



LONDON'S WASTED RESOURCE

THE MAYOR'S MUNICIPAL WASTE MANAGEMENT STRATEGY

NOVEMBER 2011

MAYOR OF LONDON

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CONTRIBUTORS CREDITS

GLA Group:

Alex Nickson, Ana Costea, Andrew Richmond, Bert Glover, Daniel Evanson, Doug Simpson, Emma Lewis, Felicity Morris, Gill Lawton, Helen Woolston, Ian Klesmer, Isabel Dedring, Jo Dack, John Jackson, Jonathan Pauling, Kevin Reid, Kulveer Ranger, Larissa Bulla, Leah Davis, Lisa Walduck, Louise Clancy, Michael Backhurst, Michael Doust, Mike Lancaster, Patrick Feehily, Pete Daw, Peter Heath, Peter North, Richard Linton, Robert Hall, Ross Hudson, Simon Cousins, Simon Wyke, Sue Johnson, Sumeet Manchanda, Stephen Tate and Tom Lancaster.

Government Departments:

All London boroughs and waste disposal authorities; Defra and WRAP – Andy Gregory, Keith James, Michael Sigsworth, Neil Hughes, Paula Cani, and the Defra Waste Policy Review Team, Environment Agency - Iain Regan, Keith Bates, Terry Coleman; London Councils – Alice Ellison, Michael Ojo and members of the Officer Advisory Panel on Waste.

Waste Authority case studies and pictures:

Ander Zabala and Mark Griffin (Hackney), Andrew Ford, Matthew Homer, and Jessica Hodge (Islington), Andrew Lappage and Barbara Herridge (NLWA), Antony Greener (Nottingham City Council), Bob Fiddik and David Gee (Southwark), Bruno Stead and Georgio Tafla (Kensington and Chelsea), Claire Fairclough (Keep Britain Tidy), Ellen Struthers and Mandy Scharer (Tower Hamlets), Helen Barclay and Stephen Didsbury (Bexley), Kevin Crook (Lambeth), Malcolm Kendal (Croydon), Michael Singham (Wandsworth), and Phil Robson (Westminster).

Other contributing organisations:

ART, British Food Drinks Association, Charity Retail Association, Coca Cola Great Britain & Coca Cola Enterprises Ltd., Environmental Services Association, Food and Drink Federation, IEC London Expert Panel on Waste, Inmidtown, Insinkerator, Keep Britain Tidy, London Assembly, London Community Resource Network, London Councils Transport and Environment Committee, London First, London Remade, London Reuse Limited, London Sustainability Exchange, London Waste and Recycling Board, May Gurney Environmental Services, Members of the EPS Steering Group, Mike Tobin Ltd, Powerday, Real Nappies for London, Six Smith Business Consultancy, Sterecycle, Team London Bridge, Veolia, Viridor, Whitehouse Consulting, WRAP.

Consultants, copy editors and designers:

Eunomia Research and Consulting, Helen Johnstone, John Wilson, Ove ARUP and Partners Ltd., Levett-Therivel Consultants, SKM Enviro, SLR Consulting.

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FOREWORD

As the old saying goes, where there is muck there is brass and there is a massive economic opportunity inherent in London's waste which we must harvest to its full potential.

In addition, there are pressing environmental imperatives driving the need for change to current practices. We must stop producing mountains of waste in the first place, discarding items that can be re-used again or recycled and move away from a reliance on landfill and incineration.

My ambition is to put 'the village' back into the city. What I mean by this is that we can improve the quality of life for Londoners by ensuring that we focus our efforts on delivering a cleaner and greener city, with stronger and safer communities through our work to make London more sustainable and prosperous for decades more to come.

My vision laid out here is to create the fertile conditions that encourage the new infrastructure and fresh approaches required to turn waste into a lucrative commodity and improve Londoners' quality of life.

This is already generating a raft of new job opportunities and enterprises in response to these changing needs.

For example, a 'greener' generation of innovative technologies is making it possible to fuel homes, businesses and vehicles from material that in the past, we have just chucked away. Significantly increasing these new ways to treat waste is an investment opportunity worth hundreds of millions to our economy, which will dramatically reduce the impact of rubbish

disposal on the environment. I am taking steps to see that the facilities we need get built and we have jump started this market through the innovative London Green Fund.

Furthermore, whilst recycling levels in the capital are steadily improving, with some boroughs achieving commendable results, we need to do more. I want recycling to rapidly become much more a part of everyday life whether at home, on the move or in the office and regardless of where people live. This is why I am working with the voluntary and community sector and borough councils to drive down waste, increase reuse and boost recycling, all of which will help to achieve my vision of making London a zero waste city.

London's waste management is complex, involving many organisations. It is the Mayor's role to outline, facilitate and accelerate positive change. This strategy seeks to establish London as a world class manager of its municipal waste. I thank everyone who has helped produce this document to the benefit of Londoners' quality of life.



A handwritten signature in black ink, appearing to read 'Boris Johnson'.

Boris Johnson
Mayor of London



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PREFACE

A strategic framework for enhancing quality of life in London and protecting the environment

The Municipal Waste Management Strategy is part of a series of strategies that together set out actions and policies to make London the best big city in the world. How? By improving the quality of life of Londoners and making the city more sustainable.

The future of the planet lies in cities. In the 1950s just 29 per cent of people lived in towns and cities. By the close of the 20th century that figure had increased to 47 per cent, and by 2050 it will hit 70 per cent. There are clearly benefits to city living. People live longer, have access to better education, extensive public transport, greater healthcare provision, more social, cultural and economic opportunities and a lower carbon footprint. The Mayor is working to ensure that London not only retains its world city status but remains among the best places on the planet to live, whatever your age or background. He also wants to ensure that the city is liveable and its development is sustainable for future generations.

The Mayor's ambition is to put 'the village' back into the city. What this means is improving the quality of life for Londoners by ensuring that we focus our efforts on delivering a cleaner and greener city with stronger and safer communities through our work to make London more sustainable.

The Mayor's environment strategies and programmes are built on three policy pillars. These are retrofitting London, greening London, and cleaner air for London. These pillars aim to improve the quality of life for Londoners and visitors, and to make the capital more attractive. The Mayor's programmes that underpin these pillars are delivering targeted improvements and benefits that Londoners can see and experience around them. They also aim to make public services more efficient and less of a burden on tax payers, whilst delivering wider environmental benefits such as conserving water, saving energy or reducing waste.

The three 'pillars' and example programmes:

Retrofitting London

Retrofitting London's existing buildings is not only crucial to tackling London's CO₂ emissions, it also reduces energy and water use, delivers new jobs and skills, as well as saving London businesses and homes money on energy bills. Almost 80 per cent of the 14,000 low carbon jobs that could be created per year from delivering the Mayor's CO₂ target and two thirds of the £721 million of annual low carbon economic activity would come from retrofitting.

Our homes and workplaces are responsible for nearly 80 per cent of the city's emissions. Fundamentally 80 per cent of these buildings will still be in use by 2050. The RE:NEW programme which installs a range of energy and water efficiency measures in homes,

enables Londoners to save money on their energy bills while making their homes more energy efficient. The RE:NEW demonstrations in 2010, have shown that households could save over £150 annually through retrofitting actions.

Greening London

The Victorians bestowed on us a city softened by trees and green spaces. Greening London builds on this legacy and aims to improve the look and feel of our city, making it more attractive whilst reducing the impact of noise and air pollution. Greening London also makes the city more resilient to flooding and extreme weather events, and can contribute to a healthy mind and body. The Mayor through his RE:LEAF programme and the London Green Grid has an ambition to increase tree cover by five per cent by 2025, therefore achieving one tree for every Londoner and creating a better network of interlinked, multi-functional and high quality open and green spaces.

Cleaner air for London

Air pollution is a serious health issue and the Mayor is determined to reduce its impact. Actions being taken to improve air quality include introducing the first ever age limit for black cabs, tougher standards for the Low Emission Zone, new cleaner hybrid and hydrogen buses and fitting older buses with equipment including filters to curb pollution. The new bus for London, which will be launched in 2012, will use the latest green technology making it 40 per cent more efficient than a conventional double decker. The Mayor is working to introduce more electric vehicles onto London's streets. In May this year, he launched Source London, the UK's first citywide electric vehicle charging network and membership scheme and we are also now investing record amounts to deliver a cycling revolution in London. Additional steps

are being taken to tackle pollution levels at some of the busiest roads in central London. This includes utilising dust suppressant technology that prevents PM10 from re-circulating, installing green infrastructure to trap pollutants and a no engine idling campaign to reduce engines running unnecessarily when stationary. Eco-marshalls are also being deployed to help both monitor and reduce the impact of taxis on air quality.

London continues to attract people and businesses and therefore continues to grow. The London Plan forecasts the city's population could increase from 7.6 to 8.8 million by 2031. These strategies show that making London a sustainable city and protecting the environment does not mean we all have to be eco-warriors or make sacrifices to our standard of living. We can work to lessen our impact on the city while at the same time improving the environment and our quality of life.

In a post-Olympic London, we can also grasp the opportunity to make the capital a digital leader, an intelligent city. By harnessing the power of data, we can run our city more efficiently, understand environmental trade-offs, and communicate better with Londoners, enabling them to make better informed and sustainable choices in how they live and work. This is already happening through the explosion of social media and digital applications that encourage behaviour change based on the choices an individual makes. Data visualisation is also allowing us to understand complex data sets, telling us the results of the millions of decisions we make, on us, on our neighbourhoods, on our city and beyond.

Transitioning our city to a sustainable low carbon economy will also bring economic opportunities for London in terms of jobs and investment. Despite the economic downturn, the value of London's low carbon and environment sector is now worth over £23 billion, growing by over four per cent a year. As London and the rest of the world continue to reduce their greenhouse gas emissions over the coming decades, the economic opportunities from that activity will be huge. London must make sure it grabs this opportunity and continues to be a world leader.

A handwritten signature in black ink, appearing to read 'Kulveer S Ranger'.

Kulveer S Ranger
Mayor's Director
of Environment

EXECUTIVE SUMMARY

The world of waste is changing. The past 20 years has seen the public, private and third sector invest considerable amounts of time, money and effort into changing the way we think about and manage our waste.

Reducing the amount of waste produced and reusing waste that cannot be prevented presents the greatest economic and environmental benefits for London. We cannot continue to manage waste by investing in expensive waste collection and treatment infrastructure without implementing an active strategy of reduction and reuse. The Mayor sets out in this document what actions London's households and businesses can take to reduce waste and also calls on the government and industry to play a role.

Developing a strategy for London's municipal waste

There are a number of key considerations influencing the Mayor's municipal waste management strategy. The overriding one is the need to manage London's municipal waste more effectively and efficiently. The rising cost of landfill, growing concerns around energy security and climate change, the emergence of new commercially available waste management technologies, and changing consumer behaviour have all made a 'business as usual' approach no longer viable.

Climate change is one of the key drivers for London's municipal waste management policy. Sending waste to landfill generates greenhouse gas emissions – particularly biodegradable waste, such as food and green garden waste, which releases methane (a powerful greenhouse gas) as it decomposes. The municipal waste that London sends to landfill generates approximately 460,000 tonnes of greenhouse gas emissions each year, expressed as a carbon dioxide equivalent (CO₂eq) figure¹.

There is a massive opportunity for London to achieve significant greenhouse gas savings by diverting more municipal waste away from landfill. Most of the waste we throw away could be reused, recycled or composted, or used to generate renewable energy, which would achieve significant CO₂eq savings. By first reducing the amount of municipal waste produced and then selecting the optimal means for dealing with the municipal waste sent to landfill, London could save approximately 1.5 million tonnes of CO₂eq emissions each year. This significant saving is a combination of avoiding the emissions that would have occurred from sending waste to landfill plus further savings of approximately one million tonnes achieved by avoiding emissions involved in manufacturing from virgin materials, and in generating energy from coal or gas. This is equivalent to avoiding the emissions associated with powering London's Underground Network each year, plus avoiding emissions from all of London's registered taxis².

Another key driver for changing the way we manage our municipal waste is the increase in costs due to landfill tax. The main effect the landfill tax has had from 2004 to 2011 is to make the cost of recycling (including collection costs) cheaper than landfill – approximately £109 per tonne for recycling compared to £142 per tonne for landfill. As of April 2011 landfill tax stands at £56 per tonne. This will increase by £8 each year until at least 2014, when it will be £80 per tonne. This will put up London's annual bill for sending municipal waste to landfill from about £265 million now to roughly £300 million. Landfill tax has also made the cost of generating energy from waste more comparable to landfill and in some cases more commercially attractive, depending on contractual arrangements.

In addition to the increase in landfill tax, the Department of Environment Food and Rural Affairs (Defra) has revised the definition of municipal waste, which now includes a lot more commercial waste. This brings it into line with other EU countries and ensures that the UK is meeting landfill diversion targets under the European Landfill Directive. Implementing this new measure will put considerable pressure on local authorities, communities and businesses to manage more of their waste better.

The Mayor's vision, objectives and targets for London's municipal waste management

The Mayor's vision for London is that it excels among global cities – expanding opportunities for all its people and enterprises, achieving the highest environmental standards and quality of life and leading the world in its approach to tackling the urban challenges of the 21st century, particularly that of climate change.

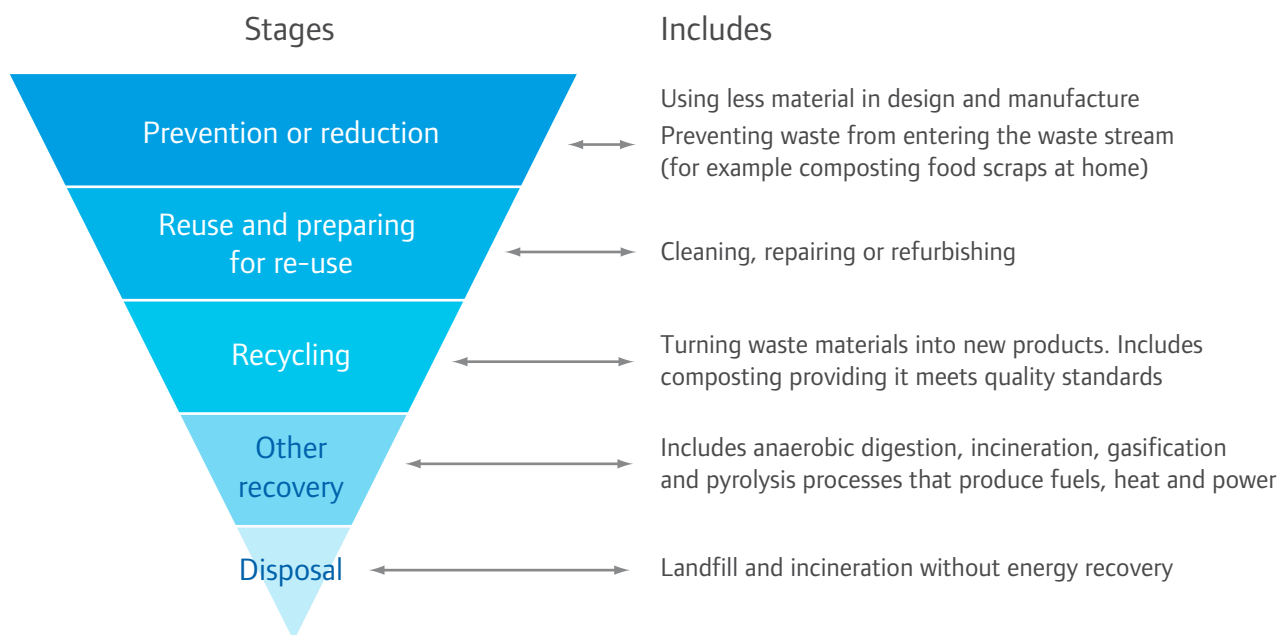
The Mayor wants London to be a city that becomes a world leader in improving the

environment locally and globally, taking the lead in tackling climate change, reducing pollution, developing a low carbon economy and consuming fewer resources and using them more effectively.

To achieve this London needs to become a world leader in waste management, making use of innovative techniques and technologies to minimise the impact of waste on our environment and fully exploit its massive economic value. We need to reduce the amount of municipal waste generated by the capital, to increase recycling and composting performance significantly, and to generate energy from rubbish that cannot be reused or recycled in a way that is no more polluting in carbon terms than the energy source it replaces.

The Mayor's vision is built upon the waste hierarchy, which is applied from the top down. It supports those activities further up the hierarchy that can achieve the greater cost savings and environmental benefits over those activities further down it.

The Waste Hierarchy



Source: Government Review of Waste Policy in England, June 2011.

If there is a tension between implementing the waste hierarchy and achieving the greater climate change mitigation benefits, preference should be given to those options achieving greater climate change mitigation benefits.

The following objectives and targets aim to support the Mayor's vision:

Objectives

- 1 Provide Londoners with the knowledge, infrastructure and incentives to change the way they manage municipal waste: to reduce the amount of waste generated, encourage the reuse of items that are currently thrown away, and to recycle or compost as much material as possible.
- 2 Minimise the impact of municipal waste management on our environment and reduce the carbon footprint of London's municipal waste.
- 3 Unlock the massive economic value of London's municipal waste through increased levels of reuse, recycling, composting and the generation of low carbon energy from waste.
- 4 Manage the bulk of London's municipal waste within London's boundary, through investment in new waste infrastructure.

The Mayor's key targets for the management of London's municipal waste are as follows:

- 1 To achieve zero municipal waste direct to landfill by 2025.
- 2 To reduce the amount of household waste produced from 970kg per household in 2009/10 to 790kg per household by 2031. This is equivalent to a 20 per cent reduction per household.
- 3 To increase London's capacity to reuse or repair municipal waste from approximately 6,000 tonnes a year in 2008 to 20,000 tonnes a year in 2015 and 30,000 tonnes a year in 2031.

- 4 To recycle or compost at least 45 per cent of municipal waste by 2015, 50 per cent by 2020 and 60 per cent by 2031.
- 5 To cut London's greenhouse gas emissions through the management of London's municipal waste, achieving annual greenhouse gas emissions savings of approximately:
 - 545,000 tonnes of CO₂eq in 2015
 - 770,000 tonnes of CO₂eq in 2020
 - One million tonnes of CO₂eq in 2031
- 6 To generate as much energy³ as practicable from London's organic and non-recycled waste in a way that is no more polluting in carbon terms than the energy source it is replacing. This is estimated to be possible for about 40 per cent of London's municipal waste after recycling or composting targets are achieved by 2031.

To achieve the Mayor's objectives and targets, the strategy will focus on the following six policy areas, each containing a number of proposals.

POLICY 1 INFORMING PRODUCERS AND CONSUMERS OF THE VALUE OF REDUCING, REUSING AND RECYCLING MUNICIPAL WASTE

Reducing or preventing the amount of municipal waste we produce is the most cost-effective and environmentally beneficial way to improve London's municipal waste position. With the number of households in London expected to increase by 22 per cent to four million by 2031, the Mayor is committed to ensuring population growth does not result in any more growth in the amount of household waste generated. The Mayor has set a London wide 20 per cent reduction in the amount of waste produced per household in 2008 by 2031. This equates to a reduction of approximately one per cent per year, in line with recent trends. The Mayor welcomes waste authorities setting their own

waste reduction targets to help achieve his overall reduction target for London.

The Mayor believes he can best influence waste reduction and the value of reuse and recycling in London by supporting local and regional education programmes and initiatives. The London Waste and Recycling Board (LWARB), which is chaired by the Mayor (or a representative of the Mayor) has funded Recycle for London from 2008 and 2013 to deliver a London-wide reduction, reuse and recycling behaviour change programme.

The Mayor wants London to lead the way in waste reduction and believes that reducing the amount of unnecessary packaging through better product design and smarter purchasing habits is the key to achieving this. The Mayor will work with London's businesses and manufacturers to deliver this through his Business Waste Strategy.

The Mayor also wants to significantly boost London's reuse performance and has supported the development of a strategic reuse network across London with third sector organisations and public bodies, supporting the repair and reuse of discarded items.

POLICY 2 REDUCING THE CLIMATE CHANGE IMPACT OF LONDON'S MUNICIPAL WASTE MANAGEMENT

The Mayor wants to achieve significant CO₂eq emission savings from the management of all London's municipal waste, particularly from waste that currently goes to landfill or incineration. This means reusing, recycling, composting or generating renewable energy from as much waste as practicable, avoiding the emissions associated with manufacturing from virgin material and generating energy using fossil fuels. The Mayor has developed a

CO₂eq emissions performance standard (EPS) for London's municipal waste management activities to work towards achieving rather than prescribing particular waste management activities or treatment technologies.

This approach will support waste activities and services that reduce the amount of municipal waste produced, and capture the greatest number and highest quality of materials for reuse, recycling or composting, and low carbon energy generation.

A key characteristic of this approach is that it allows flexibility. Waste authorities can look across the whole waste system to find the greatest CO₂eq savings to make an important contribution to achieving the EPS, depending on their specific circumstances. For example, waste authorities covering areas where there are many flats may find it difficult to collect high volumes of recyclables and may instead focus attention on the recovery of certain materials that deliver greater CO₂eq benefits. Achieving the EPS will ensure London's municipal waste management shifts from being a net contributor to climate change to an industry that plays an integral role in achieving significant climate change mitigation and energy saving benefits. London will be the first city in the world to develop an EPS for the management of municipal waste, incentivising the take-up of new technologies and sending a clear message to London's waste authorities and the waste industry to focus on waste management activities achieving the greatest CO₂eq savings.

In addition to the EPS, the Mayor has set a minimum CO₂eq emissions performance that requires all energy generated from London's municipal waste to be no more polluting in carbon terms than the energy it replaces. London waste authorities will need to make sure energy generated from their waste meets

this minimum performance, or demonstrates that they have steps in place to meet it in the near future. This approach will rule out traditional mass-burn incineration techniques burning carbon-rich waste generating electricity only and encourages a move towards cleaner, efficient energy generation from low-carbon waste material in the form of heat, power and transport fuel for local use. Generating clean, efficient energy from London's municipal waste in London will play an important role in meeting the Mayor's commitment to a target of a 60 per cent reduction in London's CO₂ emissions (on 1990 levels) by 2025⁴.

POLICY 3 CAPTURING THE ECONOMIC BENEFITS OF MUNICIPAL WASTE MANAGEMENT

Over the last 20 years there has been a tendency for waste authorities to outsource their waste management functions. Outsourcing services means outsourcing risk and therefore providing fiscal certainty. However outsourcing risk can be expensive and any potential revenue such as that from the sale of product in the form of recycled materials or energy is lost.

This strategy focuses on the economic opportunity that municipal waste in London presents. It is estimated that London could save £90 million a year if municipal waste was managed in the optimal way. There is a massive opportunity for London's waste authorities to share in these savings. LWARB will work with London Councils and London's waste authorities to develop a four year programme from 2011-2015 to identify and implement efficiencies in London's municipal waste management, in order for London's waste authorities to share in these savings. The four year programme will, amongst other things, explore opportunities for entering into revenue-sharing waste contracts and joint venture arrangements where appropriate.

POLICY 4 ACHIEVING HIGH RECYCLING AND COMPOSTING RATES RESULTING IN THE GREATEST ENVIRONMENTAL AND FINANCIAL BENEFITS

The Mayor is keen to see that both waste authorities and the waste industry provide recyclable material to the processing and treatment markets, ensuring these materials maintain the best possible prices, highest quality use, and maximum resilience to market fluctuations.

This approach needs to be supported by the provision of high quality, consistent recycling and composting collection services across London that make recycling hassle-free for the consumer, regardless of which borough or housing type they live in or where they work. The Mayor will work with waste authorities to ensure all Londoners can access a core set of cost-effective waste collection, recycling and composting services that Londoners are incentivised to use, particularly to flats and estates where recycling and composting performance is typically low. LWARB has allocated £5 million to fund a programme of infrastructure improvement to boost recycling rates from flats, in particular from high rise housing estates.

The Mayor wants to exploit recycling opportunities outside the home, and will work with waste authorities to explore funding opportunities with businesses and landowners for providing more recycling bins along main streets in London to allow Londoners to recycle on the go.

The provision of high quality recycling and composting collection services needs to be supported by new infrastructure to reprocess recyclable materials, to recover as much material as possible from non-recycled (residual) waste

for recycling and to generate renewable energy. LWARB will fund the development of pre-treatment infrastructure to support those waste authorities that find it difficult to provide cost effective recycling and composting collection services. Pre-treatment infrastructure will play an important role in helping waste authorities achieve high recycling and composting rates. Achieving high recycling rates, particularly for high embodied carbon materials such as plastics, metals and textiles, provides the greatest opportunity for London achieving the Mayor's EPS.

**POLICY 5
STIMULATING THE DEVELOPMENT OF
NEW MUNICIPAL WASTE MANAGEMENT
INFRASTRUCTURE, PARTICULARLY LOW
CARBON TECHNOLOGIES**

London must manage as much of its municipal waste as practicable within London. The Mayor is keen that this has a particular focus on new low-carbon waste management technologies where possible. LWARB represents a new dawn for the capital and the way it tackles rubbish. It will mean, for the first time, the Mayor of London and London's waste authorities working together in partnership to find innovative solutions to tackle this complex environmental challenge. London will strive to be the beacon of good practice, leading the way on innovation for next generation waste facilities, providing positive benefits to local communities in the form of new products, employment and low carbon energy.

LWARB committed £52 million to support recycling, composting, and energy infrastructure in London between 2008 and 2011. £18 million of this was used as match funding to leverage a further £18 million from the EU's Joint European Support for Sustainable Investment in City Areas (JESSICA) scheme. This combined pot of £36 million forms part of the London Green

Fund managed by Foresight Environmental who will contribute additional match funding of £36 million to enable a net £72 million investment fund for waste projects in London. LWARB secured an additional operational funding budget of £18m from the government for 2011-2015 to help deliver efficiencies in London's waste management and to develop further waste management infrastructure.

The Greater London Authority (GLA) and LWARB estimate 3.3 million tonnes of additional municipal waste management capacity is needed by 2031 requiring capital costs in the area of £800 - 900 million and operational costs of £60 -70 million. LWARB's funds alone will not be sufficient, but it will leverage additional funding from other infrastructure funds and through private investment to help fill the capacity gap.

LWARB will play a significant role in the development of new municipal waste management infrastructure in London, keeping the value of London's waste in the capital and being more self-sufficient. Borough waste apportionment and net regional self-sufficiency are dealt with in the Mayor's spatial development strategy for London – *The London Plan*. The Mayor wants London's waste management sites to move up the value chain, moving away from low-value bulking and transfer facilities to state-of-the-art resource recovery parks, providing benefits to local communities in the form of new products, employment, and heat and power. LWARB has developed a London-wide site framework in partnership with waste authorities, bringing together data on current, planned, and potential waste management sites at a local and regional level. For the first time in the UK the public and private sector will be able to identify waste management solutions that can be mapped alongside opportunities for energy use and sustainable transport.

POLICY 6 ACHIEVING A HIGH LEVEL OF STREET CLEANLINESS

The Mayor wants Londoners and visitors to enjoy a consistently high quality of life. One factor affecting quality of life is litter and cleanliness. Come 2012, the world's eyes will be on London and we must ensure that litter does not mar memories of London. Chewing gum, cigarette butts, and coffee cups are a particular blight and the Mayor will work with London boroughs and manufacturers to minimise the impact that this waste and all other street litter has on our local environment. The Mayor wants communities to develop a feeling of pride for the areas that they work and live in and will encourage community groups, boroughs, the third sector and businesses to get involved in cleaning up London.

Achieving a step change in London's municipal waste management

The Mayor believes his policies and proposals will put London on the path towards achieving zero municipal waste direct to landfill by 2025, by which time landfill sites currently used for London's municipal waste are expected to have closed. Today London relies heavily on the southeast counties for the majority of its landfill needs, with only 23 per cent going to London's own landfill sites in Rainham and Beddington. The Mayor has no desire to continue sending municipal waste to landfills outside London and will work with neighbouring counties to agree a roadmap for reducing London's exported municipal waste. The Mayor expects in the immediate future that landfill will continue to play an important role in the disposal of some municipal waste materials. Some materials, such as bonded asbestos, are currently only suitable for landfill, and for others, the technology is not yet there to reuse, recycle or to generate energy from them.

The Mayor's Business Waste Strategy

Mayor has also produced a non-statutory Business Waste Strategy for London's commercial and industrial waste, and construction demolition and excavation waste – waste which is collected and disposed of by waste operators under private contracts rather than by local waste authorities. Waste produced by businesses, be it from shops, restaurants and offices, industrial processes or construction and demolition sites makes up 80 per cent of London's waste – 16 million tonnes a year. Although the Mayor only has statutory powers with regard to London's municipal waste management, he believes we should look at all of London's waste in order to get the greatest benefits for London economically and environmentally.

His Business Waste Strategy sets out non-statutory policies and proposals to help London's businesses improve their waste position, with a particular focus on promoting the economic and environmental benefits of managing resources more efficiently. The Mayor's Business Waste Strategy can be found at www.london.gov.uk.

The London Plan

In addition to the Mayor's waste strategies, the Mayor's spatial development plan for London, *The London Plan*, has planning policies that cover all London's waste. Both waste strategies will be supported by, and should be read in the context of, *The London Plan*. The policies and proposals of *The London Plan* published July 2011, can be found at www.london.gov.uk.

Those covering waste policy issues include:

- working towards zero biodegradable and recyclable waste to landfill by 2031
- Setting recycling/composting targets of:
 - 50 per cent for municipal waste by 2020, increasing to 60 per cent by 2031
 - 70 per cent commercial waste by 2020

- 95 per cent reuse and recycling for construction, demolition, and excavation waste by 2020
- Promoting waste management activities achieving the greatest possible climate change mitigation and energy saving benefits
- Managing as much of London's waste within London as practicable, working towards managing 100 per cent of London's waste within London by 2031
- Borough level projections of London's waste arisings.

Other Mayoral strategies

The Mayor has developed other Mayoral strategies including the Economic Development Strategy, Transport Strategy, Air Quality Strategy, Water Strategy, Climate Change Mitigation and Energy Strategy and Climate Change Adaptation Strategy. The Mayor's Municipal Waste Management Strategy is consistent with relevant policies and proposals in these documents.

CHAPTER ONE

LEGISLATIVE AND POLICY CONTEXT

The Mayor is required to produce and keep under review a Municipal Waste Management Strategy containing his policies and proposals for the recovery, treatment, and disposal of municipal waste in London. In preparing and revising his strategy, the Mayor must have regard to, among other things, the National Waste Strategy which sets out the government's policies for how the UK is to achieve its commitments under the 1999 European Landfill Directive. To comply with the Landfill Directive, the UK must meet the following stringent targets on reducing the amount of biodegradable municipal waste that can be landfilled:

- 75 per cent of that produced in 1995 by 2010
- 50 per cent of that produced in 1995 by 2013
- 35 per cent of that produced in 1995 by 2020.

There are no waste targets set by the government for London or any other UK region to achieve. However in April 2005, the government introduced the Landfill Allowance Trading Scheme (LATS) providing the statutory mechanism by which UK local authorities are to reduce the amount of biodegradable municipal waste they send to landfill, in order for the UK to achieve the European Landfill Directive diversion targets. Under LATS, each waste disposal authority is given a landfill allowance setting out how many tonnes of biodegradable municipal waste it can send to landfill. The allowance decreases annually up to 2020.

The government's National Waste Strategy 2007 sets the following waste targets for the UK:

- to reduce the amount of household waste not reused, recycled or composted in 2000 by 29 per cent by 2010 with an aspiration to achieve a 45 per cent reduction on 2000 levels by 2020
- to recycle and compost household waste - at least 40 per cent by 2010, 45 per cent by 2015 and 50 per cent by 2020

- to recover value from municipal waste (including reusing, recycling, composting or energy recovery) - 53 per cent by 2010, 67 per cent by 2015 and 75 per cent by 2020.

In June 2011 the government carried out a full review of waste policy in England, looking at the most effective ways of reducing waste arisings and maximising cost benefits from waste and recycling, and at how waste policies affect local communities and individual households. A summary of the government's review¹ is set out in Appendix 1.

The European Waste Framework Directive was revised in 2008 requiring Member States, including the UK, to bring into force its laws, regulations and administrative provisions by 12 December 2010. The revised framework was transposed into UK legislation in March 2011 through the Waste (England and Wales) Regulations 2011 (S.I. 2011 No.988). The revisions to the directive are summarised in Appendix 1.

In the course of bringing the new directive into UK legislation, the government revised the definition of municipal waste² to bring the UK into line with the approach taken by other Member States for calculating waste disposal performance against the EU Landfill Directive targets. The revised definition of municipal waste now includes more commercial waste than previously. For the purposes of producing the Mayor's Municipal Waste Management Strategy, however 'municipal waste' is defined in section 360(2) of the Greater London Authority Act 1999, as 'any waste in the possession or under the control of:

- a a body which, or a person who, is a waste collection authority in Greater London, or
- b a body which, is a waste disposal authority in Greater London.

The Mayor will continue to use this definition of municipal waste for the purposes of implementing his municipal waste management strategy.

London's first municipal waste management strategy was published in 2003. Since then the waste management sector has seen increases in the landfill tax, the introduction of LATS, the setting of the government's waste management targets in 2007, the transposition of the revised European Waste Framework Directive into UK legislation in 2010, and the government's national waste policy review in 2011. There have also been a number of other significant policy developments specific to London making it timely for the preparation and publication of a new Municipal Waste Management Strategy for London. These policy developments include:

- statutory provisions in the GLA Act 2007, which require the London waste authorities to act in 'general conformity' with the Mayor's Municipal Waste Management Strategy, and which place a new duty on the Mayor to tackle climate change
- the creation of LWARB, which must 'act in accordance' with the Mayor's Municipal Waste Management Strategy. LWARB's objectives are to promote and encourage a reduction in waste, an increase in the proportion of waste that is reused or recycled, and the use of methods of collection, treatment and disposal of waste that are more beneficial to the environment
- the waste policies in the revised *London Plan*, July 2011 which require boroughs to plan for the management of waste arising in their areas by identifying suitable sites.

Appendix 1 summarises the legislation taken into consideration by the Mayor when revising his municipal waste management strategy.

Implementing the Mayor's policies and proposals and achieving targets

The Mayor's Municipal Waste Management Strategy provides a framework of policies and proposals to ensure London makes an effective contribution towards meeting the UK's commitments under the Landfill Directive 1999. The Mayor's policies and proposals contained in the strategy provide a clear lead to London's waste authorities on the actions it is expected they will need to undertake to meet the Mayor's objectives and targets for London's municipal waste management. The implementation plan in Appendix 2 sets out in detail how these policies and proposals are to be implemented and their effects monitored. The Mayor will also publish an annual monitoring report on the progress of the implementation of his policies and proposals

The Mayor will work with London's waste authorities and other stakeholders to implement his municipal waste management strategy. However it is London's waste authorities who are ultimately responsible for implementing the strategy, as they are statutorily responsible for the delivery of local waste services and for the procurement of the necessary waste treatment capacity. In exercising their functions under Part II of the Environmental Protection Act 1990, London's waste authorities have to act in general conformity with the strategy.

The Mayor has set his own targets for the management of London's municipal waste, which are more ambitious than those set for the UK by the government. The Mayor believes stronger targets than those set by the government are necessary in London to reduce the amount of municipal waste produced in the capital, and because landfills accepting London's waste are expected to close by 2025.

In transposing the revisions to the European Waste Framework Directive 2008, the

government has introduced a new definition of recycling. The definition includes the requirement for compost and the output from anaerobic digestion having to meet minimum quality standards in order to be classified as recycling. Metals recovered from incinerator ash also now count as recycling. These changes are expected to make a very small yet positive contribution towards meeting the Mayor's municipal waste recycling or composting targets set out in this strategy.

Chapter 3 sets out the Mayor's preferred approach for the management of London's municipal waste to 2031 to achieve his overall targets. This includes setting municipal waste recycling and composting targets, and aiming to generate energy from London's organic and non-recycled waste in a way that is no more polluting in carbon terms than the energy source it replaces. The government's recovery targets, which include recycling and composting of and energy generation from municipal waste, will be achieved as a result of this approach.

The Mayor has worked closely with Defra in developing his municipal waste management strategy to ensure the policies and proposals are consistent with the government's overall approach for managing waste in England. Appendix 3 sets out in detail how the Mayor's policies and proposals contribute to achieving his waste management targets, and how their achievement will enable London's waste authorities to meet or exceed their LATS requirements to 2012/13, and the government's national targets.

CHAPTER TWO

CURRENT PERFORMANCE ON MANAGING LONDON'S MUNICIPAL WASTE

London's municipal waste management performance

In 2009/10, London produced 3,822,000 tonnes of municipal waste, mostly made up of paper and board and organic waste (food and green garden waste). Municipal waste for the purposes of this strategy is waste in the control of a waste collection or waste disposal authority. Household waste makes up 79 per cent (three million tonnes) of municipal waste and includes recycling and black bag waste collected from flats and houses, street litter, bulky household waste and waste delivered to local authority reuse and recycling centers. The remaining 21 per cent (787,000 tonnes) comes from some small and medium-sized businesses, where boroughs have waste collection agreements in place to serve these businesses.

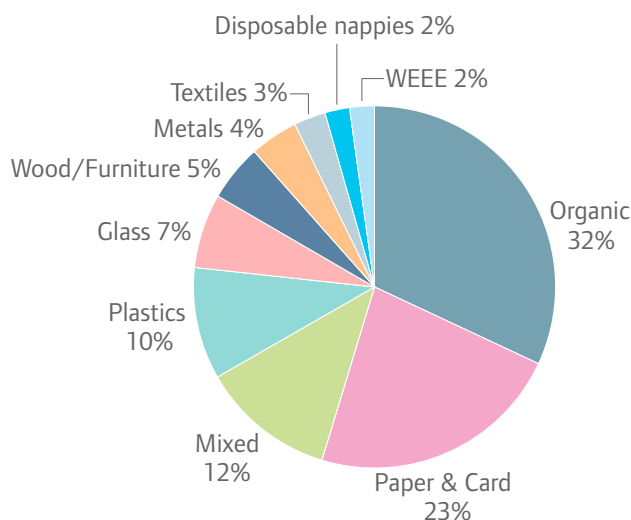
The breakdown of London's municipal waste by material is shown in Figure 1. The breakdown of London's municipal waste by management method is shown in Figure 2.

London's municipal waste governance framework

There are 32 London boroughs and the City of London Corporation. Although the responsibility for collecting waste in London has always been with the boroughs, the responsibility for disposing of waste has been dispersed since the abolition of the Greater London Council in 1986 (see Figure 3).

