Our Waste

Our Challenge

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Wales 3 Regional Waste Plans 1st Review

Final Strategic Health Impact Assessment

Main Report

March 2008

peter brett associates

Peter Brett Associates disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence within the terms of the Contract with the Client and generally in accordance with ACE Short Form Conditions of Engagement and taking account of the manpower, resources, investigations and testing devoted to it by agreement with the Client. Any such party relies upon the report at their own risk. This non-technical summary contains an overview of the key findings and conclusions.

Acknowledgements

This strategic health impact assessment has been a collaborative project and would not have been possible without the support, advice and feedback of key people and organisations. In particular the members of the Project Steering Group:

- Martha Savage and Mike Pender, Denbighshire County Council
- Liz Green, Welsh Health Impact Assessment Support Unit (WHIASU)
- Rhiannon Jones, Environment Agency
- Janet Williams, Ty AVOW, Association of Voluntary Organisations in Wrexham
- Angela Tinkler and Jackie James, National Public Health Service
- Ceri Morris, Neath Port Talbot Council
- Stuart Newland, Caerphilly Council
- Simon Cottrill, Conwy County Council
- Adrian Jones, Welsh Assembly Government

Please note that the report does not necessarily reflect the personal or organisational views of the members of the Project Steering Group or of the other key people and organisations that have provided advice and information for this Strategic HIA.

Strategic HIA Report Authors:

- Salim Vohra, Peter Brett Associates (now at the Institute of Occupational Medicine)
- Claire Holman, Peter Brett Associates
- Laura Henworth, Peter Brett Associates

TABLE OF CONTENTS

1 Introduction

1.1.1 Peter Brett Associates have been commissioned by Denbighshire County Council to carry out a Strategic Health Impact Assessment (HIA) of the Wales 3 Regional Waste Plans 1st Review (3 RWPR).

1.1.2 This is the Final Report of the Strategic HIA which incorporates the feedback from the 3 RWPRs' Public Consultation that took place between October and December 2007.

1.1.3 Waste management is an important social, environmental and economic issue which generates strong public and community interest. The drive towards more sustainable waste management methods is due to: a) European waste legislation, b) the limited landfill space available and c) the need to reduce the potential negative environmental and health impacts of climate change. This requires a shift from the disposal of wastes in landfill to reducing waste and using a range of alternative treatment and disposal methods. European legislation requires Member States to develop an adequate network of waste facilities and to prepare regional and/or local waste management plans.

1.1.4 In Wales, the National Waste Strategy for Wales: Wise about Waste, translates this European legislation into Welsh legislation. The strategy covers the waste types listed in the various EU Directives on waste; waste from household; commercial; industrial and agricultural premises; mines and quarries; and sewage treatment operations (See Appendix A: Types of Waste Produced in Wales).

1.1.5 The waste strategy links strongly, and is consistent, with the Assembly Government's overarching sustainable development scheme presented in 'Starting to Live Differently'[1]; it will make a significant contribution towards the aim of achieving a better quality of life in Wales. Two types of targets are set in the waste strategy, primary Wales specific targets where the Assembly Government and its key partners (e.g. local government) have a direct influence over their outcome and secondary Wales specific targets where the Assembly Government has less influence.

1.1.6 To implement these targets, Technical Advice Note (TAN) 21, published by the WAG in November 2001, set out the framework for regional waste planning in Wales. TAN

[1] Welsh Assembly Government, Starting to Live Differently: the sustainable development scheme of the National Assembly for Wales, 2003.

21 requires that Regional Waste Plans (RWPs) are published for each of three waste regions of Wales: the North Wales, the South West Wales and the South East Wales Waste Regions. The first plans were published in 2003-4 by the three Regional Waste Groups - North Wales, South West Wales and South East Wales - which coordinate regional waste planning in Wales. These three Regional Waste Groups are made up of a Regional Technical Group and a Regional Member Group. The RWPs are primarily land-use planning documents and are a material consideration in the planning process.

1.1.7 TAN 21 also requires the three RWPs to be reviewed every three years. Therefore the Wales 3 RWP 1st Review (RWPR) is currently underway. As part of this review process, the range of waste management options for assessment has been expanded from those in the original 2003-04 RWPs to include new waste technologies. It has also been refined to take into account more recent data on the generation and composition of waste at the level of Wales and the three Waste Regions. Each of the RWPs has produced a Regional Waste Plan 1st Review report.

1.1.8 This Strategic HIA supports and informs the 3 Regional Waste Plan 1st Reviews and ensures that health is considered during the Regional Waste Planning process. The approach taken during this HIA reflects the fact that the 3 RWP 1st Reviews are of a strategic nature and do not deal with site specific issues. This HIA does therefore not look at site specific health impacts which would vary between: sites; the nature of the existing population; and other localised factors, but rather concentrates on the strategic, generic impacts of the implementation of the 3 RWP 1st Reviews. It follows the guidance provided by WAG, TAN 21 and Improving Health and Reducing Inequalities: a practical guide to health impact assessment. This HIA process therefore aims to be an open, transparent, impartial, democratic, sustainable and equitable process.

1.1.9 This HIA has three key outcomes. Firstly, to support the Wales 3 RWPR process and help to safeguard and enhance health and wellbeing by identifying potential positive and negative health impacts and providing mitigation and enhancement measures. Secondly, to support the communication of the findings of the HIA during the 3 RWPR Public Consultation. Thirdly, engage key stakeholders early and provide practical guidance for local authorities to help them to both consider the health issues at site-specific level and address any potential concerns that local communities might have after the RWPR is completed.

2 Health Impact Assessment

2.1 Introduction

2.1.1 The international Gothenburg consensus definition of health impact assessment (HIA) is: “A combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.”[2]

2.1.2 HIA is the key systematic approach to identifying the differential health and wellbeing impacts, both positive and negative, of plans and projects. In this case the strategic and spatial options identified by the Wales 3 RWPR.

2.1.3 HIA uses a range of structured and evaluated sources of qualitative and quantitative evidence that includes public and other stakeholders' perceptions and experiences as well as public health, epidemiological, toxicological and medical knowledge. Our approach is particularly concerned with the distribution of effects within a population, as different groups are likely to be affected in different ways, and therefore we look at how health and social inequalities might be reduced or widened by a proposed plan or project.

2.1.4 HIA aims to inform and influence policy and decision-makers by providing a rigorous analysis of the potential impacts as well as recommending options, where appropriate, for enhancing the positive impacts, mitigating the negative ones and reducing health inequalities.

2.1.5 HIA uses both a biomedical and social definition of health, recognising that though illness and disease (mortality and morbidity) are useful ways of understanding and measuring health they need to be fitted within a broader understanding of health and wellbeing to be properly useful (See Fig 2.1).

[2] WHO European Centre for Health Policy; Health impact assessment: main concepts and suggested approach; Gothenburg consensus paper; WHO Regional Office for Europe; 1999.

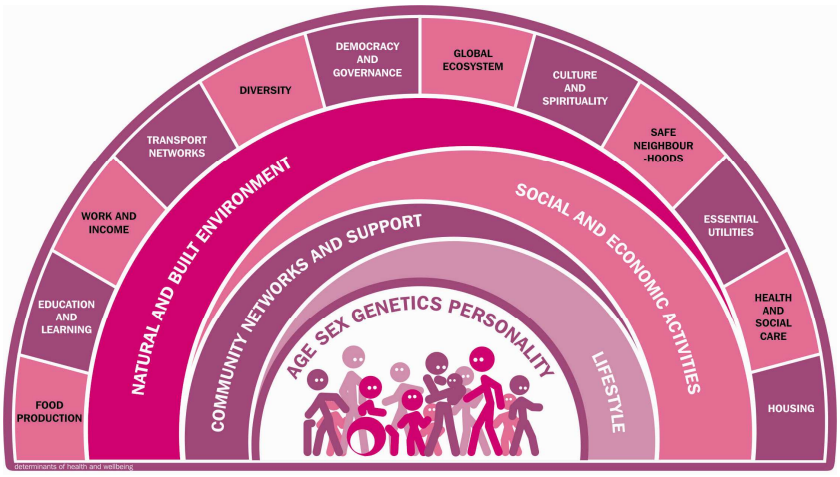


Fig 2.1: The determinants of health and wellbeing[3]

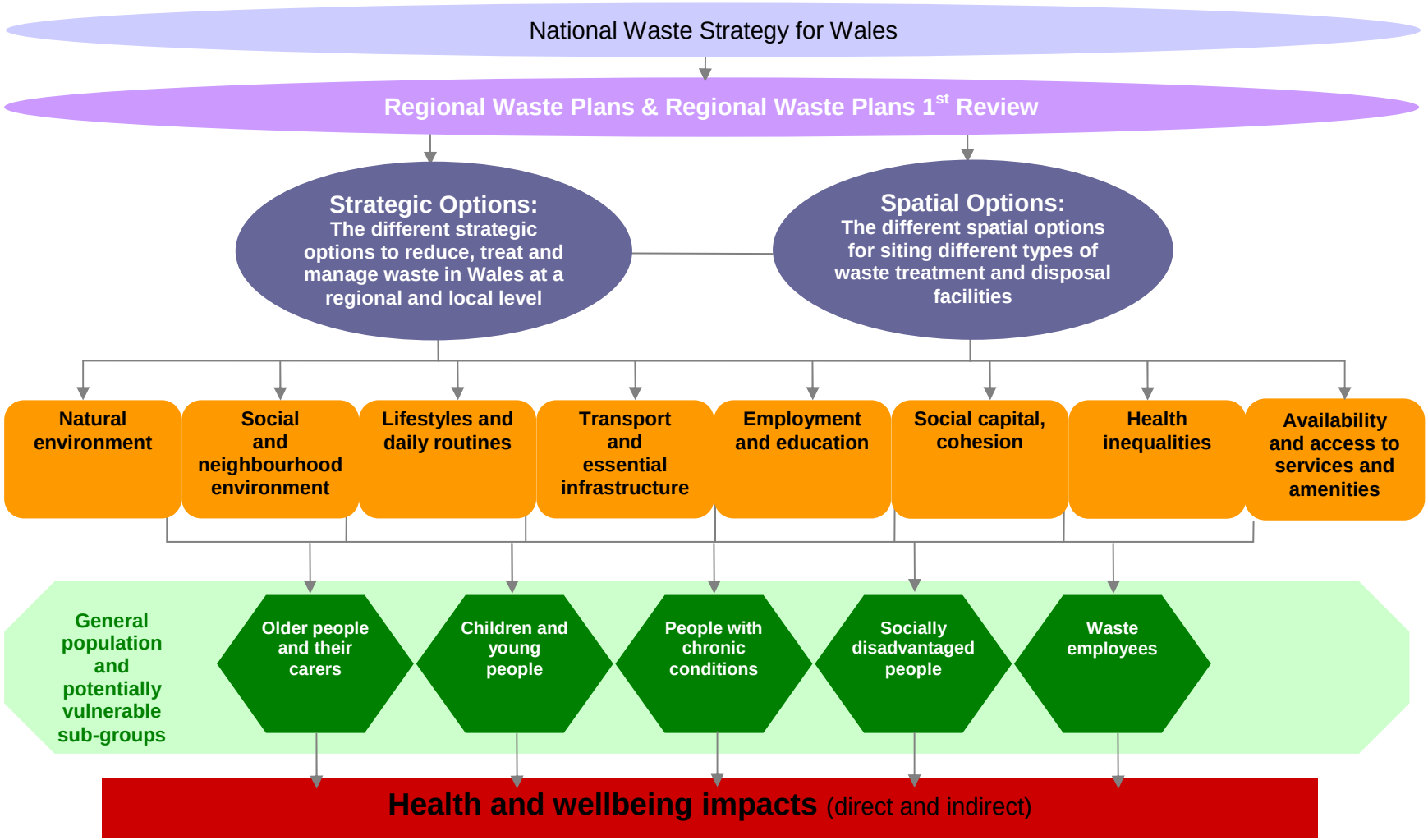
2.1.6 HIA therefore uses the following World Health Organization psycho-social definition of health: Health is "the extent to which an individual or group is able to realise aspirations and satisfy needs, and to change or cope with the environment. Health is therefore a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources, as well as physical capacities."[4] This definition builds on and is complementary to the longer established World Health Organization definition that "Health is a state of complete physical, social and mental wellbeing and not simply the absence of disease or infirmity"[5].

2.2 Approach to this HIA

2.2.1 This HIA takes a systems approach. The model used to understand the health and wellbeing impacts encompasses the plan or project, the determinants of health and wellbeing, pathways of action and the impacts themselves. Fig 2.2. illustrates this approach in relation to the HIA of the 3 RWPR.

[3] Peter Brett Associates; Adapted from Dahlgren G and Whitehead, Policies and strategies to promote social equity in health; Institute of Future Studies; Stockholm; 1991.
[4] World Health Organization; Health Promotion: A Discussion Document on the Concepts and Principles; WHO Regional Office for Europe; Copenhagen; 1984.
[5] World Health Organization; Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June 1946, and entered into force on 7 April 1948

Fig. 2.2 A systems view of the potential health and wellbeing impacts of the Regional Waste Plans



2.2.2 The 3 RWPR could influence the natural and social environment; people's lifestyles and daily routines; transport networks, employment and education, social capital and inequalities; and access to services and amenities. These in turn affects individuals and communities in different ways to generate positive and negative health and wellbeing impacts. The ways in which the RWPR could influence are discussed in the section below.

2.3 Social determinants of health [6] [7] [8] [9]

2.3.1 This is an introduction to some of the key social determinants of health and the development pathways by which they can positively and negatively affect health. The aim is to give a flavour of how the health and wellbeing of existing and new residents can be affected by a range of direct and indirect effects that are generated by land developments.

2.3.2 Employment and economy

- Unemployment generally leads to poverty and a reduction in personal and social esteem. While having employment generates self-esteem and self-worth; enhances income and develops skills and abilities.

- Poverty excludes people from: being able to afford quality and variety of foods, engaging in opportunities for leisure and physical recreation, enhancing their education and learning, having warm and comfortable homes. It also increases their difficulties in travelling and therefore accessing other services and amenities and levels of stress.

- All of these lead to poorer childhood physical growth and development, reduced general immunity to disease and reduced physical and mental health wellbeing.

- Employment and the economy affects all age groups but has the greatest effects on those already on low incomes, those with disabilities and children.

[6] Wilkinson R and Marmot M (Eds), Social determinants of health, Oxford University Press, 2006.
[7] Health impacts of the built environment: a review, National Institute of Public Health in Ireland, Ireland, 2006.
[8] Healthy sustainable communities: what works?, NHS Milton Keynes Health and Social Care Group, England, UK 2004.
[9] World Health Organization, Social determinants of health: the solid facts, 2nd Edition, 2003.

- The pathway by which employment can be affected by developments is by reducing or enhancing employment opportunities, affecting local people's social and welfare entitlements, affecting the viability of the organisations they work for, reducing their opportunities for education and training and reducing their ability to travel and access.

- Mitigation involves developing measures to ensure that existing employment, education, training, amenities and public transport are not reduced but maintained or enhanced. Enhancement involves developing measures to increase and promote the range of employment opportunities, education, training, amenities, public transport and welfare.

2.3.3 Housing and accommodation

- Poor housing that is damp, cold with poorly maintained water, electric and gas appliances has an effect on physical growth and development, reduced immunity to infections and mental health and wellbeing.

- Housing affects all age groups but the greatest effects are on older people, those with disabilities, children and people with chronic conditions such as cardiovascular or respiratory disease.

- The pathway by which housing can be affected by developments is where construction work causes vibration and subsidence in existing homes; poor maintenance of social housing; homes where large families live in overcrowded conditions.

- Mitigation involves developing measures to ensure housing meets 'decent homes' standards especially social housing, building more affordable homes and improving the access to housing maintenance services.

2.3.4 Education and learning

- Access to education improves the life chances and opportunities of people in terms of access to employment, uptake of health promotion and disease prevention information and being able to articulate need and hence access services more effectively.

- Education and learning affects all age groups but the greatest effects are on children and young people.

- The pathway by which education can be affected by developments is through direct changes to an education or training programme e.g. closure of a school and move to a new one; disruption to access to an education or training facility or disruption of their ability to deliver e.g. construction.

- Mitigation involves developing measures to ensure that existing education and training opportunities are not reduced or affected. Enhancement involves developing measures to increase educational opportunities.

2.3.5 Transport and connectivity

- Increased road traffic can lead to poorer outdoor air quality, increased traffic-related noise and an increase in traffic-related injuries.

- It can also lead to improved access to services and amenities e.g. health and social care, parks, leisure centres, etc. and increased opportunities for business expansion leading to more employment opportunities..

- Transport and connectivity affects all age groups but has the greatest effects on older people, children, those with disabilities and carers of young children.

- The pathway by which transport can be affected by developments is through the building of roads, greater flows of traffic because of new or denser housing developments, or greater flows of heavy traffic because of new or expanded business/industrial facilities.

- Mitigation involves creating safe pedestrian crossing sites, developing measures to reduce the outdoor air pollution caused by motor vehicles and factories, ensuring that residential and outdoor play areas are not built near roads with heavy motor traffic and where possible ensuring that modes of transport other than road are used, such as rail, sea and canal.

- Enhancement involves developing measures to increase walking, cycling and public transport provision wherever possible.

2.3.6 Crime and safety

- Fear of crime causes stress which reduces immunity to disease and mental wellbeing. Actual experience of crime causes stress and physical injury which reduces physical and mental health and wellbeing.

- Crime and fear of crime affects all age groups but fear of crime is greatest among women and older people.

- The pathway by which crime and safety can be affected by developments is through change that they make to neighbourhoods that bring in new people and new routines in a community making crime easier to commit and less easy to notice. Developments perceived to be undesirable may lead to a deterioration of the locality ('neighbourhood blight') as those who are most able move out of the neighbourhood, properties become difficult to sell/rent and social cohesion in the local community is reduced.

- Mitigation involves developing measures where buildings have natural surveillance from neighbours; using 'designing out crime' building design principles; and encouraging established communities to remain.

- Enhancement involves developing measures to improve local people's relationships with the Police, building neighbourhood community networks e.g. neighbourhood watch, ensuring that schools, youth facilities and others are brought together to develop a collaborative strategy to engage young people.

2.3.7 Access to health and social care

- Reduced access to health services leads to ill-health becoming worse, less amenable to treatment and more likely to lead to a permanent physical or mental impairment. Reduced access to social care services leads to stable chronic conditions becoming worse and the loss of independent living skills which in turn lead to greater physical and mental impairment.

- Access to health and social care affects all age groups but the greatest effects are on children and older people.

- The pathway by which access to health and social care provision can be affected by developments is through disruption to or reduction of public transport, locating facilities in remote locations and not making people aware of the services available to them, closure of local facilities or disruption during a move to a new facility.

- Mitigation involves appropriate planning and communication about disruption to access and ensuring alternatives are developed.

2.3.8 Social capital and community cohesion

- Disruption and reduction in the quality of the social relationships and social networks that local people and communities have can lead to feeling isolated and excluded which in turn can lead to depression and poor mental wellbeing. It can also make individuals more vulnerable to crime and to reduce their access to health and social care services.

- Social capital and community cohesion affects all age groups.

- The pathway by which social capital and community cohesion can be affected by developments is where it raises strong concerns and is not wanted by local people or an initiative that benefits some people at the expense of others.

- Mitigation involves developing measures to ensure that there is acceptance of an initiative by local people and affected groups and ensuring that everyone benefits and those that do not are compensated.

2.3.9 Environment

- Dirty and poor quality built environments as well as little or poor quality green space have a negative effect on mental wellbeing.

- Households without a car may suffer disproportionately, as they are less able to leave the waste management vicinity for recreation

- A development which is seen as unpleasant results in people leaving the area, lower property prices, and a more transient population who take less care of the neighbourhood, resulting in a downward spiral.

- Environment affects all age groups.

- The pathway by which environment can be affected by developments is where there is a reduction in street cleaning amenities and park officers, an increase in litter through the inadequate provision of bins, the lack of maintenance of streets and street furniture and the lack of maintenance of public and private buildings.

- Mitigation involves developing measures to ensure that there is an appropriate plan to manage and maintain greenspace and other public spaces.

3 Methodology

3.1 Introduction

3.1.1 The methodology for this strategic HIA is based on Improving Health and Reducing Inequalities: a practical guide to health impact assessment; the National Waste Strategy for Wales: Wise About Waste, Annex 18 Health Impact Assessment; TAN 21 and the PBA Comprehensive Health Assessment Toolbox.[10] [11] [12] [13]

3.1.2 This strategic HIA aims to provide an overarching high level public health analysis that could feed into local development plans and the siting and planning process for individual waste facilities. It could also set the context for the Environmental Impact Assessments (EIAs), and where appropriate, HIAs that might need to be undertaken at the site-specific level.

3.1.3 It assesses the SWMOs and the Spatial Options and builds on the work that has been carried out to date. This includes the Sustainability Appraisal and Life Cycle Assessment (SA and LCA) of the Strategic Waste Management Options and the Areas of Search (AOS) Study carried out as part of the 3 RWPR. It also uses existing waste-related health impact evidence reviews and health assessment work.

3.1.4 HIA is a broad and holistic form of assessment that analyses the potential direct and indirect health impacts. This is in contrast to health risk assessment which focuses solely on the potential direct physical health impacts of exposure to air, water and land emissions from waste facilities.

3.1.5 A Project Steering Group (PSG), made up of a range of key stakeholders, oversaw the development of this strategic HIA. See Chapter 4 for a list of the members.

[10] Welsh Assembly Government and Health Challenge Wales, Improving Health and Reducing Inequalities: a practical guide to health impact assessment, 2004.
[11] Welsh Assembly Government, Wise about Waste: the national waste strategy for Wales, Parts 1 and 2; 2002.
[12] Welsh Assembly Government, Technical Advice Note (Wales) 21: Waste; Planning Policy Wales, 2001.
[13] Peter Brett Associates; Comprehensive Health Assessment Toolbox (CHAT); 2005.

3.2 Regional Waste Plan 1st Review detailed HIA methodology

3.2.1 This section provides a detailed description of the methods used and their rationale. This section has been organised using the general stages of HIA.

Screening

3.2.2 In its simplest form 'screening' means stepping back as early as possible in the planning and development process to ask the question: could this proposal have an impact on, or implications for, people's health or any factors which determine people's health. This stage is quick to do and provides a preliminary picture of the potential health impacts of a plan or project on relevant populations in order to help inform the decision-making process.

3.2.3 The screening was undertaken by the PSG using the basic screening record sheet described in Improving Health and Reducing Inequalities. The screening paper is provided in Appendix B: Wales 3 RWPR HIA Screening Paper.

Scoping

3.2.4 This stage involves establishing the terms of reference and an agreed plan for what the HIA will consider. Key scoping issues include: the timescales for undertaking the HIA so that it can inform the decision-making process; the geographical boundaries of the project; what impacts/determinants should the appraisal focus on; what financial and human resources are available; should a steering group be set up and who should be involved; and what evidence could be used; and so on.

3.2.5 The scope of this strategic HIA was agreed by the PSG.

3.2.6 The geographic scope of the HIA is Wales and the three Waste Regions of Wales: the North, South East and South West (See Table 3.1).

Table 3.1: The local authorities that comprise the Waste Regions and the NPHS Regions

Local Authority / Local Health Board	Waste Region	National Public Health Service (NPHS) Region
Conwy	North	North
Denbighshire	North	North
Flintshire	North	North
Gwynedd	North	North
Isle of Anglesey	North	North
Wrexham	North	North
Powys	North / South East	Mid & West
Blaenau Gwent	South East	South East
Caerphilly	South East	South East
Cardiff	South East	South East
Merthyr Tydfil	South East	South East
Monmouthshire	South East	South East
Newport	South East	South East
Rhondda Cynon Taff	South East	South East
Torfaen	South East	South East
Vale of Glamorgan	South East	South East
Bridgend	South West	Mid & West
Carmarthenshire	South West	Mid & West
Ceredigion	South West	Mid & West
Neath Port Talbot	South West	Mid & West
Pembrokeshire	South West	Mid & West
Swansea	South West	Mid & West

3.2.7 The key population sub-groups that have been considered are the groups described in Appendix 2 of Improving Health and Reducing Inequalities and waste facility employees. These are:

- Age related groups: children, young people and older people
- Income related groups: people on low incomes, are economically inactive, are unemployed, and unable to work due to ill health
- Groups experiencing or at risk of discrimination, disadvantage or particular vulnerability: black and minority ethnic people; people with disabilities; refugee groups; people seeking asylum; travellers; single parent families; lesbian, gay, bisexual and transgender people; religious groups; and carers.
- Geographical issues: people living in areas know to exhibit poor economic, social or health indicators, people living in isolated areas, people unable to access services and facilities
- Waste facility employees: people who work in the different types of waste facilities

3.2.8 The key determinants of health and wellbeing that have been considered are those described in Appendix 1 of Improving Health and Reducing Inequalities. These are:

- Individual behaviours (Lifestyles): diet, physical activity, use of alcohol/cigarettes/non-prescribed drugs, sexual activity, other risk taking behaviour
- Social and community influences: family organisation and roles, citizen power and influence, social support and social networks, neighbourliness, sense of belonging, local pride, divisions in community, social isolation, peer pressure, community identity, cultural and spiritual ethos, racism, other social exclusion
- Living and environmental conditions: built environment, neighbourhood design, housing, indoor environment, noise, air and water quality, attractiveness of area, community safety, smell, waste disposal, road hazards, injury hazards, quality and safety of play areas
- Economic conditions: unemployment, income, economic inactivity, type of employment, workplace conditions
- Access and quality of services: medical services, other caring services, careers advice, shops and commercial services, public amenities, transport, education and training, information technology
- Macro-economic, environmental and sustainability factors: government policies, gross domestic product, economic development, biological diversity, climate change.

3.2.9 This strategic HIA assesses:

- the potential direct health impacts and the indirect impacts on the wider determinants of health and wellbeing of the SWMOs and the Spatial Options;
- the potential impacts in two geographical contexts: urban and rural. (Table 3.2 shows the key characteristics of urban and rural areas in relation to this strategic HIA);[14]
- the implications of co-locating waste treatment facilities; and
- the potential cumulative impacts.

[14] Wales Centre for Health, A profile of rural health in Wales, 2007

Table 3.2: Key strategic characteristics of urban and rural areas in Wales [Source: Wales Centre for Health]

Characteristics	Urban	Rural
Population density	>10,000	<10,000
Population spread	Circular (not constrained)	Circular (not constrained)
Roads	Dense network	Sparse network
Development density	Densely built up	Not built up
Availability of and access to services	Good	Poor
Economy	Mainly commercial and industrial	Mainly farming and tourism
Socio-cultural	Diverse with high degree of mobility and migration	Welsh speaking, less diverse and lower levels of mobility and migration

Baseline assessment and health profile

3.2.10 National, regional and local level health and wellbeing profiles have been produced from existing data from the Wales Centre for Health, the National Public Health Service for Wales, Statistics Wales and the Office for National Statistics. The profile examines the existing health issues facing the people of Wales to understand their current vulnerabilities and provides a health and wellbeing baseline from which to assess the potential impacts of the SWMOs and Spatial Options.

Consultation and involvement

3.2.11 A Project Steering Group (PSG) was set up to oversee and advise on this strategic HIA. The members of the PSG were chosen so as to ensure wide representation. It therefore included a lay representative from the voluntary sector as well as representatives from the Welsh Health Impact Assessment Unit, National Public Health Service for Wales, Environment Agency, Environmental Health, Regional Waste Groups and the Welsh Assembly Government.

3.2.12 A one page questionnaire was sent to the local Public Health Directors and Environmental Health Officers in the twenty-two Welsh local authorities to gather the

views and perspectives of these key professional stakeholders on waste and health issues in their local areas. This feedback has been incorporated into this HIA. Chapter 4 provides more details.

3.2.13 The draft version of the HIA findings has been presented to the three Regional Technical Groups and Regional Members Groups.

3.2.14 The Draft Strategic HIA Report was also disseminated during the Public Consultation on the 3 RWPR and the feedback from it has been incorporated into the Final Strategic HIA Report of the Wales 3 RWPR.

Evidence and analysis

3.2.15 Existing information resources of the Welsh Health Impact Assessment Support Unit, the Wales Centre for Health, the National Public Health Service for Wales, the Office for National Statistics, the Environment Agency and the Regional Technical Groups have been used to inform the evidence base used in this strategic HIA.

3.2.16 This HIA used existing literature reviews/reviews of the evidence of the health impacts of waste treatment facilities rather than primary literature and where necessary undertook additional literatures searches to ensure that the evidence base used to inform the assessment was up-to-date.

3.2.17 The Strategic Options Analysis used an analytical matrix to analyse the potential impacts on the wider determinants of health and wellbeing for each of the four SWMOs and 19 Sub-Options. This was done using a combination of the matrix described in Improving Health and Reducing Inequalities and the PBA Comprehensive Health Assessment Toolbox. Impacts were classified using the levels defined in Table 3.3 below.

Table 3.3: Criteria used for assessing the significance levels of the potential health impacts

Significance Level	Criteria
Severe ---- (negative only)	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process, and may threaten the viability of the project. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category. Typically, mitigation measures are unlikely to remove severe adverse effects.
Major +++/--- (positive or negative)	These effects are likely to be important considerations at a local or district scale. If adverse, potential concerns to the project may become key factors in the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the adverse effects upon the affected communities or interests.
Moderate ++/-- (positive or negative)	These effects, if adverse, while important at a local scale, are unlikely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor/Mild +/- (positive or negative)	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless they are of relevance in enhancing the subsequent design of the project and the consideration of mitigation and/or compensation measures.
Neutral/No Effect ~	No effect or effects which are beneath the level of perception or within normal bounds of variation.

3.2.18 The Spatial Options Analysis has analysed the potential spatial differences in health and wellbeing:

- arising from the different numbers of facilities that the SWMOs are likely to have;
- between siting new waste facilities in urban as compared to rural areas of Wales;
- of locating a single waste treatment facility and co-locating a number of facilities at one site;
- due to waste road traffic, at national and regional levels, associated with the siting of new waste facilities; and

- how health and health inequalities might be considered in the Areas of Search that have been developed.

Mitigation and Enhancement

3.2.19 A set of general mitigation and enhancement measures have been suggested to minimise any potential negative impacts and maximise any potential positive impacts of the SWMOs and Spatial Options.

3.2.20 Some specific guidance, in the form of a health impact screening checklist, to guide local authorities on the health and wellbeing issues they should consider at the local site specific level has also been developed.

Follow up and 1st Review Consultation

3.2.21 During the follow up stage the HIA consultants provided support for the 3 RWPR Public Consultation on how the HIA could be incorporated into the RWP 1st Review Consultation.

3.2.22 The 3 RWPR Public Consultation feedback on the Draft Strategic HIA Report and any other health-related feedback has been incorporated into the Final Strategic HIA Report.

4 Stakeholder Engagement & Involvement

4.1 Introduction

4.1.1 A range of methods are being used to gather feedback from the public and other key stakeholders during this HIA.

4.2 Public consultation

4.2.1 A full public consultation across Wales and within each of the three Waste Regions on the Wales 3 RWPR and the related assessments, including the Draft HIA Report, took place between October and December 2007.

4.2.2 The feedback from this public consultation has been incorporated, where possible and appropriate, into the Final HIA Report (See Appendix F for details).

4.2.3 Public complaints data from the Environment Agency on existing waste facilities in Wales has been used to inform the evidence review and the assessment process.

4.3 Project Steering Group

4.3.1 This HIA had a Project Steering Group (PSG) that was made up of a wide range of stakeholders (See Table 4.1).

4.3.2 This PSG played an active part in the development of this Final HIA Report and reviewed all aspects of the HIA from the screening and scoping to the development of the current state of health evidence on potential impacts, the impact analysis and the development of mitigation and enhancement measures.

4.3.3 The PSG communicated through meetings, via email and over the phone.

4.3.4 There was also a wider group of stakeholders who were emailed the draft written elements of the HIA including minutes of the PSG meetings.

4.3.5 The lay representative networked with other voluntary sector representatives in other parts of Wales.

4.3.6 A one page questionnaire was sent out to the local Public Health Directors of each of the local health boards and to Environmental Health Officers in each of the local authorities to gain their advice on the key environmental health issues in each area, the kinds of complaints that had emerged concerning existing waste facilities in their area and their key concerns about potential new waste facilities that might need to be sited as part of the implementation of the Regional Waste Plans.

Table 4.1 Members of the HIA Project Steering Group (PSG)

Name	Organisation
Simon B. Cottrill	Conwy County Council
Michael Pender	Denbighshire County Council
Martha Savage	Denbighshire County Council, North Wales Regional Plan Coordinator
Rhiannon Jones	Environment Agency
Angela Tinkler	National Public Health Service
Jackie James	National Public Health Service
Ceri Morris	Neath Port Talbot Council, South West Regional Waste Plan Coordinator
Stuart Newland	Caerphilly Council, South East Regional waste Plan Coordinator
Janet Williams	Ty AVOW, Association of Voluntary Organisations in Wrexham
Adrian Jones	Welsh Assembly Government
Liz Green	Welsh Health Impact Assessment Support Unit, Wales Centre for Health

4.4 Questionnaire survey and complaints data

4.4.1 Six completed questionnaires were received from Local Health Boards and seven completed questionnaires were received from Local Authorities. These questionnaires encompassed all the three Waste Regions.

4.4.2 Key issues in relation to the health impacts of waste management were:

- public perceptions and fears and the mental health effects due to this;
- lack of evidence in relation low level exposures;
- lack of confidence in mitigation and remediation;
- air pollution, odour, pest and nuisance issues;
- fly tipping;
- transport impacts;
- sustainability and the need to balance the impacts of the various methods of waste treatment and disposal compared to the status quo;

- need for guidance on human safety e.g. distance limits from the various types of waste facility; and
- need to engage the Environmental Partnerships in the Local Strategic Partnerships as well as the Health, Social care and Wellbeing Strategies at local level.

4.5 Other feedback

4.5.1 The Draft HIA Report was sent to the members of the Regional Technical and Regional Members Groups of the three Waste Regions and presentations of the Draft HIA Report were made to combined meetings of these groups.

4.5.2 The Wrexham County Over 50's Forum also reviewed the Draft HIA Report Non-Technical Summary for clarity and ease of reading. There comments, where possible and appropriate, have been incorporated into the Final HIA Report.

5 Policy and Regulatory Context

5.1 Introduction

5.1.1 This chapter summarises the main policies that are relevant to the Wales 3 RWPR, at the European, national and regional levels.

5.2 Waste-specific

5.2.1 European legislation has been the key driver behind the move to more sustainable waste management methods through:

- overarching legislation, which establishes the overall framework for the management of wastes, including definitions and principles;
- legislation on treatment operations, such as landfill or incineration,
- legislation that sets technical standards; and
- legislation on specific waste streams, such as waste oil or batteries. (This latter category has not been described in this policy context due to the strategic nature of this HIA.)

Directive on Waste (Waste Framework Directive), 1975, 75/442/EEC

5.2.2 The Directive establishes a framework for the management of waste across the European Community, defining key terms to enable its uniform implementation. Importantly the Directive requires that Member States: 'ensure that waste is recovered or disposed of without endangering human health and without using processes which could harm the environment.'

Directive on Hazardous Waste, 1991, 91/689/EEC

5.2.3 The Directive on Hazardous waste complements the Waste Framework Directive by providing a framework for the control of hazardous waste, which is seen as particularly important to manage properly due to the risks they pose to the human health and the environment. [15]

[15] European Commision, (Accessed 23rd May 2007), *Waste: Hazardous Waste*, http://ec.europa.eu/environment/waste/hazardous_index.htm

Directive Concerning Integrated Pollution Prevention and Control (IPPC), 1996, 96/61/EC

5.2.4 The IPPC Directive applies to major industrial and waste sites with the potential for heavy pollution, specifically air, water and land pollution. It aims to provide a high level of protection for the environment and health, extending to the inclusion of energy use, waste minimisation, vibration and noise.

5.2.5 The Directive is being implemented in England and Wales through the Pollution Prevention and Control (PPC) (England and Wales) Regulations 2000.

Directive on the Landfill of Waste, 1999, 1999/31/EC

5.2.6 The Landfill Directive aims to reduce the environmental and human health impacts of landfill across Europe, through specific technical requirements for landfills and the types of waste that can be deposited.

Directive on the Incineration of Waste, 2000, 2000/76EC

5.2.7 The Waste Incineration Directive aims to prevent negative effects on human health and the environment from incineration, through air, soil, surface water and groundwater pollution.

Wise About Waste, The National Waste Strategy for Wales, 2002

5.2.8 The national strategy for dealing with waste in Wales. This provides the framework and principles on how waste will be managed in Wales at regional and local levels.

5.2.9 It also sets targets for local authorities on treating and managing waste. Current targets include: a reduction in the use of landfills (Landfill Allowance Scheme [LAS]); the reduction in household waste, an increase in municipal waste recycling and composting; an increase in business/private recycling; and an increase in the treatment of residual waste.

Planning Policy Wales, 2002

5.2.10 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Assembly Government. It is supplemented by a series of Technical Advice Notes (TANs). Procedural advice is given in National Assembly for Wales circulars. PPW, the TANs and circulars together comprise national planning policy which should be taken into account by local planning authorities in the preparation of Unitary Development Plans (UDPs) and Local Development Plans (LDPs). They may be

material to decisions on individual planning applications and will be taken into account by the National Assembly for Wales and Planning Inspectors in the determination of called-in planning applications and appeals. Detailed advice on the preparation of UDPs is contained in Unitary Development Plans Wales, 2001 and advice on the preparation of LDPs is contained in Local Development Plan Manual, June 2006.

Regional Waste Plans, 2003-04

5.2.11 Each of the three Waste Regions of Wales – North Wales, South West Wales and South East Wales - have produced Regional Waste Plans. These plans translate the vision and principles of the National Waste Strategy into a practical plan for the integrated management of waste within Wales and the three Waste Regions. As part of this they are required to review their Waste Plans at three yearly intervals to ensure that they remain current and take account of new and emerging waste-related issues.

5.3 Other

Directive on the assessment of the effects of certain public and private projects on the environment, 1985, 85/337/EEC (EIA Directive)

5.3.1 Environmental Impact Assessment derives from Directive 85/337/EEC, which requires consideration of effects on “population.”

Directive on the assessment of the effects of certain plans and programmes on the environment, 2001, 2001/42/EC (SEA Directive)

5.3.2 Strategic Environmental Assessment derives from Directive 2001/42/EC, which requires consideration of effects on “human health”.

Wales: A Better Country, 2003

5.3.3 This is the strategic agenda of the Welsh Assembly Government, the vision of which includes ‘…a fairer, more prosperous, healthier and better educated country, rooted in our commitment to social justice and to putting health and wealth creation that is sustainable at the heart of policy-making.’

People, Places, Futures – The Wales Spatial Plan, 2004

5.3.4 The vision of the Wales Spatial Plan is that it will sustain communities by tackling the challenges presented by population and economic change; growing in ways which increase competitiveness, spreads prosperity to less well–off areas and reduces negative environmental impacts; enhancing the natural and built environment for its own sake and for what it contributes to well-being; and sustaining Wale's distinctive identity.

Making the Connections – Delivering Better Services for Wales, 2004

5.3.5 The vision of the Welsh Assembly Government's for public services: encompassing waste management and planning as structural services that benefit the community. The four principles are: citizens at the centre; equality and social justice; working together as the Welsh public service and value for money.

Beyond Boundaries: Citizen-centred Local Services for Wales (Beecham Review), 2005

5.3.6 The Beecham Review of local service delivery in Wales forms part of the implementation of the Making the Connections strategy for improving public service delivery in Wales.

Environment Strategy for Wales, 2006

5.3.7 This strategy recognises the relationship between policies, programmes and the environment, and the need for high quality, consistent environmental evidence to inform decision-making.

5.3.8 It recognises the importance of a good environment on quality of life and wellbeing. It also recognises that there are potential social justice issues in relation to poor quality environments in deprived areas and the need to improve the local environment for people living in these areas.

Technical Advice Note 8: Renewable Energy, 2005

5.3.9 This advice note provides guidance on the use of renewable energy technologies one element of which is energy recovery from waste.

Technical Advice Note 15: Development and Flood Risk, 2004

5.3.10 This advice note provides guidance on how developments, such as waste facilities should be sited in relation to land at risk of flooding.

