Councillors' Reference for

Waste & Resource Efficiency

A BREAKDOWN OF TERMS

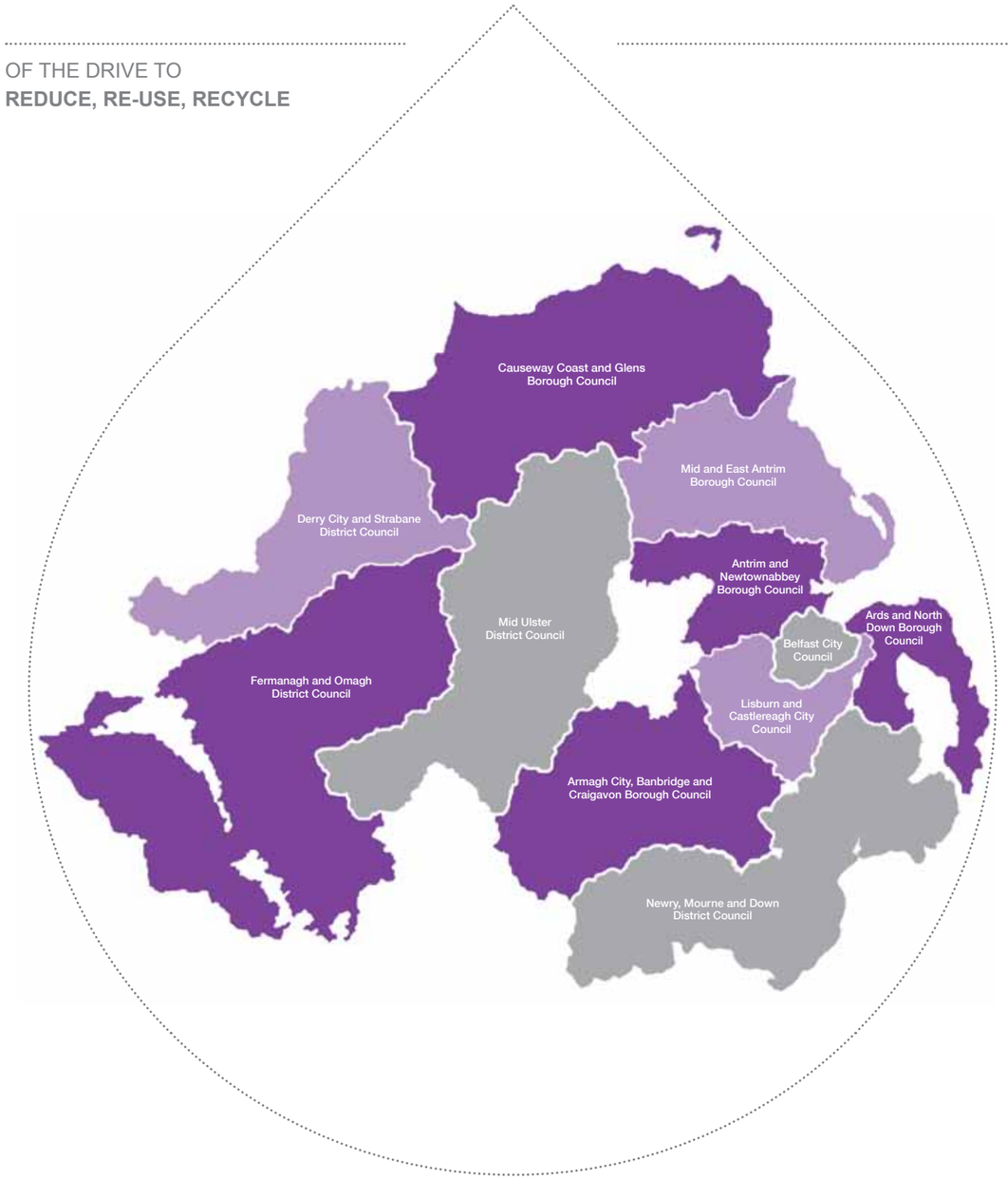
nilga northern ireland local government association

lgtg Local Government Training Group

NAC

We are at the forefront

OF THE DRIVE TO
REDUCE, RE-USE, RECYCLE



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THANKS

The President and members of the Northern Ireland Local Government Association would like to thank the following for their invaluable assistance in preparing this Guide:

Mr Ricky Burnett
Policy and Operations Director, arc21

Mr George Craig
Corporate Service Director, arc21

Dr Daniel Gaida
Department of Automation and Industrial IT, University of Applied Sciences, Cologne, Germany

Ms Linda Leahy
Local Government Staff Commission

:metabolon
Leppe Waste Disposal Centre, Germany

Mr Mark McAdoo
NI Representative, Executive of the Local Authority Recycling Advisory Committee
Head of Waste and Contract Management, Mid Ulster District Council

Mr Eamon Molloy
North West Region Waste Management Group

Mr John Quinn
President of the Chartered Institution of Wastes Management 2014-2015
Chief Executive, arc21

Mr Tim Walker
Head of Waste Management
Belfast City Council

Ms Rhiannon Williams
Brand and Design Manager
SITA UK

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National Association of Councillors
Local Government Training Group

KEY CONTACTS

in Waste Management - Northern Ireland, 2015

Arc 21
Belfast Castle, Antrim Road,
Belfast, BT15 5GR
T: 028 9072 6333
E: info@arc21.org.uk

Department of the Environment
Clarence Court, 10-18 Adelaide Street,
Belfast, BT2 8GB
T: 028 9054 0540
E: doe.internetteam@doeni.gov.uk

NILGA
Northern Ireland Local Government Association, 1 Bradford Court,
Castlereagh, Belfast, BT8 6RB
T: (028)90798972
E: k.smyth@nilga.org

Technical Advisers Group
T Walker, Belfast City Council, Cecil Ward Building, 4-10 Linenhall Street, Belfast, BT2 8BP
T: 028 9032 0202
E: walkert@belfastcity.gov.uk

North West Waste Management Group (NWRWMG)
C/o Derry City and Strabane District Council, 98 Strand Road,
Derry, BT48 7NN
T: 028 7137 0808
E: info@northwestwasteplan.org.uk

Waste Resources Action Programme (WRAP)
Regus House, 33 Clarendon Dock,
Laganside, Belfast, BT1 3BG
T: 028 9051 1518
E: keith.patterson@wrap.org.uk

FOREWORD

Welcome to the newly refreshed and contemporised Councillors' Waste Reference Guide (2015).

As local governments key spokesperson for waste, I am acutely aware of the challenges that the new local context presents to the waste sector. Moreover, I am excited by the opportunities that the new trajectory in resource efficiency presents. It is this new trajectory of the 'Circular Economy' that I would like to focus on during my tenure as key spokesperson.

The Circular Economy has evolved from an aspirational buzz term into a fully fledged direction of travel that can help us not only tackle unsustainable levels of waste but also seriously contribute to how we improve our economic and social well being prospects.

Moving towards a circular economy can promote competitiveness and innovation, a high level of protection for humans and the environment, and bring major economic benefits, thus contributing to job creation and growth. A circular economy advances sustainable development in which environmental, economic and social considerations align. It can also provide consumers with longer-lasting and innovative products that save them money and improve their quality of life.

A more circular economy means re-using, repairing, refurbishing and recycling existing materials and products. As a result, the term waste can be superseded and viewed purely in resource terms. The aim is to look beyond waste and close the loop of the circular economy. All resources need to be managed more efficiently throughout their life cycle.

Using resources more efficiently will bring new growth and job opportunities. The figures present an alluring proposition.

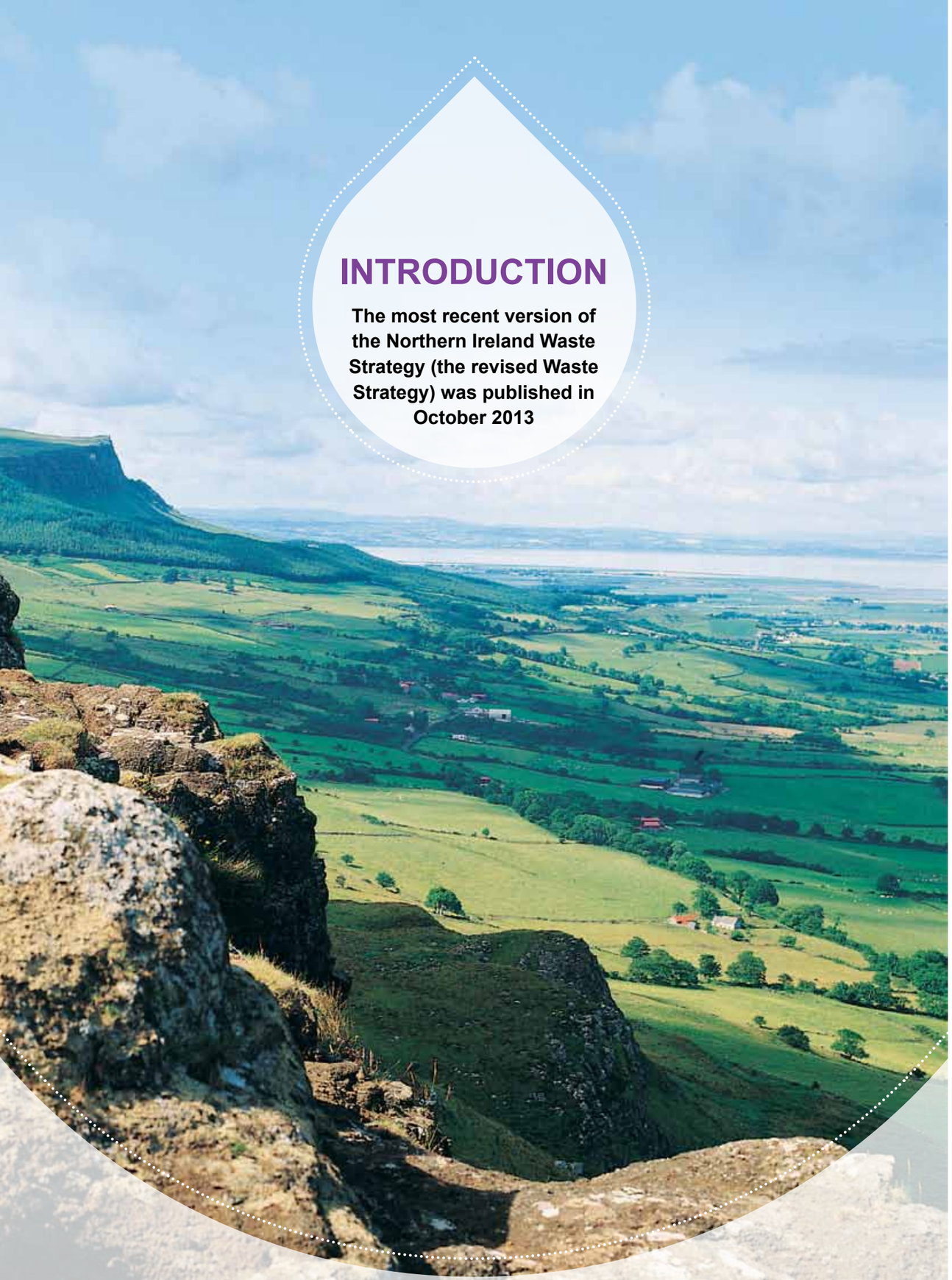
Better eco-design, waste prevention and reuse can bring net savings for EU businesses of up to EUR 600 billion, while also reducing total annual greenhouse emissions. Additional measures to increase resource productivity by 30% by 2030 could boost GDP by nearly 1% while creating 2 million jobs[1]. Such returns are too significant to ignore.