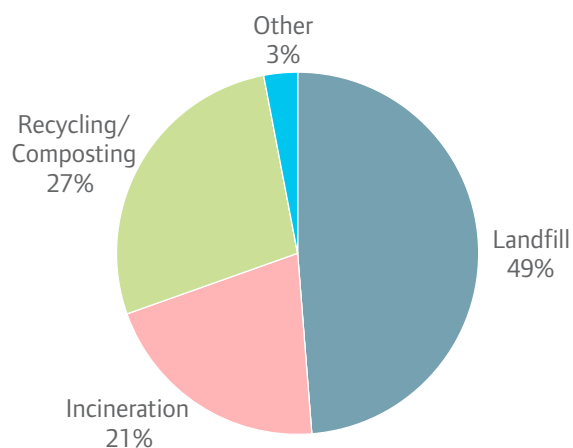
There are 12 local authorities in London that are responsible for both collection and disposal of their waste (and are known as unitary authorities). They are Bexley, Tower Hamlets, City of London, Westminster, Southwark, Lewisham, Greenwich, Sutton, Merton, Kingston, Croydon and Bromley. The remaining 21 local authorities are responsible for the collection of their waste, but with waste disposal operations arranged across four statutory waste disposal authorities. These are:

Figure 1 Municipal waste by material



Source: Defra, 2010 www.defra.gov.uk
 Notes: 'Mixed' waste includes household sweepings and soil. WEEE refers to Waste Electrical and Electronic Equipment

Figure 2 Breakdown of London's municipal waste by management method in 2009/10



Source: Defra Waste Statistics, 2010, www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/
 Notes: 'Other' is waste material sent for some form of pre-treatment or unknown destination. Recycling or composting includes organic waste sent for anaerobic digestion. Less than one per cent of London's municipal waste is treated using anaerobic digestion. Approximately five per cent of municipal waste to landfill is used for land reclamation (including landfill capping).

Figure 3 London's unitary, waste collection and disposal authorities

Source: GLA, 2011.



- East London Waste Authority (ELWA) – Newham, Redbridge, Barking and Dagenham, Havering
- North London Waste Authority (NLWA) – Camden, Islington, Hackney, Waltham Forest, Haringey, Barnet, Enfield
- Western Riverside Waste Authority (WRWA) – Kensington and Chelsea, Hammersmith and Fulham, Wandsworth, Lambeth
- West London Waste Authority (WLWA) – Richmond upon Thames, Hounslow, Ealing, Brent, Harrow, Hillingdon.

Management methods for London's municipal waste

Between 2003/04 and 2009/10, London's municipal waste actually decreased from 4.4 million tonnes to 3.8 million tonnes, despite

an increase in population from 7.39 million¹ to 7.76 million² over the same period. There are a number of possible reasons for this including:

- more restrictions on the trade waste accepted at household waste reuse and recycling centres
- changes in behaviour, as a result of direct and indirect education on waste reduction, including smarter shopping campaigns to reduce waste, campaigns to increase use of real nappies, and home composting programmes
- reductions in the waste and recycling collection services offered to small businesses
- changes to consumer packaging, such as the use of lighter materials (for example, using plastic or Tetra Pak in place of glass).

London's municipal waste arisings in 2009/10 were about two per cent lower than in 2008/09. However, they are expected to increase slightly

again as London's population grows and the capital comes out of the recession, albeit at a slower rate than previously expected. Despite these reductions, there is still too much waste being produced unnecessarily and not enough being reused, repaired or recycled. Instead, most of it ends up in landfill where its value rots away.

Research³ undertaken for the GLA shows that most of the growth in municipal waste will come from a rise in the number of households, which is predicted to increase by 12 per cent by 2020 and by 22 per cent by 2031 from the 2008 baseline of 3.2 million⁴. This means that, without any policy intervention, there will still be a small but steady increase in total municipal waste over time.

London's municipal waste recycling and composting performance

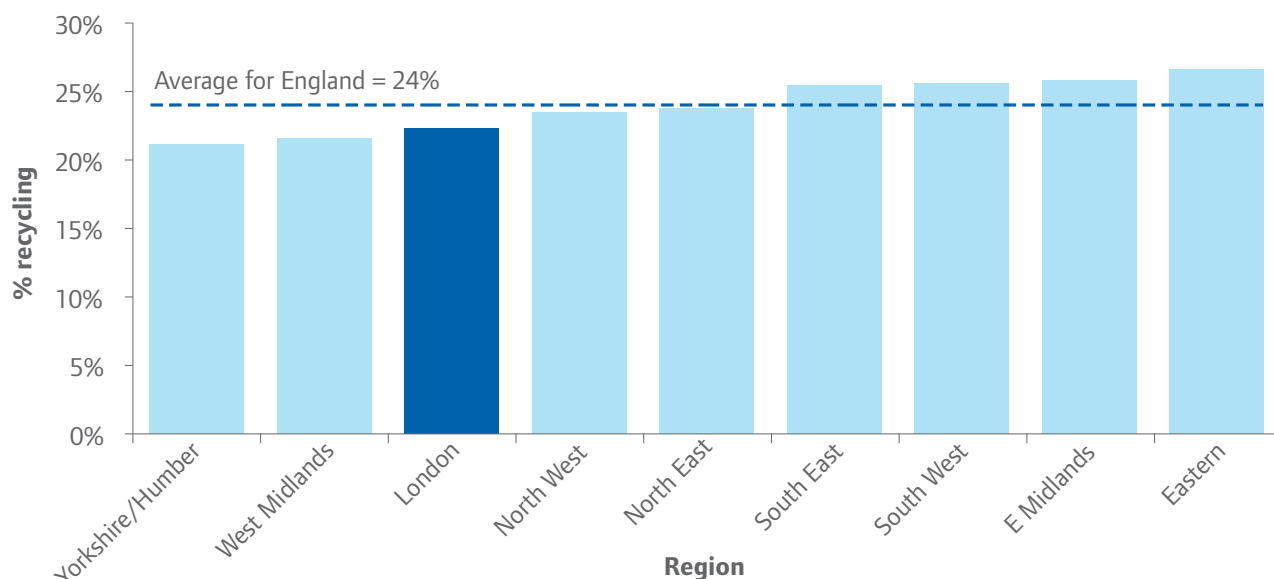
London's municipal recycling and composting performance has improved more than threefold since 2000/01, from eight per cent to 27 per cent in 2009/10. London's performance on household dry recycling (22 per cent) which

includes paper, card, plastics, glass and tins/cans recycling is similar to other UK regions (see Figure 4), despite the challenges of a highly diverse, dense and transient population.

Across England, 16 per cent of household waste is composted, while in London composting accounts for only 9 per cent of household waste. With proportionately little garden waste in London, the weight of material collected for composting is likely to be lower than in most regions, and this contributes to the challenge of achieving overall municipal recycling and composting rates in line with the England average of 39 per cent in 2009/10 (see Figure 5). While municipal recycling and composting rates in other international cities like Berlin (41 per cent) show that higher recycling rates are achievable in highly urbanised areas, London's municipal waste recycling rate (27 per cent) is similar to Sydney (29 per cent) and significantly better than Paris (19 per cent)⁵.

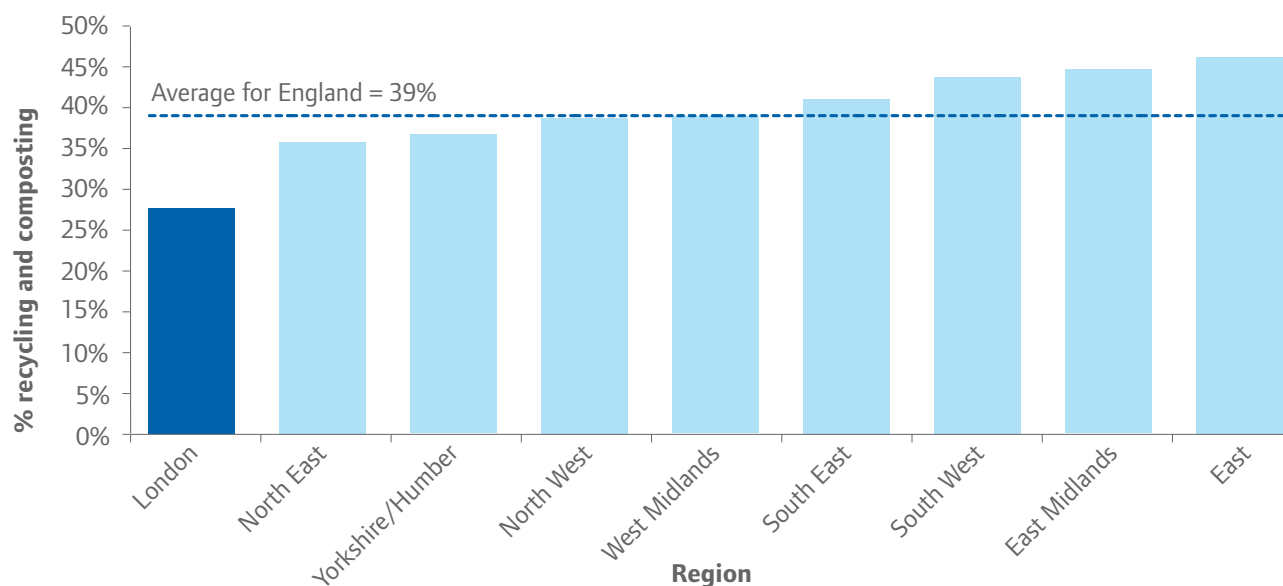
Recycling and composting play an important role in climate change mitigation by avoiding

Figure 4 England's regional household dry recycling performance 2009/10



Source: Defra Waste Statistics, 2010, www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/

Figure 5 England's regional municipal recycling and composting performance 2009/10



Source: Defra Waste Statistics, 2010, see www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/

greenhouse gas emissions that would otherwise be produced in manufacturing from virgin materials.

London borough household waste recycling and composting performance

There is considerable variation in household recycling and composting performance across London's 33 boroughs, where recycling rates range from 17 to 51 per cent in 2009/10. Figure 6 shows this variation by borough separating inner and outer London boroughs for ease of comparison. Nineteen boroughs achieved recycling or composting rates over 30 per cent, with six of these achieving over 40 per cent and one reaching over 50 per cent. Two boroughs recycled or composted less than 20 per cent. London's overall household waste recycling or composting performance rate was 32 per cent in 2009/10. Most inner London boroughs are achieving good dry recycling rates often exceeding the dry recycling rates being achieved by the outer London boroughs, and many outer London boroughs have benefitted from organic waste collection

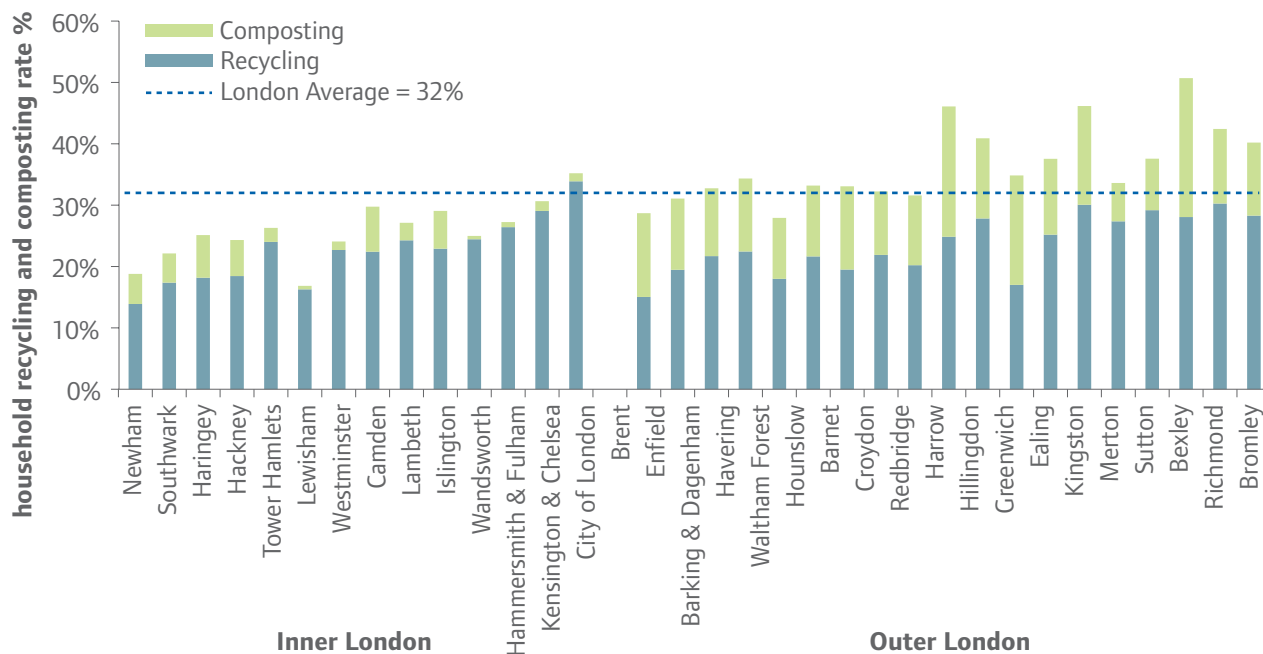
services to boost their overall recycling and composting rates.

All 33 London boroughs offer at least a basic household kerbside⁶ dry recycling collection service, although there is large disparity between the boroughs on which materials are collected and the methods of collection. London's household recycling and organic waste collection services are summarised below. Figure 7 shows the main household recycling and organic waste collection services offered by each London borough. A full list of household recycling and composting services provided by London boroughs can be found at www.capitalwastefacts.co.uk.

London's household recycling and composting services have the following characteristics:

- All boroughs provide kerbside collection services for paper, mixed cans, and plastic bottles. All except two boroughs collect glass at the kerbside and all except one collect cardboard. Thirteen boroughs collect mixed plastics from kerbside services.

Figure 6 London's household recycling performance by borough 2009/10



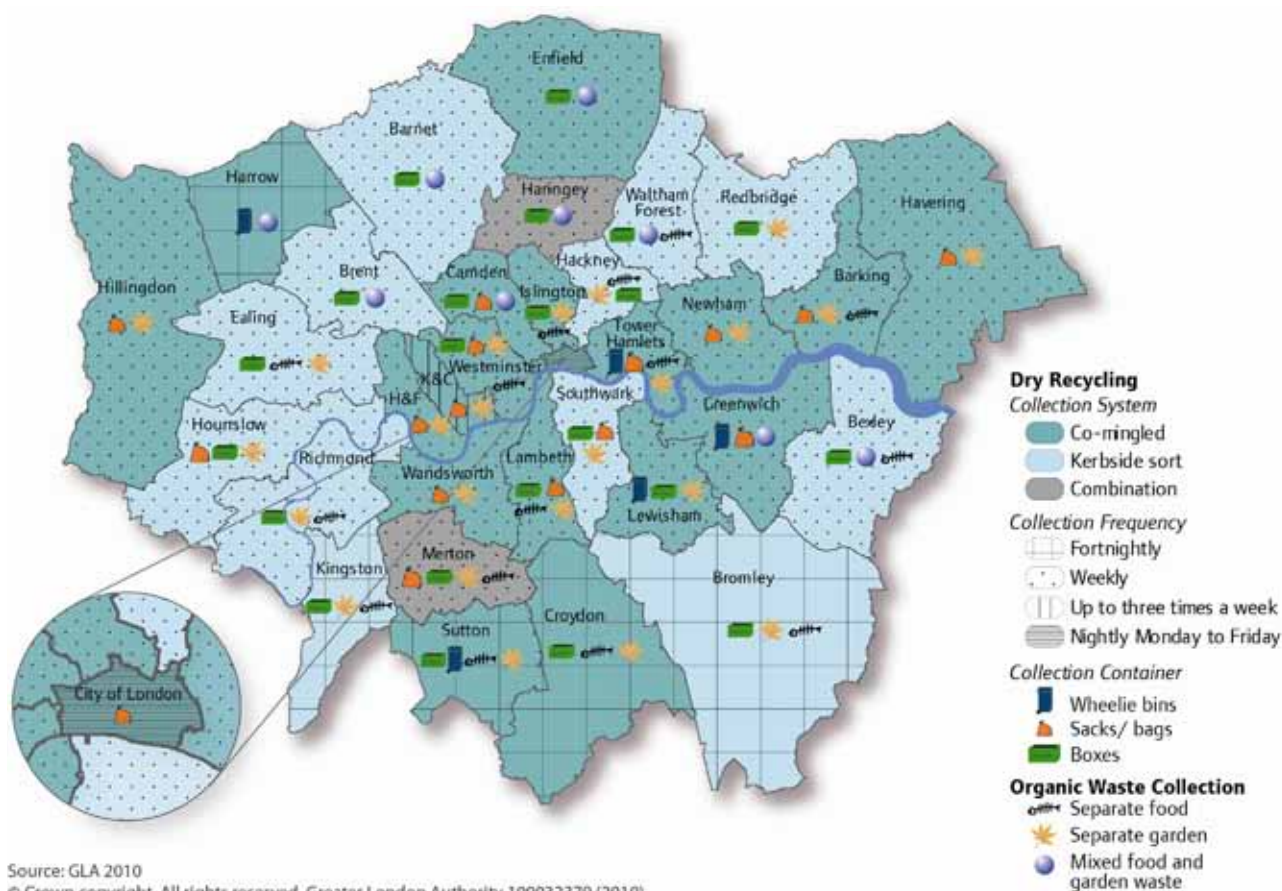
Source: Defra waste statistics, 2009/10: www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/

- Nineteen boroughs provide a kerbside co-mingled (mixed) recycling collection service. Twelve boroughs provide a kerbside sort service, and two boroughs provide a mix of the two collection services.
- Seventeen boroughs collect dry recyclables in a box or wheelie bin. Eight boroughs use a sack, and eight boroughs use a combination of boxes, sacks and wheelie bins. The colour of recycling containers varies across boroughs.
- Twenty-six boroughs provide a weekly recycling collection service. Five boroughs provide a fortnightly recycling collection service. Two boroughs provide daily recycling collection services.
- All boroughs provide near entry (close to block or estate entrances) or bring site recycling banks for flats and estates, although there is great variation between boroughs on what materials are accepted.
- All except one borough provide a green garden waste collection service. Eleven boroughs provide separate weekly kerbside collections

for food waste, and nine boroughs collect food and green garden waste together. Some boroughs provide food and green garden waste collections for flats and estates.

The variations in household recycling and composting collection services across London can cause confusion for residents, particularly when moving to other boroughs. One of the key complaints Londoners regularly cite when asked about London's environment is the confusing nature of recycling services. Furthermore, very few boroughs offer any kind of financial incentives to increase participation in household recycling or composting services. In most cases, it is cheaper for local authorities to recycle waste than it is to send the same waste to landfill or incineration. This is partly to do with income received from recycled products, but mostly due to annual increases in landfill tax of £8 per tonne until 2014, making recycling and composting more commercially attractive.

Figure 7 Household recycling and composting services provided by London boroughs



Source: GLA 2010
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Source: Recycling and organic waste collection service information taken from London borough websites and www.capitalwastefacts.com as of April 2010.

Note: Some services may have changed or may only be trial services. Updated service information will be available on www.capitalwastefacts.com

Recycling and composting performance in flats and estates

Despite extensive efforts, few boroughs have successfully tackled the problems of providing recycling and composting services to flats and other households that are not easily accessed from the street. Many boroughs continue to trial recycling and composting collection services in flats and estates, but some schemes have been withdrawn due to being too expensive, too difficult, and having low levels of participation.

GLA survey work with London boroughs in 2009/10 showed average recycling or composting rates in flats and estates to be

around ten per cent or less. Common barriers to achieving high recycling or composting in flats and estates include the lack of space for recycling storage and the difficulty of transporting materials to a collection point, often located externally to flats or estates. Targeting flats presents a huge opportunity for increasing London's recycling and composting performance, given that nearly half of London's households are flats⁷.

Recycling and composting performance for non-household municipal waste

In 2009/10, just 12 per cent of non-household waste from London's small businesses was recycled or composted, against a national average of 30 per cent⁸. Under the Environmental Protection Act 1990, boroughs are obliged to make arrangements for the collection of non-household municipal waste where a business requests it. A charge can be made to cover costs associated with the management of this waste.

Boroughs are not obliged to provide recycling or composting services to businesses, although about two-thirds of London's boroughs do provide such services, most commonly for paper and/or glass⁹. The charges to businesses for recycling collection services are typically less than those for mixed (black bag) waste, due to it being more expensive (depending on collection costs) to send waste to landfill or incineration than to send it for recycling¹⁰.

GLA survey work with some boroughs showed that the start up (and running) costs of setting up recycling collection services for businesses could be a problem particularly where there were not enough businesses participating to offset collection costs. This is further compounded by the private sector targeting the more lucrative waste contracts from large businesses, leaving smaller, less profitable waste contracts to be picked up by boroughs.

Considering that this non-household waste made up 21 per cent (or 787,000 tonnes) of waste collected by London's waste collection authorities in 2009/10, the potential for increasing recycling and composting rates by tackling this sector is significant. As it is such a substantial proportion of London's municipal waste, it is important that recycling

and composting is made a priority for non-household municipal waste.

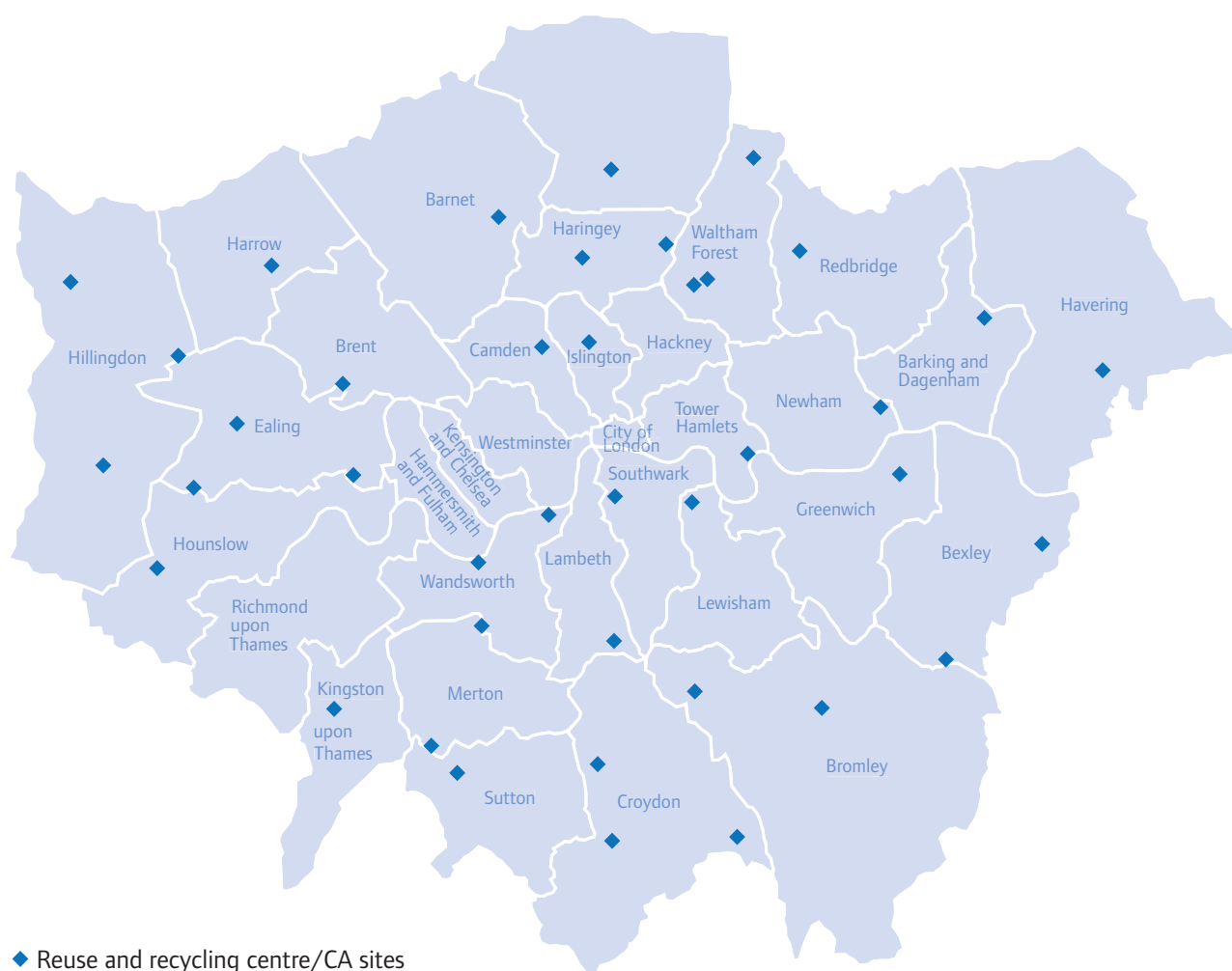
In March 2011 Defra revised the definition of municipal waste to include other commercial waste. This change will put greater emphasis on making improvements in this area that will result in an increase of commercial waste recycled and composted. The composition of this commercial waste stream is similar to that of household waste. The Mayor is keen to work with Defra and the boroughs to understand the implications of the change in definition to municipal waste, and what this means for waste authorities providing municipal waste collection services.

Generally, small and medium-sized businesses that want to recycle see their local authority as their first port of call for such a service¹¹. With well publicised and widely used business waste recycling collection services, boroughs could take significant steps to tackle climate change, improve their recycling rates, and off-set some of their collection costs. A survey completed by the Federation for Small Businesses for the 2010 local body elections¹² found that small businesses wanted their local boroughs to provide a cheaper, more efficient, waste collection service and help them to become greener businesses. Both of these ends could be achieved through a comprehensive business waste recycling collection service.

London's reuse and recycling centres

There are 41 reuse and recycling centres (RRCs) in London, providing drop-off facilities for a range of household waste materials for reuse, recycling and disposal. They serve a wide community, from the inner city to the semi-rural fringes of London. These sites are strategically important waste management facilities, contributing approximately five per cent of London's household waste recycling

Figure 8 Location of reuse and recycling centres in London



Source: Capital Waste Facts Fact File Matrix, www.capitalwastefacts.com

rate. The locations of London's RRCs are shown in Figure 8 above.

RRCs can play an important role in improving London's recycling and composting performance. A report¹³ commissioned by the GLA on best practice design of RRCs showed that the average recycling and composting rate of London's RRCs improved from 19 per cent in 2001/02 to 40 per cent in 2006/07¹⁴. Some RRCs today achieve as high as 80 per cent. The report concluded there was great scope for further improvement and that 60 per cent recycling or composting levels were

achievable in the short term through good design measures, with minimal costs. Given the strategic importance of these sites, it is important that the current network of RRCs should be safeguarded. The Mayor's *London Plan* states that existing RRCs should be protected and their use maximised.

London's municipal waste used for energy generation

London sends 21 per cent of its municipal waste for incineration, including two large incinerators in Enfield and Lewisham, managing approximately 920,000 tonnes in 2009/10

and generating energy in the form of heat and electricity. In 2010, London's incinerators generated enough electricity to power approximately 130,000 homes¹⁵, playing an important role in local energy generation and reducing London's reliance on the UK energy network.

However, neither of London's incinerators currently use the vast amounts of heat generated, making this an inefficient way to produce energy and releasing significant amounts of CO₂eq. Research¹⁶ undertaken for the GLA demonstrated that incineration of mixed waste operating in combined heat and power mode (CHP) could be carbon neutral in that it displaced the same level of CO₂eq emissions as it created. This would be achieved by avoiding the CO₂eq emissions that would otherwise have been produced in generating the same amount of heat and electricity using fossil fuels, such as coal and gas. Heat makes up two-thirds of energy generated from incineration, so capturing it would greatly improve the overall

efficiency and carbon performance of London's existing incineration facilities.

The Mayor expects London's incinerators to continue playing an important role in managing London's non-recycled waste, and is keen to work with incinerator operators to explore opportunities for making these facilities more efficient. Generating efficient, low carbon energy from London's non-recycled waste will play an important roll in helping to achieve the Mayor's CO₂ reduction targets as set out in his Climate Change Mitigation and Energy Strategy (CCMES). More information on the Mayor's plans for reducing the climate change impact of London's municipal waste and its role in contributing to the Mayor's CO₂ reduction targets for London can be found in Chapter 4 and Policy 2 of this strategy.

Table 1 shows that London is third to the West Midlands and the Southeast in the proportion of municipal waste sent for incineration. This proportion will increase when London's third incinerator at Belvedere comes online in 2011.

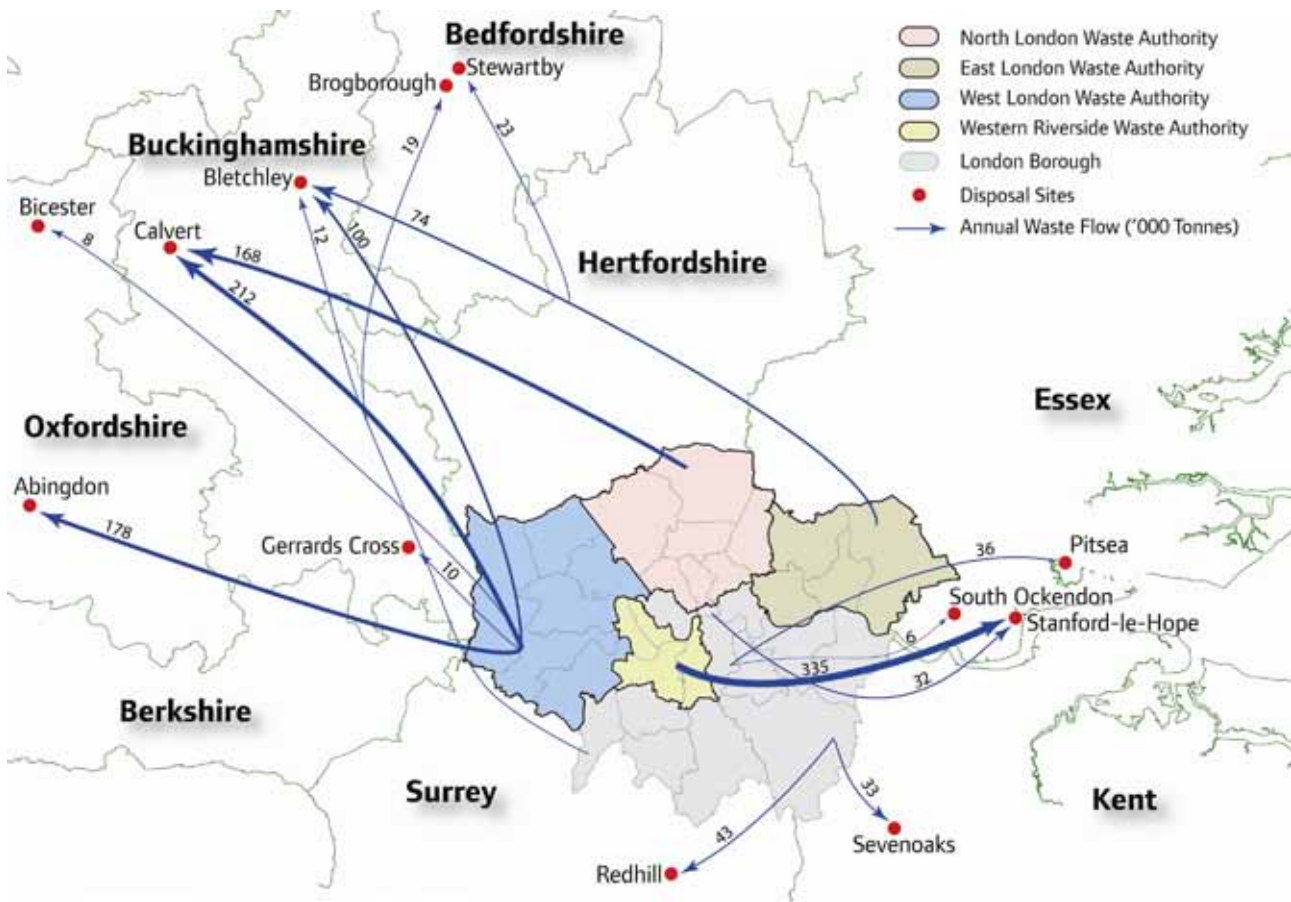
Table 1 Waste management method by UK region 2009/10

Region	% landfill	% incineration	% recycling & composting	% other
London	49%	21%	27%	3%
East	51%	3%	46%	1%
East Midlands	48%	7%	44%	1%
Northeast	44%	19%	35%	2%
Northwest	59%	2%	38%	0%
Southeast	38%	22%	41%	0%
Southwest	54%	2%	43%	1%
West Midlands	29%	33%	39%	0%
Yorkshire and Humber	50%	13%	36%	2%

Source: Defra Waste Statistics, 2010

Note: 'Other' includes small amounts of pre-treatment of waste.

Figure 9 Distribution of municipal waste to landfill sites around London



Source: Greater London Authority 100032379 (2010). © Crown copyright. All rights reserved.

London's municipal waste to landfill

Nearly half of London's municipal waste is sent to landfill each year, costing about £265 million. It will become increasingly expensive to dispose of London's municipal waste this way, as landfill tax is to rise from £56 per tonne in 2011 to £80 per tonne by 2014. In addition to the increasing costs and the environmental problems associated with landfill, London's landfill capacity is rapidly declining. London relies heavily on its surrounding regions for disposing of its waste to landfill (see Figure 9). About 77 per cent of London's landfilled waste goes to landfill sites outside London, mainly in the south and east of England. These regions are increasingly reluctant to accept London's waste and this landfill capacity is due to

expire by 2025¹⁷. The remainder is sent to London's two municipal waste landfill sites in Rainham (Havering) and Beddington Farm (Sutton). However, these sites are expected to close by 2018 and 2021 respectively¹⁸ with no new landfill capacity planned within London.

London's municipal waste flows

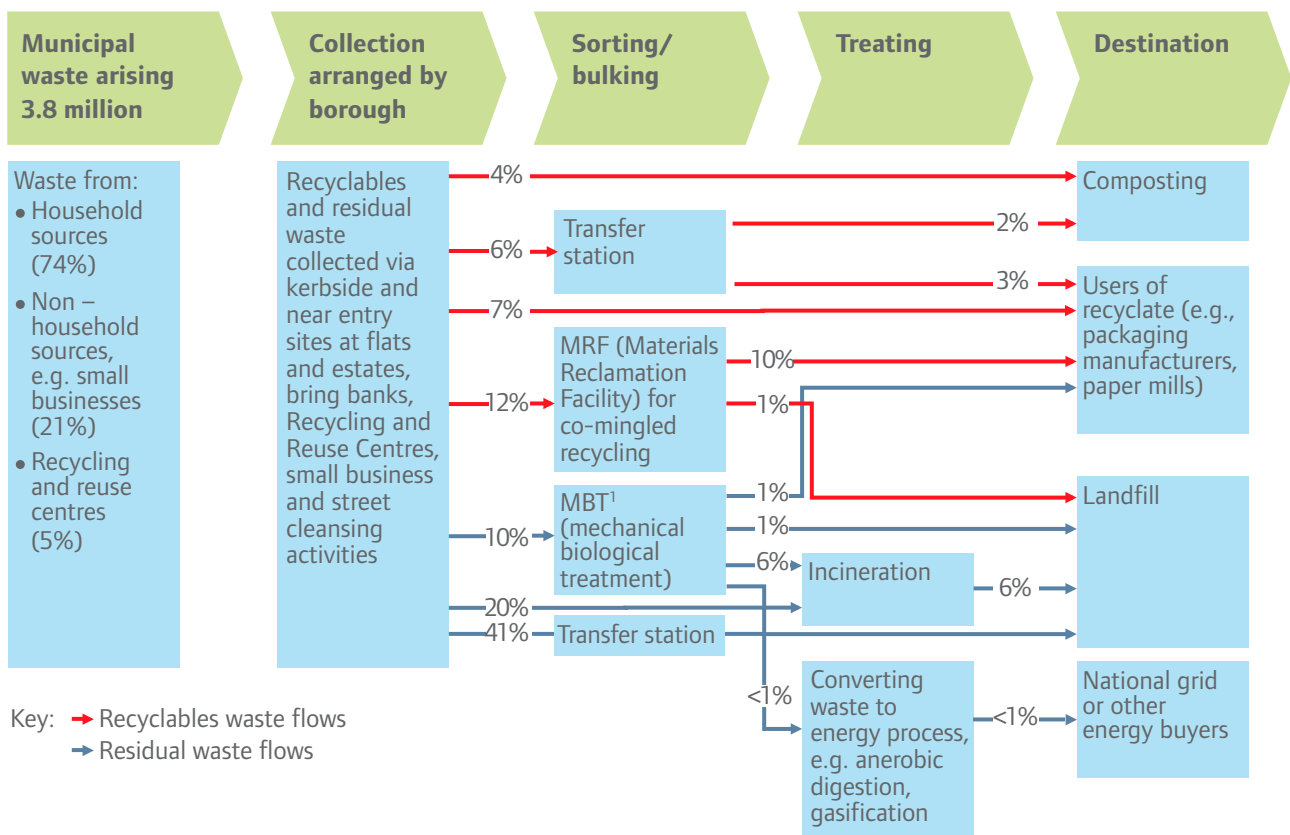
Figure 10 shows that today approximately 70 per cent of London's municipal waste goes to landfill or incineration, often without any form of pre-treatment to recover materials that could be reused, recycled or composted.

Approximately 40 per cent of municipal waste produced in London comes from flats and estates where recycling is challenging. A further 21 per cent of municipal waste is collected from small and medium-sized businesses, adding to the complexity of the municipal waste management picture.

About half of London's municipal waste sent for recycling is sorted beforehand at a MRF. If current trends continue, London will need

to at least double the infrastructure it has for sorting and processing recyclable municipal waste by 2020, in order to achieve the Mayor's 50 per cent recycling or composting target. Figure 10 also shows 41 per cent of London's non-recycled municipal waste is sent directly to landfill. There is a massive opportunity to recover recyclable material from this waste and generate low carbon energy from the waste that remains. Managing non-recycled waste this way will become increasingly important as the costs of sending waste to landfill increase and landfill capacity decreases over time. More information on London's municipal waste management infrastructure requirements is provided in Chapter 4. The Mayor's plans for developing the infrastructure to manage more of London's municipal waste are set out in Policies 3 and 5.