Technical Advice Note 21: Waste, 2001

5.3.11 This advice note provides guidance on the production of Regional Waste Plans in Wales and how the land use planning system should contribute to sustainable waste resource management.

Draft Ministerial Interim Planning Policy Statement on "Planning, Health and Well-Being", 2006, (DMIPPS 02/2006) - consultation draft

5.3.12 This draft Ministerial Interim Planning Policy Statement provides additional guidance on planning, health and well-being. Consultation closed on 27th October 2006. The document highlights the interconnected nature of planning, health and well-being and their importance in shaping sustainable patterns of development. Health Impact Assessment is noted as a process capable of assessing the impacts of policies, plans and programmes on health and well-being.

Public Health Strategic Framework, 2007, (in development)

5.3.13 This framework is currently in development and will provide an integrated agenda and tool within the Welsh Assembly Government on Public Health in Wales.

Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007

5.3.14 This strategy sets out a way forward for work and planning on air quality issues in the UK.

5.4 Regulatory context

Integrated Pollution Prevention and Control Regulatory Framework, 1996

5.4.1 IPPC is the main regulatory system to ensure that industry adopts an integrated approach to pollution control so as to achieve a high level of protection for the human health and environment.

5.4.2 Operators of new or proposed installations – industrial, waste, intensive farming - must apply for a permit from the Regulator (either the Environment Agency or a Local Authority) prior to the operation of the facility or, in the case of existing sites, within a specified time frame. The operator must consider all environmental and health impacts associated with emissions from the installation. As part of the determination process, the Regulator is required to consult with a number of Statutory Consultees including Local Health Boards (LHBs) in Wales and Primary Care Trusts (PCTs) in England because of their 'specialist knowledge' on public health.

5.4.3 The Health Protection Agency supports LHBs and PCTs in fulfilling their responsibilities as statutory consultees within the IPPC regulatory framework.

6 Health Impacts of Waste, SWMOs, and Waste Facilities

6.1 Introduction

6.1.1 This is a rapid review of the available scientific literature on the health impacts of waste, strategic waste management options (SWMOs) and waste treatment facilities and technologies. The aim of this review is to provide an overview of the potential health and wellbeing impacts of the strategic waste management options and waste treatment facilities under consideration in the Wales 3 RWPR.

6.1.2 It is worth noting that the health impact literature, to date, has primarily focused on the health impacts of individual types of waste treatment facilities and technologies rather than on comparing different SWMOs or the different combinations of waste treatment options that can make up an integrated waste management strategy. This has largely been because, historically, landfill has been the waste treatment option of choice and it is only relatively recently that the move away from landfill has generated interest in developing other waste treatment approaches.

6.1.3 Appendix C: Additional Information on Health Impacts and Assessment, provides further details that complement the discussion in this chapter.

6.2 Background

6.2.1 Most human activities generate waste and we all, to a greater or lesser degree, generate waste in our day-to-day lives. Like most other social developments and technologies, methods of waste treatment and management have potential positive and negative health and wellbeing impacts. There are three major categories of positive and negative health impacts related to waste and waste management:

- Health and wellbeing impacts of the different types of untreated waste.
- Health and wellbeing impacts of SWMOs and the different types of waste treatment facilities.

- Health and wellbeing impacts of the operations and activities associated with waste treatment facilities.

6.2.2 Interpreting the evidence from epidemiological studies[16] is particularly difficult in relation to waste and waste treatment. Both for methodological (i.e. the way they were carried out) and biological reasons (including people's age, genetic makeup and existing state of health) individual epidemiological studies do not provide sufficient evidence to be certain of the potential positive and negative health impacts of different types of waste treatment facilities.

6.2.3 This uncertainty creates a tension between the need to protect the health and wellbeing of local communities and the need to make decisions that benefit society as a whole on the basis of the best available evidence on potential positive and negative impacts. Two approaches have been advocated to overcome this tension.

6.2.4 The classical risk-based approach argues that if the evidence to date is weak, contradictory and/or uncertain then we should proceed and implement on the basis that there are no significant health impacts. [17]

6.2.5 The more recent precaution-based approach argues that if the evidence is weak, contradictory and/or uncertain we should proceed and implement on the basis that there may be some significant health impacts.[18]

6.2.6 It becomes the responsibility of decision-makers to balance the issues and come to a decision. However, from a public health perspective the precautionary approach is the better framework for waste planners and policy and decision makers to use when considering which strategic waste management option to go ahead with. This is because it is safer and less costly, in social, economic and health terms, to make strategic waste management decisions under the assumption that there may be some health impacts, only for future research to prove that there are no significant health impacts, than to make decisions assuming that there are no health impacts only to find that future research shows that there are significant health impacts.

[16] Epidemiology is the study of the occurrence and causes of illness/disease in human populations. An epidemiological study usually compares two groups of people who are similar except for one factor, such as exposure to a chemical or the presence of an illness effect. Epidemiologists then try to work out what factors, if any, are associated with the illness.
[17] The Royal Society, Risk analysis, perception and management, 1999.
[18] DEFRA, Guidelines for environmental risk assessment and management, 2000.

6.2.7 Lastly, there is growing recognition of the value of understanding, and taking into consideration, public perceptions of environmental and health risks in planning, siting and decision-making processes. [19]

6.3 Review Approach/Methodology

6.3.1 This review focuses on the health impacts of untreated waste, waste management options and waste treatment facilities.

6.3.2 There are four main sources of evidence that can be looked at when assessing any potential health impacts:

- Primary research literature (published reports of studies that have been carried out).
- Secondary research literature (reports that are based on data and findings from information found in primary literature).
- Existing reviews of primary and secondary literature (in article, report and book form).
- Previous health impact assessments on a related topic.

6.3.3 This review is based on the findings of existing reviews of primary and secondary literature and previous HIAs on different types of waste treatment facilities that are available in the public domain, i.e. Sources 3 and 4 listed above, and where necessary undertook additional literatures searches to ensure that the evidence base used to inform the assessment was up-to-date. For more details on the search methodology see Appendix C.

6.3.4 The majority of the primary research literature focuses on the human health effects of the emissions of waste treatment facilities into the air, water and soil. Of these, the health impacts of emissions into the air have been investigated in the greatest detail.

6.3.5 Much of the existing evidence on emissions relates to sites operated using older technologies, and may not be directly applicable to more recently designed and built modern waste treatment facilities and technologies which have better and more effective pollution control measures.

[19] Boholm A and Lofstedt R, Facility siting; risk, power and identity in land use planning (Risk, society and policy series), Earthscan Publications, London, 2004.

6.3.6 Direct emissions from waste facilities sites do not automatically lead to exposure. Exposure requires contact and this contact can be through breathing in, skin contact, eating food or drinking liquids contaminated by these emissions. The effects of exposure also depend on the level and duration of exposure as well as the vulnerability of the people exposed. For example, children can be more susceptible, because their physiology and immune system are immature, and they can, or have the potential to, behave in ways that increase their potential exposure.

6.3.7 There is very little primary research literature on the wider social and psychological impacts of waste treatment facilities and the potential positive and negative influence they might have on the wider determinants of health and wellbeing.

6.4 Health impacts of untreated waste

6.4.1 Waste can be classified in a number of ways, according to its source or origins e.g. municipal, commercial, industrial, agricultural, mineral, etc. See Appendix A.

6.4.2 However, in relation to health impacts there are two key types of waste: non-hazardous and hazardous. The European Waste Catalogue and Hazardous Waste List provides a detailed list of the types of waste that are hazardous and non-hazardous[20]. However, the dividing line between hazardous and non-hazardous can sometimes be difficult to make as, for example, in a stable state some plastics are non-hazardous and yet when they become degraded, treated or come into contact with other chemicals they can become hazardous. Therefore, some waste is hazardous or non-hazardous throughout the waste management lifecycle and regardless of the waste treatment option used. Conversely, other waste is rendered non-hazardous, hazardous, or will give off hazardous by-products, after waste treatment or contact with other types of waste during the waste treatment process.

6.4.3 All waste whether classified as non-hazardous or hazardous, particularly biological (e.g. food, drink, animal remains); radioactive and chemical waste (e.g. domestic cleaning fluids, batteries, industrial chemicals, plastics) can be hazardous if not collected and managed appropriately. The potential human health impacts associated

[20] European Commission, Revised European waste catalogue (EWC), 2002.

with the accumulation and decay of both non-hazardous and hazardous waste include[21]:

- emissions into the air, water and soil;
- odour;
- dust;
- an increase in pests and vermin;
- detraction from the visual aesthetics of the local environment;
- impacts on greenspace;
- impacts on flora and fauna;
- fire hazard;
- infectious diseases (both directly and from transmission by, for example, flies and rats); and
- chronic diseases e.g. pneumonia, diarrhoea, bronchitis.

6.4.4 It is clear that if waste remains uncollected and untreated (a 'do nothing' approach) there will be significant and demonstrable negative consequences for health and wellbeing. It is against this background that any actual or potential health impacts arising from different strategic waste management options needs to be compared. [22]

6.5 Health impacts of strategic waste management options (SWMOs)

6.5.1 A number of cost-benefit and health assessments of strategic waste management options have been done at regional and national levels. The regional level assessments identified by the literature review were by Oxfordshire, Milton Keynes, Bedfordshire Councils and the Greater London Authority.[23] [24] [25] [26] There were also two assessment produced by Friends of the Earth, UK Waste and Waste Watch and the Community Recycling Network.[27] [28] There have also been a number of reviews of

[21] Leonardi G., Waste and Health in London: a brief overview, London School of Hygiene & Tropical Medicine, 2001 (Part of the HIA of the London Mayor's draft Municipal Waste Strategy 2001)
[22] Williams P, Waste treatment and disposal, John Wiley & Sons, Chichester, 1999.
[23] Oxfordshire Waste Partnership, No Time to Waste: The Oxfordshire Joint Municipal Waste Strategy Appendix 2, Annex D: Options for residual waste (treatment and disposal), 2006.
[24] Milton Keynes Council, A review of the potential health and environmental impacts from municipal waste Management technologies which might be used in Milton Keynes, 2005.
[25] Bedfordshire County Council, Analysis of Waste Management Options: Developing a Sustainable Waste Strategy for Bedfordshire and Luton, 2000.
[26] London Health Commission, Mayor of London's Waste Strategy HIA, 2001.
[27] Friends of the Earth, UK Waste and Waste Watch, Beyond the Bin: the economics of waste management options, 2000.
[28] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.

research and studies have also been undertaken.[29] [30] [31] None of these demonstrates a clear best strategic management option from a cost, environmental or health perspective. However, they all broadly agree that:

- Any potential strategic waste management option will have strengths and weaknesses from an economic, social, environmental and health perspective.
- All types of waste treatment facilities, including transfer stations, civic amenities, materials recycling facilities and composting facilities, now and in the future are likely to have both some positive and some negative health and wellbeing impacts.
- High rates of reducing, re-using and recycling waste are likely to form the core of any good strategic waste management option.

6.5.2 Similarly, there seems to be a general consensus, among both environmental and health literatures, that the SWMOs that are likely to have the lowest negative impact on health and wellbeing will have high levels of waste reduction, re-use, recycling and composting. [32] [33]

6.5.3 Therefore, from a public health perspective, the societal aim over the medium to long term must be to a) reduce the amount of waste overall by moving waste up the waste hierarchy[34], b) reduce the amount of waste that is potentially hazardous, and c) substitute existing hazardous materials in products for ones that are non-hazardous.

[29] Hogg D, Costs and benefits of residual waste management options – what should we do?, Conference "The future of residual waste management in Europe" 2005.
[30] Strange K, Overview of Waste Management Options: their efficacy and acceptability, Issues in Environmental Science and Technology, No. 18, Environmental and Health Impact of Solid Waste Management Activities, Royal Society of Chemistry, 2002.
[31] European Commission, Waste management options and climate change, 2001
[32] Royal Commission on Environmental Pollution, 26th Report The Urban Environment, 2007.
[33] South West Public Health Observatory, Waste management and public health: the state of the evidence, 2002.
[34] The waste hierarchy is a framework for thinking about and dealing with waste. It is usually represented as a triangle where reduction of waste forms the base followed by reuse and recycling with treatment and disposal in landfill representing the tip. Welsh Assembly Government, The national waste strategy for Wales: wise about waste, 2002.

6.6 Health impacts of waste collection [35] [36] [37] [38]

6.6.1 There is little research and evidence to date on the potential health and wellbeing impacts of waste collection. Research to date has focussed on the potential health impacts on waste workers who collect waste. However, there has been a recent move in some local authorities to change waste collection from homes from a weekly to a fortnightly basis with recyclables collected one week and mixed non-recyclable waste collected the next week and a number of studies have been undertaken to assess the potential impacts.

Potential positive health impacts

6.6.2 The main potential direct positive health impacts of waste collection are likely to be[39]:

- Employment
- Safe collection of waste for disposal

6.6.3 The are no potential indirect positive health impacts of waste collection.

6.6.4 Overall, the consensus is that the potential positive health impacts – employment and the safe collection of waste - are likely to occur.

Potential negative health impacts

6.6.5 The main potential direct negative impacts on health of waste collection are likely to come from emissions into the air, water and soil:

- Dust and bioaerosols
- Adverse incidents and injuries (to employees)

6.6.6 The main potential indirect negative health impacts of waste collection are likely to be:

- Odour

[35] Waste collection is a local issue and is a wholly local authority matter. It has been included in this evidence review to provide a holistic assessment of the potential health implications of the whole waste treatment chain.
[36] DEFRA and Wycombe District Council, HIA of alternate weekly collections of biodegradable waste, 2007.
[37] Stoke-on-Trent Council, Alternate weekly collection of residual waste, 2006.
[38] Health & Safety Executive, Mapping health and safety standards in the UK waste industry (Research Report 240), 2004.
[39] Direct health impacts are those that occur through direct pathways of action e.g. exposure to a chemical. Indirect health impacts are those that occur through other indirect pathways of action such as through employment or unemployment, access to services, effects on quality of life which then lead to some form of health impact.

- Pests and vermin
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma

6.6.7 The above relate largely to how the waste is stored by the householder rather than the action of collection itself. If stored appropriately nuisance from odour, pests and vermin are unlikely to occur. This is likely to be easier to do for householders living in houses and more difficult for householders living in high rise flats.

6.6.8 Overall, the consensus for residents is that there are likely to be quality of life, annoyance and nuisance impacts from: odour, litter and possibly pests and vermin. For employees collecting the waste the negative health impacts are likely to be from exposure to sharps (broken glass, needles, etc), biological waste and bioaerosols which could cause injury, eye and nose irritation, skin problems, allergies and some infectious and chronic diseases e.g. pneumonia, diarrhoea, bronchitis[40].

6.7 Health impacts of waste transfer stations and civic amenities [41] [42]

6.7.1 Waste Transfer Stations (WTS) are where waste collected from homes and businesses is compacted before being transported to other waste treatment facilities. In general no waste treatment occurs within WTSs.

6.7.2 Civic Amenities (CAs) are sites where the general public can take bulky waste goods or hazardous household products such as fridges, wardrobes, chemicals, paints, batteries and electric and electronic equipment for eventual safe reuse, recycling and disposal. They can also take general household goods for recycling – such as glass, paper, plastics etc

6.7.3 There is little research and evidence to date on the potential health and wellbeing impacts of WTSs and CAs.

[40] There are existing health and safety procedures and regulations in place to prevent these kinds of impacts however these are not always adhered by employees either because they do not want to, cannot in certain circumstances or forget to follow procedures. Hence health and safety training for employees is important.
[41] Western Cheshire Primary Care Trust, Proposed Ince (waste) Resource Recovery Park HIA, 2006
[42] Health & Safety Executive, Mapping health and safety standards in the UK waste industry (Research Report 240), 2004.

Potential positive health impacts

6.7.4 The main potential direct positive health impacts of WTS and CA facilities are likely to be:

- Employment
- Safe collection and compaction of waste for eventual disposal

6.7.5 The are no potential indirect positive health impacts of WTS and CA facilities.

Potential negative health impacts

6.7.6 The main potential direct negative impacts on health of WTS and CA facilities are likely to come from emissions into the air, water and soil:

- Dust and bioaerosols
- Adverse incidents and injuries (to employees and to general public who visit the site).

6.7.7 The main potential indirect negative health impacts of WTS facilities are likely to be:

- Odour
- Noise
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma

6.7.8 Overall, the consensus in the research literature and among experts is that the potential positive health impacts – employment and the safe compaction of waste - are likely to occur. In terms of the potential negative impacts the general consensus is that for residents, there are likely to be quality of life, annoyance and nuisance impacts from: odour, litter, pests and vermin and increases in motor vehicle traffic.

6.8 Health impacts of materials recovery/recycling facilities [43] [44] [45] [46]

6.8.1 Materials recovery/recycling is a treatment to separate and sort waste either mechanically or manually. “Clean” Materials Recovery/Recycling Facilities (MRFs)

[43] Western Cheshire Primary Care Trust, Proposed Ince (waste) Resource Recovery Park HIA, 2006
[44] Government of New Zealand, A literature review on the environmental and health Impacts of waste electrical and electronic equipment, Ministry for the Environment, 2006.
[45] Health & Safety Executive, Mapping health and safety standards in the UK waste industry (Research Report 240), 2004.
[46] National Society for Clean Air for Environmental Protection, Relative impacts of transport emissions in recycling, 2002.

process dry recyclables only, while “dirty” MRFs can process mixed waste. Waste is deposited at the plant where it is then separated through a system of conveyer belts, screening and other sorting systems. After the materials have been sorted they can then be bulked and transported for further processing.

6.8.2 There is little research and evidence to date on the potential health and wellbeing impacts of Materials Recovery/Recycling technologies. There have been concerns about:

- the additional transport impacts due to recycling;
- the potential negative health impacts on waste workers of recycling electrical and electronic equipment, such as televisions, hi-fis and computers;
- the potential negative health impacts on waste workers in developing countries, such as China, India, Indonesia and Malaysia, because a lot of the recycled material generated in developed countries is being shipped to these countries for processing and these countries have less effective regulation and enforcement of workers health and safety.

Potential positive health impacts

6.8.3 The main potential positive health impacts of MRF facilities are likely to be:

- Employment
- Recyclables

6.8.4 The main potential indirect positive health impacts of MRF facilities are:

- Stimulation of the wider economy through reclaiming recyclable materials
- Reducing climate change through reductions in greenhouse gases

Potential negative health impacts

6.8.5 The main potential direct negative impacts on health of MRF facilities are likely to come from emissions into the air, water and soil:

- Dust and bioaerosols
- Waste water
- Adverse incidents and injuries (to employees)

6.8.6 The main potential indirect negative health impacts of MRF facilities are likely to be:

- Odour
- Noise

- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma

6.8.7 Overall, there are likely to be quality of life, annoyance and nuisance impacts from: the visual look of the facility, noise, litter and increases in vehicular traffic

6.9 Health impacts of composting [47] [48] [49] [50] [51] [52]

6.9.1 Composting processes for municipal waste management primarily fall into two categories: windrow composting, for garden derived wastes, and 'In-vessel' composting, some examples of which can process both garden and kitchen or catering derived organic wastes (subject to regulatory approval).

6.9.2 Windrow composting is an established technique for dealing with garden wastes in the UK, where the material is shredded and then piled in elongated rows, called windrows, and aerated through either turning of the windrows or by air forced through the material. Windrow composting may take place in buildings or externally.

6.9.3 In-vessel composting (IVC) embraces a variety of techniques whereby kitchen and garden wastes may be composted in an enclosed vessel or tunnel. The advantage of these processes is that they are more controlled and can be designed to achieve and maintain specified temperatures to facilitate the destruction of micro-organisms.

6.9.4 There is little research and evidence to date on potential health and wellbeing impacts of mass scale composting.

Potential positive health impacts

6.9.5 The main potential positive health impacts of composting facilities are:

- Employment
- Safe disposal of waste

[47] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[48] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[49] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.
[50] Devon Health Forum, Project Greensweep: a North Devon composting project HIA, 2002.
[51] Western Cheshire Primary Care Trust, Proposed Ince (waste) Resource Recovery Park HIA, 2006
[52] Health & Safety Executive, Mapping health and safety standards in the UK waste industry (Research Report 240), 2004.

6.9.6 The main potential indirect positive health impacts of composting facilities are:

- Stimulation of the wider economy through reclaiming recyclable materials (compost, mulch or soil conditioner)
- Reducing climate change through reductions in greenhouse gases

6.9.7 Overall, the consensus is that the potential positive health impacts – employment, compost/mulch/soil conditioner and the safe disposal of waste - are likely to occur.

Potential negative health impacts

6.9.8 The main potential direct negative health impacts of composting come from emissions into the air, water and soil:

- Bioaerosols[53].
- Concentration of metals, organic and inorganic compounds in the soil.
- Adverse incidents and injuries (to employees)

6.9.9 The main potential indirect negative health impacts of composting facilities are:

- Odour
- Noise
- Pests and vermin
- Quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma

6.9.10 Overall, the consensus for residents is that there are likely to be quality of life, annoyance and nuisance impacts from: the visual look of the facility, noise, litter and increases in vehicular traffic. For employees, the consensus is that exposure to bioaerosols could cause eye and nose irritation, skin problems, allergies and some infectious and chronic diseases e.g. pneumonia, diarrhoea, bronchitis.

[53] Airborne biological particles such as bacteria, fungi and allergens.

6.10 Health impacts of anaerobic digestion [54] [55] [56]

6.10.1 Anaerobic Digestion (AD) is a biological process where biodegradable wastes, such as garden and kitchen waste or the mechanically separated organic rich fraction of mixed waste, is converted into a 'digestate' (containing biosolids and a liquid) and biogas. The wastes are decomposed by bacteria in the absence of air: this is a key differentiation from composting processes. In AD systems, biodegradable material is placed into an enclosed vessel under controlled conditions and degrades generating high temperatures. The decomposition of the biodegradable material leads to the release of a methane rich biogas which can be collected and burnt as a fuel to produce electricity.

6.10.2 Given the newness of AD technology there is little research and evidence to date on potential health and wellbeing impacts.

Potential positive health impacts

6.10.3 The main potential direct positive health impacts of AD facilities are likely to be:

- Employment
- Energy from the biogas produced
- Safe disposal of waste

6.10.4 The main potential indirect positive health impacts of AD facilities are:

- Stimulation of the wider economy through reclaiming recyclable organic material (fertiliser or soil conditioner) and energy recovery
- Reducing climate change through reductions in greenhouse gases

Potential negative health impacts

6.10.5 The main potential direct negative impacts on health of AD facilities are likely to come from emissions into the air, water and soil:

- Dust, bioaerosols and gaseous emissions
- Metals in the solid digestate residue
- Liquid digestate residue

[54] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[55] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[56] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.

- Adverse incidents and injuries (to employees)

6.10.6 The main potential indirect negative health impacts of AD facilities are likely to be:

- Odour
- Noise
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma
- Fire and explosion

6.10.7 Overall, there are likely to be quality of life, annoyance and nuisance impacts from: the visual look of the facility, noise, litter and increases in vehicular traffic

6.11 Health impacts of mechanical and biological treatment [57] [58] [59] [60]

6.11.1 Mechanical Biological Treatment (MBT) or Biological Mechanical Treatment (MBT) are generic terms for an integration of several processes commonly found in other waste management technologies such as Materials Recovery Facilities (MRFs), sorting and composting plant. MBT/MBT plants can incorporate a number of different processes in a variety of combinations and can be built for a range of purposes.

6.11.2 A common aspect of all MBT/BMT plant is to sort mixed waste into different fractions using mechanical means; and to extract materials for recycling. The exact mix of technologies employed in an MBT/BMT facility will depend on the additional objectives of the plant. These objectives would typically be one or more of the following:

- part stabilise the waste prior to landfilling;
- biologically process a segregated 'organic rich' component of the waste [for example, to form a low grade soil conditioner]; and
- produce a segregated high calorific value waste to feed to an appropriate thermal process as a Refuse Derived Fuel.

[57] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[58] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[59] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.
[60] Western Cheshire Primary Care Trust, Proposed Ince (waste) Resource Recovery Park HIA, 2006

6.11.3 Given the newness of the MBT/BMT technology there is little research and evidence to date on potential health and wellbeing impacts.

Potential positive health impacts

6.11.4 The main potential direct positive health impacts of MBT/BMT facilities are likely to be:

- Employment
- Energy from waste or refuse derived fuel (RDF)
- Safe disposal of waste

6.11.5 The main potential indirect positive health impacts of MBT/BMT facilities are:

- Stimulation of the wider economy through reclaiming recyclable materials (recyclates and soil conditioner) and energy recovery
- Reducing climate change through reductions in greenhouse gases

Potential negative health impacts

6.11.6 The main potential direct negative impacts on health of MBT/BMT facilities are likely to come from emissions into the air, water and soil:

- Dust, bioaerosols and gaseous emissions
- Waste water
- Adverse incidents and injuries (to employees)

6.11.7 The main potential indirect negative health impacts of MBT/BMT facilities are likely to be:

- Odour
- Noise
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma
- Fire and explosion

6.11.8 Overall, there are likely to be quality of life, annoyance and nuisance impacts from: the visual look of the facility, noise, litter and increases in vehicular traffic.

6.12 Health impacts of mechanical heat treatment/autoclaving [61] [62] [63]

6.12.1 Mechanical Heat Treatment (MHT)/autoclave technologies have been used to sterilise hospital and medical wastes for many years and it is essentially a steam treatment process. Waste is shredded and processed in a pressurised sealed drum under the action of steam. After around an hour of processing the waste is reduced to a 'flock' like material, with metals and glass partially cleaned for extraction as recyclables. The process may melt plastics making these more difficult to recycle in some instances. The remaining material may be sorted and potentially thermally treated as a type of Refuse Derived Fuel (RDF) or used as a raw material in recycling applications, if markets/outlets are available. There will always be some remaining waste residue that will need disposal when mixed unsegregated waste is processed.

6.12.2 Given the relative newness of MHT/autoclave technologies there is little research and evidence to date on the potential health and wellbeing impacts.

Potential positive health impacts

6.12.3 The main potential positive health impacts of MHT/autoclave facilities are likely to be:

- Employment
- Energy from burning waste or refuse derived fuel (RDF)
- Safe disposal of waste

6.12.4 The main potential indirect positive health impacts of MHT/autoclave facilities are:

- Stimulation of the wider economy through reclaiming recyclable materials and energy recovery
- Reducing climate change through reductions in greenhouse gases

Potential negative health impacts

6.12.5 The main potential direct negative health impacts of MHT/autoclave facilities are likely to come from emissions into the air, water and soil:

- Dust and gaseous emissions

[61] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[62] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[63] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.

- Waste water
- Char, slag or ash solid residue
- Adverse incidents and injuries (to employees)

6.12.6 The main potential indirect negative health impacts of MHT/autoclave facilities are likely to be:

- Odour
- Noise
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma
- Fire and explosion

6.13 Health impacts of advanced thermal treatment (pyrolysis and gasification)[64] [65] [66]

6.13.1 *Pyrolysis* is the thermal degradation of waste in the absence of oxygen at temperatures of 300-800℃. The products produced fr om pyrolysing materials are a solid residue and a synthetic gas (syngas). The solid residue (sometimes described as a char) is a combination of non-combustible materials and carbon. The syngas is a mixture of gases (combustible constituents include carbon monoxide, hydrogen, methane and a broad range of other volatile organic compounds). A proportion of these can be condensed to produce oils, waxes and tars. If required, the condensable fraction can be collected by cooling the syngas, potentially for use as a liquid fuel.

6.13.2 *Gasification* can be seen as a process between pyrolysis and combustion in that it involves the partial oxidation of a substance. This means that oxygen is added but the amounts are not sufficient to allow the fuel to be completely oxidised and full combustion to occur. The temperatures employed are typically above 750ºC. The main product is a syngas, which contains carbon monoxide, hydrogen and methane and can be burned to provide electricity. The other main product produced by gasification is a solid residue of non-combustible materials (ash).

6.13.3 Given the newness of pyrolysis and gasification technologies there is little research and evidence to date on the potential health and wellbeing impacts.

[64] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[65] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.

Potential positive health impacts

The main potential positive health impacts of pyrolysis and gasification facilities are likely to be:

- Employment
- Energy from burning waste or refuse derived fuel (RDF) that is created
- Safe disposal of waste

6.13.4 The main potential indirect positive health impacts of pyrolysis and gasification facilities are:

- Stimulation of the wider economy through reclaiming recyclable materials and energy recovery
- Reducing climate change through reductions in greenhouse gases

Potential negative health impacts

6.13.5 The main potential direct negative health impacts of pyrolysis and gasification facilities are likely to be from emissions into the air, water and soil:

- Dust and gaseous emissions
- Waste water
- Char, slag or ash solid residue
- Adverse incidents and injuries (to employees)

6.13.6 The main potential indirect negative health impacts of pyrolysis and gasification facilities are likely to be:

- Odour
- Noise
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma
- Fire and explosion

6.13.7 Overall, there are likely to be quality of life, annoyance and nuisance impacts from: the visual look of the facility, noise, litter and increases in vehicular traffic

[66] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.

6.14 Health impacts of incineration with energy recovery [67] [68] [69] [70] [71] [72] [73] [74] [75]

6.14.1 Incineration with energy recovery is the controlled combustion of waste at temperatures above 850 ℃ in an oxygen environment. The waste is converted into carbon dioxide and water. Non-combustible materials, such as metals and glass, remain as solids and are known as bottom ash.

6.14.2 Incineration with energy recovery is not as efficient as Combined Heat and Power (CHP) facilities. It is likely that most incineration with energy recovery facilities will be CHP facilities.

Potential positive health impacts

6.14.3 The main potential direct positive health impacts of incineration with energy recovery facilities are:

- Employment
- Energy and heat from burning waste (combined heat and power)
- Safe disposal of waste

6.14.4 The main potential indirect positive health impacts of incineration with energy recovery facilities are:

- Stimulation of the wider economy through recycling and energy recovery
- Reducing climate change through reductions in greenhouse gases by offsetting the need for fossil fuels, reducing the amount of waste going to landfill and reducing the amount of methane[76] produced.

6.14.5 Overall, the consensus is that the potential positive health impacts – employment, energy from burning the waste and the safe disposal of waste - are likely to occur.

[67] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[68] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[69] Environment Agency, Health impacts of waste management: methodological aspects and information sources (R&D Publication P6-011/1), 2003.
[70] Health Research Board, Health and environmental effects of landfilling and incineration of waste – a literature review, Ireland, 2003.
[71] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.
[72] Devon Council, Grace Road, Exeter energy from waste facility, 2007.
[73] Lewisham Borough Council, SELCHP waste to energy plant HIA, 2005
[74] Waste Recycling Group, Eastcroft energy from waste facility HIA (part of the EIA), 2005
[75] Health & Safety Executive, Mapping health and safety standards in the UK waste industry (Research Report 240), 2004.
[76] Methane is 21 times more powerful a greenhouse gas than carbon dioxide

Potential negative health impacts

6.14.6 The main potential direct negative health impacts of incineration with energy recovery facilities come from emissions into the air, water and soil:

- Dust and gaseous emissions
- Waste water
- Bottom and fly ash
- Adverse incidents and injuries (to employees)

6.14.7 The potential negative health impacts of these emissions that are identified in the literature are: cancers; adverse, or changes, to reproductive outcomes (such as birth defects and an increase in twins); cardiovascular and respiratory symptoms (such as difficulty in breathing and wheezing).

6.14.8 The main potential indirect negative health impacts of incineration with energy recovery facilities are:

- Odour
- Noise
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma
- Fire and explosion

6.14.9 Overall, the consensus is that for residents, there are likely to be quality of life, annoyance and nuisance impacts from: the visual look of the facility, noise, litter and increases in vehicular traffic.

6.15 Health impacts of landfilling [77] [78] [79] [80] [81] [82] [83] [84]

6.15.1 A landfill is a repository for waste that is deposited in a series of compacted layers in specially constructed cells either on the land surface or in excavations into the land surface.

Potential positive health impacts

6.15.2 The main potential direct positive health impacts of landfills are:

- Employment
- Energy from burning landfill gas
- Safe disposal of waste

6.15.3 There are no potential indirect positive health impacts of landfills.

6.15.4 Overall, the consensus is that the potential positive health impacts – employment, energy from landfill gas and the safe disposal of waste - are likely to occur. However, there is debate about a) the quality of the employment in terms of likely income, skills development and career progression; b) the emissions from burning landfill gas; and c) the sustainability of disposal to landfill.

Potential negative health impacts

6.15.5 The main potential direct negative health impacts of landfills come from emissions into the air, water and soil (see Appendices R4-R7 for details):

- Dust, bioaerosols (micro-organisms)[85], landfill gas[86] and exhaust gases from the burning of landfill gas.

[77] National Public Health Service for Wales, Health effects of waste management technologies – DRAFT, 2006. [This report is an update of 'Health impacts of waste management: methodological aspects and information sources', (R&D Publication P6-011/1), 2003]
[78] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[79] Environment Agency, Health impacts of waste management: methodological aspects and information sources (R&D Publication P6-011/1), 2003.
[80] Health Research Board, Health and environmental effects of landfilling and incineration of waste – a literature review, Ireland, 2003.
[81] Community Recycling Network, Maximising recycling rates: tackling residuals, 2002.
[82] North Sheffield Primary Care Trust, Parkwood landfill site, Sheffield HIA - Volumes 1 and 2, 2005.
[83] Wales Centre for Health and Agency for Toxic Substances and Disease Registry, Public health investigations at the Nant-y-Gwyddon landfill site, 2002.
[84] Health & Safety Executive, Mapping health and safety standards in the UK waste industry (Research Report 240), 2004.
[85] Bacteria, viruses and parasites that can be found in food stuffs.
[86] Methane, carbon dioxide, nitrogen dioxides, sulphur dioxide.

- Leaching of metals[87], organic[88] and inorganic[89] compounds into water supplies.
- Concentration of metals, organic and inorganic compounds in the soil.
- Adverse incidents and injuries (to employees)

6.15.6 The potential health impacts of these emissions that are identified in the literature are: cancer; renal disease; adverse, or changes, to reproductive outcomes (such as birth defects, low birth weight babies, infertility and miscarriage); and general symptoms (such as headache, nausea, skin rashes, eye irritation and difficulties in breathing).

6.15.7 Whilst these emissions are identified in the literature as having the potential to cause the above health there is uncertainty as to whether these impacts are solely linked to living near a landfill.

6.15.8 The main potential indirect negative health impacts of landfills are:

- Odour
- Noise
- Pests and vermin
- Reduced quality of life, annoyance and nuisance
- Psychological e.g. concern, stress, worry, stigma.
- Fire and explosion
- Exacerbating climate change through the production of greenhouse gases

6.15.9 Overall, the consensus is that for residents, there are likely to be quality of life, annoyance and nuisance impacts from: odour, litter, pests and vermin and increases in motor vehicle traffic. For employees, the consensus is that working in close proximity to untreated waste within landfills is likely to expose them to bioaerosols and chemicals that could cause eye and nose irritation, skin problems, allergies and some infectious and chronic diseases e.g. pneumonia, diarrhoea, bronchitis.

[87] Arsenic, cadmium, chromium, mercury and lead.
[88] Polycyclic aromatic hydrocarbons, pesticides, PCBs, PCDD/F, dioxins, furans, alkanes, chlorinated saturated and unsaturated hydrocarbons.
[89] Hydrogen sulphide

6.16 Health impacts of waste transportation [90] [91] [92] [93]

6.16.1 There are no specific studies on the health impacts of waste transportation however there is significant evidence of the negative health and wellbeing impacts from the emissions of motor vehicles that run on petrol and diesel fuels. Transport to and from waste treatment facilities accounts for less than 1% of all motor vehicle movements in the UK.

Potential positive health impacts

6.16.2 The main potential positive health impacts of waste transportation are:

- Employment
- Transportation of waste for safe disposal

Potential negative health impacts

6.16.3 The main potential direct negative health impacts of waste transportation come from emissions into the air. The major directs impact are from:

- Road traffic collisions
- Dust and gaseous emissions.

6.16.4 The potential health impacts of these emissions that are identified in the literature include: circulatory and respiratory disease and symptoms (such as difficulty in breathing and wheezing).

6.16.5 The main potential indirect negative health impacts of waste transportation are:

- Odour
- Noise
- Quality of life, annoyance and nuisance
- Increasing climate change through increase in greenhouse gases

[90] Committee on the Medical Effects of Air Pollution, Long term exposure to air pollution: effect on mortality, Draft report for consultation, Department of Health, 2007.
[91] Committee on the Medical Effects of Air Pollution, Cardiovascular disease and air pollution, Department of Health, 2006.
[92] DEFRA, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, 2004.
[93] National Society for Clean Air for Environmental Protection, Relative impacts of transport emissions in recycling, 2002.

6.17 Public perceptions of the health risks of waste treatment facilities [94] [95] [96] [97] [98]

6.17.1 All planning and siting processes involve change. All change involves a degree of uncertainty and this uncertainty tends to lead to increased anxiety, worry and concern. Therefore, most developments, whether housing, transport, business or industrial, generate concern among local residents about potential health and wellbeing impacts.

6.17.2 People see risk as multi-dimensional. Risks are generally seen to be more worrying and less acceptable if they are perceived to be involuntary (e.g. exposure to pollution) rather than voluntary (e.g. dangerous sports or smoking). Risks that are avoidable by taking personal precautions are more likely to be acceptable. They are considered more worrying if some people appear to benefit while others suffer the consequences. They are less likely to be acceptable if they threaten a form of death arousing particular dread such as cancer, or pose some particular danger to small children, pregnant women or future generations. Man-made, rather than natural sources are more likely to be worrying than natural sources, particularly if they arise from an unfamiliar or novel source. Media coverage and pressure groups may amplify the public's concern but seldom create it.

6.17.3 In relation to waste treatment facilities the research literature shows that the major risks perceived by local communities are based on their existing concerns about their neighbourhood and can be divided into a range of issues:

- technical design and operation concerns about the waste treatment facility itself and its associated activities;
- planning and siting process concerns; and
- socio-political concerns about who is doing what, and how the new facility will change their sense of identity and sense of place.

6.17.4 The ***technical design and operation concerns*** that communities faced with having a waste treatment facility sited near them have are:

- Traffic (size, numbers and speed)
- Air pollution

[94] Vohra S, Understanding public and other stakeholders perceptions of environmental and health risks in the planning and siting process, PhD Thesis, 2003.
[95] Chen M (Ed), Risk in the modern age, Macmillan Press, 2000.
[96] Lofstedt R and Frewer L (Eds), Risk and modern society, Earthscan, London, 1998.
[97] Lash L, Szerszynski B and Wynne B (Ed), Risk, environment and modernity, Sage Publications, London. 1996.

- Noise
- Degradation and blight to the (residential) area
- General environmental effects (including water and soil pollution)
- Smell
- Disruption-disturbance
- Litter/ dirt
- Impacts on children
- No community benefit
- Quality of life
- Property values
- Wider strategic waste management issues (reducing packaging, increasing recycling, use of water and rail for waste transport, etc.)
- Reduction in the potential for green space

6.17.5 The ***planning and siting process concerns*** that communities faced with having a waste treatment facility sited near them have are:

- That the consultation was not fully involving of the community and was not early or long enough.
- That there was not enough detailed information given on the consequences and implications of the operation of the waste treatment facility.
- They were not shown the alternatives, the history of the site and previous proposals.
- They did not feel they had the power to significantly influence the planning process and were not sure about the legal framework of the siting and planning process and how it worked.
- That the impact assessments are based on misleading assumptions and biased in favour of the proponent of the facility.

6.17.6 The ***socio-political concerns*** that communities faced with having a waste treatment facility sited near them have are:

- The power and influence of the stakeholders involved in the process. Communities tend to see themselves as less powerful and influential than public and private sector agencies and their representatives, hence they are suspicious and distrustful of them.

[98] Krimsky S and Golding D, Social theories of risk, Praeger Publishers, Westport, 1992.

- The values that drive the planning and siting process. Communities see protecting the community and residents from harm, respect and dignity for others, a fair and equitable distribution of risks and benefits as well as openness, honesty and transparency as key values that should, and should be seen to, drive the planning and siting process. However, many communities often judge, based on the actions of the other stakeholders, that these values are not being upheld.
- The perceived unfairness of them having to live with any negative impacts of the proposed facility disproportionately compared to the wider community that would benefit from it.
- At a social and cultural level waste is seen as a negative and something that should be avoided. So when waste treatment facilities, and so waste, are sited in or near residential neighbourhoods they change how residents see themselves and their locality in a way that is profoundly negative and disruptive. It tends to a) destroy residents' vision of what a good 'community' is and their aspirations for improving their neighbourhoods and b) it creates associations between themselves, their neighbourhood and waste in the minds of both residents and outsiders which stigmatises them as being a 'rubbish' individual, a 'rubbish' community and a 'rubbish' neighbourhood.