To realise these benefits, action is required at all stages in the value chain: from the extraction and transportation of raw materials, through material and product design, production distribution and consumption of goods, repair, remanufacturing and reuse schemes, to waste management and recycling.

Such an approach will require all economic actors across the product value chain to be engaged and taking measures aimed at closing the loop. I can assure that local government in Northern Ireland, for its part, will be doing all it can to help develop the local approach.

COUNCILLOR MERVYN REA
NILGA Waste Management Spokesperson

[1] **European Commission (2015) Moving Towards a Circular Economy:** http://ec.europa.eu/environment/circular-economy/index_en.htm



INTRODUCTION

The most recent version of the Northern Ireland Waste Strategy (the revised Waste Strategy) was published in October 2013

The most recent version of the Northern Ireland Waste Strategy (the revised Waste Strategy) was published in October 2013. During 2011 the Department of the Environment carried out a scoping exercise and it was agreed that the 2006 Strategy should be revised to cover all EU Directive requirements and provide a coherent approach to the waste policy framework for Northern Ireland. The revised Waste Strategy moves the emphasis of waste management from resource management to resource efficiency, with a new focus on waste prevention and recycling in accordance with the waste hierarchy.

The revised Waste Strategy follows the priority order for waste treatment set out in the Waste Hierarchy, a cornerstone of EU Waste policy and legislation, with Part 2 divided into seven sections containing policy measures that build on core principles of the 2006 Strategy. The Strategy has a renewed focus on waste prevention (including re-use), preparing for re-use, recycling, and moves the emphasis of waste management in Northern Ireland from resource management to resource efficiency i.e. using resources in the most efficient way while minimising the impact of their use on the environment.

Since the introduction of the first Waste Management Strategy in Northern Ireland in 2000, district councils have been at the forefront of the drive to reduce, reuse and recycle household waste produced in Northern Ireland, to ensure we make best use of our natural resources and that our waste management activities are sustainable.

A Councillors' Waste Management Reference Guide was originally developed in February 2008 in response to calls from NILGA members seeking a guide to the many acronyms surrounding the waste management agenda in relation to the work of local government.

It has since been agreed that this Guide requires updating and contemporising to reflect the shift and impact of waste policy emanating from Europe which moved from resource management to resource efficiency; and more recently the emergence of an emphasis of waste as a resource as a means of creating a circular economy. The Guide has also been updated to reflect the impact of local government reform.

Section 1 of this reference guide provides a contemporised and updated acronyms list covering a wide range of waste management related terms; the 'Waste and Resource Efficiency Acronyms' list.

Section 2 includes short descriptions for a number of key terms from the acronyms list and these definitions are compiled in a glossary. The updated and contemporised 'Glossary of Waste and Resource Efficiency Terms' can be found in Section 2 of this guide. Together, Sections 1 and 2 are intended as a reference for Councillors seeking a quick guide to the meaning of waste and resource efficiency acronyms and/or brief descriptions of key waste issues.

Section 3 outlines the policy context for tackling the waste agenda in Northern Ireland on the basis of local government reform and the expected changes to government department structures. Section 3 also considers legislation in the form of directives and regulations emerging from the EU and market forces that have resulted in waste becoming increasingly viewed as a resource.

Section 4 offers an updated overview of the various options available for dealing with municipal solid waste, drawing on information from a number of sources. This reference guide does not, however, make any recommendation in terms of which options should be adopted to treat municipal solid waste in Northern Ireland.

SECTION 1

Waste and Resource Management Acronyms

3Rs	Reduce, reuse and recycle
AA	Appropriate Assessment
ABPR	Animal By-Products Regulations
ACORD	Automotive Consortium on Recycling and Disposal
AD	Anaerobic Digestion
ADR	Accord European Relatif aux Transport International des Marchandises Dangereuses Par Route (European agreement concerning the international carriage of dangerous goods by road
AONB	Area of Outstanding Natural Beauty
APC	Air Pollution Control
APME	Association of Plastics Manufacturers in Europe
APSWG	Associate Parliamentary Sustainable Waste Management Group
ARC21	Arc21
ASSI	Area of Special Scientific Interest
ASSURE	Association for Sustainable Use and Recovery of Resources
ATF	Authorised Treatment Facility
ATT	Advanced Thermal Treatment
AWP	Area Waste Plan
BAT (NEEC)	Best Available Technique (Not Entailing Excessive Costs)
BATRRT	Best Available Treatment Recycling and Recovery Technology
BBMA	British Battery Manufacturer Association
BFR	Brominated flame retardent
BMF	British Metal Federation
BMW	Biodegradable Municipal Waste
BOD	Biological Oxygen Demand
BOO	Build Own Operate
BPEO	Best Practicable Environmental Option
BPF	British Plastics Federation
BRE	Building Research Establishment

BREW(p)	Business Resource Efficiency and Waste Programme
BRMA	British Rubber Manufacturers Association
BSI	British Standards Institute
BSI PAS 100	Composting specification
BSI PAS 101	Specification for recovered container glass
BSI PAS 102	Specification for processed glass for selected secondary end markets
BSI PAS 103	Specification for quality and guidance for good practice for the supply of post consumer wood consumption in the manufacture of panel board products
BSI PAS 105	Specification for paper waste
BVPI	Best Value Performance Indicator
C&D	Construction and Demolition (Waste)
C&I	Commercial and Industrial (Waste)
CA	Civic Amenity (site)
CAT	Cheapest Available Technology
CBI	Confederation of British Industry
CCL	Climate Change Levy
CCMA	County and City Manager's Association
CCT	Compulsory Competitive Tendering
CD&E	Construction, Demolition and Excavation
CEC	Commission of the European Communities
CEN	Committé Européen De Normalisation (European Committee for Standardisation)
CFC	Chlorofluorocarbon
CHP	Combined Heat and Power
CIPFA	Chartered Institute of Public Finance and Accountancy
CIWEM	Chartered Institution of Water and Environmental Management
CIWM	Chartered Institution of Waste Management
CLO	Compost Like Outputs
C02	Carbon Dioxide
CoD	Certificate of Destruction
COD	Chemical Oxygen Demand
COMAH	Control of Major Accident Hazards Regs (Repl. CIMAH 1984 Regs)
COPA	Control of Pollution Act 1974 (Control of Pollution (Amendment) Act 1989
COSHH	Control of Substances Hazardous to Health Regulations (2002) replaced (1999 Regs)
COSLA	Convention of Scottish Local Authorities
COTC	Certificate of Technical Competence
CPA	Comprehensive Performance Assessment
CRA	Chemical Recycling Association
cRDF	Coarse Refuse Derived Fuel
CRN	Community Recycling Network
CRT	Cathode ray tube
CSO	The Central Statistics Office
CSR	Corporate Social Responsibility
CUR	Connacht-Ulster Region
CV	Calorific Value
DARD	Department of Agriculture and Rural Development (NI)
DBFO	Design Build Finance Operate
DCAL	Department of Culture, Arts and Leisure (NI)
DCENR	The Department of Communications, Energy and Natural Resources

DCLG	Department of Communities and Local Government (England)
DDT	Dichlorodiphenyltrichloroethane
DE	Department for Education (NI)
DECLG	Department of the Environment, Community and Local Government (ROI)
DEFRA	Department for Environment, Food and Rural Affairs (England)
DEL	Department for Employment and Learning (NI)
DETE	Department for Enterprise, Trade & Employment (ROI)
DETI	Department for Enterprise, Trade and Investment (NI)
DFP	Department for Finance and Personnel (NI)
DG	Directorate General (EU)
DGXI	Director General of the European Commission responsible for the Environment
DH&C	Department of Health & Children (ROI)
DHSSPS	Department of Health, Social Services and Public Safety (NI)
DLO/DSO	Direct Labour Organisation/DirectService Organisation
DOC	Duty of Care
DoELG	Department of Environment, Heritage and Local Government (ROI)
DOE	Department of the Environment (NI)
DRD	Department for Regional Development (NI)
DRDF	Densified Refuse Derived Fuel
DRI	Dynamic Respiration Index
DSD	Department for Social Development (NI)
DTI	Department of Trade and Industry (England)
EA	Environment Agency (England and Wales)
EC	European Commission/Community
ECJ	European Court of Justice
EEA	European Environment Agency
EEC	European Economic Community
EEE	Electrical and electronic equipment
EFW	Energy from Waste
EHO	Environmental Health Officer
EHS	Environmental & Heritage Service (Northern Ireland)
EI	Enterprise Ireland
EIA	Environmental Impact Assessment
EIC	Essential Interim Capacity
EIS	Environmental Impact Statement
ELV	End of Life Vehicles (Directive 2000/53/EC) (Regs 2003)
EMAS	Eco-Management and Audit Scheme
EMS	Environmental Management System
ENCAMS	Environmental Campaigns (Umbrella name for former Going Green and Tidy Britain Group)
ENFO	Environmental Information Service (ROI)
ENTRUST	The European Trust Scheme Regulatory Body
EOW	End of Waste
EPA	Environmental Protection Act (1990)
EPA	Environmental Protection Agency
EPS	Expanded Polystyrene
EPR	Extended Producer Responsibility
EQS	Environmental Quality Standards