Figure 10 London's municipal waste flows 2009/10



Source: Best available data from: Defra, 2009; Environment Agency, 2009; GLA, 2009

Notes: Numbers may not add up due to rounding. ¹Approximately 25 per cent is lost as water during MBT processes

CHAPTER THREE

THE MAYOR'S APPROACH

London needs to reduce the amount of municipal waste generated and move away from its reliance on landfill and incineration. This can be achieved by preventing waste at source and then significantly increasing the amount of waste reused, recycled and composted, and generating renewable energy from the remaining waste using a range of technologies. It is particularly important that London stops sending mixed untreated or unsorted waste to landfill or incineration.

In preparing this strategy the GLA considered ten different waste management scenarios, which were independently modelled on their economic and environmental performance¹. The ten scenarios were compared against an 11th 'do nothing new' baseline scenario to see how each scenario could help London to improve its waste position and make an effective contribution towards meeting the UK's commitments under the Landfill Directive 1999. The modelling considered various options for managing London's municipal waste, including landfill, recycling, composting, anaerobic digestion, incineration and new thermal treatment energy generation technologies. Judging the outcomes of the model against a number of criteria and sensitivities, a preferred approach (the Mayor's preferred approach) has been selected. The criteria and sensitivities include:

Criteria

- Achieving the Mayor's net self sufficiency targets set out in *The London Plan*
- achieving a reduction in the amount of municipal waste produced
- achieving an increase in the amount of municipal waste reused
- achieving high recycling and composting performance, reliant on:
 - a providing recycling or composting services to every London household
 - b providing recycling and composting collections to local businesses
 - c increasing pre-treatment of residual waste to further recover recyclable material

- reducing London's reliance on landfill as recycling or composting performance and energy generation from non-recycled waste increases
- achieving government targets set for the UK.

Sensitivities

- London waste authority contractual requirements for using existing waste management facilities
- the GLA's knowledge of new waste management infrastructure that London's waste authorities are planning for in the near future
- the time necessary to plan, procure, build and operate new waste management facilities
- the estimated cost and benefits of waste management options, including new waste management facilities
- the availability and environmental performance of waste management options, including their climate change impact
- the strategy applies the same growth rate used to update London's municipal waste arisings set out in the Mayor's strategic plan for London, *The London Plan*.

The modelling estimated London's 2008/09 annual municipal waste management bill to be about £580 million. The modelling concluded a 'do nothing new' approach would lead to an increase in London's annual municipal waste management bill to about £680 million by 2031. This figure includes all costs associated with the collection, transport, treatment, and final disposal of London's municipal waste. It also includes capital and operational costs associated with new infrastructure to treat London's municipal waste. This figure does not include project development and consenting costs as

these vary greatly depending on the project and location. This £100 million increase will largely be a result of the increase in landfill tax pushing up total disposal costs.

The costs and potential benefits represented in the modelling are indicative only and are based on national research undertaken by WRAP (Waste Resources Action Programme), consultants market knowledge and some limited data provided by a handful of London waste authorities. It is difficult to fully anticipate the actual costs of managing London's municipal waste which is likely to be quite different from the rest of the country. Some of London's special circumstances include:

- London's fragmented waste governance arrangements. London has 33 waste collection authorities² providing 33 different waste and recycling collection services procured through multiple and varied contracts;
- London's diverse and transient population, which presents various challenges, including the potentially higher costs involved in effectively communicating details about local waste and recycling services;
- London's diverse housing stock and, in particular, the number of flats and multi-occupancy properties where provision of recycling services can be expensive.

Table 2 summarises the scenarios modelled and their economic and environmental performance (in potential CO₂eq emission saving terms) from 2008 - 2031. The scenarios modelled against the baseline 'do nothing new' scenario look at a number of different approaches to recycling or composting, as well as different pre-treatment options for remaining waste (residual waste) to recover more materials for recycling, and to produce solid recovered fuel (SRF) for energy generation. A mix of thermal treatment technologies including incineration and

gasification were also modelled for generating energy from residual waste and SRF.

When looking at residual waste, different pre-treatment waste management processes were considered that produce SRF with either low or high proportions of biomass waste. Biomass waste includes materials such as food and green garden waste, and paper and card. Biomass waste can be used to generate low carbon energy and qualifies for renewable obligation certificates (ROCs). More information on ROCs and the carbon performance of waste management approaches can be found in Chapter 4.

The results from the modelling showed that by changing the way we manage our municipal waste London could save between £573 million and £838 million and save between 20 million and 33 million tonnes of CO₂eq emissions by 2031. These savings can be achieved predominantly by:

- a reducing the amount of household waste produced per household each year by approximately one per cent
- b a gradual decline in municipal waste sent to landfill
- c achieving 45-67 per cent recycling and composting rates (including reuse)
- d increasing the amount of non-recycled and organic waste used for energy generation.

The results from the modelling demonstrated that there is relatively little difference between the core scenarios that focus on high dry waste recycling rates and those that focus on collecting food waste. This supports an outcome-based approach applied across the whole waste management system, allowing flexibility to achieve the greatest environmental benefits at least cost. Due to variations in local infrastructure needs and housing stock, it might be appropriate for some waste authorities to

Table 2 Economic and environmental performance of waste management scenarios modelled 2008-2031

Recycling approach	Residual approach	Scenario	Financial costs or benefits (£M)	Cumulative CO ₂ eq savings (Mt)
'Do nothing new' baseline		1	0	0
Do nothing new	Pre-treatment: low biomass SRF to thermal treatment	2	£111	-20
	Pre-treatment: high-biomass SRF to thermal treatment	3	£217	-27
Focus on dry recyclables	'Do nothing new'	4	-£628	-25
	Pre-treatment: low biomass SRF to thermal treatment	5	-£599	-31
	Pre-treatment: high-biomass SRF to thermal treatment	6	-£578	-33
Focus on food waste	'Do nothing new'	7	-£628	-25
	Pre-treatment: low biomass SRF to thermal treatment	8	-£599	-32
	Pre-treatment: high-biomass SRF to thermal treatment	9	-£573	-33
Focus on properties with doorstep recycling collection services	Pre-treatment: low biomass SRF to thermal treatment	10	-£679	-33
Services achieving the greatest greenhouse gas emission savings	Pre-treatment: high-biomass SRF to thermal treatment	11	-£838	-33

Notes:

1 The residual waste management approaches assume declining amounts of untreated residual waste going directly to incineration over time. 2. The residual waste management approaches assume energy generation facilities are operating in combined heat and power mode (CHP). 3. All scenarios assume 50 per cent of organic waste collected going to composting and 50 per cent going to anaerobic digestion.

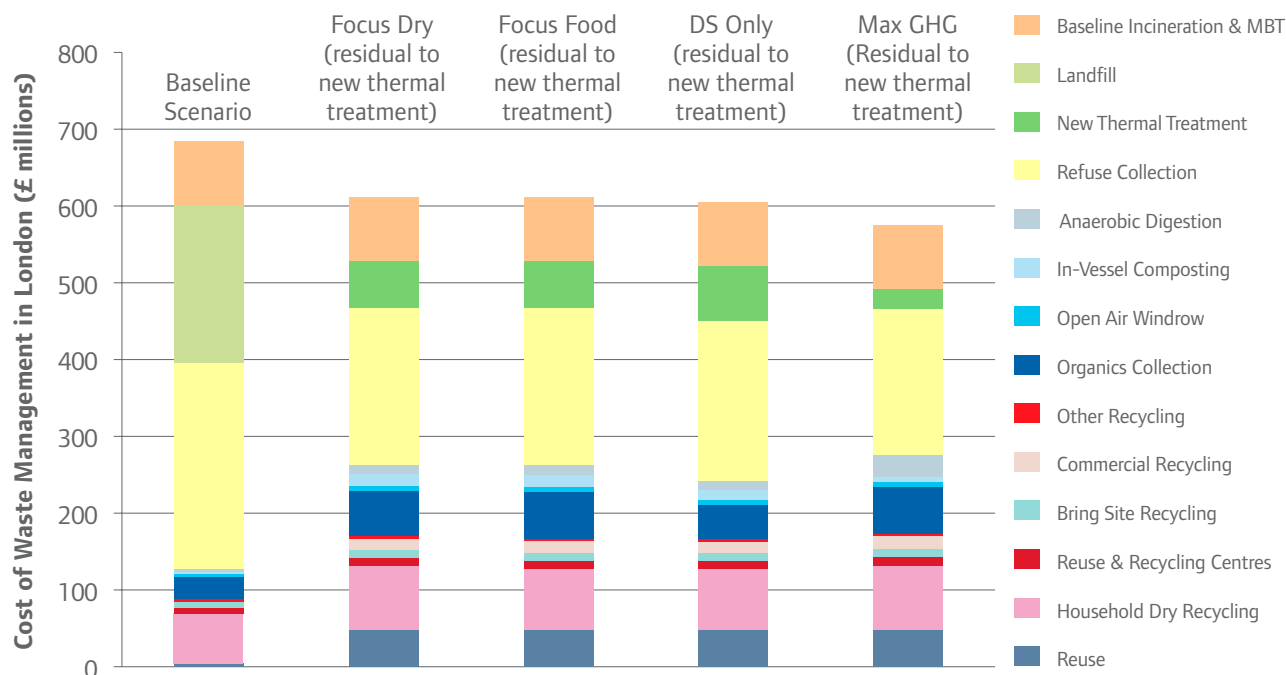
focus on food waste collection while others focus on dry waste recyclables to achieve high recycling and composting rates. Alternatively waste authorities that find it difficult to provide a full suite of cost effective recycling and composting collection services may be better suited to focus on solutions producing low carbon SRF from waste for energy generation.

Figure 11 shows the overall annual net cost of implementing four of the core waste scenarios split by the various waste management activities.

These scenarios can be compared to the 'do nothing new' scenario for managing London's municipal waste in 2008/09 with no new waste services or infrastructure. The economic and environmental performance of all waste scenarios modelled can be found in Table 8.3 in Appendix 4a of this strategy.

Figure 11 shows there is relatively little difference between each of the scenarios, as the greatest savings come in reducing the amount of waste sent to landfill. The most cost-effective

Figure 11 Total (annual) net costs of waste management in London in 2031



Notes:

'Incineration and MBT' refers to London's current and planned incineration capacity (Belvedere) plus existing mechanical biological treatment (MBT) capacity.

'New thermal treatment' for the purposes of the modelling undertaken refers to gasification technologies.

'DS Only' refers to a focus on properties only with door step recycling collection services. These are properties, typically detached or semi-detached properties, with their own dedicated recycling collection container.

'Max GHG' refers to a focus on providing services achieving the greatest possible greenhouse gas (GHG) savings. This assumes dry recycling and food waste collection services provided to every London household.

scenario in 2031 that achieves the best CO₂ eq savings is the 'Max GHG savings (residual to thermal treatment)' scenario, whereby the quantity of residual waste decreases significantly such that the costs of residual waste collection and treatment also fall significantly. This highlights the value of achieving high recycling or composting rates (about 67 per cent). The modelling, however, did show that achieving such high recycling and composting rates would generally require greater up-front service investment costs than the other scenarios, with the financial benefits realised over a longer timeframe.

The modelling suggested that collecting source segregated waste for recycling or treatment (such as the separately collected food waste

for treatment by anaerobic digestion) could be less expensive than residual waste treatment. This needs to be taken into consideration when developing new infrastructure in order to strike a balance between recycling, pre-treatment, and residual waste management infrastructure requirements and, avoid over-capacity.

Aligning economic and environmental considerations

Ultimately the Mayor wants to achieve significant climate change mitigation and energy saving benefits from the management of London's municipal waste management at least cost. To achieve this, the Mayor has developed a lifecycle CO₂ equivalent (CO₂eq) emissions performance standard (EPS) for activities associated with the collection, treatment, energy

generation, and final disposal of London's municipal waste to work towards achieving. This approach looks at the total CO₂eq emissions associated with waste products over their lifecycle, from their production through to their final disposal. While there are other important environmental considerations including air quality and biodiversity, CO₂eq emissions acts as a good proxy for determining the overall environmental impact of waste management activities.

In aligning the Mayor's commitment to reducing London's CO₂eq emissions and significantly improving the capital's recycling and composting rate, the EPS has been developed based on the modelled scenarios that meet his recycling and composting targets in 2015, 2020 and 2031 (Scenarios 5, 6 and 8-11). The five remaining scenarios modelled 'no change' to London's recycling or residual waste management performances, and were not considered given the expectation that London's municipal waste management activities would change and improve over time.

Rather than specifying particular waste management technologies or services, this outcome-based approach focuses on waste management activities that achieve the greatest CO₂eq savings. Generally, after waste reduction and reuse, the greatest CO₂eq savings are achieved through high recycling and composting rates, but significant CO₂eq savings can also be made by generating low carbon energy from organic and non-recycled waste. Generating low carbon energy from this waste avoids emissions that otherwise would have been generated using fossil fuels, and plays an important part in London's municipal waste management achieving the EPS. Generating low carbon energy this way will also be crucial in helping to deliver the Mayor's decentralised energy goals and help achieve

his target of a 60 per cent reduction in London's CO₂ emissions (on 1990 levels) by 2025, as set out in his Climate Change Mitigation and Energy Strategy.

The Mayor's outcome-based approach complements the government's approach for managing England's waste, as set out in *The Government Review of Waste Policy in England 2011*. In the Review, the government promotes the use of lifecycle approaches for waste policy and waste management decisions, and supports the reporting of waste management in carbon terms as an alternative to weight based targets and measures that are currently used.

Following public consultation on this strategy, further economic modelling³ was undertaken to determine in more detail the financial and technical implications of a wide range of waste management scenarios incorporating different recycling and composting rates and technologies for London's municipal waste management achieving the EPS. A thousand different waste scenarios were modelled on their economic performance against the achievement of the EPS. This modelling concluded 658 of the 1000 scenarios would meet the overall EPS up until 2031. Conclusions drawn from the modelling included:

- The total cost of the scenarios meeting the EPS ranged from £405 million to £645million per year, with the largest proportion of the scenarios costing between £550 million and £625 million per year. This can be compared to London's 2008/09 municipal waste management bill of £580 million, and the projected £680 million annual municipal waste management costs if no waste management improvements are made.
- The EPS can be achieved using a range of recycling and composting collection services and performance rates (between 25 – 60 per cent), and a range of technical

solutions to generate low carbon energy from non-recycled waste. Scenarios with higher recycling rates of high embodied carbon materials such as metals, plastics and textiles performed well against the EPS. Where recycling targets high embodied carbon materials, it leaves a higher organic component in the residual waste stream, which is beneficial for generating low carbon energy.

- Scenarios incorporating waste management technologies with high energy efficiency performed well against the EPS, particularly those generating both heat and power.
- Scenarios with SRF sent to cement kilns consistently performed well against the EPS. This is due to waste displacing fossil fuels (primarily coal) to generate heat in the cement manufacturing process. Generating heat in cement kilns using coal is nearly twice as polluting in carbon terms as using SRF. Cement kilns are not expected to play a significant role in the long term management of London's non-recycled waste however, as greater efficiencies can be achieved with other energy generation technologies. Cement kilns are also typically located long distances outside London, resulting in increased transport costs and providing no benefit to London's heat supply.
- Generally scenarios with untreated waste sent directly to thermal treatment facilities generating electricity only do not perform well against the EPS. This is because these facilities are generally configured in a way that produces electricity at relatively low efficiency, and because the untreated waste is generally more carbon intense than SRF due to its higher proportions of recyclable material, particularly mixed plastics.

The lifecycle methodological approach used to establish London's baseline performance and to develop the EPS has been independently peer

reviewed⁴. The peer review concluded that the methodology is fit for purpose for developing the EPS, and recommended a number of improvements that have been incorporated into developing the EPS for this strategy. These improvements present no significant change to the overall approach for meeting the EPS, and include:

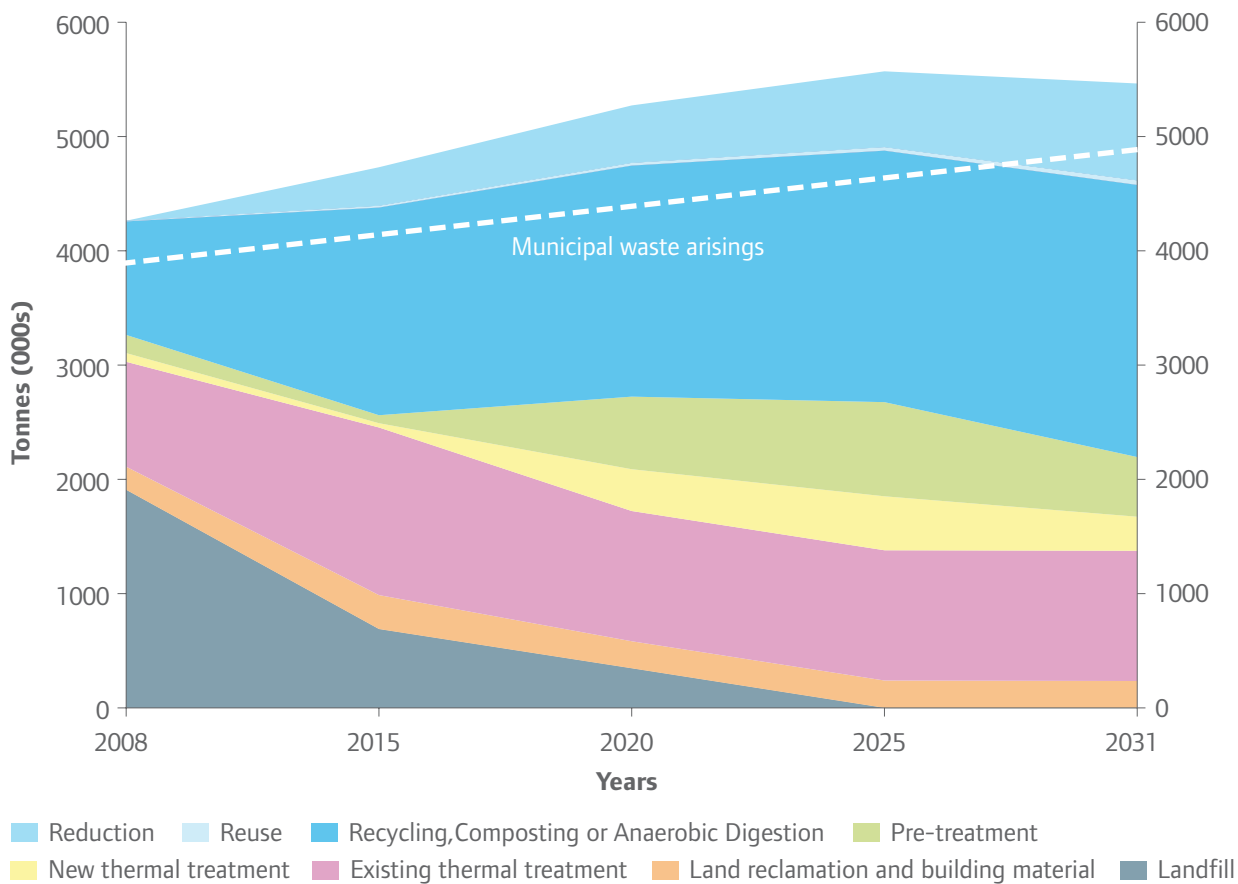
- accounting for transport emissions from municipal waste management activities
- greater clarity how the EPS will be implemented and London's performance against it monitored
- using the latest information and guidance produced by the Department of Energy and Climate Change (DECC) for accounting for CO₂ emissions from energy generation in the UK
- reviewing the EPS on a regular basis to recognise any changes in lifecycle modelling methodology and revisions to reporting CO₂eq emissions from waste management activities.

The full economic modelling reports used to inform the Mayor's preferred approach can be found in Appendices 4a and 4b. Further detail on the operation of the EPS and the environmental performance of waste management activities is set out in Chapter 4, Policy 2 and Appendix 4c. The report on the independent review of the methodology used to develop the EPS can be found in Appendix 4d.

Developing a strategy for London's municipal waste management

The Mayor's targets set out in the Executive Summary to this strategy have been set based on a combination of the economically appraised waste management scenarios and the environmental performance of waste management options, including their impact on climate change. From here the Mayor's preferred approach is determined for managing London's municipal waste to 2031.

Figure 12 The Mayor's preferred approach for managing London's municipal waste by 2031



Notes:

'Recycling, composting or anaerobic digestion' includes anaerobic digestion capacity for separately collected organic waste and recyclable material extracted from pre-treatment processes.

'Pre-treatment' refers to processes such as mechanical biological treatment and autoclave that recover materials for recycling and prepare a solid recovered fuel (SRF) from remaining waste for energy generation.

'Existing thermal treatment' refers to London's existing incineration capacity including the Belvedere incinerator expected to be operational in 2011.

'New thermal treatment' refers to advanced conversion technologies gasification and pyrolysis. It could also include incineration of high-biomass waste generating heat and power.

As some waste is expected to go through several processes (for example, pre-treatment), the overall capacity required is greater than total waste arisings.

Modelling used to inform the Mayor's preferred approach is indicative only and focuses on a number of sensitivities and assumptions including waste arising projections, waste flows, collection methods, and improvements in recycling or composting performance. In implementing this strategy the GLA will continue to update the modelling annually to reflect changes in London's municipal waste position.

See Appendix 5 for key assumptions of waste flows and waste sources.

Source: GLA, 2011.

London's municipal waste is expected to increase from approximately four million tonnes in 2008/09 to about five million tonnes in 2031 without any intervention. Figure 12 illustrates the Mayor's preferred approach for managing London's municipal waste to 2031. Chapter 4 of this strategy sets out the amount of current and planned municipal waste management infrastructure in London, and sets out the estimated additional waste management infrastructure capacity required to implement the Mayor's preferred approach.

Policies 1 to 5 in this strategy set out how London can achieve the Mayor's preferred approach, with a strong focus on waste reduction and developing the new waste management infrastructure that London needs to improve its recycling and composting performance and become more self-sufficient in its municipal waste management. In achieving the Mayor's preferred approach it is assumed that:

- There will be no increase in household waste generated between 2009 and 2031. The Mayor hopes his waste reduction policy and proposals will off-set any growth in household waste, despite an expected 22 per cent increase in the number of households in London. Implementing the Mayor's waste reduction policy and proposals will result in approximately 850,000 tonnes less waste produced than that would otherwise require management by 2031. A particular focus will be on reducing the amount of waste produced per household (Policy 1).
- The amount of waste reused each year will increase from approximately 6,000 tonnes in 2008/09 to about 30,000 tonnes a year by 2031 (Policy 1).
- Diverting municipal waste from landfill by increasing reuse, recycling and composting, and generating energy from non-recycled municipal waste more efficiently will achieve significant CO₂ savings, resulting in a carbon positive outcome (Policy 2) and will better capture the economic benefits of London's municipal waste management for London (Policy 3).
- There will be a step change in London's municipal waste recycling or composting performance to achieve 45 per cent performance by 2015, 50 per cent by 2020 and 60 per cent by 2031 (Policy 4), coupled with an increase in pre-treatment waste management infrastructure discussed below. The waste management infrastructure to sort and process London's recyclable and organic waste will need to more than double in capacity from approximately 850,000 tonnes per year in 2011 to 1.8 million tonnes per year by 2020 to achieve 50 per cent recycling or composting performance. Most of this capacity will be necessary by 2015.
- There will need to be a significant increase in new waste management pre-treatment capacity to recover as many materials as possible for recycling from mixed waste, with the remaining waste turned into fuel for low carbon energy generation. This capacity will need to increase from approximately 250,000 tonnes per year in 2011 to about one million tonnes per year by 2031.
- The overall capacity available for thermal treatment energy generation capacity will increase from approximately 1.4 million tonnes per year in 2011 to about 1.9 million tonnes in 2025, with a particular focus on combined heat and power (Policy 5). The Mayor's preferred approach assumes new thermal treatment capacity to generate low carbon energy that will help to meet his EPS, and is keen to encourage advanced conversion technologies including gasification and pyrolysis that can achieve high energy efficiency.
- Demand for thermal treatment capacity is expected to decline from 2025 as recycling

and composting performance increases, reducing the quantity of mixed waste requiring treatment (Policy 5).

- With the exception of the Belvedere incinerator, it is assumed there will be no more incinerators in London, and that the Edmonton incinerator will close by 2021, having reached the end of its life. The Mayor expects London's incinerators to be making use of the waste heat generated by 2031 and moving towards the incineration of treated, non-recycled waste only (Policy 5).

The Mayor's policies and proposals will put London on the path to achieving zero municipal waste to landfill by 2025, particularly with respect to untreated waste to landfill. Some of this waste, such as incinerator bottom ash and other wastes from treatment processes are already used as building materials and for land reclamation and these amounts are expected to increase slightly by 2031. Today landfill is the only suitable disposal method for some wastes such as asbestos and contaminated mixed waste. The Mayor expects that the amount of municipal waste that is currently only suitable for landfill (about 10 per cent) will decline as waste treatment and generation technologies improve.

Implementing the Mayor's municipal waste management strategy will ensure London is well placed to meet the challenges for managing the capital's municipal waste in ways that reduce its environmental impacts and better capture the economic benefits this resource presents. London will be a world leader in driving forward innovative waste management solutions, and is well positioned to respond in a positive way to policy announcements made by the government in its 2011 national waste management review. In particular it will be able to respond in a positive way to the shift towards using carbon accounting techniques alongside weight

based targets, to a potential landfill ban on certain waste materials, to potential increased recycling targets for packaging materials, and to drive towards generating low carbon energy from non-recycled waste as a way to make an important contribution to national CO₂ reduction targets.

CHAPTER FOUR

THE RATIONALE FOR THE MAYOR'S APPROACH

Reducing the environmental impact of London's municipal waste

There are a number of reasons why we need to manage our municipal waste more effectively and efficiently. The rising cost of landfill, growing concerns around energy security and climate change, the emergence of new commercially available waste management technologies, and changing consumer behaviour have all made a 'business as usual' approach no longer viable.

Climate change is a key driver for London's municipal waste management policy. Sending waste to landfill generates greenhouse gas emissions – particularly biodegradable waste, such as food, garden waste, paper and card, which releases methane (a powerful greenhouse gas) as it decomposes. London's sends about 1.8 million tonnes of municipal waste to landfill each year releasing approximately 460,000 tonnes of greenhouse gas emissions, expressed as a CO₂eq emission figure.

There is a massive opportunity for London to achieve significant CO₂eq savings by diverting more municipal waste away from landfill. This will also reduce energy bills, create economic value and increase energy security. Most of the waste we throw away could be reused, recycled or composted, or used to generate renewable energy, which would achieve significant CO₂eq savings. By first reducing the amount of municipal waste produced and then selecting the optimal means for dealing with the municipal waste sent to landfill, London could save approximately one million tonnes of CO₂eq emissions each year, resulting in a 1.5 million tonne net positive carbon outcome. This is because reusing, recycling or composting, or generating energy from waste not only saves emissions from landfill (direct emissions), it also avoids indirect emissions that would have otherwise occurred in manufacturing from virgin

materials or generating energy using fossil fuels (such as coal or gas). The net effect would be a substantial positive carbon outcome from London's municipal waste management.

Considering direct and indirect emissions is a common approach for determining the overall lifecycle CO₂eq performance of waste management. A lifecycle approach allows us to better understand how waste can positively contribute to climate change mitigation by focusing on the management methods that achieve the greatest CO₂eq savings as a whole.

Tables 3a and 3b show the potential lifecycle CO₂eq performance of different waste management methods for various waste materials. Negative figures in red text represent CO₂eq emissions avoided that would otherwise have occurred in manufacturing from virgin materials, sending waste to landfill, or generating energy using current UK energy grid mix. The UK grid mix is dominated (80 per cent) by energy produced from fossil fuels, such as coal and gas, and therefore has a greater 'carbon intensity' than, for example, methods of generating energy from food waste and wood, which are deemed to be 'carbon neutral'.

The figures in Tables 3a and 3b can help identify the optimal treatment methods for each material. For example, the optimal treatment method for food waste, after waste reduction, is anaerobic digestion. Each year London sends approximately 460,000 tonnes of municipal food waste to landfill¹. By applying the lifecycle emission factor for landfill given in Table 3a, it can be seen that this waste releases approximately 137,000 tonnes of CO₂eq each year. Using food waste to generate renewable energy instead, through anaerobic digestion, would save about 175,000 tonnes of CO₂eq a year. This figure represents the combined emissions saved from both landfill diversion

Table 3a Lifecycle CO₂eq performance (expressed in kg CO₂eq per tonne of waste)

Waste Material	Waste prevention	Recycling (closed loop ¹)	Anaerobic digestion (generating electricity only)	Composting	Landfill
Paper and card	-950	-299			407
Kitchen/food waste	-2428		-83	-47 ²	297
Garden/plant waste	-89		-83	-42 ³	297
Wood	-256	-1			1139 ⁴
Textiles	-19294	-4372			213
Plastic (dense)	-3100	-1182			11
Plastic (film)	-2500	-1000			5
Metals (ferrous)	-3100	-1623			3
Metals (non-ferrous)	-11000	-10721			4
Glass	-840	-169			3
Mixed waste ⁵					260

Source: WRATE 2 emission factors, Environment Agency, August 2011.

1 Closed loop recycling refers to recycling materials back into their original form and use; for example, recycling glass back into glass instead of recycling it into aggregate.

2 In-vessel composting (IVC)

3 Open windrow composting (OWC)

4 Discussions with the Environment Agency have clarified that the emission factor assigned to wood when sent to landfill represents an error within WRATE 2. It has been presented here as it is what remains in the current version of WRATE 2.

5 Based on a residual mixed waste composition that would be expected with a 25 per cent recycling and composting rate.

(137,000 tonnes) and from energy that would otherwise have been generated (38,000 tonnes) using the current UK energy grid mix.

Table 3b provides ‘material-specific’ emission factors associated with sending one tonne of material for energy generation using the thermal treatment waste management technologies gasification and incineration, as modelled for this strategy. In reality it is very unlikely, aside from in the case of wood, that such facilities will ever process individual material streams in this way. It is far more likely that they will be combined as part of a mixed waste stream. However it is useful to refer to the figures in Table 3b to understand how the different materials within a mixed waste stream would perform in CO₂eq terms.

Table 3b shows that food waste and other biodegradable waste materials including paper/card, food waste, green garden waste and wood used in thermal treatment waste management facilities perform well in CO₂eq saving terms. Conversely thermal treatment of plastics and textiles produce significant CO₂eq emissions. This is due to these materials having high embodied carbon which is released during the energy conversion process.

Table 3b also highlights the potential additional CO₂eq savings that can be achieved when thermal treatment facilities operate in combined heat and power (CHP) mode. The benefits of CHP, and of different thermal treatment technologies are discussed later in this chapter,

Table 3b Lifecycle CO₂eq performance (expressed in kg CO₂eq per tonne of waste)

Material	Incineration		Gasification (Gas Engine) ¹		Gasification (Steam Turbine) ¹		Landfill
	Electricity only	CHP	Electricity only	CHP	Electricity only	CHP	
Paper and card	-164	-364	-36	-515	-257	-288	407
Food waste	-2	-65	-88	-137	-56	-65	297
Garden waste	-19	-95	-116	-175	-76	-88	297
Wood ²	-29	-596	-572	-809	-414	-462	1,139
Textiles	486	226	245	44	379	338	213
Plastic (dense)	1,521	1,069	1,125	776	1,358	1,288	11
Plastic (film)	1,346	959	1,006	707	1,206	1,145	5
Residual Waste ³	57	-93	-3	-113	8	-57	26

Notes:

- 1 It should be noted the figures presented are for ‘standalone’ gasification, that is not including any upfront MBT (pre-treatment) of waste.
- 2 Discussions with the Environment Agency have clarified that the emission factor assigned to wood when sent to landfill represents an error within WRATE. It has been presented here, however, as it is what remains in the current version of WRATE
- 3 Based on the residual waste composition that would be expected with a 25 per cent recycling and composting rate

under the section *Treatment of unsorted waste through energy generation*.

Tables 3a and 3b can give an indication of the emissions generated or avoided by each waste management method. The true performance will depend on many factors, including the quality of the waste materials, the composition of waste going for treatment, and the configuration and performance of waste management facilities. All of these need to be taken into consideration.

Implementing the waste hierarchy

The Mayor’s vision for the management of London’s municipal waste is guided by the waste hierarchy developed by the EU Waste Framework. UK waste authorities are required to implement the waste hierarchy when undertaking their waste management functions. The waste hierarchy should be

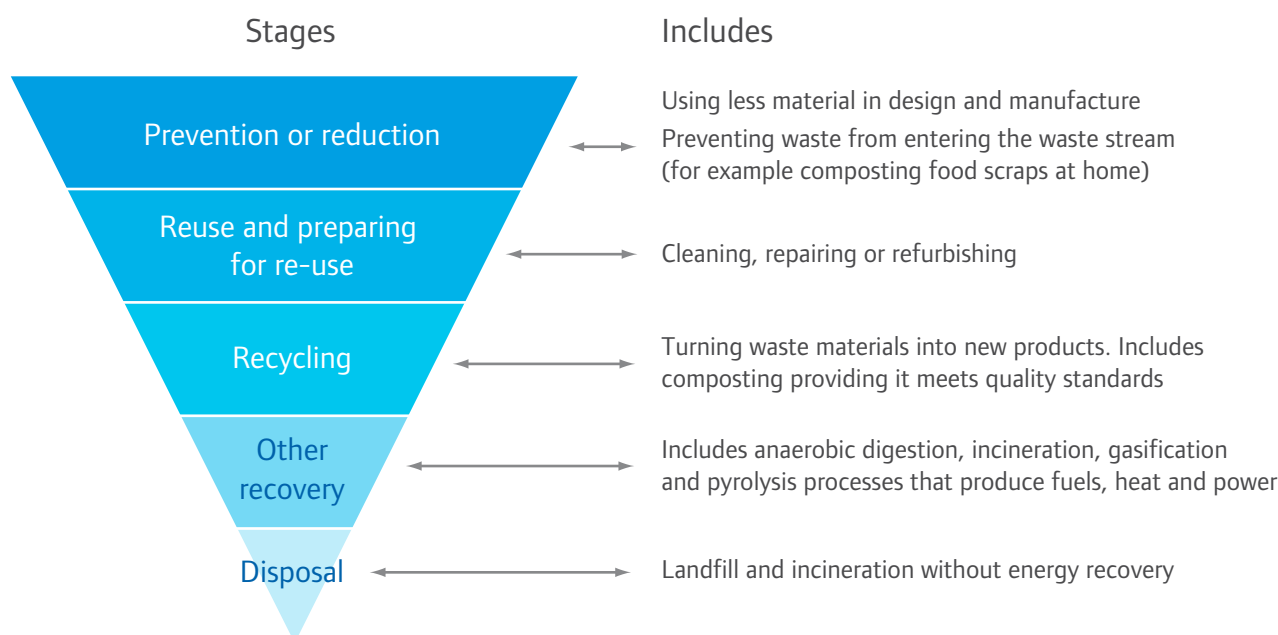
applied in sequence from the top down where it results in the greatest environmental benefits.

Generally, applying the waste hierarchy will achieve the greatest CO₂eq savings. However, there are certain circumstances where the waste hierarchy conflicts with achieving the greatest climate change mitigation benefits. For example, depending on the condition of wood, it may be better to generate energy using wood waste rather than to recycle it. In these cases, waste authorities should aim to take the approach that will deliver the greater climate change mitigation benefits.

Reduction or prevention

Waste reduction, or prevention is by far the most cost-effective and environmentally beneficial way to reduce the impact that waste has on the environment. There are two main aspects to this:

The Waste Hierarchy



Source: Government Review of Waste Policy in England, June 2011.

- improving London's resource efficiency – reducing or preventing waste minimises the demand for new resources and energy, reducing the size, costs and environmental impact of waste treatment and disposal facilities
- reducing the contribution of waste to London's CO₂eq emissions – notably methane from landfill sites but also CO₂ (a benefit of more reuse and recycling).

By reducing the amount of municipal waste produced each year by only one per cent, London could save around £5.8 million in waste management costs and 73,000 tonnes of CO₂eq emissions.

Preparing for reuse and reuse

Preparing for reuse and reuse should then be considered, because it reduces demand for both new and reprocessed materials, avoiding their associated production costs and environmental impacts. Preparing for reuse – checking, cleaning or repairing products or parts of products so that they can be re-used – plays an important role

in ensuring high quality materials are produced from discarded materials. Reuse and preparing for reuse also deliver substantial value in the form of local employment and training, as well as in the local distribution of items to people in need of support, helping to alleviate poverty.

Voluntary and community groups (third sector groups) have in the past been the pioneers of reuse. The reuse sector in London employs about 450 staff and 1,500 volunteers and trainee placements. In 2008, 16,000 households living in poor conditions were helped by the provision of reusable furniture and appliances, after referrals by social workers and housing officers.

The Third Sector Reuse Capacity Report 2007 (Reuse Capacity Report)² undertaken by the London Community Resource Network (LCRN) for the GLA estimates London's households throw away 1.7 million reusable household items every year (mainly bulky waste such as furniture, appliances and small household effects). More

recent research³ undertaken by LCRN of the reuse tonnage available in London shows at least two-thirds of London's annual bulky waste stream (65,000 tonnes) is reusable. However LCRN estimates that only about ten per cent (or 6,000 tonnes) of this perfectly good material is collected. The greatest reuse opportunities exist for capturing a greater proportion of household bulky waste and old office equipment.

The reuse sector is keen to do more but faces a number of barriers. The Reuse Capacity Report identified the following key barriers faced by the third sector to providing effective reuse services:

- insufficient funding, often under short-term arrangements (typically year to year) making it difficult to secure long-term contracts
- insufficient skills and capacity – many are volunteer-based services, focusing more on delivering social services and not contract and business development
- insufficient storage space despite a full stock of donated materials
- low visibility of reuse and the lack of publicity about reuse options, which are limiting demand
- significant market weaknesses, identified in both the supply and demand side of reuse, with less than ten per cent of items that could be reused in London captured, and less than five per cent of households in need of affordable furniture, appliances and other vital equipment accessing reuse services.

Without a centrally co-ordinated operational reuse network in London, most reuse organisations are unable to tackle these problems.

Recycling (includes composting)

Following reduction and reuse, preference should then be given to recycling or composting at source. As shown in Table 3a, recycling common household items, particularly plastics, metals, paper/card and textiles, achieves

significant greenhouse gas savings. This is also true, to a lesser extent, of glass and wood.