6.18 Environmental inequality/justice and waste treatment facilities [99] [100] [101] [102] [103]

6.18.1 Environmental inequality refers to the unequal social distribution of environmental risks and hazards as well as access to environmental goods and services. It is closely related to the concept of environmental justice. There is no definitive definition of environmental justice. It means different things to different people. The term originally came to prominence in the USA, where it was used to embrace notions of discrimination, equity, the denial of benefits and adverse effects, initially, to people of colour and other minority populations but more recently to poor communities.

6.18.2 The Welsh Assembly Government Environment Strategy for Wales discusses this issue as part of social justice: "Environmental factors such as poorly maintained

[99] Sustainable Development Research Network, Environmental and social justice: rapid research and evidence review, DEFRA funded research, 2004.
[100] Mitchell G and Walker G, Environmental quality and social deprivation Phase II: national analysis of flood hazard, IPC industries and air quality, R&D Project for the Environment Agency, 2003.
[101] Friends of the Earth, Communities speak out on waste, 2002.
[102] Addressing Environmental Inequalities, Position Statement, Environment Agency, England & Wales
[103] Burden of Disease: Environmental Inequalities, Chemical Hazards and Poisons Division, Health Protection Agency, UK.

buildings, litter and other nuisance issues and a lack of green space can have a significant negative impact on quality of life. We must deliver high quality places for people to live. This means a high quality built environment and opportunities to access green space and biodiversity, where environmental nuisances are minimised and where flood risk is understood and managed. There is a clear social justice driver for activity in this area - local environmental quality is often worse in our most deprived communities. Ensuring that all communities enjoy higher levels of environmental quality is crucial." [104]

6.18.3 In relation to air quality, environmental noise, flooding, road traffic collisions, integrated pollution control sites, landfill and water quality the research into environmental inequalities ranges from an almost complete absence in the case of environmental noise; to incomplete or uncertain analyses in the case of flooding or the location of landfill sites; through to a fairly robust evidence base related to road traffic injuries and air quality where multiple studies at different levels exist.

6.18.4 For air quality, the balance of evidence suggests that deprived communities are exposed to an above average burden of poor air quality. For example, neighbourhoods with younger populations, more deprived populations and those with lower rates of car ownership are exposed to higher levels of local air pollution. In general, where research has addressed the social distribution of impacts from these planning and infrastructural issues, patterns of inequality against deprivation are being found. However, this is not always the case for all geographical areas or for all topics. An analysis of air pollution in Wales found both the most and least deprived wards experienced above average pollutant concentrations, with the highest concentrations in the least deprived wards.

6.18.5 In the case of road traffic injuries, children face a significant amount of the risk. Children in the lowest socio-economic group are five times more likely to die in a road traffic collision than those from higher socio-economic groups. There is a disproportionately high rate of pedestrian injuries amongst minority ethnic children, over and above the effect of social class.

6.18.6 For some topics the relationships with people's wellbeing can be complex, multifaceted and often poorly understood. Negative impacts tend to focus predominantly on health concerns, although other forms of impact such as aesthetics,

[104] Environment Strategy for Wales, Welsh Assembly Government, 2006

quality of life, sense of place and economic impacts on housing markets can also be important. Whilst for some environment-related issues there may also be positive impacts (e.g. employment in waste facilities), these may not be locally focused to the same degree.

6.18.7 Like the evidence on the impact of emissions the evidence base on environmental justice issues is weakest on causation. In most cases the processes that have been suggested are only hypothetical or indirectly related to other surrogate evidence. Common suggested causative factors include the operation of the housing market, the norms of land-use planning, NIMBY (Not in My Back Yard) protests by middleclass articulate and politically-connected communities, lack of distributional concerns in policy/plan appraisal and the urban concentration of environmental problems and deprived areas.

6.18.8 Research to date suggests that environmental problems may accumulate in four ways:

- spatial concentrations, over time, at particular geographical levels and localities;
- multiple health impacts;
- the impact on particularly disadvantaged groups (e.g. the very poor, the very young and very old); and,
- as a result of 'knock-on' effects.

6.18.9 Taken together, research in this area suggests that where a neighbourhood or area experiences one environmental problem this is rarely in isolation. Ill health and reduced quality of life is usually the result of an accumulation of these problems over an individual's lifetime or even over a number of generations. Some sectors of the population are consistently more adversely affected than others and these are almost always those that are already recognised as the most disadvantaged. Environmental ills may not only self perpetuate, but also lead to other environmental, economic and social problems if left unaddressed.

6.19 Conclusion

6.19.1 This literature review found that in relation to the direct and indirect positive and negative health impacts there is a clearer consensus on the potential positive health

and wellbeing impacts of waste treatment and management compared with a do nothing scenario.

6.19.2 There is much less consensus on the potential negative health and wellbeing impact of waste treatment and management.

6.19.3 The lack of consensus in the health impact literature, and among experts, is because of the difficulties in establishing causation and the potential levels of risk[105]. This is because the majority of health studies on waste treatment options have been ecological in design. That is, they use a population characteristic, such as residence within a 2km radius of a site, as a proxy for the exposure of residents to a potential hazard e.g. dioxin emissions. The problem with this approach is that the exposure is dependent on many things other than place of residence for example, occupational exposure, diet, and so on. Even in a well defined population, exposure will vary depending on local geography, weather conditions and how long people spend outdoors and indoors. Without individual exposure data over the whole length of time they have lived there, it is impossible to conclusively prove cause and effect.[106]

6.19.4 As the evidence of potential negative health impacts is not conclusive - with evidence for negative health impacts in some studies and the lack of, or inconsistency of, the evidence in other studies - a range of valid positions can be taken on what the potential positive and negative health impacts of waste treatment facilities are and their significance.

6.19.5 On balance, the current evidence and this evidence review points to the following set of conclusions.

6.19.6 The different types of waste treatment facilities, including those dealing with hazardous waste, give rise to broadly similar kinds of potential positive and negative health impacts.

6.19.7 The main potential positive health impacts arise from:

- the systematic collection and treatment of waste from domestic and commercial premises;
- the employment opportunities that are opened up within these facilities;
- the wider economic stimulus as waste is recycled and energy recovered;

[105] Hennekens C and Buring J, Epidemiology in Medicine, Little Brown and John, Boston, 1987.

- and the minimisation of potential climate change impacts through the reduction in the use of landfills and the production of greenhouse gases.

6.19.8 The main potential negative health impacts arise from nuisance and quality of life effects of odour, noise, pests and worry due:

- the emission of pollutants into the air, water and soil;
- litter; and
- the physical and visible presence of the facility in a locality.

6.19.9 Alongside these operational positive and negative health impacts there are also positive and negative health impacts associated with the construction and decommissioning of waste treatment facilities.

6.19.10 In relation to the two main activities associated with the operation of waste treatment facilities: the collection of waste from domestic and commercial premises and the physical movement of waste using road, rail and water transport. Both of these also give rise to positive and negative health impacts. The important positive health impacts are again the systematic collection and treatment of waste from domestic and commercial premises and the employment opportunities associated with the collection and transport of waste. The important negative health impacts are the emissions of air pollutants from the vehicles used to collect and transport waste; potential for road traffic injuries, their noise, their speed; their movement and the dust 'footprint' they produce in residential areas; the support infrastructure they need to operate effectively e.g. waste vehicle depots; and the potential for litter and smell.

6.19.11 Overall, there is consensus in the literature and among experts that the specific potential positive and negative impacts of a waste treatment facility are dependent on:

- the material being treated (e.g. waste all mixed together or sorted and segregated waste),
- the type of facility,
- the effectiveness of the emission controls,
- the effectiveness of the management of the facility and
- effective regulatory control.

[106] Nieuwenhuijsen M (Ed), Exposure assessment in occupational and environmental epidemiology, Oxford Medical Publications, Oxford, 2003.

6.19.12 Therefore well designed, well operated and properly regulated waste treatment facilities are likely to have mainly positive and little or no negative impacts on the overall health and wellbeing of nearby communities and the employees working within them. Furthermore, those waste treatment technologies which further separate and segregate waste for recycling before treatment and have closed treatment processes are likely to have the most positive and the fewest negative impacts on the health and wellbeing of local communities and employees.

6.19.13 In this country there is a legal duty for waste to be disposed of properly in an official authorised site. Waste operations are monitored to ensure that operate within the current legislative and regulatory guidelines with respect to human health and environmental issues. The regulatory framework in place, Integrated Pollution Prevention and Control (IPPC), ensures that the potential health impacts from emissions into the air, water and soil and nuisance effects from waste facilities are reduced to levels that are considered safe. These safe levels are based on current evidence of the potential health impacts of waste facilities and associated activities. The regulatory authority in Wales is the Environment Agency Wales who are responsible for the licensing and monitoring of sites.

7 Health and Wellbeing in Wales and the three Waste Regions

7.1 Introduction

7.1.1 This chapter provides a high level health and wellbeing profile of Wales, the three waste regions[107] – North, South West and South East – and the twenty-two local authorities of Wales (See Fig. 7.1).

7.1.2 It provides a baseline understanding of the current health and wellbeing issues in Wales, the three waste regions and the Welsh local authorities so that they are considered and taken into account in the overall assessment of the health and wellbeing impacts of the Strategic Waste Management Options that have been proposed in the Wales 3 Regional Waste Plans 1st Review.

7.1.3 Existing national and regional level health information has been used to create this profile. These sources use the term 'significance' in its epidemiological and statistical sense, meaning that the difference of a health indicator from the Wales average – whether 'significantly' better or 'significantly' worse – is a 'true' difference that is unlikely to have occurred by chance[108]. It is also worth noting that some of the health indicators e.g. smoking, alcohol intake, and physical and mental health scores are based on self-reported information. A comparison to England, Scotland and Northern Ireland has also been used to establish a context for the levels of health and wellbeing in Wales.

7.1.4 This profile, wherever possible, has used existing Welsh reports and datasets so that this profile can be compared with other profiles that are based on the same reports and datasets now and in the future. Though many of these reports have been written

[107] These regions have been developed for the purposes of the Regional Waste Plans and are slightly different to the regions developed by other agencies e.g. National Public Health Service which split Welsh local authorities into the North Wales. Mid and West Wales and South East Wales regions.

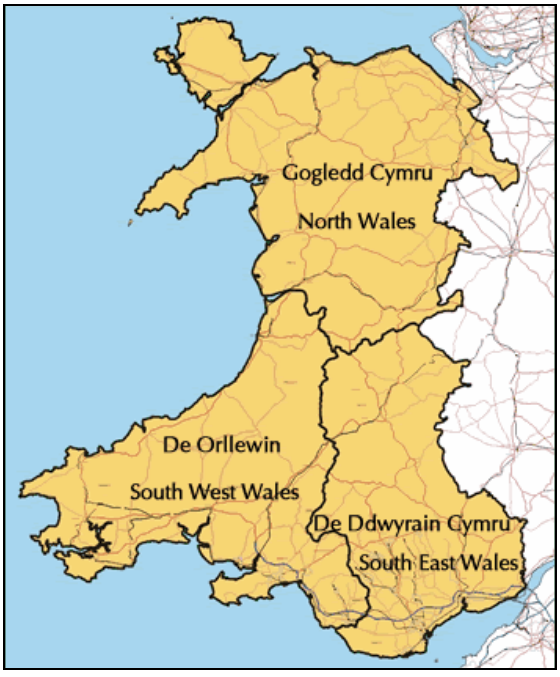
[108] In this context, significance is a statistical term that measures the robustness and strength of a finding. It means that a ill-health or death rate for one population (Welsh LA) is a real/true difference from the comparator population (Wales) and not something that has occurred by chance at one point in time. Not all the high rates in Welsh LAs therefore have been found to be significant. This is because these rates and their significance is determined by the underlying demography - population size, age, gender and socio-economic profile - of the Welsh LA. Therefore, a low rate in one LA could be significant while a high rate in another is not because of differences in the characteristics of the populations.

in the last two years the datasets they have used are between two to six years old. Therefore, it is likely that the actual figures described in this report will have changed. Some of the data is also self-reported which can mean that there is some under or over-reporting within these indicators. However, the key public health issues and the relative health and wellbeing differences between the regions, local authorities and lower super output areas is likely to have remained.

7.1.5 Overall, the picture of health and wellbeing in Wales, the three waste regions and at local authority level is complex. Residents of urban areas in Wales, such as Merthyr Tydfil and Neath Port Talbot, tend to have the poorest health and wellbeing. Residents of less sparsely populated rural areas, such as Denbighshire and Monmouthshire, have slightly better health and wellbeing and residents of very sparsely populated rural areas, such as Powys and Ceredigion, have the best health and wellbeing. Some of the more deprived areas in the South Wales Valleys are classed as rural less sparse and are likely to contribute substantially to the poorer results in the rural less sparse areas.

7.1.6 In terms of the three waste regions in Wales, the North Wales Waste Regions has the best health and wellbeing profile, followed by the South West Wales Waste Region with the South East Wales Waste Region having the poorest health profile. However, this regional picture hides significant inequalities in the health of residents living in areas within the local authorities that make up each of the regions.

Fig. 7.1: Map of Wales and the three waste regions



7.2 Wales – the national profile [109] [110] [111] [112] [113] [114] [115]

7.2.1 Wales has a largely rural environment with around 1 in 3 people living in a rural area. In comparison, around 1 in 5 people live in rural areas in England.

7.2.2 In relation to its closest geographical, social, economic and cultural neighbours - England, Northern Ireland and Scotland - Wales has a generally higher level of health and wellbeing than Scotland, a similar level of health and wellbeing to Northern Ireland but a poorer level of health and wellbeing than England.

Demography

7.2.3 Wales has a population of just under 3 million (2,958,600). Compared to England, Scotland and Northern Ireland it has less people aged 20-39 years and more people aged 60 years and over. There are equal proportions of men and women though there are a higher proportion of women over the age of 70 years and a higher proportion of boys and men aged 5-29 years.

7.2.4 The average population density in Wales is 1.42 people per hectare though the range goes from less than 0.5 people per hectare in Powys to over 7 people per hectare in Newport with Cardiff having over 22 people per hectare. People are concentrated in the South of Wales and along the northern edge of North Wales.

7.2.5 The population of Wales is expected to grow by 37,000 by 2013; 82,000 by 2018; 121,000 by 2023 and 146,000 by 2028, with the highest proportion of growth occurring in the South East and South West of Wales. This is a 1-2% increase in population every five years.

7.2.6 Approximately, 2% of the population of Wales is non-white compared to 9% of the population of England, 2% of Scotland and just under 1% of Northern Ireland.

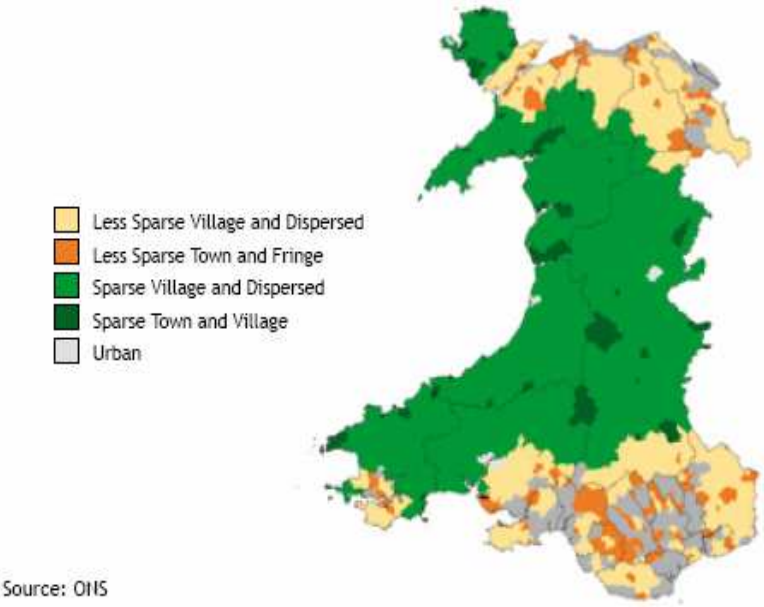
[109] National Public Health Service for Wales, Health needs assessment 2006 – Demography, 2007.
[110] National Public Health Service for Wales, Health needs assessment 2006 – Health status and key determinants, 2007.
[111] National Public Health Service for Wales, Health needs assessment 2006 – Injuries, 2007.
[112] National Public Health Service for Wales, Health needs assessment 2006 – Mental health, 2007.
[113] Wales Centre for Health, A profile of rural health in Wales, 2007.
[114] Local Government Data Unit Wales, Wales Index of Multiple Deprivation 2005, 2006.
[115] Office of National Statistics, Census 2001 and other neighbourhood data,.2001.

7.2.7 In relation to urban-rural differences Wales shows considerable variation. Urban and rural areas are classified by type of rural settlements (i.e. hamlet and isolated dwelling; village; town and fringe; and urban) and the density of the resident population (i.e. spare and less sparse). Table 7.1 below shows the structure of the classification for Lower Layer Super Output Areas (LSOAs)[116], where the rural areas are divided further into settlement types. Figure 7.2 shows a map of the urban and rural areas in Wales.

Table 7.1: Characteristics of urban and rural areas in Wales [Source: Wales Centre for Health]

	Context	Settlement type	Number of areas (LSOAs)	% population
Urban	Sparse	<= 10000 people	37	2%
	Less Sparse	> 10000 people	1201	62.9%
Rural	Sparse	Town and fringe	72	3.7%
		Village and dispersed	167	9%
	Less Sparse	Town and fringe	265	14.1%
		Village and dispersed	154	8.3%

Fig. 7.2: Urban and rural areas in Wales [Source: Office of National Statistics]



[116] A geographical area used for census purposes to ensure greater comparability in the future as they are independent of administrative boundaries e.g. wards. LSOAs are defined as areas having an

Deprivation

7.2.8 Following the general pattern of population density, the majority of deprivation is concentrated in the South East and along the northern edge of North Wales. For almost every measure of health and wellbeing those in the most deprived 20% of the population of Wales tend to have the poorest overall health and wellbeing.

7.2.9 The Welsh Index of Multiple Deprivation 2005 (WIMD) is a measure of relative multiple deprivation at the small area level - Lower Layer Super Output Area (LSOA) - that are experienced by individuals living in the area. People may be counted in one or more of the domains, depending on the number of types of deprivation that they experience. The overall WIMD is conceptualised as a weighted area level aggregation of these specific dimensions of deprivation. The WIMD contains seven domains of deprivation: income; employment; health; education, skills and training; housing, physical environment and geographical access to services by bus and walking.

7.2.10 Table 7.2 shows the number of LSOAs that are in the 20% most deprived for each of the local authorities in Wales. There are a total of 1,896 LSOAs in Wales. These vary in geographical size but have a fairly constant population generally averaging 1,500 residents. This shows that Merthyr Tydfil, Blaenau Gwent, Rhondda Cynon Taff and Neath Port Talbot are among the most deprived local authorities in Wales. In contrast, Monmouthshire, Ceredigion and Powys are among the least deprived local authorities in Wales.

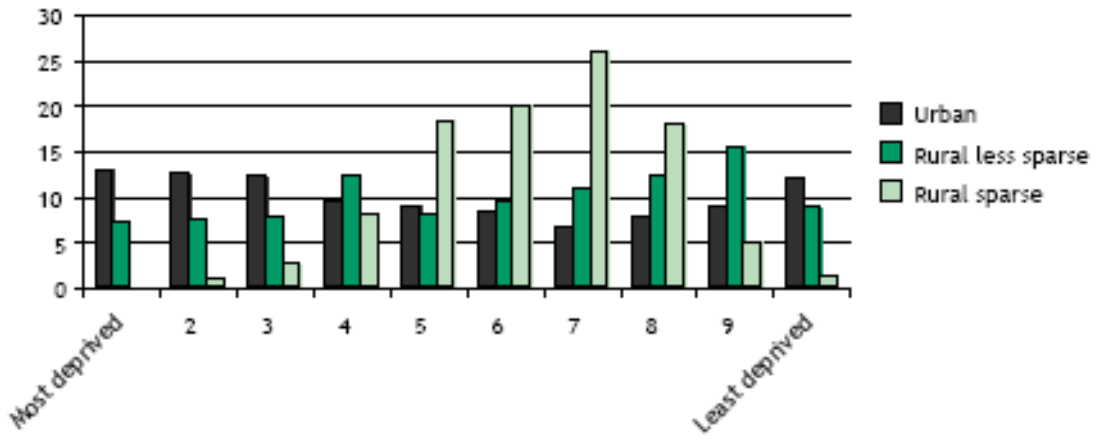
7.2.11 Figure 7.3 shows the percentage of urban, rural less sparse and rural sparse LSOAs when split into 10 equal bands of deprivation from most deprived to least deprived. Urban areas in Wales are the most overall deprived closely followed by rural less sparse areas. The rural sparse areas are the least overall deprived areas in Wales.

average population of 1,500 residents (minimum 1,000 residents). There are 1,896 LSOAs in Wales.

Table 7.2: Number of Lower Layer Super Output Areas in each Welsh local authority that are in the 20% overall most deprived in Wales (the local authorities have been ranked by the percentage of LSOAs that are most deprived) [Source: Welsh Local Government Data Unit]

Local Authority (total number of LSOAs in the local authority)	Waste Region	Urban/Rural designation	Number of LSOAs that are in the 20% (380) of most deprived in Wales	Percentage of most deprived LSOAs compared to the total number of LSOAs in the local authority
Merthyr Tydfil (36)	South East	Urban	20	56%
Blaenau Gwent (47)	South East	Urban	22	47%
Rhondda Cynon Taff (152)	South East	Urban	57	38%
Neath Port Talbot (91)	South West	Urban	31	34%
Caerphilly (110)	South East	Urban	32	29%
Newport (94)	South East	Urban	26	28%
Cardiff (203)	South East	Urban	55	27%
Swansea (147)	South West	Urban	37	25%
Bridgend (85)	South West	Urban	18	21%
Denbighshire (58)	North	Rural	9	16%
Wrexham (85)	North	Urban	13	15%
Carmarthenshire (112)	South West	Rural	16	14%
Conwy (71)	North	Rural	9	13%
Torfaen (60)	South East	Urban	8	13%
Isle of Anglesey (44)	North	Rural	5	11%
Pembrokeshire (71)	South West	Rural	6	8%
Flintshire (92)	North	Urban	6	7%
Vale of Glamorgan (78)	South East	Rural	5	6%
Gwynedd (75)	North	Rural	3	4%
Ceredigion (47)	South West	Rural	1	2%
Powys (80)	North	Rural	1	1%
Monmouthshire (58)	South East	Rural	0	0%

Fig. 7.3: Overall deprivation in Wales in relation to the percentage of urban, rural less sparse and rural sparse LSOAs (split into 10 equal bands – deciles - from most to least deprived) [Source: Wales Centre for Health]



Unemployment and low income

7.2.12 Wales has a higher proportion of unemployed people aged 16-74, 5.7%, than England and Scotland, 5% and 5.2% respectively but a lower proportion than Northern Ireland which has 6.6%.

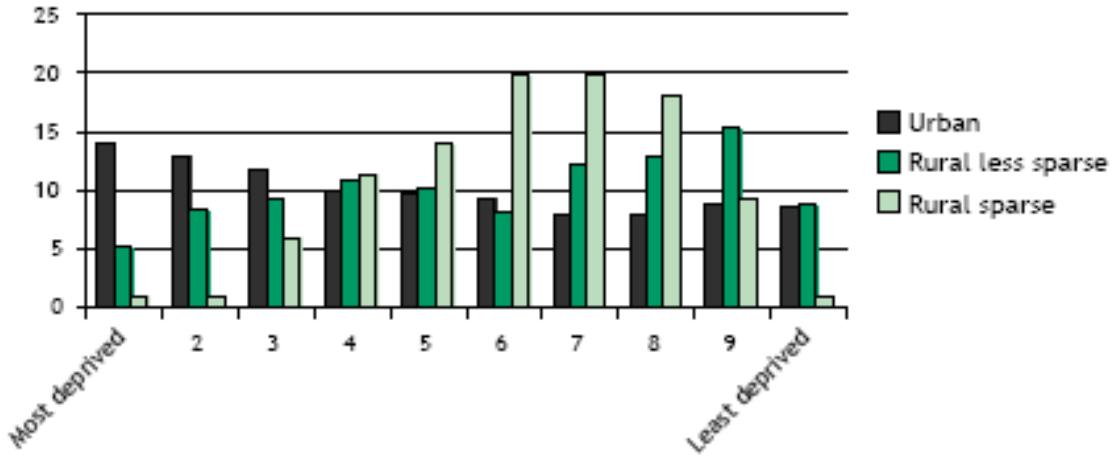
7.2.13 9% of residents in urban areas receive income support compared to 7% of rural less sparse and 6% of rural sparse areas in relation to a Wales average of 8%.

7.2.14 20% of residents in urban areas receive pension credits compared to 17% of rural less sparse and 14% of rural sparse areas in relation to a Wales average of 19%.

7.2.15 3% of residents in urban areas receive jobseeker's allowance compared to 2% of rural less sparse and 2% of rural sparse areas in relation to a Wales average of 3%.

7.2.16 Fig. 7.4 shows the percentage of urban, rural less sparse and rural sparse LSOAs when split into 10 equal bands of income deprivation from most income deprived to least income deprived. Urban areas are the most income deprived followed by rural sparse areas. Rural sparse areas are the least income deprived.

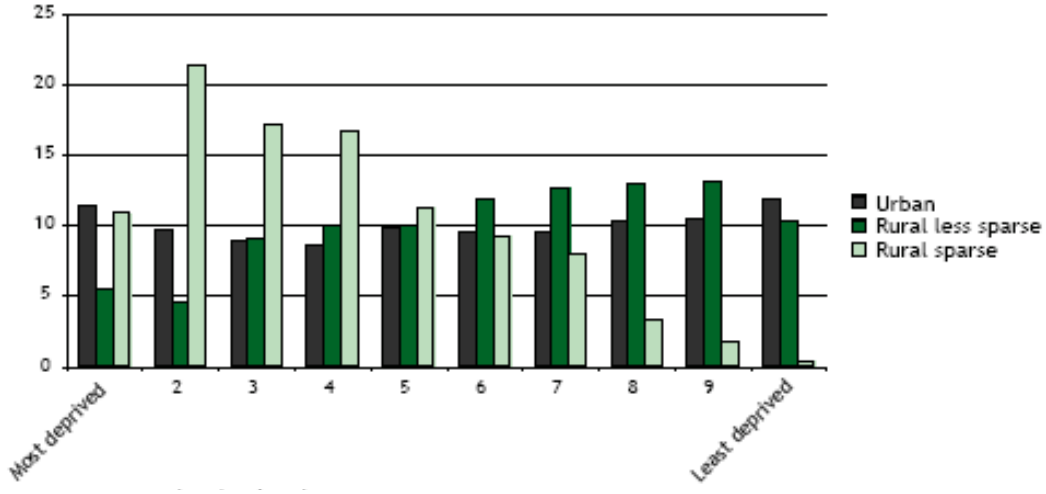
Fig. 7.4: Income deprivation in Wales in relation to urban, rural less sparse and rural sparse LSOAs (split into 10% bands from most to least deprived) **[Source: Wales Centre for Health]**



Housing

7.2.17 Fig. 7.5 shows the percentage of urban, rural less sparse and rural sparse LSOAs when split into 10 equal bands of housing deprivation from most housing deprived to least housing deprived. Rural sparse areas are the most housing deprived followed by urban areas. Rural less sparse areas are the least housing deprived.

Fig. 7.5: Housing deprivation in Wales in relation to urban, rural less sparse and rural sparse LSOAs (broken down into 10% bands from most to least deprived) **[Source: Wales Centre for Health]**



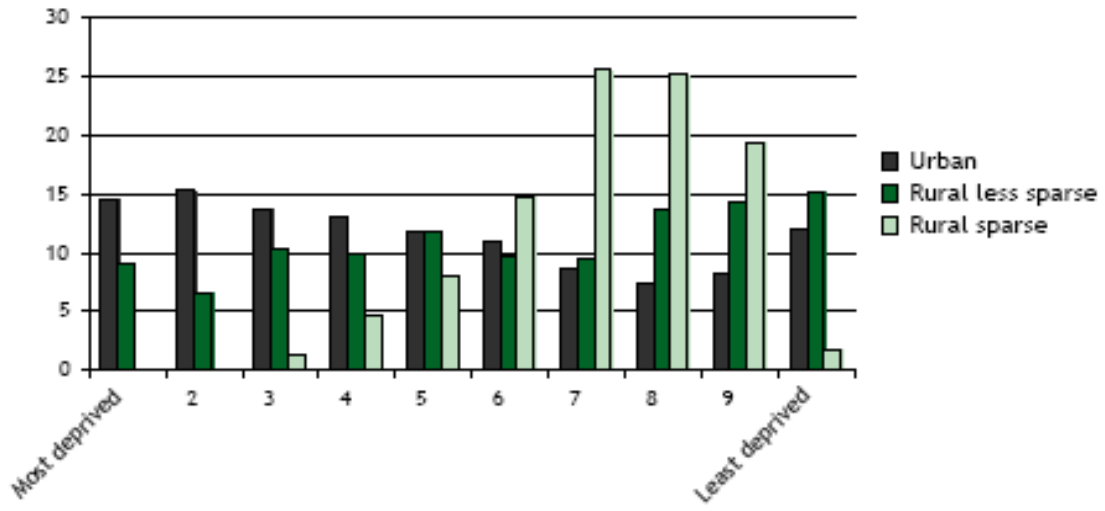
Education

7.2.18 Wales has a higher proportion of young people aged 16-24 years, 20%, who have no educational, vocational or professional qualifications compared to England, Scotland and Northern Ireland who have 18%, 12% and 17%.

7.2.19 19% of residents in urban areas have 5 or more GCSEs or equivalent compared to 20% of rural less sparse and 22% of rural sparse areas compared to the Wales average of 20%.

7.2.20 Fig. 7.6 shows the percentage of urban, rural less sparse and rural sparse LSOAs when split into 10 equal bands of education deprivation from most education deprived to least education deprived. Urban areas are the most education deprived followed by rural less sparse areas. Rural sparse areas are the least education deprived.

Fig. 7.6: Education deprivation in Wales in relation to urban, rural less sparse and rural sparse LSOAs (broken down into 10% bands from most to least deprived) **[Source: Wales Centre for Health]**



Lone parent families with dependent children

7.2.21 25% of dependent children in Wales live in lone parent families compared to 23% in England, 25% in Scotland and 23% in Northern Ireland.

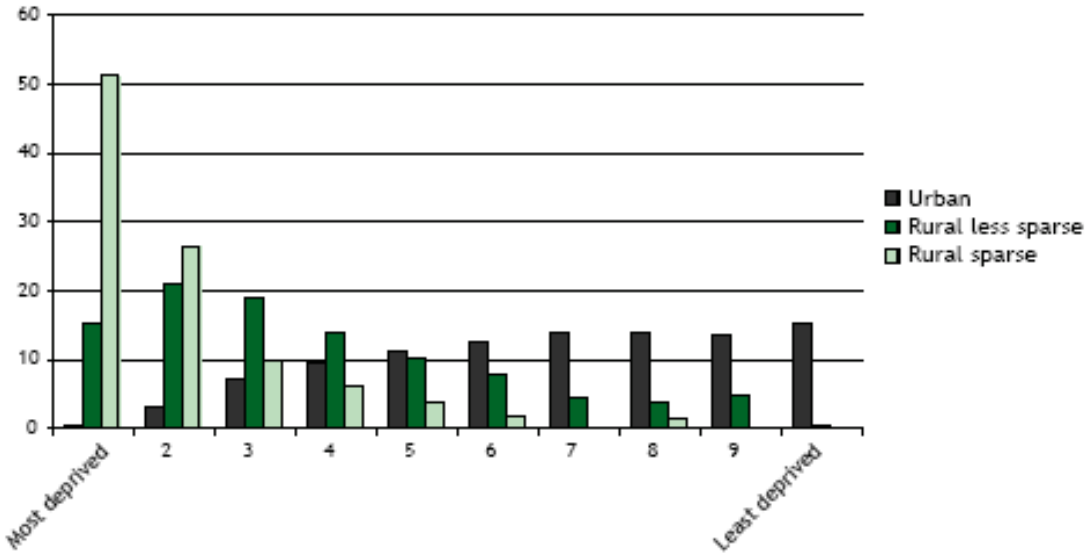
Health Status

7.2.22 87% of people in Wales judge their health to be good or fairly good with 18% of people of working age having a long term limiting illness. This compares with 91% and 90% of people in England and Scotland judging their health to be good or fairly good with 13% and 20% of people of working age, respectively, having a long term limiting illness.

Access to services

7.2.23 Fig. 7.7 shows the percentage of urban, rural less sparse and rural sparse LSOAs when split into 10 equal bands of access deprivation from most access deprived to least access deprived. Rural sparse are the most access deprived followed by rural less sparse areas. Urban areas are the least access deprived.

Fig. 7.7: Access to services deprivation in Wales in relation to urban, rural less sparse and rural sparse LSOAs (broken down into 10% bands from most to least deprived)



Health outcomes in general

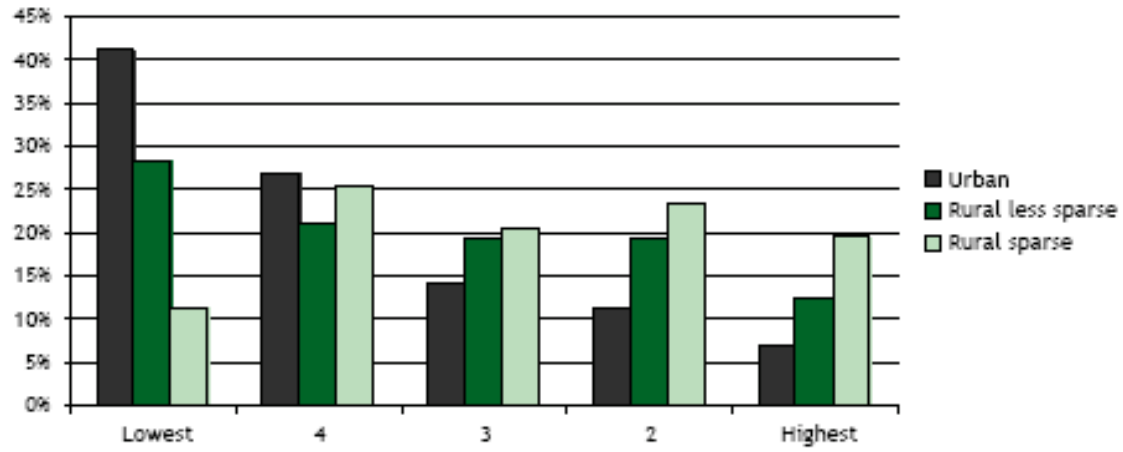
7.2.24 Life expectancy in Wales, on average, is lower than England and Northern Ireland but higher than Scotland at 76 years with women, on average, living 4 years longer than men.

7.2.25 Fig. 7.8 shows the percentage of urban, rural less sparse and rural sparse wards when split into 5 equal bands of life expectancy from the lowest life expectancy to the highest life expectancy. Urban areas have the lowest life expectancy followed by rural less sparse areas. Rural sparse areas have the highest life expectancy[117].

7.2.26 The rate of deaths from all causes is higher in Wales than England and Northern Ireland but lower than that in Scotland.

7.2.27 The rate of deaths from all causes is highest in urban areas, lower in rural less sparse areas and lowest in rural sparse areas in Wales.

Fig. 7.8: Percentage of Welsh wards by life expectancy in relation to urban, rural less sparse and rural sparse LSOAs (broken down into 20% bands from lowest life expectancy to highest)



Coronary heart disease

7.2.28 Since 1996, deaths due to coronary heart disease have been falling continuously. In 2004, coronary heart disease accounted for 19% of all deaths. Wales has a higher rate of deaths due to coronary heart disease than England or Northern Ireland but a lower rate than Scotland.

7.2.29 The rate of deaths from coronary heart disease is highest in urban areas, lower in rural less sparse areas and lowest rural sparse areas in Wales.

[117] It has to be noted that unlike for LSOAs, ward populations vary in size considerably and the proportions of wards in the graph for a given fifth are unlikely to reflect the corresponding proportion of

Cerebrovascular disease (stroke)

7.2.30 Since 1996, deaths due to cerebrovascular disease have been falling though not as markedly as the trend for coronary heart disease. Wales has a higher rate of deaths due to cerebrovascular disease than England or Northern Ireland but a lower rate than Scotland.

Suicides

7.2.31 Since 1996, there has been a slight increase in the rate of deaths by suicides in Wales. Wales has a higher rate of deaths by suicide than England and Northern Ireland but a lower rate than Scotland. This is particularly marked in relation to men committing suicide.

7.2.32 The rates of deaths from suicide in urban areas, rural less sparse areas and areas of Wales are close to each other though there are slightly more deaths from suicide in rural sparse areas than urban and rural less sparse areas in Wales.

Respiratory Disease

7.2.33 Deaths due to respiratory diseases accounts for 13% of all deaths in Wales. Wales has a higher rate of deaths due to respiratory disease than England but a lower rate than Northern Ireland and Scotland.

7.2.34 The rate of deaths from respiratory disease is highest in urban areas, lower in rural less sparse areas and lowest rural sparse areas in Wales.

Injuries

7.2.35 Since 1996, there has been an increase and then a slight reduction in deaths due to unintentional injuries. The age groups in Wales that tend to have the most significant injuries, ones that require hospital treatment, are children, young people and the elderly. The top five major types of injuries are sprains, fractures, bruises/abrasions, laceration/wounds and poisoning/overdoses.

7.2.36 In 2004, there were approximately 9,500 road traffic collisions which resulted in at least one injured person per collision and the number of casualties were approximately 13,700.

7.2.37 The rates of deaths from transport related injuries is highest for residents of rural sparse areas, lower for residents of rural less sparse areas and lowest for residents of urban areas in Wales[118].

Cancer

7.2.38 Since 1996, the rate of premature deaths from cancer have decreased in Wales though the overall number of cancer deaths has remained relatively constant. Wales has a slightly higher death rate due to cancer than England and Northern Ireland but a lower rate than Scotland.

7.2.39 The rates of premature deaths from cancer is highest in urban areas, lower in rural less sparse areas and lowest in rural sparse areas in Wales.

[118] The classification of injuries in terms of urban, rural less sparse and rural sparse have used area of residence and not area where the injury occurred.

7.3 Wales- regional profiles [119] [120] [121] [122] [123] [124] [125]

7.3.1 The following is a high level health and wellbeing profile of the three waste regions.

North Wales Waste Region[126]

7.3.2 The North Wales Waste Region has better than average levels of health compared to Wales as a whole. However, this hides significant inequalities between the local authorities, and indeed between wards within local authorities, in the North Wales Waste Region. Residents of Powys and Flintshire have significantly better levels of health than the residents of Isle of Anglesey and Gwynedd.

7.3.3 Male and female life expectancy is high compared to the Wales average. Educational levels are high and unemployment is low except in Conwy, Gwynedd and Isle of Anglesey. Both Physical and Mental Health Scores are high[127]. Smoking, alcohol consumption and obesity are low though smoking is high in Gwynedd and Isle of Anglesey and obesity is high in Wrexham. Deaths from all causes and premature deaths from cancer and heart disease are low. Premature deaths from road traffic injuries and suicide are in line with the Wales average.

South West Wales Waste Region

7.3.4 The South West Waste Region has average levels of health compared to Wales as a whole. However, residents of Ceredigion and Swansea have significantly better levels of health than the residents of Neath Port Talbot and Bridgend.