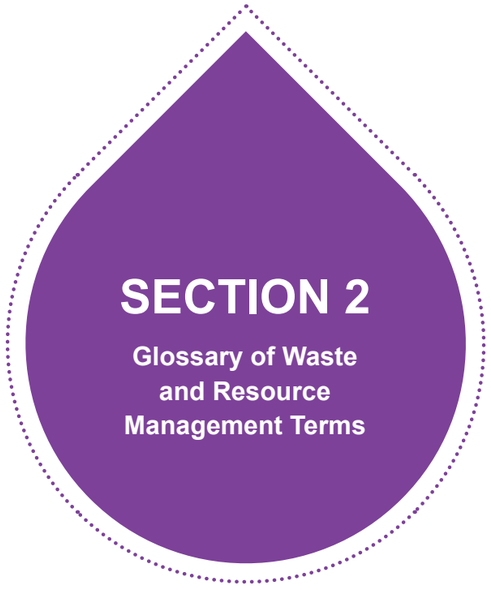
ERP	European Recycling Platform
ES	Environmental Statement
ESA	Environmental Services Association (Northern Ireland ESA, Welsh ESA, Scottish ESA - NIESA, WESA, SESA
ESART	Environmental Services Association Research Trust
ESRI	The Economic and Social Research Institute
ETBPP	Environmental Technology Best Practice Programme
ETSU	Energy Technology Support Unit
EU	European Union
EWC	European Waste Catalogue
EWWR	European Week of Waste Reduction
FBT	Fluidised Bed Technology
FEL	Front end loader
FOE	Friends of the Earth
FORWARD	Forum for Waste and Resource Research and Development
FRAG	Fragmentised Waste (from the motor trade industry)
FSC	Forestry Stewardship Council
FRN	Furniture Recycling Network
FTE	Full Time Equivalent
GAP	Global Action Plan
GDP	Gross Domestic Product
GHCP	Green Healthcare Programme
GIS	Geographical Information System
GPP	Green Public Procurement
HCFC	Hydrochlorofluorocarbons
HCW	Healthcare Waste
HDPE	High-density-polyethlene
HFC	Hydrofluorocarbon
HHW	Household Hazardous Waste
HSE	Health & Safety Executive
HWRA	Household Waste Recycling Act (2003)
HRC	Household Recycling Centre
IAS	Invasive Alien Species
IBA	Incinerator Bottom Ash
IBEC	Irish Business Employers Confederation
ICE	Institute of Civil Engineers
ICER	Industry Council for Electronic Equipment Recycling
IDA	Industrial Development Agency
IED	Industrial Emissions Directive
IFI	Inland Fisheries Ireland
IMT	Institute of Municipal Transport
INCPEN	Industry Council for Packaging and the Environment
IPC	Integrated Pollution Control
IPP	Integrated Product Policy
IPPC	Integrated Pollution Prevention and Control Directive
ISO	International Standards Organisation
ISWA	International Solid Waste Association
IVC	In-vessel Compositing

IWM	Integrated Waste Management
KAT	Kerbside Assessment Tool
KPI	Key Performance Indicator
LAAPC	Local Authority Air Pollution Control
LACORS	Local Authority Co-ordinating Body on Regulatory Standards
LACMW	Local Authority Collected Municipal Waste
LAPC	Local Air Pollution Control
LAPD	Local Authority Prevention Demonstration
LAPN	Local Authority Prevention Network
LARAC	Local Authority Recycling Advisory Committee
LATS	Landfill Allowance Trading Scheme
LAWDC	Local Authority Waste Disposal Company
LCA	Life Cycle Assessment
LCPD	Large Combustion Plans Directive (2001/80/EC)
LDPE	Low Density Polyethylene
LEL	Lower Explosive Limit
LFD	Landfill Directive (199/31/EC)
LFG	Landfill Gas
LGA	Local Government Association (England)
LPG	Liquefied Petroleum Gas
LPSA	Local Public Service Agreement
LTCS	Landfill Tax Credit Scheme
MBT	Mechanical Biological Treatment
MCDA	Multi Criteria Decision Analysis
MDF	Medium-density fibreboard
MDR	Mixed Dry Recylables
MEL	Maximum Exposure Limit
ME	Material efficiency
MFA	Materials Flow Analysis
MHSWR	Management of Health & Safety at Work Regulations 1999
MoD	Ministry of Defence
MPA	Mineral Planning Authority
MRF	Materials Recovery Facility
MRW	Materials Recycling Week
MSW	Municipal Solid Waste
Mt	Million Tonnes
MT/AD	Mechanical Treatment/Anaerobic Digestion
MW	Megawatt
NACE	Nomenclature générale des activités économiques dans l'Union Européenne (general name for economic activities in the European Union)
NAWDO	National Association of Waste Disposal Officers
NDP	National Development Plan
NFFO	Non Fossil Fuel Obligation
NGO	Non-governmental Organisation
NHA	National Heritage Area
NHHWF	National Household Hazardous Waste Forum
NHS	National Health Service
NHWMP	National Hazardous Waste Management Plan

NiCd	Nickel-cadmium (battery)
NIEA	Northern Ireland Environment Agency
NIECE	Network for Ireland's Environmental Compliance and Enforcement
NILAS	Northern Ireland Landfill Allowance Scheme
NILGA	Northern Ireland Local Government Association
NIMBY	"Not in my back yard"
NISP	National Industrial Symbiosis Programme
NISRA	Northern Ireland Statistics and Research Agency
NOF	New Opportunities Fund
NPWS	National Parks and Wildlife Service
NRF	National Recycling Forum
NRWF	National Resources and Waste Forum
NSBW	National Strategy on Biodegradable Waste
NSS	National Spatial Strategy
NTDP	New Technologies Demonstrator Programme
NVQ	National Vocational Qualification
NWAI	National Waste Awareness Initiative
NWMRF	National Waste Minimisation Recycling Fund
NWP	National Waste Plan (Scotland)
NWPP	National Waste Prevention Programme
NWR	National Waste Report
NWRWMG	North West Region Waste Management Group
ODS	Ozone Depleting Substance
OECD	Organisation for Economic Co-operation Development
OFMDFM	Office for First Minister and Deputy First Minister
OJEU	Official Journal of the European Union
OPRA	Operator Pollution Risk Appraisal
ORA	Oil Recycling Association
OSNI	Ordnance Survey of Northern Ireland
PAH	Polycyclic aromatic hydrocarbons
PAS	Publicly Available Specification
PCB	Polychlorinated Biphenyl (s)
PDSU (SG)	Programme Delivery Support Unit (Steering Group)
PE	Polyethylene
PEPG	Planning and Environmental Policy Group
PERN	Packaging Waste Export Recovery Note
PET	Polyethylene Terephthalate
PFI	Private Finance Initiative
PIU	Performance and Innovation Unit
PM	Particulate Matter (e.g. PM 10 particles under 10 microns)
POP's	Persistent organic pollutants
PP	Polypropylene
PPC	Pollution Prevention and Control Act (1999) (Regulations 2000) beware many amendments after 2000.
PPE	Personal Protective Equipment
PPG	Planning Policy Guidance (UK government)
PPP	Public Private Partnership
PPS	Planning Policy Statement (NI Planning Service

PR	Producer Responsibility
PRN	Packaging Recovery Note
PRO	Producer Responsibility Operator
PS	Polystyrene
PSA	Public Service Agreement
PVC	Polyvinyl Chloride
QMS	Quality Management Systems
QUANGO	Quasi Autonomous Non-Governmental Organisation
RAGS	Recycling Advisory Group, Scotland
RCE	Regional Centre of Excellence
RCV	Refuse Collection Vehicle
RDA	Regional Development Agencies
RDF	Refuse Derived Fuel
RDS	Regional Development Strategy
ReBAT	An organisation set up under the BBMA to encourage the collection of rechargeable batteries
RECOUP	Recycling of Used Plastics
REL	Rear End Loader
REMADE	Recycled Market Development
ReNew	Resource innovation Network for European Waste
REPAC	Regional Environmental Protection Advisory Committee
RFID	Radio Frequency Identification Tags
RIA	Regulatory Impact Assessment
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
RIDDOR	Reporting Injuries, Diseases and Dangerous Occurrences Regulations 1995
RMCEI	Recommendation on Minimum Criteria for Environmental Inspections
ROC	Renewables Obligation Certificate
RoHS	Restricting of Hazardous Substances in product manufacture
RoRo	Roll-on-Roll-off, demountable container system
RPGs	Regional Planning Guidelines
RWMP	Regional Waste Management Plan
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SEPA	Scottish Environmental Protection Agency
SI	Statutory Instrument
SIDs	Strategic Infrastructure Developments
SLF	Secondary Liquid Fuel
SME	Small to medium size enterprise
SMM	Sustainable Materials Management
SMMT	Society of Motor Manufacturers and Traders
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SocEnv	Society for the Environment
SPA	Special Protection Area
SPG	Strategic Planning Guidance
SPPS	Strategic Planning Policy Statement
SRF	Solid Recoverable Fuel
SRI	Static Respiration Index
SSA	Standard Spending Assessment