Particular opportunities exist for treating London's municipal food waste using anaerobic digestion. Anaerobic digestion breaks down organic material (food and green garden waste) in the absence of oxygen, producing a compost material⁴ that can be used as a fertiliser substitute in gardens, parks and farms. Anaerobic digestion also produces biogas that can be burnt in a gas engine or linked to hydrogen fuel cells to generate renewable energy (see the *Energy generation* section below).

To achieve higher recycling and composting performance, the Mayor believes recycling and composting needs to be easy for Londoners to do, whether they are at home, in the workplace or on the street.

Boroughs need to be able to offer a core set of waste collection, recycling and composting services, irrespective of where Londoners live or work, and the type of property they occupy. The Mayor supports waste authorities setting high recycling and composting targets to ensure London makes an effective contribution to achieving the 50 per cent national household waste recycling and composting target by 2020 as required by the Waste Framework Directive. The Mayor wants London to go further than the national target and has set an aspirational 60 per cent municipal waste recycling and composting target by 2031. Although this poses a big challenge, the proposed targets match those set by the South London Waste Partnership and West London Waste Authority for their constituent boroughs. Together, they represent a third of London's municipal waste authorities.

Once reduction, reuse and recycling and composting activities at source have been

exhausted, the waste remaining (residual waste) should be treated to recover as much additional recyclable material as possible, particularly seeking to recover those materials with high embodied carbon such as plastics, cans and textiles. This can be done using pre-treatment technologies such as autoclave, a steam sterilisation process that enables the different materials to be sorted more easily, and mechanical biological treatment (MBT), where a combination of mechanical and biological treatments separate certain elements of the waste.

Such technologies are important if the best climate change mitigation benefits are to be achieved for London. Research⁵ undertaken for the GLA found that untreated mixed waste being used for energy generation had the greatest climate change impact after landfill as a waste treatment method. Recycling offered a much better environmental outcome in terms of CO₂eq savings. It also showed the importance of using pre-treatment technologies to produce SRF for energy generation from the remaining non-recycled waste. Generating energy from SRF with a high biomass content achieves the greatest CO₂eq savings, as well as opportunities for securing renewable obligation certificates (ROCs).

Renewable Obligation (RO)

The RO is the main government programme for delivering renewable electricity. Energy companies are required by law to generate a proportion of their electricity supply from renewable sources. Renewable obligation certificates (ROCs) are issued to show compliance. Energy generators can sell their ROCs to energy suppliers (such as EDF or Scottish Power) to receive a premium on top of income from electricity generated. As of April 2010 the RO only applies to generating installations of 5MW generating capacity or higher.

Energy generation

The waste hierarchy dictates that once reduction, reuse and recycling options have been exhausted, non-recycled waste left over should then be used to generate energy. However generating energy from waste needs to be considered from a resource management perspective, not from a waste disposal perspective. Preference should be given to using facilities and technologies that generate energy (including transport fuel) in a way that is equal to or less carbon polluting than the same amount of energy that would otherwise have been generated, for example energy generated using fossil fuels coal, gas and diesel.

This should be done using a process that is eligible for ROCs. Particular opportunities exist for waste facilities where both heat and power generated are used. Heat makes up two-thirds of energy generated in thermal treatment technologies, so capturing waste heat greatly improves the overall efficiency of these facilities and avoids emissions that would otherwise have occurred from generating heat using fossil fuels. Table 3b shows significant CO₂eq savings can be achieved using energy generation technologies operating in combined heat and power (CHP) mode.

Preference should also be given to those technologies with the greatest electrical efficiencies and fuel flexibility. Significant opportunities exist for using advanced conversion technologies including anaerobic digestion, gasification and pyrolysis. These technologies are increasingly gaining acceptability in the market and are becoming commercially available at large scale. Greater take-up of these kinds of new technologies is essential as they can achieve higher efficiencies, and can achieve lower CO₂eq emissions than incineration as indicated by the figures in Table 3b.

The gas fuels produced by advanced conversion technologies can be burnt to produce steam, used as a fuel for gas engines or used in hydrogen fuel cells to generate renewable energy. There is also a developing opportunity to inject clean waste-derived gas into the gas grid network which, given London's extensive gas network, is a real opportunity. Incineration can only produce electricity through the production of steam at electrical efficiencies of around 25–28 per cent. Gas engines can produce electrical efficiencies in the region of 30 per cent or above, while fuel cells can be in excess of 50 per cent efficient.

In addition to making carbon savings, optimising the treatment of waste can also contribute significantly to a reduction in London's energy bill. Based on the wholesale cost of electricity and gas, London's municipal waste after maximising recycling could contribute £92 million of savings to London's £4.4 billion electricity bill and take £24 million off London's £2.5 billion gas bill⁶.

Disposal of waste to landfill

This is the last and least desirable waste management option and one that is becoming increasingly unacceptable. Biodegradable waste sent to landfill produces methane, a greenhouse gas 21 times more potent than CO₂. Non-biodegradable waste sent to landfill is removed from the resource chain and becomes a wasted commodity.

In the short to medium term, the Mayor expects landfill will continue to play a part in the management of certain types of waste, such as asbestos, where landfill is currently the most appropriate means of disposal.

Energy generation, and pre-treatment processes such as MBT and autoclave, also produce reject or inert residues (for example, rubble, and

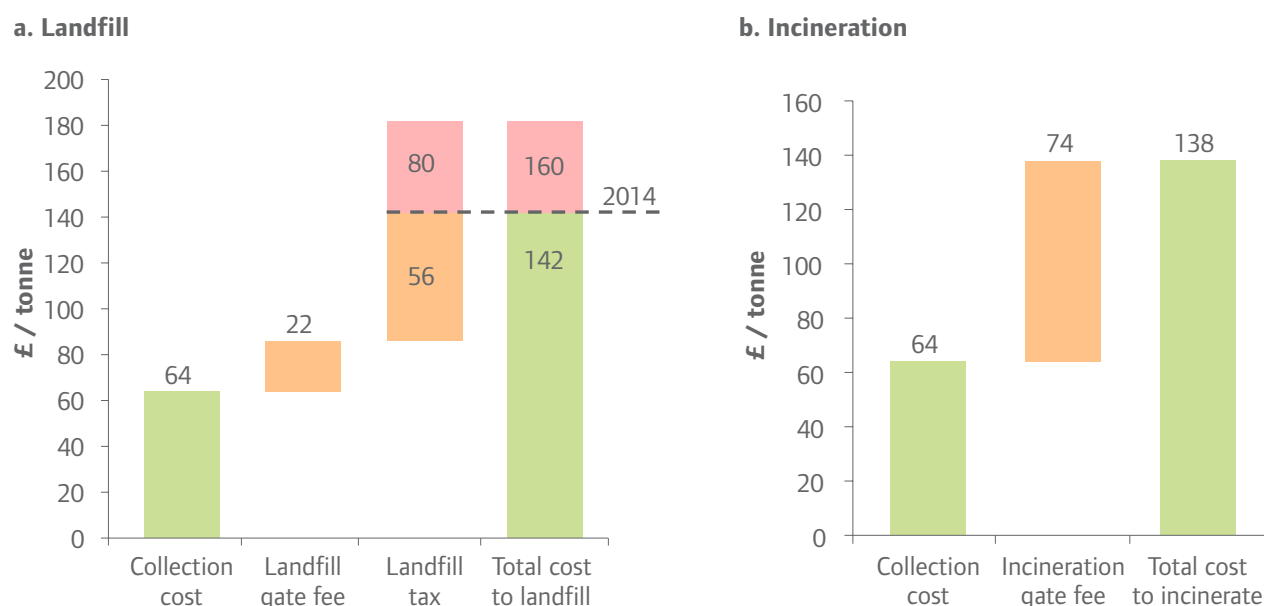
contaminated silt and glass) where landfill is currently the only suitable treatment option. Material currently only suitable for landfill makes up about ten per cent of municipal waste. It is expected this fraction will decrease over time as technologies improve to be able to recover more value from this waste. However the focus now needs to shift from landfilling unsorted, untreated waste containing recyclables and organic waste to the disposal of reject and inert residues from recycling, energy generation and other treatment processes.

It is costing London too much

The second biggest driver for change is the increasing cost of managing our waste, mainly due to the rise in landfill tax. The total cost to London of managing its municipal waste, including the collection, transport, treatment, and final disposal activities, was approximately £580 million in 2008/09⁷. This figure represents about 20 per cent of London's total council tax bill of £2.98bn. The average annual household council tax bill in London is £1,212 and therefore waste management represents £242 for the average council tax payer.

Waste authorities must pay fees to have waste collected (collection costs) and then pay for waste that is not reused, recycled or composted to be accepted at landfill sites or incinerators (landfill and incineration gate fees). A tax is then applied to waste disposed to landfill. These costs are shown in Figure 13.

The main effect the landfill tax has had from 2004–2011 is to make the cost of recycling (including collection costs) cheaper than landfill – approximately £109 per tonne for recycling compared to £142 per tonne for landfill. The 2011 landfill tax rate is £56 per tonne. This will increase by £8 each year until at least 2014, when it will be £80 per tonne. This will raise London's annual bill for sending municipal waste

Figure 13 Collection costs and landfill and incineration gate fees

Note: Landfill tax at £56 per tonne in 2011, rising £8/tonne per year to £80 by 2014

Source: Economic Modelling for the Mayor's Municipal Waste Management Strategy, 2010; London Borough Survey, GLA, 2009. Typical collection costs based on interviews with waste authorities. Individual waste authority costs will vary. WRAP Gatefees report 2010.

to landfill from about £265 million in 2008/09 to roughly £300 million. Landfill tax has also made the cost of energy generation from waste more comparable to landfill and in some cases more commercially attractive, depending on contractual arrangements.

Defra has also revised the definition of municipal waste to include a lot more commercial waste to make sure the UK is meeting its landfill diversion targets under the European Landfill Directive. Implementing these new measures will put considerably more pressure on local authorities, communities and businesses to manage their municipal waste better to reduce costs. More information on the revised definition of municipal waste can be found at www.defra.gov.uk.

As with landfill and incineration, most waste authorities also incur collection costs and gate fees with the processing of recyclable materials. These costs will be lower for the small number

of waste authorities that have a share in waste treatment facilities or have revenue-share entitlements worked into their contracts.

Table 4 sets out indicative prices for the most common recovered materials, indicating the significant revenue potential. It is difficult to express exact figures as prices are subject to market fluctuations. Figure 14 shows average annual prices for recycling materials has been on the increase from 2002 to 2010, particularly for textiles and to a lesser degree mixed plastic bottles. The market for recycled mixed paper and glass has been relatively static during the same period, with a slight increase in mixed paper prices between 2009 and 2010. Typical recycling collection and gate fee costs and potential revenue are shown in Figure 15.

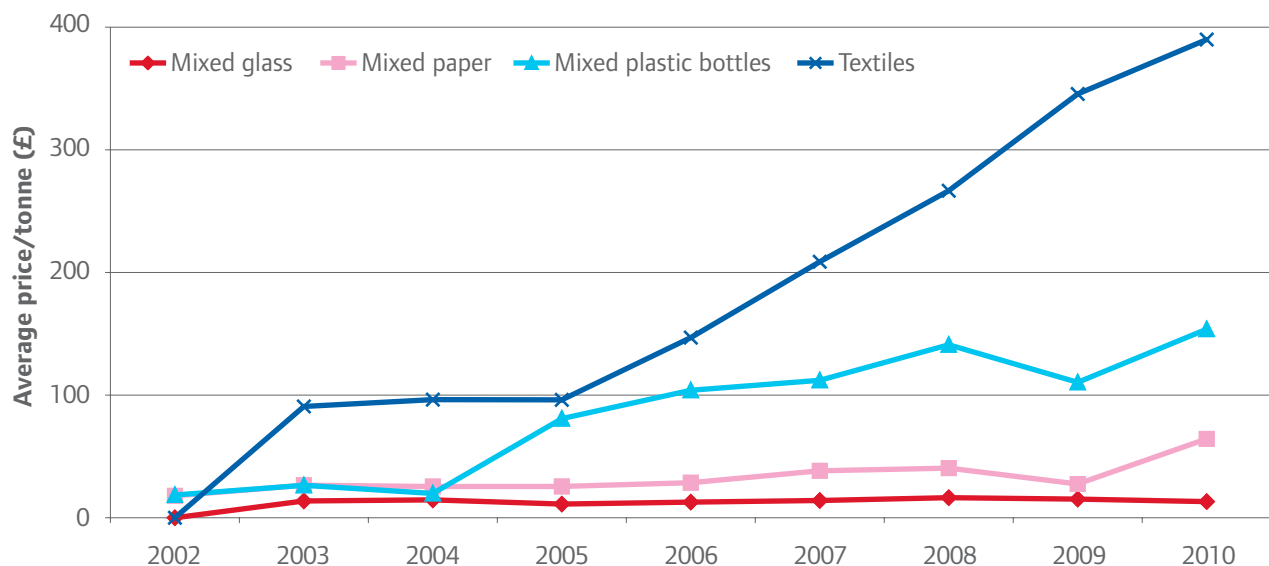
Recycling collection costs have traditionally been higher than residual waste collection costs because:

Table 4 Average prices paid for common recyclable materials

Material	Price per tonne
Mixed paper	£55
Mixed card	£50
Mixed glass	£20
Plastic bottles	£110
Mixed cans	£142
Textiles	£200

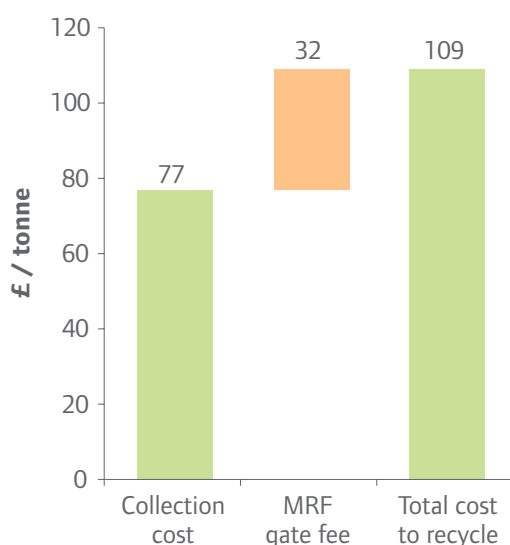
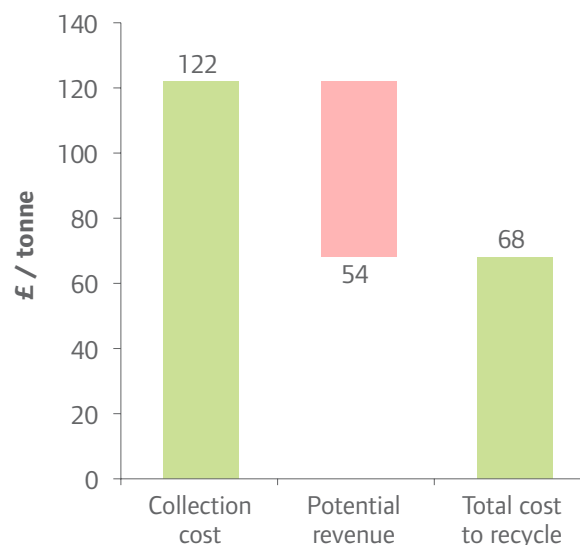
Source: Economic Modelling for the Mayor's Municipal Waste Management Strategy, Appendices Table 22, GLA, August 2010.

Figure 14 Annual average prices for recyclable materials 2002-2010



Source: www.letsrecycle.com

- volumes of recyclable materials per household have been lower than volumes of residual waste, so collection vehicles have to travel further to reach capacity
- collecting recyclable materials can require separate vehicles or multiple compartments within one vehicle to collect different materials
- compaction vehicles collecting recyclables compact less than those collecting residual waste and therefore carry less material by weight.

Figure 15 Typical costs to recycle waste**a. Co-mingled collection****b. Source - segregated collection**

Compared to typical landfill costs of £142/tonne and typical incineration costs of £138/tonne

Source: Economic Modeling for the Mayor's Municipal Waste Management Strategy, GLA, 2010; GLA Survey of Boroughs, 2009; WRAP Kerbside Recycling: Indicative costs and performance, 2008

Notes: Typical costs based on median values from WRAP. Individual waste authority costs will vary.

Figure (b) does not include sorting or bulking costs

Potential revenue is calculated using WRAP's recycled material prices and average waste composition analysis from Defra.

Mean revenue for source-segregated recycling is based on:

- 1 The average composition and weight of materials (paper, glass, plastics, cans) in household waste arisings, see Appendix 4a Economic Modeling for the Mayor's Municipal Waste Management Strategy, GLA, 2010.
- 2 The average price for materials (paper, glass, plastics, cans), see Appendix 4a Economic Modeling for the Mayor's Municipal Waste Management Strategy, GLA, 2010.

Waste contractual arrangements

To date the main focus of London's waste authorities has been to manage municipal waste as efficiently as possible and at minimal cost to the taxpayer. Traditionally this has been by adopting low-cost collection methods and outsourcing the treatment and disposal (usually sending it to landfill). One consequence of this approach is that sometimes waste authorities have not actively pursued the opportunity to generate income from their waste management activities.

This approach will not be the most cost-effective approach for much longer. The cost of waste management in London has increased

in recent years and will continue to rise for the foreseeable future, as changes in European and central government legislation are pushing up the cost of landfill. The decline of landfill space is exacerbating the problem.

Many waste authorities have not yet capitalised on the growing market for recycled materials, or on the demand for the energy that can be produced from waste because of this approach. Part of the problem lies in the fact that waste authorities have tended to enter in to long-term inflexible contracts, where the emphasis has been on a stable pricing structure. These contracts have rarely been linked to the revenue generated by private contractors from selling

on materials and generating energy from waste, partly due to legislation and partly due to a preference to outsource risk.

The Mayor believes that London is missing a huge proportion of the economic opportunity that municipal waste presents to the city. The data in Figures 13, 14 and 15 suggests there are significant savings to be made - in the region of £90 million⁸ per year – by managing municipal waste in the optimal way.

Waste authorities sharing the benefits

In most cases waste authorities do not own or have any share in waste sorting or reprocessing infrastructure, nor do they receive any revenue from recycled materials. There is an economic opportunity for waste authorities in getting hold of some or all of the potential revenue from recyclable material. Figure 15 (b) highlights potential revenue from recyclable waste of £54 per tonne for material collected separately at the kerbside, excluding any sorting or bulking costs (the costs of gathering material together). The precise level of revenue available to a waste authority will depend on whether they own and operate the sorting and bulking facilities or procure the services from a third party.

Organic waste collections

Based on initial analysis with some waste authorities, the cost of separately collecting and treating organic waste (food and green garden waste) stands at about £149 per tonne in 2010, which is broadly similar to collecting residual waste and sending it to landfill. Separate collections of organic waste, particularly food waste, which is particularly well suited to renewable energy generation using anaerobic digestion, will become more commercially attractive as landfill taxes increase. At the same time, energy generation will bring additional income through ROCs, the heat feed-in-tariff (FIT), and the Renewable Heat Incentive (RHI)

- government incentives to encourage the generation of power from renewable sources.

Feed in tariff (FIT)

The FIT is a financial support scheme to encourage the growth of renewable electricity capacity. The government requires that energy companies purchase electricity from renewable generators for a guaranteed price, which is significantly above the normal market rate. This gives micro-generation up to 50kW and renewable energy installations up to 5MW a guaranteed tariff for the electricity they generate and also for their electricity sales. The UK FIT came into force in April 2010.

Renewable Heat Incentive (RHI)

Both the RO and FIT only cover renewable electricity generation. From 2011 the RHI will support growth in renewable heat. It is expected that the incentive would apply to the generation of renewable heat at all scales, whether it is in households, communities or at an industrial scale.

The need to manage more of our municipal waste locally to be self-sufficient

Increasingly there is a need to manage waste closer to its source and reduce reliance on landfill. The counties surrounding London no longer want to landfill London's waste in their countryside and therefore the Mayor has set a net self-sufficiency target for the management of London's municipal and commercial waste of 100 per cent by 2031. In order to meet this, it is possible for London to offset waste exported outside the city by bringing waste in for processing.

This strategy does not deal specifically with regional self-sufficiency or how it is to be achieved as it is a planning issue dealt with in

the *London Plan*. This can be found at www.london.gov.uk. The key waste policies in the *London Plan* include:

- working towards zero biodegradable and recyclable waste to landfill by 2031
- Setting recycling/composting targets of:
 - 50 per cent for municipal waste by 2020, increasing to 60 per cent by 2031
 - 70 per cent commercial waste by 2020
 - 95 per cent reuse and recycling for construction, demolition, and excavation waste by 2020
- Promoting waste management activities achieving the greatest possible climate change mitigation and energy saving benefits
- Managing as much of London's waste within London as practicable, working towards managing 100 per cent of London's waste within London by 2031 and
- Borough level projections of London's waste arisings.

Today, about 40 per cent of London's municipal waste is bulked up for treatment or landfill outside London and, along with it goes the economic value of recovered materials for recycling or energy generation. London needs to invest in new waste facilities to manage more of its waste and reduce its reliance on outer regions, as well as retaining the value of its waste by making sure more of the reuse, recycling and energy generation stays within London.

LWARB was set up to help address this issue and attract private investment to new waste infrastructure projects. LWARB, chaired by a Mayoral appointee manages a £73.4 million fund provided by the GLA Group and Defra from 2008-2015. The objective of LWARB is to promote and encourage a reduction in waste and an increase in the proportion that is reused or recycled, as well as promoting methods of

collection, treatment and disposal of waste that are more beneficial to the environment.

More information about LWARB, including its members and funding priorities, can be found at www.lwarb.gov.uk.

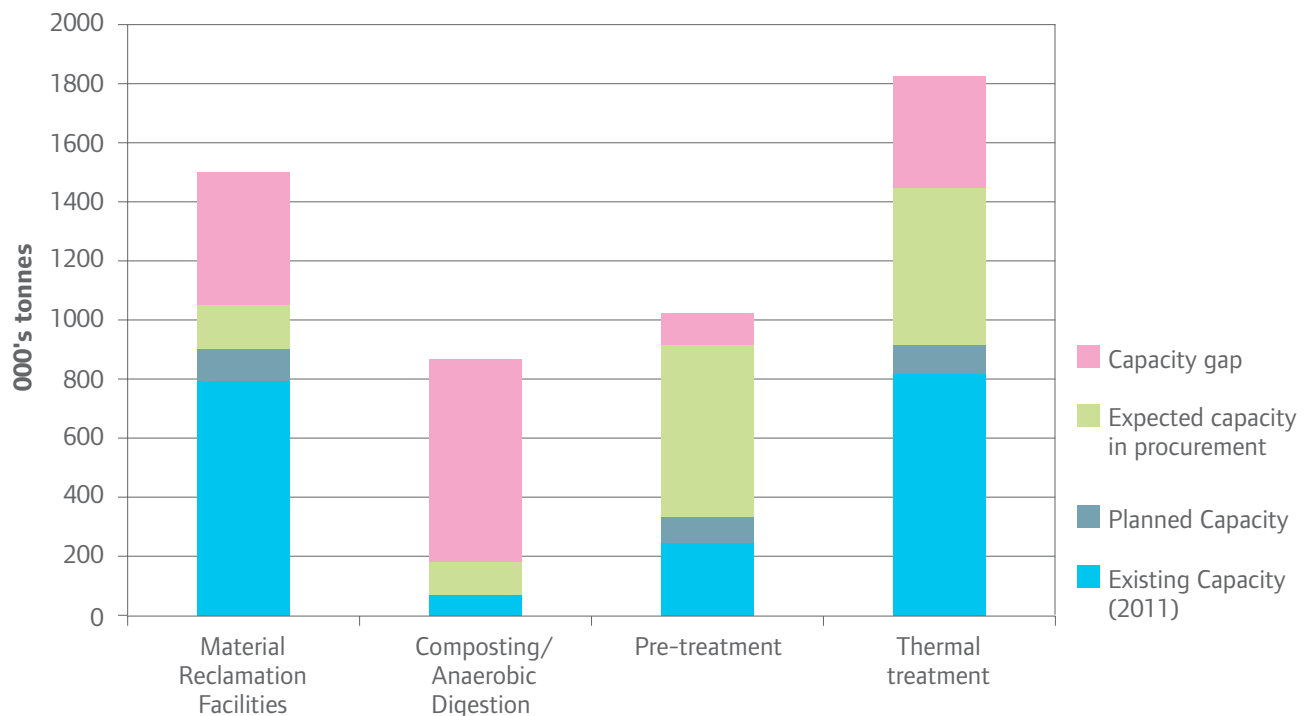
LWARB's remit covers municipal waste, commercial and industrial waste, and construction, demolition and excavation waste. The GLA has worked with LWARB to identify 'capacity gaps' between the Mayor's preferred approach for municipal waste management and known projects in development for all waste in London. The resulting focus of LWARB is set out in Figure 16.

It is estimated London needs an additional 3.3 million tonnes of municipal waste management infrastructure capacity by 2031. This includes approximately 1.7 million tonnes of municipal waste management infrastructure the GLA is aware of that is in procurement or has been granted planning permission within London⁹. To develop that infrastructure, LWARB's funds alone will not be sufficient. Given the extent of the capacity gap and the capital cost associated with waste management infrastructure development, LWARB's fund is only capable of supporting partial fulfilment of the 'gap' requirements. LWARB will therefore take a targeted approach to the use of its funding to make sure the identified capacity gaps are narrowed as much as possible.

It is estimated London needs the additional municipal waste management infrastructure capacity in order to implement the Mayor's preferred approach for managing London's municipal waste to 2031, and, in particular, to:

- achieve zero municipal waste sent directly to landfill by 2025

Figure 16 Estimated additional waste infrastructure capacity required to manage London's municipal waste to 2031



Source: GLA, waste authorities and London Waste and Recycling Board, August 2011. Final figures are subject to procurement and planning decisions to be made after 2011.

Note: 'Existing capacity (2011)' represents waste management infrastructure to treat London's municipal waste in 2011 that is expected to be available in 2031. It includes the Belvedere incineration capacity expected to be built in 2011. It does not include Edmonton incinerator capacity because this facility is expected to close in 2021.

- achieve the revised Waste Framework Directive target for recycling or composting 50 per cent of household waste by 2020
- achieve the Mayor's targets for municipal waste recycling or composting
- generate energy from as much organic and non-recycled municipal waste as practicable in a way that is no more polluting in carbon terms than the energy it replaces.

It is estimated that the total infrastructure investment required for London's municipal waste management could have capital costs in the region of £800 - 900 million¹⁰ and annual operational costs of £60 -70 million. At the time of publishing this strategy LWARB had committed to making loans to five infrastructure projects totalling £24 million. These projects will

deliver a total of 365,000 tonnes of additional waste management capacity, of which 100,000 tonnes will be supplied by contracted local authority collected municipal waste. The remainder will come from a range of local authorities and businesses who have yet to sign contracts. More information on LWARB's project portfolio can be found at www.lwarb.gov.uk.

Figure 16 shows London's existing (as at 2011), planned, and required municipal waste management infrastructure capacity to implement the Mayor's Municipal Waste Strategy. Figure 16 shows an infrastructure capacity gap of approximately 1.6 million tonnes by 2031. More detail on London's existing and planned municipal waste management infrastructure is set out in Table 1 in Appendix 3.

The funding for new waste management infrastructure to fill the capacity gap will need to be met by a mixture of public and private investment. It is evident through LWARB's project portfolio that the waste industry is keen to help fill London's waste management capacity gap, but significant additional investment is necessary from banks and other financial institutions to fill the market. It is essential LWARB continues to receive funding from the government beyond 2015 to develop projects currently in the pipeline, to give certainty to the market, and to leverage in additional funding for further projects that will help fill the capacity gap. There are currently a number of funds to leverage investment from, which could contribute to developing waste management infrastructure in London, including the London Green Fund (£114 million). More information on how LWARB is working with the London Green Fund can be found in Policy 3.

The GLA expects an additional 24,000 tonnes of reuse capacity will also be required by 2031 in order to meet the Mayor's reuse target. The greatest opportunities are for reusing items direct from households (that is, donations), local authority bulky waste collections, and reuse and recycling centres.

With the exception of the Belvedere incinerator, expected to open in 2011, the modelling used for Figure 16 assumes there will be no more additional incinerators in London. The modelling further assumes that the SELCHP (South East London Combined Heat and Power) incinerator will only operate until 2031¹¹ and the Edmonton incinerator will close by 2021¹².

The GLA estimates that approximately 380,000 tonnes of new capacity for thermal treatment will be required for municipal waste by 2031, and that this capacity will be met through new technologies producing both heat and power.

Finally, the modelling used for Figure 16 assumes that, as recycling and composting performance increases, the demand for material reclamation facilities will also increase. By contrast, it assumes a continued increase in recycling and composting will ultimately lead to a decline in the capacity needed for the pre-treatment of waste and its use for energy generation over the longer term (although there will initially be a significant period of increase).

Contributing towards decentralised energy generation

A number of factors are coming together to drive forward changes in how we use and supply our energy. There are rising concerns about the carbon intensity of our energy supply, energy security, long-term increases in fossil fuel prices and a growing awareness that global fossil fuel resources are finite. Today, virtually all our electricity is produced from large, fossil fuel-powered power stations outside the capital and these stations fail to capture and make use of the waste heat created during the production processes. This, in combination with transmission and distribution losses, means that conventional power stations have an efficiency of around 35 to 55 per cent.

By contrast, locally produced CHP generating facilities are around 80 per cent efficient. Increasing decentralised CHP facilities using waste reduces CO₂ emissions by avoiding the need to generate heat from fossil fuels, gets rid of costly transmission losses, cleans up the source of power, and gives London more control over its own energy supply.

Decentralised energy will play an important part in helping London meet its 60 per cent CO₂ reduction target by 2025 by reducing the carbon intensity of the energy that London consumes. The Mayor has set a target for London to generate 25 per cent of its energy requirements

in work places and homes from low-carbon decentralised energy by 2025. Generating energy from London's organic and non-recycled waste (including commercial waste) will make an important contribution towards achieving this target.

Today, only about a fifth of London's municipal waste (920,000 tonnes) is used to generate energy, the large majority of which is untreated waste sent to incineration, generating electricity only at efficiencies of around 21 per cent. London's waste is a resource and, once recyclable materials have been removed from the waste stream, the remaining materials in the waste stream can be used to produce low carbon energy. This is estimated to be around 1.5 million tonnes or just under 40 per cent of total municipal waste produced once the Mayor's recycling or composting targets have been achieved. Policy 2 sets out the Mayor's plans for generating low carbon energy from London's non-recycled waste.

Decentralised energy generation

Decentralised energy generation is defined here as low carbon power and/or heat generated and delivered in London. London's non-recycled municipal waste, used as low carbon fuel, will play an important role in delivering the Mayor's decentralised energy targets. There are broadly four scales of decentralised energy system:

1. *Type 1 Micro-generation:* Generation systems are often mounted on or next to a particular building, supplying energy to a single user who usually owns the generation equipment; typically, renewable energy systems of a capacity up to 50 kilowatts of electricity (kWe).
2. *Type 2 Single development:* Energy is generated and sold to a single

development that may include a number of buildings and customers (up to around 3,000 domestic customers). The plant may or may not be owned and operated by the energy users. This would include smaller communal heating schemes, such as BedZed in Sutton. It would also include larger onsite networks with CHP generation equipment in the order of three Megawatts of electricity (MWe) capacity and project capital cost in the region of £10 million. The Cranston Estate regeneration project in Hackney is a typical example.

3. *Type 3 Multi-development (medium scale):* These supply energy to more than one site, for which district heat networks are a necessary requirement. A wide range of customers and demand types may be involved, with a number of different generation systems connected totalling up to 40MWe in capacity. This scale could support up to 20,000 homes, public buildings and commercial sector consumers. It is very likely that the plant would be owned and operated by a third party. The system could cost up to £100 million. The Southwark Multi-Utility Services Company (MUSCo) is a typical example.
4. *Type 4 Area wide (large scale):* These are large infrastructure projects with a lifetime of at least 40 years. Such schemes typically involve several tens of kilometres of heat pipe supplying 100,000 customers or more and providing connection to multiple heat generators such as power stations. Capital costs of piping would exceed £100 million. It is likely that separate bodies would own and be responsible for different parts of the system. Such systems can take from five to ten years to deliver. The planned London Thames Gateway Heat Network is an example.

Improving Londoners' quality of life

The UK has been branded the dirty man of Europe for too long. The UK gained this reputation for two reasons: firstly, for the amount of waste we send to landfill as a nation and secondly, for a perception that the UK has a problem with litter. The latter may be somewhat hard to establish, as there is no comparable data for Europe and the wider world.

We can, however, compare London's performance alongside the other English regions. Table 5 sets out the National Indicator 195 regional benchmarks for 2009/10. This indicator (NI195) measures the percentage of land surveyed that is of a poor or unsatisfactory standard of cleanliness for litter, detritus, graffiti and fly-posting.

Table 5 shows that London is currently ranked ninth out of the nine English regions for cleanliness when it comes to litter, detritus, graffiti and fly-posting when comparing NI195 scores represented as regional averages.

The cleanliness of London's streets also remains a key issue for Londoners. Results of the 2010 Annual Survey of Londoners¹³ showed that the most problematic issue affecting the quality of the environment in London were perceived to be litter and pollution from traffic, scoring equally highly (mentioned by 23 per cent of respondents each) with fly tipping coming third (17 per cent). When asked what the priorities for improving the environment in London were; pollution from traffic (mentioned by 22 per cent) ranked first, followed jointly by noise from traffic and fly tipping (21 per cent each) and then litter (20 per cent).

For visitors and commuters alike, the first impression of the cleanliness of London is its transport corridors and stations. London Councils has signed a Memorandum of

Understanding with Network Rail on improving the cleanliness of land adjoining Network Rail land and the Mayor is keen to see if this joint approach will improve London's transport corridors. Trains and tube cars are another area for attention, especially following the increase in the number of free newspapers in circulation. Newspapers left on trains and in tube cars tend to attract other litter, such as coffee cups.

Year after year, Local Environmental Quality surveys identify the most prevalent type of litter on London's streets as cigarette ends and other smoking-related litter, found in around 95 per cent of survey samples. Cigarette ends are not only unsightly but are often washed into London's watercourses during heavy rainfall, causing harm to fish and birds due to the leaching of toxic chemicals. The Clean Neighbourhoods and Environment Act 2005 amended the Environment Protection Act 1990, providing clarity that cigarette ends are to be considered as litter and it is therefore an offence to drop cigarette ends on the ground or into any body of water.

Chewing gum dropped on the street continues to be an unsightly and costly problem for London. The GLA estimates that cleaning up chewing gum from London's streets costs between £5 million and £10 million each year, depending on the level cleaning undertaken. To put this in perspective, the last time Trafalgar Square was cleared of chewing gum, the bill came to £8,500. Chewing gum manufacturers are beginning to develop solutions to this problem with at least one degradable chewing gum product now on the market.

London Councils estimates that in the UK over 13 billion plastic bags are issued to shoppers each year¹⁴. That means the average person gets 220 plastic bags each per year. On this basis, Londoners as a whole are given almost 1.5

Table 5 National Indicator 195 regional averages 2009/10

NI 195 2009/10 Regional averages – The percentage of relevant land and highways that is assessed as having deposits of litter, detritus, fly-posting and graffiti that fall below an acceptable level

Region	Litter NI 195a	Detritus NI 195b	Graffiti NI 195c	Fly-posting NI 195d
South West	4%	9%	1%	0%
South East	4%	9%	1%	0%
East of England	5%	12%	2%	1%
West Midlands	5%	12%	3%	0%
North East	5%	7%	2%	0%
East Midlands	6%	12%	2%	0%
Yorkshire & Humber	6%	13%	3%	0%
North West	7%	12%	3%	1%
London	8%	14%	6%	2%

Source; www.pat.communities.gov.uk/pat/

Note: Detritus is defined as 'non-living particulate organic matter'.

billion plastic bags per year. This is not only a waste of resources but also often a contributor to London's litter. Plastic bags are a particularly difficult form of litter as they are easily blown about, often end up in our watercourses, harm wildlife and look particularly unsightly when they are caught in trees. The public's view of plastic bags is changing and many retailers are leading the way by either charging for plastic bags, providing re-usable bags or rewarding shoppers for using their own bags. However, still more can be done.

The Mayor intends to tackle the issue of litter through a programme of work, set out in Policy 6, which will encourage community action, work with producers of products that frequently end up as litter, improve the cleanliness of transport network and make it easier for London to report environmental crimes such as fly tipping and graffiti.

CHAPTER FIVE

POLICIES AND PROPOSALS

POLICY 1 INFORM PRODUCERS AND CONSUMERS OF THE VALUE OF REDUCING, REUSING AND RECYCLING MUNICIPAL WASTE

VISION

Consumers understand and respond to the value of reducing, reusing and recycling municipal waste.

From vision to policy

The Mayor will work with local authorities, the third sector, businesses and the waste industry to promote the reduction, reuse and recycling of municipal waste, with the aim of decreasing the amount of municipal waste produced in London.

FROM POLICY TO ACTION – PROPOSALS

Proposal 1.1 Setting waste reduction and reuse targets

- The Mayor has set a London-wide target to reduce household waste by 10 per cent of 2008/09 levels per household by 2020, increasing to 20 per cent per household by 2031.
- The Mayor has set a London-wide target to increase the amount of London's municipal waste that could be reused or repaired from 6,000 tonnes each year in 2008 to 20,000 tonnes a year in 2015 and 30,000 tonnes a year in 2031.

Proposal 1.2 Supporting London-wide engagement to promote the reduce, reuse and recycle message

- The Mayor will work with WRAP (Waste Resources Action Programme), London boroughs and the London Community Resource Network to deliver the Recycle

for London communications programme encouraging waste reduction, reuse and recycling among both consumers and producers. LWARB has awarded funds to the Recycle for London communications programme for the three year period 2010-2013.

- The Mayor, through Recycle for London, will promote Zero Waste Places projects in London as a means to showcase best practice and encourage London boroughs to participate in the scheme.
- The Mayor, through Recycle for London, will make communications support available to London boroughs that have obtained funding from LWARB to improve recycling in flats (see Policy 4 for details of the programme to develop recycling in flats).
- LWARB has allocated funds to develop a London-wide Reuse Network. The Mayor will work with London waste authorities, LWARB and the London Community Resource Network to develop the London Reuse Network, promoting waste reduction and reuse initiatives in the third sector, including furniture reuse schemes, which can support and supplement existing local authority waste collection services.