[119] National Public Health Service for Wales, Regional Health Profiles – North Wales, Designed for Life Project, 2005.
[120] National Public Health Service for Wales, Regional Health Profiles – Mid & West Wales, Designed for Life Project, 2005.
[121] National Public Health Service for Wales, Regional Health Profiles – South East Wales, Designed for Life Project, 2005.
[122] Wales Centre for Health, Pictures of health in Wales – 22 local authorities, 2006.
[123] Wales Centre for Health, Pictures of health in Wales: a technical supplement, 2006.
[124] National Public Health Service for Wales, Health needs assessment 2006 – Local Authorities Specific Information, 2007.
[125] National Public Health Service for Wales, Health needs assessment trends data 2007 – Local Authorities, 2007.
[126] In this health profile Powys is presented as being part of North Wales to avoid duplication. In terms of public health regional boundaries in Wales it actually sits in the South East Region. Additionally, only North Powys sits within the North Wales Waste Region with a large part of Powys (South Powys) sitting within the South East Wales Waste Region.
[127] It is important to note that high physical and mental health scores are positive and indicate good health and wellbeing.

7.3.5 Male and female life expectancy is in line with the Wales average though lower for men in Neath Port Talbot and women in Bridgend. Educational levels are high except in Neath Port Talbot and Bridgend. Unemployment is low except in Neath Port Talbot and Pembrokeshire. Both Physical and Mental Health Scores are in line with the Wales average. Smoking, alcohol consumption and obesity are low though alcohol consumption is high in Neath Port Talbot and Bridgend. Deaths from all causes is average though it is higher in Neath Port Talbot, Bridgend and Carmarthenshire. Premature deaths from cancer and heart disease are in line with the Wales average except for heart disease in Neath Port Talbot where the rate is higher. Deaths from road traffic injuries and suicide are in line with the Wales average except for road traffic injury deaths in Pembrokeshire and suicide deaths in Neath Port Talbot and Swansea where rates are higher.

South East Wales Waste Region

7.3.6 The South East Wales Waste Region has worse than average levels of health compared to Wales as a whole. However, residents of Monmouthshire and The Vale of Glamorgan have significantly better levels of health than residents of Blaenau Gwent, Merthyr Tydfil, Caerphilly and Rhondda Cynon Taf.

7.3.7 Male and female life expectancy are low. Educational levels are low and unemployment is high except for Monmouthshire which has high education levels and low unemployment and Cardiff which has low unemployment. Both Physical and Mental Health Scores are lower with Merthyr Tydfil and Blaenau Gwent having low scores for both. Smoking and obesity are in line with the Wales average but alcohol consumption is higher except in Monmouthshire. Deaths from all causes and premature deaths from cancer and heart disease are higher. Premature deaths from road traffic injuries and suicide are lower.

Table 7.3: Comparison of key health and wellbeing indicators for the local authorities in Wales against the Welsh average [Source: Wales Centre for Health]

		Year	2002-2004	2002-2004	2001	2001	2003/4	2003/4	2003/4	2003/4	2003/4	2001-2003	2001-2003	2001-2003	1999-2003	1999-2003
Waste Region	**Urban/ Rural Designation**	**Local Area**	**Male Life Expectancy**	**Female Life Expectancy**	**Education**	**Unemployment**	**Physical Health Score**	**Mental Health Score**	**Smoking**	**Obesity**	**Alcohol**	**All Causes**	**Under 75s Cancers**	**Under 75s Circulatory Disease**	**Road Traffic Injury**	**Suicide**
North	Rural	Conwy	75.8	80.8	228.7	3.7	48.6	50.2	24.5	48.9	33.3	680.0	133.6	103.1	5.7	14.8
North	Rural	Denbighshire	76.5	80.4	229.9	3.4	48.6	50.2	27.1	51.1	35.4	676.4	133.2	110.7	7.9	14.3
North	Urban	Flintshire	76.1	80.9	228.5	3.0	49.8	51.0	26.5	51.7	38.7	674.3	118.5	112.4	6.9	10.9
North	Rural	Gwynedd	76.8	80.7	214.7	4.1	50.4	52.2	31.5	51.2	39.6	643.8	127.2	94.0	6.6	10.9
North	Rural	Isle of Anglesey	76.7	81.2	226.4	4.7	48.9	51.7	33.1	51.5	42.0	658.0	131.3	89.6	6.5	11.1
North	Urban	Wrexham	75.8	80.0	212.2	3.3	47.9	50.6	26.4	58.3	41.4	723.1	135.1	117.1	6.9	9.0
North/SEast	Rural	Powys	77.5	81.1	223.6	2.7	50.1	51.2	21.6	51.8	38.0	637.9	109.7	100.1	9.9	12.3
South East	Urban	Blaenau Gwent	73.8	78.4	183.0	4.7	47.0	47.0	28.4	58.6	47.7	831.8	150.1	152.1	4.4	13.4
South East	Urban	Caerphilly	74.8	79.4	193.8	3.6	48.6	49.0	25.8	54.1	42.2	763.1	138.6	142.9	5.0	11.0
South East	Urban	Cardiff	75.9	80.5	172.2	3.1	50.1	49.5	24.9	53.5	38.4	698.5	137.0	114.1	3.8	11.1
South East	Urban	Merthyr Tydfil	73.8	78.1	176.4	4.0	46.7	47.3	29.4	58.3	48.5	826.1	135.7	160.4	7.6	14.4
South East	Rural	Monmouthshire	78.0	81.3	216.9	2.6	50.3	50.9	20.5	51.6	35.2	628.6	107.5	103.4	7.6	9.0
South East	Urban	Newport	75.3	80.7	202.3	3.9	49.3	50.1	25.1	53.6	39.0	706.8	133.8	131.8	3.1	9.5
South East	Urban	Rhondda Cynon Taff	74.8	79.2	181.0	3.6	48.1	47.9	27.6	57.8	45.9	770.8	135.7	144.4	5.6	13.5
South East	Urban	Torfaen	75.9	80.6	210.3	3.4	48.1	49.2	27.8	54.7	41.5	697.6	141.7	121.8	4.3	9.4
South East	Rural	The Vale of Glamorgan	76.0	80.9	225.5	3.3	51.0	50.3	22.3	51.5	38.4	667.3	112.8	104.5	5.0	11.0
South West	Urban	Bridgend	75.5	79.6	194.5	3.5	48.0	48.9	27.3	57.5	46.2	735.5	135.9	114.5	3.9	14.3
South West	Rural	Carmarthenshire	75.4	80.2	219.0	3.4	47.5	49.2	28.8	53.6	39.9	735.0	132.8	119.3	8.2	13.6
South West	Rural	Ceredigion	77.7	81.6	206.9	2.9	48.9	51.1	25.4	47.3	33.3	573.9	103.4	84.0	7.4	11.2
South West	Urban	Neath Port Talbot	74.5	80.1	193.8	3.9	47.2	49.3	28.7	55.5	45.4	743.4	128.1	130.5	5.9	14.7
South West	Rural	Pembrokeshire	76.0	80.5	237.4	3.9	47.9	50.6	28.5	53.7	40.0	694.3	131.8	109.9	10.1	13.2
South West	Urban	Swansea	75.7	80.5	204.0	3.6	48.5	49.6	26.7	52.1	42.2	696.6	132.1	113.6	5.4	14.6
		Wales	**75.8**	**80.3**	**203.5**	**3.5**	**48.8**	**49.8**	**26.4**	**53.7**	**40.0**	**702.9**	**129.8**	**117.3**	**5.9**	**12.1**
		Definition of Data, please see Glossary	Years	Years	EASR per 1000	Percentage	Physical Component Summary Score SF36	Percentage	Percentage	Percentage	EASR per 100,000	EASR per 100,000	EASR per 100,000	EASR per 100,000	EASR per 100,000	EASR per 100,000

A significantly worse outcome for health within the area than the Wales average
A significantly better outcome for health than the Wales average

NB: Some of the indicators e.g. smoking, alcohol intake, physical and mental health scores are derived from self reported information.

North Wales Waste Region

7.3.8 The following sections provide an overview of the local authorities in North Wales. See Table 7.3 for an overview.

Conwy

7.3.9 Conwy has a health profile that is better than the Wales average.

7.3.10 On the positive side, Conwy has average male life expectancy and higher female life expectancy. It has a significantly better educated population with a higher proportion of residents who have 5 GCSEs or equivalent. There is lower alcohol consumption and smoking and average body mass index are lower[128]. The overall mental health score is slightly higher and the rate of deaths from all causes, premature heart disease and road traffic injuries are lower.

7.3.11 On the negative side, Conwy has a significantly higher unemployment, slightly lower overall physical health score, a slightly higher rate of premature deaths from cancer and a very high rate of deaths from suicide.

Denbighshire

7.3.12 Denbighshire has a health profile that is better than the Wales average.

7.3.13 On the positive side, Denbighshire has higher male and female life expectancy. It has a significantly better educated population with a higher proportion of residents who have 5 GCSEs or equivalent and a low unemployment. There is lower alcohol consumption and the average body mass index is lower. The overall mental health score is slightly higher and the rate of deaths from all causes and premature deaths from heart disease are lower.

7.3.14 On the negative side, Denbighshire has a slightly lower overall physical health score, a slightly higher number of smokers, a slightly higher rate of premature death from cancer and high rates of deaths from both suicide and road traffic injuries.

[128] A high body mass index is not good because it means the person or people are overweight compared to other men or women of a similar height.

Flintshire

7.3.15 Flintshire has a health profile that is better than the Wales average.

7.3.16 There is lower alcohol consumption, just over average numbers of smokers and the average body mass index is lower. Both the overall mental and physical health score are higher. The rate of deaths from all causes, premature deaths from cancer, premature deaths from heart disease and deaths from suicide are lower.

7.3.17 On the negative side, Flintshire has a higher rate of deaths from road traffic injuries.

Gwynedd

7.3.18 Gwynedd has a health profile that is generally better than the Wales average.

7.3.19 On the positive side, Gwynedd has higher male and female life expectancy. It has a significantly better educated population with a significantly higher proportion of residents who have 5 GCSEs or equivalent. There is slightly lower alcohol consumption and the average body mass index is lower. The overall physical health score is higher and the overall mental health score is significantly higher. The rate of deaths from all causes and premature deaths from heart disease are significantly lower. The rate of premature deaths from cancer and deaths from suicide are lower.

7.3.20 On the negative side, Gwynedd has a significantly higher unemployment, significantly higher numbers of smokers and a slightly higher rate of deaths from road traffic injuries.

Isle of Anglesey

7.3.21 Isle of Anglesey has a health profile that is generally better than the Wales average.

7.3.22 On the positive side, the Isle of Anglesey has higher male and female life expectancy. It has a better educated population with a higher proportion of residents who have 5 GCSEs or equivalent. The average body mass index is lower. Both the overall mental and physical health score are higher. The rate of deaths from all causes and premature deaths from heart disease are significantly lower. The rate of deaths from suicide is also lower.

7.3.23 On the negative side, the Isle of Anglesey has significantly higher unemployment. It has higher alcohol consumption and significantly high numbers of smokers. The rate

of premature deaths from cancer and deaths from road traffic injuries are slightly higher.

Powys (North and South)[129]

7.3.24 Powys has one of the best health profiles in Wales.

7.3.25 On the positive side, Powys has significantly higher male and female life expectancy. It has a significantly better educated population with a higher proportion of residents who have 5 GCSEs or equivalent and significantly lower unemployment. Alcohol consumption is lower, the number of smokers is significantly lower and the average body mass index is lower. Both overall physical and mental heath scores are higher. The rate of deaths from all causes, premature deaths from cancer and premature deaths from heart disease are significantly lower.

7.3.26 On the negative side, Powys has a very high rate of deaths from road traffic injuries and slightly higher rate of deaths from suicide.

Wrexham

7.3.27 Wrexham has a health profile that is similar to the Wales average.

7.3.28 On the positive side, Wrexham has average male life expectancy. It has a better educated population with a significantly higher proportion of residents who have 5 GCSEs or equivalent and significantly lower unemployment. The overall mental heath score is higher and the numbers of smokers is the same as the Wales average. The rate of deaths from premature heart disease is average and the rate of deaths from suicide is significantly lower.

7.3.29 On the negative side, Wrexham has lower female life expectancy. Alcohol consumption is higher and the average body mass index is significantly higher. The rate of deaths from all causes is significantly higher and the rates of premature deaths from cancer and deaths from road traffic injuries are higher.

[129] As stated earlier, in this health profile Powys is presented as being part of North Wales for convenience and to avoid duplication. In terms of public health regional boundaries in Wales it actually sits in the South East Region. Additionally, only North Powys sits within the North Wales Waste Region with a large part of Powys (South Powys) sitting within the South East Wales Waste Region.

South West Wales Waste Region

7.3.30 The following sections provide an overview of the local authorities in South West Wales.

Carmarthenshire

7.3.31 Carmarthenshire has a health profile that is similar to the Wales average.

7.3.32 On the positive side, Carmarthenshire has a better educated population with a significantly higher proportion of residents who have 5 GCSEs or equivalent and lower unemployment. Alcohol consumption and the average body mass index slightly lower.

7.3.33 On the negative side, Carmarthenshire has lower male and slight lower female life expectancy. It has significantly higher numbers of smokers. Both the overall mental and physical health score are lower. The rate of deaths from all causes is significantly higher. The rates of premature deaths from cancer and heart disease are slightly higher. The rate of deaths from suicide and road traffic injuries are higher.

Ceredigion

7.3.34 Ceredigion has one of the best health profiles in Wales.

7.3.35 On the positive side, Ceredigion has significantly higher male and female life expectancy. It has a better educated population with a slightly higher proportion of residents who have 5 GCSEs or equivalent and significantly lower unemployment. There is significantly lower alcohol consumption, slightly lower numbers of smokers smoking and the average body mass index is significantly lower. The overall mental health score is higher and the overall physical health core is slightly higher. The rate of deaths from all causes, premature deaths from cancer and premature heart disease are significantly lower. The rate of deaths from suicide is also lower.

7.3.36 On the negative side, Ceredigion has a higher rate of deaths from road traffic injuries.

Swansea

7.3.37 Swansea has a health profile that is similar to the Wales average.

7.3.38 On the positive side, Swansea has slightly higher female life expectancy. It has a better educated population with a slightly higher proportion of residents who have 5

GCSEs or equivalent. The average body mass index is lower. The rate of deaths from all causes, premature heart disease and deaths from road traffic injuries are lower.

7.3.39 On the negative side, Swansea has a slightly lower male life expectancy. It has slightly higher unemployment. Alcohol consumption is higher and the number of smokers is slightly higher. Both the overall physical and mental health scores are lower. The rate of premature deaths from cancer is higher and the rate of deaths from suicide is significantly higher.

Pembrokeshire

7.3.40 Pembrokeshire has a health profile that is similar to the Wales average.

7.3.41 On the positive side, Pembrokeshire has slightly higher male and female life expectancy. It has a better educated population with a significantly higher proportion of residents who have 5 GCSEs or equivalent. Alcohol consumption and body mass index are average. The overall mental health score is higher. The rates of deaths from all causes and premature deaths from heart disease are lower.

7.3.42 On the negative side, Pembrokeshire has significantly higher unemployment. The number of smokers is higher. The overall physical health score is lower. The rates of premature deaths from cancer and deaths from suicide are higher with the rate of deaths from road traffic injuries being significantly higher.

Bridgend

7.3.43 Bridgend has one of the worst health profiles in Wales.

7.3.44 On the positive side, Bridgend has average unemployment. The rate of deaths from premature heart disease are slightly lower and the rate of deaths from road traffic injuries is significantly lower.

7.3.45 On the negative side, Bridgend has lower male life expectancy and significantly lower female life expectancy. It has a less well educated population with a significantly lower proportion of residents who have 5 GCSEs or equivalent. Alcohol consumption is significantly higher, the number of smokers is slightly higher and the average body mass index is higher. Both the overall physical and mental health score are lower. The rates of premature deaths from cancer and deaths from suicide are higher.

Neath Port Talbot

7.3.46 Neath Port Talbot has one of the poorest health profiles in Wales.

7.3.47 On the positive side, Neath Port Talbot has a slightly lower rate of premature deaths from cancer and an average rate of deaths from road traffic injuries.

7.3.48 On the negative side, Neath Port Talbot has significantly lower male life expectancy and slightly lower female life expectancy. It has a less well educated population with a significantly lower proportion of residents who have 5 GCSEs or equivalent and significantly higher unemployment. The overall physical health score is very low and the overall mental health score is low. Alcohol consumption is significantly higher, the number of smokers and the average body mass index is higher. The rates of deaths from all causes, premature deaths from heart disease and deaths from suicide are significantly higher.

South East Wales Waste Region

7.3.49 The following sections provide an overview of the local authorities in South West Wales. Only nine of the counties are described below as Powys has already been described in the section on the North Wales Waste Region local authorities.

Blaenau Gwent

7.3.50 Blaenau Gwent has one of the poorest health profiles in Wales.

7.3.51 On the positive side, Blaenau Gwent has a lower rate of deaths from road traffic injuries.

7.3.52 On the negative side, Blaenau Gwent has significantly lower male life expectancy and female life expectancy. It has a less well educated population with a significantly lower proportion of residents with 5 GCSEs or equivalent and significantly higher unemployment. The overall physical health score is very low and the overall mental health score is significantly lower. Alcohol consumption is significantly higher, the number of smokers is higher and the average body mass index is considerably higher. The rate of deaths from all causes, premature deaths from cancer and premature deaths from heart disease are significantly higher. The rate of deaths from suicide are also higher.

Caerphilly

7.3.53 Caerphilly has one of the poorest health profiles in Wales.

7.3.54 On the positive side, Caerphilly has a lower number of smokers and lower rates of deaths from road traffic injuries and suicide.

7.3.55 On the negative side, Caerphilly has significantly lower male life expectancy and female life expectancy. It has a less well educated population with a significantly lower proportion of residents with 5 GCSEs or equivalent and slightly higher unemployment. The overall mental health score is lower and the overall physical health score is slightly lower. Alcohol consumption is higher and the average body mass index is slightly higher. The rate of deaths from all causes, premature deaths from cancer and premature deaths from heart disease are significantly higher.

Cardiff

7.3.56 Cardiff has a health profile that is similar to the Wales average.

7.3.57 On the positive side, Cardiff has slightly higher male and female life expectancy. Unemployment is significantly lower. The overall physical health score is higher. Alcohol consumption is lower, the number of smokers is lower and the average body mass index is slightly lower. The rate of deaths from all causes and premature deaths from heart disease are slightly lower. The rate of deaths from suicide are lower and deaths from road traffic injuries are significantly lower.

7.3.58 On the negative side, Cardiff has a less well education population with a significantly lower proportion of residents with 5 GCSEs or equivalent, a lower overall mental health score and a significantly higher rate of deaths from cancer.

Torfaen

7.3.59 Torfaen has a health profile that is similar to the Wales average.

7.3.60 On the positive side, Torfaen has slightly higher male and female life expectancy. It has a well educated population with a significantly higher proportion of residents who have 5 GCSEs or equivalent and slightly lower unemployment. The rate of deaths from all causes is slightly lower, deaths from road traffic injuries is lower and deaths from suicide is significantly lower.

7.3.61 On the negative side, Torfaen has higher alcohol consumption, higher numbers of smokers and the average body mass index is higher. Both the overall physical and mental health scores are lower. The rate of premature deaths from heart disease is slightly higher and premature deaths from cancer is significantly higher.

The Vale of Glamorgan

7.3.62 The Vale of Glamorgan has one of the best heath profiles in Wales.

7.3.63 Female life expectancy is higher and male life expectancy is slightly higher. It has a well education population with a significantly higher proportion of residents who have 5 GCSEs or equivalent and significantly lower unemployment. Alcohol consumption is lower, the numbers of smokers is significantly lower and the average body mass index is lower. The overall physical health score is significantly higher and the overall mental health score is higher. The rate of deaths from all causes is significantly lower and the rates of premature deaths from cancer and heart disease are significantly lower. The rate of deaths from road traffic injuries and suicide are also lower.

Rhondda Cynon Taff

7.3.64 Rhondda Cynon Taff has one of the poorest health profiles in Wales.

7.3.65 On the positive side, Rhondda Cynon Taff has a slightly lower rate of deaths from road traffic injuries.

7.3.66 On the negative side, Rhondda Cynon Taff has significantly lower male and female life expectancy. It has a less well education population with a significantly lower proportion of residents with 5 GCSEs or equivalent and slightly higher unemployment. Both the overall physical and mental health scores are lower. Alcohol consumption is significantly higher, the numbers of smokers is higher and the average body mass index is significantly higher. The rate of deaths from all causes and premature deaths from heart disease are significantly higher. The rate of premature deaths from cancer and deaths from suicide are also higher.

Newport

7.3.67 Newport has a similar health profile to the Wales average.

7.3.68 On the positive side. Newport has higher female life expectancy. Both the overall physical and mental health scores are slightly higher. Alcohol consumption is lower,

the numbers of smokers is lower and the average body mass index is very slightly lower.. The rate of deaths from suicide is lower and the rate of deaths from road traffic injuries is significantly lower.

7.3.69 On the negative side, Newport has lower male life expectancy. It has a less well education population with a slightly lower proportion of residents with 5 GCSEs or equivalent and significantly higher unemployment. The rate of deaths from all causes and the rates of premature deaths from cancer and heart disease are higher.

Monmouthshire

7.3.70 Monmouthshire has one of the best health profiles in Wales.

7.3.71 On the positive side. Monmouthshire has significantly higher male and female life expectancy. It has a well educated population with a significantly higher proportion of residents with 5 GCSEs or equivalent and significantly lower unemployment. Both the overall physical and mental health scores are higher. Alcohol consumption is significantly lower, the numbers of smokers is significantly lower and the average body mass index is lower. The rate of deaths from all causes, premature deaths from cancer, premature deaths from heart disease and deaths from suicide are significantly lower.

7.3.72 On the negative side, Monmouthshire has a higher rate of deaths from road traffic injuries.

Merthyr Tydfil

7.3.73 Merthyr Tydfil has one of the poorest health profiles in Wales. There are no positive key health indicators in Merthyr Tydfil.

7.3.74 On the negative side, Merthyr Tydfil has significantly lower male and female life expectancy. It has a less well educated population with a significantly lower proportion of residents with 5 GCSEs or equivalent and significantly higher unemployment. Both the overall physical and mental health scores are significantly lower. Alcohol consumption is significantly higher, the numbers of smokers is higher and the average body mass index is higher. The rate of deaths from all causes and premature deaths from heart disease are significantly higher. The rate of premature deaths from cancer, deaths from road traffic injuries and deaths from suicide are also higher.

7.4 Conclusion

7.4.1 This profile of the health and wellbeing in Wales, the three waste regions – North Wales, South West Wales and South East Wales - and the twenty-two Welsh local authorities in Wales was produced to:

- ensure that the current health and wellbeing issues in Wales and the regions are taken into account in the analysis and

- provide a baseline context from which the potential health and wellbeing impacts of the Strategic Waste Management Options proposed in the Wales 3 RWPR could be assessed properly assessed. .

7.4.2 This high level health and wellbeing profile of Wales shows that the picture of health and wellbeing of the people of Wales and the three waste regions is complex. Even in local authorities that have the best overall health profiles there are areas (Lower Super Output Areas) that show deprivation and poor health.

7.4.3 In summary, the residents of the North Wales Waste Region have the best health and wellbeing profile, followed by residents of the South West Wales Waste Region with residents of the South East Wales Region having the poorest health and wellbeing profile. However, this overall regional pictures hides significant variations in health and wellbeing, and health inequalities, both between the Welsh local authorities and within them. This means that there will need to be some further work at local authority level to map out areas of health inequalities, particularly, in local authorities where the overall health and wellbeing of residents is very good once the RWPR is completed.

7.4.4 In the North Wales Waste Region, residents of Powys and Flintshire have the best levels of health while the residents of Isle of Anglesey and Gwynedd have the poorest levels of health in the region. The key negative health and wellbeing issues at a regional level are the rates of premature deaths from cancer and deaths from road traffic injuries which are higher than the Wales average.

7.4.5 In the South West Wales Waste Region, residents of Ceredigion and Swansea have the best levels of health while residents of Bridgend and Neath Port Talbot have the poorest levels of health in the region. The key negative health and wellbeing issues at a regional level are the rates of death from suicide and premature deaths from cancer which are higher than the Wales average.

7.4.6 In the South East Wales Waste Region, residents of Monmouthshire and The Vale of Glamorgan have the best levels of health while residents of Blaenau Gwent, Caerphilly, Merthyr Tydfil and Rhondda Cynon Taff have the poorest levels of health in the region. The key negative health and wellbeing issues at a regional level are the levels of unemployment and the rates of premature deaths from heart disease and cancer which are higher than the Wales average.

7.4.7 Lastly, it is important to reiterate that this profile is based on datasets that are between two to six years old. Therefore, it is likely that the actual figures described in this report will have changed. Some of the data is also self-reported which can mean that there is some under or over-reporting within some of the indicators. However, the key public health issues and the relative health and wellbeing differences between the regions, local authorities and lower super output areas are likely to have remained. Therefore the overall conclusions in this profile are sound.

8 Strategic Waste Management Options for 2013

8.1 Introduction

8.1.1 There are many possible combinations of the different types of waste management facilities which could be provided to deal with the waste generated in Wales and the three Waste Regions. As part of the process of the 3 RWPR, these different combinations of waste management facilities were merged to create 4 main Strategic Waste Management Options (SWMOs) with 19 Sub-Options and these are being assessed to see what the environmental and health implications of these would be in relation the waste that is likely to be generated in 2013.

8.1.2 The amount of waste within the different waste streams (arisings) has been projected to 2013 based on current understanding of waste growth and trends. These figures were agreed by each of the Regional Waste Groups.

8.2 Strategic Waste Management Options (SWMOs)

8.2.1 The SWMOs (see Fig. 8.1 for an outline description) were discussed and developed by the three Regional Waste Groups, WAG, Welsh Local Government Association (WLGA) and the Environment Agency (EA). It was agreed that, for each option apart from Option 0, the 2020 landfill directive target would be met in the study year: "…to reduce the amount of biodegradable municipal waste landfilled to 35% of that produced in 1995."

8.2.2 Substantial levels of recycling/composting of municipal waste will be required through source segregation, doorstep recycling, to satisfy the WAG targets set for each Local Authority.

Fig. 8.1: Outline Description of the Strategic Waste Management Options [130] [131]

Option 0

'Do Nothing' strategy[132] (This option is included for assessment purposes only – as a baseline to compare the other Options against). Front end levels of recycling and composting from the other options with no further treatment, projected on to waste tonnages arising in 2013

Option 1

A landfill-led strategy for residual waste

High recycling and composting levels followed by low levels of thermal treatment of residual waste using either:

- Pyrolysis (Option 1A), or
- Gasification (Option 1B), or
- Incineration with energy recovery (Option 1C)

All remaining residual waste would then be sent to landfill.

(Recycling / treatment levels are those required to achieve the 2020 (Biodegradable Municipal Waste (BMW) Landfill Directive target in 2013) where possible.

Option 2

An Energy from Waste-led strategy for residual waste

High recycling and composting levels with all remaining residual wastes, where possible, being treated by high levels of thermal treatment using either:

- Pyrolysis (Option 2A), or
- Gasification (Option 2B), or
- Incineration with energy recovery (Option 2C)
- Anaerobic digestion (Option 2D)

Any remaining residual waste would then be sent to landfill.

(Recycling/treatment levels are those required to achieve the 2020 BMW Landfill Directive target in 2013. Energy from Waste levels aim to minimise waste to landfill).

Option 3

An MBT/BMT-led strategy for residual waste

High recycling and composting levels, all remaining residual wastes being sent to MBT/BMT with the output recovered / disposed of using either:

- Pyrolysis (Option 3A), or
- Gasification (Option 3B), or
- Incineration with energy recovery (Option 3C), or
- Fuel to off-site energy use (Option 3D), or
- On-site Anaerobic digestion (Option 3E), or
- Landfill (Option 3F)

For Options 3A–3E, any remaining residual waste would then be sent to landfill.

(Recycling/treatment levels are the maximum possible – may exceed those required to achieve the 2020 BMW Landfill Directive target in 2013).

Option 4

An autoclave-led strategy for residual waste

High recycling and composting levels, all remaining residual wastes being sent to autoclave with the output recovered / disposed of using either:

- Pyrolysis (Option 4A), or
- Gasification (Option 4B), or
- Incineration with energy recovery (Option 4C), or
- Fuel to off-site energy use (Option 4D), or
- Landfill (Option 4E)

For Options 4A to 4E, any remaining residual waste would then be sent to landfill.

8.2.3 The source segregation recycling/composting rates relate primarily to the performance of local authorities in the management of municipal solid waste (MSW).

[130] Environment Agency Wales, Sustainability Appraisal and Life Cycle Assessment of the Strategic Waste Management Options, 2007.

[131] In all cases, the recycling/composting rate for municipal waste will exceed 50%. For option 1, the aspiration for the treatment of residual waste is to achieve the 2020 (Biodegradable Municipal Waste (BMW) Landfill Directive target in 2013. For options 2-4 all residual waste will be treated using the chosen technology type.

WAG targets will need to be met for other waste streams i.e. recycling targets for construction and demolition (C&D) waste, landfill diversion for industrial and commercial (I&C) waste. The major impact on these streams will be the method of management used for residual waste. It is assumed that, where appropriate, all waste streams will use the waste treatment facilities described in the SWMOs.

8.2.4 The waste management facilities identified within the SWMOs are those that will receive household waste or similar fractions of industrial, commercial and agricultural wastes.

8.2.5 Hazardous waste forms a small percentage of the overall waste that needs to be treated within Wales and, the health and wellbeing issues relating to waste, in general, are applicable to the treatment and disposal of hazardous waste. All hazardous waste will require will require treatment before disposal to a hazardous landfill. The type of treatment that these wastes will need will depend on the characteristics of the hazardous waste.

8.2.6 The assumed composition of household, industrial, commercial, agricultural and hazardous waste have been taken from the Sustainability Appraisal and Life Cycle Assessment reports for the 3 RWPR.

8.2.7 For all Options, there is diversion of municipal solid waste at the front end to recycling and composting. This reflected the proposed 2020 target in the review of the English Waste Strategy[133] . Also, for all Options, there will be some residual waste remaining after treatment that will require disposal in a landfill. This is because there are components in the waste stream that cannot be broken down any further through treatment and cannot be recycled or re-used.

[132] This option has been amended for the life cycle analysis to represent a scenario whereby no alternative disposal or treatment options are developed and all residual waste is sent to landfill. Source separated recycling and composting rates are the same as in all other options

[133] Review of England's waste strategy – a consultation document, February 2006. DEFRA

9 Health Impacts of the Strategic Waste Management Options 0-4

9.1 Introduction

9.1.1 This chapter details the key potential health and wellbeing impacts of the Strategic Waste Management Options (SWMOs) 0-4.

9.1.2 Option 0: 'Do Nothing' Strategy is the comparator option against which the other SWMOs, Options 1-4, were assessed.

9.1.3 For the full summary health impact matrices see Appendix D.

9.1.4 In Option 0: 'Do Nothing Strategy', though there are new waste facilities to deal with the front end (recycling and composting) it has been assumed that no new waste treatment facilities, including landfills, will be built by 2013. However, it is important to note that the implications of Option 0 were it to be implemented would be the expansion of existing and the creation of new landfills to meet the projected growth in waste after 2013. This is particularly so for North Wales. Given this the actual health implications of Option 0 are very similar to Option 1.

9.1.5 In Option 1: landfill-led strategy, after 50% recycling and composting, low volumes of the remaining (residual) waste will be thermally treated with the majority sent directly to landfill. In Option 1A the thermal treatment of choice is pyrolysis, in Option 1B the thermal treatment of choice is gasification and in Option 1C the thermal treatment of choice is incineration with energy recovery.

9.1.6 In Option 2: energy from waste-led strategy, after front end recycling and composting, high volumes of the remaining (residual) waste will be thermally treated with the remainder then sent to landfill. In Option 2A the thermal treatment of choice is pyrolysis, in Option 2B the thermal treatment of choice is gasification, in Option 2C the thermal treatment of choice is incineration with energy recovery and in Option 2D the thermal treatment of choice is anaerobic digestion.

9.1.7 In Option 3: mechanical and biological treatment/biological and mechanical treatment(MBT/BMT)-led strategy, after front end recycling and composting, high volumes of the remaining (residual) waste will be mechanically and biologically

treated with the remainder then sent to landfill. In Option 3A the MBT/BMT treatment is followed by pyrolysis, in Option 3B MBT/BMT treatment is followed by gasification, in Option 3C MBT/BMT treatment is followed by incineration with energy recovery, in Option 3D MBT/BMT treatment is followed by refuse derived fuel being taken away for off-site use, in Option 3E MBT/BMT treatment is followed by anaerobic digestion and in Option 3F MBT/BMT treatment is not treated further and sent directly landfill.

9.1.8 In Option 4: mechanical heat treatment/autoclave-led strategy, after front end recycling and composting, high volumes of the remaining (residual) waste will be processed by mechanical heat treatment with the remainder then sent to landfill. In Option 4A the thermal treatment of choice is pyrolysis, in Option 4B the thermal treatment of choice is gasification, in Option 4C the thermal treatment of choice is incineration with energy recovery and in Option 4D the thermal treatment of choice is anaerobic digestion.

9.1.9 The numbers of new Civic Amenities, HIC Transfer Stations, C&D Transfer Stations, In-Vessel Compositing Facilities, Open Windrow Composting Facilities, C&D Exemption Sites, C&D Recycling Sites and Inert Landfill Sites needed across Wales, the three waste regions and the local authorities will be the same for all the Options 0-4 and so the potential impacts of these new waste facilities have not been assessed. However it is important to note that some of these facilities, at the very least, will arouse similar concerns in local communities as the additional new waste treatment facilities proposed by the SWMOs 0-4.

9.1.10 The assessment of impacts on each determinant of health at the levels of Wales and the three regions is for the combined impacts of all the potential waste treatment facilities that will be built as part of the SWMO on the determinant of health.

9.1.11 This analysis is a qualitative assessment based on the health impact evidence, past experience of waste issues and expert judgement.

9.1.12 Impacts were classified using the levels defined in Table 9.1 below.

Table 9.1: Criteria used for assessing the significance levels of the potential health impacts

Significance Level	Criteria
Severe ---- (negative only)	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process, and may threaten the viability of the project. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or local scale site or feature may also enter this category. Typically, mitigation measures are unlikely to remove severe adverse effects.
Major +++/--- (positive or negative)	These effects are likely to be important considerations at a local or district scale. If adverse, potential concerns to the project may become key factors in the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the adverse effects upon the affected communities or interests.
Moderate ++/-- (positive or negative)	These effects, if adverse, while important at a local scale, tend to be less critical issues in the decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still remain.
Minor/Mild +/- (positive or negative)	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless they are of relevance in enhancing the subsequent design of the project and the consideration of mitigation and/or compensation measures.
Neutral/No Effect ~	No effect or effects which are beneath the level of perception or within normal bounds of variation.

9.2 Impact analysis – construction phase

9.2.1 For the purposes of this assessment, Option 0 assumes no building of new waste treatment facilities - apart from the collection, recycling and composting facilities which will be the same in all the Options 0-4. Given this there would be no construction-related impacts from residual waste treatment facilities. However, as stated earlier there would still be a need for new landfills and the extension of landfills after 2013 and this will require the planning and siting process for these landfills to start now. And, in common with the other SWMOs, there will be the construction of new Civic Amenities, HIC Transfer Stations, C&D Transfer Stations, In-Vessel Compositing Facilities, Open Windrow Composting Facilities, C&D Exemption Sites, C&D Recycling Sites and Inert Landfill Sites.

Positive health impacts – construction phase

9.2.2 There are likely to be **two main potential positive health and wellbeing impacts** of the construction phase of the SWMOs 1-4:

9.2.3 There are likely to be employment and economy effects. These are likely to be through the creation of direct construction-related and indirect jobs for people at a local and regional level through the stimulation of the wider economy from increased passing trade for local shops and other retail amenities, the setting up of new businesses linked to construction and waste management, e.g. re-use and recycling facilities, as well as the potential for increased rents from providing accommodation to the construction workers who come from outside the local area of the site of a waste facility.

9.2.3.1 For the SWMOs 1-4, this is likely to be a minor to moderate positive health impact at the local level in both rural and urban areas.

9.2.3.2 Option 1: the landfill-led strategy, is likely to have a minor positive health impact at the level of Wales and the three waste regions.

9.2.3.3 Option 2: the energy from waste-led strategy, is likely to have a moderate to major positive health impact at the level of Wales and the three waste regions.

9.2.3.4 Option 3: the MBT/BMT-led strategy, is likely to have a major positive health impact at the level of Wales and the three waste regions.

9.2.3.5 Option 4: the MHT/Autoclave strategy, is likely to have a moderate to major positive health impact at the level of Wales and the three waste regions.

9.2.4 There are likely to be education and learning effects. These are likely to be through the on-the-job construction training opportunities and construction experience as well as the potential for linking into construction courses and apprenticeship schemes.

9.2.4.1 For the SWMOs 1-4, this is likely to be a minor positive health impact at local level in both rural and urban areas.

9.2.4.2 Option 1: the landfill-led strategy, is likely to have be a minor positive health impact at the level of Wales and the three waste regions.

9.2.4.3 Options 2, 3 and 4 are likely to have a minor to moderate positive health impact at the level of Wales and the three waste regions.

Negative health impacts – construction phase

9.2.5 There are likely to be **six main potential negative health and wellbeing impacts** during the construction phase of the SWMOs 1-4.

9.2.6 There are likely to be physical injury effects. These are likely to be through the potential effects on the health and safety of construction workers and, to a much lesser extent, nearby residents due to construction activities e.g. fall, injuries from equipment failure or failure to follow health and safety guidelines.

9.2.7 For the SWMOs 1-4, this is likely to be a minor negative health impact at local level in both rural and urban areas.

9.2.7.1 Option 1 is likely to have a minor negative health impact at the level of Wales and the three waste regions.

9.2.7.2 Options 2, 3 and 4 are likely to have a minor to moderate negative health impact at the level of Wales and the three waste regions.

9.2.8 There are likely to be mental health effects. These are likely to be through the planning and siting of a waste facility if it is near, or seen to be near, a residential neighbourhood as some residents will see it as an unwanted and dangerous development.

9.2.8.1 For the SWMOs 1-4, this is likely to be a minor to moderate negative health impact at local level in rural and urban areas.

9.2.8.2 Option 1 is likely to have a minor to moderate negative health impact at the level of Wales and the three regions.

9.2.8.3 Option 2 is likely to have a moderate to major impact at the level of Wales and the three regions.

9.2.8.4 Option 3 is likely to have a minor to major negative health impact at the level of Wales and the three regions.

9.2.8.5 Option 4 is likely to have be a minor to major negative impact at the level of Wales and the three regions

9.2.9 There are likely to be transport and connectivity effects. These are likely to be through the movement of the construction lorries which may generate more congestion of key routes and increase the risks of road traffic collisions.

9.2.9.1 For the SWMOs 1-4, this is likely to be a minor negative health impact at local level. It is potentially greater, a minor to moderate negative health impact, in rural areas; given their limited road infrastructure, greater reliance on cars and lower background levels of traffic; compared to a minor negative health impact in urban areas.

9.2.9.2 Option 1 is likely to have no effect or a minor negative health impact at the level of Wales and the three waste regions.

9.2.9.3 Options 2, 3 and 4 are likely to have a minor to moderate negative health impact at the level of Wales and the three waste regions.

9.2.10 There are likely to be housing effects. These are likely to be through construction workers moving into the area and renting local accommodation.

9.2.10.1 For the SWMOs 1-4, this is likely to be a minor to moderate negative health impact at the local level in both rural and urban areas.

9.2.11 There are likely to be lifestyle and daily routine effects. These are likely to be through nuisance effects associated with the construction activities on the site e.g. traffic, noise and dust.

9.2.11.1 For the SWMOs 1-4, this is likely to be a minor to moderate negative health impact at the local level in both rural and urban areas.

9.2.11.2 Option 1 is likely to have a minor negative health impact at the level of Wales and the three waste regions.

9.2.11.3 Option 2, 3 and 4 are likely to have a moderate to major negative health impact at the level of Wales and the three waste regions.

9.2.12 There are likely to be land and spatial effects. These are likely to be through making the development site visually unattractive and compacting and degrading the land in and around the site.

9.2.12.1 For the SWMOs 1-4, this is likely to be a minor to moderate negative health impact at local level. It is potentially greater, a moderate to major negative health impact, in rural areas; given the less urban and more sensitive environment; compared to a minor to moderate negative health impacts.

