RTD projects for recycling contaminated mixed plastics. This may include site visits to plants at the forefront of sorting/processing that may not necessarily be located in regions or nations of the WasteKIT partners.

7.9. Data collection for waste management (arisings/feedstock vs regional capacity. Related implications for importing waste)

Nature of the problem

Collecting waste data is crucial for any waste management sector. Waste data allows local authorities (in the UK) to:

- Access faster and more accurate data collection of municipal waste statistics, more regularly and efficiently.
- Enhance their local data management for reporting and strategic planning purposes.
- Offer them streamlined access to performance benchmarking with other authorities.

Waste Data allows governments:

- To monitor progress towards national and local targets.
- To produce National Statistics on municipal waste (submitted to Eurostat).
- To enable local authorities to meet the requirement to report quarterly data to the Monitoring authority under Landfill Allowances Schemes regulations.
- To monitor progress towards national and local targets.
- To provide an evidence base to guide government policy.

There are a number of issues relating to a lack of understanding surrounding waste arisings and waste flow at a local, regional and national level. The most pertinent and pressing is an issue of overcapacity. Without a clear understanding of arisings planning authorities and governments may still be supporting and approving waste facilities that will have no feedstock – now, in five or ten years time. Within some regions proving this need and proving the availability of feedstock is fundamental in receiving financial backing for waste facilities.

Collecting waste data statistics spans across the waste hierarchy and affects all scales. Local, regional and national waste data should be collated on waste prevention, reuse, recycling/composting, treatment/recovery and finally disposal. It is unrealistic to expect the WasteKIT project to achieve this yet development of a framework for nations/regions/local areas to follow or implement would prove valuable.

Regional performance and opportunities

In the Yorkshire and Humber region data collection and reporting is still an issue for the industry. “Outturn data for the municipal sector has improved dramatically since the introduction of Wastedataflow¹⁰ in 2005. For the commercial and industrial sector, data is less reliable. In fact there is no definitive data available that provides a comprehensive illustration of the size of the commercial and industrial (C&I) waste stream.” This is likely to change in the future as waste consignments will be better logged and Defra embark on a nationwide study into the size of the C&I waste stream.

In the Emilia-Romagna region, there is an electronic tracking system for hazardous waste. It is unknown what other waste data management systems are in place. This revolutionary system is suggested to simplify procedures and formalities and reduces business costs and undoubtedly guarantees greater transparency, knowledge and prevention of lawlessness.

The Amsterdam region notes “There is an overcapacity in so-called ‘waste to energy’ facilities as a result of too many new facilities being built and decreasing waste volumes as a result of the financial crisis and increased recycling. This overcapacity leads to significantly lower gate fees for waste treatment.” The region has “Adequate monitoring, registration and enforcement practice.” The Waste Management Council, in the Netherlands, has been given a central co-coordinating role in monitoring waste. The goal provided by the report: looking for good & best practices to learn from each other in those waste management areas with no competition (municipal services) within the “triangle” of services, costs and environment. The Waste Management Department (WMD) of the Dutch agency “AgencyNL” (formally known as SenterNovem) has a leading role to monitor waste flows and waste

¹⁰ WasteDataFlow is the web based system for municipal waste data reporting by UK local authorities to government.

management activities in the Netherlands and abroad.

Further information is required from Sofia.

Call for action

A WP4 action group could assess existing waste data management systems in more detail, once more information is provided by partners. The action group could identify pilot projects by exploring best practice. This could act to uncover suggested improvements for tracking consignments of waste from the point of generation through to its final destination. It could also seek to look at ways of preventing potential double counting caused by existing systems and increasing the level of accountability and knowledge for regional planners.

Effective waste data management has benefits from a number of different angles. From a local perspective a business and/or householder has an increased awareness of their waste arisings (waste production level) and thus raising awareness. A local (or regional) planning authority, who ultimately grants planning permission to a facility, requires localized data in order to justify the need for the plant. Data gathered by tracking software could show the supply of potential waste feedstock over an agreed time period.

This raises an important point: Do regions know how much C&I and C&D waste is being produced? How detailed is this information, and how much is going to licensed and unlicensed facilities? Importantly, how can best practice be shared and passed to Sofia so that as the infrastructure develops they have the necessary reporting tools to track waste consignments.

7.10. Knowledge transfer from research to market

Nature of the problem

A region may lack a specific skill set or struggle to develop partnerships between higher education institutions and businesses within the region. Striking this balance at a business specific, local, regional and national scale is vital to ensure the adequate level of business workforce expertise in wastes management.

Regional performance and opportunities

In the UK, Knowledge Transfer Partnerships (KTP) help businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills and are funded by the Technology Strategy Board (TSB) with additional funding from 17 other funding organisations. The programme has worked with over 3,000 organisations, more than 400 within the Yorkshire and Humber region. KTPs involve a partnership between a company and an academic institute (knowledge base partner) to harness research expertise and develop commercial experience.

The knowledge required is embedded into the business from the knowledge base through a project, or series of projects, undertaken by a recently qualified person (known in the KTP as the Associate), and recruited to

specifically work on that project. KTPs can vary in length from one to three years (classic KTP) and from ten to forty weeks (shorter KTP), depending on the needs of the business and the desired outcomes.

KTP enables new capability to be embedded into the business and has benefited and continues to benefit a wide range of businesses across many sectors, including micro sized, small and large businesses, third sector organisations or public.