Proposal 1.3 Reducing the amount of municipal waste entering the waste stream

- The Mayor will, through the Mayor's Green Procurement Code, work with businesses to help them reduce waste and improve resource efficiency
- The Mayor will work with business and education establishments to hold a packaging and product design competition aimed at 'designing out' waste from the start.

Proposal 1.4 Tackling the barriers to providing effective reuse services

- The Mayor will work with third sector organisations, LWARB and waste authorities to tackle barriers that make it hard for the third sector to deliver local authority reuse and recycling services by:
 - a providing funding through LWARB to develop a reuse network that would allow reuse organisations to work together to share resources and bid more effectively for local authority reuse and recycling services.
 - b working with waste authorities to link their bulky waste services, where practicable, with local reuse services, when developing municipal waste contracts.

What this will achieve

Overall these proposals will help reduce the amount of municipal waste generated in London informing producers and consumers of the value of waste reduction, reuse and recycling.

The best option is to prevent waste from being produced in the first place. Through the Mayor's Green Procurement Code the Mayor will influence businesses to help them reduce this element of municipal waste at source.

Based on the GLA's projected likely increases in the number of new households over the next two decades, the Mayor has set a waste reduction target of 10 per cent per household by 2020 increasing to 20 per cent per household by 2031 (based on 2008/09 household waste arisings). If achieved, the Mayor's household waste reduction targets will result in no overall increase in the total amount of household waste produced in London each year over the next 20 years, even taking into account the likely increase in

population. In 2031, London would produce the same amount of household waste as in 2008/09, even though it would accommodate an additional 753,000 households.

The reduction and reuse of municipal waste will also deliver significant savings to London's waste authorities through avoided treatment and disposal costs. It is estimated that London waste authorities spent approximately £580 million in 2008/09 managing London's municipal waste. Every one per cent of London's municipal waste that is reduced or reused can save London as much as £5.8 million.

While the exact benefits of these policies can be difficult to quantify precisely, the Mayor will put in place performance indicators and monitoring programmes to track the success of engagement with his policies.

A well resourced, coordinated and publicised London Reuse Network could divert up to 1.7 million reusable household items from landfill each year, representing approximately 30,000 tonnes of waste. It could also cut £5 million off London's waste bill. Increased levels of reuse and repair will also result in many social benefits including creating jobs, increasing training and development locally, and alleviating poverty.

There can be positive changes in behaviour when engagement and initiatives for reduction, reuse and recycling of waste are well integrated, and targeted at producers and consumers. Engagement with the Mayor's waste policies will play an important role in achieving his target of 45 per cent municipal waste recycling or composting by 2015, 50 per cent by 2020 and 60 per cent by 2031.

Proposals

The Mayor believes promoting smarter, better-informed purchasing habits and less packaging in product design is the most effective way to cut down on London's unnecessary waste. The Mayor considers that he can best influence waste reduction and increase awareness of the value of reusing and recycling waste in London in these areas by supporting local and regional communications and initiatives. The Mayor wants London to lead the way in waste reduction but believes that, to be truly effective, waste reduction actions need to be taken as a matter of national policy. The Mayor welcomes the government's plans to develop a comprehensive waste prevention programme by the end of 2013, and seeks to work with Defra to develop a set of measures that can be adopted to reduce waste, offering his assistance in promoting, trialling and enhancing such measures in London.

Proposal 1.1 Setting waste reduction and reuse targets

The Mayor has set a London-wide target to reduce household waste by 10 per cent per household by 2020, increasing to 20 per cent per household by 2031, based on 2008/09 levels. These targets are consistent with the trend of decreasing levels of household waste produced in London in recent years, which have seen waste volumes fall by one per cent per year on average since 2006. The Mayor's targets also reflect what he believes he can achieve in reducing the production of household waste by engaging with manufacturers and retailers, as well as householders, to reduce household waste. The Mayor welcomes London's waste authorities developing their own waste prevention plans and setting their own waste reduction targets in order to achieve the London-wide reduction target.

Proposal 1.2 Supporting London-wide engagement to promote the reduce, reuse and recycle message

LWARB has allocated funds to the GLA to run Recycle for London in partnership with WRAP. Recycle for London's expanded remit addresses waste prevention, reuse and recycling through communications, and targets priority materials including plastics, textiles and food waste and priority housing stock including flats and multi occupancy dwellings. Recycle for London has commenced a programme of communications of greater scope and complexity than previously undertaken, incorporating a number of focused themes instead of a single recycling campaign. Communication from a central body helps to develop a consistent approach and alleviates confusion among Londoners. Recycle for London co-ordinates its activities so that they are complimentary with national and local waste reduction, reuse and recycling initiatives.

Recycle for London will continue to work with the London boroughs to ensure the delivery of coordinated and consistent communications across London that will lead to a reduction in waste and an increase in recycling and reuse rates. Recycle for London develops Pan-London communications that are delivered both at a London level and a local level with two-thirds of the investment delivered at the local level. In addition, at least 35 per cent of the Recycle for London budget has been allocated to support borough waste reduction initiatives and recycling services. Since Recycle for London received funding from LWARB in 2010 it has worked with every London borough and waste authority on projects including promoting local reduction, reuse, and recycling initiatives, and localising the 'nice save' campaign (see Case Study 1).

Reduction

Recycle for London's primary focus is to reduce the production of unnecessary food (and drink) waste by raising awareness of the economic and environmental cost of food waste disposal and providing clear, practical guidance on how to reduce food waste. Waste authorities can apply to Recycle for London for funding, guidance and communication support for local waste minimisation campaigns, and for supporting waste reduction activities such as home composting.

The Mayor will promote the Zero Waste Place projects in London through Recycle for London, as a way of showcasing best practice and encouraging London boroughs to participate in the scheme.

Reuse

The two main challenges for a successful reuse programme are to increase the donations of items, by both individuals and businesses, and to persuade customers to purchase or acquire used items as an alternative to buying new products. Recycle for London targets campaigns and uses online tools to achieve both these objectives, as during the WEEE (Waste Electrical and Electronic Equipment) focused Give and Take events that ran during Recycle Week, 21st -27th June 2010. The campaigns will emphasise primarily the reuse of furniture and textiles.

Recycling

A Recycle for London survey in March 2009 showed 87 per cent of Londoners believed they recycled 'a lot' or 'everything', yet the city's municipal waste recycling and composting rate in 2009/10 stands at just 27 per cent. Targeted engagement helps consumers turn this claimed behaviour into real action, by showing that recycling is worthwhile (for example, by explaining that it costs London boroughs less to recycle than it does to dispose of waste) and

by providing the practical information that Londoners need in order to recycle more.

The Recycle for London website www.recycleforlondon.com is the primary tool for providing the practical information that Londoners need to recycle more. The re-designed website enables Londoners to access information on local recycling and re-use services via the 'Postcode Locator' tool and also provides hints and tips on how to reduce waste at home.

Evaluation

Specific performance indicators including landfill tonnage diversion and CO₂ saving benefits, and monitoring systems will be put in place to track the progress of individual activities.

Zero Waste Places

Zero Waste Places is a Defra initiative, delivered by the BREW (Business Resource Efficiency and Waste) Centre for Local Authorities and supported by the University of Northampton. Zero Waste seeks to prevent waste occurring, conserve resources and recover all value from materials. Zero Waste Places can range in size from a small street market, to a retail park, high street, village, town or a whole borough or district.

The objective of the initiative is to identify barriers and illustrate solutions that will help others to adopt the most effective approach to reducing their waste to zero. Defra made £140,000 of funding available to fund Zero Waste Places pilots. In 2009/10 six projects were selected as Zero Waste projects, three of which were in London boroughs – Lambeth, Hackney and Newham.

Promoting London's reuse and repair network

LWARB has allocated funds to the development of a London-wide reuse network. The Mayor will work with London's waste authorities, LWARB and the London Community Resource Network (LCRN) to develop the London Reuse Network, as well as promoting waste reduction and reuse initiatives in the third sector, including furniture reuse schemes, which can support and supplement existing local authority waste collection services.

LCRN has formed a joint venture called London Reuse Ltd. (LRL) with its leading reuse member organisations. LRL will be the operating company of the London Reuse Network, which will become the platform for an unprecedented London-wide reuse and repair service. This service will be accessible through simple convenient one-stop contacts – one telephone number for reuse in London, one web portal linking all reuse services in London, serving London's business communities as well as householders and public sector organisations. The integrated reuse service will be tailored to complement, and dovetail with, existing bulky waste collection services.

Once the service infrastructure is developed, LRL will make sure maximising reuse is at the heart of dealing with bulky waste in all sectors. Leading waste and recycling contractors, and the majority of London's local authorities, have asked, or indicated a willingness, to work with the London Reuse Network, which will also play an important part in developing skills, employment and volunteering experiences for Londoners who want to join the booming low carbon economy.

The London Reuse Network will transform existing reuse services in London by extending their reach, capacity and viability. By investing

in significant new warehouse space for reuse organisations to use as depots, hubs and outlets, introducing a quality standard and management system, and by coordinating their activities effectively, the London Reuse Network will raise the capacity of reuse organisations and services to a new level across London. With greater capacity, reuse organisations will be equipped to take on more of the bulky waste streams, making them more reliable and useful partners for local authorities.

The Mayor will work with LCRN and other reuse and repair networks in London (including furniture reuse schemes, Freecycle, and Myskip) to develop a map of reuse facilities across the capital, which will then be promoted through the postcode locator on Recycle for London's website. This will allow Londoners to easily see what local reuse and repair opportunities there are.

FREECYCLE/FREEGLE

The Freecycle Network is a private, non-profit organisation which provides an online resources exchange scheme, where users exchange unwanted items using the online message board and email service. Membership is free, and everything posted must be free, legal and appropriate for all ages. Members wanting to 'offer' an item can send an email to their group or, if looking to acquire something, can post a 'wanted' message on the online information board. Once an exchange is completed members are encouraged to alert the group with a follow-up 'received' email.

The Freecycle concept has spread to over 85 countries. The first Freecycle group in London was set up in October 2003. There are now 38 active Freecycle groups in London, divided along local authority boundaries. There are currently 240,562

members exchanging approximately 564,166 items each year. A UK Freecycle group, 'Freegle', was set up in August 2009. The scheme operates in the same way as Freecycle but was set up to give UK Freecycle groups more autonomy from the US-based Freecycle Network. Approximately half of London's local authorities now operate under the Freegle brand, with the remaining half using Freecycle.

The Mayor considers that a target of reusing 20,000 tonnes of municipal waste in London each year by 2020, increasing to 30,000 tonnes a year by 2031, is challenging but achievable. The Mayor, working with LCRN, LWARB, waste authorities and Recycle for London will develop a programme of work to achieve these targets for municipal waste reuse over the lifetime of this strategy.

More information on supporting reuse and other waste management infrastructure in London can be found in Policy 5.

Proposal 1.3 Reducing the amount of municipal waste entering the waste stream

The Mayor is also committed to working more closely with manufacturers and retailers to reduce packaging and he will develop a programme of action as part of his Business Waste Strategy. The programme will include:

- working with businesses to help them reduce waste and improve resource efficiency, using the Mayor's Green Procurement Code and the government's Waste Prevention Fund
- setting up a packaging and product design competition to encourage young talented designers to 'design out' waste.

The Mayor's Business Waste Strategy sets out in more detail the programme of work outlined above.

Proposal 1.4 Tackling the barriers to providing effective reuse services

The Mayor values the contribution the third sector makes to waste management in London and will work with LWARB, London's waste authorities and the LCRN to increase the third sector's involvement in London's waste and resource management. In addition to helping with the London Reuse Network, the Mayor will work with waste authorities and other third sector organisations to tackle the barriers that make it hard for these organisations to deliver local authority reuse and recycling services.

Developing an effective reuse service

The Mayor will work with the London Reuse Network to develop a reuse service that meets the needs of local authority bulky waste collection services and uses local reuse and repair schemes to add value to existing local authority services. The London Reuse Network will promote a London-wide approach, whereby groups of reuse organisations work together as business units in a 'cluster' to deliver reuse to a waste disposal authority area or a group of London waste authorities. This is considered to be the optimum use of resources in contrast to either very local, small-scale operations or completely centralised services, serving a number of boroughs from one warehouse.

Promoting reuse services through Recycle for London

Recycle for London has allocated funding to promote reuse and provide communications support to the London Reuse Network. Recycle for London will engage with Londoners, inform them of the value of donating for reuse and of reusing items, and direct them to the London Reuse Network to take action.



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CASE STUDY 1

Recycling Saves Money campaign

What: 'nice save' campaign

Date: Summer 2011

Success: London-wide campaign with widespread borough involvement (31 out of 33 boroughs intending to localise the campaign)

Cost: Budget of £460,000

In May 2011, Recycle for London launched its nice save campaign, which targets 'non committed recyclers' – those who recycle a little bit, some of the time (that is those with the potential to greatly increase their recycling levels).

Traditionally, recycling campaigns have focused on environmental messages. Most Londoners who are motivated by the environment are now already recycling. The nice save campaign provides a different motivation to recycle more, other than being good for the environment – by explaining that recycling has an economic benefit. Recycling saves money for our city, and is therefore beneficial to our local community. This breaks down the psychological barrier that people question whether recycling is worthwhile, and whether their own recycling efforts can really make a difference.

The creative approach is to positively reinforce good recycling behaviour by saying 'nice save' (thank you/well done), then providing the fact ('Last year Londoners saved £30 million by recycling'), and giving a call to action to visit the recycleforlondon.com website to find out how to recycle even more. The website features a postcode locator which allows Londoners to find out exactly what they can recycle where they live.

Recycle for London delivered the campaign across London-wide media during the summer, and made the majority of the budget available to London boroughs to localise the messaging and deliver it through local media channels, thereby telling local residents how much they saved at a borough level. At September 2011, 31 out of 33 boroughs had confirmed their intention to localise.

The campaign model means that London boroughs are able to deliver an 'off the shelf' campaign that has been centrally developed and tested, which means they don't incur those costs as a borough.

CASE STUDY 2

Waste reduction campaign

What: 'Less in your bin, more in your pocket' waste reduction campaign

Date: Launched Summer 2009

Success: Between 2008/09 and 2009/10 the amount of municipal waste produced in Wandsworth decreased by 3,842 tonnes (3.5 per cent) to 106,162 tonnes. This has saved Wandsworth approximately £345,000 in disposal costs.

Cost: Approximately £40k plus staff costs for the campaign including signage, advertising space, campaign materials, and stickers on waste collection vehicles.

Wandsworth Council's 'Less in the bin, more in your pocket' waste minimisation campaign was launched in summer 2009 following the introduction of a different weight charging system by Western Riverside Waste Authority. The change meant that Wandsworth Council would receive the full benefit of any reduced waste disposal costs achieved by minimising waste and increasing recycling, as well as making significant greenhouse gas savings.

Two key campaign messages were used: 'Less in the bin, more in your pocket' and '1kg less waste per household per week saves £500,000 a year'. Residents were challenged to reduce the amount of rubbish they produced by one kilo per week, which would save the Council £500,000 per year in disposal costs, and ultimately save money in terms of council tax. While it is difficult to quantify the exact impact of the campaign, figures showed that the Wandsworth residents had gone a long way to achieving this target - waste collected for recycling, composting or disposal had fallen by almost four thousand tonnes between 2008/09 and 2009/10. Municipal waste arisings fell by a further 1.5 per cent during 2010/11, resulting in the borough saving £180,000 in disposal costs.

CASE STUDY 3

Community composting

What: Waste Prevention Implementation Plan

Date: 2011

Success: Benefits to the community including:

- approximately four tonnes of organic waste diverted from the waste stream each year per community or 32 tonnes in total
- cost savings for the Residents Association as they no longer have to purchase compost.
- carbon emissions avoided from waste collection and treatment
- improved community cohesion and a stronger links with the council recycling team
- National recognition after winning the award for Best Waste Prevention Project at Local Authority Recycling Advisory Committee Awards in 2010 and shortlisted for National Recycling Awards in 2011.

Cost: £900 to £2,500 per communal composting site

In 2008, Hackney set a target of ten community composting projects across the borough by 2012 as part of its waste prevention implementation plan. By April 2011 eight schemes were operational;

- 1 Warburton & Darcy (W&D) Estate in London Fields
- 2 Follingham Court, Hoxton, as part of the 'Zero Waste Places' initiative
- 3 Gibson Gardens, a private block in Stoke Newington
- 4 Kempton House in Hoxton
- 5 Kennaway Estate in Stoke Newington
- 6 Benthall Primary School in Stoke Newington
- 7 Hackney Downs Estate in Hackney Central
- 8 Shacklewell Primary School in Stoke Newington

The Warburton & Darcy Estate project was launched in August 2009. This estate is managed by Hackney Homes, but the compost project is run entirely by its residents. This was set up in partnership with the London Community Resource Network. The success of this project has led to it being used as a best practice model.

Warburton & Darcy Estate is a high rise building comprising of 70 flats and includes a community garden. Residents choose to opt into the service and, to date, 30 caddies have been distributed with an approximate participation rate of 20 per cent, diverting approximately four tonnes of kitchen waste per year from the waste stream to on-site composting.

This scheme uses a two-stage composting process:

- The first stage is a ScotSpin tumbler that takes a mixture of food waste and woodchip.

- In the second stage, the compost from the tumbler is then stored in two Hotboxes with a 1,000 litre capacity, which are also enclosed to deter pests and the high temperatures generated means that compost is produced quickly. Each of the HotBoxes has a 1,000 cubic litre capacity. The total cost for these three units is £1,500 (two hotboxes and one ScotSpin).

The next phase of the project is to promote the scheme and increase participation rates within each operational site and to keep expanding the number of community composting sites in the borough.

Bright Sparks Shop, funded by Islington Council, run by social enterprises DigiBridge with LCRN, and supported by Homes for Islington, aims to cut waste by repairing usable appliances items that would otherwise be thrown away.

Some items can be taken to the shop, repaired and returned to the owner, or they can be donated at collection points around Islington, repaired and resold in the shop. Items beyond repair will be recycled.

For more information see www.islington.gov.uk/brightsparks.

CASE STUDY 4

Community reuse

What: Bright Sparks Repair and Reuse Shop for small electrical items

Date: Shop opened 21 June 2010

Success: In its first year Bright Sparks:

- diverted 4066 items from waste to reuse or recycling
- served approximately 4000 customers
- provided training and employment opportunities for over 50 individuals

Cost: £250,000 per year running costs, some of which will be offset by sales income, repair service income, and income from providing training.

The Bright Sparks Shop in Islington, thought to be the first of its kind in London, takes broken or unwanted electrical items and brings them back into use.

A team of recyclers, trainees and volunteers will repair and return, or repair and resell, small electrical items like kettles, hair dryers and lamps that are often binned simply because they are no longer needed or not the latest fashion.



Top: Community composting in Hackney. © London Borough of Hackney
Bottom: Bright Sparks Reuse and Repair Shop. © London Borough of Islington

POLICY 2 REDUCING THE CLIMATE CHANGE IMPACT OF LONDON'S MUNICIPAL WASTE MANAGEMENT

Vision

The way London's municipal waste is managed can and should deliver the greatest possible CO₂eq savings by reducing waste, increasing its reuse, recycling and composting, and by the generation of low carbon energy from waste.

From vision to policy

The Mayor wants London's municipal waste management to move from being a net contributor to climate change to an activity that plays a key role in achieving significant climate change mitigation and energy saving benefits. To achieve this, the Mayor has developed a lifecycle¹ CO₂eq emissions performance standard (EPS) for London's municipal waste management activities to work towards achieving. This EPS is a metric that will help inform the way waste authorities undertake their functions, aiming to ensure the collection, treatment, energy generation and final disposal of municipal waste collectively achieve the greatest CO₂eq savings. The GLA will monitor London's municipal waste management performance against the EPS annually using data from WasteDataFlow. The GLA will review the EPS at least every three years to take account of any changes in lifecycle modelling methodology and/or revisions to reporting CO₂eq emissions from waste management activities.

In addition to the EPS, the Mayor has set a minimum CO₂eq emissions performance for energy generated from London's municipal waste, such that energy is generated in a way that is no more polluting in carbon terms

than the energy it replaces. This minimum performance is called a 'carbon intensity floor'. London's waste authorities will need to make sure energy generated from their municipal waste meets the carbon intensity floor, or demonstrates that there are steps in place to meet it in the near future. The objective of the carbon intensity floor is to ensure that energy generated from municipal waste that cannot be reduced, reused, recycled or composted is done efficiently and in the most environmentally beneficial way practicable. Generating energy this way will play an important part in helping meet the Mayor's CO₂ reduction targets and decentralised energy targets as set out in his Climate Change Mitigation and Energy Strategy.

Whilst achieving the EPS is not a mandatory requirement for London's waste authorities, the Mayor requires waste authorities to achieve the carbon intensity floor, or demonstrate that there are steps in place to meet it in the near future, in order to be in general conformity with his Municipal Waste Management Strategy. The Mayor, when determining waste authority contracts and strategies, will consider the likelihood of these proposals and plans meeting the carbon intensity floor for the purposes of implementing his strategy.

From policy to action – proposals

- **Proposal 2.1** The Mayor will work with waste authorities to put London on a path for its municipal waste management functions to collectively achieve the EPS.
- **Proposal 2.2** The Mayor has developed a lifecycle CO₂eq EPS for London's municipal waste management to work towards achieving. The EPS has been set to achieve

the greatest climate change mitigation benefits practicable from London's municipal waste at least cost. London's municipal waste management performance against the EPS will be monitored and reported annually.

- **Proposal 2.3** The Mayor has set a minimum CO₂eq performance for energy generation from London's municipal waste, known as a 'carbon intensity floor'. Waste authorities that are considering options for generating energy from waste will need to demonstrate how their preferred solutions will meet the carbon intensity floor, or demonstrate what steps are in place to meet it in the near future.
- **Proposal 2.4** The Mayor will work with the Environment Agency and waste authorities to ensure that achieving the EPS and the carbon intensity floor will not have any significant adverse impacts on other environmental considerations, including air quality and biodiversity.
- **Proposal 2.5** The Mayor, through Transport for London (TfL), will work with waste authorities to maximise cost efficiencies and reduce the environmental impact of transporting municipal waste. The Mayor will encourage waste authorities to join TfL's Freight Operator Recognition Scheme (FORS) to help make the transport of waste safer, greener and more efficient.

What this will achieve

The EPS concept is an increasingly popular way for regional and national authorities to manage carbon emissions in the industrial, manufacturing and power generation sectors.

The government's national review of waste policy in June 2011 promotes approaches

that consider the lifecycle effects of waste policy and waste management decisions, and supports the reporting of waste management in carbon terms as an alternative to weight based targets and measures. The Department of Energy and Climate Change (DECC) is considering developing an EPS for all new thermal power stations, which might be achieved by either coal-fired or combined cycle gas turbine (CCGT) power stations through fitting of carbon capture and storage infrastructure. The Enterprises pour L'Environment (EpE), an organisation of French and international businesses representing the waste sector and concerned about the environment, has developed a greenhouse gas reporting protocol for local authorities and companies to quantify, report and verify greenhouse gases emissions from waste management activities in order to obtain an emissions inventory.

London will be the first city in the world to develop an EPS for the management of municipal waste, sending a clear message to London waste authorities and the waste industry to focus on waste management activities that achieve the greatest CO₂eq savings. London's municipal waste sent to landfill today produces about 460,000 tonnes of CO₂eq emissions a year. London's municipal waste sent for incineration (generating electricity only) produces about 42,000 tonnes of CO₂eq emissions a year and London's municipal waste sent for recycling or composting each year saves about 450,000 tonnes of CO₂eq emissions a year. All together, and when you include emissions from transport, pre-treatment and other associated activities, London's municipal waste management activities produce approximately 98,000 tonnes of CO₂eq emissions each year. Achieving the EPS

could result in significant net annual CO₂eq emissions savings of approximately:

- 545,000 tonnes by 2015
- 770,000 tonnes by 2020
- one million tonnes by 2031.

Rather than produce CO₂eq emissions, waste management activities can make significant carbon savings. These savings can be achieved through high levels of recycling and composting, and low-carbon energy generation that offset emissions that would otherwise be produced by waste to landfill and the generation of energy using fossil fuels.

In addition to making significant CO₂eq savings, a lifecycle CO₂eq EPS and carbon intensity floor for the management of London's municipal waste will:

- ensure waste is managed as a resource
- encourage waste authorities to focus on the waste management activities that make the greatest CO₂eq savings.
- encourage the rollout of the most efficient energy generating technologies, in particular those generating heat and power
- help waste planning applications to be in general conformity with *The London Plan*.

Achieving the carbon intensity floor will ensure that energy generated from London's municipal waste will cease to be a net contributor to climate change, and help drive the market for new waste management technologies without specifying a particular technical solution. This will be achieved by providing the energy market with SRF from London's waste with a lower carbon intensity than fossil fuels including coal and gas, and developing highly efficient energy generation waste management facilities. Providing low carbon fuel from waste for energy generation in London will help to secure a reliable energy supply for the capital, and help meet the

Mayor's target for 25 per cent of London's energy needs to be met through low carbon decentralised energy systems.

Generating energy from London's municipal waste this way will also ensure London makes an important contribution to the UK meeting its target for 30 per cent of its electricity to come from renewable sources by 2020, as set out in the government's Renewable Energy Strategy 2010.

Ultimately, the Mayor wants to achieve significant climate change mitigation and energy saving benefits from the management of London's municipal waste, particularly for untreated waste that currently goes to landfill or incineration. Rather than focusing on particular waste management services or technologies, the Mayor will look at the outcomes of particular waste management methods, based on their lifecycle CO₂eq emissions performance. This outcome-based approach incorporates two key principles:

- that after waste reduction the focus will be on recovering waste materials and choosing the reprocessing systems that deliver the greatest CO₂eq savings
- that there will be support for decentralised energy generation from municipal waste in a way that is no more polluting in carbon terms than the energy generation it replaces.

An outcome-based approach, using lifecycle CO₂eq performance, will support waste activities and services that reduce the amount of waste produced, and capture the greatest number and highest quality of materials for reuse, recycling or composting. It will rule out energy generation using waste with high proportions of carbon-rich materials (for example plastics and textiles) that produces electricity only. It will support energy generation where both the heat and power

generated are used. It will also drive increases in recycling and pre-treatment of waste to produce low-carbon solid recovered fuel (SRF) for renewable energy generation.

Proposals

Proposal 2.1 The Mayor will work with waste authorities to put London on a path for its municipal waste management functions to collectively achieve the EPS.

Proposal 2.2 The Mayor has developed a lifecycle CO₂eq EPS for London's municipal waste management to work towards achieving. The EPS has been set to achieve the greatest climate change mitigation benefits practicable from London's municipal waste at least cost. London's performance against the EPS will be monitored and reported annually.

To implement this outcome-based approach, a baseline lifecycle CO₂eq performance for London's municipal waste management needs to be established. It is then possible to develop an appropriate CO₂eq EPS for London to work towards.

A steering group comprising representatives from some London waste authorities, London Councils, LWARB and the Environment Agency contributed to establishing a lifecycle CO₂eq baseline performance for London and contributed to the development of the EPS. The GLA has developed a CO₂eq baseline performance by drawing upon London's waste authorities' 2008/09 data from the WasteDataFlow system and feeding it into the Environment Agency's Waste Resources Assessment Tool for the Environment (WRATE).

WRATE and WasteDataFlow

WRATE, already used by a number of London's waste authorities, is the Environment Agency's tool for calculating a lifecycle assessment of the resources used and the operation of a whole range of waste management processes, taking into account their environmental costs and benefits. Users pay an annual subscription to use WRATE software to model in detail a wide range of waste management approaches on their economic and environmental performance to help inform waste management decisions. The GLA has developed a more simplified Excel tool (a ready reckoner) based on the WRATE methodology to enable waste authorities to gain an indication of the CO₂eq performance of different waste management options, and how they perform against the EPS and the carbon intensity floor, when developing their waste management contracts and strategies.

WasteDataFlow is a web-based tool for UK local authorities to report their waste data to government. The government in their 2011 review of national waste policy indicated that WasteDataFlow might be amended to calculate the CO₂eq emissions performance of UK local authorities waste management activities.

Proposal 2.3 of this strategy sets out the Mayor's plans to work with government and London's waste authorities to ensure consistency and easy usability between WRATE, the ready reckoner and WasteDataFlow. More information on WRATE and WasteDataFlow can be found at www.environment-agency.gov.uk and www.wastedataflow.org respectively.

Table 6 sets out London's CO₂eq emission performance for 2008/09 and 2009/10, showing how emissions savings achieved as a result of reducing the amount of waste produced, and from recycling or composting

activities (represented as negative figures) offset emissions from pre-treating waste, incinerating waste, and sending waste to landfill.

Table 6 Lifecycle CO₂eq performance of London's municipal waste activities expressed in kilo tonnes of CO₂eq (kt CO₂eq) 2008/09 and 2009/10

Waste management activity	Waste managed (ktpa) in 2008/09	Associated emissions (ktCO ₂ eq) in 2008/09	Waste managed (ktpa) in 2009/10	Associated emissions (ktCO ₂ eq) in 2009/10
Residual waste				
Landfill	1,831	476	1,752	456
Incineration	838	47	745	42
MBT ¹	278	-3	296	-4
Organic waste				
Anaerobic digestion	4	-0.4	11	-1
In-vessel composting	124	-6	128	-6
Open air windrow composting	143	-6	134	-6
Materials recycling/reprocessing				
Paper/card	385	-115	391	-117
Glass	62	-6	125	-12
Metals (ferrous)	50	-80	50	-80
Metals (non-ferrous)	13	-135	13	-139
Plastics	24	-29	29	-34
Textiles	12	-53	12	-53
Wood	33	0.03	50	0.05
Rejects	176 ²	8 ³	167 ²	7 ³
Transport	n/a	52	n/a	45
TOTAL	3,973⁴	150	3,903⁴	98

Notes:

- 1 Within the information presented in WasteDataFlow, it is unclear as to where the solid recovered fuel (SRF) from Mechanical-biological treatment (MBT) facilities in London is currently sent, although it is understood that some tonnage is sent to cement kilns outside London
- 2 The reject stream comprises materials rejected from MRFs and 'on-the-go' recycling, incinerator bottom ash, and rejected material from MBT facilities. All material from these streams is assumed to be sent to landfill
- 3 To avoid double-counting, emissions from MBT rejects have been excluded as these are already included within the total emissions modelled from the MBT process itself
- 4 Data published by Defra (see Table 2 in <http://archive.defra.gov.uk/evidence/statistics/environment/wastats/download/mwb200910.xls>) suggests that this figure should be 3,975 ktpa in 2008/09 and 3,822 ktpa in 2009/10. At the time of publishing this strategy it has not been possible to verify why the analysis of WasteDataFlow ktpa figures is slightly different than the figures reported by Defra. It is not considered, however, that this has a significant impact on the relative CO₂ eq figures represented in Table 6

Source: See Appendix 4c Development of a CO₂ eq emissions performance standard for the management of London's municipal waste, GLA June 2011.

The basis for developing an EPS for London's municipal waste management

Developing an EPS for London's municipal waste management needs to take into account the financial modelling of different waste management scenarios to ensure solutions are cost-effective, technologically robust and practicably achievable.

As set out in Chapter 3, six of the ten waste management scenarios modelled that met the Mayor's recycling and composting targets in 2015, 2020, and 2031 were used as the basis for modelling and developing the EPS. More information on all the scenarios modelled in preparing this strategy and developing the EPS can be found in Appendix 4a and Appendix 4b.

Figure 17 sets out how London's municipal waste management activities performed in 2008/09 and 2009/10 on CO₂eq emissions, and what improvements are necessary to meet the EPS levels for the target years in 2015, 2020 and 2031 (shown as pink bars). For each year, the emissions (or emissions saved) are broken down to show emissions from landfill, energy generation using thermal treatment technologies, recycling, and organic waste treatment (including emissions from pre-treatment and energy generation of separately collected organic waste).

Figure 17 shows that the net CO₂eq emissions of London's municipal waste management activities in 2008/09 were around 150,000 tonnes. London's net annual performance improved to 98,000 tonnes CO₂eq emissions in 2009/10, demonstrating positive progress against the EPS. This improvement is largely the result of less waste being sent to landfill and incineration, along with increased levels of anaerobic digestion and glass recycling.

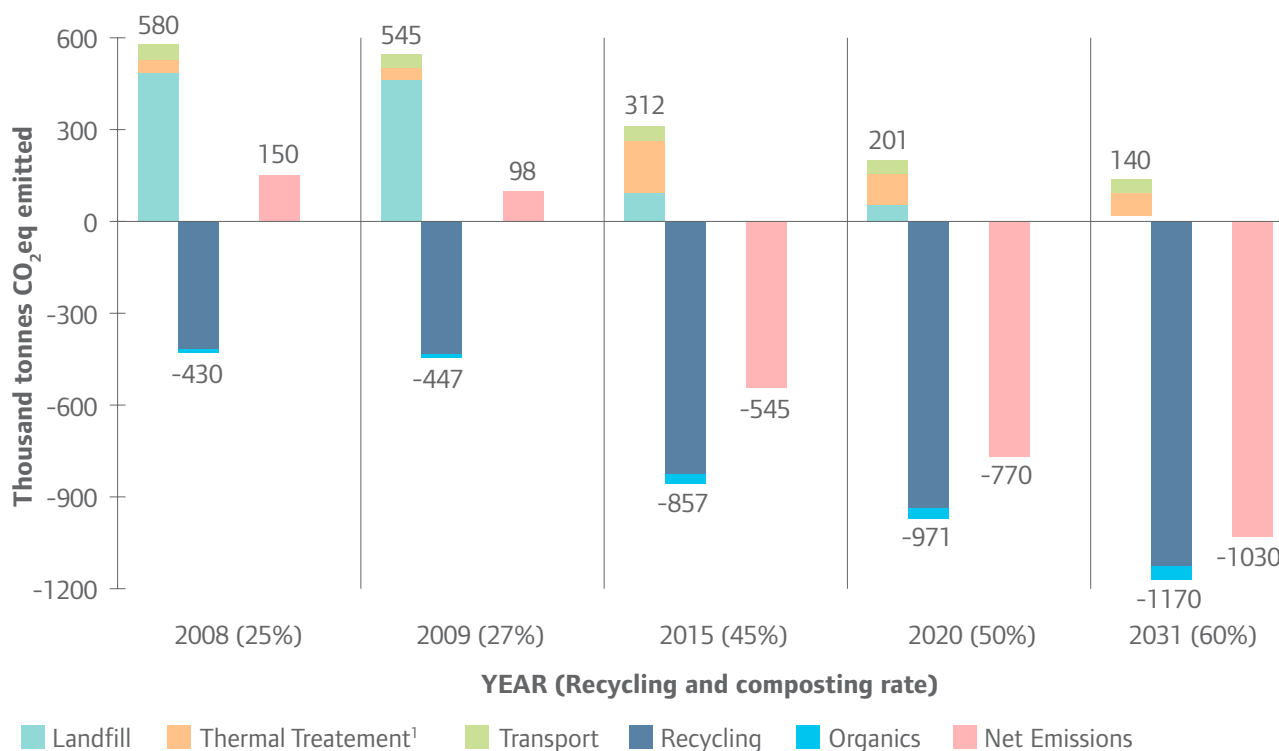
After waste reduction and reuse, Figure 17 shows that recycling will play the most significant role in achieving the EPS, which becomes more challenging over time to 2031. Figure 17 also shows how thermal treatment and pre-treatment, in addition to increased levels of recycling and composting, will be an important element in avoiding CO₂eq emissions from sending waste to landfill, which decreases significantly by 2031.

There will be a sharp increase in CO₂eq emissions from thermal treatment and pre-treatment processes from 2009 to 2015, as these technologies will be required in order for London to make a step change in recycling and composting performance, and to generate energy from non-recycled waste. It is important to note that a fairly basic pre-treatment process with relatively low recovery levels of recyclable material has been assumed in developing the EPS. Much higher CO₂eq emission savings could be achieved using more advanced pre-treatment processes that recover more recyclable material and produce low carbon SRF for energy generation.

All assumptions relating to capture rates of materials from different recycling activities and the modelled roll-out (and performance) of different waste services and treatment technologies to enable London's municipal waste management to meet the EPS have been developed using information published by WRAP².

The metric for developing and determining performance against the EPS, set out in Table 7, is expressed in 'kilograms of CO₂eq emitted or saved per tonne of waste managed' (kgCO₂eq/t waste managed). Negative numbers represent emissions savings. The GLA annually monitors London's municipal waste management performance against the EPS and has developed

Figure 17 Achieving the EPS for London's municipal waste management (tonnes CO₂eq emissions, 2008-2031)



¹Thermal treatment bars include emissions from pre-treatment processes used to prepare SRF.

a tool that allows local authorities to determine how their own waste management options and services could perform against the EPS (see Proposal 2.3).

A key characteristic of the EPS is that it allows flexibility, so that waste authorities, after exhausting waste reduction and reuse opportunities, can look across the whole waste system to find opportunities achieving the greatest CO₂eq savings, depending on their specific circumstances.

For example, waste authorities covering areas where there are many flats may find it difficult to collect high volumes of recyclables and may instead focus attention on the recovery of certain materials that deliver greater CO₂eq saving benefits. Recycling collection services focussing on high embodied carbon materials

such as plastics, metals and textiles will reduce the carbon intensity of residual waste, so that it can be used to generate low carbon energy. Generating low carbon energy from waste plays a key role for meeting the EPS. This is explained in more detail in Proposal 2.3.

Plastics are light and bulky, which can make it difficult for some local authorities to collect large enough quantities of in order to make a significant contribution towards weight-based recycling targets. It is important that as much plastic is recycled as possible due to its high embodied carbon and its economic value as a recycled product. The Mayor wants waste authorities to have more of an incentive to target plastics and other high embodied carbon materials for recycling to exploit their value and to help in the production of low carbon residual waste for renewable energy generation.

Table 7 EPS levels 2015, 2020, and 2031

Year	EPS performance level (kgCO ₂ eq/t waste managed).
2010 (current performance)	30
2015	-130
2020	-190
2031	-240

The Mayor supports the government's plans in its national waste policy review 2011 to consult on increased recycling targets for packaging producers from 2013 to 2017, and to consult on a landfill ban of certain waste materials, namely high embodied carbon materials.