9.2.12.2 Option 1 is likely to have a minor negative health impact the level of Wales and the three waste regions.

9.2.12.3 Options 2, 3 and 4 are likely to have a minor negative health impact the level of Wales and the three waste regions.

Uncertain health impacts – construction phase

9.2.13 There are likely to be **two main uncertain potential health impacts** that could be either positive or negative during the construction phase of the SWMOs 1-4.

9.2.14 There are likely to be social capital and community cohesion effects. These are likely to be through the concern, worry and anxiety generated by the planning and siting of a waste facility near a residential neighbourhood. This can have negative effects on social capital and community cohesion depending on how the planning and siting process is managed and how early communities are consulted and involved in the decision-making process. Well managed planning and siting processes can have positive effects and poorly managed ones can have negative effects.

9.2.14.1 For Options 1 and 2, this could range from a major negative to a moderate positive health impact at local level, in both rural and urban areas, and at the level of Wales and the three waste regions.

9.2.14.2 For Options 3 and 4, this could range from a moderate negative to a moderate positive health impact at local level, in both rural and urban areas, and at the level of Wales and the three waste regions.

9.2.15 There are likely to be energy and waste effects. These are likely to be through the way energy and waste are managed on the development site i.e. whether sustainable

energy sources are used, whether materials are reused, recycled and whether contaminated soil and hazardous materials are disposed of appropriately.

9.2.16 For the SWMOs 1-4, this could range from a minor negative to a moderate positive health impact at the local level in both rural and urban areas.

9.2.16.1 Option 1 could range from a minor negative to a moderate positive health impact at the levels of Wales and the three waste regions.

9.2.16.2 Options 2, 3 and 4 could range from a moderate negative to a moderate positive health impact at the levels of Wales and the three waste regions.

9.3 Impact analysis – operation phase

Positive health impacts – operation phase

9.3.1 As this assessment assumes that no new residual waste treatment facilities are built in Option 0, there are no potential positive health and wellbeing impacts of the operation phase of Option 0. Though, in common with the other SWMOs, there will be the operation of new Civic Amenities, HIC Transfer Stations, C&D Transfer Stations, In-Vessel Compositing Facilities, Open Windrow Composting Facilities, C&D Exemption Sites, C&D Recycling Sites and Inert Landfill Sites.

9.3.2 There are likely to be **two main potential positive health impacts** during the operation phase of the Options 1-4:

9.3.3 There are likely to be employment and economy effects. These are likely to be through the creation of direct waste facility-related jobs and indirect jobs for people at a local and regional level through the stimulation of the wider economy from increased passing trade for local shops and other retail amenities and the setting up of new businesses linked to waste management, e.g. re-use and recycling facilities.

9.3.3.1 For the Options 1-4, this is likely to be a minor to moderate positive health impact at the local level, in both rural and urban areas.

9.3.3.2 Option 1 is likely to have a minor positive health impact at the level of Wales and the three waste regions.

9.3.3.3 Options 2, 3 and 4 are likely to have a moderate to major positive health impact at the level of Wales and the three waste regions.

9.3.4 There are likely to be energy and waste effects. These are likely to be through the further recycling and energy recovery from waste that the waste treatment facilities will enable. This will have significant positive mitigating influence on climate change and its potential negative health impacts.

9.3.4.1 For Option 1, this is likely to be a minor positive health impact at the local level, in both rural and urban areas, and at the levels of Wales and the three waste regions because the low levels of thermal treatment will slightly reduce the overall amount of waste disposed to landfill and recover some energy from waste.

9.3.4.2 For Option 2, this is likely to be a moderate to major positive health impact at the local level, in both rural and urban areas, and at the levels of Wales and the three waste regions because the high levels of thermal treatment will reduce the overall amount of waste disposed to landfill significantly and recover an equally significant amount of energy from waste.

9.3.4.3 For Option 3, this is likely to be a moderate to major positive health impact at the local level, in rural and urban areas, and a major positive health impact at the level of Wales and the three waste regions because of the high levels of MBT/BMT treatment will reduce the overall amount of waste disposed to landfill significantly through further recycling and the recover of energy from waste.

9.3.4.4 For Option 4, this is likely to be a moderate to major positive health impact at the local level, in rural and urban areas, and a major positive health impact at the levels of Wales and the three waste regions because the high levels of thermal treatment will reduce the overall amount of waste disposed to landfill significantly and further recycling and recovery of energy from waste.

Negative health impacts – operation phase

9.3.5 There are likely to be **four main potential negative health impacts** during the operation phase of the Options 0-4:

9.3.6 There are likely to be physical injury effects. These are likely to be through the potential effects on the health and safety of waste facility workers and, to a much

lesser extent, nearby residents due to operation activities e.g. fall, injuries from equipment failure or failure to follow health and safety guidelines.

9.3.6.1 For the Options 0 - 4, this is likely to be no effect or a minor negative health impact at local level in both rural and urban areas.

9.3.6.2 For the Options 0 - 4, this is likely to be a no effect or a minor negative health impact at the level of Wales and the three waste regions.

9.3.7 There are likely to be mental health effects. These are likely to be through the planning and siting of a waste facility if it is near, or seen to be near, a residential neighbourhood as some residents will see it as an unwanted and dangerous development.

9.3.7.1 For the Options 0-4, this is likely to be no effect, a minor or a moderate negative health impact at local level in both rural and urban areas.

9.3.7.2 Option 0 would have no effect, given that it has been assumed that there would be no new waste residual treatment facilities. Though in reality, new landfills would need to be planned for as of now. And, in common with the other SWMOs, there will be the operation of new recycling and composting facilities..

9.3.7.3 Option 1 is likely to have a minor to moderate negative health impact at the level of Wales and the three regions.

9.3.7.4 Option 2 is likely to have a moderate to major negative health impact at the level of Wales and the three regions.

9.3.7.5 Options 3 and 4 are likely to have a minor to major negative health impact at the level of Wales and the three regions.

9.3.8 There are likely to be transport and connectivity effects. These are likely to be through the movement of the waste lorries, if road is the main mode of transport, which may generate more congestion of key routes and increase the risks of road traffic collisions.

9.3.8.1 For the Options 0-4, this is likely to be a minor to moderate negative health impact at local level. It is potentially greater, a minor to moderate negative

impact, in rural areas compared to a minor negative health impact in urban areas.

9.3.8.2 Option 0 and 1 are likely to have a minor negative health impact at the level of Wales and the three waste regions.

9.3.8.3 Options 2, 3 and 4 are likely to have a minor to moderate negative health impact at the level of Wales and the three waste regions.

9.3.9 There are likely to be lifestyle and daily routine effects. These are likely to be through nuisance effects associated with the waste facility and related waste traffic e.g. traffic, noise and dust.

9.3.9.1 For the Options 0-4, this is likely to be no effect, a minor to a moderate negative health impact at the local level in both rural and urban areas.

9.3.9.2 Option 0 is likely to have no effect or a minor health impact at the level of Wales and the three waste regions.

9.3.9.3 Option 1 is likely to have a minor negative health impact at the level of Wales and the three waste regions.

9.3.9.4 Option 2, 3 and 4 are likely to have a moderate to major negative health impact at the level of Wales and the three waste regions.

Uncertain health impacts – operation phase

9.3.10 There are likely to be **three main uncertain potential health impacts** that could be either positive or negative during the operation phase of the Options 0 - 4.

9.3.11 There are likely to be education and learning effects. These are likely to be through the education, training and learning opportunities available to waste facility workers, the potential provision of community education facilities and the development of an environmental education and awareness programme involving school and group visits to the waste facility.

9.3.11.1 For Option 0 this is likely to be no effect at local level, in rural and urban areas, and at the level of Wales and the three waste regions.

9.3.11.2 For the Options 1-4, this is likely to be no effect, a minor or a moderate positive health impact at local level, in rural and urban areas, and at the level of Wales and the three waste regions.

9.3.12 There are likely to be social capital and community cohesion effects. These are likely to be through continuing concern, worry and anxiety about the waste facility and related traffic and is likely to continue for at least the first five years of operation after which any potential negative effects are likely to lessen.

9.3.12.1 For Option 0, this is likely to be no effect at local level, in rural and urban areas, and at the level of Wales and the three waste regions.

9.3.12.2 For the Options 1-4, this could range from a minor negative health impact to a moderate positive health impact at local level in both rural and urban areas.

9.3.12.3 For Option 1 this could range from a moderate negative health impact to a moderate positive impact at the levels of Wales and the three waste regions.

9.3.12.4 For Option 2 this could range from a major negative to a moderate positive health impact at the levels of Wales and the three waste regions.

9.3.12.5 For Options 3 and 4 this could range from a moderate negative to a major positive health impact at the levels of Wales and the three waste regions.

9.3.13 There are likely to be land and spatial effects. These are likely to be through the size and design of a waste treatment facility and its surroundings.

9.3.13.1 For Option 0, this is likely to be no effect at local level, in rural and urban areas, and at the level of Wales and the three waste regions.

9.3.13.2 For the Options 1-4, this could range from a minor negative to a moderate positive health impact at the local level, in both rural and urban areas, and at the levels of Wales and the three waste regions.

9.4 Impact analysis – decommissioning phase

9.4.1 The decommissioning phase will be influenced by what the site will be used for in the future. The site could be used to build another waste facility, an industrial facility, a new housing development and so on. This assessment assesses the impacts of decommissioning only and not what might potentially come after.

9.4.2 The level of impact during decommissioning is largely dependant on what the subsequent use of the land is though the act of cleaning up the site and generally improving the land is, in itself, likely to be a positive health and wellbeing impact. If there is another waste or industrial facility then there are likely to continue to be a similar set of negative health impacts as described above.

Positive health impacts – decommissioning phase

9.4.3 There are likely to be **three main potential positive health impacts** during the decommissioning phase of Options 0-4:

9.4.4 There are likely to be mental health effects. These are likely to be through the decommissioning and removal of a facility that many local people do not like or are concerned about.

9.4.4.1 For all the Options 0-4, this is likely to have a minor to moderate positive health impact at local level in both rural and urban areas.

9.4.4.2 Options 0 and 1 are likely to have a minor positive health impact at the level of Wales and the three waste regions.

9.4.4.3 Options 2, 3 and 4 are likely to have a minor to moderate positive health impact at the level of Wales and the three waste regions.

9.4.5 There are likely to be social capital and community cohesion effects. These are likely to be through the removal of the facility and the cleaning up of the site and the surrounding area.

9.4.5.1 For all the Options 0-4, this is likely to have a minor to moderate positive health impact at local level in both rural and urban areas.

9.4.5.2 Option 0 is likely to have a minor to moderate positive health impact at the level of Wales and the three waste regions.

9.4.5.3 Option 1 is likely to have a minor positive health impact at the level of Wales and the three waste regions.

9.4.5.4 Option 2 is likely to have a moderate positive health impact at the level of Wales and the three waste regions.

9.4.5.5 Options 3 and 4 are likely to have a minor to moderate positive health impact at the level of Wales and the three waste regions.

9.4.6 There are likely to be land and spatial effects. These are likely to be through the facility being dismantled, recycled and disposed of and any contaminated land or materials remediated.

9.4.6.1 For all the Options 0-4, this is likely to have a minor positive health impact at the local level in both rural and urban areas, and at the level of Wales and the three waste regions.

Negative health impacts – decommissioning phase

9.4.7 There are likely to be **two main potential negative health impacts** during the decommissioning phase of the Options 1-4:

9.4.8 There are likely to be employment and economy effects. These are likely to be through the loss of direct waste facility-related jobs and indirect jobs created in the wider economy.

9.4.8.1 For all the Options 0-4, this is likely to have a minor to moderate negative health impact at local level in both rural and urban areas.

9.4.8.2 Option 0 is likely to have a moderate negative health impact at the levels of Wales and the three waste regions.

9.4.8.3 Option 1 is likely to have a minor negative health impact at the levels of Wales and the three waste regions.

9.4.8.4 Option 2 is likely to have a moderate negative health impact at the levels of Wales and the three waste regions.

9.4.8.5 Options 3 and 4 are likely to have a moderate to major negative health impact at the levels of Wales and the three waste regions. It is likely to be

greater, a moderate negative health impact, in rural areas compared to a minor to moderate negative health impact in urban areas.

9.4.9 There are likely to be transport and connectivity effects. These are likely to be through decommissioning lorries and other vehicles coming to and from the site. These will replace the waste lorries going to and from the waste facility.

9.4.9.1 For the Options 0-4, this is likely to have a minor negative health impact at local level. It is potentially greater, a minor to moderate negative health impact, in rural areas compared to a minor negative health impact in urban areas.

9.4.9.2 Options 0 and 1 is likely to have a minor negative health impact at the level of Wales and the three waste regions.

9.4.9.3 Options 2, 3 and 4 are likely to have a minor to moderate negative health impact the level of Wales and the three waste regions.

Uncertain health impacts – decommissioning phase

9.4.10 There is **one uncertain potential health impact** that could be either positive or negative during the decommissioning phase of the Options 0-4.

9.4.11 There are likely to be education and learning effects. The education and learning programmes for waste facility workers and local communities would be lost.

9.4.11.1 For the Options 0-4, this could have no effect, a minor or a moderate negative health impact at local level in both rural and urban areas.

9.4.11.2 For all the Options 0-4, this could have no effect or a minor negative health impact at the levels of Wales and the three waste regions.

9.5 Impact analysis of the sub-options

9.5.1 The potential positive and negative health impacts of the sub-options are likely to be similar to each other. The most significant difference is likely to be that thermal treatment technologies, particularly incineration with energy recovery, are likely to

raise the greatest amount of concern initially and throughout the construction and operation phases at local and regional levels.

9.6 Cumulative impacts

9.6.1 The potential cumulative impacts of the implementation of the Options 0 – 4 both in relation to waste management and the wider policy and development context is difficult to interpret.

9.6.2 This is because while the wider society and community will have the benefits of the proposed waste treatment facilities, local communities living around these facilities are likely to have the same benefits but also face the nuisance and minor to moderate negative health impacts of these facilities during the construction, operation and decommissioning phases. The effects are not equivalent and the environmental health burdens are not evenly distributed.

9.6.3 The cumulative effects depend on what the existing economic, social, environmental and health context is in a locality where a waste treatment facility is being sited

9.6.4 Furthermore, it depends on what other potential developments, particularly waste or industrial developments, will be proposed alongside a potential new waste treatment facility.

9.6.5 Finally, these impacts depend on how the planning and siting processes are conducted.

9.7 Conclusion

9.7.1 In Option 0. landfill will be the only significant method of treating and disposing of waste. Given this overall, the implementation of Option 0 will have a minor to moderate negative health impact at the level of Wales and each of the three waste regions.

9.7.2 Compared to the other Options 1-4 this will mean there will be no new residual treatment waste facilities which will mean less communities concerned about the proposed siting of a new residual treatment waste facility. Although over the short

term there is enough landfill space for waste disposal over the longer term, by 2013 and beyond, there will need to be both the extension of existing landfills and the building of new landfills.

9.7.3 Large amounts of landfilling are prohibited under EU and national legislation because of its unsustainability and this will mean the payment of large fines for non-compliance which is likely to have negative economic and social costs. There will also be negative effects on climate change through the increased production of greenhouse gases and the lack of further recycling and energy recovery for a half of all waste at national, regional and local levels.

9.7.4 Option 1 has overall minor positive health impact at the level of Wales and each of the three waste regions. This is because the strategy plans for a small number of facilities to help to recover energy from some of the residual waste remaining after 50% recycling and composting. This will create jobs, education and learning opportunities, help mitigate climate change and provide a small degree of flexibility in the waste management system at a regional and national level.

9.7.5 Option 2 has an overall moderate positive health impact at the level of Wales and each of the three waste regions. This is because the strategy plans for a larger number of facilities, compared to Option 1, to help to recover energy from the majority of the residual waste remaining after front end recycling and composting. This will create jobs, education and learning opportunities, help significantly mitigate climate change effects arising from activity in Wales and provide some flexibility in the waste management system at a regional and national level.

9.7.6 Option 3 has an overall moderate to major positive health impact at the level of Wales and each of the three waste regions. This is because the strategy plans for a large number of MBT/BMT facilities with associated thermal treatment facilities to help further recycle and recover energy from the majority the residual waste remaining after front end recycling and composting. This will create jobs, education and learning opportunities, help to considerably mitigate climate change effects arising from activity in Wales and provide a considerable degree of flexibility in the waste management system at a regional and national level.

9.7.7 Option 4 has an overall moderate to major positive health impact at the level of Wales and each of the three waste regions. This is because the strategy plans for a large number of MHT/Autoclave facilities with associated thermal treatment facilities to help

further recycle and recover energy from the majority of the residual waste remaining after front end recycling and composting. This will create jobs, education and learning opportunities, help mitigate climate change effects arising from activity in Wales and provide a considerable flexibility in the waste management system at a regional and national level.

9.7.8 On balance, there are no significant differences in the potential positive and negative health impacts in relation to rural and urban areas.

9.7.9 It has not been possible to identify any differences between the various sub-options within each of the Options 1-4 except to say that there are likely to be greater potential negative mental health and social capital and community cohesion effects from the potentially greater concern some local people are likely to have about thermal treatment facilities, particularly incineration with energy recovery, that might be sited near their neighbourhoods.

9.7.10 It has also not been possible to identify any differences in the potential impacts for each of the three waste regions compared to Wales as a whole.

10 Health Impacts of the Spatial Options

10.1 Introduction

10.1.1 The previous chapter analysed the potential health and wellbeing implications of the Strategic Waste Management Options (SWMOs). Each of the SWMOs has different implications in terms of the numbers of waste treatment facilities that might be needed, where they may be sited and the potential differences in the distances that waste is likely to be moved by road. This chapter considers these issues in more detail.

10.1.2 This chapter analyses the spatial health and wellbeing implications of the SWMOs, i.e. the potential Spatial Options. This is based on information from the Sustainability Appraisal and Life Cycle Assessment (SA and LCA) and the Areas of Search (AoS) Study.

10.1.3 The analysis of the SWMOs highlighted that the main negative health and wellbeing impacts in relation to a potential new waste facility are likely to be related to community concern at the siting of a waste facility and the traffic impacts of waste lorry movements.

10.1.4 As discussed in Chapter 6, there are a range of factors that influence the degree of community concern generated and the size of the community likely to be affected. These factors interact with each other. Of these, two have a spatial dimension:

- Number of facilities
- Size and co-location of facilities

10.1.5 There are likely to be also a range of factors that influence traffic impacts. These factors also interact with each other. Of these, two have a spatial dimension:

- The amount of waste transported by road compared to rail and water.
- The size of the waste facility and/or the number of co-located waste facilities.

10.1.6 This Spatial Options analysis has analysed the potential spatial differences in health and wellbeing:

- arising from the different numbers of facilities that the SWMOs are likely to have;
- between siting new waste facilities in urban as compared to rural areas of Wales;
- of locating a single waste treatment facility and co-locating a number of facilities at one site.
- due to waste road traffic, at national and regional levels, associated with the siting of new waste facilities.

10.2 Numbers of potential facilities

10.2.1 As described in Chapter 6, in general,

- The more new facilities that are sited the higher the number of local residents that are likely to be affected and the higher the numbers of people that could become concerned.
- Similarly, the larger a waste site, because of co-location of facilities and/or a larger facility, the greater the amount of concern that is likely to be generated i.e. though fewer numbers of local residents would be affected by the fewer waste sites the concern among them is likely to be greater.
- Though all types of waste facilities generate some concern, some facilities are likely to generate more concern than others, for example, incineration with energy recovery compared to anaerobic digestion or materials recycling/recovery facilities.

10.2.2 The Sustainability Appraisal and Life Cycle Assessment (SA and LCA) provides indicative figures for the number of potential facilities that are likely to be required in the three Waste Regions and in Wales as a whole.

10.2.3 Table E1 in Appendix E shows a detailed breakdown of the indicative figures provided by the SA and LCA by region and by urban/rural areas. They are based on typical sizes of the various waste facilities, the appropriateness of which were agreed upon in consultation with the three Regional Waste Technical Groups.

10.2.4 Overall, there are likely to be, approximately, 1,278 civic amenity, waste transfer, recycling and recovery, composting and landfill facilities across the whole of Wales. There are likely to be, approximately, 320 of these facilities in North Wales, approximately, 417 in South West Wales and, approximately, 541 in South East Wales. It is important to note that these figures include facilities that are currently in operation and therefore the actual number of new facilities that will be needed, of the type described above, will be somewhat less than these overall figures.

10.2.5 These figures are based on the SA and LCA. The SA and LCA has allocated fractions of a facility to each Welsh local authority and in this table these fractions have been rounded up or down depending on whether the fraction is above or below 0.5 (½) and combined to generate the overall indicative numbers of facilities at the Wales and regional levels.

10.2.6 There is therefore some slight overestimation and underestimation of the number of facilities in some of the sub-options compared to the SA and LCA (i.e. +/- 1 facility per type of facility listed).

10.2.7 However, given that these are indicative and not the actual final numbers of potential facilities, the important measure is the relative differences in the number of facilities between each of the Sub-Options and these are consistent when taking whole numbers or fractions of facilities.

10.2.8 For Option 1, there are likely to be between 6–26 new residual waste treatment facilities in Wales with between 2–10 new facilities in each region depending on which of the Sub-Options is chosen and whether the facilities are co-located. In terms of the Sub-Options, Option 1C, incineration with energy recovery, with only 6 new facilities across Wales and 2 within each of the waste regions is likely to generate the least overall public concern at the national and regional levels.

10.2.9 For Option 2, there are likely to be between 17–41 new residual waste treatment facilities in Wales with between 6–14 new facilities in each region depending on which of the Sub-Options is chosen and whether the facilities are co-located. In terms of the Sub-Options, Option 2C, incineration with energy recovery with only 17 new facilities and between 5-7 within each of the regions is likely to generate the least amount of overall public concern at regional and national levels.

10.2.10 For Option 3, there are likely to be between 16–39 new residual waste treatment facilities in Wales with between 6–14 new facilities in each region

depending on which of the Sub-Options is chosen and whether the facilities are co-located. In terms of the Sub-Options, Options 3D, mechanical and biological treatment with refuse derived fuel (RDF) going to offsite energy users, and 3F, mechanical biological treatment with the remainder going directly to landfill, with 16 new facilities across Wales and between 5-6 within the each of the regions are likely to be generate the least amount of overall public concern at regional and national levels. However, Option 3D is likely to generate concern among communities living near the offsite energy users that will use the RDF.

10.2.11 For Option 4, there are likely to be between 12–16 new residual waste treatment facilities in Wales with between 4–7 new facilities in each region depending on which of the Sub-Options is chosen and whether the facilities are co-located. In terms of the Sub-Options, Options 4D, autoclave/mechanical heat treatment and RDF going to offsite energy users, and 4E, autoclave/mechanical heat treatment and the remainder going directly to landfill, with 12 new facilities are likely to generate the least amount of overall public concern at regional and national levels. However, Like Option 3D, Option 4D is likely to generate concern among communities living near the offsite energy users that will use the RDF.

10.3 Urban and rural areas

10.3.1 The SWMOs analysis showed little difference in the potential positive and negative health and wellbeing impacts between urban and rural areas between Options 1 – 4 (see Chapter 10).

10.3.2 In terms of the potential Spatial Options, while urban areas have greater connectivity they also have higher levels of general traffic and hence are more prone to congestion of key routes. In contrast, though levels of general traffic are low, the quality of the road infrastructure and connectivity in rural areas tends to be considerably poorer than in urban areas.

10.3.3 Air quality also tends to differ. Rural areas tend to have better air quality than urban areas though at a local level this depends on the proximity of roads, railways, farms and industrial facilities to residential neighbourhoods.

10.3.4 Additionally, although both rural and urban areas have pockets of significant deprivation, overall urban areas tend to have greater deprivation and residents with poorer health and wellbeing than rural areas.

10.3.5 The analysis of the number of new residual waste treatment facilities that are likely to be required in each region shows that in the North and South West Wales Waste Regions there are likely to be more of these facilities sited in rural areas than urban ones because they have largely rural local authorities. In contrast, the South East Wales Waste Region will have equal numbers of urban and rural facilities or slightly more urban than rural facilities as its local authorities are largely urban.

10.3.6 Urban waste treatment facilities, i.e. those in urban areas serving mostly urban communities, are also likely to be larger and treat a larger amount of waste than rural facilities of the same type because of the greater numbers of people living in urban areas, generating greater amounts of waste, compared to rural areas.

10.4 Size and co-location

10.4.1 It is difficult to predict the implications of co-location at a regional and national levels as this is dependent on the specifics of the waste facilities that may be co-located.

10.4.2 There are two main aspects to consider: the potential increase in the size of a waste site if facilities are co-located and the potential traffic impacts.

10.4.3 As stated earlier, the larger the size of a waste facility or set of co-located facilities the greater the likelihood and the greater the degree of community concern there is likely to be.

10.4.4 In terms of the potential traffic impacts, where co-located waste treatment facilities are linked i.e. where the output of one waste treatment facility becomes the input for another there would be a reduction in overall waste movements nationally, regionally and locally compared to if these facilities were located at different sites some distance away from each other. For example, in Option 3 and 4, where mechanical biological treatment (MBT) facilities, and autoclave/mechanical heat treatment (MHT) facilities are the technologies that would be used, these two types of facilities can be co-located because the output from MBT facilities would be treated in the autoclave/MHT facilities.

10.4.5 Similarly, if some of these residual waste treatment facilities are co-located with waste transfer stations and landfills then this would also reduce waste movements nationally, regionally and locally.

10.4.6 In contrast, where the co-located waste facilities are independent of each other, for example, where residual waste treatment facilities are co-located with civic amenities, materials recovery facilities and composting facilities, because these facilities do not feed their outputs into the residual waste treatment facilities, the number of waste movements would remain the same regionally and national, whether these facilities are co-located or not, however there would be an increase in waste movements locally.

10.4.7 Co-locating facilities that are inter-related is likely to reduce the potential traffic impacts but the larger the site the more it is likely to generate community concern.

10.4.8 There is, therefore, a need to balance these conflicting impacts. Where a road is the major transport mode used to move waste, then wherever possible, waste facilities that are inter-related should be co-located at one site. However, this may mean that there will be greater local community concern although the general reduction in traffic impacts will have both local, regional and national health and wellbeing benefits. Where rail or waterways are used then the need to co-locate facilities becomes less important.

10.5 Transport implications

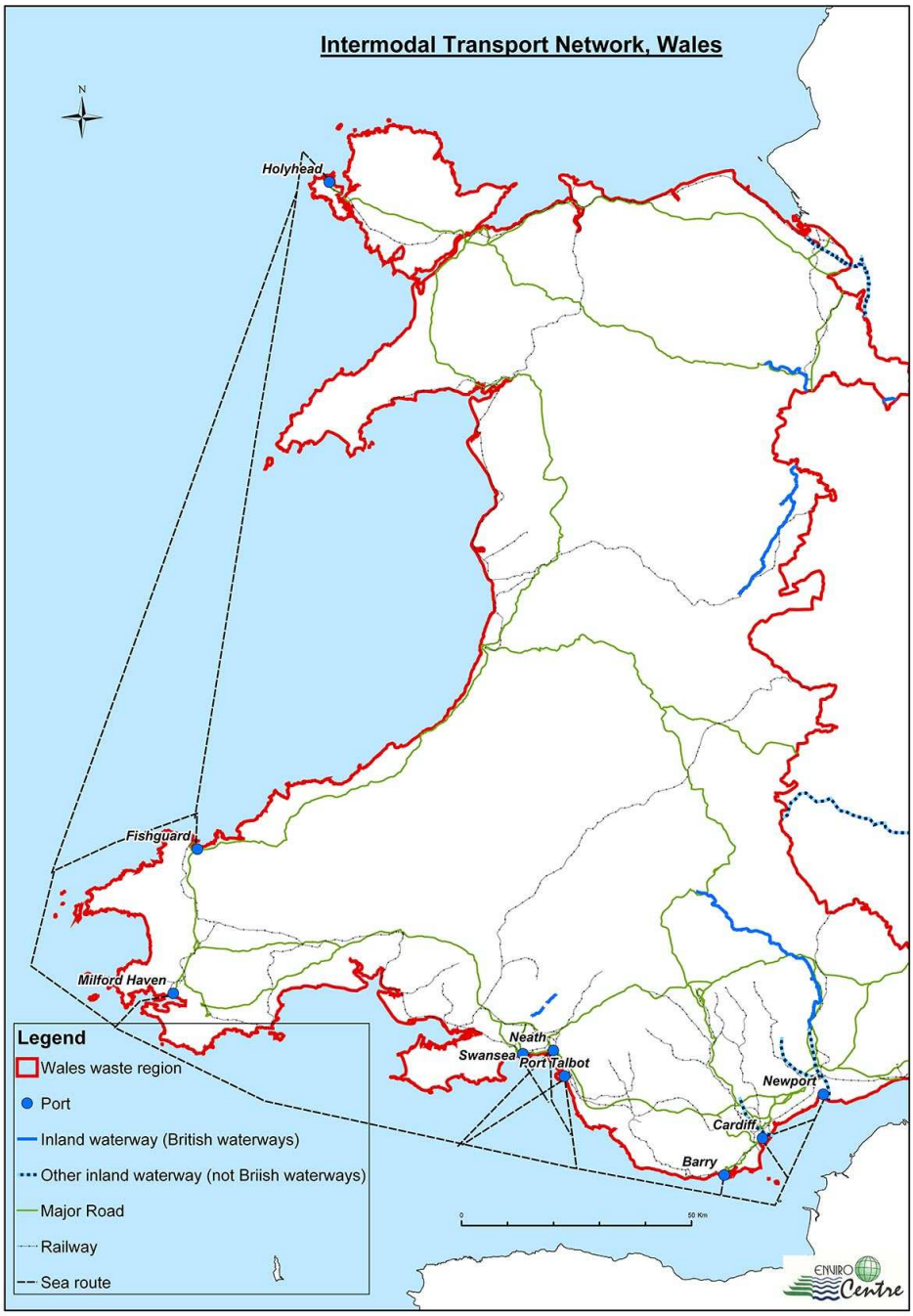
10.5.1 From both a health and sustainability perspective the use of water and rail compared to road is important. However, there may be practical and feasibility constraints to the full use of waterways and rail networks in many areas of Wales.

10.5.2 As discussed in the Chapter 10, the major implications of increased waste lorry movements by road are potential increases in road traffic injuries, air pollution, congestion, traffic noise and severance.

10.5.3 Some work has already been undertaken by Sustainable Transport Resources And Waste (STRAW) analysing the potential greater use of rail and water through the development of strategic sites located near major water, rail and road links e.g. ports. This has identified some intermodal transport networks in Wales. See Fig 10.2.

However, this work is at an early stage and no firm conclusions have been drawn from this work to date.

Fig. 10.1: Major road, rail and water transport infrastructure for waste in Wales



10.5.4 The SA and LCA has estimated the annual number of kilometres travelled by waste vehicles (waste vehicle kilometres), and the annual number of waste vehicle kilometres on non-motorway roads, in the three Waste Regions and Wales as a whole.

10.5.5 This shows that compared to Option 0, Option 1, where the majority of residual waste, after the front end of the waste is recycled and composted, goes directly to landfill are overall likely to generate the least number of vehicle kilometres.

10.5.6 Option 2, is overall likely to produce the next lowest number of vehicle kilometres.

10.5.7 This is followed by Option 3 with Option 4 overall likely to produce the highest number of vehicle kilometres.

10.5.8 Currently there are no proposed sites and therefore it has not been possible to develop a meaningful detailed analysis of the transport implications of the possible Spatial Options.

10.6 Areas of Search (AoS) study and health

10.6.1 As stated earlier many aspects determine where a facility is sited: the availability of suitable land, the geology of the area, good transport links, distance from sensitive environmental sites, distance from residential development and so on.

10.6.2 The AoS study identified 80 weighted criteria to determine the possible areas where open-air waste treatment facilities (landfill and composting sites) could be sited and 69 weighted criteria to determine the possible areas where in-building waste treatment facilities (transfer stations, materials and metals recovery facilities, in-vessel composting, anaerobic digestion, mechanical biological treatment and thermal treatment facilities) could be sited.

10.6.3 Of these, three criteria are explicitly relevant from a public health perspective. These are: distance from a residential development between 0-250m and 250-500m for open-air waste treatment facilities; location near existing active waste, other active industrial facilities or brownfield sites for both open-air and in-building waste treatment facilities; and the locations of existing air quality management areas also for both types of waste treatment facilities.

10.6.4 However, it is important to note that the other environmental criteria do implicitly incorporate a public health component, for example the potential for a site to be prone to flooding and the protection of greenspace and waterways from encroachment and contamination have public health relevance.

10.6.5 Two important public health criteria that has not been analysed spatially in the AoS Study is the geographical/spatial distribution of health inequalities and deprivation across Wales. As stated in Chapter 6, residents of deprived communities tend to face higher environmental and health burdens than residents who live in less deprived areas.

10.6.6 Therefore, taking into account whether an area is deprived or whether a community faces significant health inequalities are an important public health consideration because of the potential for health and environmental inequalities to be widened.

10.6.7 Deprivation is already mapped spatially to very small areas at local level by the Welsh Index of Multiple Deprivation and this data can be used to identify which potential sites are located in deprived areas.

10.6.8 Deprivation and health inequalities are issues that are likely to need consideration at the local level once the number of potential sites are narrowed down from a technical, design and feasibility standpoint possibly by doing further HIA work at the planning stage or within the consultation framework with local people.

10.7 Conclusion

10.7.1 From a spatial perspective Option 1 - because it would undertake the least amount of residual waste treatment - is likely to have the lowest number of potential new facilities and waste vehicle kilometres.

10.7.2 Options 2 and 3 are likely to generate similar numbers of potential new waste facilities, nationally and regionally, but Option 2, overall, generates less vehicle kilometres than Option 3.

10.7.3 Option 4 is likely to generate the second-lowest number of potential new waste facilities, nationally and regionally, but the highest number of vehicle kilometres per year.

10.7.4 There are no clear spatial urban and rural issues except in relation to deprivation and health inequalities. It is important to consider the issue of deprivation and health inequalities at local level when decisions are made on where to potentially site a new waste treatment facility.

10.7.5 Where road is the major transport mode used to move waste, then wherever possible, waste facilities that are inter-related should be co-located at one site. However, this may mean that there will be greater local community concern though the general reduction in traffic impacts will have both local, regional and national health and wellbeing benefits. Where rail or waterways are used then the need to co-locate facilities becomes less important.

10.7.6 This Spatial Options Analysis shows that there is no clear best Spatial Option. In contrast to the findings of the Strategic Options Analysis, from a spatial perspective, Option 2 is on balance a better SWMO from a public health perspective than Options 3 and 4. The spatial issues, i.e. where waste facilities are located, will therefore need to be considered at the local authority level once the number of potential sites are narrowed down from the technical, design and feasibility standpoints; and the viability of potential rail and water transport links to move waste are analysed.

11 Mitigation and Enhancement Measures

11.1 Introduction

11.1.1 The chapter outlines the key mitigation and enhancement measures that can be applied to the SWMOs 1-4.

11.1.2 At the regional and national level what are important are key principles by which potential negative health impacts can be minimised (mitigated) and potential positive health impacts maximised (enhanced).

11.1.3 Technology or waste treatment facility specific measures are best developed at local level as they are dependent on the potential site of the facility, the size and design of the facility and the transport and other related infrastructure that are available in the locality.

11.1.4 The mitigation and enhancement measures described in this chapter are based on the health impact evidence, past experience of waste issues and the authors' expert judgement.

11.2 Mitigation and enhancement measures – national and regional level

11.2.1 Waste treatment facilities need to be sensitively, imaginatively and aesthetically designed so that they maintain the sense of community (social capital and community cohesion), are not divisive but bring people together and maintain or enhance the urban landscape for example by having community facilities like an artificial ski slope or an environmental resource centre at the waste facility.

11.2.2 These sites could also be surrounded by a green 'Eden' buffer zone that softens and enhances the industrial aesthetic of these facilities, for example creating a roof garden and landscaped areas with scented flowers, shrubs and trees.

11.2.3 Alongside these design aspects operationally these facilities need to integrate into and become part of their local neighbourhoods by bringing people into the facility and becoming community and neighbourhood resources through open days for local people, school visits, environmental seminars and other kinds of social and educational activities. This could mean the creation of classes with computer, printing

and internet resources that local people, particularly children can have access to. However, the movement of waste vehicles to and from the facility may act as a significant barrier for people, and children in particular, in accessing any such amenities.

11.2.4 Planning for a waste treatment facility should also involve an environmental improvement programme that visibly raises the quality of the wider local environment, ideally as the waste treatment facility is being built, by improving the cleanliness of the area, removing graffiti and refurbishing existing local parks and amenities. This could be linked to an environmental or neighbourhood renewal or remedy fund - created by the developer, operator and government - that would provide long term finance for remedying any damage caused by the construction, operation and decommissioning of a waste treatment facility as well as improving the local area more generally. This fund would be community and resident-led with local people directing what the environmental priorities are and how the money is spent.

11.2.5 The previous operational, worker health and safety, complaints and community engagement track records of all prospective waste operators who wish to operate facilities should be an explicit criterion when national, regional and local waste authorities choose a preferred provider for waste treatment and management services.

11.2.6 Ensure that waste transport issues feed into the emerging national and regional transport strategies.

11.3 Mitigation and enhancement measures – local level planning and siting phase

11.3.1 Consultation and engagement

11.3.1.1 Early and active involvement of local communities where a potential waste facility may be sited is important to generating trust and reducing the long term mental health impacts even though in the short term it is likely to generate greater concern, protest and anxiety.

11.3.1.2 A wide range of stakeholders including schools, community organisations and local environmental groups should be part of the process of developing a formal consultation and engagement plan.

11.3.1.3 Consultation and engagement should involve meeting venues that are easy and convenient for local people who are likely to be directly affected. Visits to other similar waste facilities should be scheduled for weekends and advertised widely.

11.3.1.4 Further consideration of local people's health and wellbeing, possibly through a site-specific HIA, are also likely to reassure local communities and ensure that any potential positive health impacts are maximised and any potential negative health impacts are minimised.

11.3.1.5 Any site-specific HIA or consideration of health and wellbeing impacts should include a baseline health study of the local community, in consultation with local people, to provide a reference point from which the health impacts of any proposed waste facility are monitored.

11.3.1.6 A baseline study of existing levels of key pollutants should also be undertaken to provide a baseline background context to any increases in pollution caused by a proposed waste facility.

11.3.2 Involvement of public health and environmental health professionals

11.3.2.1 Public health and environmental health officers based in local health boards and local authorities must be a key part of the team that takes forward the siting, planning and consultation processes for any proposed waste facility.

11.3.3 Strategic approach to siting

11.3.3.1 A strategic and explicit approach to identifying potential sites and communicating the approach and rationale for why certain sites are chosen to local communities is also likely to generate greater trust and less concern over the longer term.

11.3.3.2 Consider the implications - cumulative effects – of siting in an area with existing industry e.g. open coal mine or steel works.

11.3.4 Consider the Facility Siting Credo during the siting and planning process at local level. These are a general set of principles which though they are not applicable or appropriate in every site-specific context provides a useful guide on the general

issues that are worthwhile considering when sites for waste facilities are being chosen:[134]

11.3.4.1 Achieve agreement that the status quo is unacceptable, in other words, that the facility is needed and doing nothing now or in the future will also have negative consequences.

11.3.4.2 Seek consensus and involvement of all stakeholders and address their values, concerns, needs and wants.

11.3.4.3 Work to develop trust by admitting mistakes and avoiding misleading statements and exaggerated promises.

11.3.4.4 Choose the solution that best addresses the problem.

11.3.4.5 Guarantee that safety standards will be met.

11.3.4.6 Fully address all the negative aspects of the facility.

11.3.4.7 Make the host community better off.

11.3.4.8 Use conditional agreements.

11.3.4.9 Seek acceptable sites through a voluntary process.

11.3.4.10 Consider a competitive siting procedure.

11.3.4.11 Work for geographic fairness, in other words build several smaller facilities rather than a single large one.

11.3.4.12 Set realistic siting and planning timetables.

11.3.4.13 Keep multiple siting options open at all times.

11.4 Mitigation and enhancement measures – local level construction phase

11.4.1 Health and safety in and around the construction site

[134] Kunreuther H and Susskind E, Facility Siting Credo: guidelines for an effective facility siting process; Environmental Impact Assessment Review, University of Pennsylvania, 1991.