A similar programme is in existence in Emilia-Romagna – the High Technology Network. It includes networked industrial research and TT laboratories and innovation centres, to facilitate the knowledge from research to market.

Little is known about the networks existing between academic and research institutions and the business sector in the Amsterdam and Sofia region from analysing the Regional Overview Reports.

Call for action

Experiences of the knowledge transfer platform could be exchanged within the four involved regions. In addition, knowledge transfer from other regions could have the potentials to improve the waste management of the Sofia region.

Specifically the WP4 action group should consider:

- Existing national and regional schemes to link and transfer knowledge, expertise and skills sets associated with the waste management sector considering the supply chain and waste hierarchy.
- The formation of a KTP scheme perhaps financed by each Government or related Government Bodies.
- The formation of a WasteKIT specific scheme to pilot. This has the potential to link into a proposed “Summer School” in WP6. A newly qualified student from Amsterdam, for example, could take a work placement opportunity in Sofia transferring and cementing knowledge to that Sofia based business.
- Encouraging networks constructed by students themselves. There is a NetImpact event run by the students of the University of Leeds to look at sustainable business alternatives, for example, that attracts business and academics alike.

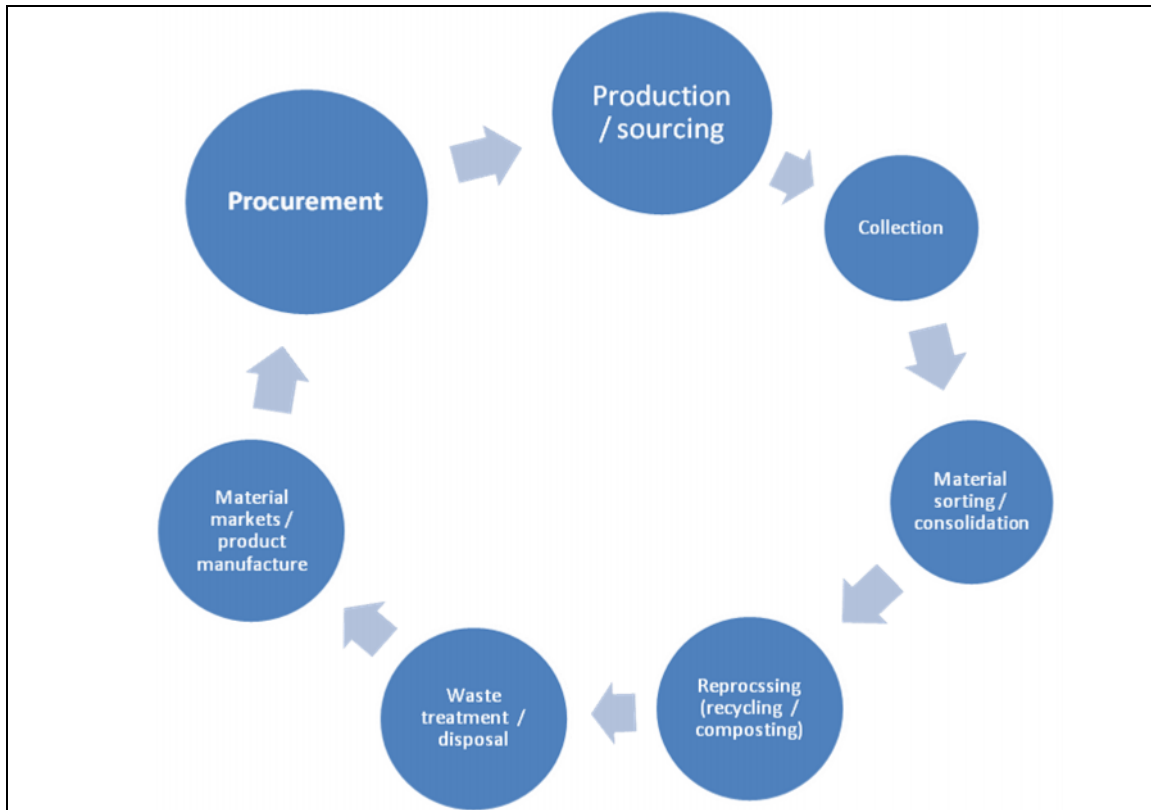
7.11. Sustainable Procurement (Green Procurement)

Nature of the problem

Sustainable Procurement, more accurately in the context of the WasteKIT project, Green Procurement is a vital consideration in regional waste management practices. There is now a wide variety of recycled materials and environmentally friendly products which are available in the common marketplace. These products are now competing at realistic, affordable prices whilst being made to a high standard.

Whilst acknowledging this may fall outside of the WasteKIT waste management innovation / RTD remit, Green Procurement is still part of the waste management sector as shown in Figure 7.4. The procurement of recycled content products creates the demand factor that the rest of the supply chain can supply.

Figure 7.4: Regional waste management – headline areas of consideration



Regional performance and opportunities

In reference to the Amsterdam Regional Report: “Further embedding is necessary to embed the concept of cradle to cradle thinking in product design) that will minimize waste streams and stimulate recycling and re-use of materials.”

With regards to design, the Yorkshire and Humber region has recently seen new innovative micro companies develop to respond to associated products for the waste sector such as security for the reprocessing/recycling bins and other containers. Another start-up is focusing on sustainable construction products and product design using waste materials to stimulate the requirement for waste segregation and utilisation of waste plastics.