SSC	Sector Skills Council
SSSI	Site of Special Scientific Interest
SWAG	Scottish Waste Advisory Group
SWaMP	Southern Waste Management Partnership
SWB	Strategic Waste Board (NI)
SWF	Strategic Waste Fund (Scotland)
SWM	Sustainable Waste Management
TAG	Technical Advisors Group
TAN	Technical Advice Note (Wales)
TFS	Trans Frontier Shipment
Teep	Technically, Environmentally and Economically Practicable
Tpa	Tonnes per annum
TSN	Targeting Social Need
UEL	Upper Explosive Limit
UNECE	United Nations Economic Committee for Europe
UNEP	United Nations Environment Programme
UVB	Ultraviolet B radiation.
VCU	Vertical Composting Units
VM	Value Management
VOC	Volatile Organic Compound
VRQ	Vocationally Related Qualification
WAC	Waste Acceptance Criteria/Waste Awareness Certificate
WAMITAB	Waste Management Industry Training & Advisory Board
WCA	Waste Collection Authority
WDA	Waste Disposal Authority
WEEE	Waste Electrical and Electronic Directive (2002/96/EC) amendments transposed to UK law 13/08/04)
WET	Waste and Emissions Trading Act (2003)
WFD	Waste Framework Directive 75/442/EEC Revised Waste Framework Directive (2008/98/EC)
WHO	World Health Organisation
WID	Waste Incineration Directive (2006/76/EC)
WIP	Waste Implementation Programme
WISARD	Waste integrated Systems Assessment for Recovery and Disposal
WLAS	Wrap Local Government Support
WLGA	Welsh Local Government Association
WML	Waste Management Licence
WPA	Waste Planning Authority
WPB	Waste Programme Board
WPSG	Waste Programme Steering Group
WRA	Waste Regulation Authority
WRAP	Waste and Resources Action Programme
WtE	Waste-to-energy
WTP	Water Treatment Plant
WWG	Waste Working Group
WWTW	Waste water treatment works



Advanced Thermal Treatment (ATT)
A generic term often used to described two main forms of thermal treatment-gasification and pyrolysis.

Aerobic Compositing
The biological decomposition of biowaste in the absence of oxygen and under controlled conditions in order to produce biogas and digestate.

Agricultural waste
A general term used to cover animal excreta, litter, straw, waste, carcasses and silage liquors.

Anaerobic Digestion (AD)
Anaerobic digestion is the biological decomposition and stabilisation of organic material in the absence of oxygen and under controlled conditions which produces methane, carbon dioxide, hydrogen sulphide and a digestable. It results, either directly or after subsequent aerobic treatment, in a final product that has been sanitised and stabilised, is high in humic substances and can be used as a soil improver, as an ingredient in growing media, or blended to produce a top soil that will meet British Standard BS 3882, incorporating amendment No.1.

Animal By-products Regulations (ABPR)
Regulations that prescribe how certain organic materials should be treated. Places restrictions on the use of some composts.

Aquifer
A subsurface zone of formation of rock that contains exploitable resources of ground water.

arc 21
arc21 was originally incorporated and established in 2003, after a gradual process of closer co-operation between its councils. arc21 works on behalf of its member councils to guide, support and help them meet their legal requirements and drive forward innovative waste management programmes. arc21's work is governed by a legally binding collaborative agreement between all of its councils.

Area of Outstanding Natural Beauty (AONB)
A landscape recognised as being of distinctive character and special scenic value.

Area of Special Scientific Interest (ASSI)
Identified by scientific surveying as being an area of the highest degree of conservation value.

Ash
The non-combustible solid by-products of incineration or other burning process.

Backfilling
Recovery of C&D waste through the permanent placement of suitable material in land reclamation or for engineering purposes where the waste is a substitute for non-waste material.

Baghouse
A combustion plant emission control device that consists of an array of fabric filters through which flue gases pass in an incinerator flue. Particles are trapped and thus prevented from passing into the atmosphere.

Basel Convention
An international agreement on the control of trans-boundary movements of hazardous wastes and their disposal, drawn up in March 1989 in Basel, Switzerland, with over 100 countries as signatories

Best Available Techniques (BAT)
The most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and impact on the environment as a whole.

Best Value Performance indicator (BVPI)
A range of performance indicators specified by central government for measuring the performance of local authorities.

Biodegradable content
The percentage content of waste which is biodegradable. For municipal waste in Northern Ireland this is estimated to be 64%.

Biodegradable material
Any organic material that can be broken down by microorganisms into simpler, more stable compounds. Most organic wastes (e.g. food, paper) are biodegradable.

Biodegradable Municipal Waste
Municipal waste that is capable of undergoing anaerobic or aerobic decomposition, such as food garden waste, paper and paperboard.

Biological Treatment
Involves composting, anaerobic digestion, mechanical-biological treatment or any other process for stabilising and sanitising biodegradable.

Biowaste
Source segregated household or commercial waste of an organic or putrescible character, such as food or garden waste.

Bottom ash (Ash and Fly Ash)
Relatively coarse, non-combustible, generally toxic residue of incineration that accumulates on the grate of a furnace.

Bring Banks
These are facilities in which members of the public deposit recyclable waste materials such as glass, metals and plastics in material specific receptacles for subsequent collection and delivery to material recovery facilities.

Capture Rate
The percentage of the available material in the waste that people participating in a recycling scheme separate for kerbside collection. For example, if there is 10kg of paper in the waste stream and 5kg is separated for recycling, this represents a 50% capture rate.

Cell
The basis unit by which a landfill site is developed. It is the general area where incoming waste is tipped, spread, compacted and covered.

Central Composting Facility
A facility at which the biowaste is delivered to be processed by composting into a compost product - this can be for garden waste, selected food waste or a combination of both materials.

Circular Economy (Industrial Ecology, Green Tech, Biomimicry)
A circular economy means re-using, repairing, refurbishing and recycling existing materials and products. What used to be regarded as ‘waste’ can be turned into a resource. The aim is to look beyond waste and to close the loop of the circular economy. All resources need to be managed more efficiently during their life cycle.

Civic Amenity (CA) Site (also called Household Recycling Centres)
A reception facility that enables householders to deposit a wide range of household waste including recyclable and non-recyclable materials, bulky household waste and certain categories of household hazardous waste. Sites are provided by local authorities for the disposal of excess household and garden waste free of charge, as required by Section 51(1)(b) of the Environmental Protection Act 1990/ Refuse Disposal (Amenity) Act 1978 / Pollution Control and Local Government (Northern Ireland) Order 1978.

Cleaner production
Processes designed to reduce the waste generated by production.

Clinical waste
Any waste which consists wholly or partly of human or animal tissue, blood or other bodily fluids, excretions, drugs, or other pharmaceutical products, swabs or dressing, or syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous to any person coming in contact with it.

Co-disposal
The disposal of different types of waste in one area of a landfill or dump. For instance, sewage sludges may be disposed of with regular solid wastes.

Co-Incineration
Involves plants where waste is used as a regular or additional fuel, or is disposed of at a plant along with other substances, where energy generation or production of material products may take place (e.g. Cement Works)

Co-mingled materials
Dry recyclables Wastes collected in a mixed form that are destined for recycling after further sorting.

Collection
The process of picking up wastes from residences, businesses, or a collection point, loading them into a vehicle, and transporting them to a processing, transfer, or disposal site.

Collection System
A system of gathering, sorting or mixing of waste for the purpose of it being transported to a waste recovery or disposal facility.

Combined heat and Power (CHP)
Facilities in which waste is combusted to produce heat for domestic or industrial purposes in addition to the generation of electricity.

Combustion
Burnable materials in the waste stream, including paper, plastics, wood and food and garden waste.

Commercial Waste
Waste from premises used wholly or mainly for the purposes of trade or business, recreation or entertainment, excluding household waste, mines, quarries and agricultural waste.

Communal Collection
A system of collection in which individuals bring their waste directly to a central point, from which it is collected.

Community Composting Facilities
Facilities set for the composting of bio-waste by a group of people in a locality with the aim of composting their own and other people's bio-waste in order to manage the supplied bio-waste as close as possible to the point at which it was produced.

Compliance Scheme
Non-profit producer responsibility scheme that takes on the obligations of its producer members for the collection, treatment and recycling of Producer Responsibility Initiative waste.

Composite liner
A liner system for a land-fill consisting of an engineered soil layer and a synthetic sheet of material.

Compost
The stable, sanitised and humus-like material, rich in organic matter and free from malodours, resulting from the composting process of separately collected bio-waste

Compost Quality Standards
A set of industry technical standards, which may be statutory in nature, and which are designed to safeguard against potentially harmful aspects of compost production and use, thereby resulting in high quality compost protecting the environment and human health.

Composting
The degradation of organic wastes in the presence of oxygen to produce fertiliser or soil conditioner.

Construction and demolition (C&D) Waste
All waste that arises from construction and demolition activities (including excavated soil from contaminated sites). These wastes are listed in chapter 17 of the European waste catalogue (EWC).

Containment site
Landfill site where the rate of release if leachate into the environment is extremely low. Polluting components in waste are retained within such landfills for such sufficient time to allow biodegradation and attenuation processes to have occurred; thus preventing the escape of polluting species at unacceptable concentration.

Contamination
The presence of a material or materials in another substance to such a degree as to render it unfit for its intended purpose.

Contracting
The waste management groups were established to procure waste management treatment services and waste management supply services, on behalf of their constituent councils. IN doing so, the waste management groups will either contract directly with waste management contractors as is the case with arc21, or the constituent councils will enter into contracts directly with waste management contractors and not through waste management groups.

Curing
Allowing partially composted materials to sit in a pile for a specified period of time as part of the maturing process in composting.

Decomposition
Breakdown of matter into more simple molecules. Decomposition may be caused by physical, chemical or micro-biological action

"Delivering Resource Efficiency"
The 2006 Strategy 'Towards Waste Management' was revised during 2011 to cover all relevant EU Directive requirements and provide a coherent approach to the waste policy framework for Northern Ireland. A revised Strategy was published in October 2013. The revised Strategy moves the emphasis of waste management from resource management to resource efficiency, with a new focus on waste prevention and recycling in accordance with the waste hierarchy. The Revised 'Delivering Resource Efficiency' Strategy was published in October 2013.

Digestate
The material resulting from the anaerobic digestion of biowaste.