11.4.1.1 Develop and agree on a site specific Code of Construction Practice (CoCP) to deal with potential nuisance issues resulting from the construction site and its operation. This should include a clear line of communication, for example a dedicated helpline phone number provided by the waste facility operator to enable local people to report issues, and clear responsibilities for how waste facility operators will respond to these issues. The setting up of a group that meets on a regular basis can also help to reassure communities.

11.4.1.2 Ensure adherence to the new Construction (Design & Management) Regulations 2007 (CDM 2007) that have come into force and aim to integrate health and safety into project management. The Health and Safety Executive has produced an accompanying Approved Code of Practice document *'Managing Health and safety in Construction'* which sets out the implications of the new legislation for developers, contractors, designers and workers.

11.4.1.3 Secure the perimeter of the construction site and consider regular patrols after dark either by local police/community wardens or a private security company.

11.4.1.4 Have a good community liaison ideally with a named person responsible to deal with any community issues as they arise.

11.4.1.5 Ensure that best practice is used in dealing with construction related noise, dust and materials.

11.4.1.6 Ensure appropriate remediation of any agriculture or industry-related contaminated land on the site.

11.4.2 Recruitment of construction workers:

11.4.2.1 Ensure recruitment for the construction jobs starts locally through job centres and recruitment agencies in the local area and the surrounding villages before being advertised more widely. This will also reduce the potential pressures on local housing and be more sustainable in transport terms.

11.4.2.2 Develop a plan for dealing with the accommodation and healthcare needs of construction workers moving into the area from elsewhere. This will

need to be developed once construction recruitment has started and there is a clearer idea of the number of workers likely to move into the area. Housing construction workers in existing permanent dwellings is always preferable to temporary 'portacabin' type accommodation even for a short while.

11.4.3 Construction skills training and apprentice programme:

11.4.3.1 Before and during the construction phase, a training and skills programme should be set in place to enable local people, both those already involved in construction and those who are unemployed, to access the construction job opportunities. Alongside this there could be employment or work experience-linked apprenticeship building and construction programmes for young people.

11.4.4 Construction traffic:

11.4.4.1 Develop a construction traffic route and timing plan, in consultation with local people, so that construction traffic avoids peak times on the key routes in and around the facility and the local area. Ensure that local people are aware of the plan so that they can be proactive in avoiding those routes and those times when possible. The routes taken by construction vehicles are likely to change over the course of the development so the plan will need to be reviewed and updated regularly. It will be important to ensure that local people are made aware of all updates.

11.4.4.2 The construction programme should also aim to encourage construction workers to walk, cycle and use public transport, where available, to get to work through a construction worker active travel plan.

11.4.5 Industrial design

11.4.5.1 As stated previously the design and form of a waste facility needs to blend in and become a part of the wider locality within which it sits. Time and resources spent on good design will enhance community acceptance and reduce community concerns. Actively engaging local people and local children in the design of a waste facility is also likely to generate greater civic ownership of the facility.

11.4.6 Neighbourhood design:

11.4.6.1 The design and construction of a waste facility should also consider the neighbourhood adjacent to and surrounding the site. This should involve not just making limited adjustments to junctions and roads but using Home Zone and Safer Routes principles to ensure that road traffic does not adversely affect local people and their sense of neighbourhood and community. This would include enhancing and maintaining pavements, cycleways and public transport links to, from and around the waste facility.

11.4.7 Culture, leisure and greenspace provision:

11.4.7.1 The design of the waste facility should build in new greenspace to soften its industrial and functional form and the design of this should take into account existing green and open space.

11.4.7.2 Where a site impinges on or reduces existing open and greenspace, especially children's playspace, then new spaces should be developed in partnership with local people to ensure that a) there is no loss of green, open and play space; b) that greenspace is actually enhanced and increased; and c) new greens paces should be as accessible as those that they replace.

11.4.7.3 If greenspace is designed as part of the building of a waste facility then a clear plan on the management and maintenance of this public and green spaces should be developed to ensure that the long term financial and other costs of ensuring a high quality, clean and safe public and green spaces are considered and budgeted for.

11.5 Mitigation and enhancement measures – local level operation phase

11.5.1 Residents committees and representatives

11.5.1.1 Wherever possible a residents committee or a community representative should have influence and active involvement in the operational issues of a waste facility. This would start during the planning and siting process so that the committee/representatives are already involved in the design and operational details of the proposed facility e.g. the working hours, the proposed route through residential areas, etc.

11.5.2 Pollution monitoring

11.5.2.1 Regular public air, water and soil pollution monitoring where the results of the monitoring are actively fed back to local residents should be considered as it will also do much to reassure local people.

11.5.3 Operation Traffic

11.5.3.1 Just as construction traffic should be planned, so an operation traffic route and timing plan should be developed, in consultation with local people, so that operation traffic avoids peak times on the key routes in and around the facility and the local area. Ensure that local people are aware of the plan so that they can be proactive in avoiding those routes and those times when possible. The routes taken by operation vehicles are likely to change over the course of the development so the plan will need to be reviewed and updated regularly. It will be important to ensure that local people are made aware of all updates.

11.5.3.2 Safe Routes to School should be protected.

11.5.3.3 Waste facility workers should be encouraged to walk, cycle and use public transport to commute to the facility and a waste facility active and sustainable travel plan should be developed.

11.5.3.4 Use of waterways and rail links to transport waste would reduce air pollution and potential road traffic injuries. In the case of waterways, developed or brought back into use, these would create new leisure amenities for local communities.

11.5.3.5 Low emission vehicles and the use of liquid petroleum gas and electric vehicles should be considered and phased in over time.

11.5.4 Waste treatment facilities as community resources

11.5.4.1 Developing explicit benefits for local people from free waste services at civic amenity sites through the development of community, educational facilities that local residents can use and improvement of local parks and children's play facilities will provide visible benefits to local people that are

linked directly to the operation of a waste facility. These benefits should not just be considered at the beginning but should be maintained and enhanced over the lifetime of the waste facility.

11.5.5 Education and learning

11.5.5.1 Developing and active environmental education and awareness programme in partnership with local school and local environmental groups will also help to make waste facilities more of a positive for local communities.

11.5.6 Health and safety of waste facility workers

11.5.6.1 The health and safety of waste facility workers through good facility design, good training, access to high quality washing facilities, availability of enough protective clothing and the active nurturing of an organisational culture where worker and community health and safety are paramount will ensure that worker injury and health problems will be at a minimum.

11.6 Mitigation and enhancement measures – local level decommissioning phase

11.6.1 Decontamination and remediation

11.6.1.1 Decontaminating the waste facility and ensuring the safe reuse, recycling and disposal of the materials and equipment that make up a waste facility will be important.

11.6.1.2 As will cleaning and remediation of the site to ensure that any potential hazardous contamination has been treated and hazardous material taken away and safely disposed of.

11.6.1.3 Any residents' committee or community/residents representatives should be involved in the development of the decommissioning programme.

11.6.1.4 The whole community should be made aware of the proposal to decommission the facility and remediate the site.

11.6.2 Health and safety of decommissioning workers

11.6.2.1 The health and safety of decommissioning workers through good facility design, good training, access to high quality washing facilities, availability of enough protective clothing and the active nurturing of a decommissioning site culture where worker and community health and safety are paramount will ensure that worker injury and health problems will be at a minimum.

11.6.3 Future development

11.6.3.1 Any potential future development needs to be considered early so that the site can be decommissioned in a way that enhances the site and the local area.

12 Conclusion

12.1.1 Untreated waste, in and of itself, has negative health and wellbeing impacts. Therefore, the overarching aim of the National Waste Strategy and the 3 RWPRs is to significantly reduce the total amount of waste being treated and disposed of in Wales by reducing, re-using and recycling waste i.e. moving up the waste hierarchy. This goal will take some time to achieve and in the meantime waste treatment facilities will be needed to appropriately treat and dispose of this waste.

12.1.2 Overall, this strategic HIA after taking into account both the strategic and spatial analyses finds that there is no single best public health Strategic Waste Management Option (SWMO). Options 2, 3 and 4, are good from a public health perspective but each has strengths and weaknesses.

12.1.3 The Strategic (SWMO) Analysis points to further residual waste recycling rather than just energy recovery as the better option i.e. Options 3 and 4 (though Option 2 is seen as a good option). In contrast, the Spatial Options Analysis, because of the numbers of facilities, size of sites, and the need for more waste lorry movements, points to Option 2 (fewer sites, though larger, and less waste lorry movements overall) on balance being better than Options 3 and 4.

12.1.4 Decisions will therefore need to be made at local authority level with further local consideration of the health and wellbeing issues when a specific site is chosen to host a particular waste treatment facility. Local site-specific HIAs, either separate or integrated within Strategic Environmental Assessments (SEA) of Local Development Plans (LDPs) or Environmental Impact Assessments (EIAs) at the planning application stage, are likely to be worthwhile in addressing specific local community concerns. Additionally, any planning and siting process should involve local Public Health and Environmental Health Departments from the outset.

12.1.5 The benefit of carrying out this HIA is to support the decision-making process and ensure that health, and the wider determinants of health, are considered during the waste planning process. As with Strategic Environmental Assessment (SEA), human health is one of the crucial considerations when deciding how to manage and plan for the safe treatment and disposal of waste. Other factors, such as technological feasibility, economic viability, the availability of sites and so on, also have an important role in the selection of the most appropriate technology and site. If a

particular technology, or range of technologies, are too expensive this in itself can have negative impacts on human health because there is the potential for resources to be diverted from elsewhere.

12.1.6 This HIA is also a resource that can be used when considering the development of Local Development Plans (LDPs) and local site specific level issues related to the siting of waste facilities and the development of an integrated, sustainable and public health approach to waste management.

13 Appendix A

Types of Waste Produced in Wales

APPENDIX A

Types of Waste Produced in Wales

The Wales 3 RWPR relates to the following principal 'controlled'[135] waste streams:

- Municipal Solid Waste (MSW);
- Industrial Waste;
- Commercial Waste;
- Construction & Demolition Waste (C&D);
- Hazardous Waste; and
- Agricultural Waste (the proportion requiring external management only).

'Controlled waste' is defined as being composed of household, commercial and industrial.

Radioactive and explosive wastes are controlled by other legislation and procedures. Very low level radioactive waste can already be disposed of with controlled waste. Some low level radioactive waste can also be disposed of via these routes.

Municipal Solid Waste (MSW)

MSW includes household waste and any other wastes collected by a Waste Collection Authority, such as municipal parks and gardens waste, beach cleansing waste, commercial or industrial waste and waste resulting from the clearance of fly-tipping. Household waste includes domestic waste from household collection rounds, waste from services such as street sweepings, bulky waste collection, litter collection, hazardous household waste collection and garden waste collection, waste from civic amenity sites and wastes separately collected for recycling or composting through bring recycling schemes and kerbside recycling schemes.

Industrial Waste

Industrial waste is waste from any factory or industrial process (excluding mines and quarries).

Commercial Waste

Commercial waste is waste arising from premises used wholly or mainly for trade, business, sport, recreation or entertainment, excluding MSW and Industrial Waste.

135

C&D Waste

C&D waste is waste arising from the construction, repair, maintenance and demolition of buildings and structures, including roads. It consists mostly of brick, concrete, hardcore, subsoil and topsoil, but it can also contain quantities of timber, metal and plastics.

Agricultural Waste

Agricultural waste is waste produced at agricultural premises as a result of an agricultural activity. New agricultural waste regulations came into force on 15 May 2006[136]. With the introduction of the new regulations, all substances or objects from premises used for agriculture, and which the holder discards, are subject to control as waste. This includes many non-natural types of waste. However, manure and slurry is not classified as waste when used as a fertiliser[137]. The regulations prohibit unregulated burying and burning of agricultural waste on farms and require farmers and growers to:

- send or take their waste for disposal off-farm at licensed sites; and / or
- register a licensing exemption with the EA to recycle waste on-farm; and /or
- apply to the EA for a licence to continue on-farm disposal.

Hazardous Waste

The term 'Hazardous Waste' covers a wide range of waste materials that present different levels of risk. Some could present a serious and immediate threat to human health and the environment, for example those that are toxic, could cause cancer or infectious disease. Others, such as fluorescent tubes or cathode ray tubes in televisions, pose little immediate threat but could cause long-term damage over a period of time. In July 2004 the Landfill (England and Wales) Regulations banned the practice of co-disposing of hazardous and non-hazardous wastes in the same landfill and introduced a requirement to pre-treat hazardous waste prior to landfill. In July 2005 the Hazardous Waste (England and Wales) Regulations and the List of Wastes (Wales) Regulations come into force, replacing the Special Waste Regulations. These new regulations had the effect of increasing the number of wastes classified as 'hazardous' – they include waste TVs, computer monitors and some other waste electrical and electronic equipment, fluorescent tubes, and pesticides.

[136] The Waste Management (England and Wales) Regulations 2006

[137] From 'DEFRA, 2006. "The Agricultural Waste Regulations": Frequently Asked Questions and Answers. Version 2.0. London: DEFRA.'

14 Appendix B

Wales 3 RWPR HIA Screening Paper

APPENDIX B

Wales 3 RWPR HIA Screening Paper

Introduction

In health impact assessment (HIA), the purpose of screening is to identify at an early stage of a proposal - a new plan, programme or project – what, if any, potential positive and negative health impacts might occur if the proposal was implemented. Screening can be carried out by an individual, a proposal team, a group of interested stakeholders or a proposal steering group.

This HIA screening paper was prepared to formally establish:

a) whether there are potential positive or negative health implications of the Wales 3 Regional Waste Plans 1st Review (3 RWPR) on the people of Wales and, if so,
b) whether a HIA was warranted on the Wales RWP 1st Review.

Points to note when reading this screening paper

This screening paper has been produced by the Project Steering Group of the HIA of the Wales 3 RWPR.

The aim of this screening paper was to identify the potential health impacts that the Project Steering Group considered to be important using existing knowledge and experience, and to assess whether these needed further investigation through a formal HIA of the Wales RWP 1st Review.

A screening paper can be presented in a number of ways. This screening paper has used the methodology outlined in the Welsh HIA Guide *Improving Health and Reducing Inequalities: a practical guide to health impact assessment*[138].

Where the screening has identified positive or negative impacts that affect the population as a whole it then assumes that these impacts also affect the specific sub-groups that have been considered, for example children and older people, that are identified as needing particular consideration. Therefore when specific sub-groups are considered the health impacts that are described are those that are in addition to the health impact affecting the population as a whole i.e. the ones that are likely to affect these groups only. It is important

[138] Improving Health and Reducing Inequalities: a practical guide to health impact assessment, Welsh Assembly Government, Cardiff, 2004

to note that individuals can be a member of two or more of the sub-groups identified in this screening paper. Therefore, a resident living near a facility can also be an older person, on a low income and with a disability. However, the overall health impact remains the same i.e. in the above example this does not triple the impact.

Lastly, it is important to note that the health impacts identified in this screening paper are for possible impacts that might occur. They are therefore key potential impacts not a definitive lists of all possible impacts.

1. Title of the programme, policy or project

Wales Regional Waste Plan (RWP) 1st Review

2. Description (including key aims and objectives)

Wales 3 RWPs were published in 2004 to fulfil the requirements set out in the Welsh Assembly Government Technical Advice Note (TAN) 21. They aim to ensure that land use planning in Wales accounts for the needs of waste management. There is a requirement for revision of the plans to take place every three years, reflecting changes in the sorts of waste arising within the regions, changes in capacity within the regions, changes in legislation and developments in the treatment methods that may be adopted.

3. Key population groups affected by the programme, policy or project.

General population:

The whole population and all groups will be affected to a greater or lesser degree.

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The 3 RWPR is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Specific sub-groups to consider:

Those living near any potential new waste facilities that are likely to be built in response to the 3 RWPR (or where existing facilities are extended or closed). The following are worth particular consideration (see table on next page):

- Children and young people
- Older people
- People on low income
- Economically inactive
- Unemployed
- People with a chronic ill-health condition
- Traveller communities
- People living in areas known to exhibit poor economic and/or health indicators
- People living in isolated areas
- People with poor access to services and amenities
- Women who are pregnant and women/couples trying to become pregnant
- Employees of new waste facilities

3. Key population groups affected by the programme, policy or project. Continued…

Population Groups	Does the RWP 1st Review need to consider this group?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
General population of Wales	Yes	Waste will be managed in a more effective and efficient way. New waste treatment facilities produce less emissions and the potential energy recovery from some forms of waste treatment can reduce the emissions from other industrial facilities.	Potentially positive.	Yes
Residents living near a waste facility	Yes	Waste facilities can provide jobs for local people. Combined Heat and could provide subsidised heat and energy to a local community. Impacts from the direct operation of the facility e.g. noise, odour, dust, emissions. Impacts from associated activities: dust cart traffic and emissions. Actual and perceived impacts on house prices and the local environment Mental health effects through worry, anxiety and stigma that can come from having a facility sited in or near their	Potentially both positive and negative. Potential mitigation and enhancement measures can reduce the negative impacts and enhance the positives. If recruiting from the local community may provide benefit to the local area in terms of job creation. May also attract other waste-related businesses into the area as well as other business if cheap energy provided, providing more jobs. May result in the removal/replacement of older, more polluting industry. Possible mitigation measures include: using dust carts that use liquid petroleum gas rather than petrol	Yes

Population Groups	Does the RWP 1st Review need to consider this group?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		neighbourhood. Sense of unfairness that they have the positive and negative impacts of the waste facility while other people outside the area only have the positive impacts.	and diesel, having strict speed limit and route strategies for dust carts, have the surrounding area, a community oversight committee. Possible enhancement measures include: getting the community involved in developing the design and look of the facility. Improving the neighbourhood by creating a nature reserve, better children's play areas and general greenspace.	
Children and young people	Potentially, yes.	Environmental awareness and education through school and other group visits to waste facilities. The use of alternative modes of transportation e.g. rail, water may also result in a net decrease of emissions in the surrounding area especially if the facility is replacing existing industry that has high traffic volumes. May reduce outdoor play in neighbourhoods near waste facilities due to waste traffic, smell, emissions or parent's perception that outdoor play is likely to expose children to emissions from the facility and waste	Potentially both positive and negative. Mitigation and enhancement measures are likely to reduce the potential negative impact.	Yes

Population Groups	Does the RWP 1st Review need to consider this group?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		lorry traffic.		
Older people	Potentially, yes.	For those older people with pre-existing respiratory conditions air quality effects may exacerbate their conditions. May also reduce time spent outdoors and physical activity.	Potentially negative Mitigation and enhancement measures are likely to reduce the potential negative impact.	Yes
People on low income	Potentially, yes.	Employment at a waste facility and other associated business that may emerge.	Potentially positive If recruitment local.	Yes
Economically inactive	Potentially, no.	People who are economically inactive are those who could work but for a variety of reasons, e.g. caring for young children, cannot or choose not to work.		No
Unemployed	Potentially, yes.	Employment at a waste facility and other associated business that may emerge. Unemployed may stay at home longer and therefore be more exposed to possible emissions.	Potentially both positive and negative If recruitment local.	Yes
People with a chronic ill-health condition	Potentially, yes.	For those people with pre-existing respiratory conditions air quality effects may exacerbate their conditions May also reduce time spent outdoors and physical activity.	Potentially negative Mitigation and enhancement measures are likely to reduce the potential negative impact.	Yes
People with	Potentially,			No

Population Groups	Does the RWP 1st Review need to consider this group?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
disabilities	no.			
Refugees groups	Potentially, no.			No
People seeking asylum	Potentially, no.			No
Traveller communities	Potentially, yes.	A waste facility may be sited on a formal or informal traveller caravan site.	Potentially negative.	Yes
Single parent families	Potentially, no.			No
Lesbian and gay people	Potentially, no.			No
Ethnic minority groups	Potentially, no.			No
Religious groups	Potentially, no.			No
People living in areas known to exhibit poor economic and/or health indicators	Potentially, yes.	Greater likelihood of siting in their neighbourhood	Potentially both positive and negative. Mitigation and enhancement measures are likely to reduce the potential negative impact e.g. involvement in the design of the facility and early consultation/ engagement	Yes
People living in isolated areas	Potentially, no.			No
People with poor access to services and amenities	Potentially, no.			No
Women who are pregnant and women/couples who are trying to become pregnant	Potentially, yes.	Concerns about increases in air emissions from waste facilities that might affect the unborn foetus,	Potentially negative.	Yes

Population Groups	Does the RWP 1st Review need to consider this group?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		pregnant women and women trying to get pregnant.		
Employees of new waste facilities	Potentially, yes.	General effects include: income, self esteem, effect on social relationships, working conditions; exposure to airborne pollutants	Potentially both positive and negative. Mitigation measures are likely to reduce the negatives impacts. Good management, the availability of protective equipment and clothing and adherence to health and safety procedures will reduce the potential negative health impacts.	Yes

4. Summary of significant or moderate impacts.

A. Individual lifestyles

Brief explanation of impact and who it is likely to be affected from No. 3

General population:

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The RWP 1st Review is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Residents around proposed sites (new and extensions):

See table below.

Determinants of Lifestyle	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Diet	Potentially, yes.	Potential effects on residents living near a waste facility if they eat wild food stuffs, e.g. mushrooms from a local wood, or grow produce in their gardens and allotments. There could also be concerns about and reluctance to eat food that has been produced on farms near a waste facility.	Potentially negative.	Yes
Physical exercise	Potentially, yes.	Children, older people and those with existing health conditions may reduce the time spent outdoors because of smells, noise, concerns about air pollution, waste lorry traffic.	Potentially negative	Yes

Determinants of Lifestyle	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Use of alcohol, cigarettes, non-prescribed drugs	Potentially, yes.	If worried and anxious about the siting of a waste facility.	Potentially negative	Yes
Sexual activity	Potentially, no.			No
Other risk-taking activity	Potentially, no.			No

B. Social and community influences

Brief explanation of impact and who it is likely to be affected from No. 3

General population:

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The RWP 1st Review is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Residents around proposed sites (new and extensions):

See table below.

Determinants of Social and Community Influences	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Family organisation and roles	Potentially, yes.	If previously unemployed, the provision of a job may affect the family organisation in a positive way. Depends on the resilience of individuals, families and other groups and how they cope with the implications of a waste facility in their neighbourhood.	Potentially both positive and negative. Mitigation and enhancement measures are likely to reduce the potential negative impact. Early and active engagement of local people in the designing, siting and planning process for a waste facility can reduce concerns and enhance support and a sense of community ownership.	Yes
Citizen power and influence	Potentially, yes.	Depends on the local siting and planning process.	Potentially both positive and negative. See mitigation	Yes

Determinants of Social and Community Influences	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
			and enhancement measures above.	
Social support and social networks	Potentially, yes.	Depends on whether there are active supporters and opposers of the waste facility	Potentially both positive and negative. See mitigation and enhancement measures above.	Yes
Neighbourliness	Potentially, yes.	May bring neighbours together whether through opposition or support of the facility. However over the long term these kinds of negative social cohesion tend to breakdown over the longer term and damage social capital in a neighbourhood.	Potentially both positive and negative. See mitigation and enhancement measures above.	Yes
Sense of belonging	Potentially, yes.	Change to the perception of neighbourhood and community.	Potentially both positive and negative. See mitigation and enhancement measures above.	Yes
Local pride	Potentially, yes.	See above.		Yes
Divisions in community	Potentially, yes.	May divide people that are opposed and people that support the siting of the facility.	Potentially negative. See mitigation and enhancement measures above.	Yes
Social isolation	Potentially, yes.	If the facility utilises rail and water modes of transport and reduces the use of	Potentially both positive and negative. See mitigation	Yes

Determinants of Social and Community Influences	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		roads this could have a positive effect. Increased road traffic movements may make children and older people less likely to go out.	and enhancement measures above.	
Peer pressure	Potentially, no.			No
Community identity	Potentially, yes.	See sense of belonging.	Potentially both positive and negative. See mitigation and enhancement measures above.	Yes
Cultural and spiritual ethos	Potentially, no.			No
Racism	Potentially, no.			No
Other social exclusion	Sense of unfairness/ inequity. Environmental/social justice issues.	Feelings that local people living near the waste facility - have to bear the negatives while the wider community benefits.	Potentially negative. See mitigation and enhancement measures above.	Yes

C. Living conditions

Brief explanation of impact and who it is likely to be affected from No. 3

General population:

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The RWP 1st Review is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Residents around proposed sites (new and extensions):

See table below.

Determinants of Living Conditions	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Built environment	Potentially, yes.	Industrial facility sited in or near the neighbourhood. Appropriate design of a waste facility, involving local communities, could improve an area.	Potentially both positive or negative. Mitigation and enhancement measures are likely to reduce the potential negative impact. Early and active engagement of local people.	Yes
Neighbourhood design	Potentially, yes.	Industrial facility sited in or near the neighbourhood. Good design and masterplanning of the waste facility and its surroundings could enhance the local area.	Potentially positive or negative.	Yes
Housing	Potentially, yes.	Waste facility could provide subsidised heat and energy.	Potentially both positive or negative.	Yes

Determinants of Living Conditions	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		Possible or feared reduction in value of local housing .		
Indoor environment	Potentially, yes.	External air pollution, noise and smell coming indoors.	Potentially negative.	Yes
Noise	Potentially, yes.	Noise from the facility and waste traffic while not high could be a nuisance/annoyance particularly if operating times are long e.g. 7 days a week, 24 hours a day.	Potentially negative.	Yes
Air and water quality	Potentially, yes.	Potential effects on air/water quality from the facility and the associated traffic.	Potentially negative.	Yes
Attractiveness of area	Potentially, yes.	Industrial facilities tend to be functional buildings Through appropriate design of the waste facility and its surroundings could improve the area.	Potentially both positive or negative.	Yes
Community crime and safety	Potentially, no.			No
Smell/odour	Potentially, yes.	Smell from the waste being treated in facility.	Potentially negative.	Yes
Waste disposal	Potentially, yes.	An integrated and more sustainable plan for waste management and treatment is likely to benefit everyone. Changes to collection processes or frequency of collection.	Potentially both positive or negative.	Yes

Determinants of Living Conditions	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Road hazards	Potentially, yes.	Increase in traffic hazard from waste lorries If rail or water modes of transport are used this could actually reduce traffic in some areas.	Potentially both positive or negative.	Yes
Injury hazards	Potentially, yes.	For employees of the waste facilities.	Potentially both positive or negative.	Yes
Quality and safety of play areas/ open spaces/ greenspace	Potentially, yes.	If these are located near a waste facility there may be an increase in smell, noise and air pollution. There could also be concerns about the above from parents. However, landfill tax credits and planning obligations (S106) money could be used to enhance the local open and greenspace and play areas.	Potentially both positive or negative.	Yes

D. Economic conditions

Brief explanation of impact and who it is likely to be affected from No. 3

General population:

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The RWP 1st Review is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Residents around proposed sites (new and extensions):

See table below.

Determinants of Economic Conditions	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Unemployment	Potentially, yes.	New jobs in the new waste facilities and other businesses that emerge to support the waste facility. Need to ensure training and development and good working environments. Jobs may also be taken by migrant workers from outside the area and country e.g. economic migrants from Eastern Europe.	Potentially both positive and negative. Mitigation and enhancement measures are likely to reduce the potential negative impact. For example protective clothing, adherence to health safety protocols and local recruitment and local training and development programmes.	Yes
Income	Potentially, yes.	More competition for local labour.	Potentially positive.	Yes
Economic activity	Potentially, yes.	Associated recycling and other related facilities.	Potentially both positive and negative.	Yes

Determinants of Economic Conditions	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		However, some existing and potential new businesses may not wish to be located near a waste facility and may move or locate elsewhere.		
Type of employment	Potentially, yes.	Increase the number of jobs in waste and waste-related industries. Jobs could be potentially low paid and low skill.	Potentially both positive and negative.	Yes
Workplace conditions	Potentially, yes.	Some facilities may pose hazards to employees. Depends on the management of the facility, availability of protective clothing and equipment and adherence to health and safety procedures.	Potentially both positive or negative.	Yes

E. Access and quality of services

Brief explanation of impact and who it is likely to be affected from No. 3

General population:

The whole population and all groups will be affected to a greater or lesser degree.

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The RWP 1st Review is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Residents around proposed sites (new and extensions):

See table below.

Determinants of Access to and Quality of services	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Medical services	Potentially, yes.	Need for medical waste treatment facilities to safely dispose of biological material and contaminated instruments and equipment. In relation to major accidents at a waste facility. Impacts during construction and decommissioning phases.	Potentially both positive and negative.	Yes
Other caring services	Potentially, no.			No
Careers advice	Potentially, no.			No
Shops and commercial services	Potentially, yes.	Employees are likely to use local shops and amenities. Impacts during construction and decommissioning	Potentially both positive and negative.	Yes

Determinants of Access to and Quality of services	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		phases.		
Public amenities	Potentially, yes.	Impacts during construction and decommissioning phases.	Potentially negative.	Yes
Transport	Potentially, yes.	Increased congestion if waste transported by road. Possible reduction in road congestion if rail or water modes of transport are used.	Potentially both positive or negative.	Yes
Education and training	Potentially, yes.	Increase in environmental awareness and education through school and group visits to waste facilities. Training schemes linked to the construction and operation of a waste facility. Potential community concern if a waste facility is located near a school.	Potentially both positive and negative.	Yes
Information technology	Potentially, no.			No

F. Other direct and indirect effects on health and wellbeing

Brief explanation of impact and who it is likely to be affected from No. 3

General population:

The whole population and all groups will be affected to a greater or lesser degree.

There are likely to be positive health benefits related to better, more sustainable and more integrated waste management and treatment.

The RWP 1st Review is likely to assist the general population to adopt a more sustainable lifestyle and reduce their carbon footprint.

Other direct and indirect effects on the determinants of health and wellbeing	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
Government policies	Potentially, yes.	A better, more sustainable and integrated waste management at regional and local level will support the development of healthy and sustainable policies in other areas.	Potentially positive.	Yes
Gross Domestic Product	Potentially, yes.	Greater re-use and recycling of waste creating new business opportunities and reducing resource and energy consumption.	Potentially positive.	Yes
Economic Development	Potentially, yes.	Greater re-use and recycling of waste creating new business opportunities and reducing resource and energy consumption.	Potentially positive.	Yes
Biological diversity	Potentially, yes.	Productive use of existing derelict brownfield sites. Siting on greenfield	Potentially both positive and negative.	Yes

Other direct and indirect effects on the determinants of health and wellbeing	Does the RWP 1st Review need to consider this issue?	How might any potential health impacts occur?	Are these potential health impacts positive, negative or both?	Does this need further consideration?
		or biologically rich sites may reduce biodiversity at a local level. Creation of a conservation area around a waste facility may enhance biological diversity.		
Climate	Potentially, yes.	Reduction in resource and energy usage and the national and local carbon footprint. May also help to reduce reliance upon fossil fuels and provide an alternative sustainable source of energy.	Potentially positive.	Yes

F. Recommendations

Are the impacts that have been identified enough to warrant a health impact assessment? If No, what are the reasons for not conducting an assessment

Given the rapid screening of the potential health impacts of the RWP 1st Review a more detailed formal HIA is recommended to assess in greater depth the potential health and wellbeing implications of the RWP 1st Review on the health and wellbeing of the people of Wales.

15 Appendix C

Additional Information on Health Impacts and Assessment

APPENDIX C

Methodology used for the health impact evidence review

The literature search involved the following methods.

1. Search of major systematic review databases – Cochrane Collaboration, Campbell Collaboration: EPPI-Centre (Evidence for Policy and Practice Information) and its Database of Promoting Health Effectiveness Reviews, National Institute for Health and Clinical Excellence (NICE) Public Health, Centre for Reviews and Dissemination (CRD), University of York: Database of Abstracts of Reviews of Effects (DARE), Health Evidence Bulletins – Wales.

2. Search of other key HIA related sites - World Health Organization (WHO) Health Evidence Network, HIA Gateway, UK Public Health Observatories.

3. Search of online bibliographic databases – Pubmed, Ovid and Ingenta.

4. Search via Google search engine.

5. Search through citations within the key reviews identified.

The search used general key words in a variety of permutations.

The general terms were: waste, health, review, health impact, health risk, health effect, health hazard.

The specific terms used alongside the above were: landfill, incineration, mechanical biological treatment, advanced thermal treatment, pyrolysis, gasification, autoclave, mechanical heat treatment, anaerobic digestion, composting, materials recycling, strategic waste management options.

Health risk assessment [139]

HIA is a broader and more holistic assessment that analyses the potential direct and indirect health impacts rather than health risk assessment which focuses solely on the potential biophysical health impacts of exposure to emissions from waste facilities that are traditionally considered. This Section outlines the underlying concepts and ideas used in health risk assessment.

It is important to recognise that exposure to air, water or soil pollution from waste treatment facilities do not automatically lead to a health outcome. These exposures should also be seen in the context of exposure to other background levels of pollution from household chemicals and furnishings; garden chemicals; cars and other motor vehicles; and other industry in the area. When taking this background context into account the levels of emissions from waste facilities and the transportation of waste are low (See Table C1).

Health risk assessment

Health risk assessment involves quantifying, this is estimating the size of, the potential risks of emissions into the air, water and soil. It is not always possible to quantify a potential health impact. The assessment involves working out the potential source-pathway-receptor linkages through which health impacts are likely to occur. In this context toxicity, hazard and risk have specific scientific meanings:

Source, pathway and receptors

Potential risks to human health and the environment can be regarded as comprising the three components that make up a source-pathway-receptor linkage:

Source:	anything associated with a waste management facility with the potential to cause harm;
Pathway:	a route by which a receptor can be exposed to, or affected by, the potentially harmful source;
Receptor:	a particular entity that may be harmed or adversely effected by the emission.

[139] Potential Health and Environmental Impacts from Municipal Solid Waste Management: summary review, Milton Keynes Council, Environmental Protection Team, 2005

Table C1: Emissions into the air from different types of waste facilities [Source: DEFRA 2004]

Emissions to air from waste management facilities (grams per tonne of waste).
Note1: The uncertainty associated with these estimates is set out in the source. Data Pedigree: P(1-4): Poor; M(5-8): Moderate; G(9-12): Good; VG(13-16): Very Good.

Substance	Windrow Composting	MBT	Anaerobic Digestion	Pyrolysis / Gasification	Incineration with energy recovery	Small scale incineration / pre-sorting	Landfill / engines	Landfill / flaring	Transportation
Nitrogen Oxides	Not likely to be emitted	72.3 M(5)	188 M(8)	780 M(8)	1600 G(9)	1587 M(7)	680 M(6)	75 M(6)	31 M(7)
Total Particulates	175 P(3)	No data	No data	12 M(8)	38 G(9)	8 M(7)	5.3 M(6)	6.1 M(6)	1.3 M(7)
Sulphur Dioxide	Not likely to be emitted	28 M(5)	3.0 M(8)	52 M(8)	42 G(9)	20 M(7)	53 M96)	90 M(6)	0.11 M(7)
Hydrogen Chloride	No data	1.2 M (5)	<0.2 M(8)	32 M(8)	58 G (9)	74 M (7)	3 M(6)	14 M(6)	Not likely to be emitted
Hydrogen Fluoride	Not likely to be emitted	0.4 M(5)	<0.007 M(8)	0.34 M(8)	1 G(9)	1M(7)	3 M(6)	2.7 M(6)	Not likely to be emitted
Volatile Organic Compounds	No data	36 M(5)	No data	11 M(8)	8 M(8)	33 M(7)	6.4 M(6)	7.6 M(6)	5.1 M(7)
1,1 – Dicholoroethane	No data	No data	No data	Not likely to be emitted	Not likely to be emitted	Not likely to be emitted	0.66 M(6)	0.66 M(6)	Not likely to be emitted
Chloroethane	No data	No data	No data	Not likely to be emitted	Not likely to be emitted	Not likely to be emitted	0.26 M(6)	0.26 M(6)	Not likely to be emitted
Chlorothene	No data	No data	No data	Not likely to be emitted	Not likely to be emitted	Not likely to be emitted	0.28 M(6)	0.28 M(6)	Not likely to be emitted
Chlorobenzene	No data	No data	No data	Not likely to be emitted	Not likely to be emitted	Not likely to be emitted	0.59 M(6)	0.59 M(6)	Not likely to be emitted
Tetrachloroethene	No data	No data	0.0004 M(7)	Not likely to be emitted	Not likely to be emitted	Not likely to be emitted	0.98 M(6)	0.84 M(6)	Not likely to be emitted
Benzene	No data	No data	No data	Not likely to be emitted	Not likely to be emitted	Not likely to be emitted	0.00006 M(6)	0.00006 M(6)	0.0029 M(7)
Methane	No data	411 M(5)	No data	No data	19	No data	20,000 M(6)	19,000 M(6)	`
Cadmium	Not likely to be emitted	No data	<0.0001 M(8)	0.0069 M(8)	0.005 G(9)	0.007 M(7)	0.071 M(6)	0.071 M(6)	No data
Nickel	Not likely to be emitted	No data	<0.0003 M (8)	0.04 M(8)	0.05 M(8)	0.33 M(7)	0.0095 M(6)	0.0095 M(6)	No data
Arsenic	Not likely to be emitted	No data	<0.0005 M(8)	0.06 M(8)	0.005 M(8)	0.033 M(7)	0.0012 M(6)	0.0012 M(6)	No data
Mercury	No data	No data	<0.0006 M(8)	0.069 M(8)	0.05 M(8)	0.021 M(7)	0.0012 M(6)	0.0012 M(6)	No data
Dioxins and Furans	No data	4.0×10^{-8} M(5)	No data	4.8×10^{-8} M(8)	4.0×10^{-7} G(9)	2.4×10^{-6} M(7)	1.4×10^{-7} M(6)	5.5×10^{-8} M(6)	3.8×10^{-11} M(7)
Polychlorinated Biphenyls	No data	No data	No data	No data	0.0001 M(8)	No data	No data	No data	No data
Carbon Dioxide	No data	181000 M(5)	No data	No data	1000000 G(9)	No data	300000 M(6)	200000 M(6)	1170

Receptors include, people inside or outside the site boundary; properties outside the site boundary; ecosystems; surface water in the vicinity of the site; groundwater in the vicinity of the site; the atmosphere, (in terms of risk of climate change).

Toxicity, hazard and risk

In the context of health risk assessment, toxicity, hazard and risk have particular meanings:

Toxicity:	the potential of a material to produce injury in biological systems
Hazard:	the nature of the adverse effect posed by the toxic material
Risk:	the probability of suffering harm or loss under specific circumstances

Hazards arising from exposure to a potentially harmful source are specifically characterised by the nature of the potential adverse effect, the pathway and the receptor they affect. They are only realised when there is a linkage between the source, the pathway and the receptor. If this linkage does not exist, or can be broken, then there is no hazard.

The relationship between risk and hazard can be expressed as:

$R = f (H \times E) = f (H \times D \times t)$

where R is risk, f is function of, H is hazard, E is amount of exposure, D is dose and t is time.

Therefore, substances which pose only a small hazard but to which there is frequent or excessive exposure may pose as much risk as substances which have a high degree of hazard but to which only limited exposure occurs.

Dose-response assessment

Dose-response assessment is an essential aspect of assessing possible health risks from chemicals. It involves the investigation of the relationship between the amount of the substance to which the subject is exposed and the frequency and severity of any adverse effects. For many types of adverse effects, such as organ-specific effects, neurological, immunological, reproductive, developmental and non-genotoxic carcinogenesis, there may be a threshold dose, below which no observed adverse effect will occur.

However, there is a generally held assumption that there is no threshold for safe exposure to substances that may cause cancer by mutation of the genetic information in DNA (genotoxic

substances). This is because it is believed that there is some probability of effect at any given dose, no matter how low. In the absence of data in humans to the contrary, chemicals that can induce cancer in experimental animals are regulated as if they could induce cancer in humans.

Unfortunately there is not a consensus of opinion about which chemicals have, and which do not have, a threshold effect. Take 'dioxins' as an example. The US Environmental Protection Agency takes the view dioxins do not have a threshold for
safe exposure, i.e. any dose could in theory cause cancer. In contrast. the UK Department of Health Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) and the World Health Organisation (WHO) are of the opinion that there is a practical threshold of dioxin exposure below which there is no cancer risk. Thus they believe a Tolerable Daily Intake (TDI) can be established to set allowable levels in foods.

However, there is also a range of opinion about the level at which a TDI should be set. There is even disagreement about what effects low doses of toxic chemicals may have on human health.