CO2Sense is offering Yorkshire and Humber businesses the chance to trial environmental products and services that can substantially reduce environmental impacts and costs. Through the Targeted Market Development (TMD) project, businesses can trial green products and services that have been manufactured by local Yorkshire businesses. The incentive for regional business to take part (buy a product or service) in this project is a reduction in costs and environmental impacts and help to create a market for local green products and services. CO2Sense is working with businesses to:

1. Monitor how well the products and services work.
2. Help businesses put together the case for roll-out of products or services across your business.
3. Help businesses understand finance opportunities to reduce your environmental impacts.

The main conditions of trials are:

1. If the trials are successful - prove to be cost effective, and provides environmental benefits – a business will make a commitment to buy the product or service in the future.
2. Allow CO2Sense access to all monitoring data. This will help demonstrate the benefits to other businesses.

CO2Sense Yorkshire is also developing a ‘Green Product & Services Guide’ to promote and increase spending on green products and services in the region. The Green Product & Services Guide will be a comprehensive database of regional green products, specifically:

Table 7-3: Green Product & Services Guide

Products	Services
<ul style="list-style-type: none"> • <u>recycled content products</u>; • energy saving and low carbon technology products; • water saving products; • <u>reused and remanufactured products</u>; • <u>waste reducing products</u>; • renewable energy products; 	<ul style="list-style-type: none"> • energy efficiency/ management; • environmental consulting; • green energy suppliers; • green transport; • installing, managing and maintaining renewable and low carbon equipment; • <u>recycling and re-use services</u> • <u>waste management</u>, and; • water efficiency/management.

It will be a central source where buyers can search for green products & services that can help them to save money, become more resource efficient and reduce their carbon footprint. The main target audience will be regional businesses, but it will be suitable for both consumer and trade markets to use. It is an opportunity for businesses of all sizes to showcase their products free of charge and will make finding local green suppliers quick and easy for consumers and businesses.

Call for action

A WP4 action group should consider:

- Whether sustainable procurement fits under the WasteKIT remit. There will be re-processors and potentially new technology (in the form of re-manufacturing technology) evolving as a result of increased recycled material entering the market.
- Educational opportunities to inform public, private and third sector organizations of the benefits of buying “Green” products and services leading in turn to a development in the market potential. Promotion of Key Performance Indicators to organisations, to illustrate the environmental benefits of buying recycled product is required. The use of recycled paper, for example, in business is not yet main stream across the board and more advocacy work needs to be done to promote the benefits of this. An increased focus is

required on projects that can deliver the most opportunities for recycled content procurement, such as large scale, high value construction projects. This opportunity spans all scales and three sections of the waste hierarchy – Treatment/Recovery, Recycling/Composting and Reuse.

- Roll out of projects similar to those that CO2Sense Yorkshire is working / planning to work on. Are there similar support networks / agencies / organisations across Europe, nationally or regionally that can provide the service and contact point for businesses.

8. Recommendations for work package 4 (WP4) Joint Actions Plans (JAP's)

All participating regions have common barriers to overcome. Through the reflection of WP2 documents alone it has not been possible to identify and collate all barriers to innovation and RTD and all solutions to all of the problems experienced by involved regions. As the WasteKIT project evolves it will unearth more barriers and solutions in each region's waste management sector.

This WP3 report aims to provide the participating WasteKIT regions a context as to how other regions are performing within specific areas of their waste management sector. This is with a view to highlighting “champions” to share their individual expertise.

This report:

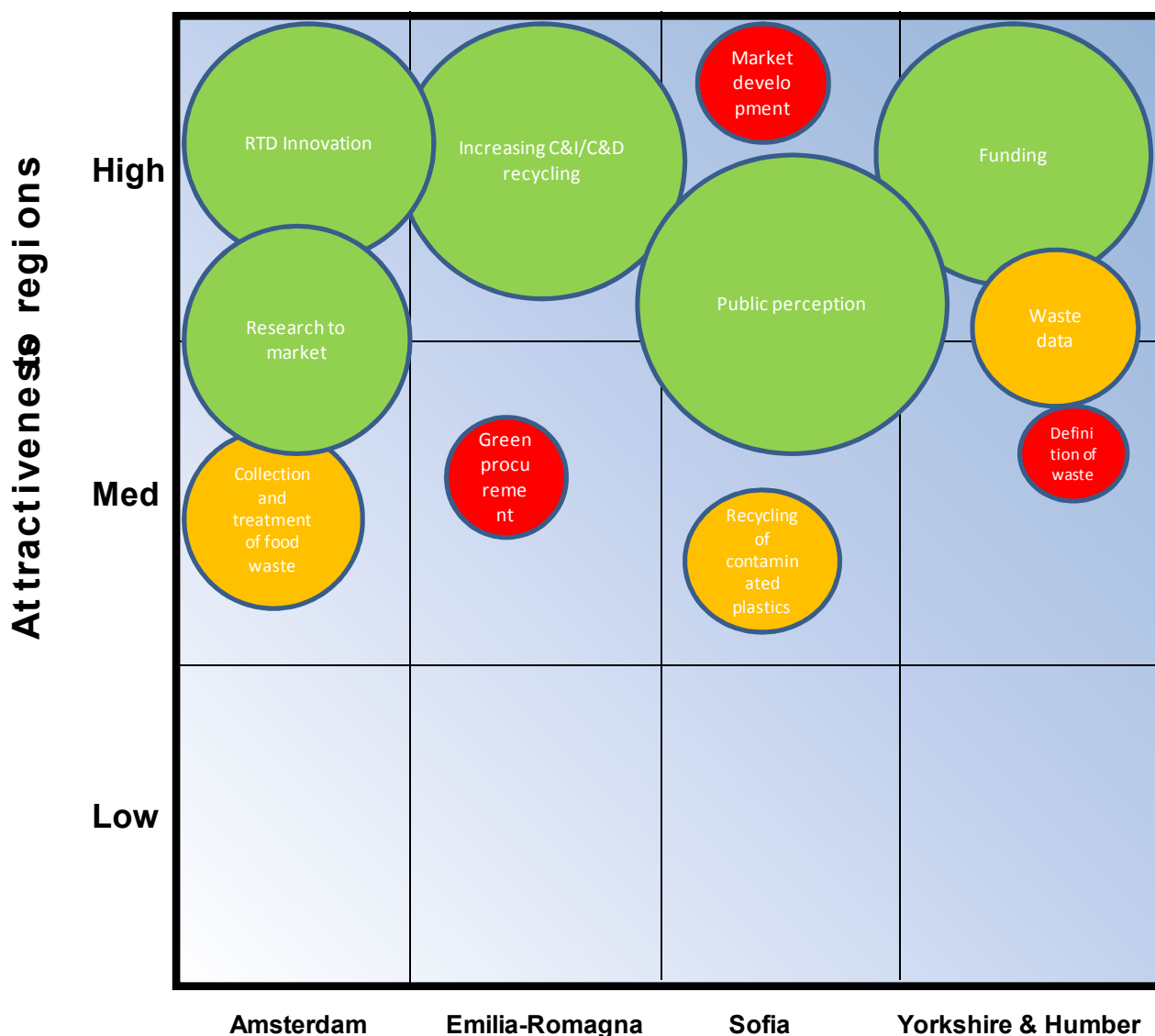
- Captures some regional barriers to RTD that are alluded to in the WP2 Reports.
- Captures some regional and interregional barriers to innovation that may be solved by knowledge/skill transfer, mentoring programmes and pilot schemes.
- Suggests internal (regional) solutions through the sharing of best practice.
- Suggests further research opportunities to identify a new solution and/or a more effective way of working on a local, regional, national and European scale.
- Indicates interregional opportunities to overcome these barriers. Examples include: knowledge transfer opportunities and mentoring schemes, site visits to waste management facilities and coaching programmes to increase skill sets to instigate change.

The Amsterdam City Region, Sofia, Emilia-Romagna and Yorkshire and the Humber all possess strengths in certain parts of the waste sector / hierarchy and are ideally placed to offer something tangible to the WasteKIT project. The Netherlands are recognised throughout Europe as an “advanced” country in terms of its waste management practice. As such, the Amsterdam City region boasts the best overall performance, making the region ideally placed to tutor on most aspects of sustainable waste management practice. The Emilia-Romagna Region has a heavy and concentrated cluster of facilities and infrastructure processing bio-waste and agri-wastes. The Yorkshire and Humber region was a well established waste materials market and has done for some time. The region provides a high level of business support. In contrast, the Sofia region is uniquely placed to learn from the other regions. It has the most potential to innovate through business practice and RTD. Sofia also has the greatest potential to attract inward investment as feedstock levels for waste processing sites appears guaranteed and secure; a pre-requisite for investment security.

The region that will benefit the most from a synergy potential (or topic) is ideally placed to lead that topic. This guarantees information packs, seminars, learning or coaching sessions and site visits are developed and

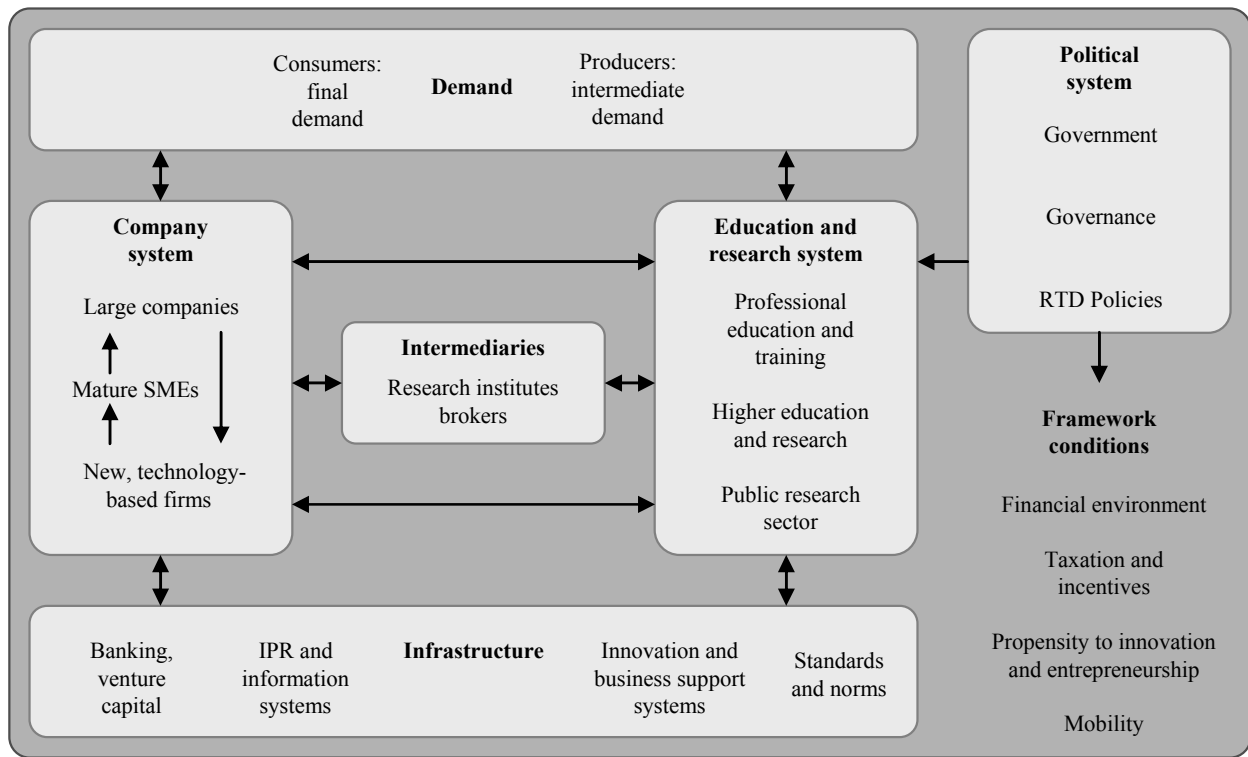
implemented in a simple and structured way making them transferable to those countries across Europe in a similar position. The synergy potentials have been plotted in line with the importance for each region suggesting a WP4 action group (regional) leader. Topics are positioned within the grid ranking their importance to the region that stands to benefit the most from leading the action group. The size (and colour) of the synergy potential indicates the value for all regions involved within the WasteKIT project. Green portrays the largest opportunity for interregional intervention these areas affect all involved regions; amber shows less opportunity for interregional intervention only affecting some regions; and red indicates regional specific opportunities. Green (sustainable) procurement needs further clarification on whether this is outside the remit of the WasteKIT project.