The EPS does not include any CO₂eq savings that might be achieved by reducing the amount of waste produced more than is necessary to meet the Mayor's waste reduction targets. This is because it is difficult to determine accurately which waste materials will be reduced and the rate of waste reduction over time. Nor does the EPS include any CO₂eq savings from reusing waste. This is because there is great uncertainty over the appropriate emissions factors to ascribe to different reuse options, and consequently such factors are not included in WRATE.

Reducing and reusing the amount of waste produced provides the greatest cost and CO₂eq saving benefits. The Mayor wants to ensure waste reduction and reuse activities are correctly identified as contributing to meeting the EPS. The GLA is working with DECC to develop a carbon credit system that will be applied to London's municipal waste management performance against the EPS where there has been a reduction in waste. The EPS has been developed to be flexible over time, and will accommodate any reduction in waste beyond the Mayor's targets, and be updated to recognise the CO₂eq benefits of reuse activities once credible emission factors are available.

Proposal 2.3 The Mayor has set a minimum CO₂eq performance for energy generated from London's municipal waste, known as a 'carbon intensity floor'. Waste authorities that are considering options for generating energy from waste will need to demonstrate how their preferred solutions will meet the carbon intensity floor, or demonstrate what steps are in place to meet it in the near future.

Energy generation, including the generation of transport fuel, as a way of treating municipal waste needs to work with other elements of municipal waste management to help achieve the whole waste system's EPS. However, it must also contribute to the Mayor's aim to encourage the development of low-carbon decentralised energy and significantly cutting London's CO₂ emissions.

To support the shift towards low carbon energy, the energy generated from municipal waste must meet a minimum CO₂eq performance. In aligning this strategy with the CCMES, all energy generated from London's municipal waste should have a carbon intensity less than, or equal to, the source of energy generation it replaces (otherwise known as the 'marginal source' of generation).

Based on DECC guidance for studies of this nature, the marginal source of electricity generation which is considered to be displaced

is the combined cycle gas turbine (CCGT) plant. Such facilities are assumed to generate electricity at a carbon intensity of about 393 grams of CO₂ per kilowatt hour (kWh) of electricity generated. As a result of the work undertaken³ to review and refine the EPS following public consultation on this strategy, and to support the transition to a low carbon economy, the GLA has set the carbon intensity floor level to 400 grams of CO₂ per kWh of electricity produced. Therefore facilities generating electricity from London's municipal waste must perform within this CO₂eq performance.

The ability to meet the carbon intensity floor will be affected by three key variables:

- the efficiency of technology employed, for example, the efficiency of incineration or gasification and whether the heat generated is used

- the amount of biomass in the waste that is supplied to the facility, as higher levels of biomass make it easier to meet the carbon intensity floor
- the carbon intensity of the energy sources being displaced, for example, coal, gas, marginal source electricity, or transport fuel (diesel).

The greatest opportunity for meeting the carbon intensity floor is by ensuring facilities are efficient and in particular that they generate electricity and utilise the waste heat (operate in combined heat and power mode). Pre-treatment technologies such as MBT or autoclaving can be used to produce SRF which contains sufficient levels of biomass to meet the carbon intensity floor. Table 8 shows indicative requirements, in terms of biomass content by its calorific value (CV), for meeting the carbon intensity floor under

Table 8 Indicative requirements for achieving the carbon intensity floor

Technology	Mode of operation	Electricity generation efficiency ¹	Net heat delivered to user ²	CV from Biomass (%) ³	
				Untreated waste	SRF
Incineration ⁴	Electricity only	28%	n/a	69%	66%
	Electricity only	17%	n/a	82%	80%
	CHP	19%	30%	57%	54%
Gasification (steam turbine)	Electricity only	20%	n/a	78%	75%
	CHP	17%	27%	62%	59%
Gasification (gas engine)	Electricity only	27%	n/a	68%	66%
	CHP	27%	24%	48%	45%

Notes:

1 The data presented is in the form of 'net' efficiencies, i.e. taking into consideration both parasitic load and all other energy 'losses' from input of fuel to the plant to output of useful energy. It should also be noted that the efficiencies presented are scenarios only, and do not purport to represent either the mix of facilities currently operating in London or the full technical potential of any particular technology.

2 Please see Appendix 4c for details of the methodology by which heat generation and use is included in the calculation of the carbon intensity floor.

3 Values for SRF are calculated in WRATE on a dry matter basis, whereas those for untreated wastes are calculated on a fresh matter basis (i.e., including the impact of the moisture content).

4 It should be noted that there are significant differences in the scale and related efficiency of incineration plant, with smaller facilities of 50-60ktpa achieving lower efficiencies than larger 800-900ktpa facilities. This is reflected in the potential differences in the efficiencies presented.

a range of different technology scenarios, for both untreated and treated wastes. Table 8 can be used as reference points for waste authorities when considering the options for generating energy from their residual waste.

Table 8 indicates that waste that goes to incineration or gasification facilities generating electricity only needs to have relatively high levels of biomass waste of around 70-80 percent to meet the carbon intensity floor. In some cases pre-treatment may not be necessary depending on the efficiency of the waste facility, particularly when operating in CHP mode operating at efficiencies upwards of 44 per cent.

The GLA modelled the performance of four residual municipal waste treatment scenarios against the carbon intensity floor using London borough waste data taken from WasteDataFlow 2009/10. Table 9 below shows the performance of four residual waste treatment scenarios

modelled for the four London boroughs. Table 9 indicates that all four boroughs sending their municipal residual waste to incineration or gasification scenarios operating in combined heat and power mode would comfortably meet the carbon intensity floor level, regardless of what recycling or composting rate is achieved. All four boroughs (except for borough C) currently provide separate food waste collection services, where the food waste collected goes for in-vessel composting. The fourth scenario in Table 9 indicates the additional benefit sending this food waste to AD can make towards achieving the carbon intensity floor. Table 9 shows waste sent directly to incineration generating electricity only at 24 per cent electrical efficiency (scenario 1) will not meet the carbon intensity floor.

None of London's incinerators operate in CHP mode, although some ideas are now being explored regarding the feasibility of

Table 9 Indicative performance against the carbon intensity floor (using London waste authority waste data)

Residual treatment scenario	Borough A	Borough B	Borough C	Borough D
	Grams of CO ₂ per kwh of electricity (including heat)			
1 Incineration generating electricity only (24% electrical efficiency)	676	647	686	754
2 Gasification CHP (32% electricity 26% heat efficiency)	248	237	252	277
3 Incineration CHP (16% electricity 40% heat efficiency)	287	274	291	320
4 Incineration CHP (16% electricity 40% heat efficiency) + food waste to AD generating electricity only	278	274*	NA	302
Municipal waste recycling or composting rate (%)	25	14	22	45
CV from biomass (% of residual waste)	52	54	51	47

Notes:

The results are indicative only. True performance will depend on factors including the composition of mixed waste going for treatment and the configuration of pre-treatment facilities. The same assumptions for Table 9 apply as set out in Notes 1-3 in Table 8 above.

*Borough B provides a very limited food waste collection service. Sending this food waste to anaerobic digestion results in a modest improvement in the decimal places against the carbon intensity floor.

installing heat distribution networks from the Belvedere incinerator and a project is underway with the SELCHP incinerator in Lewisham to provide heat to neighbouring residential and commercial developments. The GLA Group has developed a London Heat Map that identifies opportunities for introducing heat networks for London's incinerators as well as other decentralised energy opportunities. The Mayor will work with London's incinerator operators to explore opportunities to introduce heat-use infrastructure and improve the incinerators' overall efficiency (and thus their lifecycle CO₂eq performance). More detail on the Mayor's proposals to work with London's incinerator operators is set out in Policy 5. Nottingham City Council has developed a successful CHP waste management facility in Nottingham City (see Case Study 5).

Scenario 4 in Table 9 provides an indication for how anaerobic digestion of organic (i.e. food or green garden) wastes relate to the carbon intensity floor. As anaerobic digestion does not generate any energy from fossil fuels (including plastics), operated in isolation, such facilities, will always meet the carbon intensity floor.

As set out in Chapter 4, biogas technologies can offer greater fuel flexibility and higher efficiencies than traditional incineration techniques. Biogas produced from anaerobic digestion can be used to generate electricity via gas engines or hydrogen fuel cells, or used to produce renewable transport fuel to offset CO₂ emissions from the use of diesel or petrol.

The Mayor supports the use of anaerobic digestion for generating renewable energy. Waste authorities sending organic waste for anaerobic digestion will be able to offset its CO₂eq performance against other energy generation solutions for treating its residual waste for meeting the carbon intensity floor.

More information on how waste authorities can determine the CO₂eq performance of waste management options is set out in Proposal 2.3.

Treating waste in cement kilns

SRF can be used to generate heat in cement kilns. When used in this way the SRF is displacing the conventional fuel, which is primarily coal, and therefore it performs very well when measured against the carbon intensity floor. Coal has a very high carbon intensity of about 870 grams of CO₂eq per kwh. However, as mentioned in Chapter 3, the Mayor does not expect cement kilns to play a significant role in the long-term management of London's non-recycled municipal waste as greater efficiencies can be achieved by generating energy from waste using other technologies. Cement kilns are also typically located long distances outside London, resulting in increased transport costs and providing no benefit to London's heat supply.

Working with waste authorities to achieve the EPS and the carbon intensity floor

The EPS will be used to benchmark and monitor the climate change impact of London's municipal waste management. The Mayor will use the carbon intensity floor as the basis for determining whether London's waste authorities are in general conformity with his municipal waste management strategy. Achieving high recycling and composting rates will almost certainly enable waste authorities to make the most effective contribution towards meeting the EPS.

It is not expected that waste authorities with high recycling and composting rates should make significant changes to their waste management services in order to make an effective contribution towards achieving the EPS and to meet the carbon intensity floor. The

figures in Table 9 indicate that waste authorities with high recycling and composting rates would comfortably meet the carbon intensity floor if their residual waste is sent to thermal treatment facilities achieving overall energy efficiencies upwards of 56 per cent. Work⁴ undertaken by the GLA on the financial and technical implications for meeting the EPS concluded that both the carbon intensity floor and EPS could be met as a result of achieving a wide range of recycling and composting rates and as a result of providing a range of recycling and composting collection services. Recycling options that concentrate on high embodied carbon materials can be beneficial as they leave waste with a higher organic component, and therefore a higher calorific value from biomass to generate energy from.

The GLA will work with waste authorities to focus on waste management options that put them on the path for achieving the EPS and the carbon intensity floor and making an important contribution towards meeting the Mayor's recycling and composting targets (set out in Policy 4).

The GLA has developed a web-based CO₂eq performance ready reckoner tool that allows London's waste authorities to easily test the CO₂eq performance of a limited number of waste scenarios against the EPS and against the carbon intensity floor. The ready reckoner tool is accompanied by a user manual and includes advice on what waste services or technical changes can be made to improve performance. This tool has a built-in flexibility, so that it can be modified to reflect the contribution waste reduction and reuse make in reducing emissions, once robust emissions factors for these activities are made available. The ready reckoner tool and user guide can be found at www.london.gov.uk.

The Mayor expects waste authorities to use the ready reckoner tool for determining performance against the carbon intensity floor in the development of new municipal waste management contracts that include energy generation, and in the development of waste strategies.

Waste authorities, working together or alone, when procuring more than one energy generation solution can pool together the CO₂eq performance of those solutions to meet the carbon intensity floor. For example a waste authority can combine the CO₂eq performance of an AD solution with the CO₂eq performance of a thermal treatment option. The ready reckoner tool allows users to model the CO₂eq performance of a number of different energy generation solutions, and to determine their overall combined CO₂eq performance against the carbon intensity floor.

Links between the ready reckoner and WRATE

The purpose of using the ready reckoner is to give a quick and easy indication of how waste management options perform against the EPS and the carbon intensity floor, and to identify what measures can be put in place to improve performance. WRATE is a more sophisticated tool allowing assessment of a far greater range of waste management scenarios and technological options. Waste authorities may alternatively choose to undertake a full WRATE analysis of waste management options against the EPS. However, WRATE as currently designed cannot be used to determine performance against the carbon intensity floor. This is because WRATE only measures the CO₂eq emissions performance of waste management activities per tonne of waste managed, whereas performance against the carbon intensity floor is measured in CO₂eq emissions per kwh of electricity generated.

Defra in its national waste policy review in 2011 promotes the use of a carbon metric reporting tool for local authorities to measure and report on their waste management activities. It is envisaged such a tool would be linked to existing waste reporting procedures such as WasteDataFlow using WRATE or similar CO₂eq emissions lifecycle methodology. The Mayor welcomes Defra's invitation to build on existing carbon metric tools and will work with them, the Environment Agency and waste authorities to explore how the GLA's ready reckoner tool might be developed for all UK local authorities to use. This will help deliver a single, consistent carbon reporting mechanism for waste management activities across the UK, and avoid the burden of additional waste reporting for waste authorities.

Proposal 2.4 The Mayor will work with the Environment Agency and waste authorities to ensure that achieving the EPS and the carbon intensity floor will not have any significant adverse impacts on other environmental considerations, including air quality and biodiversity.

While there is a significant focus within this strategy on reducing CO₂eq emissions in response to climate change, waste authorities must also take into account any adverse impact on human health their waste management activities might have, such as on local air quality. Primarily, these impacts relate to oxides of nitrogen (NOx) and particulates (PM₁₀ and PM_{2.5}), for which there are high concentration levels in London, estimated to exceed the targets set for the capital¹⁵. These pollutants are of considerable concern in London because of their potential adverse impacts on human health.

The potential air quality impacts from all new developments (not just waste-related ones) in London are considered on a case by case basis through the local and strategic planning process. The development of new residual waste management facilities might result in concentrations of NOx and PM₁₀ exceeding target levels in specific locations, particularly in those areas where concentrations are already elevated. Consideration needs to be given to the location of facilities near existing sensitive areas (such as residential areas, schools, hospitals) in order to reduce or minimise the community's exposure to pollutants. Waste treatment facilities, if managed and operating as designed and located in appropriate locations, and using best available abatement and mitigation technology, are unlikely to have a significant effect on meeting air quality objectives.

The Mayor expects proposals for new waste facilities within London to be sited where the impact on air quality and biodiversity is minimal. The Mayor expects that all new waste management facilities will make use of the best available emissions abatement technologies, and will work with the Environment Agency to monitor their impact on air quality and biodiversity.

Waste and air quality

Nitrogen oxides (NOx), which contribute to nitrogen dioxide (NO₂), and fine particulate matter (PM₁₀) are the two main emissions from waste management processes potentially affecting human health. For example, PM₁₀ aggravates respiratory and cardiovascular conditions. At high levels, NO₂ causes inflammation of the airways, while long-term exposure can affect lung function and give rise to harmful respiratory symptoms. The EU has set limits on these emissions, aimed at significantly reducing the health impacts of poor air quality. The

Mayor's Air Quality Strategy sets out how the Mayor will protect the health of Londoners and increase their quality of life by improving the quality of air they breathe.

Areas around waste sites in London sometimes have high levels of PM₁₀ concentrations due to resuspension of particles from vehicles or on-site processes. The Environment Agency is responsible for the regulation of waste transfer and disposal sites in London, as in the rest of England and Wales and Environment Agency Officers liaise directly with boroughs about these sites. The Environment Agency has powers to serve notice, prosecute, and in extreme circumstances, revoke an operational permit.

The GLA, TfL, the Environment Agency and the London boroughs meet on a regular basis in response to reported high levels of particulate pollution around a number of waste transfer stations in London. These sites are jointly regulated by the Environment Agency and the boroughs. The meetings address a number of complex regulatory and planning issues, including on-site processes, transport access to the sites and the cleaning of surrounding roads. The work of this group has led to a number of improvements at waste sites in London including installing wheel-washing facilities, moving operations inside buildings, installing water spray systems to damp down sites, regular road sweeping on and off the public highway, operator self-monitoring and changing the types of waste accepted at the sites. The GLA and TfL will continue to help the Environment Agency and boroughs to implement measures that improve air quality at and around waste sites.

Reducing emissions from waste transport

Proposal 2.5 The Mayor will encourage waste authorities to join TfL's Freight Operator Recognition Scheme (FORS) to help make the transport of waste safer, greener and more efficient.

Waste transport makes up around 10 per cent of London's annual municipal waste management CO₂eq emissions, producing about 45,000 tonnes of CO₂eq in 2009/10. A significant proportion of these emissions are from transporting municipal waste over long distances to landfills outside London. The Mayor will work with TfL and waste authorities to reduce the environmental impact of transporting London's municipal waste, with a focus on reducing the number and distances of waste vehicle movements, and ensuring that London's waste vehicles are operating safely and as efficiently as possible. The Mayor will encourage all London's waste authorities to join TfL's Freight Operator Recognition Scheme (FORS). Developed in partnership with key industry bodies, FORS aims to help operators of all kinds of vehicles become safer, more efficient and more environmentally friendly and provides a quality benchmark for the industry.

The Mayor also wishes to see greater use of rail and water for transporting London's municipal waste, and supports the development of more waste infrastructure at railheads and wharves. More information on this initiative is set out in Policy 5.

Freight Operator Recognition Service (FORS)

FORS is a unique, industry-led membership scheme, in which over 55,000 vehicles from around 430 companies are registered as members. Twenty London boroughs are currently members. Membership is free and open to any company operating vans or lorries in London. Membership allows access to a range of benefits including workshops, toolkits and online driver training, which cover fuel efficiency, safety and Penalty Charge Notices. By encouraging operators to minimise fuel consumption, for example, and providing them with tools and guidance on how to do so, FORS aims to reduce emissions across London at the same time as helping companies to lower costs.

FORS members can also participate in the FORS online benchmarking system. Benchmarking helps members to manage their fuel better fuel management, with some seeing their fuel consumption performance improve by around one mile per gallon over a year. Others have found that the improved understanding of their operation afforded by benchmarking has enabled them to justify procurement of more suitable vehicles, in one case resulting in a reduction in fuel consumption of around 30 per cent, with obvious associated environmental benefits. Benchmarking also allows operators to anonymously compare performance with their competitors and identify areas of strength or potential improvement. Appendix 6 sets out the City of London Corporation's positive experience with FORS.

More information on FORS can be found at www.tfl.gov.uk/fors

CASTE STUDY 5 Waste management facilities generating heat and power for local use

Nottingham City Council

What: Nottingham Energy from Waste (EFW) and District Heating Scheme (capacity 160,000 tonnes residual waste per year).

Date: 1972 to present day.

Success: The Eastcroft EFW plant, operated by the Waste Recycling Group (WRG) provides Nottingham City Council with a cost effective solution that enables the council to recover heat and power from over 50 per cent (75,000 tonnes) of its municipal waste. Nottingham City recycles or composts approximately 40% per cent of its waste, resulting in only 10 per cent of its waste going to landfill.

Cost: The contract associated with the scheme covers gate fees and capital costs for maintaining the facility totalling on average £4 million- £4.5 million each year to process the council's residual waste. Building and maintaining a similar size facility in 2010/11 would expect to cost around £5.5m - £6m per year (at 5 per cent interest), or £137m – £150m over a 25 year period. Operational costs associated with steam production are about £2 million annually, however this cost is offset by income generated by the sale of heat and power to key partners across the city. The result is a competitive waste treatment solution for the council to manage its residual waste locally and the ability to generate energy and income through sales.

The wholly owned council company, Enviroenergy Ltd utilises the high pressure steam produced to provide combined heat and power to civic, commercial and domestic buildings across the city including:



Nottingham Energy from Waste and District Heating Scheme. © CWP Photography

- over 4,500 domestic properties that benefit from the provision of low cost district heating with prices benchmarked below the major utilities
- over 150 commercial customers including the National Ice Stadium, Inland Revenue Offices, Courts, civic buildings, major shopping centres and Nottingham Trent University.

Customers enjoy security of low carbon energy supply through district heating and/or private wire electricity provision, making Nottingham the UK's leading sustainable energy city. Negotiations are underway for increasing capacity for waste treatment provision and steam supply which will enable the scheme to expand its provision as an independent energy supplier to meet the growing energy demands of the city.

The key elements for making the EFW plant a success include:

- A strong strategic relationship between the Councils, WRG and Enviroenergy with a holistic approach to meeting the waste and energy needs of the city for the benefit of all parties
- Provision for expanding the EFW plants capacity to meet future waste and energy needs.

POLICY 3 CAPTURING THE ECONOMIC BENEFITS OF MUNICIPAL WASTE MANAGEMENT

Vision

The approach to managing London's municipal waste changes from 'a problem to be disposed of' to 'an opportunity to be maximised'.

From vision to policy

The Mayor will work with London Councils, the waste industry, waste authorities and third sector organisations to ensure that London is taking steps to maximise the economic benefits obtainable from its municipal waste management.

From policy to action – proposals

Proposal 3.1 The Mayor, through LWARB, will develop a four-year programme (2001-2015) to identify and implement efficiencies in municipal waste management in London. Working with waste authorities and London Councils, LWARB's efficiency programme will explore the opportunities to:

- establish joint waste authority procurement contracts and shared service arrangements where appropriate that would bring about benefits through economies of scale.
- develop a municipal waste management services framework from which waste collection authorities will be able to award a contract to a supplier following a shorter tendering process
- develop model municipal waste management contracts and service specifications for waste authorities to use
- develop best practice tools for disseminating information on London's municipal waste management and cost data and for sharing best practice on waste service provision.

- establish a Reuse and Recycling Centre development programme that aims to maximise the use of these important sites to increase reuse, recycling and composting rates, and explore opportunities for accommodating new waste management facilities.

Proposal 3.2 The Mayor, through LWARB, will secure investment in London's municipal waste management infrastructure:

- The Mayor will provide financial assistance for the development of facilities for the management of municipal waste produced in London through LWARB's funds.
- The Mayor will seek to involve financial partners who are able to make financial and/or in-kind investments to increase the value of LWARB's fund.
- The Mayor will explore commercial loan opportunities through LWARB that could help waste authorities that are interested in building and operating their own waste management facilities to develop those facilities, particularly where they are able to work in partnership with other waste authorities.

What this will achieve

Waste authorities jointly procuring waste services and infrastructure will:

- achieve economies of scale to get a better deal than if they were acting alone
- be more commercially attractive to suppliers who are interested in securing a larger market share by contracting with more than one waste authority at a time
- help deliver more consistent household waste and recycling services across London boroughs, to reduce confusion and instil confidence in the public.

Waste authorities wishing to work together or alone will be able to use a municipal waste

management services framework to enable them to procure waste services more quickly and efficiently. Waste management contract suppliers on the Framework will have already completed the initial Official Journal of the European Union (OJEU) procurement process including the pre-qualification stage, saving time and resources. Waste authorities will be able to use the Framework to add their specific service requirements to standard templates for contract terms, key performance indicators, specification and pricing. This will make the procurement process simpler, quicker and easier and therefore cheaper for both the supplier and the waste authority.

Developing model municipal waste management contracts and service specifications with London's waste authorities tailored to London's specific municipal waste management governance arrangements and infrastructure requirements will:

- speed up procurement, by avoiding the need to develop waste contracts from scratch
- improve the skills and capacity of waste authority procurement teams to successfully procure waste management projects
- help deliver more consistent waste and recycling collection services across London, regardless of which borough or housing type people live in
- encourage bidders to make high quality bids by providing guidance and standardisation so that they can avoid excessive bidding costs.

In order for municipal waste to become a greater source of economic benefit to London, the quality of the waste material produced for recycling, composting and low carbon energy generation needs to be of a high standard. Managing London's municipal waste as a resource will improve its quality, making it a commodity that is more desirable to the re-

manufacturing sector, and helping to develop the market for low carbon energy generation.

LWARB spent £52 million on delivering waste management infrastructure and behaviour change programmes in London from 2008-2011. This has been supplemented by a further £18 million in match funding from the European Regional Development Fund (through the JESSICA scheme). This forms part of the London Green Fund and is managed by the Foresight Group who will also contribute funding to enable a net £72 million investment fund for waste projects in London.

LWARB has secured an additional operational funding budget of £18m from the government for the period 2011-2015 to help deliver efficiencies in London's waste management and to develop further waste management infrastructure.

Managing waste materials in the most optimal way through reuse, recycling and renewable energy generation could save London up to £90 million per year.

Preparing London to manage all its waste (including commercial and industrial waste, and construction demolition and excavation waste) in the most carbon efficient and economically beneficial way could generate approximately 1260 green-collared jobs and contribute £52 million of direct Gross Value Added (GVA) to the economy each year to 2025.

Energy generated from London's municipal waste, after maximising recycling, could contribute £92 million of savings to London's £4 billion electricity bill and take £24 million off London's £2.5 billion gas bill.

The Mayor believes that London is missing a huge economic opportunity from managing its municipal waste more efficiently. The GLA Act 1999 (as amended 2007) allows LWARB to do anything that it thinks will facilitate achieving its objectives, and it is well placed to identify and implement efficiency savings in the management of London's municipal waste. LWARB will work with London's waste authorities to assist them in realising efficiency savings and in capturing the economic benefits from their waste, using the mechanisms and interventions set out below. LWARB as a London-wide body is uniquely positioned and resourced to help deliver the Mayor's municipal waste management objectives in this area. More information on LWARB's funding programme is addressed in Policy 5.

Proposals

Proposal 3.1 The Mayor, through LWARB, will develop a four-year programme (2011-2015) to identify and implement efficiencies in municipal waste management in London.

The Mayor supports those waste authorities already working together to develop cross-boundary contracts and service agreements and will work with other waste authorities to explore further opportunities for joint working in waste management. Joint working arrangements are likely to become increasingly attractive following the government's 2011 Comprehensive Spending Review, which presents significant challenges for local authorities to maintain high quality and cost-effective front-line waste management services. The Mayor believes neighbouring waste authorities could achieve significant financial and operational efficiencies by sharing some waste management activities on some activities. For example, neighbouring waste authorities with similar housing stock might jointly procure a recycling collection

service for flats. Efficiency opportunities identified will be evaluated and a business case will be prepared and presented to London's waste authorities for consideration.

LWARB will work with waste authorities and London Councils to develop a four-year programme to find ways of making significant savings in municipal waste management operations in London. This programme, set out in detail in LWARB's 2011/12 Business Plan, focuses on delivering efficiencies in the following areas:

- *Joint procurement:* developing a cycle of procurements of waste management equipment to take advantage of London waste authorities' combined buying power and make the procurement of capital equipment and services more efficient, and more affordable. A steering group will help guide this process. Through its successful Flats Recycling Programme, LWARB has already demonstrated the savings that can be made through the joint procurement of waste management equipment. In 2011 LWARB achieved a 40 per cent cost saving on the procurement of reusable recycling bags. LWARB's joint procurement project for waste containers and food waste housing units under the Flats Recycling Programme made savings of approximately £200,000. The Mayor wishes to see the procurement of equipment through London-wide tenders rolled out to the procurement of other waste management equipment. More information on LWARB's Flats Recycling Programme is set out in Policy 4.
- *Shared services:* LWARB will work closely with waste authorities to deliver a more consistent waste management service to Londoners through a programme of shared waste management services, delivered locally, but procured strategically. LWARB will work with waste authorities to develop

London wide or sub regional shared services. In the first instance this will look to build upon the success of other London wide service contracts, such as the London wide Hazardous Waste Contract, and offer specific waste related services across borough boundaries. Significant efficiencies (financial and operational) can be achieved by targeting specific waste activities for shared contracts.

- *Municipal waste management services framework*: LWARB will continue working with Improvement and Efficiency South East (iESE) to develop and operate a municipal waste management services framework for waste and recycling collection, street cleaning, grounds maintenance and bulky waste collection services. This framework will provide a way for waste collection authorities to access a range of waste collection and cleansing services by holding a discrete tender exercise to call off a contract from a range of service providers that would have already met the pre qualification criteria. The use of the framework will provide transparency on price, a consistent set of terms and conditions, and save money and time by avoiding the need for a full EU procurement process to be undertaken for any call off contract.
- *Model waste management contracts and service specifications*: LWARB will develop a library of links to existing model waste management contracts and service specifications, and where appropriate will work with waste authorities to tailor model contracts and specifications to meet individual waste authority needs. LWARB will work with London Councils and London's waste authorities to identify good examples of revenue-sharing and joint venture arrangements that achieve cost-efficiency savings and encourage the use of more environmentally beneficial waste management solutions. LWARB will also work in partnership with iESE to develop model

contracts and specifications for services that are listed in the waste management services framework.

- *Best practice tools and co-ordination*: LWARB will continue to work with waste authorities to improve the accessibility and presentation of local authority waste services information and data on the collection, reuse, recycling, treatment and disposal of municipal waste within London. This will be achieved through the development of best practice tools including Capital Waste Facts and the London Waste Map. LWARB has funded Capital Waste Facts to download, analyse and present London's waste authorities' waste data to help inform London's municipal waste management position and to identify trends.
- *Reuse and Recycling Centre (RRC) development programme*: LWARB recognises the important role that RRCs offer in providing a large range of recycling and composting opportunities for householders. LWARB will develop a programme in consultation with London's waste authorities to maximise recycling and composting opportunities at RRCs through good design and site layout. Improvements could include better signage, increasing the number of recycling banks, or feasibility studies exploring the case for re-orientating and intensifying the operation of RRCs to support the development of new waste management facilities.

London Waste Map

The London Waste Map is a London-wide geographic information system (GIS) map of London's waste management infrastructure. The map allows users to identify those areas that are most promising for waste infrastructure development, and the

allows for the first time the ability to map waste management projects with energy, transport and other major utility development projects. More details on the London Waste Map is set out in Policy 5 and at www.londonwastemap.org/.

Capital Waste Facts

Capital Waste Facts is the centre for waste management and recycling information and data across London. Capital Waste Facts is used by waste authorities, policy makers, academics, the waste industry and the public to better understand how London's waste flows through the waste management system and identify where the opportunities for improvement can be realised. More information can be found at www.capitalwastefacts.com.

Proposal 3.2 The Mayor, through LWARB, will secure investment in London's municipal waste management infrastructure.

LWARB will secure funds to be used to support the development of new waste management infrastructure for all London's waste, including commercial and construction waste. As set out in Chapter 4, LWARB's funding alone will not be sufficient to fill London's waste management infrastructure capacity gap. Therefore LWARB will use its brokerage service to seek external strategic partners who are able to make financial and in-kind investments to increase the value of LWARB's fund. This will be achieved using a number of mechanisms including:

- providing loans to enable private sector investment
- participation in other funding schemes, such as EU match funding and the London Green Fund and
- the formation of joint ventures, where investors provide extra funding.

EU match funding and the London Green Fund

The Joint European Support for Sustainable Investment in City Areas (JESSICA) scheme is an initiative managed by the European Investment Bank to promote sustainable investment and growth in jobs in Europe's urban regeneration areas. In addition to the funds directly managed by LWARB, LWARB has contributed £18m to the London Green Fund which will use the JESSICA initiative to develop waste management infrastructure in London. LWARB's contribution has been matched by £18m from the European Regional Development Fund. This £36 million of public sector funding is independently managed by Foresight Environmental, a private sector fund manager that has a target of bringing similar private sector match funding. As such a total waste fund of circa £72m will be available to invest in waste infrastructure projects in London over the period to 31 December 2015. While the broad strategy for this fund is in line with LWARB's strategy the fund is independent of LWARB and may support the same or different projects as determined by its own evaluation process. The London Green Fund and LWARB fund are complementary funds working towards the same goal.

More information can be found at www.lwarb.gov.uk

LWARB funding could be used, on commercial loan terms, to support those waste authorities that are prepared to consider owning and operating waste management facilities for municipal waste to help them retain the revenue from the sale of recyclables and energy, and to offset their collection costs. It is envisaged waste authorities could invest in relatively low-tech facilities, such as Materials Reclamation Facilities (MRFs) and in-vessel

composting facilities. Such facilities typically have less associated risk and may therefore be more practicable for waste authorities to procure compared to sophisticated and expensive pre-treatment and thermal treatment facilities. Policy 5 sets out the Mayor's plans for developing more waste management infrastructure in London.

CASE STUDY 6

Revenue sharing contracts

What: Waste Collection, Recycling, Street Cleansing and Ancillary Services Contract

Date: 2010

Success: The contract represents an innovative arrangement for both the City Council and the contractor as there is a built in level of flexibility in service focus and both the risks and the profits are shared;

- 50/50 share of avoided waste disposal costs;
- 50/50 share of excess profits above the agreed margin.

Cost: The contract is £36 million per annum (£252 million over seven years)

In 2010 Westminster City Council let its high profile waste collection, recycling, street cleansing and ancillary services contract to Veolia. The contract was let using the Competitive Dialogue process for a term of seven years with an option to extend up to another seven years.

The Competitive Dialogue process, the first time this approach was used in Westminster, provided an opportunity to discuss the wider economic, social and technical changes that were expected to take place in Westminster during the contract term. Discussions also took place on a range of key issues including fleet procurement options, indexation and fuel prices, managing major special events including the Olympics, sharing information

systems and developing a performance framework that gave incentives for the achievement of positive outcomes for both parties.

The key elements of the contract include:

- A Partnership Board setting annual Key Performance Indicators against which a percentage of the supplier's profit margin is assessed;
- Incentives to increase the City Council's commercial waste portfolio;
- An efficient and operationally reliable vehicle fleet that reduces emissions of CO₂ by 20 per cent.

From its inception the contract documentation was developed to allow flexibility in service focus, the encouragement of innovative solutions, the improvement of customer experience and the continual delivery of efficient and effective waste management services.

CASE STUDY 7

Supporting waste authority investment in waste infrastructure

What: In-Vessel Composting Facility (IVC)

Date: 2004

Success: The facility was the first in the country to be certified as producing PAS100 quality compost. The IVC facility treats 30,000 tonnes of organic waste each year, saving about £1.7 million on landfill tax costs. Composting this organic waste instead of sending it to landfill avoids approximately 8,500 tonnes of CO₂eq emissions each year.

Cost: £5.2 million for a new 30,000 tonne capacity IVC.

In 2004 the North London Waste Authority (NLWA) led a project comprising 'master composter' support for home and community

composting by the London Community Resource Network, new organic waste infrastructure collection services by its constituent borough councils and the development of a new in-vessel composting facility by its contractor, LondonWaste Ltd, for which it was awarded £4m by the former London Recycling Fund (LRF) to make it all affordable.

The first organic wastes were delivered in September 2005, and the first loads of finished compost were delivered to borough parks and allotments in February 2006.

The borough organic waste collection services have proved to be very successful, with the full IVC capacity being used in the first year, and additional third-party merchant capacity being used since then as more organic waste has been collected.

The LondonWaste compost continues to be in great demand by north London allotment sites, parks and community projects as well as LondonWaste's farming, landscaping and educational customers. In 2009/10 over a third of the compost was used within North London.

CASE STUDY 8

Revenue share contracts

WHAT: MRF (Materials Reclamation Facilities) Services Contract

Date: October 2009

Success: The contract, including income sharing with the contract provider, delivered savings to the North London Waste Authority (NLWA) of over £1.5m in 2010/11. Annual savings will vary depending on the market value for recyclable materials.

Cost: N/A

In 2009 the NLWA let a MRF services contract for the co-mingled dry recyclables arising in five of its constituent boroughs of Camden, Hackney, Haringey, Islington and Waltham Forest. The contract was for 'lots' of merchant capacity (facilities independently built to treat municipal waste) ahead of NLWA's long-term procurement of significant new waste management infrastructure.

As the contract was let at a time when the value of sorted recyclable wastes was very low the NLWA decided to structure their contract with a basic gate fee to cover MRF contractors' direct operational costs alongside an income sharing arrangement under which the NLWA receives 50 per cent of the contractors' relevant income (and a higher percentage if the income more than doubles).

This contract structure gives the contractors the confidence that they will receive an income sufficient to cover their essential costs and an incentive to minimise process losses, and it gives the NLWA budget certainty at competitive prices along with improved recycling rates. NLWA is also using income it receives under the MRF contract to subsidise the same five boroughs' collections costs, such that the net financial impact on local council tax payers has been brought in at the lowest levels ever achieved locally.

CASE STUDY 9

Cost benefits from achieving high recycling performance

What: Household recycling and organic waste collection service

Date: N/A

Success: Achieving 51 per cent recycling performance in 2010/11 and an annual gross income of £893,000 from the sale of recyclables collected at the kerbside. This

saved Bexley residents £3 million on disposal costs. Bexley's household recycling and organic waste services helped reduce the borough's residual waste by approximately 1,800 tonnes in 2009/10 and 980 tonnes in 2010/11.

Cost: Including income from recycling, the net cost to collect and recycle Bexley's household waste is about £75 per tonne of waste recycled. This can be compared to a cost of £122 per tonne if this material was collected and sent to landfill. This represents a saving of £47 per tonne for every tonne of waste that is recycled rather than sent to landfill.

Recycling and composting

The London Borough of Bexley has a recycling scheme which is offered to 97 per cent of its households. Householders separate out recyclables and organic waste for recycling or composting into different containers provided by the council.

Flats have a similar scheme but have wheelie bins or communal bins provided for their dry recycling. Only a limited number of small blocks of flats have a food waste collection scheme.

Refuse

Households have a fortnightly collection of refuse in 180 litre refuse bins. Flats that do not have the space for the full set of containers still have a weekly collection of refuse.

Capture rates

The capture rates for materials recycled are high for paper (91 per cent), glass (94 per cent) and garden waste (98 per cent). The lowest capture rate is for food waste at 69 per cent, the other materials are between 79 per cent and 86 per cent.

Key contributing factors:

The introduction of a limited capacity fortnightly refuse collection (in 2008) was key to increasing the recycling rate. It helped to persuade some residents who previously did not recycle to start to do so.

Bexley has always sought to inform residents on the benefits of recycling rather enforce its use. This includes running frequent, sustained and clear communications campaigns and having Recycling Advisors visiting residents. Recycling Advisors look after certain areas of the borough and deal with issues such as those arising for residents who are struggling to understand the recycling scheme or can not fit all their refuse in the bin provided. This has also helped to minimise the amount of municipal waste produced in Bexley.

The School's Waste Action Club (SWAC) visit primary schools and secondary schools in the borough. The Club take assemblies and run activities in these schools to educate the children about waste. The aim is to reduce the schools waste production and for the children to take home the waste reduction message and to reduce their waste at home.



Recycling in Bexley. © London Borough of Bexley

POLICY 4 ACHIEVING HIGH MUNICIPAL WASTE RECYCLING AND COMPOSTING RATES RESULTING IN THE GREATEST ENVIRONMENTAL AND FINANCIAL BENEFITS

Vision

Recycling or composting in London will be a straightforward part of Londoners' daily lives, to achieve high municipal waste recycling and composting rates.