Disposal
Any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substance or energy. Annex 1 of the Waste Framework Directive (Directive 2008/98/EC) sets out a non-exhaustive list of disposal operations.

Diversion rate
The proportion of waste material diverted from recycling, composting, or reuse and away from land-filling or incineration.

Domestic waste
Waste which comes from homes - also known as household waste

Drop-off Centre (aka HRC)
An area or facility for receiving compostable or recyclable waste deposited by waste generators.

DUMP
Disposal of unwanted medicines.

Eco-labelling
The provision of environmental and /or financial information on products, detailing for example whole life costs, emissions and wastes created during manufacture.

Ecology
The scientific study of the relationship between living organisms and their surroundings.

Emission
A material which is expelled or released into the environment. Usually applied to gaseous or odorous discharges to atmosphere.

End of Life Vehicles (ELVs)
Vehicles which have reached the end of their useful lives, either because of old age or due to accident. This waste is a priority EC waste stream and principally regulated by The End-of-Life Vehicles Directive (2000/53/EC) which came into force in the UK in November 2003.

Energy from Waste (EfW, aka CHP, thermal Treatment)
Processes whereby energy may be recovered from waste. This may be achieved in three main ways: incineration (burning waste), via methane recovery from landfill, and via controlled anaerobic digestion. (See Anaerobic Decomposition, page 74). In all three cases, the resultant energy can be used to create power, heat or combined heat and power. Also known as energy from waste.

Environmental Impact
The total effect of any operation on the surrounding environment.

Environmental Impact Assessment (EIA)
An evaluation designed to identify and predict the impact of an action or a project on the environment and human health and well-being. Can include risk assessment, typically evaluating the probabilities and magnitudes of harm that could come from environmental contaminants.

Environmental Statement
Information about the likely effects of a proposed development submitted by an applicant for planning permission so that the planning authority is able to make an environmental assessment.

European Waste Catalogue (EWC)
Now known as the List of Waste (LoW), this is a list of all waste types

Extended Producer Responsibility
A policy that encourages producers to consider the lifecycle of their products at the design stage, by widening their responsibility for the products they create to include their post-consumer end-of-life.

Fabric filter
See baghouse.

Flaring
The burning of methane emitted from collection pipes at a landfill

Fly ash
The highly toxic particulate matter captured from the flue gas incinerator by the air pollution control system.

Fly-tipping
The illegal dumping of rubbish in unauthorised places.

Gasification Plant
Facility for the production of combustible gas from waste.

Government Contracts Committee
The Committee assists the Department of Finance in formulating overall policy on public procurement. It is made up of senior officials in the higher spending Departments and is chaired by a Department of Finance representative. The committee also adjudicates on contracts.

Green Purchasing
Exercising environmental awareness in the choice of products and the buying of environmentally sustainable products.

Green/Organic Waste
Biodegradable material such as garden and kitchen waste. This may also include other compostables such as cardboard if collected as part of a composting collection scheme.

Greenhouse Gases
Gases that absorb heat and contribute to the warming of the Earth's atmosphere (the 'greenhouse effect'). Examples of greenhouse gases include water vapour, carbon dioxide and methane.

Groundwater
Water beneath the earth's surface that fills underground pockets (known as aquifers), supplying wells and springs.

Hazardous Waste
Waste is considered 'hazardous' when it contains substances or has properties that might make it harmful to human health or the environment. This does not necessarily mean it is an immediate risk to human health, although some waste can be.

Healthcare Waste
The term 'healthcare waste' is used to describe all waste resulting from healthcare activity. It includes waste which falls within the statutory definition of clinical waste and other non-clinical waste.

Heavy metals
Metals of high atomic weight and density, such as mercury, lead, and cadmium that are toxic to living organisms.

Home Composting
A process whereby biowaste is composted and used in gardens belonging to private households.

Household Clinical Waste
Waste arising within the household waste stream that falls within the definition of clinical under The Controlled Waste Regulations 1992/The Controlled Waste Regulations (Northern Ireland) 2002 para.2.

Household Hazardous Waste
Waste arising within the household waste stream that is classified as Hazardous under EC Directive 91/689/ECC (7). Examples of Household Hazardous Wastes include: asbestos waste, batteries, fluorescent light tubes, garden and household chemicals, medicines, oils, paints, glues and varnishes, paint thinners and removers, refrigeration equipment and smoke detectors.

Household Waste
Waste arising from a domestic property or waste of similar composition from other properties such as residential homes or hospitals.

Household Waste Managed
Sum of the household waste collected at kerbside and the non-kerbside household waste collected.

Humic
Substances which are highly abundant organic compounds formed in soils and sediments by the decay of dead plants, microbes and animals.

Incineration
The process of burning solid waste under controlled conditions to reduce its weight and volume, and often to produce energy. Thermal treatment of waste in an incineration plant as defined in Article 3 (4) of Directive 200/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste. Types of Incineration include: Fluidized-bed incinerator, Moving grate incinerator both types of Mass burn incinerator.

Industrial Symbiosis
Industrial symbiosis is an association between two or more industrial facilities or companies in which the wastes or by-products of one become the raw materials for another.

Industrial symbiosis can help companies:
- Reduce raw material and waste disposal costs
- Earn new revenue from residues and by-products
- Divert waste from landfill and reduce carbon emissions
- Open up new business opportunities

As in the natural world, this type of industrial synergy brings advantages to both parties, and is usually done for both commercial and environmental reasons.

Industrial Waste
Waste produced or arising from manufacturing or other industrial activities or processes.

Inert Waste
Inactive or un-reactive waste. Contains no organic or biodegradable materials.

Inorganic waste
Waste composed of material other than plant or animal matter such as sand, dust, glass and many synthetics.

Integrated Pollution Prevention and Control (IPPC)
A regulatory system introduced in accordance with EU Directive 96/61/EC which is designed to exercise control over releases of waste to air, water and land with the aim of achieving the best practicable environmental option.

Integrated solid waste management
Coordinated use of a set of waste management methods, each of which can play a role in an overall municipal solid waste management plan.

Integrated Waste Management Facility (IWMF)
A license that combines a landfill and other waste infrastructure such as civic amenity site, transfer station, composting or other treatment facilities.

In-vessel Composting
The composting of biowaste in a closed reactor where the composting process is accelerated by controlled and optimised air exchange, water content and temperature control.

IPPC Licence
Legal processes, by which large industrial processes are licensed and regulated, refers specifically to the requirements of the European Commission's IPPC (integrated pollution prevention and control) Directive (96/61/EC) top provide protection of the environment and the protection of human, animal and plant life from harm or nuisance from certain industrial activity.

Joint Committee Incorporated
A Joint Committee which is incorporated has the power to enter into contracts directly with the waste management contractors and manage the contract until completion or until the end of its life.

Joint Venture
A partnership, involving a local authority (or authorities) and a private community sector organisation.

Kerbside collection
Collection of compostables, recyclables, or rubbish from in front of a residence or shop.

Landfill
The engineered practice of depositing waste into or onto land which will be restored at the end of its life to provide land for alternative use in accordance with the definitions contained within the relevant national legislation and guidance implementing Landfill of Waste Directive (1999/31/EC)

Landfill Directive
An EU Directive which aims, by means of stringent operational and technical requirements on the landfilling of waste, to implement measures, procedures and guidance to prevent, or reduce as far as possible, negative effects on the environment; in particular the pollution of surface water, groundwater, soil and air, and on the global environment - including the greenhouse effect - as well as any resulting risk to human health, during the whole life cycle of the landfill.

Landfill Tax
A tax on every tonne of waste sent to landfill sites. The tax is designed to reduce the amount of rubbish sent to landfill by increasing the amount of waste being reduced, reused and recycled. Landfill Tax operates at two rates: a standard rate for active waste (substances that either decay or contaminate land - which includes household waste); and a lower rate for inert materials. In 2010 the Government announced a floor under the standard rate which will not fall below £80 per tonne from 2014-15 to 2019-20. In 2014 it was clarified that the floor of £80 per tonne in the standard rate should be interpreted in real terms and announced that the lower rate will, in future, also increase each year in line with RPI.

Standard Rate
From 1 April 2015, the Standard Rate rose to £82.60 per tonne, and will increase again on 1st April 2016 to £84.40 per tonne.

Lower rate
From 1st April 2015, the Lower Rate rose to £2.60 per tonne, and will increase again on 1st April 2016 to £2.65 per tonne.

Landfill Allowance Trading Scheme (LATS)
DEFRA have introduced landfill allowances for each Waste Disposal Authority (WDA), with a phased reduction in municipal waste that is landfilled from 2005/06. By 2020 each WDA must have reduced the landfilling of biodegradable waste to 35% of the 1995 level. DEFRA have also introduced a trading scheme that allows WDAs to trade their unused landfill allowance.

Leachate
Leachate is formed when water passes through waste landfill. The water can come from precipitation or the waste itself. As the liquid moves through the landfill many organic and inorganic compounds, for example, bacteria, heavy metals and other potentially harmful materials are transported in leachate. Leachate moves to the base of the landfill cell and collects. If uncontrolled, leachate can contaminate both groundwater and surface water.

Leachate pond
A pond or tank constructed at a landfill to receive the leachate from the area. Usually the pond is designed to provide some treatment of the leachate, by allowing settlement of solids or by aeration to promote biological processes.

Leachate treatment
A process to reduce the polluting potential of leachate. Such processes can include leachate recirculation, spray irrigation over adjacent grassland and biological and physiochemical processes.

Licensing
The granting of formal permission for landfill operations at a specified site. See also Waste Management Licence.

Life Cycle Analysis
A tool that can be used to assess the true costs over the whole life of a product, including the initial capital outlay, operational costs, maintenance and ultimately disposal costs.

Lift
The completed layer of compacted waste in a cell at a landfill.

Liquid Waste
Waste which in the condition under which it is handled will flow and can be transferred by pump and includes leachate from waste.

Litter
The haphazard distribution of waste on land. At landfill sites this is usually light, windblown, fraction in household waste such as paper and plastic which escapes before the waste is compacted and covered.