Figure 8-1: A diagram illustrating the importance of each synergy potential for each participating region



As WasteKIT moves into WP4, WP4 leaders should consider frameworks to position the synergy potentials (topics) in order to better understand the magnitude of each topic. The WP3 report will assist in this thought process covering the macro (European, National) / meso (Regional) / micro (local, specific business level) scales of the topics. An example framework can be seen below in order to position the elements of WP3-work and WP4-work.

Figure 8-2: dynamic (regional) innovation system



Source: Technopolis - S. Kuhlman¹¹

WP4 will see the creation of action groups to research in more detail the opportunities identified in this report. These expert groups may be partly formed with partners outside of the WasteKIT consortium who have a vested interest in the synergy potential topics and recommendations. The expert groups will feed into the formation of Joint Action Plans at a regional and interregional scale.

¹¹ Minez (2006), *Science, Technology and Innovation in the Netherlands Policies: facts and figures 2006*, Dutch Ministry of Economic Affairs.

9. D3.1 Work Package 3 Workshop

On the 21st October 2010 a meeting, attended by all project partners, was held in Amsterdam. The meeting was focused on WP3 with a view to feed in synergy potentials to kick-start the up and coming WP4 – the creation of Joint Actions Plans. This was a crucial step for the project as the synergy potentials (or topics) are the themes for future consideration throughout the rest of the project.

Chapters one to eight of this report were presented to the consortium for reflection and circulated amongst work package leaders for comment. All elements of WP3 received positive feedback. Two workshops made up integral parts of the WP3 presentation. The two workshops satisfied deliverable D3.1. The purpose of D3.1 was to collectively exchange knowledge possessed by different partners and agree synergy potentials.

Workshop 1 titled “Are the synergy potentials fit for purpose?” used a round table discussion to extract every partner’s desired output from the project. The facilitator then compared and contrasted outputs against the synergy potentials ensuring every partner could still achieve their desired output from the project before the 31st march 2012 deadline. Figure 9.1 illustrates the results of this process.

Figure 9.1: Project partners’ desired outputs

Region	Partner organisation	Comments	Relevant synergy potential
Amsterdam	Amsterdam Innovation Motor (AIM)	Personal development and opportunity to raise profile working on European Commission projects. Desire to explore opportunities for Amsterdam to improve on their sustainable waste management practices and to explore markets across Europe. Ilse would like to see WasteKIT stimulating the birth of follow-on EC funded research projects.	<ul style="list-style-type: none"> • Funding for sustainable waste management & technology. • Recycling of commercial and Industrial, and construction and demolition waste. • Options for contaminated plastics. • Technology innovation related to waste processing.
	Gemeente Amsterdam Afval Energie Bedrijf (AEB)	AEB were not present at the time of the first Workshop as the WasteKIT project contact was changing and joining the group in the afternoon. Previous discussions have	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Exploring the options for the recycling of