Low dose effects

The fact that there is not a complete scientific consensus about the possible health effects of chemicals released into the environment is shown by the current controversy over so-called 'low-dose effects'. Some scientist hold that substances known as 'endocrine disrupters' (including 'dioxins', PCB's and some metals such as arsenic As, cadmium, lead, and mercury and many other substances found in untreated waste) cause adverse health effects at doses much less than those considered in classical dose-response assessments. Thus they argue that the 'safe' levels determined by such experiments are not 'safe' at all.

Another group of scientists argues that many chemicals (including 'dioxins', arsenic, cadmium, lead and mercury, etc.), which are toxic at high doses, actually cause beneficial health effects at low doses (the 'hormesis' effect). Thus they argue that by imposing unrealistically low limits on emissions of such chemicals we are actually harming public health. Before dismissing this idea out of hand consider alcohol consumption and vitamin A. There is good evidence to show that low or modest consumption of ethanol reduces total mortality in humans, whilst high alcohol consumption is a well-known cause of life-shortening disease. Similarly vitamin A is essential for good health, serious deficiency being a leading

cause of blindness in children, but if taken in high doses it is toxic. Thus it could be said that both alcohol and vitamin A exhibit a hormetic effect.

Low-dose effects, whether negative or positive, are complex and to some extent contradictory, however, they do pose some serious questions in regard to dose-response, regulatory policy and risk assessment in respect of potential impacts from waste management in particular and toxic substances in general.

Risk assessment

Risk assessment put simply is the evaluation of the probability of harm from a particular hazard. In the context of waste treatment facilities, it is normally concerned with gathering and interpreting information on the characteristics of emission sources, pathways and receptors at specific sites and attempting to understand the uncertainties inherent in the assessment of these specific risks.

Risk assessment of potential human health impacts from waste treatment facilities is critically reliant on the available data on human exposure. Much of this data comes from epidemiological studies investigating possible links between waste treatment facilities and the incidence of various types of disease.

Epidemiological studies

Epidemiology is the study of the patterns and causes of disease in human populations. Unfortunately most such studies investigating links between waste management and health outcomes use proxy evidence for actual exposure, usually that of residence or employment near the site. Only a tiny minority of studies are based on quantified ambient or personal measurements of pollutants taken at the time of potential exposure. In most studies, the waste treatment facility is just assumed to be a box emitting toxic compounds but no actual measurements are taken to use in the exposure assessment.

This means that even when an epidemiological study does find a statistical association between a waste management site and a health effect, it is difficult to decide if this is caused by emissions from the site. It may be just a chance association produced by random coincidence or it may be caused by other personal, social and neighbourhood factors unconnected with the waste treatment facility.

Such factors include the pre-existing health and wellbeing of the people studied; their exposure to emissions and chemicals at work, their genetics and lifestyle, their family and social relationships, their relative wealth or poverty; the standard of local health and social care services; other past or present sources of pollution and wider population movements.

Table C2 describes some of the possible health effects that can occur due to exposures to some of the emissions that are generated by waste facilities and other industries and technologies e.g. power stations, burning wood, barbecues, car exhausts, etc.

Risk management

Risk management involves evaluating alternative options within a political, regulatory, social, economic, environmental scientific and technological framework, in order to determine the most appropriate and practical means of reducing risk to an acceptable level. Risk can never be reduced to zero. All human activity carries at least some risk. In practice the overriding principle when considering the potential health impacts of waste treatment facilities is that risk is managed by breaking the source-pathway-receptor pollutant linkages and mitigating any potential negative impacts through the implementation of protective measures. This is done by treating, removing or isolating sources of emissions, intercepting exposure pathways and by protecting receptors. Risk management is based on a technical and scientific assessment of the risks but also takes into account other factors such as community concerns, public perceptions of the risk, planning constraints and the economic and technological feasibility of particular technologies.

Table C2: Potential health effects of key pollutants (if exposure is sufficient)

[Source: Health Effects of Waste Management Technologies, National Public Health Service for Wales, 2006]

Pollutant	Potential Health Effects
Arsenic	Reproductive Effects Cancer Effects on liver Effects on kidney
Benzene	Effects on the immune system Reproductive Effects Cancer
Cadmium	Reproductive Effects Effects on kidney
Carbon Monoxide	Reduction in oxygen-carrying capacity of blood Effects on the central nervous system
Chlorinated compounds	Reproductive Effects
Chloroform	Effects on liver
Chromium	Cancer Effects on kidney
Dioxins	Effects on the immune system Endocrine effects (especially on the foetus) Cancer
Halogenated Hydrocarbons	Effects on kidney
Lead	Effects on the central nervous system Effects on the immune system Reproductive Effects Effects on kidney
Manganese	Effects on the central nervous system
Mercury	Effects on the immune system Reproductive Effects Effects on kidney
Nickel	Cancer
Nitrogen Dioxide	Asthma attacks
Organic Solvents	Effects on kidney
Organochlorine Compounds including vinyl chloride, nickel, chromium, toluene	Effects on the immune system
Particulate Matter	Bronchitis
Pesticides	Effects on kidney
Polychlorinated Biphenyls	Effects on the immune system Reproductive Effects Effects on liver
Polycyclic Aromatic Hydrocarbons	Effects on the immune system Reproductive Effects Cancer
Sulphur Dioxide	Bronchitis Increased susceptibility to respiratory infection
Vinyl Chloride	Cancer Effects on liver
Volatile Organic Compounds	Eye irritation

Risk perception and how judgements about risk are made

When societal decisions need to be made there can be disagreements particularly when the decisions involve what can be seen as potentially hazardous or risky activities and technologies. This is the case with the societal decisions such as the treatment and disposal of waste.

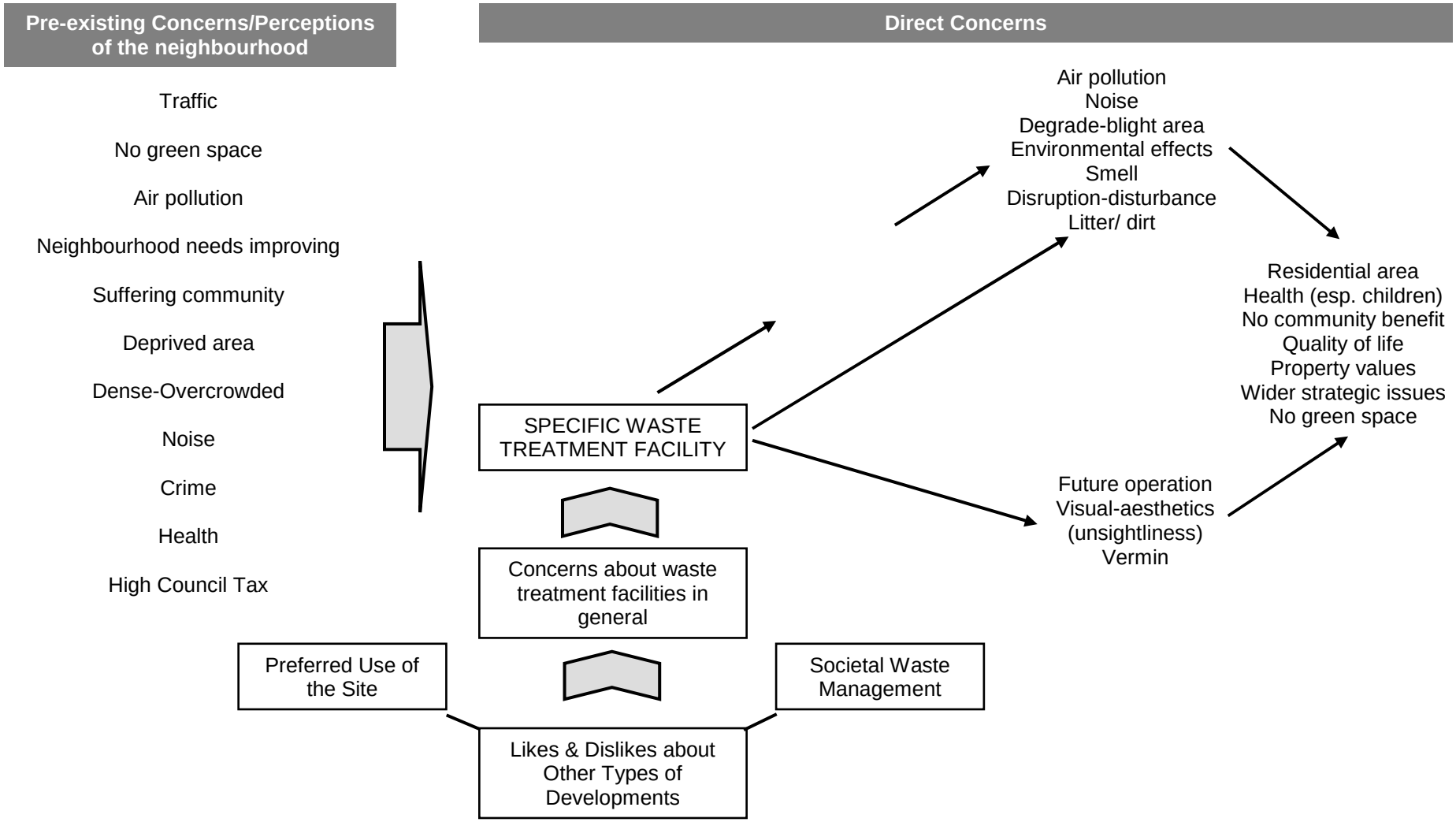
This occurs not just because of different interpretations of scientific evidence but because of the different judgements people make about how risky they believe the activity to be. Individuals as well as regulatory bodies try to avoid or control activities they judge to be too risky and yet ignore or tolerate others. Residents of an area see the additional potential risks that, for example, the siting of a waste facilities imposes in the context of their existing concerns about their neighbourhoods and their wider concerns about waste and waste management. Figure C.1 shows the issues that individuals and communities tend to consider when weighing up the potential environmental and health risks that a waste facility might pose to their neighbourhoods.

Disagreements about risk are inevitable because there is no way to define risk that does not include values, beliefs and assumptions - especially when information on which to base the judgement is scarce. However, though these differences in perspectives can lead to protest and conflict this does not necessarily need occur.

Where there is uncertainty, judgements about risk are based on assumptions and mental strategies that help decision making, and on qualitative aspects inherent in a hazard. As well as the likelihood of harm, people consider whether incurring the risk is voluntary, has catastrophic consequences, is unknown and unfamiliar, and is new to society. Judgements about risk are also influenced by individuals' views of the world and the kind of society they want to live in.

Risk assessment is the scientific estimation of the size of a risk or set of risks. It is perceived as an objective exercise and is expressed in terms of probabilities - the likelihood that something bad, usually bad, will happen. If the probability is low, then they perceive the risk to be low; a high probability describes a high risk. This view of risk can be challenged because there are inherent assumption in the model and statistics used to estimate the risks.

Fig. C1: Diagram of the direct concerns that residents have about waste treatment facilities in relation to their pre-existing concerns about the neighbourhood [Source: Understanding public and other stakeholders perceptions of environmental and health risks in the planning and siting process, Vohra S, 2003]



When we make judgements about risk, when the there is uncertainty, we all make use of the same mental strategies or 'rules of thumb', known as heuristics. The commonly used heuristics are:

- **Availability (how easy it is to recall)** – we tend to overestimate frequency of rare, unusual, memorable causes of death (e.g. unintentional injuries) and underestimate more common ones (e.g. risks of smoking and driving cars).
- **Overconfidence** – we tend to be more certain about our estimates of what will or will not happen.
- **Trustworthiness of public institutions and officials** – living in complex societies we have to trust others to keep us safe and provide food, water, warmth and shelter. When there are repeated human errors, organisational failings and management styles that negatively affect real life operation of technological systems then we can begin to lose trust in public institutions and officials who have a responsibility to protect us. This trust is slow to develop but easily lost.
- **Framing effect** – our attitude to risks are influenced by the way these risks choices are presented or the context in which they occur, e.g. some people take more risks on holiday abroad than they would when they are at home, we tend to be more concerned about costs rather than benefits so that small costs can loom larger than large benefits.
- **Optimistic bias** – we tend to think we are less vulnerable and more knowledgeable about a hazards and risks than other people and better able to deal with then than average e.g. young drivers tend to overestimate their driving ability.

These heuristics have developed to help us deal with everyday situations, in earlier times when dangers were more immediate, physical and visible, but they are less useful when dealing societal and long term environmental and health issues.

There are also another set of factors that affects how individuals and communities can respond to environmental and health risks (See Table C1). These so-called outrage factors provide a guide as to which situations and decisions are likely to generate community concern and protest.

Given the diversity of groups and views in society, there will never be consensus on risks or how to manage them. Better management of risks is possible if the different approaches to risk are recognised as valid. The main lessons for education and communication are making value judgements explicit, acknowledging and validating the outrage factors and

communicating truthfully. For public decision making, the lessons are about sharing power and responsibility and about fostering public trust.

Table C1: Factors that generate community concern, protest and 'outrage'

Factors	Generate high public concern	Generate low or no public concern
Catastrophic potential	Fatalities and injuries grouped in time and space	Fatalities scattered and random
Familiarity	Unfamiliar	Familiar
Understanding	Mechanisms or process not understood	Mechanisms or process understood
Uncertainty	Risks scientifically unknown or uncertain	Risks known to science
Controllability (personal)	Uncontrollable	Controllable
Voluntariness of exposure	Involuntary	Voluntary
Effects on children	Children specifically at risk	Children not specifically at risk
Manifestation of effects	Delayed effects	Immediate effects
Effects on future generations	Risk to future generations	No risk to future generations
Victim identity	Identifiable victims	Statistical victims
Dread	Effects dreaded	Effects not dreaded
Trust in institutions	Lack of trust in responsible institutions	Trust in responsible institutions
Media attention	Much media attention	Little media attention
Accident history	Major and sometimes minor accidents	No major or minor accidents
Equity	Inequitable distribution of risks and benefits	Equitable distribution of risks and benefits
Benefits	Unclear benefits	Clear benefits
Reversibility	Effects irreversible	Effects reversible
Personal stake	Individual personally at risk	Individual not personally at risk
Origin	Caused by human actions or failures	Caused by acts of nature or God

16 Appendix D

Health Impact Matrices for SWMOs 0-4

APPENDIX D

The detailed health impact analysis tables for SWMOs 0-4 are available as a separate appendix report.

Summary health impact matrix for Option 1: Landfill-led Strategy compared to Option 0: 'Do Nothing' Strategy

Construction (Between 2-5 years for each facility)	Option 0: 'Do Nothing' Strategy 50% recycling/composting Disposal to Landfill with no further treatment	Option 1: Landfill-led Strategy 50% recycling/composting Low levels of thermal treatment followed by disposal to landfill				Option 1A 50% recycling/composting Thermal treatment used: Low levels of Pyrolysis	Option 1B 50% recycling/composting Thermal treatment used: Low levels of Gasification	Option 1C 50% recycling/composting Thermal treatment used: Low levels of Incineration
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~**	**-/--**	**-/--**	**-/--**	**-/--**	**-/--**	**-/--**	**-/--**
Infectious disease	~	~	~	~	~			
Non-infectious/chronic disease	~	~	~	~	~			
Physical injury and poisoning	~	-	-	-	-			
Mental health	~	-/--	-/--	-/--	-/--			
Population profile	~	~	~	-	~			
Employment & economy	~	+	+/++	+/++	+/++			
Housing and accommodation	~	~/-	~/-	-/--	~/-			
Transport and connectivity	~	-	-/--	-/--	-			
Education and learning	~	+	+	+	+			
Crime & safety	~	~	~	~/-	~			
Health & social care services	~	~	~	~	~			
Shops and other retail amenities	~	+	+/++	+	++			
Social capital and cohesion	~	--/-/+/++	---/--/-/+/++	---/--/-/+/++	---/--/-/+/++			
Culture and leisure	~	~	~	~	~			
Lifestyle and daily routines	~	-	-/--	-/--	-/--			
Energy and waste	~	-/+/++	-/+/++	-/+/++	-/+/++			
Land and spatial	~	-	-/--	--/---	-/--			

The potential positive and negative health and wellbeing impacts of the construction phase of the three sub-options - Option 1A, Option 1B and Option 1C - are likely to be similar to each other and similar to those identified in the general table.

Operation (0-20 years after construction)	Option 0: 'Do Nothing' Strategy 50% recycling/composting Disposal to Landfill with no further treatment	Option 1: Landfill-led Strategy 50% recycling/composting Low levels of thermal treatment followed by disposal to landfill				Option 1A 50% recycling/composting Thermal treatment used: Low levels of Pyrolysis	Option 1B 50% recycling/composting Thermal treatment used: Low levels of Gasification	Option 1C 50% recycling/composting Thermal treatment used: Low levels of Incineration
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**-/--**	**+**	**~/+**	**~/+**	**~/+**	**+**	**+**	**+**
Infectious disease	~	~	~	~	~			
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-			
Physical injury and poisoning	~/-	-	~/-	~/-	~/-			
Mental health	~/-	-/--	-/--	-/--	-/--			
Population profile	~	~	~	~	~			
Employment & economy	-/--	+	+/++	+/++	+/++			
Housing and accommodation	~	~	~	~/-	~			
Transport and connectivity	-	-/--	-/--	-/--	-			
Education and learning	~	~/+/++	~/+/++	~/+/++	~/+/++			
Crime & safety	~	~	~	~	~			
Health & social care services	~	~/-	~	~	~			
Shops and other retail amenities	~	+	+	+	+			
Social capital and cohesion	~	--/-/+/++	-/+/++	-/+/++	-/+/++			
Culture and leisure	~	~	~	~	~			
Lifestyle and daily routines	~/-	-/--	-/--	-/--	-/--			
Energy and waste	---	+	+	+	+			
Land and spatial	~	-/~/+/++	-/~/+/++	-/~/+/++	-/~/+/++			

The potential positive and negative health and wellbeing impacts of the operation phase of the three sub-options - Option 1A, Option 1B and Option 1C - are likely to be similar to each other and similar to those identified in the general table.

Decommissioning (20-30 years after construction)	Option 0: 'Do Nothing' Strategy 50% recycling/composting Disposal to Landfill with no further treatment	Option 1: Landfill-led Strategy 50% recycling/composting Low levels of thermal treatment followed by disposal to landfill				Option 1A 50% recycling/composting Thermal treatment used: Low levels of Pyrolysis	Option 1B 50% recycling/composting Thermal treatment used: Low levels of Gasification	Option 1C 50% recycling/composting Thermal treatment used: Low levels of Incineration
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~/-**	**~/-**	**~/-**	**~/-**	**~/-**	**~/-**	**~/-**	**~/-**
Infectious disease	~	~	~	~	~			
Non-infectious/chronic disease	~	~	~	~	~			
Physical injury and poisoning	~	~/-	~/-	~/-	~/-			
Mental health	+	+	+/++	+/++	+/++			
Population profile	~	~	~	~	~			
Employment & economy	--	-	-/--	-/--	-/--			
Housing and accommodation	~	~	~	~	~			
Transport and connectivity	-	-	-/--	-/--	-			
Education and learning	~/-	~/-	~/-/--	~/-/--	~/-/--			
Crime & safety	~	~	~	~	~			
Health & social care services	~	~	~	~	~			
Shops and other retail amenities	~/-	~/-	~/-	~/-	~/-			
Social capital and cohesion	+/++	+	+/++	+/++	+/++			
Culture and leisure	~/+	~/+	~/+	~/+	~/+			
Lifestyle and daily routines	~/-	~/-	~/-	~/-	~/-			
Energy and waste	~/+	~/+	~/+	~/+	~/+			
Land and spatial	+	+	+	+	+			

The potential positive and negative health and wellbeing impacts of the decommissioning phase of the three sub-options - Option 1A, Option 1B and Option 1C - are likely to be similar to each other and similar to those identified in the general table.

Definition of the levels of potential impact

Significance Level	Criteria
Severe ---- (negative only)	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process, and may threaten the viability of the project. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category. Typically, mitigation measures are unlikely to remove severe adverse effects.
Major +++/--- (positive or negative)	These effects are likely to be important considerations at a local or district scale. If adverse, potential concerns to the project may become key factors in the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the adverse effects upon the affected communities or interests.
Moderate ++/-- (positive or negative)	These effects, if adverse, while important at a local scale, are unlikely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor/Mild ++/-- (positive or negative)	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless they are of relevance in enhancing the subsequent design of the project and the consideration of mitigation and enhancement measures.
Neutral/No Effect ~	No effect or effects which are beneath the level of perception or within normal bounds of variation.

Summary health impact matrix for Option 2: Energy from Waste-led Strategy compared to Option 0: 'Do Nothing' Strategy

Construction (Between 2-5 years for each facility)	Option 0: 'Do Nothing' Strategy	Option 2: Energy from Waste-led Strategy				Option 2A	Option 2B	Option 2C	Option 2D
	50% recycling/composting Disposal to Landfill with no further treatment	50% recycling/composting High levels of thermal treatment followed by disposal to landfill				50% recycling/composting Thermal treatment used: High levels of Pyrolysis	50% recycling/composting Thermal treatment used: High levels of Gasification	50% recycling/composting Thermal treatment used: High levels of Incineration	50% recycling/composting Thermal treatment used: High levels of Anaerobic Digestion
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~**	**--/---**	**-/--**	**-/--**	**-/--**	**--/---**	**--/---**	**--/---**	**--/---**
Infectious disease	~	~	~	~	~				
Non-infectious/chronic disease	~	~	~	~	~				
Physical injury and poisoning	~	-/--	-	-	-				
Mental health	~	--/---	-/--	-/--	-/--				
Population profile	~	~	~	~/-	~				
Employment & economy	~	++/+++	+/++	+/++	+/++				
Housing and accommodation	~	~/-	~/-	~/-	~/-				
Transport and connectivity	~	-/--	-/--	-/--	-				
Education and learning	~	+/++	+	+	+				
Crime & safety	~	~	~	~/-	~				
Health & social care services	~	~	~	~	~				
Shops and other retail amenities	~	+/++	+/++	+	+/++				
Social capital and cohesion	~	---/--/-/+/++	---/--/-/+/++	---/--/-/+/++	---/--/-/+/++				
Culture and leisure	~	~	~	~	~				
Lifestyle and daily routines	~	--/---	-/--	-/--	-/--				
Energy and waste	~	--/-/+/++	-/+/++	-/+/++	-/+/++				
Land and spatial	~	-	-/--	--/---	-/--				

The potential positive and negative health and wellbeing impacts of the construction phase of the four sub-options - Option 2A, Option 2B, Option 2C and Option 2D - are likely to be similar to each other and similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Operation (0-20 years after construction)	Option 0: 'Do Nothing' Strategy	Option 2: Energy from Waste-led Strategy				Option 2A	Option 2B	Option 2C	Option 2D
	50% recycling/composting Disposal to Landfill with no further treatment	50% recycling/composting High levels of thermal treatment followed by disposal to landfill				50% recycling/composting Thermal treatment used: High levels of Pyrolysis	50% recycling/composting Thermal treatment used: High levels of Gasification	50% recycling/composting Thermal treatment used: High levels of Incineration	50% recycling/composting Thermal treatment used: High levels of Anaerobic Digestion
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**-/--**	**++**	**+/++**	**+/++**	**+/++**	**++**	**++**	**++**	**++**
Infectious disease	~	~/-	~/-	~/-	~/-				
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-				
Physical injury and poisoning	~/-	-	~/-	~/-	~/-				
Mental health	~/-	--/---	-/--	-/--	-/--				
Population profile	~	~	~	~	~				
Employment & economy	-/--	++/+++	+/++	+/++	+/++				
Housing and accommodation	~	~	~	~/-	~				
Transport and connectivity	-	-/--	-/--	-/--	-				
Education and learning	~	~/+/++	~/+/++	~/+/++	~/+/++				
Crime & safety	~	~	~	~/-	~				
Health & social care services	~	~/-	~	~	~				
Shops and other retail amenities	~	++	+	+	+				
Social capital and cohesion	~	---/--/-/+/++	-/+/++	-/+/++	-/+/++				
Culture and leisure	~	~	~	~/-	~				

The potential positive and negative health and wellbeing impacts of the operation phase of the four sub-options - Option 2A, Option 2B, Option 2C and Option 2D - are likely to be similar to each other and similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Lifestyle and daily routines	~/-	-/--	-/--	-/--	-/--
Energy and waste	---	++/+++	++/+++	++/+++	++/+++
Land and spatial	~	-/~/+/++	-/~/+/++	-/~/+/++	-/~/+/++

Decommissioning (20-30 years after construction)	**Option 0: 'Do Nothing' Strategy**	**Option 2: Energy from Waste-led Strategy**				**Option 2A**	**Option 2B**	**Option 2C**	**Option 2D**
	50% recycling/composting Disposal to Landfill with no further treatment	50% recycling/composting High levels of thermal treatment followed by disposal to landfill				50% recycling/composting Thermal treatment used: High levels of Pyrolysis	50% recycling/composting Thermal treatment used: High levels of Gasification	50% recycling/composting Thermal treatment used: High levels of Incineration	50% recycling/composting Thermal treatment used: High levels of Anaerobic Digestion
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~/-**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**
Infectious disease	~	~	~	~	~				
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-				
Physical injury and poisoning	~	~/-	~/-	~/-	~/-				
Mental health	+	+	+	+	+				
Population profile	~	~	~	~	~				
Employment & economy	--	--	-/--	-/--	-/--				
Housing and accommodation	~	~	~	~	~				
Transport and connectivity	-	-/--	-/--	-/--	-				
Education and learning	~/-	~/-	~/-/--	~/-/--	~/-/--				
Crime & safety	~	~	~	~	~				
Health & social care services	~	~	~	~	~				
Shops and other retail amenities	~/-	-	~/-	-	~/-				
Social capital and cohesion	+/++	++	+/++	+/++	+/++				
Culture and leisure	~/+	~/+	~/+	~/+	~/+				
Lifestyle and daily routines	~/-	~/-	~/-	~/-	~/-				
Energy and waste	~/+	~/+	~/+	~/+	~/+				
Land and spatial	+	+	+	+	+				

The potential positive and negative health and wellbeing impacts of the decommissioning phase of the four sub-options - Option 2A, Option 2B, Option 2C and Option 2D - are likely to be similar to each other and similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Definition of the levels of potential impact

Significance Level	Criteria
Severe ---- (negative only)	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process, and may threaten the viability of the project. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category. Typically, mitigation measures are unlikely to remove severe adverse effects.
Major +++/--- (positive or negative)	These effects are likely to be important considerations at a local or district scale. If adverse, potential concerns to the project may become key factors in the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the adverse effects upon the affected communities or interests.
Moderate ++/-- (positive or negative)	These effects, if adverse, while important at a local scale, are unlikely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor/Mild ++/-- (positive or negative)	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless they are of relevance in enhancing the subsequent design of the project and the consideration of mitigation and enhancement measures.
Neutral/No Effect ~	No effect or effects which are beneath the level of perception or within normal bounds of variation.

Summary health impact matrix for Option 3: MBT/BMT-led Strategy compared to Option 0: 'Do Nothing' Strategy

Construction (Between 2-5 years for each facility)	Option 0: 'Do Nothing' Strategy	Option 3: MBT/BMT-led Strategy			Option 3A	Option 3B	Option 3C	Option 3D	Option 3E	Option 3F
	50% recycling/composting	50% recycling/composting			50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting
	Disposal to Landfill with no further treatment	MBT treatment plus further treatment followed by disposal to landfill			MBT followed by Pyrolysis	MBT followed by Gasification	MBT followed by Incineration	MBT followed by fuel to off-site use	MBT followed by on-site Anaerobic Digestion	MBT followed by Landfill
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~**	**--/---**	**-/--**	**-/--**	**-/--**	**--/---**	**--/---**	**--/---**	**--/---**	**--/---**	**--/---**
Infectious disease	~	~	~	~	~						
Non-infectious/chronic disease	~	~	~	~	~						
Physical injury and poisoning	~	-/--	-	-	-						
Mental health	~	-/--/---	-/--	-/--	-/--						
Population profile	~	~	~	~/-	~						
Employment & economy	~	+++	+/++	+/++	+/++						
Housing and accommodation	~	~/-	~/-	-/--	~/-						
Transport and connectivity	~	-/--	-/--	-/--	-						
Education and learning	~	+/++	+	+	+						
Crime & safety	~	~	~	~/-	~						
Health & social care services	~	~	~	~	~						
Shops and other retail amenities	~	+/++	+/++	+	+/++						
Social capital and cohesion	~	--/-/+/++	--/-/+/++	--/-/+/++	--/-/+/++						
Culture and leisure	~	~	~	~	~						
Lifestyle and daily routines	~	--/---	-/--	-/--	-/--						
Energy and waste	~	--/-/+/++	-/+/++	-/+/++	-/+/++						
Land and spatial	~	-	-/--	--/---	-/--						

The potential positive and negative health and wellbeing impacts of the construction phase of the six sub-options - Option 3A, Option 3B, Option 3C, Option 3D, Option 3E and Option 3F - are likely to be similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Operation (0-20 years after construction)	Option 0: 'Do Nothing' Strategy	Option 3: MBT/BMT-led Strategy			Option 3A	Option 3B	Option 3C	Option 3D	Option 3E	Option 3F
	50% recycling/composting	50% recycling/composting			50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting
	Disposal to Landfill with no further treatment	MBT treatment plus further treatment followed by disposal to landfill			MBT followed by Pyrolysis	MBT followed by Gasification	MBT followed by Incineration	MBT followed by fuel to off-site use	MBT followed by on-site Anaerobic Digestion	MBT followed by Landfill
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**-/--**	**++/+++**	**+/++**	**+/++**	**+/++**	**++/+++**	**++/+++**	**++/+++**	**++/+++**	**++/+++**	**++/+++**
Infectious disease	~	~/-	~/-	~/-	~/-						
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-						
Physical injury and poisoning	~/-	-	~/-	~/-	~/-						
Mental health	~/-	-/--/---	-/--	-/--	-/--						
Population profile	~	~	~	~	~						
Employment & economy	-/--	++/+++	+/++	+/++	+/++						
Housing and accommodation	~	~	~	~/-	~						
Transport and connectivity	-	-/--	-/--	-/--	-						
Education and learning	~	~/+/++	~/+/++	~/+/++	~/+/++						

The potential positive and negative health and wellbeing impacts of the operation phase of the six sub-options - Option 3A, Option 3B, Option 3C, Option 3D, Option 3E and Option 3F - are likely to be similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Crime & safety	~	~	~	~	~
Health & social care services	~	~/-	~	~	~
Shops and other retail amenities	~	++	+	+	+
Social capital and cohesion	~	--/-/+/++/+++	-/+/++	-/+/++	-/+/++
Culture and leisure	~	~	~	~	~
Lifestyle and daily routines	~/-	-/--	-/--	-/--	-/--
Energy and waste	---	+++	++/+++	++/+++	++/+++
Land and spatial	~	-/~/+/++	-/~/+/++	-/~/+/++	-/~/+/++

Decommissioning (20-30 years after construction)	**Option 0: 'Do Nothing' Strategy**	**Option 3: MBT/BMT-led Strategy**				**Option 3A**	**Option 3B**	**Option 3C**	**Option 3D**	**Option 3E**	**Option 3F**
	50% recycling/composting	50% recycling/composting				50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting	50% recycling/composting
	Disposal to Landfill with no further treatment	MBT treatment plus further treatment followed by disposal to landfill				MBT followed by Pyrolysis	MBT followed by Gasification	MBT followed by Incineration	MBT followed by fuel to off-site use	MBT followed by on-site Anaerobic Digestion	MBT followed by Landfill
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~/-**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**
Infectious disease	~	~	~	~	~						
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-						
Physical injury and poisoning	~	~/-	~/-	~/-	~/-						
Mental health	+	+	+	+	+						
Population profile	~	~	~	~	~						
Employment & economy	--	--/---	-/--	-/--	-/--						
Housing and accommodation	~	~	~	~	~						
Transport and connectivity	-	-/--	-/--	-/--	-						
Education and learning	~/-	~/-	~/-/--	~/-/--	~/-/--						
Crime & safety	~	~	~	~	~						
Health & social care services	~	~	~	~	~						
Shops and other retail amenities	~/-	-	~/-	~/-	~/-						
Social capital and cohesion	+/++	+/++	+/++	+/++	+/++						
Culture and leisure	~/+	~/+	~/+	~/+	~/+						
Lifestyle and daily routines	~/-	~/-	~/-	~/-	~/-						
Energy and waste	~/+	~/+	~/+	~/+	~/+						
Land and spatial	+	+	+	+	+						

The potential positive and negative health and wellbeing impacts of the decommissioning phase of the six sub-options - Option 3A, Option 3B, Option 3C, Option 3D, Option 3E and Option 3F - are likely to be similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Definition of the levels of potential impact

Significance Level	Criteria
Severe ---- (negative only)	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process, and may threaten the viability of the project. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category. Typically, mitigation measures are unlikely to remove severe adverse effects.
Major +++/--- (positive or negative)	These effects are likely to be important considerations at a local or district scale. If adverse, potential concerns to the project may become key factors in the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the adverse effects upon the affected communities or interests.
Moderate ++/-- (positive or negative)	These effects, if adverse, while important at a local scale, are unlikely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor/Mild ++/-- (positive or negative)	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless they are of relevance in enhancing the subsequent design of the project and the consideration of mitigation and enhancement measures.
Neutral/No Effect ~	No effect or effects which are beneath the level of perception or within normal bounds of variation.

Summary health impact matrix for Option 4: Mechanical Heat Treatment/Autoclave-led Strategy compared to Option 0: 'Do Nothing' Strategy

Construction (Between 2-5 years for each facility)	Option 0: 'Do Nothing' Strategy 50% recycling/composting Disposal to Landfill with no further treatment	Option 4: Autoclave-led Strategy 50% recycling/composting Autoclave treatment plus further treatment followed by disposal to landfill				Option 4A 50% recycling/composting Autoclave followed by Pyrolysis	Option 4B 50% recycling/composting Autoclave followed by Gasification	Option 4C 50% recycling/composting Autoclave followed by Incineration	Option 4D 50% recycling/composting Autoclave followed by fuel to off-site use	Option 4E 50% recycling/composting Autoclave followed by Landfill
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~**	**--/---**	**-/--**	**-/--**	**-/--**	**--/---**	**--/---**	**--/---**	**--/---**	**--/---**
Infectious disease	~	~	~	~	~					
Non-infectious/chronic disease	~	~	~	~	~					
Physical injury and poisoning	~	-/--	-	-	-					
Mental health	~	-/--/---	-/--	-/--	-/--					
Population profile	~	~	~	~/-	~					
Employment & economy	~	++/+++	+/++	+/++	+/++					
Housing and accommodation	~	~/-	~/-	-/--	~/-					
Transport and connectivity	~	-/--	-/--	-/--	-					
Education and learning	~	+/++	+	+	+					
Crime & safety	~	~	~	~/-	~					
Health & social care services	~	~	~	~	~					
Shops and other retail amenities	~	+/++	+/++	+	+/++					
Social capital and cohesion	~	---/--/-/+/++	--/-/+/++	--/-/+/++	--/-/+/++					
Culture and leisure	~	~	~	~	~					
Lifestyle and daily routines	~	--/---	-/--	-/--	-/--					
Energy and waste	~	--/-/+/++	-/+/++	-/+/++	-/+/++					
Land and spatial	~	-	-/--	--/---	-/--					

The potential positive and negative health and wellbeing impacts of the construction phase of the five sub-options - Option 4A, Option 4B, Option 4C, Option 4D and Option 4E - are likely to be similar to each other and similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Operation (0-20 years after construction)	Option 0: 'Do Nothing' Strategy 50% recycling/composting Disposal to Landfill with no further treatment	Option 4: Autoclave-led Strategy 50% recycling/composting Autoclave treatment plus further treatment followed by disposal to landfill				Option 4A 50% recycling/composting Autoclave followed by Pyrolysis	Option 4B 50% recycling/composting Autoclave followed by Gasification	Option 4C 50% recycling/composting Autoclave followed by Incineration	Option 4D 50% recycling/composting Autoclave followed by fuel to off-site use	Option 4E 50% recycling/composting Autoclave followed by Landfill
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**-/--**	**++/+++**	**+/++**	**+/++**	**+/++**	**++/+++**	**++/+++**	**++/+++**	**++/+++**	**++/+++**
Infectious disease	~	~	~	~	~					
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-					
Physical injury and poisoning	~/-	-	~/-	~/-	~/-					
Mental health	~/-	-/--/---	-/--	-/--	-/--					
Population profile	~	~	~	~	~					
Employment & economy	-/--	++/+++	+/++	+/++	+/++					
Housing and accommodation	~	~	~	~/-	~					
Transport and connectivity	-	-/--	-/--	-/--	-					
Education and learning	~	~/+/++	~/+/++	~/+/++	~/+/++					
Crime & safety	~	~	~	~	~					
Health & social care services	~	~/-	~	~	~					
Shops and other retail amenities	~	++	+	+	+					
Social capital and cohesion	~	--/-/+/++/+++	-/+/++	-/+/++	-/+/++					
Culture and leisure	~	~	~	~	~					
Lifestyle and daily routines	~/-	-/--	-/--	-/--	-/--					
Energy and waste	---	+++	++/+++	++/+++	++/+++					

The potential positive and negative health and wellbeing impacts of the operation phase of the five sub-options - Option 4A, Option 4B, Option 4C, Option 4D and Option 4E - are likely to be similar to each other and similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Land and spatial	~	-/~/+/++	-/~/+/++	-/~/+/++	-/~/+/++

Decommissioning (20-30 years after construction)	**Option 0: 'Do Nothing' Strategy** 50% recycling/composting Disposal to Landfill with no further treatment	**Option 4: Autoclave-led Strategy** 50% recycling/composting Autoclave treatment plus further treatment followed by disposal to landfill				**Option 4A** 50% recycling/composting Autoclave followed by Pyrolysis	**Option 4B** 50% recycling/composting Autoclave followed by Gasification	**Option 4C** 50% recycling/composting Autoclave followed by Incineration	**Option 4D** 50% recycling/composting Autoclave followed by fuel to off-site use	**Option 4E** 50% recycling/composting Autoclave followed by Landfill
	For the purposes of this assessment it is assumed that the positive and negative health impacts from existing facilities are already part of the baseline profile and that no new waste facilities will be built by 2013	All the proposed new residual treatment waste facilities in Wales and the three regions	Individual new residual treatment waste facilities	New residual treatment waste facility in a rural area	New residual treatment waste facility in an urban area	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region	All the proposed new residual treatment waste facilities in the region
Overall	**~/-**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**	**+/++**
Infectious disease	~	~	~	~	~					
Non-infectious/chronic disease	~	~/-	~/-	~/-	~/-					
Physical injury and poisoning	~	~/-	~/-	~/-	~/-					
Mental health	+	+/++	+	+	+					
Population profile	~	~	~	~	~					
Employment & economy	--	--/---	-/--	-/--	-/--					
Housing and accommodation	~	~	~	~	~					
Transport and connectivity	-	-/--	-/--	-/--	-					
Education and learning	~/-	~/-	~/-/--	~/-/--	~/-/--					
Crime & safety	~	~	~	~	~					
Health & social care services	~	~	~	~	~					
Shops and other retail amenities	~/-	-	~/-	-	~/-					
Social capital and cohesion	+/++	+/++	+/++	+/++	+/++					
Culture and leisure	~/+	~/+	~/+	~/+	~/+					
Lifestyle and daily routines	~/-	~/-	~/-	~/-	~/-					
Energy and waste	~/+	~/+	~/+	~/+	~/+					
Land and spatial	+	+	+	+	+					

The potential positive and negative health and wellbeing impacts of the decommissioning phase of the five sub-options - Option 4A, Option 4B, Option 4C, Option 4D and Option 4E - are likely to be similar to each other and similar to those identified in the general table. The most significant difference is that thermal treatment facilities, especially incineration with energy recovery, is likely to cause greater concern in communities living near potential sites for these facilities.

Definition of the levels of potential impact

Significance Level	Criteria
Severe ---- (negative only)	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process, and may threaten the viability of the project. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category. Typically, mitigation measures are unlikely to remove severe adverse effects.
Major +++/--- (positive or negative)	These effects are likely to be important considerations at a local or district scale. If adverse, potential concerns to the project may become key factors in the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the adverse effects upon the affected communities or interests.
Moderate ++/-- (positive or negative)	These effects, if adverse, while important at a local scale, are unlikely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor/Mild ++/-- (positive or negative)	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless they are of relevance in enhancing the subsequent design of the project and the consideration of mitigation and enhancement measures.
Neutral/No Effect ~	No effect or effects which are beneath the level of perception or within normal bounds of variation.