Local Authority Municipal Waste (LACMW)
Is defined in the Waste Emissions Trading Act 2003 (Amendment) Regulations 2011, and means waste that is collected by, or on behalf of, a District Council. These wastes can be collected either directly at the household or premises by the council or its agents, or through civic amenity sites and bring banks. In general, it includes waste arising from : waste collection rounds (including separate rounds for collection for recyclables; street cleansing and litter collection; beach cleansing; bulky waste collections' hazardous household waste collections; household clinical waste collections; garden waste collections; drop off/bring systems; weekend skip services; and any other household waste collected by the authority ; rubble; clearance of fly-tipped waste; and commercial waste from shops and trading estates where local authority waste collection agreements are in place.

Manual landfill
A landfill in which most operations are carried out without the use of mechanized equipment.

Marine Nature Reserve (MNR)
Provides for the conservation of the flora, fauna, landforms and other features of scientific interest and for study of these features.

Mass-burn Incinerator
A type of incinerator in which solid waste is burned without prior sorting of processing.

Material Efficiency
Describes the use of materials in a way that reduces consumption, production or disposal of materials relative to previous processes. ME prevents waste while avoiding problems relating to the definition of waste focussing on the lifecycle approach.

Materials Flow Analysis
Provides for an analytical framework for measuring the energy and resources used by a given economy. Relationships between human activities, material flows and environmental impact can be analysed using MFA tools, which include accounting mechanisms and indicators.

Materials recovery
Obtaining materials from the waste stream that can be reused or recycled.

Materials recovery facility (MRF)
A facility for separating commingled recyclables by manual or mechanical means. Some MRFs are designed to separate recyclables from mixed municipal solid waste. MRFs then bale and market any recoverable materials.

Mechanical Biological Treatment (MBT)
A combination of biological treatment that can be anaerobic digestion, composting or frying, combined with mechanical sorting such as screening, shredding, and other separation techniques. Outputs may include refuse derived fuel combustion in industrial processes (where markets allow) or for thermal recovery in a dedicated EFW plant. Other potential outputs are compost-like materials, some materials suitable for recycling, or materials for subsequent landfill.

Methane
CH4, a colourless, odourless, flammable gas formed during anaerobic decomposition of putrescrible matter. It forms an explosive mixture in the range 5-15% methane in air. Methane is a potent greenhouse gas.

Mixed Dry Recyclables
Recyclates (glass bottles and containers, plastic bottles and containers and metal tin cans) not including putrescrible wastes.

Mixed waste
Unsorted materials that have been discarded into the waste stream.

Modular incinerator
A relatively small type of prefabricated solid waste combustion unit.

Monofill
A landfill intended for one type of waste only.

Municipal Solid waste (MSW) or municipal waste or municipal managed waste (MMW)
Solid waste collected and controlled by local authorities. Generally includes household and commercial waste, street sweepings/litter and materials from civic amenity sites. Generally excludes hazardous wastes except to the extent that they enter the municipal waste stream.

Natural Resources
Substances of use to humans that are derived either from the Earth e.g. coal, oil or metal ores or from living things.

NIMBY (NIMTO or BANANA)
Expressions of opposition e.g. to the siting of a solid waste of a solid waste facility based on the particular location proposed:
NIMBY: Not in my back yard
NIMTO: Not in my term of office
BANANA: Build absolutely nothing anywhere near anything.

Non Clinical Waste
Non clinical waste is deemed to be all non toxic and non-hazardous waste.

Non-kerbside Household Waste Collection
Bulky household waste collected by authorised collectors, waste brought by householders to landfills, bring banks, civic amenity facilities and WEE and batteries brought to retailers and collected on specific collection days.

Northern Ireland Environment Agency
The statutory body responsible for issuing licenses, permits and other associated regulatory functions that apply to the waste management industry.

North West Region Waste Management Group (NWRWMG)
The North West Region Waste Management Group continues as an unincorporated Joint Committee, established under the Local Government Act 2014. Membership of the group comprises Derry City and Strabane District Council and Causeway Coast and Glens Borough Council.

Odour
The smell of a material or collection materials. The characteristic odour of landfill gas is due mainly to alkyl benzenes and limonene, occasionally and additionally associated with esters and organo - sulphur compounds.

Open dump
An unplanned “landfill” that incorporates few if any of the characteristics of a controlled landfill. There is typically no leachate control, no access control, no cover and no management.

Organic Waste
Biodegradable food, garden and landscaping waste, and where the context permits, will also include industrial organic sludges (e.g. from the food and drink production sector).

Other Recovery
Any operation meeting the definition of recovery under the Waste Framework Directive but failing to comply with the specific requirements for preparation for reuse or recycling.

Packaging
Used to contain, protect and present goods. Virtually all packaging eventually becomes waste. Packaging is made from such materials as cardboard, paper, glass, plastic, steel, aluminium, wood, and composite materials such as those used in milk and juice cartons.

Participation Rate
The participation rate measures the number of households making recyclable waste materials available for collection.

Pathogen
An organism capable of causing disease.

Pay-By-Use (PBU) Schemes
Schemes whereby residents pay in direct proportion to the amount of waste collected from individual households. This scheme is devised to offer financial incentives for residents to reduce the amount of waste which is presented for collection and subsequent management by public or private waste collectors.

Polluter Pays Principle
The principle set out in European Council Recommendation 75/436/Euratom, ECSC, EEC of 3rd March 195 1(20) requiring the polluting party to pay for damage done to the natural environment.

Pollution
The contamination of soil, water, or the atmosphere by the discharge of waste or other offensive material

Post-consumer materials
Materials that a consumer has finished using, which the consumer may sell, give away or discard as wastes.

Precautionary principle
The avoidance or the reduction of risks to the environment by prudent action before any serious problem is encountered.

Preparing for re-use
Preparing for re-use means checking, cleaning or repairing recovery operations, so products or components that have become waste are prepared so that they can be reused without any other pre-processing.

Pre-treatment
The processing of waste which still results in a waste that subsequently undergoes other waste recovery or disposal treatment. Pre-treatment activities include operations such as “dismantling, sorting, crushing, compacting, palletising, drying, shredding, conditioning, repackaging, separating, blending or mixing if the material or substance resulting from such operations is still waste”. These activities do not sit on any particular rung of the waste hierarchy and instead can be regarded as “precursors” to specific types of treatment.

Prevention
Measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the reuse of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products. Technically prevention is not a waste operation because it concerns substance or objects before they become waste.

Priority waste streams
EU priority waste streams include municipal waste, packaging waste, tyres, waste electrical waste and electronic equipment, construction and demolition waste, hazardous waste, end-of-life vehicles, healthcare waste, waste oil and sewage sludge.

Primary material
A commercial material produced from virgin materials used for manufacturing basic products. Examples include wood pulp, iron ore, and silica sand.

Processing
Preparing MSW materials for subsequent use or management, using processes such as bailing, magnetic separation, crushing and shredding. The term is also sometimes used to mean separation of recyclables from mixed MSW.

Producer responsibility Initiatives
A series of initiatives undertaken by industry with the agreement of the Government and generally having a requirement to take steps for the purpose of prevention, minimisation, limitation or recovery of waste as respects the class or classes of product to which the requirement relates and may include a requirement to achieve specified targets in relation to those matters, in line with the “Polluter Pays Principle”.

Proximity Principle
The principle set out in the EU Framework Directive (91/156/EEC) whereby member states should establish a network enabling waste to be disposed of in the nearest appropriate installations, by means of the most appropriate methods and technologies to ensure a high level of protection for the environment and for public health.

Putrescribles (aka biodegrabale)
Solid wastes which are biodegrabale. Usually used in reference to food wastes and other organic wastes that decay quickly.

Pyrolosis
Chemical decomposition of a substance by heat in the absence of oxygen, resulting in various hydrocarbon gases and carbon-like residue. Treatment unproven for MSW at this stage.

Quality Assurance Schemes
Usually non-statutory in nature, and designed to ensure producers maintain a large degree of control over process management and produce a compost product of high quality, which will be easily marketed and profitable in nature.

Reclamation
Process of re-manufacturing waste back into new material.

Recovery
Options for recovering value from the waste stream. May include recycling and composting, thermal and biological treatments that use waste to produce energy.

Recylables
Items that can be reprocessed into feedstock for new products. Common examples are paper, glass, aluminium, corrugated cardboard and plastic containers.

Recycling
The process of transforming materials into raw materials for manufacturing new products, which may or may not be similar to the original product.

Reduction of Hazardous Substance (RoHS)
These European Union regulations set maximum concentration limits on hazardous materials used in electrical and electronic equipment (See WEEE). The substances are lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE).

Reduction of Waste
A reduction of waste at source involving minimisation of the use of environmentally harmful substances and /or minimising material or energy consumption.

Refuse
A term often used interchangeably with solid waste.

Refuse Derived Fuel RDF (Combustion)
Fuel produced from waste through a number of processes such as mechanical separation, blending and compressing to increase the calorific value of the waste. Such waste derived fuels can comprise paper, plastic and other combustible wastes and can be combusted in a waste-to-energy plant, cement kiln or industrial furnace.

RE Roadmap
The “Road Map to a Resource Efficient Europe” was published by the European commission in September 2011 defines medium and long term objectives and the means for achieving them. The vision is of a European economy that, by 2050, has grown and developed in such a way that respects the constraints and planetary boundaries, and this contributes to a global transformation. A key milestone is not just to manage waste but to recognise it as a resource and thereby create a ‘circular economy’ with residual waste reduced as far as possible. This will require a greater focus on waste prevention followed by increased recycling.

Refuse Derived Fuel
The Combustible fraction of municipal solid waste can be mechanically and/or thermally separated into a product called Refuse Derived Fuel (RDF). This may be pelletized or utilised as a loose “flock” product in a controlled combustion process (either a dedicated incineration / gasification process of co-combusted in an industrial type application, for example a cement kiln or power station.

Residual Municipal Waste
The fraction of municipal waste remaining after the source separation of municipal waste fractions, such as food and garden waste, packaging, paper and paperboard, metals, glass and is usually unsuitable for high quality recovery or recycling.