		<p>inferred AEB are interested in exploring opportunities for Amsterdam to improve on their sustainable waste management practices and to explore markets across Europe. Harmen is also interested in knowledge transfer and education, Suggesting a WasteKIT learning academy as part of WP6.</p>	<p>contaminated plastics.</p> <ul style="list-style-type: none"> • Enhanced source separated collection and treatment of food waste. • Market development for recycled / recovered materials. • Improvement of public perception of waste • Understanding the definition of waste – is it a resource, fuel or waste? • Technology innovation related to waste processing. • Knowledge transfer from research to market.
	Qeam (Qeam)	<p>Erik has previously worked on projects involving knowledge transfer. Erik has developed an internet platform called Energy2B. Energy2B is an innovation stimulating initiative that targets university students and encourages them to turn energy innovation ideas into reality via new business start-ups. (http://www.energy2b.eu/)</p>	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Improvement of public perception of waste. • Understanding the definition of waste. • Technology innovation related to waste processing. • Knowledge transfer from research to market.
	Delft University of Technology (TUD)	<p>Working on solid waste separation technology, specifically bottom ash and separating minerals and materials. Interested in areas where they have previously worked include C&D waste, industrial design and the associated educational network they have developed.</p>	<ul style="list-style-type: none"> • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Improvement of public perception of waste. • Understanding the definition of waste. • Technology innovation related to waste processing. • Collection of waste data. • Knowledge transfer from research to market.
	Van Gansewinkel (AVRVG)	<p>Interested in Business opportunities. Desire to promote waste as a resource.</p>	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Exploring the options for the recycling of contaminated plastics. • Enhanced source separated collection and treatment of food waste.

			<ul style="list-style-type: none"> • Market development for recycled / recovered materials. • Improvement of public perception of waste • Understanding the definition of waste – is it a resource, fuel or waste? • Technology innovation related to waste processing. • Knowledge transfer from research to market.
Emilia Romagna	Aster (Aster)	<p>Are collectively interested in public perception. Analysing how to overcome the “not in my back yard” NIMBY attitude. In Italy (it was explained) there is a public perception that incineration or AD plants would affect the very high food quality production of the area.</p> <p>Feedback at the Workshop from Aster indicated the topic of bioplastics and its use in Sofia was of interest to the Emilia-Romagna region due to the massive tonnages of food production and associated wastes.</p> <p>Are interested in knowledge transfer and the definition of waste synergy potential as, interestingly, food industry waste is defined as a by-product rather than a “waste”.</p> <p>Technology innovation related to waste processing is also of interest. Daniela explained there is interest in filtration systems in biogas production.</p> <p>The region also has waste tracking systems which relates to the waste data synergy potential.</p>	<ul style="list-style-type: none"> • Exploring the options for the recycling of contaminated plastics. • Enhanced source separated collection and treatment of food waste. • Market development for recycled / recovered materials. • Improvement of public perception of waste. • Understanding the definition of waste. • Technology innovation related to waste processing. • Collection of waste data. • Knowledge transfer from research to market.
	Research Centre on Animal Production (CRPA)		
	Conserve Italia Group (ConIT)		
	Emilia-Romagna Region (RER)		
Sofia	Sofia Municipality	Is interested in incineration technology options, district	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology

	(Sofia)	heating and options for bottom/fly ash. Also interested in developing and understanding waste markets, options for packaging – product design etc and sustainable procurement. Sofia municipality recognise they can benefit knowledge and technology transfer and funding opportunities.	<p>development.</p> <ul style="list-style-type: none"> • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Exploring the options for the recycling of contaminated plastics. • Market development for recycled / recovered materials. • Improvement of public perception of waste. • Technology innovation related to waste processing. • Collection of waste data. • Knowledge transfer from research to market. • Sustainable procurement (green procurement).
	Balkan Science & Education Centre for Ecology & Environment Protection (BSECEE)	Works on Environmental Impact Assessment of waste management facilities. Relating to this is interested in thermal power plants in Bulgaria. Knowledge transfer is also of interest to the BSECEE.	<ul style="list-style-type: none"> • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Exploring the options for the recycling of contaminated plastics. • Technology innovation related to waste processing. • Knowledge transfer from research to market.
	Bulgarian Academy of Sciences (BAS)	The Bulgarian Academy of Sciences is interested in waste to product, and the technology required making this transition.	<ul style="list-style-type: none"> • Market development for recycled / recovered materials. • Technology innovation related to waste processing. • Knowledge transfer from research to market.
	Bulgarian Chamber of Commerce & Industry (BCCI)	The Bulgarian Chamber of Commerce works with Businesses. As such, synergy potentials 1, 6, 7 and 9 are of great interest.	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Improvement of public perception of waste. • Understanding the definition of waste. • Collection of waste data.
	Denkstatt Bulgaria BOO (Denkstatt)	Looks at waste management options in Bulgaria and wants to increase understanding and build contacts. Has worked on the C&D waste strategy for Bulgaria.	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Exploring the options for the recycling of

			<p>contaminated plastics.</p> <ul style="list-style-type: none"> • Market development for recycled / recovered materials. • Improvement of public perception of waste. • Understanding the definition of waste. • Technology innovation related to waste processing. • Collection of waste data. • Knowledge transfer from research to market.
Yorkshire and Humber	Yorkshire Forward (Yorkshire)	Interested in forming European partnerships and building networks to improve regional waste management practices. Funding opportunities and spin-off projects.	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Increasing the levels of recycling of commercial and industrial, and construction and demolition waste. • Exploring the options for the recycling of contaminated plastics. • Enhanced source separated collection and treatment of food waste. • Improvement of public perception of waste • Understanding the definition of waste – is it a resource, fuel or waste? (In particular the associated implications for planning and permitting). • Technology innovation related to waste processing. • Collection of waste data (arising / feedstock vs. regional capacity. Related implications for importing waste). • Knowledge transfer from research to market.
	University of Sheffield (USFD)	Was unable to attend the Workshops.	N/A
	University of Leeds (LUD)	Wanted to explore funding for RTD projects. Would like to use WasteKIT as a platform to successfully bid into a spin-off EC project. Paul's main interests lie in synergy potential & - technology innovation related to waste processing (in particular	<ul style="list-style-type: none"> • Identification of funding for sustainable waste management and technology development. • Exploring the options for the recycling of contaminated plastics. • Technology innovation related to waste processing (pyrolysis, gasification / incineration efficiencies). • Knowledge transfer from research to