17 Appendix E

Indicative Numbers of Waste Facilities for the SWMOs 0 - 4

APPENDIX E

Table E1: Indicative numbers of residual waste treatment facilities as identified by the Sustainability Appraisal and Life Cycle Analysis

	Urban		**Rural**
North Wales	Flintshire Wrexham		Conwy Denbighshire Gwynedd Isle of Anglesey Powys (North)
South West	Bridgend Neath Port Talbot Swansea		Carmarthenshire Ceredigion Pembrokeshire
South East	Blaenau Gwent Cardiff Newport Torfaen	Caerphilly Merthyr Tydfil Rhondda	Monmouthshire Powys (South) The Vale of Glamorgan

Facilities that are common to all the Options 0-4:
320 civic amenities, waste transfer, recycling, composting and landfill facilities in North Wales
417 civic amenities, waste transfer, recycling, composting and landfill facilities in South West Wales
541 civic amenities, waste transfer, recycling, composting and landfill facilities in South West Wales
1,278 civic amenities, waste transfer, recycling, composting and landfill facilities in Wales overall

In Option 0, there will be:
The assessment, for comparison purposes, assumes there will be no new residual treatment facilities

Table E1 continued (**<** means having fewer new facilities than)

The possible urban and rural splits described below i.e. the numbers of potential residual waste treatment facilities sited in a rural or urban area, are based on the amount of waste that is forecast to be generated within rural and urban Welsh local authorities by 2013. There are likely to be more rural local authorities in the North Wales and South West Wales Waste Regions hence these regions are likely to have more facilities sited in rural areas. In contrast, the South East Wales Waste Region, which has more urban than rural local authorities, is likely to have more urban than rural waste treatment facilities.

In Option 1, there will be:
Between 6 – 26 new residual waste treatment facilities across Wales as a whole
Option 1C < Option 1A < Option 1B

In Option 1A, there will be:	
4 pyrolysis facilities in North Wales	(1 urban, 3 rural)
3 pyrolysis facilities in South West Wales	(1 urban, 2 rural)
4 pyrolysis facilities in South East Wales	(2 urban, 2 rural)
11 pyrolysis facilities in Wales overall	*(11 new facilities altogether)*
In Option 1B, there will be:	
5 Dirty MRFs and 3 gasification facilities in North Wales	(MRF: 1 urban, 4 rural; Gasification: 1 urban, 2 rural)
5 Dirty MRFs and 3 gasification facilities in South West Wales	(MRF: 2 urban, 3 rural; Gasification: 1 urban, 2 rural)
6 Dirty MRFs and 4 gasification facilities in South East Wales	(MRF: 4 urban, 2 rural; Gasification: 3 urban, 1 rural)
16 Dirty MRFs and 10 gasification facilities in Wales overall	*(16 new facilities if all gasification facilities are co-located with MRFs, 26 new facilities if no gasification facilities are co-located with MRFs)*
In Option 1C, there will be	
2 incineration with energy recovery facilities in North Wales	(0 urban, 2 rural)
2 incineration with energy recovery facilities in South West Wales	(0 urban, 2 rural)
2 incineration with energy recovery facilities in South East Wales	(1 urban, 1 rural)
6 incineration with energy recovery facilities in Wales overall	*(6 new facilities altogether)*

Table E1 continued (< means having fewer new facilities than)

In Option 2, there will be:	
Between 17 – 41 new residual waste treatment facilities across Wales as a whole	Option 2C < Option 2D < Option 2A < 2B
In Option 2A, there will be	
13 pyrolysis facilities in North Wales	(2 urban, 11 rural)
11 pyrolysis facilities in South West Wales	(4 urban, 7 rural)
12 pyrolysis facilities in South East Wales	(6 urban, 5 rural)
36 pyrolysis facilities in Wales overall	*(36 new facilities altogether)*
In Option 2B, there will be:	
9 Dirty MRFs and 5 gasification facilities in North Wales	(MRF: 2 urban, 7 rural; Gasification: 1 urban, 4 rural)
8 Dirty MRFs and 5 gasification facilities in South West Wales	(MRF: 3 urban, 5 rural; Gasification: 2 urban, 3 rural)
9 Dirty MRFs and 5 gasification facilities in South East Wales	(MRF: 6 urban, 3 rural; Gasification: 3 urban, 2 rural)
26 Dirty MRFs and 15 gasification facilities in Wales overall	*(26 new facilities if all gasification facilities are co-located with MRFs, 41 new facilities if no gasification facilities are co-located with MRFs)*
In Option 2C, there will be	
7 incineration with energy recovery facilities in North Wales	(1 urban, 6 rural)
5 incineration with energy recovery facilities in South West Wales	(2 urban, 3 rural)
5 incineration with energy recovery facilities in South East Wales	(2 urban, 3 rural)
17 incineration with energy recovery facilities in Wales overall	*(17 new facilities altogether)*
In Option 2D, there will be	
7 anaerobic digestion facilities in North Wales	(1 urban, 6 rural)
6 anaerobic digestion facilities in South West Wales	(2 urban, 4 rural)
6 anaerobic digestion facilities in South East Wales	(3 urban, 3 rural)
19 anaerobic digestion facilities in Wales overall	*(19 new facilities altogether)*

Table E1 continued (< means having fewer new facilities than)

In Option 3, there will be:	
Between 16 – 39 new residual waste treatment facilities across Wales as a whole	Option 3 D & F < Option 3E < Option 3B & C < 3A
In Option 3A, there will be	
7 MBT and 8 pyrolysis facilities in North Wales	(MBT: 1 urban, 6 rural; Pyrolysis: 1 urban, 7 rural)
5 MBT and 6 pyrolysis facilities in South West Wales	(MBT: 2 urban, 3 rural; Pyrolysis: 2 urban, 4 rural)
6 MBT and 7 pyrolysis facilities in South East Wales	(MBT: 3 urban, 3 rural; Pyrolysis: 4 urban, 3 rural)
18 MBT and 21 pyrolysis facilities in Wales overall	*(21 new facilities if all MBTs are located with pyrolysis facilities* *39 new facilities if no MBT facilities are co-located with pyrolysis facilities)*
In Option 3B, there will be	
5 MBT and 6 gasification facilities in North Wales	(MBT: 1 urban, 4 rural; Gasification: 2 urban, 4 rural)
5 MBT and 5 gasification facilities in South West Wales	(MBT: 2 urban, 3 rural, Gasification: 2 urban, 3 rural)
6 MBT and 6 gasification facilities in South East Wales	(MBT: 3 urban, 3 rural; Gasification: 4 urban, 2 rural)
16 MBT and 17 gasification facilities in Wales overall	*(17 new facilities if all MBTs are co-located with gasification facilities* *33 new facilities if no MBTs are co-located with gasification facilities)*
In Option 3C, there will be	
8 MBT and 4 incineration with energy recovery facilities in North Wales	(MBT: 2 urban, 6 rural, EfW: 1 urban, 3 rural)
7 MBT and 3 incineration with energy recovery facilities in South West Wales	(MBT: 3 urban, 4 rural, EfW: 1 urban, 2 rural)
8 MBT and 3 incineration with energy recovery facilities in South East Wales	(MBT: 5 urban, 3 rural, EfW =: 1 urban, 2 rural)
23 MBT and 10 incineration with energy recovery facilities in Wales overall	*(23 new facilities if all MBTs are co-located with incineration with energy recovery* *33 new facilities if no MBTs are co-located with incineration with energy recovery)*
In Option 3D, there will be	
5 MBT facilities with RDF to existing offsite energy users in North Wales	(1 urban, 4 rural)
5 MBT facilities with RDF to existing offsite energy users in South West Wales	(2 urban, 3 rural)
6 MBT facilities with RDF to existing offsite energy users in South East Wales	(3 urban, 3 rural)
16 MBT facilities in Wales overall	*(16 new facilities altogether)*
In Option 3E, there will be	
7 anaerobic digestion facilities in North Wales	(1 urban, 6 rural)
6 anaerobic digestion facilities in South West Wales	(2 urban, 4 rural)
6 anaerobic digestion facilities in South East Wales	(3 urban, 3 rural)
19 anaerobic digestion facilities in Wales overall	*(19 new facilities altogether)*
In Option 3F, there will be	
5 MBT facilities with the remainder going directly to landfill in North Wales	(1 urban, 4 rural)
5 MBT facilities with the remainder going directly to landfill in South West Wales	(2 urban, 3 rural)
6 MBT facilities with the remainder going directly to landfill in South East Wales	(4 urban, 2 rural)
16 MBT facilities with the remainder going directly to landfill in Wales overall	*(16 new facilities altogether)*

Table E1 continued (< means having fewer new facilities than)

In Option 4, there will be:	
Between 12 – 16 new residual waste treatment facilities across Wales as a whole	Option 4 D &E < Option 4C (Options 4A & B were not calculable)
In Option 4A & 4B, there will be	
Could not be calculated	
In Option 4C, there will be	
5 Autoclave and 2 incineration with energy recovery facilities in North Wales	(Autoclave: 2 urban, 3 rural; EfW: 0 urban, 2 rural)
4 Autoclave and 1 incineration with energy recovery facilities in South West Wales	(Autoclave: 2 urban, 2 rural; EfW: 0 urban, 1 rural)
3 Autoclave and 1 incineration with energy recovery facilities in South East Wales	(Autoclave: 1 urban, 2 rural; EfW: 0 urban, 1 rural)
12 Autoclave and 4 incineration with energy recovery facilities in Wales overall	*(12 new facilities if all autoclave facilities are co-located with incineration with energy recovery facilities* *16 new facilities if no autoclave facilities are co-located with incineration with energy recovery facilities)*
In Option 4D, there will be	
4 Autoclave facilities with RDF to existing offsite energy users in North Wales	(1 urban, 3 rural)
4 Autoclave facilities with RDF to existing offsite energy users in South West Wales	(2 urban, 2 rural)
4 Autoclave facilities with RDF to existing offsite energy users in South East Wales	(2 urban, 2 rural)
12 Autoclave with RDF to existing offsite energy users in Wales overall	*(12 new facilities altogether)*
In Option 4E, there will be	
4 Autoclave facilities with the remainder going directly to landfill in North Wales	(1 urban, 3 rural)
4 Autoclave facilities with the remainder going directly to landfill in South West Wales	(2 urban, 2 rural)
4 Autoclave facilities with the remainder going directly to landfill in South East Wales	(2 urban, 2 rural)
12 Autoclave with the remainder going directly to landfill in Wales overall	*(12 new facilities altogether)*

18 Appendix F

RWP Public Consultation feedback on the HIA and changes made to the final report

APPENDIX F

Strategic Health Impact Assessment Public Consultation Comments			
Respondent	**Paragraph**	**Comment**	**Action taken**
Public consultation	Did you find the Final Draft RWPR HIA Report and Summary useful in informing you about the potential positive and negative health impacts?	North (all figures below rounded to the nearest whole number) 58% Yes, useful 10% No, not useful 6% Didn't know 8% Did not know HIA was undertaken 17% Had not read it South West 49% Yes, useful 9% No, not useful 11% Didn't know 10% Did not know HIA was undertaken 21% Had not read it South East 45% Yes, useful % No, not useful % Don't know 14% Did not know HIA was undertaken 21% Had not read it Key comments concerning the length and complexity of the HIA and not enough information in relation emissions, particularly those into the atmosphere. One other concern was in relation to the HIA not being participatory enough. Comments were also made in relation further health assessment at local level.	Noted. The complexity of the Regional Waste Plans has made the HIA complex. Attempts have been made to balance length and readability with ensuring enough detail to provide transparency in how the assessment was undertaken. The use of diagrams and tables still requires explanatory text and some issues cannot be reduced to a table that is of a manageable size. Given that the size of the facilities has not been determined only general emissions figures have been provided in the Main Report. It was also considered that to reduce length the detailed findings of other review reports were not described and readers were referred to those documents. Every effort was made to ensure that at this strategic level the HIA was participatory through having a diverse steering group and contacting Public Directors and Environmental Health Officers at the draft stage. It would have been difficult to have further participation given that there was also going to be a formal public consultation on the RWP which was also part of the HIA process and comments have been incorporated into the draft HIA (see below). The need to consider health at local level is discussed in the HIA report.
	Do you have any health concerns regarding any specific options?	North 35% No concerns 27% Did have concerns 18% Did not have enough info 21% Didn't know	Noted. Monitoring is discussed in the Mitigation and Enhancement Chapter. The evidence to date strongly suggest the short and long term health impacts are small if facilities are well designed, well run and well regulated.

Strategic Health Impact Assessment Public Consultation Comments			
		South West 47% No concerns 15% Did have concerns 17% Did not have enough info 21% Didn't know South East 38% No concerns 22% Did have concerns 24% Did not have enough info 16% Didn't know Key concerns related to emissions particular from incineration options and the disposal of hazardous fly and bottom ash and the potential long term impacts. Comments also advised on the need for monitoring and regulation of facilities.	
	Do you have any health concerns regarding the waste treatment technology options?	North 37% No concerns 23% Did have concerns 17% Did not have enough info 23% Didn't know South West 40% No concerns 19% Did have concerns 14% Did not have enough info 28% Didn't know South East 37% No concerns 17% Did have concerns 15% Did not have enough info 31% Didn't know Similar concerns to previous questions in relation to	Noted.

Strategic Health Impact Assessment Public Consultation Comments			
		emissions, clarity of the comparisons, locating appropriately and monitoring emissions.	
	Were there any health issues that were not covered or poorly covered in the HIA Report & Summary?	This question is ambiguous because the No and Lack of info respondents are grouped together when they should be treated separately. There is also some ambiguity in relation to the yes or no answers. The assumption is that: Yes means: Yes there are (issues that are not covered or poorly covered in the HIA) No means: No there are not (issues that are not covered or poorly covered in the HIA) Given the responses to previous questions the above assumption is more likely to be correct however, it is still possible that some respondents meant the exact opposite. <u>North</u> 14% Yes 86% No/lack of info <u>South West</u> 11% Yes 89% No <u>South East</u> 14% Yes 86% No	Noted.
Cylch		The HIA appears to be fair	Noted.
Penhesgyn Action Group		Expressed concern that the HIA states in relation to	Noted

Strategic Health Impact Assessment Public Consultation Comments			
		Anaerobic Digestion, Mechanical Biological Treatment, Mechanical Heat Treatment , Autoclaving, Pyrolysis and Gasification that "Given the newness of the technology there is little research evidence to date on potential health and wellbeing impacts."	
Together Creating Community	Did you find the Final Draft RWPR HIA Report and Summary useful in informing you about the potential positive and negative health impacts?	The statement that, 'Well designed, well operated and properly regulated waste treatment facilities are likely to have mainly positive and little or no negative impacts on the overall health and well being…' greatly concerns us. From the research TCC has undertaken in its previous work on waste technology, we have yet to find any technology it that will have, 'mainly positive' impacts on overall health and well being. For example, the operations at Neath Port Talbot and the instances of incomplete combustion at Stoke-on-Trent show that the technology options lack reliable working models and the emissions are toxic. In the Consultation Document, the section on emissions effectively negates community concerns about waste treatment emissions, yet also states that there is little or no research on some types of emissions (e.g. PAH emissions, p.20). It is also recognized that there is little research and evidence on health impacts for those living near to large scale composting plants. Other than job creation, education and learning, we would question what exactly the positive health impacts of living near to any waste disposal technology site are.	Noted. Many of these issues have occurred as a result of poor operation and management. Noted. The HIA states throughout that community concerns and mental health and wellbeing are the most significant negatives that are likely to arise in any siting process. At a strategic national and regional level the sound management of waste in a sustainable manner is conducive to population health and wellbeing.
	Do you have any health concerns regarding any of the specific Options?	Yes. That, particularly in the section about emissions, it was acknowledged that little or no data exists regarding the health impacts of some of the technology Options. The inclusion of baseline health studies should be a requirement of planning approval for any of the Options.	Added. A sentence in the Mitigation and Enhancement Chapter on having a baseline health study. Point 11.3.1.5 in Main Report and NTS

Strategic Health Impact Assessment Public Consultation Comments			
		This would help with gaining and developing trust in such technologies amongst the local community. Where such studies have not been undertaken in the development of new facilities, there is nothing to allay local concerns about negative health impacts that are perceived as a direct consequence of that technology. For example, requests for baseline health studies in the area of Castle Cement, Flintshire, were turned down and as a result there is nothing to refute or support community concerns about perceived higher rates of cancer and thyroid problems. This clearly has serious implications about how the company and the technology it employs is received within the community.	
	Were there any health issues that were not covered, or poorly covered in the Final Draft RWP 1st Review HIA Report and Summary?	Yes. As per our answer to question 7. The need for baseline health studies were not covered at all.	Noted. See above.
NPHS		The difficulty in gaining a consensus on the debate about geographic fairness versus pollution reduction that could be achieved by the proximity principle is highlighted but this is something that warrants further discussion and the document would benefit from featuring this more explicitly throughout, in order to help inform local decision making.	Noted. This is an important issue however it may be better addressed within the RWP itself and in the National Waste Strategy (NWS) given that NWS develops thirteen key principles that should influence the development of waste management strategies. It is difficult to see how the HIA can in itself address this issue any further than highlight the tension.
		Regarding the various methods of waste management there seems to be a general lack of evidence quoted as to any risks to human health. Table C2 summarises risks from pollutants, but does not	Noted. This was an issue in keeping the size of the report manageable and the fact that there are already a considerable number of reviews on the health impacts of waste facilities. It was considered better to refer readers to these reviews directly than to quote in detail the findings of these reviews. Noted. Table C1 in Appendix C provides a list of the

Strategic Health Impact Assessment Public Consultation Comments			
		relate these to likely emissions from the different methods of disposal. For example, it would be useful see a summary table which lists emissions from the various processes in their likely proportions, how this compares with levels currently considered acceptable, and the likely effect on human health.	key pollutants by facility and their likely air emissions per tonne of waste. The issue of further tables – water and soil emissions - was considered for size reasons these were subsequently removed. The idea of a summary table is useful however there are practical difficulties as the size of table is likely to be quite large unless separate tables are created for each type of waste facility. There is also an issue of developing comparable emissions rates, given that the size of facilities is not yet known, in relation regulatory limits. Considerable descriptive notes on what the figures in the tables mean would also be required. Furthermore, it would also potentially change people's focus of the HIA. This HIA considers the Strategic Waste Management Options (SWMOs) and the Spatial Options as a whole and not individual waste treatment technologies and facilities per se (though they are embedded with the SWMOs). A summary table such as the one described would move people away from considering what the SWMO to a focus on individual technologies only without a consideration of the strategic dimension. It could also be easily taken out of context.
		Acceptable levels are constantly being revised downwards and there remains variation in the consensus on exposure levels considered safe for human health.	Noted. While regulatory limits can and do get revised downwards in light of new evidence there is good consensus on current regulatory limits and over recent years agencies like WHO and IARC have incorporated a precautionary approach in setting occupational and environmental limits which have fed into national emissions limits particularly in relation to waste facilities.
		The health impacts of the Strategic Waste Management and Spatial Options (section 5) are termed as minor, moderate and/or major in the non-technical summary with	Explanatory Criteria Table added to the Non-Technical Summary. This is a standard and established approach in HIA and other forms of Impact Assessment.

Strategic Health Impact Assessment Public Consultation Comments			
		no associated definitions being given for this term. The authors have provided clarity around this in the main report, but it may be better to quantify these terms in the summary document. In addition there are no weightings related to health impacts and we feel it is important that this should form part of the health impact assessment process and be agreed with consulted stakeholders, otherwise reliance on the use of minor, moderate and/or major is likely to dilute/over-simplify what is a complex decision making process.	Noted. This is an interesting point. However weighting by committee still faces the same flaw as the above qualitative categorisation in terms who decides and how and why. The qualitative criteria have been used in detailed Analysis tables which describe the complexity of the individual impacts and should be seen as linked to the analysis chapters in the main report. Notwithstanding that, it would be useful to have more details on exactly how such a weighting could be undertaken and which stakeholders should feed into such a process. This is something to be considered and discussed in any future HIAs of the RWPs.
		Whilst it is important to consider deprivation this does not always have the same distribution as health inequalities, which is ultimately the more important. For example, Powys is deprived in terms of access to services and amenities but its population has much better health than other parts of Wales.	Noted. It is arguable whether health inequalities is more important than deprivation. They are equally important indicators. Deprivation does encompass health inequalities by having a health status domain. Having said this as it is a composite high level index it may not fully reflect health inequalities. Deprivation is a good single proxy measure of health and wellbeing. Health inequalities have been added where the need to consider deprivation is mentioned in the report.
		With regard to health impacts, the HIA lists the usual nuisances but a reference to the unknown and more controversial suggested negative impacts, e.g. reproductive health, increased risk of a small excess of congenital anomalies, cancers and low birth-weight, should perhaps be acknowledged although we accept a cause effect relationship is yet to be proven.	This is already in the main report but has been added to the non-technical summary.
		Though this health impact assessment is useful, site specific HIAs will be necessary. This is a general problem with HIAs of wide ranging plans and strategies which usually turn out to be relatively positive, because the devil	Noted. This is a point highlighted in the main report and the NTS where further consideration of the health and wellbeing impacts is discussed.

Strategic Health Impact Assessment Public Consultation Comments			
		is in the detail. Agreeing on specific sites is likely to be much more difficult and this is where issues of health inequalities/disadvantage, risk perception will be crucial as will gaining a consensus on geographical fairness versus the advantages of proximity.	
	Specific Comments		
	Section 1 HIA	• Page 2, 1.1.9, in the last sentence it would be preferable to use the word 'address' rather than 'reduce'.	Amended
		• Page 5, Fig 2.2, yellow boxes As these boxes are all determinants of health, it seems inappropriate to include inequalities with social capital and social cohesion, as they can be very different issues. Inequalities are a separate determinant, as identified in the Whitehall Studies (sense of unfairness), Brunner (physiological effects of social hierarchies) and Wilkinson (unequal societies). In addition, with an aging population and the anticipated increase in chronic conditions and dementia in the older population there will be an increase in the number of informal carers in the population. It would be helpful to highlight this accordingly.	Amended Amended
		• Page 6, final bullet Unsure what 'it' refers to in the sense of this point. In the context of what has gone before, it must be either poverty of unemployment but needs clarification. • Page 6/7 On the topic of employment, there is a possibility that opportunities could decline as businesses may not wish to	Amended Specific statement in relation to waste has been removed. The chapter is about the wider determinants

Strategic Health Impact Assessment Public Consultation Comments			
		locate near a waste facility, either from the point of view of attracting employees or by the nature of business, e.g. food related.	generally without giving specific waste facility related examples.
		• Page 7, 2.2.3 We would challenge the statement that housing is "not directly relevant to waste issues". As stated later, construction work is likely to be an issue but factors such as indoor and immediate outdoor environment should be considered, including particulate pollution, spores from waste/processing, odours, noise, etc. all of which have a direct effect on an individuals housing: for example, householders may be unable to open windows or use their garden. 3rd bullet - Include "*people with chronic conditions such as cardiovascular or respiratory disease"*	Sentence removed. Amended
		• Page 8, 2.3.5, there needs to be a reference to the potential health effect of noise from increased traffic, and to the possible increase in traffic-related injuries, with the inclusion of safe pedestrian crossing sites as a mitigating factor.	Amended
		• Page 9, 2.3.6 Crime & safety 3rd bullet – another pathway is neighbourhood blight, whereby those who are most able move out of an undesirable neighbourhood, properties become difficult to sell/rent and the population becomes destabilised and lacking in social cohesion. 4th bullet – Mitigation should also involve measures that	Amended with some re-wording Amended

Strategic Health Impact Assessment Public Consultation Comments			
		encourage established communities to remain.	
		• Page 10, 2.3.8: suggest the title is changed to 'Social capital and *community* cohesion', as this better summarises the 'quality of social relationships and social networks' referred to. This would also mean amendments to the same phrase throughout the document	Amended throughout.
		• Page 10, 2.3.9.Environment Insert extra points as follows: > Households without a car may suffer disproportionately, as they are less able to leave the waste management vicinity for recreation > A development which is seen as unpleasant results in people leaving the area, lower property prices, and a more transient population who take less care of the neighbourhood, resulting in a downward spiral.	Added Added
	Section 2 - Methodology		
		• Page 13, 3.2.7 3rd bullet – insert "*black and minority ethnic people*" and lesbian, gay *"bisexual and transgender"* people. In addition we would support emphasis also being placed on Carers as a key population group in its own right. Alternatively the wording could be re-phrased as follows: 'people experiencing or at risk of discrimination, dis-advantage or particular vulnerability'.	Amended

Strategic Health Impact Assessment Public Consultation Comments			
		• Page 14 1st bullet – better to use physical *activity,* as this includes active lifestyle rather than exercise *per se*.	Amended
		3.2.8 Last bullet point needs to make reference to the impact of Climate Change.	
		3.2.9 In addition to considering the cumulative effects of co-location, the HIA also needs to consider cumulative effects on the area of other polluting industries, for example open-cast mining or steelworks in the vicinity.	Added in the mitigation and enhancement Chapter.
	Section 6 HI of Waste, SWMOs and waste facilities		
		• Page 29, 6.2.6 The statement that both are valid approaches has been superseded by events, where processes and emissions previously thought to be safe have been shown to endanger human health or where permitted emission levels have been revised downwards. It would therefore be better to lose the first part of the sentence and begin with “It becomes the responsibility”	Amended
		• Page 30, 6.3.3 The statements in this paragraph do not appear to be consistent with those in 3.2.16 (page 16) which suggested that that the researchers ‘used existing literature reviews …and where necessary undertook additional literature searches to ensure that the evidence base used to inform the assessment was up-to-date’.	Amended

Strategic Health Impact Assessment Public Consultation Comments			
		• Page 40 and onwards We would query the distinction between some direct and indirect negative impacts, for example odour (why a different category from gaseous emissions?), noise, fire and explosion (why a different category from adverse incident?) as they seem to be direct impacts.	Noted. This was an issue discussed with the Steering Group. The distinction is sometimes difficult to see but the aim is to highlight those potential impacts that directly affect physical health e.g. through harmful emissions from the facility itself and those indirect ones e.g. through noise and odour which while not directly harmful i.e. causing hearing loss or odorous but not leading to disease, have a more subtle effect via generally reducing quality of life and wellbeing i.e. to highlight the indirect and wider determinants of health and wellbeing and move non-health professionals from an understanding of good health as just the direct biophysical effects of emissions from the facility.
		This seems to be an Environmental Impact Assessment approach where easily measured emissions such as bio aerosols and soil deposits are given higher priority than noise, odour and nuisance, which can also have damaging impacts, especially on mental health and wellbeing. This probably needs further discussion.	Noted. Mental wellbeing is given a high priority in the report it is referred to as one of the most important impacts. The use of the phrase 'nuisance impacts' is not diminish its importance but to place it into context with other potential impacts that can more directly lead to injury, illness and death. Nuisance impacts are taken seriously both by Waste Authorities and the Environment Agency and are a material consideration.
		• Page 51, 6.17.3 The 9th bullet – health is not a separate concern but something that will be impacted upon by all other bullets points. It would therefore be better to remove health as a bullet point and change the first sentence as follows: "…that communities have about the *health and wellbeing impacts* of waste treatment facilities are:"	Amended however the first sentence has been re-worded differently from that recommended because while they are health and wellbeing concerns from a public health perspective this set of paragraphs is describing research that has explored community perspectives and this is what communities say when they are faced with a siting issue.
		• Page 52, 6.17.5 The 1st bullet - To say that "Communities tend to see themselves as less powerful" seems to be putting rather an unfair perspective on the issue. Communities *are* less	Noted. These are statements on the research findings in relation to community perspectives when they are faced with a siting issue.

Strategic Health Impact Assessment Public Consultation Comments			
		powerful because they don't have the finances or professional resources of large organisations. The 2nd bullet – The sentence "Communities see…as key values." seems rather misleading. Surely these should be key values for *everyone*, not just in the community's opinion. 3rd bullet – Similar point – why perceived	Small amended made in an earlier paragraph to emphasise these are findings from the research literature.
		4th bullet – '*At a social and cultural level waste is inherently seen as a negative and something that should be avoided'* – whist it is certainly the case that waste should be avoided where possible ('reduce'), it is 'waste materials' that are 'inherently negative'. This sentence needs to be clarified.	Amended 'inherently' removed. See point above.
		• Page 54 In general we observed no specific public health references quoted for various risk exposures.	Noted. This was an issue in keeping the size of the report manageable and the fact that there are already a considerable number of reviews on the health impacts of waste facilities. It was considered better to refer readers to these reviews directly than to quote in detail the findings of these reviews.
		6.18.5 "…children *seem to* face a significant…" – Delete *seem to.* It would be more accurate to refer to road traffic injuries rather than collisions, as collisions implies vehicles colliding with each other, whereas children are at greatest risk as pedestrians.	Amended.
		6.18.6 Aesthetics, quality of life, sense of place and economic impacts are all health determinants.	Noted. These are statements of the findings of environmental justice research.

Strategic Health Impact Assessment Public Consultation Comments			
		Positive impacts – employment. Forecasts of employment are often over estimates and jobs for local people are more likely to be unskilled.	Noted. This is considered in the detailed analysis tables in relation to good quality jobs that benefit local people.
		• Page 55, 6.19.1 Add to the end of the sentence (after 'management'): compared with a 'do nothing scenario'	Amended
		• Page 57, 6.19.10 Line 5 – After "used to collect and transport waste" insert "*potential for road traffic injuries"*	Amended
		• Page 57, 6.19.12 –To say "little or no negative impacts" may be over optimistic. Why not fewer?	Noted. Using the fewer' would invite the question of how few. The evidence points more strongly to little or no negative health impacts than fewer negative health impacts.
		• Page 57, 6.19.13 – second sentence – amend to 'Waste operations are monitored to ensure that they operate within the current legislative and regulatory guidelines with respect to human health and environmental issues.'	Amended
		Page 69, 7.2.35 Line 4 – These are major *types of injury* rather than "causes of injuries".	Amended
		Page 72, 7.3.5 Line 9 – "…heart disease in Neath Port Talbot." Add *"where the rate is higher."*	Amended
		"Premature deaths from road traffic injuries…" Delete "premature", as by their nature, RTA deaths are not	Amended

Strategic Health Impact Assessment Public Consultation Comments			
		classified as premature and non-premature.	
		Line 11 – "… in Neath Port Talbot and Swansea." Add *"where rates are higher."*	Amended
	Section 9 – Health impacts of SWMOs		
		This section needs to show how the assessments of minor, moderate and major have been arrived at for each option, or at the very least a summary table. Otherwise readers could view these assessments as value judgements by the authors. The use of the word 'therefore' also needs to be considered.	Summary tables in excel have been produced and will be an appendix of the main report because of their size. There is a strong element of expert judgement involved in linking the evidence base, to the potential impacts and their implications. 'Therefore' has been removed throughout.
		• Page 90, 9.2.3 – the potential for increased rents (from providing accommodation to construction workers) may mean that 'local people' find themselves unable to afford accommodation in their own area.	Housing effects point 9.2.10 in the potential negative health impacts has been added.
		• Page 93, 9.2.13 – suggest amending the heading to 'social capital and community cohesion effects' There may be some positive effect on social capital in *bonding* as residents combine to express concerns regarding a proposed site. There could also be increases in *linking* social capital as communities develop skills in dealing with local authorities, developers and other organisations.	Amended throughout. Noted. This is captured if not stated so explicitly. There needs to be some caution as the research literature suggests that this is a short term positive and over the long term as the process drags on it tends to becomes destructive of social capital as stress and anxiety take their toll on family and neighbour relationships.

Strategic Health Impact Assessment Public Consultation Comments			
		• Page 99 9.4.1 - This paragraph states that the HIA does not consider what development may follow decommissioning. This is absolutely crucial to community values: for example land use by another 'dirty' industry would have largely negative impacts, whereas decontamination and re-use for housing or leisure would be seen as positive. This has implications for the whole section on decommissioning, which cannot really provide any useful assessment if potential future use is not considered.	Noted. This is because this would begin assessment of the next cycle of planning, construction and operation of any new business/industry with its own set of health impacts. This is a difficult thing to predict given that the operational phase is likely to be 20-30 years by which time a whole new generation of people will have grown up and become residents of the local area and the local economy and neighbourhood will have changed considerably. The main aim of assessing this phase in the HIA was to highlight the importance of considering decommissioning during the design and planning stage to ensure that this influenced the final design and operation of the facility and its future decommissioning.
		9.4.2 Cleaning the site and improving the land on decommissioning should not be classified as a positive health and wellbeing impact as it is probably only restoring the *status quo ante,* i.e. it is restoring the land to its status before the waste development and could best be regarded as only neutral.	Noted. Given that decommissioning is likely to occur 20-30 years after a facility is commissioned the positive is in relation to the preceding 20-30 years when the facility was in operation.
		• Page 100, 9.4.8 - Negative impacts These effects will only occur if subsequent land use does not generate employment. Decommissioning itself could have a positive impact on the local economy as it could attract developments which would have not occurred in the vicinity of a waste management facility.	Noted. As stated above this would get into the next cycle of planning, construction and operation with its own set of health impacts. It is also difficult to predict whether the same people who lose their jobs will gain employment in any new businesses that opens up. It is likely that those with skills in the waste industry would be less able to take up jobs in non-waste related businesses. Therefore there would still be a potential negative in this regard though there may be wider community benefits should the waste facility be

Strategic Health Impact Assessment Public Consultation Comments			
			replaced by another type of business. More importantly this process is likely to take at least 1-2 year after decommissioning as planning permission and construction are undertaken. In the meantime all the people who lose their jobs will need to find employment.
	Section 11 Mitigation and enhancement measures		
		In general the statements in this chapter are 'recommendations' rather than 'measures'.	Noted. 'Measures' is preferred as the aim is to use these suggestions and create their own local recommendations for dealing with the development of new waste facilities.
		• Page 115, 11.1.4 – It is unclear as to who made the 'expert judgement'	Amended. The authors' expert judgement.
		• Page 115, 11.2.3 – The usefulness of developing a waste facility as a community or neighbourhood resource, particularly for access by children, is significantly compromised if it not 'in their back yard', as transport access may create a major barrier to the uptake of any facilities, however desirable. This 'enhancement opportunity' may be over optimistic.	Sentence added to that effect.
		• Page 118, 11.3.4.9 - Is voluntary siting a realistic option and on whose behalf would it be voluntary? A local authority may volunteer to take a facility, but the local community may still object.	Noted. The Facility Siting Credo has been developed over many years and is supported by most researchers/ practitioners dealing with siting issues. IT is difficult to do but not impossible and there are cases internationally where this has happened.
		• Page 119, 11.4.2.1 – The statement regarding the recruitment of local workers to 'reduce	Section added earlier in the Analysis chapter regarding the potential negative impacts on housing. Point 9.2.10

Strategic Health Impact Assessment Public Consultation Comments			
		pressure on local housing' is at odds with the potential for 'increased rents from providing accommodation to the construction workers who come from outside the local area of the site of a waste facility' that was cited in 9.2.3 (page 90) as a 'likely positive potential health impact'	
	Screening		
		Some of the possible impacts mentioned at the screening stage have not been mentioned in the main report, notably the potential for developing waterways which could decrease pollution and open up facilities for leisure use	Amended in mitigation and enhancement Chapter. Point 11.5.3.4
	Appendix 1		
		• Page 2, 1.1.9, in the last sentence it would be preferable to use the word 'address' rather than 'reduce' • Page 5, 1.1.9, fourth line down insert 'to' after 'Secondly' • Page 9, 2.3.6 Crime & safety, 2nd bullet – add "*and older people*" • Page 11, 3.1.5, makes reference to a list of members in chapter 8 – there is no list in this chapter; should it refer to Table 8.1, on page 20? (see also note below) • Page 15, Heading for Table 3.2 – capital C for 'Wales Centre for Health' • Page 15, 3.2.11 – add 'for Wales' after National Public Health Service	Amended Amended Amended Amended Amended Amended

Strategic Health Impact Assessment Public Consultation Comments			
		• Page 15, 3.2.12 - amend 'local Directors of Public Health' to 'local Public Health Directors'	Amended
		• Page 16, 3.2.12 – Chapter 8 does not appear to contain this feedback. However, it is referred to in 4.4.	Amended
		• Page 16, 3.2.15 – amend 'National Office of Statistics' to 'Office for National Statistics'	Amended
		• Page 12, 3.2.4, last sentence insert 'and what' after the word 'collect'	Amended
		• Page 15, 3.2.10, replace 'provided' with 'provides'	Amended
		• Page 20, 4.3.6 - amend 'local Directors of Public Health' to 'local Public Health Directors'	Amended
		• Page 20 – The Table is numbered '8.1' – should this be 4.1?	Amended
		• Page 23, 5.2.9 – delete 'how'.	Amended
		• Page 30 – footnote 19 spans two pages	Amended
		• Page 31, 6.4.2 – 'types' not 'typoes'	Amended
		• Page 32 – 6.5.1 – 'levels' not level	Amended
		• Page 33. 6.5.1, final bullet point – 'are', not 'is'	Amended
		• Page 33 – in footnote 34, which way up is an 'upside down triangle'?	Deleted

Strategic Health Impact Assessment Public Consultation Comments			
		• Page 34, 6.6.2 – insert ‘direct’, and link to footnote 39	Amended
		• Page 41, 6.11.2 – the details of reference 61 are to be missing in the footnote	Amended
		• Page 42, last line – add full stop after ‘recyclables’.	Amended
		• Page 51, 6.17.3 – ninth bullet point – ‘especially’ should be in full	Amended
		• Page 53, 6.18.2 – the details of reference 103 appear in a footnote on page 54	Amended
		• Page 86, footnote 129 is in a larger font than the others	Amended
		• Page 96, 9.3.8 – ‘transport and community effects’ should be underlined	Amended
		• Page 97, 9.3.9 – ‘lifestyle and daily routine effects’ should be underlined	Amended
		• Page 97, 9.3.11.1 – delete ‘Again, what about the front end’	Amended
		• Page 98, 9.3.12 – insert ‘which’ between ‘after’ and ‘any’	Amended used the word ‘maintain’
		• Page 103, top line –replace ‘at’ with ‘by’	Remains as health inequality added as a criterion alongside deprivation.
		• Page 109, 10.4.4 – the first sentence appears incomplete	Added

Strategic Health Impact Assessment Public Consultation Comments			
		• Page 115, 11.2.1 insert 'enhance' between 'they' and 'the' • Page 116, 11.2.5, 'criterion' not 'criteria' • Page 121 11.4.7.2 – Final sentence, add *(c) new green spaces should be as accessible as those that they replace.* • 11.5.3.1 – Insert *"Safe Routes to School should be protected."*	Added
Environment Agency Wales		The Health Impact Assessment document is very long, and it is unlikely that it will be widely read. Environment Agency Wales feels that there are two key messages that come from this work. The first is the need for the public to be made more familiar with the technologies, and for a comprehensive consultation process to be conducted. Open discussion often results in a more positive public opinion, reduced stress and anxiety and therefore improved public health. The second message is that facilities will be well designed, well operated and properly regulated, and as such are likely to have mainly positive and little or no negative impacts on overall health. As the regulator for waste management facilities, the Agency is charged with safeguarding the Regional Waste Plan 1st Review Consultation. Environment Agency survey response	Noted. There is a difficulty in being transparent about the analysis and show how it was arrived at versus keeping the report short.

Strategic Health Impact Assessment Public Consultation Comments			
		environment and human health through the permitting process and through regular monitoring and inspections.	
		The Agency is aware that there are concerns among some members of the public about waste management facilities, particularly incineration, and the effects of emissions on health. The Waste Incineration Directive sets very stringent limits on emissions from facilities that derive energy from waste. These limits are much tighter than those placed on facilities that generate energy from other sources, for instance gas or coal fired power stations. This fact should be made more widely known in order to raise public confidence in these facilities. By ensuring that we are effective regulators, the Agency can help with this issue.	Noted
		The issues were covered, but unfortunately the evidence base largely consists of reports of ill-health as a result of badly run facilities, or old style landfills that were operational before tight environmental legislation came into existence.	Noted