Resource recover
The extraction and utilisation of materials and energy from wastes.

Reuse
The use of a product more than once in its original form, for the same or a new purpose.

ReNew
ReNEW represented a network of organisations whose aim was to deliver innovations for the waste supply chain - promoting recovery of valuable materials from waste. ReNEW (Resource innovation Network for European Waste): a €4.88 million project, funded at a rate of 50% (€2.44 million) by the Interreg IVB North West Europe scheme. The project ran until June 2015.

Renewables Obligation Certificates (ROCs)
The Renewable Obligation requires power suppliers to derive a specified proportion of electricity they supply to their customers from renewables. This started at 3% in 2003, rising gradually to 10% by 2010. The cost to consumers will be limited by a price cap and the obligation is guaranteed in law until 2027. Eligible renewable generators receive Renewables Obligation Certificates for every MWh of electricity generated. These ROCs can be sold to suppliers to fulfil their obligations.

Rethink Waste
Rethink Waste is a communications campaign of the Department of the Environment in Northern Ireland. The campaign aims to encourage people in NI to rethink what they do with waste by promoting the reduction, reuse and recycling of items that might otherwise become ‘waste’. Since its inception in 2010, the campaign has contributed to increased diversion from landfill across Northern Ireland and a decreasing amount of waste going to landfill.

Sanitary Landfill
An engineered method of disposing of solid waste on land, in a manner that meets most of the standard specifications, including sound sitting, extensive site preparation, proper leachate and gas management and monitoring, compaction, daily and final cover, complete access control, and record keeping.

Solid Recovered Fuel
High-quality fuel derived from mechanically processing residual waste, which must comply with the international standard, CEN/TC 343 (meet minimum standards for moisture content, particle size, metals, chloride, chlorine content and calorific value).

Scrap metal
Any old metal and any broken, worn out, deface or partly manufactured articles made wholly or partly of metal and metallic wastes. Also includes old, broken, worn out or defaced tooltips or dies made of any materials commonly known as hard metal or of cemented or sintered metallic carbides.

Scrubber
Emission control device in an incinerator, used primarily to control acid gases, but also to remove some heavy materials.

Secondary material
A material covered from post-consumer wastes for use in place of primary material in manufacturing a product.

Secure landfill
A disposal facility designed to permanently isolate wastes from the environment. This entails burial of the wastes in a landfill that includes clay and /or synthetic liners, leachate collection, gas collection (in cases where gas is generated) and an impermeable cover.

Separate Collection/source segregation
The separate collection of certain categories of biodegradable Local Authority Collected Municipal Waste, such as paper / cardboard and organic waste, in such a way as to avoid different waste fractions or waste components being mixed, combined or contaminated with other potentially polluting wastes, products or materials.

Set-out-container
A box or bucket used for residential waste that is placed outside for collection.

Sewage sludge
The residue produced at a sewage treatment works which is not discharged with the treated effluent.

Site remediation
Treatment of a contaminated site by removing contaminated solids or liquids or treating them on-site

Solid Recovery Fuel
High-quality fuel derived from mechanically processing residual waste, which must comply with the international standard, CEN/TC 343 (meet minimum standards for moisture content particle size, metals, chloride, chlorine content and calorific value).

Source reduction
The design, manufacture, acquisition, and reuse of materials so as to minimize the quantity and/or toxicity of waste produced.

Source separation
Setting aside of compostable and recyclable materials from the waste stream before they are collected with other MSW, to facilitate reuse, recycling and composting.

Special Area of Conservation (SAC)
EC Habitats Directive requires member states to designate Special Areas of Conservation to protect some of the most seriously threatened habitats and species across Europe. Implemented through the Conservation (Natural Habitats etc) Regulations (NI) 1985 (as revised 2015).

Special waste
Controlled wastes that fall within the Special Waste (NI) Regulations 1998. These Regulations apply to all movements of special waste including to and from storage, treatment and recycling facilities and movement to final disposal sites. Includes household and hazardous waste, medical waste, construction and demolition debris, earthquake debris, tyres, oils, wet batteries, sewage sludge, human excreta, slaughterhouse waste and industrial waste.

Stabilised Biowaste
Waste resulting from the mechanical biological treatment of biowaste. Stabilised Biowaste will include IVC and AD Compost as well as Compost Like Output. There is still a question hanging over CLO and its contribution to recycling targets.

Strategic Investment Board (SIB)
The Strategic Investment Board Limited was launched in April 2003. It is a company, limited by guarantee and owned by the Office of First Minister and Deputy First Minister (OFMDFM).

SIB was established by the Executive to:
• Accelerate infrastructure investment, and
• Overcome the barriers that sometimes interfere with delivering policy priorities.

In relation to waste management the SIB will support the Department of the Environment in the funding and delivery of the infrastructure required to meet the municipal solid waste bio-diversion targets in the EU Landfill Directive and related legislation. SIB is assisting waste management groups in relation to pre-procurement, procurement and funding of waste management facilities and services.

Street Cleaning Waste
Includes waste collected by litter pickers, street sweepers and mechanical sweepers, but excludes gully emptying and poop-scoop wastes.

Street Recycling Bins
Litter bins for recycling located on streets; but not at Civic Amenity Sties or Bring Sites.

Subsidy
Direct or indirect payment from government to businesses, citizens, or institutions to encourage a desired activity.

Supply Chain Management
The management of the entire sequence of processes and activities within manufacturing and retailing operations. With respect to waste management, the purpose is to encourage the introduction of measures further up the supply chain in order to reduce the quantities of waste produced at all stages in the production and distribution.

Sustainable Development
Finding ways to meet the needs of the present generation without damaging the environment or preventing future generations from being able to meet their own needs.

Sustainable Materials Management
Provides a new way of interacting materials, repositioning wastes as potential resources and moving towards the use and reuse of materials in the most productive and sustainable way across their entire life cycle.

Technical Officer Group (TAG)
Local government Technical Advisors Group which meets bi-monthly to discuss technical issues which affect local government which include amongst others: waste, refuse collection, health and safety and car parking.

Teep(Technically, Environmentally and Economically Practicable)
'Technically, Environmentally and Economically Practicable' with reference to the separate collection of wastes destined for recovery operations.

Tipping fee
A fee for unloading or dumping waste at a landfill, transfer station, incinerator, or recycling facility.

Tipping floor
Unloading area for vehicles or dumping waste at a landfill, transfer station, incinerator, or recycling facility.

Tradable Landfill Permits
Economic instrument applied in the UK, devised to minimise the cost of meeting the Landlfill Directive targets whilst giving local authorities the greatest amount of flexibility. An allowance to landfill a certain amount of waste is issued to the landfill operator - exceeding this amount requires the purchase of 'surplus' allowances from other operators who have not used their full allowance.

Trade Waste
Waste collected from commercial premises by district councils, as part of their service provided under the provisions of the Waste and Contaminated Land (NI) Order 1997.

Transfer point
A designated point, often at the edge of a neighbourhood, where small collection vehicles transfer waste to larger vehicles for transport to disposal sites.

Transfer station
Central depot where collection vehicles deliver waste where it is compacted and loaded into bulk transfer vehicles for onward transport to a recovery or disposal facility.

Treatment Facilities
Facilities where waste undergoes thermal, physical, chemical or biological processes that change the characteristics of waste in order to reduce its volume or hazardous nature or facilitate its handling, disposal or recovery.

Unmanaged household waste
Estimate of the quantity of waste generated by households but not captured via one of the kerbside or non-kerbisde collection systems.

Unprocessed Residual Waste
Residual municipal waste collected at kerbside or deposited at landfills, CA sites/ transfer stations that has not undergone appropriate treatment through physical, biological, chemical or thermal processes, including sorting.

Upcycling
Upcycling is taking an item that is not longer needed or wanted and giving it a new life as something that is either useful or creative.

Variable charging
A method where local authority or private sector operators determine waste charges for various waste management services undertaken within a particular administrative Biodegradable Waste area, designed to promote best practice in prevention, recycling and biological treatment among producers. Pay-by-Use is a form of variable charging.

Vectors
Organisms that carry disease causing pathogens. At landfills, rodents, flies and birds are the main vectors that spread pathogens beyond the landfill site.

Vermicomposting
Composting system using worms.

Virgin materials
Any basic material for industrial processes that has not previously been used, for example, wood-pulp trees, iron ore, crude oil, bauxite.

Void space
The space existing between and within solids in refuse or soil.

Waste
Any substance or object which the holder discards, or intends, or is required to discard, by the Waste Framework Directive (2008/98/EC)

Waste characterization study
An analysis of samples from a waste stream to determine its composition.

Waste collector
A person employed by a local authority or a private firm to collect waste from residences, businesses, and community bins.

Waste Co-ordination Group (WCG)
In January 2014 a Waste Co-ordination Group was established to provide a forum for the discussion of key operational and policy issues pertinent to the statutory responsibilities of public sector waste and resource management bodies and to facilitate the co-ordinated delivery of those responsibilities. The Group comprised senior officials from DOE, the (then) three Waste Management Groups and NILGA. The Group is scheduled to meet eight times a year to support the work of the Waste Programme Board and the membership is currently under review, post-reform.

Waste dealer
A middleman who buys recyclable materials from waste generators and itinerant buyers and sells them, after sorting and some processing, to wholesale brokers or recycling industries.

Waste Electrical and Electronic Equipment (WEEE) Directive
A waste stream defined by the European Community directive on waste electrical and electronic equipment (Directive 2002/96/EC) which, together with the RoHS Directive, became European Law in February 2003, setting collection, recycling and recovery targets for all types of electrical goods. The purpose of the WEEE directive is, as a first priority, the prevention of electrical and electronic equipment, and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. It also seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, e.g. producers, distributors and consumers and in particular those operators directly involved in the treatment of waste electrical and electronic equipment.