		thermal treatment).	market.
	Yorwaste (Yorwaste)	Was unable to attend the Workshops.	N/A
	ITI Energy Ltd (ITIE)	Wants to see the birth of an education programme better explaining thermal treatment of waste. This is specifically angled at the understanding associated with the definition of waste. Wants to see an increase in public understanding. Currently works on another successful FP7 project. Originally joined to gain an understanding of European waste markets.	<ul style="list-style-type: none"> • Improvement of public perception of waste. • Understanding the definition of waste – is it a resource, fuel or waste? • Technology innovation related to waste processing. • Knowledge transfer from research to market.

Workshop 2 titled “Next steps for your involvement: synergy potential prioritisation” prioritised and condensed the synergy potentials. The consortium split into two groups and discussed for 30 minutes the presented 11 themes separately, feeding these back to a reconvened consortium discussion.

The synergy potentials were integrated and ranked in importance as follows:

Table 9-3: Streamlined synergy potentials

Original 11 identified synergy potentials	Agreed WP3 synergy potentials
Technology innovation related to waste processing (pyrolysis, gasification / incineration efficiencies)	1. Technology waste to energy
Collection of waste data	
Knowledge transfer from research to market	
Collection and treatment of food waste	
Recycling of commercial and industrial, and construction and demolition waste	3. Options for plastics
Options for contaminated plastics	
Funding for sustainable waste management & technology	4. Funding & spin-off projects
Market development for recycled / recovered materials	

Sustainable procurement (green procurement)	
Improvement of public perception of waste increasing levels of re-use, recycling and prevention	5. Public perception & understanding of waste
Understanding the definition of waste – is it a resource, fuel or waste?	

The final agreed synergy potentials were then allocated to at least one region to mentor or provide a consultation service to sound-proof ideas and actions on that synergy topic. For example, the Emilia-Romagna region volunteered for the synergy potential “options for plastics”. Providing consultation in this way increases communication in WP4 and ensures knowledge transfer between the differing regions. The regions allocated to synergy potentials are listed below:

- Technology: waste to energy – Sofia and Yorkshire and Humber
- Knowledge transfer (including data and education) – Amsterdam and Sofia
- Options for Plastics – Emilia-Romagna
- Funding & spin-off projects (including procurement) – Amsterdam and Yorkshire and Humber
- Public perception & understanding (of waste and associated technology) – all regions.

The emphasis has been put on the regional partners to elaborate further and develop a set of targeted actions for their region. This instils a sense of ownership and maintains an aspect of what is realistically achievable by the partners committing to carry out the agreed actions in each region. Each region may decide to carry out further scoping research to identify their actions under the five agreed synergy topics for their regional action plan. This will be coordinated by the WP coordinator.

10. Appendices

Appendix 1: Meta-table

See attached file 1(Excel file).

Appendix 2: Main waste management drivers from policies and directives

Region	National and regional legislations and policies	EU Directive
Emilia-Romagna (IT)	<p>Legislative Decree 152/2006; In particular, two instruments are already available at national level to help the directive application:</p> <p>Garwer – Italian waste exchange – The Italian B2B stock exchange for waste recycling. The place where waste producers can be matched with waste recyclers.</p> <p>Sistri – Register for the electronic tracking of hazardous waste – SISTRI, an innovative procedure based on computer technology, is an electronic system for checking the traceability of waste (hazardous and non hazardous waste).</p>	
Yorkshire and Humber (UK)	<p>The Waste Strategy for England (2007) sets the national policy context for waste management including revised targets for household waste recycling, household residual waste, municipal waste recovery and commercial and industrial waste disposal. The Yorkshire and Humber Regional Waste Strategy (2003) has a priority to improve the long term environment of the region through the reduction of the amount of waste produced and improving levels of recycling across the region.</p>	<p>2008/98/EC: establishes a legal framework for the treatment of waste; including definition of waste, prevention of waste, recovery, reuse and recycling, disposal, responsibility for waste management, control of hazardous waste, permits and registrations, plans and programmes and inspections and records etc.</p>
Sofia (BG)	<p><i>Long-term strategy on MSW management of Sofia Municipality, March 2007:</i> To assist Sofia Municipality in determination of steps necessary for long-term solving of the MSW problem.</p> <p><i>Revised program on waste management of Sofia Municipality, 2009 – 2011:</i> Includes the main measures and activities that should be performed in the period 2009-2011, according to the program.</p> <p><i>Program for waste management on the territory of Sofia Municipality (expanded and revised edition), 2006 – 2010:</i> The main goals of the program are the activities of collection, transport and treatment of the MSW, packaging wastes, demolition, health-care, industrial and dangerous wastes, carcasses and slaughterhouse wastes, green wastes, sludge WWTP; the control of these activities and to propose waste management measures for the period of the program.</p>	
Amsterdam (NL)	<p>In 2003, the so-called National Waste Management Plan (Landelijk afvalbeheerplan; LAP) was activated. In a recent update (2010), the plan - called LAP2 - broadened its scope to (policies focusing on) entire materials chains. The LAP consists of a policy framework, sector plans and capacity plans.</p>	