From vision to policy

The Mayor will work with London's waste authorities, Defra, LWARB, and the private sector to provide municipal waste recycling and composting collection services that are accessible and as consistent as possible across London, and that provide incentives for households and businesses to use them.

From policy to action – proposals

- **Proposal 4.1** The Mayor has set recycling and composting (including anaerobic digestion¹) targets for London's municipal waste of 45 per cent by 2015, 50 per cent by 2020 and 60 per cent by 2031.
- **Proposal 4.2** The Mayor, through LWARB's best-practice co-ordinator service, will work with waste authorities and Defra's Waste and Resources Action Programme (WRAP) to provide cost-effective and easily accessible recycling and composting services to all London households and small businesses. The aim is to showcase good practice and identify opportunities to deliver high quality, consistent and cost-effective collection services, achieving high recycling and composting rates.
- **Proposal 4.3** The Mayor, through LWARB, has allocated £5 million to fund infrastructure measures to increase recycling

or composting rates for household waste collected from flats, particularly those providing social housing.

- **Proposal 4.4** The Mayor will work with waste authorities and other stakeholders to provide incentives for Londoners to reduce, reuse and recycle municipal waste.
- **Proposal 4.5** The Mayor will work with waste authorities, WRAP, TfL and the private sector to provide 'on-the-go' recycling bins across London.

Providing high quality, consistent and cost effective recycling and composting services to London's households and businesses needs to be supported by infrastructure to recover, treat, and process materials into saleable products. Policy 5 sets out the Mayor's proposals for developing waste management infrastructure in London.

What this will achieve

After waste reduction and reuse, achieving high recycling and composting rates in most cases is the most cost effective way to reduce the environmental impact of managing London's waste and to achieve the Mayor's EPS. Recycling or composting 50 per cent of London's municipal waste could save around 970,000 tonnes of CO₂eq emissions² and £60 million in waste collection and landfill disposal costs each year³.

Furthermore, it will be essential to recycle and compost more if we are to avoid higher landfill costs in the future.

Between 2011 and 2015, LWARB expect projects funded through its Flats Recycling Programme to deliver the following benefits:

- increase recycling and composting performance by 43 per cent on average per project

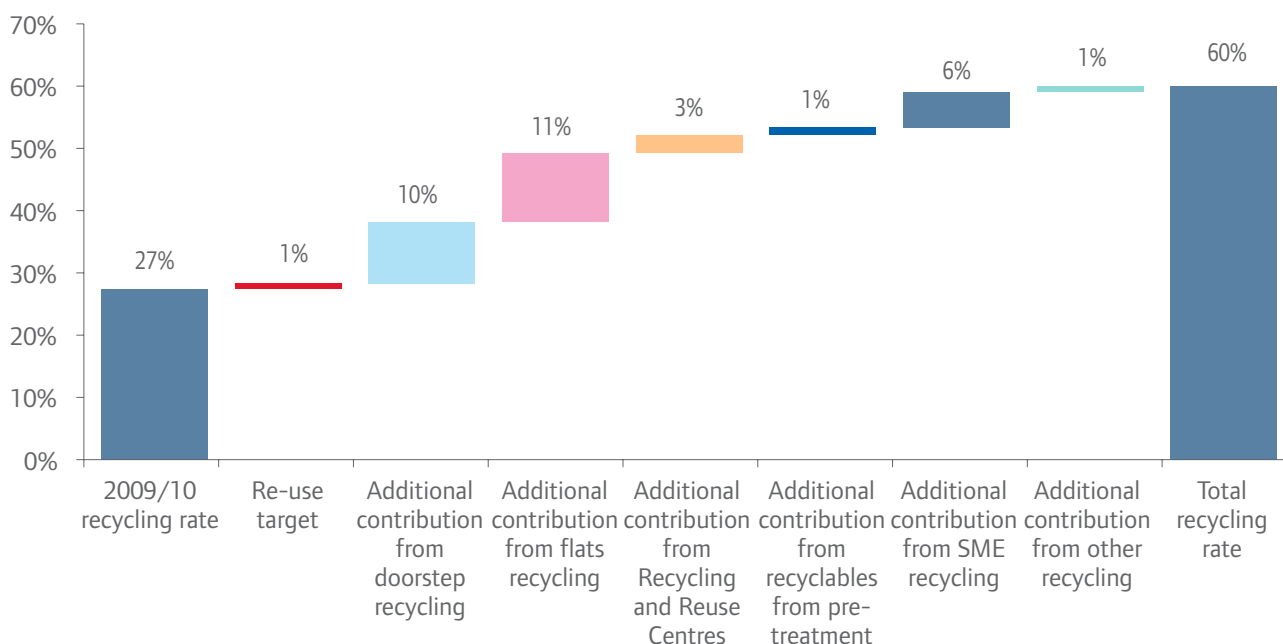
- provide 520,000 households with new/improved recycling services
- divert around 75,000 tonnes of waste from landfill
- prevent almost 66,000 tonnes of CO₂eq emissions from entering the atmosphere

The Mayor believes the best opportunities for improving London's recycling and composting performance lie in providing recycling and composting services to flats and small businesses, which today only recycle or compost about five to ten per cent of the waste they generate. Figure 18 below provides a breakdown of the main services and their contribution to London's current recycling or composting performance. Figure 18 also indicates what

improvements are likely to be necessary for London to achieve the Mayor's 60 per cent recycling or composting target by 2031 and identifies the routes through which to capture materials for recycling and composting. The improvements necessary include some pre-treatment of residual waste to recover materials for recycling. Pre-treatment technologies typically recover 10-15 per cent of recyclable material from residual waste, although higher recovery rates are possible with some autoclave technologies.

Recycling and composting services provided to properties with doorstep collections will continue to play an important role in boosting London's recycling or composting performance.

Figure 18 How London can achieve 60 per cent recycling or composting rates by 2031



Sources:

- Appendix 4a: 'Economic modelling of the Mayor's municipal waste management strategy', GLA, August 2010;
- Appendix 4e: 'The Performance of London's Municipal Recycling Collection Services', GLA, 2010;
- 'Recycling collection schemes from flats – Performance,' WRAP, 2009.
- 'Analysis of dry recycling performance 2007/08', WRAP, 2009.

Notes:

Figures based on potential yields obtained from best performing recycling services based on WRAP research and scenario modelling in Appendix 4a to this strategy.

Assumes flats comprise 50 per cent of housing stock and residual waste arising from flats are similar to other housing types.

'Other recycling' includes bring bank recycling, recycling street litter and composting green waste from municipal parks.

Although many of these services are already reasonably well developed across London, improvements can still be made and these services are typically the most cost-effective way to obtain the highest yield of recyclable materials.

Pre-treatment of residual waste to recover additional materials for recycling will also be necessary to improve London's recycling performance, particularly in areas where it is difficult to provide cost-effective recycling and composting collection services, such as flats. More information on the Mayor's proposals to develop waste management infrastructure in London is set out in Policy 5.

Table 11 shows indicative recycling and composting rates expressed as percentages for the main waste management services. In addition to household and business waste collection services, there is significant potential for improving recycling and composting rates from Reuse and Recycling Centres to increase from the 45 per cent levels achieved in 2010 to about 60 per cent in 2020 and 80 per cent by 2031. Materials recovered from other activities such as street litter for recycling and municipal

park green waste for composting and from recycling bring banks are expected to make increasing contributions to London's recycling and composting performance.

Proposals

Proposal 4.1 The Mayor has set recycling and composting (including anaerobic digestion⁴) targets for London's municipal waste of 45 per cent by 2015, 50 per cent by 2020 and 60 per cent by 2031.

The Mayor believes that setting high recycling and composting targets for London will ensure that recycling and composting is always considered before energy generation, wherever recycling and composting delivers the best economic and environmental outcomes.

Proposal 4.2 The Mayor, through LWARB's best-practice co-ordinator service, will work with waste authorities and WRAP to provide cost-effective and easily accessible recycling and composting services to all London households

Table 11 Indicative municipal waste recycling and composting rates by collection service that would achieve the Mayor's overall recycling and composting targets

Indicative recycling or composting rates	2011	2015	2020	2031
Household collection services - doorstep	40%	45%	50%	55%
Household collection services - flats	10%	25%	35%	40%
Business collection services	10%	30%	35%	40%
Reuse and Recycling Centres	45%	60%	70%	80%
Other activities*	30%	32%	34%	36%
Reuse	<1%	<1%	1%	1%
Total	27%	45%	50%	60%

Notes: 2011 figures are calculated from 2010/11 WasteDataFlow figures and from survey work with London boroughs on recycling performance in flats and business.

*Includes recycling bring banks and recycling or composting of street litter and park green waste

and small businesses. The aim is to showcase good practice and identify opportunities to deliver high quality, consistent and cost-effective collection services, achieving high recycling and composting rates.

In 2010, the GLA undertook research⁵ on London's recycling and composting performance, looking at how performance related to different collection methods and building types, to help identify areas for improvement and keep collection costs to a minimum. The research was guided by a steering group made up of London borough representatives, and supported by the economic modelling used to inform the Mayor's preferred approach for managing London's municipal waste. The key findings of the research were:

- The highest performing waste authorities collected at least six materials for recycling (paper, card, cans, glass, mixed plastics, and textiles). Collecting at least six materials gave rise to higher yields – up to 40 per cent more than waste authorities collecting four materials or less. Consistency in the materials collected across different housing types was found to increase performance, as it provided a consistent message.
- Residents with weekly recycling collections recycled twice as much on average as those residents with a fortnightly recycling collection service.
- For flats with near-entry collection services, residents provided with internal receptacles such as boxes or reusable bags to carry recyclables to communal waste collection points recycled on average nearly twice as much as those residents without any internal receptacles.
- High profile and continuous communication about recycling and composting services,

typically through signage on the street and on collection vehicles, leaflet drops, advertisements in local newspapers and information in council publications, was linked to better participation and higher performance rates. For example, participation levels in Ealing's household recycling collection service increased by 16 per cent following a door stepping and performance monitoring activity to promote the borough's recycling services.

- In boroughs where operating contracts were linked to performance incentives, there were generally better recycling or composting rates. For example Camden's 'Community Recycling' incentive initiative offered to 2,500 flats in an estate to increase the amount of materials recycled yielded 10-20 per cent higher participation rates than other estates in the borough, with some estates reaching 90 per cent participation rates. Residents were offered incentives including free energy saving light bulbs and doorstep collection services rather than asking residents to take their recyclables to a communal recycling point.
- Due to expensive collection costs and typically low yields from flats, boroughs with a high proportion of flats should consider investing in residual waste treatment facilities to recover recyclables and material for energy generation.
- Recycling services for small businesses that collected a wide range of materials produced higher participation rates, and in some cases were more cost-effective than those collecting only one or two materials.

Most of the data on costs used to inform the research is based on national surveys and incomplete data from only a handful of waste authorities. As a result it is difficult to present an accurate assessment of London waste authority collection costs and opportunities for improved performance.

LWARB will work with partner organisations to collate and communicate accurate information on London's waste management position and share best practice with waste authorities. This work will aim to help deliver consistent levels of recycling and waste collection services across London, regardless of the type of housing or borough Londoners live in. LWARB does not have the resources to deliver this service alone and will work with London's waste authorities, WRAP and London Councils to achieve this. One option is to work with London Councils on its twinning and mentoring programme to provide a forum within which London's waste authorities could share information and experiences on local waste management. The Mayor will also encourage London's waste authorities to join up to the government's new 'Recycling and Waste Services Commitment' – a pledge committing all waste authorities in the UK to consult and communicate fully with their residents on the types of waste and recycling services they provide, and to make it easier for residents that want to recycle to do so. More information on the Recycling and Waste Service Commitment can be found at www.wrap.org.uk.

Ideally, recycling collections should accept as many materials as possible, in order to achieve the best CO₂eq savings. However, in developing their services, the Mayor expects waste authorities to focus first on collecting those materials that achieve the greatest CO₂eq savings by being diverted from landfill or energy generation. These include organic waste, mixed plastics, metals, paper and card, textiles, and glass containers, which make up approximately 90 per cent of the municipal waste stream. With the exception of mixed plastics, markets for treating organic waste and recycling these other materials are already well established. Closed loop recycling, in which materials are recycled back into their original

products, offers both the greatest CO₂eq savings and the greatest economic opportunities from recycling. Plastics reprocessing lends itself well to closed loop recycling in London, as it involves relatively light industrial processes and the cost of transporting recyclable plastic long distances is relatively expensive (plastic is light and therefore yields a high transportation cost per tonne). London currently has a closed loop plastics recycling plant for plastic bottles but the Mayor is keen for London to have a closed loop recycling plant for mixed plastics in London due to the significant environmental benefits and economic opportunities recycling this material presents. The Mayor through LWARB will support the development of at least one mixed plastics recycling facility in London.

The Mayor encourages boroughs to work with small and medium-sized businesses (SMEs) to realise the economic and environmental benefits of recycling. Lower disposal costs for recyclables and potential revenue from the materials collected for the boroughs can go hand-in-hand with lower collection charges to businesses, so that both sides benefit. The Royal Borough of Kensington and Chelsea currently provides a commercial waste recycling service, similar to the service provided to households, to around 3,800 commercial premises. Collecting and recycling business waste instead of sending it to landfill saves the borough £55 per tonne of waste collected (see Case Study 10).

Through LWARB's best practice co-ordination service, the Mayor will help waste authorities to provide cost-effective business waste recycling or composting services to SMEs, equal to the services offered to households. The Mayor will encourage waste authorities to sign up to the government's Business Waste and Recycling Collection Commitment to be published in 2011, setting out how waste authorities can help local businesses meet their waste management

responsibilities and recycle more. As set out in Chapter 2, the revised definition of municipal waste and the government's removal of the Landfill Allowance Trading Scheme (LATS) from 2013 will provide an incentive for waste authorities to provide waste and recycling collection services to SMEs.

In delivering his Business Waste Strategy, the Mayor will continue to support the London Business Improvement Districts (BIDs) network as a way to provide access to, and achieve economies of scale for, waste re-use and recycling collection services. In addition, he will work with BIDs to offer best-practice advice on the delivery of waste management projects. He will also help to promote opportunities to find waste management efficiencies between neighbouring BIDs and assist with the setting up of resource-efficiency clubs within these forums. The Mayor's Business Waste Strategy can be found at www.london.gov.uk.

The Mayor recognises that investment in waste management infrastructure is necessary to develop the reuse, recycling, composting and treatment capacity in London. To warrant the investment in high quality services, and to ensure that the economic benefits of recycling and efficient energy generation stay in London, Policy 5 will set out what the Mayor proposes to do to develop waste management infrastructure in London.

Proposal 4.3 The Mayor, through LWARB, has allocated £5 million to fund infrastructure measures to increase recycling or composting rates for household waste collected from flats, particularly those providing social housing.

In June 2010 LWARB launched a £5m Flats Recycling Programme to support local

improvements in recycling and composting performance in flats. Funding has been made available for waste authorities in London wanting to:

- introduce a new flats recycling service or
- expand an existing flats service or
- improve the performance of an existing flats recycling or composting collection service.

In 2010/11 the Flats Recycling Programme funded 29 projects across 26 waste authorities. All projects are due to be fully operational by March 2012. Funding has been made available to projects including:

- the provision of dry and food waste recycling collection infrastructure, to include:
 - purchase of containers and liners, vehicle costs, staffing or other service delivery costs, underground containers and chutes
- recycling site improvement works, including new and improved signage, fencing and lighting and
- incentive schemes – including rewarding residents for reducing, reusing or recycling waste with 'local green points' or 'green credits' funded from savings made on waste disposal. Green points or credits can be spent at local shops or donated to local community projects.

The Mayor will work with boroughs, housing associations, and Arms Length Management Organisations (ALMOs) to target London's social housing as a way to boost London's recycling and composting performance. Social housing makes up a large proportion of flats and estates in London, and thanks to its close association with the boroughs, this sector presents an excellent opportunity for working in partnership to improve local recycling and composting. Any flat recycling support schemes funded by LWARB is required to be integrated with other housing retrofit programmes where practicable, and supported by education programmes and

revenue from boroughs. More information on LWARB's Flat's Recycling Programme can be found at www.lwarb.gov.uk.

Proposal 4.4 The Mayor will work with waste authorities and other stakeholders to provide incentives for Londoners to reduce, reuse and recycle municipal waste.

The Mayor supports rewarding households for good behaviour instead of imposing charges on households who do not recycle, or who produce large quantities of waste. The Mayor will encourage waste authorities to adopt incentive-based schemes, such as Local Green Points and RecycleBank. This will be achieved through the Flats Recycling Programme, and through LWARB's best practice co-ordination service which will provide a forum for waste authorities to share the experiences of successful incentive schemes, and work with scheme providers to deliver them in London. LWARB will also work with waste authorities to help them access the government's grant funding programme for innovative reward and recognition schemes. The government is providing up to £0.5 million grant funding in 2011/12 and has indicated there may be further funding in later years. More information can be found at www.defra.gov.uk.

LWARB funded London's first Local Green Points Scheme for waste and recycling, to be launched in Bexley from autumn 2011. The London borough of Lambeth launched London's first RecycleBank trial to 47,000 estate households in May 2011. Several thousand residents had signed-up to the scheme by August and started benefiting from the rewards on offer from over 100 local and national reward shops and partners. Against a backdrop of waste arisings continuing to fall in Lambeth, the amount of recycling collected on the trial estates during June and July 2011 was 10 per

cent higher than the same period in 2010. If successful, RecycleBank will be rolled out to all households in Lambeth during 2012.

Local Green Points

Local Green Points is a service delivered to boroughs to motivate residents to take positive actions to reduce the environmental impact of their everyday lives. Participating residents are awarded 'green points' funded by savings made on local authority services. Local green points can be accrued for (but are not limited to):

- reducing waste
- recycling
- using public transport
- home energy savings
- reducing carbon
- community volunteering.

Green Points can then be redeemed in ways relevant to the demographics of the individual or community and include (but are not limited to):

- discount or full payment for eco-products and services
- free or discounted access to council owned health facilities
- discounts or payments for other accredited goods and services.

More information can be found at www.localgreenpoints.com.

RecycleBank

RecycleBank is a scheme in which householders receive money-off vouchers for chains and local stores, or can choose to donate money to charity, when they recycle household waste. The scheme can deliver a sustained increase in recycled municipal waste by giving people an incentive to recycle. The typical financial benefit to households in London could be

about £14 a month, assuming an additional 100–200 kilograms of waste recycled per household a year. More information can be found at www.recyclebank.com.

In 2011 the Royal Borough of Windsor and Maidenhead rolled out the UK's first RecycleBank programme to the whole borough after a successful trial scheme, which resulted in:

- a 35 per cent increase in recycling performance in the trial area of 6,500 properties
- 60 per cent of eligible households activating their rewards accounts.
- more than twenty million RecycleBank points being earned for discounts and offers at over 100 shops, leisure centres, businesses, attractions, cafés and restaurants.

Proposal 4.5 The Mayor will work with WRAP, waste authorities, TfL and the private sector to provide 'on-the-go' recycling bins across London.

A number of boroughs provide recycling bins on streets in strategic locations, such as outside bus stops and train stations and in town centres, so that Londoners can recycle on-the-go during their daily commute. Recycling bins are most commonly available for paper, although some boroughs provide on-the-go recycling bins for plastic bottles, glass and cans.

However, on the whole in London, there is still a significant missed opportunity to recycle waste generated outside the home. The Mayor is therefore keen to promote on-the-go recycling across London. Research⁶ undertaken for the London Assembly showed more than 260 tonnes of waste is produced at lunchtime in London every day, illustrating the need to capture the

proportion of that waste that can be recycled. The Mayor will therefore seek to promote on-the-go recycling across London.

The Mayor considers that improving on-the-go recycling points in London can be best achieved through a combination of public funding and private sponsorship. The Mayor will work with WRAP and waste authorities to collate and share good practice on recycling on-the-go services on the street and in public areas. The Mayor will work with the GLA Group overall and in particular with TfL, to improve on-the-go recycling significantly on the GLA's own estate. He will also explore funding opportunities with businesses and land owners for providing more recycling bins along main streets across London, integrated where practicable with local authority recycling services, to allow Londoners to recycle as they go.

CASE STUDY 10 Business waste recycling collection services

What: Commercial Waste and Recycling Collection Services

When: Since 2005

Success: The proportion of businesses that are using the borough's recycling collection service has increase from 11 per cent in 2005 to 35 per cent in 2010.

Cost: A 240 litre wheelie bin costs £4.79 per lift plus £1.60 per week hire on each bin for general waste compared to only £1.66 per lift and no hire charge for recycling. A general waste bag costs £1.69 each compared to a recycling bag costing 69 pence each. Collecting and disposing of general business waste costs the council £128/tonne. This can be compared with £73 per tonne for collecting and recycling mixed recyclables, representing a £55 per tonne (43 per cent) saving.

The Royal Borough of Kensington and Chelsea provides an innovative commercial waste collection service with a strong recycling focus. The materials collected for recycling include paper, card, glass bottles and jars, plastic bottles, tins and cans, and food and drink cartons (tetra packs). The service operates seven days a week with three collections a day for recycling customers.

There has been a 24 per cent increase in the number of businesses using the recycling service since 2005. This can be attributed to a strong marketing campaign to encourage businesses to recycle that includes regular articles in the borough publications and a sales team actively promoting the service and educating businesses. This alongside a competitive pricing structure and a contamination monitoring programme has led to a significant increase in the number of recycling sacks sold, from 250,000 in 2005 to 875,000 in 2010.

The Royal Borough of Kensington and Chelsea currently have around 3,800 customers that use their recycling service - representing a 75 per cent market share.

CASE STUDY 11 **Improving recycling and composting rates in boroughs with a high density of flats**

What: Dramatically improved recycling rates/ Recycling Improvement Plan

Date: 2007/08 - present

Success: Doubling household waste recycling rates from 13 per cent in 2007/08 to 26 per cent in 2009/10.

Cost: Approximate cost of Recycling Improvement Plan was £1.6 million. Savings in 2008/09 on disposal costs were £156,000.

Tower Hamlets poor recycling performance in 2007/08 (13 per cent) attracted ministerial attention and a requirement to secure a recycling performance of 19 per cent by the end of 2008/09. To address this Tower Hamlets put in place a Recycling Improvement Plan and set themselves an even more challenging target of 26 per cent for 2009/10 and 32 per cent for 2010/11.

Tower Hamlets faces some unique challenges; it has a large proportion of high density housing (76 per cent of properties are purpose-built flats), and has the most ethnically diverse population in inner London. There are also a large number of private landlords and housing associations that own and manage properties within the borough.

Since flats form the majority of properties in the borough their recycling collection requirements have formed a key element of the Recycling Improvement Plan. Approximately half the flats in the borough (40,000) now have a bring scheme for dry waste recycling with the remainder having a weekly collection from their doorstep. In addition a food waste collection service was introduced to 6,000 flats.

The key initiatives that are being undertaken to improve recycling operations for flats include:

- working to adopt a customer-orientated view of the borough where public and private land are maintained to the same standard.
- the launch of a forum called the 'Public Realm Subgroup' that acts as a mechanism for the Council and managing organisations to work jointly to improve services for residents.



Promoting recycling in Tower Hamlets. © London Borough of Tower Hamlets

- developing a closer working relationship with Tower Hamlets Homes, and developing a partnership estates recycling and cleansing project due to be launched in 2011.
- in 2010/11 the council will trial a new style of recycling bring bank, which will reduce levels of contamination.

Across the borough there has been a concentrated communications programme to raise awareness of recycling and to encourage residents to recycle more.

Initiatives included:

- a new high profile campaign launched in October 2008 called 'Together We Can Recycle More'. This campaign had an immediate and visible impact on increasing the tonnage collected for recycling and employed local residents as champions to foster community spirit and engage groups of people that did not previously recycle.
- the launch of a new recycling champions programme in spring 2010, with the recruitment of 30 resident champions.
- new picture-based leaflets and fliers to overcome literacy and language barriers.
- new ways of communicating with residents including stickers to go on refuse chute doors to remind residents to recycle.
- weekly messages and articles about waste prevention and recycling in the local press.

CASE STUDY 12

Achieving high rates of recycling at Reuse and Recycling Centres

What: Management of Reuse & Recycling Centres (RRCs)

Date: September 2008

Success:

- Achieving average recycling performance of 79 per cent in 2008/09 compared to 50 per cent in 2007/08 across seven

Reuse and Recycling Centres in southwest London.

- Reducing the amount of residual waste sent to landfill from 34,000 tonnes in 2007/2008 to 12,100 tonnes in 2009/2010.

This represents an overall reduction of 64 per cent during this period

Cost: Reducing the amount of residual waste sent to landfill between 2007/2008 and 2009/2010 has saved the Partnership £876,000 on landfill tax costs at the 2009 landfill tax rate of £40 per tonne.

The South London Waste Partnership consists of the three London Boroughs of Croydon, Merton, Sutton and the Royal Borough of Kingston upon Thames.

As part of the Partnership's waste management procurement strategy, the contract for the management of the seven RRCs across the Partnership was procured as a separate contract awarded during 2008.

The Partnership awarded the contract for a 14 year period with a further option to extend by up to five years, to a Liverpool based Company called Environmental Waste Controls (EWC). EWC started managing the Partnership's RRCs from 1 September 2008.

The Partnership through their contract terms and conditions set stretched yearly recycling performance targets for each of the seven RRCs, and put in place a service failure mechanism should EWC not achieve the recycling targets.

It was evident within a couple of months of the start of the contract that the introduction of EWC's business culture had generated levels of recycling at each of the RRCs that

exceeded both the targets, and expectations of the Partnership.

The change in performance has been attributable to a number of factors including;

- the culture of EWC focussing on diversion of waste from landfill bins for recycling and reuse
- a bonus payment to EWC rewarding the achievement of high levels of recycling.
- the introduction of new concise signage for customers
- regular contract performance meetings with Partnership officers
- the introduction of compactors for high volume recycling materials
- extending the range of recyclables recovered at each of the seven RRCs
- EWC allocating staff to educate customers on how to maximise recycling, and minimise waste for landfill
- the flexibility of EWC to adapt services to ensure that they are fit for purpose at each of the seven different RRCs.

The Partnership acknowledges that the provision of a single provider to manage their RRCs has ensured that consistency and high landfill diversion rates are being achieved across the Partnership's area.

POLICY 5 STIMULATING THE DEVELOPMENT OF NEW MUNICIPAL WASTE MANAGEMENT INFRASTRUCTURE IN LONDON, PARTICULARLY LOW- CARBON TECHNOLOGIES

Vision

London manages the bulk of its municipal waste within the Greater London area by investing in appropriate waste management infrastructure.

From vision to policy

The Mayor, through LWARB, will work with waste authorities, businesses and other stakeholders to develop appropriate municipal waste management infrastructure in London.

From policy to action - proposals

Proposal 5.1 The Mayor, through LWARB, will actively support the development of municipal waste management infrastructure in London, and in particular the use of low-carbon technologies:

- The Mayor will, through LWARB, work with waste authorities and the private sector to help the development of new waste management facilities and improve existing facilities for reuse, recycling, composting and low carbon energy in London.
- The Mayor will, through the Mayor's Food to Fuel Alliance, aim to develop at least five exemplar food waste management projects in London. The Food to Fuel Alliance will support food waste management projects that generate renewable heat and power (including transport fuel), and compost material for local use.
- The Mayor through the GLA Group's Decentralised Energy Programme will work with London's incinerator operators to

find ways of making London's incinerators carbon neutral by capturing heat from the incineration process that is currently being wasted.

Proposal 5.2 The Mayor will work with waste authorities to manage as much of London's municipal waste as practicable within London to achieve regional self-sufficiency targets as set out in the

London Plan:

- The Mayor, when reviewing municipal waste contracts and waste strategies, will work with waste authorities to intensify and re-orientate waste sites in their control, so that more of London's municipal waste can be treated in London where practicable. He will also consider and evaluate all aspects of the development of new or planned waste management sites, looking for a commitment to good design, and consideration for development of new waste management facilities.
- The Mayor will hold an open dialogue with local authority leaders to identify where there are further specific opportunities for developing waste management infrastructure in London. The Mayor will also actively explore opportunities to use land owned by the GLA Group for managing municipal waste.

Proposal 5.3 The Mayor, through TfL, will encourage the movement of municipal waste using sustainable modes of transport.

- The Mayor, through TfL, will promote sustainable forms of transport for municipal waste, maximising the potential of rail and water transport where practicable
- The Mayor, through TfL, will work with waste authorities to make better use of London's wharves and canals and the River Thames for developing the city's municipal waste management infrastructure.

What this will achieve

Building new and more efficient waste management facilities in London will help keep the economic value of London's waste within London. London will strive to be a beacon of good practice, leading the way on innovation for next-generation waste management facilities that provide real benefits to local communities in the form of new products, employment and low-carbon energy. New waste management infrastructure will be essential if London is to achieve zero municipal waste direct to landfill by 2025.

Using LWARB commercial loans to develop more waste management facilities in London, will mean that in the future London's waste authorities will be able to select waste management options from a market of facilities. This will reduce costs and allow waste authorities to enter into simpler and more flexible waste management contracts.

Generating low carbon energy from more of London's organic and non-recycled municipal waste will make an important contribution to achieving London's decentralised energy and CO₂ reduction targets. The Mayor expects London's non-organic waste to play a declining role in energy generation as recycling and composting performance increases.

Particular opportunities exist for generating renewable energy from London's municipal food waste. Each year around 460,000 tonnes of municipal food waste is sent to landfill. This waste, which produces methane as it decomposes in landfill sites, could instead be used to generate renewable, low carbon energy using anaerobic digestion, potentially providing enough electricity for

about 24,000 homes and heat for 6,750 homes.

There is the potential to supply heat from the South East London Combined Heat and Power (SELCHP) incinerator to about 2,700 homes in Southwark, saving approximately 8,000 tonnes of CO₂eq emissions per year. Other opportunities have been identified that could provide up to 20,000 homes with heat, saving 60,000 tonnes of CO₂eq emissions per year. These savings would be a result of avoiding the emissions from running gas boilers.

London will benefit from managing as much of its municipal waste as practicable within London. This chapter sets out how the Mayor will work with LWARB and other partners to develop new waste management infrastructure to keep the value of London's municipal waste in the capital and achieve greater regional self-sufficiency.

Proposals

Proposal 5.1 The Mayor, through LWARB, will actively support the development of municipal waste management infrastructure in London, and in particular those using low-carbon technologies.

Working with LWARB, waste authorities and the private sector, the Mayor will assist the development of new waste management facilities and the improvement of existing facilities to offer the best environmental performance and economic benefits for London. These facilities will include:

- Reuse and Recycling Centres
- recycling sorting facilities (such as material reclamation facilities) that maximise the recovery of high quality materials

- reprocessing facilities
- composting facilities
- pre-treatment facilities to recover high quality recyclable material from residual waste
- low carbon energy generation technologies to generate renewable heat and power (including transport fuel).

The GLA and LWARB estimate that an additional 8 million tonnes of waste management capacity will be required by 2031 to manage London's waste more effectively in response to declining landfill capacity and increasing disposal costs. This capacity gap is over and above waste management infrastructure that is already in the planning or procurement process. Approximately 3.3 million tonnes of this capacity will be required for the management of municipal waste.

Table 12 sets out the waste management infrastructure projects LWARB funded in 2008-2011 that will deliver approximately 365,000 tonnes of waste management capacity a year from 2013. It is expected that about 100,000

tonnes of this capacity will be available for London's municipal waste. At the time of publishing this strategy, the other 265,000 tonnes is un-contracted capacity that London's waste authorities will have the opportunity to use following the appropriate tendering process.

In summer 2011 LWARB launched a new expression of interest process to develop a further pipeline of waste management infrastructure projects, from which new projects will be selected for funding, from a pot of approximately £16 million from 2011-2015¹. LWARB, in its revised 2011-2015 Business Plan, aims to fund up to a further six waste infrastructure projects in addition to the projects set out in Table 12. More information on LWARB-funded waste infrastructure projects can be found at www.lwarb.gov.uk.

Given the extent of the capacity gap and the capital cost associated with infrastructure development, the LWARB fund is only capable of supporting partial fulfilment of the 'gap' requirements. LWARB will take a targeted

Table 12 LWARB-funded waste infrastructure projects 2008-2011

Project sponsor	Description	LWARB assistance	Total cost	Tonnage (per year)	Location	Expected to be operational
Biossence	Gasification facility with CHP	£8.9 million	£100 million	100,000	Havering	2013
London Reuse Limited	London Reuse Network	£8.1 million*	£9.5 million	30,000	London-wide	Establishing from 2011-2015
GreenTech	Plastics recycling facility	£1 million	£6 million	25,000	Enfield	2012
TEG	Anaerobic digestion	£1.9 million	£10.6 million	30,000	Barking and Dagenham	2012
Orchid	Mechanical heat treatment (waste pre-treatment)	£4 million	£45.5 million	160,000	Bexley	2013

*£4.1 million secured. The remaining balance of £4 million will come from future LWARB funding if available

approach to the use of its funding to enable greatest closure of the identified capacity gaps. In most cases, LWARB's funding will be used to invest in waste management projects on commercial terms. LWARB aims to 'recycle' its funds, as the investment is recouped, and re-invest in new projects over five-year periods. With a leverage target of around 4:1, four investment periods will deliver a 16:1 leverage of private investment.

The introduction of new waste management infrastructure in London will significantly reduce London's reliance on declining landfill capacity, slashing millions off London's municipal waste disposal bill. It will also provide positive benefits to local communities in the form of new products, employment, and heat and power. Waste authorities will also benefit, by being able to establish flexible contracts in the waste sector. Rather than engaging in long (typically 25-30 year) contracts, waste authorities in London will be able to take advantage of a market place created for waste management, with a variety of solutions on offer. They will be able to enter into contract lengths to suit their needs, as the service providers will not be aiming to recoup their infrastructure capital costs through gate fees over a fixed long term contract.

The Mayor, through LWARB, will help develop partnerships for new waste management projects, particularly those that aim to deliver facilities using new technologies. LWARB has a web-based service that allows project sponsors, financiers, technology providers, landowners and waste producers to communicate with each other and form viable projects. More information on LWARB's web-based service is available at www.lwarb.gov.uk.

A key element of the partnerships will be building and maintaining relationships with

stakeholders and delivery partners, and, where possible, integrating municipal and non-municipal waste management projects. LWARB is required to produce an annual business plan setting out its priorities for the year ahead, and to report on its funding allocations. LWARB, through its annual plans, will report its progress on developing municipal waste management infrastructure to address the 'capacity gap', the state of its investments and the progress towards making new investments. The Mayor requires LWARB to report on the following key performance indicators: waste diverted from landfill, CO₂eq avoided, and jobs created.

The role of London's municipal waste for low carbon decentralised energy generation

As set out in Policy 2, energy generated from municipal waste will need to be no more polluting in carbon terms than the energy source it replaces. Generating low carbon energy from London's municipal waste will play an important part in achieving the Mayor's EPS, and in achieving the Mayor's decentralised energy and CO₂ reduction targets for London.

Waste lends itself well to decentralised energy systems, due to the flexibility of the fuel that can be produced from it. Waste-derived gases from technologies such as anaerobic digestion and gasification, once cleaned, can be piped to local energy centres or to the national gas grid, or can be used directly in gas engines or reformed and used in hydrogen fuel cells, producing electricity and heat where it is required.

London's dense urban and built up environment provides good opportunities for generating energy locally from its non-recycled waste and making use of CHP and heat networks. Its mixed building types and uses and high building densities provide the high and diverse energy demands that allow CHP systems to be

run efficiently, as well as the high heat demand densities that make heat network deployment more cost-effective.

The Mayor will work with the GLA Group, LWARB and waste authorities to assist the development of waste facilities that generate as much energy as practicable from London's organic waste and non-recycled municipal waste in a way that is no more polluting in carbon terms than the energy source it replaces. This will be done through a combination of introducing new technologies and using London's existing incinerators to generate heat as well as power. More information on London's decentralised energy programmes and policies can be found in the Mayor's Climate Change Mitigation and Energy Strategy.

Turning London's food waste into an opportunity

The Mayor will work with LWARB, TfL, and the private sector to develop infrastructure for managing food waste in London. To tackle the issue of food waste, the Mayor has already established the Food to Fuel Alliance, which will aim to develop at least five exemplar food waste projects in London that deliver one or more of the following:

- decentralised renewable heat and power
- renewable transport fuel (bio-fuel or hydrogen)
- demonstrable links to hydrogen fuel cells
- compost material for local use, linked to the Mayor's Capital Growth programme.

The Food to Fuel Alliance is a brokerage service that seeks to bring together technology providers, energy companies and food waste producers in cross-sector partnerships that can deliver economies of scale, increase value for money and share some of the risk involved in developing new food waste treatment infrastructure. Working closely with LWARB, the alliance is creating partnerships for the

development of anaerobic digestion facilities, used cooking oil processing and other fuel or energy producing projects, for which there is plenty of opportunity in London. The alliance is made up of a number of representatives from the GLA Group, including the GLA, LWARB, TfL and Capital Growth. Businesses involved in this programme to date include British Airways, BAA, Sainsbury and Keystone Distribution. More information on the development of Food to Fuel projects is set out in the Mayor's Business Waste Strategy.

The Food to Fuel Alliance will also work with the London Food Board to ensure that London's food businesses deal with their food waste streams more effectively. The London Food Board is made up of representatives from London's food industry covering catering, wholesale markets, and retail supermarkets. The London Food Board will work with its members and draw on their areas of influence to develop the necessary supply chains of food waste feedstock for treatment in anaerobic digestion facilities. More information on the London Food Board can be found at www.london.gov.uk/londonfood/.

Using London's existing energy generation facilities more efficiently

Although there is a need for new waste management infrastructure in London, the Mayor also wants to work with waste facility operators to enhance existing waste management, making it more efficient and improving its environmental performance. The greatest opportunity is in harnessing the vast amounts of heat generated but not currently captured for use by London's incinerators in Lewisham (SELCHP) and Enfield (Edmonton). Opportunities also exist for developing infrastructure to use the heat

from London's third incinerator at Belvedere, in Bexley, which is expected to open in 2011.

Research² commissioned by the GLA showed that incinerators generating energy from untreated waste, and operating in CHP mode, are carbon neutral in that they create only as much carbon dioxide through the combustion process as they avoid through energy generation. However, retrofitting heat networks that can make use of incinerator heat is expensive and can have significant commercial risks. The Mayor wishes to understand, on a case-by-case basis, what the costs are, and whether there is a case for directing funds from the GLA Group, or London Green Fund, to help. The Mayor expects new energy generation facilities in London to operate in CHP mode where practicable, and through LWARB's brokerage service will work with waste facility operators to make sure the opportunities for CHP are fully explored.