Appendix 3: Reducing the amount of waste disposed at landfill

Region	Targets	Performances	Outcome
Emilia-Romagna (IT)	N/A	N/A	N/A
Yorkshire and Humber (UK)	Landfill Allowance Trading Scheme: by 2013 to reduce the amount of BMW going to landfill to 50% of that produced in 1995; by 2020 to reduce the amount of BMW going to landfill to 35% of that produced in 1995.	Landfill Tax: the UK Landfill Tax was introduced in 1996 and was the UK's first environmental tax. Landfill tax is seen as a key mechanism in enabling the UK to meet its targets set out in the Landfill Directive for the landfilling of biodegradable waste. Landfill Tax duty for active waste would rise by £8 a tonne on April 1 each year from 2011 to 2013. Failure to achieve these targets will result in £150 fines for each tonne of waste landfilled over the permissible levels, and a share of the national daily fine levied by the European Union if the national target is not met.	Through increasing the cost of landfill, other advanced waste treatment technologies with higher gate fees are made to become more financially attractive. More bio-degradable wastes are expected to be diverted from landfill.
Sofia (BG)	The region is targeting to reduce by about 52% the total landfilled waste in comparison to the 2008 quantities of 425,000 t/a	Disposal only of pre-treated and stabilized waste at the landfill; Introducing composting and MBT plants in order to divert waste from landfill.	Wastes disposal by landfill are expected to be reduced.
Amsterdam (NL)	Reduce land filling of combustible residues from 1,7 megatons (2007) to zero megatons (2012)	National Waste Management Plan, LAP2. Combustible residue will be diverted to be incinerated.	Waste landfill will be further reduced.

Appendix 4: Waste prevention and recycling activity

Region	Targets	Performances	Outcome
Emilia-Romagna (IT)	Legislative Decree 36/2003 set up the targets for the reduction of the disposal of bio-degradable waste.	Italian law set up CONAI, the national packaging consortium, with obligation of adhesion on the part of all packaging Producers and Users. The implementation of green waste collection in 310 municipalities out of 341, mainly through the appropriately equipped “ecological collection points”, the collection of organic domestic waste in 204 municipalities out of 341 through a “door-to-door” collection system.	875,202 tonnes waste were recycled in 2005. 75% of total bio-degradable wastes were collected in the region in 2009.
Yorkshire and Humber (UK)	Preliminary recycling of glass, metals, paper, cardboard, and plastics up to 48.5% by 2013.	Producer Responsibility Obligations (Packaging Waste) Regulations 2007 SI 871: Requires producers to recover and recycle packaging waste to achieve EU targets; Guidance on Producer Responsibility Obligations (Packaging Waste) Regulations 2007. Calderdale, Hull and Leeds have introduced / are introducing kerbside collections of food waste; Trials of domestic food waste segregation were carried out in Stockport, significant waste minimisation was achieved as a result of householders having to handle their food waste	MSW waste recycling increases from 10 to 33 % in 2009 compared with 2000.
Sofia (BG)		Increase public awareness to the waste prevention and recycling. Packaging Recovery Organisations (PROs) were established and delegated the responsibility to collect packaging waste.	30.5% MSW waste recycling rate was obtained in 2009, higher than the national target (17%)
Amsterdam (NL)	Increase recovery of total waste from 83% in 2006 to 85% in 2015. Increase the recovery of total household waste 51% in 2006 to 60% in 2015. Increase the recovery of the HDO waste (waste from the sectors trade, services and government) 46% in 2006 to 60% in 2015.	Instruments to enhance public participation. ‘Stimulation Programme on Separation & Prevention of Household Waste’ (A00 2001b) includes a large number of projects for encouraging waste segregation and waste prevention. Six so-called waste points have opened in recent years: open six days a week and are used by local residents (free of charge) and businesses to dispose of all kinds of waste.	Comparatively high recycling rate of waste

Appendix 5: Innovation policy and activity

Region	Policy innovation	Innovative research centres and universities
Emilia-Romagna (IT)	Regional Programme for Industrial Research Innovation and Technology Transfer (PRRIITT): an implementing programme of the regional policy for R&D and innovation focused on the promotion of industrial research, technological development and the transfer of new technologies from knowledge production centres to the regional industrial system. The regional policy for research and innovation aims at the promotion of closer interactions between businesses, research institutes, the university and the centres for technology transfer operating in the region.	The region counts six universities. The region hosts national research centres such as National Research Council (CNR), National Agency for New Technologies (ENEA). 7,800 researchers are employed in the region.
Yorkshire and Humber (UK)	Knowledge Transfer Partnerships (KTP) help businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills and are funded by the Technology Strategy Board (TSB) with 17 other funding organizations; Landfill Allowance Trading Scheme.	The region has 8 large universities and a number of recognised independent research centres. Yorkshire Forward has set up the Environmental Technologies CIC (Centre of Industrial Collaboration) to foster partnership working between industry and the region's universities.
Sofia (BG)	N/A	N/A
Amsterdam (NL)	So-called "national innovation programmes" are strategic innovation programs based on partnerships of companies and research institutes in areas where Netherlands in international perspective excels or wants to excel.	The major of the Dutch knowledge institutions, research institutions and educational institutions are located in the Randstad region. Most important universities in the Randstad region are: Free University Amsterdam, University of Amsterdam, Delft University of Technology, University of Leiden, Erasmus University Rotterdam, and Utrecht University.

Appendix 6: Synergy tables according to the comments

See attached file 2 (Word file).