There is an opportunity for the GLA Group to work with Southwark, Lewisham and Veolia to develop heat infrastructure to supply affordable low carbon heat from SELCHP to local housing estates and public and private sector buildings in Southwark and Lewisham. The first phase of work could provide heat to five estates in Southwark. A second phase could extend the heat network to Canada Water.

Veolia (who operate and part-own SELCHP) have been granted planning permission to build an integrated waste facility on the Old Kent Road in Southwark. This facility will comprise a materials recovery facility and an MBT facility to produce a solid recovered fuel. As part of the planning approval, Veolia agreed under a S106 planning agreement with Southwark Council to supply low carbon heat from SELCHP to neighbouring estates in Southwark (approximately 2,700 homes).

Significant additional heat load would improve the economics of the scheme and Convoys Wharf in Lewisham could provide the extra heat load, following the phase one and two work in Southwark.

Existing and proposed heat requirements along this route could also add to the opportunity and diversity of heat loads. The identified opportunities in Southwark (phases one and two) have a combined peak demand which is equivalent to a peak winter heat load of 40 MW. This is enough energy to heat approximately 20,000 homes.

SELCHP is potentially capable of supplying a continuous heat load up to around 40 MW at the expense of some loss of electricity generation. An additional boiler plant would be needed to meet the total peak heat demand. The GLA Group will work with SELCHP and Lewisham to explore opportunities for expanding SELCHP's heat infrastructure to the Deptford/New Cross area in Lewisham which includes 50 per cent of the borough's housing growth.

The arrangements for ownership and management of the heat network have not been determined. The GLA Group will explore the potential for the network to be owned and operated by a public interest special purpose vehicle, which could include private sector involvement. Ideally the network would commence operation by 2012 and continue to expand for many years after that.

The GLA Group will work with the Edmonton and Belvedere incinerator operators in Enfield and Bexley, and work with local authorities to explore heat infrastructure opportunities for these facilities. There is scope for a decentralised energy network in the Upper Lee Valley area as part of a wider regeneration project in Enfield.

At the time of publishing this strategy, the opportunities for supplying heat in the area immediately around the proposed Belvedere incinerator are limited. However the size of the plant represents a strategic asset that has the potential to supply significant volumes of low carbon heat in the wider East London area. Work is underway to establish the potential capacity and logistics for heat infrastructure to neighbouring areas. This work will allow the GLA to consider how a heat transmission network might work, including crossing the River Thames to supply the London Thames Gateway regeneration areas.

With regards to the existing landfill sites, the Mayor supports the conversion of landfill gas for energy generation. This energy generation could include the production of a transport fuel, which would offer lower CO₂ emissions and less pollution when compared to conventional fuels (petrol and diesel).

Managing more of London's municipal waste locally to achieve greater regional self-sufficiency

London currently has 41 Reuse and Recycling Centres and approximately 800 other waste management sites, most of which are privately owned³. The large majority of these sites are used to separate and bulk up waste materials for recycling and composting at other locations, or to send to landfill sites, mostly outside London, or to incinerators.

The Mayor wants London's waste management sites to move up the value chain so that more of the economic value of London's waste stays in London. The possibilities for re-orientating and increasing capacity on existing waste management sites are significant, although new sites will also be required. Existing sites could be redeveloped to accommodate composting facilities, material reclamation

facilities, pre-treatment facilities, reprocessing plants or energy generation facilities. New waste management facilities should be well designed, and developed in consultation with local communities, taking account of health and safety within the facility, the site, and adjoining neighbourhoods.

Proposal 5.2 The Mayor will work with waste authorities to manage as much of London's municipal waste as practicable within London to achieve regional self-sufficiency targets as set out in the *London Plan*.

The London Plan sets a target for London to work towards managing the equivalent of 100 per cent of its waste within London by 2031. This means that should London manage waste from other regions, there might be room for some of London's waste to be dealt with outside the capital, while still meeting the Mayor's self-sufficiency target.

The greatest opportunity for managing more of London's waste within its boundaries is through the protection and development of London's existing and planned waste management sites. When reviewing municipal waste contracts and waste strategies, the Mayor will work with waste authorities to intensify and re-orientate waste sites in their control. This will ensure that these sites are used to tackle London's waste challenge and help waste authorities achieve their apportionment targets, as set out in *The London Plan*.

Good design will be crucial in ensuring these sites maximise reuse, recycling, composting, and energy generation opportunities, and make waste management facilities more acceptable to the public. In 2008 the GLA published a report⁴ on design ideas for waste facilities in London. The report shows how new waste management

facilities can be brought into the city and, through thoughtful design, find an appropriate place on our streets where waste is turned into new materials and energy for the benefit of the community.

LWARB has worked with waste authorities, landowners and other stakeholders to develop a London waste map, providing a geographical representation of London's waste management infrastructure. This GIS based tool can be used to map both opportunities and constraints for new waste management infrastructure, and identify those areas that are most promising for future development. Information that can be mapped in this way includes:

- waste arisings
- existing waste sites (or other industrial sites)
- heat networks
- transport networks
- planning boundaries
- the planning status of sites
- development plan documents (produced by local authorities) identifying potential waste management sites.

The maps can also show such constraints as:

- environmental issues, including Sites of Special Scientific Interest (SSSI)
- conservation areas and listed buildings
- people – the proximity of sites to dwellings
- ground stability and flood risk.

More information on the London Waste Map can be found at www.londonwastemap.org/.

A live and interactive waste site map does, for the first time, allow the public and private sector to identify waste management solutions that can be linked with London's wider land-use planning needs, and in particular, the city's energy generation and transport infrastructure. It will enable businesses, waste

authorities and investors to make informed investment decisions on the suitability of sites without risking significant development costs.

The Mayor is keen to see this joined-up approach help overcome planning constraints by linking to other developments within the urban fabric. A GIS map of London's waste management infrastructure will enable all the key players in London to identify the opportunities for mapping waste management with heat and power use in neighbouring developments, linking with the London Heat Map developed by the GLA Group. Some non-mapped information is also provided, relating to waste collection and disposal contracts in London, contact information and links to London waste policies.

London Heat Map

The London Heat Map is an interactive online tool that allows users to identify opportunities for decentralised energy projects in London. The heat map provides spatial intelligence on factors relevant to the identification and development of decentralised energy opportunities, such as major energy consumers, fuel consumption and CO₂ emissions, energy supply plants, community heating networks and heat density. The London Heat Map is available at www.londonheatmap.org.uk.

As well as safeguarding and upgrading existing municipal waste management sites, the Mayor will work with stakeholders to help identify additional sites in London where practicable and feasible. The Mayor will hold an open dialogue with waste authorities to identify where there are opportunities to develop waste management infrastructure in London. The Mayor will also actively explore opportunities to use land owned by the GLA Group, where appropriate, for managing municipal waste.

Proposal 5.3 The Mayor, through TfL, will encourage the movement of waste using sustainable modes of transport.

In 2008/09, water and rail carried 447,000 and 560,000 tonnes of waste respectively, transporting 11 and 14 per cent of London's municipal waste, mainly to landfills outside London. During 2004-2010 the amount of waste carried by rail and water declined as increasing levels of waste were recycled. Very little use is made of these sustainable modes of transport by recycling operations, yet there is the potential for this sector to make greater use of rail and water in the future. For example paper could be sent to processing mills in Kent this way or exporting material via the Thames' ports.

The London Plan states that the criteria for evaluating waste management proposals should include the full transport and environmental impacts of waste movements. When reviewing municipal waste management contracts and waste planning applications, the Mayor will work with TfL and waste authorities to promote the most sustainable forms of transporting waste, maximising the potential use of rail and water transport. The Mayor will work with TfL to explore opportunities to open up the rail and navigable water network for increased transportation of waste, in order to help waste authorities and the waste management industry sector to reduce their vehicle mileage and the associated environmental and social impacts including congestion, CO₂ emissions, air quality, noise and dust.

The cost-effective use of rail and water relies on access to the necessary modal infrastructure such as rail-heads and wharves. Locating waste transfer stations and waste processing facilities near safeguarded wharves

and rail heads, such as those at Smugglers Way, Wandsworth and Transport Avenue, Brentford, are critical in delivering a viable and sustainable transport solution.

Making better use of London's wharves and canals for developing municipal waste management infrastructure

As of 2011, London's waste authorities use five safeguarded wharves on the River Thames, though these will increase to six when the Belvedere incineration facility becomes operational. TfL is currently working with the North London Waste Authority to investigate the potential of using the River Lee for the movement of material to and from a proposed Edmonton waste management facility, and it will explore the potential for maximising water transport in their existing contracts with the other waste authorities. The Mayor will work with TfL and waste authorities to ensure that wharfs and canals with an existing or potential for waste management be identified and safeguarded specifically for that use. The Mayor will also work with TfL and waste authorities, when reviewing waste contracts to investigate the potential for developing waste management infrastructure along London's wharves, canals and railheads. Proposal 38 in the Mayor's Transport Strategy supports safeguarding London's wharves and canals to increase the use of the River Thames and London's canal network for waterborne freight transport

Where appropriate, TfL will also promote the use of multi-modal refuse collection vehicle (MMRCV) technology in collection fleets, as one way of making better use of sustainable transport in the collection of municipal waste and its transfer to waste management sites.

POLICY 6 ACHIEVING A HIGH LEVEL OF STREET CLEANLINESS

Vision

Londoners should enjoy a consistently high standard of street cleanliness regardless of where they are living, working or visiting in London.

From vision to policy

The Mayor will work with London boroughs, businesses and public transport providers to develop and implement a programme of work to make London a clean and pleasant city to live in and visit.

From policy to action – proposals

Proposal 6.1 The Mayor will encourage London boroughs to adopt Love Clean London, a mobile and online reporting and recording system for graffiti, fly-tipping and other quality of life issues.

Proposal 6.2 The Mayor will work with local authorities to improve enforcement of environmental crimes, including litter and graffiti.

Proposal 6.3 The Mayor will encourage boroughs to recycle or compost their street cleaning waste where practicable.

Proposal 6.4 The Mayor will work with a range of partners, including London boroughs and the private sector, to provide on-street recycling opportunities and to recycle waste from London's events.

Proposal 6.5 The Mayor will work with the Capital Clean-Up campaign, London Organising Committee of the Olympic Games (LOCOG), Thames 21, CleanupUK and other voluntary organisations to coordinate the

most clean-up activity ever in the run up to the 2012 Games.

Proposal 6.6 The Mayor will work with London Councils and London boroughs to develop a road map towards a plastic-bag-free London.

Proposal 6.7 The Mayor will work with gum manufacturers and London boroughs to reduce the blight of chewing gum on London's streets by piloting non-stick and degradable gum in London.

Proposal 6.8 The Mayor will work with London boroughs, tobacco companies and tobacco retailers to develop a London wide smoking-related litter reduction programme.

Proposal 6.9 The Mayor will work with London Councils and the Chewing Gum Action Group to develop a behaviour change communications programme on chewing gum litter for London to launch in advance of the 2012 Games.

Proposal 6.10 The Mayor will work with TfL and London Underground to empower Londoners and visitors to be more responsible with their rubbish while on London's transport network.

What this will achieve

Targeted London-wide behaviour change campaigns for prevalent forms of litter and chewing gum will contribute towards a reduction in the presence of litter and chewing gum and help to reduce chewing gum staining ahead of the 2012 Olympic and Paralympic Games. Promoting and encouraging the development of non-stick, low-stick and degradable gum bases will not only improve the appearance of London's streets, but will also save significant amounts

of public money spent removing affixed gum and associated staining.

Littering will become increasingly unacceptable in London, as the public is empowered to dispose of their litter responsibly, through the provision of 'on-the-go' recycling bins, and as it becomes more aware of products such as personal/portable ashtrays. London's transport network will become considerably cleaner as more litter and recycling bins are rolled out across the network and on-street cigarette butt bins are provided outside all suitable stations and interchanges.

Clean up campaigns, such as those co-ordinated by the Capital Clean-up campaign, will enable volunteers, community groups and local residents to reclaim areas of land for recreational or functional uses, such as planting vegetables. These campaigns not only clean up local areas, but also instil a sense of ownership and responsibility for plots of land that were otherwise blighted, abandoned and ignored.

Accessible and interactive reporting systems, such as Love Clean London, will enable Londoners not only to inform London boroughs of areas of abuse and blight from fly-tipping and graffiti, but also to share the good work they are undertaking in their own neighbourhood. Such systems can also save London boroughs money by reducing the number of reporting channels and lowering back office costs.

Proposals

With the spotlight on London in 2012, London's streets need to be among the cleanest in England. To achieve this, London will need to take a unified approach, with the GLA and London boroughs engaging

with communities, landowners, transport providers, charity organisations and many other stakeholders, to ensure a consistent and coherent approach over the next year.

The public's perception of the success of the 2012 Games is likely to be influenced by how clean the streets are and whether they can recycle easily around the capital. If the 2012 Games are to achieve their goals for waste, then a co-ordinated approach to cleaning and on-street recycling is required for the whole of London. The Mayor will work with boroughs to continue to drive up cleansing standards. He also wants to see campaigns such as Capital Clean-up gather momentum and support in the run up to 2012, to help deliver a high level of cleanliness both during and after the Games.

High standards of cleanliness cannot be achieved simply by more cleaning before, during and after the Games. There also needs to be a change in the behaviour of Londoners and visitors with regard to litter. The Mayor will develop a programme of work with London Councils, London boroughs and Keep Britain Tidy that will aim to change people's behaviour towards litter and restore some civic pride.

Businesses need to take responsibility for litter that is generated as a result of their activities. Retail and take-away food outlets, for example, need to work with their local authority, neighbouring businesses or Business Improvement District to take action. Local authorities have legislative support¹ to work with businesses, to ensure they can reach an agreement. Good examples include the agreement between London's free newspaper distributors and the City of Westminster to put paper recycling bins in appropriate places.

Proposal 6.1 The Mayor will encourage all London boroughs to adopt Love Clean London, a mobile and online reporting and recording system for graffiti, fly-tipping and other quality of life issues.

The Mayor wants Londoners to be informed and empowered when it comes to quality of life and the quality of the local environment. He is keen for Londoners to have more information on their environment and to improve the processes for reporting environmental crime. To that end, in February 2011, the Mayor launched a London specific mobile and online reporting and recording tool called Love Clean London.

Love Clean London is based on the London Borough of Lewisham's Love Clean Streets programme. It allows Londoners and council workers to photograph and upload images such as a fly tip or graffiti, either via a smart phone application, a mobile phone SMS or directly on to the website. In Love Clean London, the reports will be sent to a central portal to be directed to the appropriate London borough for recording and action. The public can then request an update as to when the issue has been resolved. The tool also enables the public to upload images of areas or incidents they have cleared or cleaned themselves, promoting social responsibility and community spirit.

Love Clean London enables local authorities to target their workload more effectively with the public becoming their eyes on the ground. Further savings can be realised by integrating the tool into back office services and by reducing the number of reports made in more costly ways, such as by telephone.

The Mayor has written to all London borough leaders to encourage them to support him in the London-wide rollout of this reporting system.

Proposal 6.2 The Mayor will work with local authorities to improve enforcement of environmental crimes, including litter and graffiti.

Education and enforcement have a role to play in changing people's behaviour. There is a raft of legislation available to local authorities to tackle street cleanliness and environmental crimes, but the degree to which it is used varies greatly across London. The Mayor will encourage London boroughs to adopt enforcement strategies that clearly set out how and when they will use the legislation. The Mayor will encourage consistency across boroughs' enforcement strategies by promoting partnerships and the sharing of best practice.

The Mayor will investigate the opportunity to establish a service level agreement for the enforcement of environmental crimes in London that will set a minimum level of enforcement to be expected across London. A service level agreement would assure Londoners that wherever they live, individuals that are caught littering and fly-tipping will be treated in the same way, with a minimum penalty applied.

Proposal 6.3 The Mayor will encourage boroughs to recycle or compost their street cleaning waste where practicable.

Policy 4 sets out how London will meet the Mayor's recycling targets of 45 percent by 2015, 50 per cent by 2020 and 60 per cent by 2031. Recycling and composting of street waste will, albeit minimally, contribute towards the achievement of these targets. When reviewing street cleansing services, London boroughs should consider the opportunities available to them to recycle and compost their street cleansing waste.

Proposal 6.4 The Mayor will work with a range of partners, including London boroughs and the private sector, to provide on-the-go recycling opportunities and to recycle waste from London's events.

On-the-go recycling is the next great recycling opportunity for London. As recycling becomes normal behaviour, people expect to be able to recycle wherever they are. The Mayor will work with London boroughs and the private sector to encourage investment in on-the-go recycling bins throughout London.

London hosts some of the world's largest and best-known events such the London marathon and Notting Hill Carnival. The level of recycling achieved at these events varies dramatically and the Mayor wants all of London's events to perform to the same high standard. The London 2012 Games will be the largest event London has hosted in modern times and the Mayor will work with the Olympic boroughs and the Live Site operators to ensure that recycling facilities are available to Londoners and visitors whilst they enjoy events and activities outside of the Olympic Park. Through the Recycle for London programme the Mayor will make communications expertise available with the aim that throughout London, Londoners and visitors will know what, where and how they can recycle.

Proposal 6.5 The Mayor will work with the Capital Clean-Up campaign, London Organising Committee of the Olympic Games (LOCOG), Thames 21, CleanupUK and other voluntary organisations to coordinate the most clean-up activity ever in the run up to the 2012 Games.

The Mayor has long supported the work of Capital Clean-up, Thames 21, CleanupUK and other voluntary organisations that engage

and encourage Londoners to take it upon themselves to rid areas of litter, shopping trolleys, overgrown vegetation and fly tips, and make London's neglected and ignored open spaces great places to enjoy.

In the run up to the 2012 Games the Mayor will put his weight behind these organisations and help co-ordinate the most clean-up activity ever. The Mayor is providing funding to Capital Clean-Up to co-ordinate and support clean up activity from June 2011 through until the opening ceremony of the 2012 Games. The Mayor has also integrated Capital Clean-up into Team London, increasing access to volunteers and volunteer opportunities and raising the profile of the campaign.

Capital Clean-Up is made up of representatives from the London boroughs, Thames 21, LOCOG, Keep Britain Tidy, The Metropolitan Police, London Probation, CleanupUK and the GLA. It aims to co-ordinate clean-up activities undertaken at the community level, local authority level and corporate level. The year of action building up to the Olympic Games commenced in June 2011 and will include further bursts of coordinated activity in September 2011 and early in 2012. Capital Clean-Up will then focus on organising a final big push before the Games.

Proposal 6.6 The Mayor will work with London Councils and the London boroughs to develop a road map towards a plastic-bag-free London.

The Mayor would like London to become a plastic-bag-free city and will work with London Councils to determine the best way to achieve this goal. The Mayor is a strong supporter of local campaigns such as Greener

upon Thames and, he encourages communities across London to establish plastic-bag-free zones similar to the one established in Kingston. Many of the larger retailers have embraced the voluntary reduction scheme but the smaller and independent retailers have not necessarily received the support and guidance they need to attain the level of change still required.

The Mayor will work with the Association of Convenience Stores to help and encourage convenience stores to voluntarily reduce the number of single use plastic bags they provide to their customers. The Mayor and London Councils will also write to the major supermarkets to encourage them to re-double their efforts in reducing the number of single use plastic bags they distribute in light of recent reports that distribution is on the increase.

Proposal 6.7 The Mayor will work with gum manufacturers and London boroughs to reduce the blight of chewing gum on London's streets by encouraging the development and subsequent roll-out of degradable and non-stick gum in London.

Manufacturers need to be pro-active in reducing the blight of chewing gum. The Mayor is keen to work with gum manufacturers to invest in an educational campaign in London that would encourage the proper disposal of gum and develop non-stick or degradable gum alternatives.

In July 2010, the Mayor invited chewing gum manufactures, innovators, cleansing technology suppliers and street cleaners to an event at City Hall focused on sharing good practice and information. One of the highlights of the event was hearing from

a company called GumDrop that is providing containers for the collection of spent chewing gum and recycling the latex gum base to produce usable latex-based products. The event was well attended and the Mayor will continue to work with the attendees of this group to work towards his aspiration of a gum-litter-free London.

The Mayor is particularly interested in the products that have been produced by Peppersmith, a Putney based company that uses natural ingredients to produce a gum that is both non stick and degradable. The Mayor is also interested in the new non-stick product by Revolymer. Revolymer's non-stick gum has gone on sale in the US and the company hopes to launch it in the UK in 2011.

Proposal 6.8 The Mayor will work with the London boroughs, tobacco companies and tobacco retailers to develop a London-wide smoking-related litter reduction programme.

Similarly the tobacco industry needs to take some responsibility for the prevalence of cigarette ends on our streets and in our watercourses. Innovations have been forthcoming with personal/portable ashtrays being on sale for some years now. They have often been purchased by local authorities to distribute when enforcing litter offences. However they are sold in relatively few shops in London and most Londoners are not aware they can buy them. The Mayor is keen to work with the tobacco industry and retailers to increase awareness of the offence of dropping cigarette ends, and offering the concept of portable ashtrays as a solution to the problem.

The Mayor is keen to engage with tobacco manufacturers and retailers to develop a London-wide campaign that both educates smokers that dropping cigarette butts and other spent tobacco

products is littering, and encourages the use of alternatives such as personal ash trays and on-street cigarette butt bins. As part of a campaign the Mayor is keen to increase the provision of on street cigarette butt bins outside London's tube stations and transport interchanges as these areas are particularly blighted.

Proposal 6.9 The Mayor will work with London Councils and the Chewing Gum Action Group to develop a behaviour change communications programme on chewing gum litter for London to launch in the months leading up to the 2012 Games.

The Chewing Gum Action Group is made up of chewing gum manufacturers, Defra, Keep Britain Tidy and the Food and Drink Federation. Each year the group provides up to £1m of support to local authorities to run behaviour change campaigns aimed at stopping people from dropping chewing gum on the streets.

Given that the world's eyes are on London in 2012, the Mayor and London Councils wrote to the then Environment Minister Lord Henley requesting that the Chewing Gum Action Group provides the resources for a London-wide campaign to reduce chewing gum litter in the run up to the 2012 Games. Lord Henley and the Chewing Gum Action Group expressed an interest in working with London on this idea with a view to launching a campaign in 2012.

Proposal 6.10 The Mayor will work with TfL and London Underground to empower Londoners and visitors to be more responsible with their rubbish while on London's transport network.

The Mayor is currently working with TfL, London Underground, Network Rail and the train operators to explore opportunities to improve

the cleanliness of our transport network and to investigate how customers can be empowered to do the right thing with their litter, particularly by improving the provision of recycling and litter-bins inside the stations and on platforms.

London Underground have recently increased the number of litter bins that are available across the London Underground network by 25 per cent. London Underground is also aiming to recycle at least 75 per cent of litter that is collected on the network. The Mayor now wishes to work with TfL, Network Rail, and the train operators to rollout similar programmes across the whole of London's transport network.

CASE STUDY 13

Volunteer clean-up campaign

What: Capital Clean-up campaign

Date: Ongoing – The 2011 campaign launched on 10th June 2011

Success: London-wide campaign with widespread borough involvement. 124 events ranging from responsible dog-owner training to canal clean-ups and enforcement campaigns took place during June and July 2011 across 20 of the 33 London boroughs. Approximately 1,700 volunteers took part in these events.

Cost: Annual budget of £40,000

In June 2011, the Capital Clean-up campaign launched its fifth year of activity to make London cleaner, greener and safer in advance of the 2012 Games through local action, education and enforcement against grime crime. The campaign is led by the Mayor of London and delivered in partnership with litter action charities, London boroughs, Thames21, London Councils, the Metropolitan Police and the London Organising Committee for the Olympic and

Paralympic Games (LOCOG). The campaign aims to deliver a London-wide legacy of increased volunteering and community participation in the maintenance of local spaces.

The 2011 campaign includes new digital tools to help achieve these goals. An interactive online map helps the public to identify clean-up events near them and to contact organisers directly. Any London clean-up activity can be registered and added to the event map (visit www.london.gov.uk/capitalclean-up for more information). To help the public take action in their local areas, the website also provides information on how to plan and execute a volunteer clean-up, as well as a poster template that can be filled in and printed to promote local clean-ups. A regularly updated Twitter and Facebook profile promotes registered events and spreads the word when the campaign or its partners are in the news.

Outside the digital realm, a dedicated campaign co-ordinator is available to put members of the public in contact with borough officers who can help deliver locally-organised clean-ups. A partnership with Keep Britain Tidy has allowed any Capital Clean-up event to be co-registered with the national 'Big Tidy Up' campaign, generating a wider audience to engage with across both campaigns and making free 'Big Tidy Up' litter bags and tabards available to Capital Clean-up volunteers.

The June launch event of the Capital Clean-up campaign was an example of locally-driven activity that delivered long-term change. The event took place in a disused alleyway in the London borough of Lewisham that over the years had become overgrown and used for fly-tipping and graffiti. A group of

neighbours notified the council that the site was a concern and offered to help clean it up and maintain it in future.

The day before the launch, London Probation led Community Payback volunteers who cleared away the bulky fly-tipped rubbish. The following morning, campaign partners including CleanupUK, Keep Britain Tidy and City Hall staff joined forces with residents, Lewisham Council officers and children from two local schools to clear away unwanted vegetation, pick up litter and paint a graffitied wall using recycled paint from Community RePaint. One of the student volunteers from St. Augustine's Primary School was the winner of the 2010 Capital Clean-Up poster competition and her artwork was on the front of t-shirts distributed to volunteers at the event.

Despite rainy weather, the morning's activities attracted still more local residents who spontaneously joined in to help transform the derelict spot. In total, nearly 50 volunteers took part. Local residents have since started the Sevenoaks Action Group Against Fly-tipping (SAGAF) and are using the converted site as a community garden.

Further campaign activity is planned for September 2011, during the 'National Love Where You Live' campaign, as well as in January/February 2012 leading up to the Olympic and Paralympic Games.



Before and after – the Capital Clean Up campaign launch event in Lewisham, June 2011. © GLA



(Top) Student volunteers from St. Augustine's School and (above) local residents and City Hall staff helping at the Capital Clean Up campaign launch event in Lewisham, June 2011. © GLA

ENDNOTES

Preface

- 1 Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2007 Revision, Blueprint for a Green Economy, Quality of Life Policy Group, 2007
- 2 'Mapping an urban ecosystem service: quantifying above-ground carbon storage at a city-wide scale', Zoe G. Davies, Jill L. Edmondson, Andreas Heinemeyer, Jonathan R. Leake and Kevin J. Gaston, *Journal of Applied Ecology*, 2011,
- 3 INNOVAS, A Market Assessment of London's Low Carbon and Environmental Goods and Services Sector (2011)

Executive Summary

- 1 Greenhouse gases have different global warming impacts. For example, one tonne of methane is 21 times stronger than one tonne of CO₂. Sulphur hexafluoride is 23,900 times stronger than CO₂. A CO₂-equivalent figure is used to represent the warming impact of greenhouse gases as a whole.
- 2 London's Underground tube network and registered taxis make up approximately 10 per cent of London's annual CO₂ emissions from Transport (9.6 million tonnes). Source: 'The Mayor's Climate Change Mitigation and Energy Strategy', GLA, 2011.
- 3 Energy generation means the production of electricity, heat or transport fuel from organic or non-recycled municipal waste
- 4 'The Mayor's Climate Change Mitigation and Energy Strategy', GLA, 2011.

Chapter One

- 1 More detail on the government's waste policy review can be found at <http://www.defra.gov.uk>.
- 2 More detail on the definition of municipal waste can be found at <http://www.defra.gov.uk/statistics/environment/waste/la-definition/>.

Chapter Two

- 1 Table 1 Populations trend (at mid-year), *Focus on London's Demography*, DMAG briefing 2005/17, published 2005.

- 2 2010 Round Demographic Projections using the 2009 SHLAA, GLA Demography, Update 01-2011, February 2011.
- 3 'Future waste arisings in London 2009-2031', GLA, December 2009
- 4 Source: GLA, 2010
- 5 GLA survey, 2008. Note: differing governance arrangements for municipal waste in other cities makes direct comparison on recycling rates difficult.
- 6 Properties where waste is collected at the kerbside – usually excludes blocks of flat and large multi-occupancy properties.
- 7 London housing statistics: www.ons.gov.uk/census/index.html
- 8 Source: Defra waste statistics, 2009/10, see: www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/
- 9 Business waste collection services offered by London's unitary authorities and waste collection authorities: www.capitalwastefacts.com
- 10 The overall costs for providing waste collection services depend on a number of variables including the cost of collection (including transport), participation levels in the service, the quality of materials for recycling or composting, and the spot market price for recycled or composted material.
- 11 SMEs and sustainable waste management in London research findings, GfK for the London Assembly, July 2007 (www.london.gov.uk/assembly/reports/environment/business-waste-strategy-response-app-a-gop-research.pdf).
- 12 The Federation of Small Businesses compiled 32 local manifestos, one for each London borough (excluding the City of London), outlining what local councils can do to give a better deal for small businesses. see: www.fsb.org.uk/CouncilManifestoIntro.
- 13 'London Reuse and Recycling Centre Best Practice'. Resource Futures, March 2008.
- 14 Recycling rates exclude inert waste (such as rubble and soil)
- 15 Assumes incinerators generate 564 kWh electricity per tonne of waste incinerated, based on *Technical, economic and environmental analysis of energy production from municipal solid waste*, Murphy, J.D., & McKeogh, E. 2004, *Renewable Energy*, vol 29, pp 1043-1057). Also assumes the average annual London home energy requirement is 4,000 kWh (GLA 2011).

- 16 'Greenhouse gas balances of waste management scenarios', GLA, January 2008.
- 17 Source: East of England landfill capacity: East of England RTAB (2002) East of England Regional Waste Management Strategy (consultation draft) Table 12 and 14. South East England landfill capacity report:
www.southeastra.gov.uk/sustain_publications_research.html
- 18 Source: GLA Planning Decisions Unit, 2011

Chapter Three

- 1 See Appendix 4a *Economic modelling for the Mayor's municipal waste management strategy*, GLA 2010.
- 2 Includes the City of London Corporation
- 3 See Appendix 4b *Determining the costs of meeting the EPS and carbon intensity floor*, GLA June 2011.
- 4 See Appendix 4d *A review of the methodological approach used to develop an EPS for the management of London's municipal waste*, GLA May 2011

Chapter Four

- 1 Based on food waste making up 26 per cent of London municipal waste to landfill. Taken from 'Greenhouse gas balances of waste management scenarios', Appendix Four: Waste Composition, GLA, January 2008. London household waste arisings are taken from Defra 2009/10 household waste statistics.
- 2 Third Sector Reuse capacity in London, GLA 2007.
- 3 London Reuse Network submission to the London Waste and Recycling LWARB, LCRN 2010
- 4 The Environment Agency permits material from the anaerobic digestion of organic waste to be used as a recycled product, material or substance for land treatment resulting in benefit to agriculture or ecological improvement. More details can be found at www.environment-agency.gov.uk.
- 5 'Greenhouse gas balances of waste management scenarios', GLA, January 2008
- 6 Potential energy contribution based on: Organics include the following
- (1) ROC subsidy of £90/MWh@0.151 MWh/tonne = £13.59/tonne. Refer: www.enviros.com/PDF/BN020RenewableObligation/pdf
- (2) Wholesale electricity price of 6.67p/Kwh. Refer DECC 2011 Quarterly energy prices, wholesale electricity prices are based on average price in 2010 for extra large industrial consumers. (www.decc.gov.uk/assets/decc/Statistics/publications/prices/1492-qepmar11.pdf).

- (3) Wholesale gas (heat) price of 1.68p/KWh. DECC 2011 Quarterly energy prices, wholesale gas prices are based on average price in 2010 for large industrial consumers. (www.decc.gov.uk/assets/decc/Statistics/publications/prices/1492-qepmar11.pdf).
- 7 Economic Modelling of the Mayor's Municipal Waste Management Strategy, GLA, July 2010
- 8 Source: GLA modeling, 2010. Key assumptions:
- Collection costs and gate fees figures taken from 'Economic Modeling for the Mayor's Municipal Waste Management Strategy', GLA, 2010; GLA Survey of Boroughs, 2009
 - Wood waste going to biomass boilers with no gate fee. Source: GLA 2009
 - Paper, card, textiles, metals, glass, plastics going for recycling. Organic waste going to anaerobic digestion.
 - Remaining residual waste going for energy generation.
 - Landfill tax set at 2014 rate of £80 / tonne
- 9 A full breakdown of existing and planned municipal waste management infrastructure is set out in Appendix 3.
- 10 Based on a range of capital and operational costs for waste infrastructure taken from Economic Modelling for the Mayor's Municipal Waste Management Strategy, GLA, August 2010
- 11 Veolia, 2009
- 12 London Waste Limited, 2009
- 13 2010 Annual Survey of Londoners www.london.gov.uk/sites/default/files/Annual%20London%20Survey%202010%20toplines.pdf
- 14 London Councils www.londoncouncils.gov.uk/banthebag/Shoppingbagskeyfacts.htm

Chapter Five

Policy 1

- 1 The London 'Housing Strategy', February 2010.

Policy 2

- 1 Life cycle assessment techniques measure the environmental and economic costs and benefits of products and activities (in this case waste) at every stage of its existence, from production to final disposal. The environmental costs and benefits in this case would be expressed in CO₂e emissions.
- 2 'Analysis of kerbside dry recycling performance in England 2007/08', WRAP (2009), available at: www.wrap.org.uk/local_authorities/research_guidance/collections_recycling/benchmarking.html
- 3 See Appendices 4b, 4c and 4d to this strategy. These appendices are final reports setting out the work undertaken to review and refine the EPS and carbon intensity floor following public consultation on this strategy.

- 4 'Determining the costs of meeting the EPS and carbon intensity floor', GLA, 2011 (see Appendix 4b to this strategy)
- 5 'Clearing the Air: The Mayor's Air Quality Strategy', GLA 2011.

Policy 3

- 1 'Prospectus for London – low carbon capital', Ernst and Young, March 2009 (pg 26). See: www.lda.gov.uk/Documents/Prospectus_for_London,_the_Low_Carbon_Capital_5608.pdf

Policy 4

- 1 Where products from the anaerobic digestion process can be 'used as a soil improver, as an ingredient in growing media or blended to produce a top soil that will meet British Standard BS 3882'.
- 2 Assumes 60 per cent recycling or composting rates across material streams, with paper and card, metals, plastics, organic waste, textiles, and glass making up approximately 90 per cent of municipal waste. The actual CO₂ eq savings will depend on the materials recycled or composted.
- 3
 - a) Residual waste costs based on collection and disposal costs of £160 per tonne for waste sent to landfill. This comprises collection costs of £64 per tonne, and landfill fee of £96 per tonne (including the 2014 landfill tax of £80 per tonne). Source: Economic Modelling for the Mayor's Municipal Waste Management Strategy, GLA, 2010; WRAP Gates Fees Report, 2010.
 - b) Dry recycling costs based on recycling collection and gate fee costs of £86 per tonne. Source: WRAP Kerbside Recycling: Indicative costs and performance report, 2008.
 - c) Assumes organic waste is collected separately for treatment via anaerobic digestion at £126 per tonne. Source: GLA borough survey, March 2009.
- 4 Where products from the anaerobic digestion process can be 'used as a soil improver, as an ingredient in growing media or blended to produce a top soil that will meet British Standard BS 3882'.
- 5 See Appendix 4e The Performance of London's municipal waste recycling collection services, GLA, September 2010.
- 6 'On the go recycling', Report for the London Assembly Environment Committee, May 2009

Policy 5

- 1 Subject to final funding commitments.
- 2 'Greenhouse gas balance of waste management scenarios', GLA, January 2008.
- 3 'Recycling and Recovery facilities: site investigation in London', GLA 2005.

- 4 'Rubbish in Resources out – design ideas for waste facilities in London', GLA 2008. Available at www.london.gov.uk/priorities/environment/waste-resource/energy-recovery

Policy 6

- 1 Clean Neighbourhoods and Environment Act 2005

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Chinese

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Vietnamese

Nếu bạn muốn có văn bản tài liệu này bằng ngôn ngữ của mình, hãy liên hệ theo số điện thoại hoặc địa chỉ dưới đây.

Greek

Αν θέλετε να αποκτήσετε αντίγραφο του παρόντος εγγράφου στη δική σας γλώσσα, παρακαλείστε να επικοινωνήσετε τηλεφωνικά στον αριθμό αυτό ή ταχυδρομικά στην παρακάτω διεύθυνση.

Turkish

Bu belgenin kendi dilinizde hazırlanmış bir nüshasını edinmek için, lütfen aşağıdaki telefon numarasını arayınız veya adrese başvurunuz.

Punjabi

ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਦਸਤਾਵੇਜ਼ ਦੀ ਕਾਪੀ ਤੁਹਾਡੀ ਆਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਚਾਹੀਦੀ ਹੈ, ਤਾਂ ਹੇਠ ਲਿਖੇ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਹੇਠ ਲਿਖੇ ਪਤੇ 'ਤੇ ਰਾਬਤਾ ਕਰੋ:

Hindi

यदि आप इस दस्तावेज़ की प्रति अपनी भाषा में चाहते हैं, तो कृपया निम्नलिखित नंबर पर फोन करें अथवा नीचे दिये गये पते पर संपर्क करें

Bengali

আপনি যদি আপনার ভাষায় এই দলিলের প্রতিলিপি (কপি) চান, তা হলে নীচের ফোন নম্বরে বা ঠিকানায় অনুগ্রহ করে যোগাযোগ করুন।

Urdu

اگر آپ اس دستاویز کی نقل اپنی زبان میں چاہتے ہیں، تو براہ کرم نیچے دئے گئے نمبر پر فون کریں یا دیئے گئے پتے پر رابطہ کریں

Arabic

إذا أردت نسخة من هذه الوثيقة بلغتك، يرجى الاتصال برقم الهاتف أو مراسلة العنوان أدناه

Gujarati

જો તમને આ દસ્તાવેજની નકલ તમારી ભાષામાં જોઈતી હોય તો, કૃપા કરી આપેલ નંબર ઉપર ફોન કરો અથવા નીચેના સરનામે સંપર્ક સાદો.