Waste Framework Directive
The Framework Directive on Waste (75/442/EEC as amended by 91/156/EEC, 96/59/EC, and 2008/98/EC) is the overarching legislative framework for waste management in the European Union. It provides a foundation for sustainable waste management practice and defines waste. The amended framework contains 19 articles that set out requirements for waste management in the European Union. The Directive requires each member state to produce a Waste Management Plan and adopts a system of waste regulations to protect the environment. Proposed amendments to the Waste Framework Directive are currently being discussed with the Member States.

Waste Hierarchy
Waste hierarchy is the cornerstone of European waste policies legislation. Its primary purpose is to minimise adverse environmental effect from waste and to increase and optimise resource efficiency in waste management policy. The hierarchy under the Waste Framework Directive is a priority order for the management of waste and prioritises the ways of dealing with waste as follows (1) prevention; (2)preparing for reuse; (3) recycling; (4)other recovery; (5) disposal.

Waste Management
Means the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites; and including actions taken as a dealer or broker.

Waste Management Facility
A site or premises used for the recovery or disposal of waste

Waste Minimisation
Any technique, process or activity that either avoids, reduces or eliminates waste at source, or results in reuse or recycling.

Waste Prevention
The reduction of the quantity (weight and volume) and hazardousness of waste generated for collection and treatment for disposal for a third party.

Waste Producer
Anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in change in the nature or composition of this waste, under the Waste Framework Directive (2008/98/EC).

Waste Programme Board
Current governance arrangements for waste in Northern Ireland are headed by the Waste Programme Board (WPB), set up in 2010, which comprises representatives from the Department, local government and non-governmental organisations under the chairmanship of the Minister of the Environment. It is a non-executive advisory Board with a remit to oversee the implementation of the targets contained in the Northern Ireland Waste Management Strategy; advise on the structure of waste programme targets/actions; provide a channel of communication for key stakeholders and consider the impact of new waste related policy initiatives as they emerge.

Waste Producer
A person whose activities produce waste or who carried out pre-processing, mixing or other operations resulting in a change in the nature or composition of waste.

Waste reduction
All means of reducing the amount of waste that is produced initially and that must be collected by solid waste authorities. This ranges from legislation and product design to local programs designed to keep recyclables and compostables out of the final waste stream.

Waste solvent
Solvent which is contaminated, spoiled or otherwise unfit for its original purpose.

Waste Strategy
See ‘Delivering Resource Efficiency’.

Waste stream
The total flow of waste from a community, region or facility.

Waste Transfer Station
A suite to which waste is delivered for sorting or compacting/bulking prior to transfer to another place for recycling, treatment or disposal.

Waste-to-energy (WTE) plant
A facility that uses solid waste materials (processed or raw) to produce energy. WTE plants include incinerators that produce steam for district heating or industrial use, or that generate electricity; they also include facilities that convert landfill to gas or electricity.

Water table
Level below the earth’s surface at which the ground becomes saturated with water.

Weighbridge
A machine used to weigh large objects such as vehicles. Used to weigh the quantity of waste received at a landfill site.

Windrow
An elongated pile of aerobically composting materials that are turned periodically to expose the materials to oxygen and to control the temperature to promote biodegradation.

Working face
The length and width of the row in which waste is being deposited at a landfill. Also known as the tipping face.

SECTION 3

Outlines the policy context for tackling the waste agenda in Northern Ireland

LOCAL CONTEXT

The first Waste Management Strategy for Northern Ireland was published in April 2000 and was revised in March 2006 under the title “Towards Resource Management”. During 2011 the Department of the Environment carried out a scoping exercise and it was agreed that the 2006 Strategy should be further revised to cover all relevant EU Directive requirements and provide a coherent approach to the waste policy framework for Northern Ireland. The contemporary revised Strategy was published in October 2013.

The legislative and regulatory framework for waste in Northern Ireland is complex (See Appendix one). The revised Northern Ireland Waste Management Strategy 2013[2] contains references to eight European Directives, 19 pieces of domestic waste legislation and 14 relevant Strategies, Plans and Programmes.

The Northern Ireland revised waste management strategy “Delivering Resource Efficiency” (the revised Strategy) was revised in 2013 for the period up to 2020.

It contains actions and targets to meet EU Directives and takes into consideration the current “direction of travel of EU policy towards life cycle thinking and a resource efficient Europe”.

The Revised Strategy moves the emphasis of waste management from resource management to resource efficiency, with a new focus on waste prevention and recycling in accordance with the waste hierarchy. The Revised Strategy also provides for the possibility of a 60% recycling rate of local authority collected municipal waste by 2020[3].

[2] **Mills (2013):** A review of waste disposal at the Mauboy Site and lessons learnt for the future regulation of the waste industry in Northern Ireland

[3] **DOE (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy

The Department is responsible for preparation of the Waste Management Strategy setting out its policies in relation to the recovery and disposal of waste. Local government is responsible in turn for the preparation and implementation of Waste Management Plans setting out the councils’ arrangements for the collection and disposal of waste.

Councils have delegated preparation of Waste Management Plans and any agreed ancillary functions to their Waste Management Groups, using powers in the Local Government Act (NI) 1972 and more recently the Local Government Act (NI) 2014.

The Local Government Act (NI) 1972 enabled councils to establish joint committees for collective delivery of council functions. They can also apply to the Department for body corporate status for those committees.

The Local Government Act (NI) 2014 included legislative provision for collective working through joint committees including the provision for a joint committee to have body corporate status. The Bill received Royal Assent in June 2014. Existing body corporate legislation lists the constituent councils of each joint committee. With local government reorganisation now implemented the councils named in the existing body corporate legislation no longer exist, though technically the body corporate itself will continue to exist as a separate body.

The rationale for joint committees is to deliver functions, in collaboration, on behalf of their constituent councils. The new councils will need to determine whether they wish to establish new joint working structures for waste management and if so, what the status and membership of those structures should be, or whether each new council will operate independently.

In terms of arc21, in 2014 the Shadow Councils agreed to continue with the provision of waste management services, from 1 April 2015, provided by arc21 Waste Management Group operating as a Body Corporate Joint Committee.

New terms of agreement were then drawn up and formally approved by the Shadow Councils. The Terms of Agreement set out the arrangements by which Participant Councils would operate both with arc21 and each other.

The Department of the Environment was then formally requested to update the legislation to facilitate the creation of the Joint Committee and provide the relevant powers for it to operate from 1 April 2015.

The Local Government (Constituting a Joint Committee a Body Corporate) Order (Northern Ireland) 2015 was made on 25 March 2015 by the Department and came into operation on 1 April 2015.

The Participant Councils of the new arc21 Joint Committee are:

- Antrim and Newtownabbey Borough Council
- Ards and North Down Borough Council
- Belfast City Council
- Lisburn and Castlereagh City Council
- Mid and East Antrim Borough Council
- Newry, Mourne and Down District Council

The North West Region Waste Management Group continues as an unincorporated Joint Committee, established under the Local Government Act 2014. Membership of the group comprises Derry City and Strabane District Council and Causeway Coast and Glens Borough Council.

EUROPEAN CONTEXT

The Northern Ireland strategic approach is set not only within the context of Northern Ireland policy and legislation, but also takes into consideration the wider context of relevant EU Environmental Directives and the current 'direction of travel' of EU policy toward life cycle thinking and a resource efficient Europe. The EU provides strong direction to Member States on waste issues and much of UK and NI waste policy and guidance is based on EU legislation.

As part of the UK, Northern Ireland must comply with the EU's waste management policy as laid down in the Waste Framework Directive and associated legislation. The EU Waste Framework Directive was established in 1975 and provides a legal framework for all EU waste regulation.

It has been updated repeatedly in response to changes in the waste burden and waste management tools. The revised EU Waste Framework Directive (2008/98/EC) (The revised WFD) seeks to position the EU as a "recycling society", with broad aims "to avoid waste generation and to use waste"[4].

Decoupling economic growth from the environmental impacts associated with waste generation is a key objective of the revised WFD. Stabilising waste generation is no longer considered enough, waste growth in Northern Ireland must now reverse[5].

The Roadmap to a Resource Efficient Europe[6], which was published by the European Commission in September 2011 defines medium to long term objectives and the means for achieving them.

The vision is of a European economy that, by 2050, has grown and developed in such a way that respects resource constraints and planetary boundaries, and thus contributes to a global economic transformation.

A key milestone is not just to manage waste but to recognise it as a resource and thereby create a 'circular economy' with residual waste reduced as far as possible. An integral part of this is greater focus on waste prevention followed by increased recycling.

The revised WFD required the establishment of waste management strategies and plans and sets out the elements that must be contained within them. It also introduced statutory targets for preparing for re-use and recycling of waste from households as well as preparing for re-use, recycling and other material recovery of construction and demolition waste. The requirements of the revised WFD have been transposed into NI legislation through the Waste Regulations (NI) 2011[7].

[4] **Waste Framework Directive (2008/98/EC) cited in DOENI: (2013):** The Waste Prevention Programme for Northern Ireland, the Road to Zero Waste.

[5] **European Commission (2012):** Preparing a Waste Prevention Programme, Guidance Document.

[6] http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

[7] **DOENI (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

The revised WFD required Member States to create national waste prevention programmes by 12 December 2013. The objective[8] of these programmes is to present a co-ordinated national approach to waste prevention, delineating targets and policies with the aim of decoupling economic growth from environmental impacts of waste generation. England, Wales, Scotland and Northern Ireland have all created their own Waste Prevention Programmes which take account of local issues and needs.

EU waste management policies aim to reduce the environmental and health impacts of waste and improve Europe's resource efficiency. The long term goal is to turn Europe into a zero waste society, avoiding waste and using unavoidable waste as a resource whenever possible. The aim is to achieve much higher levels of recycling and to minimise the extraction of additional natural resources.

Proper waste management is a key element in ensuring resource efficiency and the sustainable growth of European countries. This reference guide has been developed in the context of the relevant EU Environmental Directives and the current direction of EU policy towards life cycle thinking and a resource efficient Europe.

The revised WFD introduced a 5-step Waste Hierarchy (detailed in Section 4), establishing a priority order for waste with the highest emphasis being placed on the prevention of waste. The next three priorities, that is, preparing for re-use, recycling and recovery, all recognise waste as a valuable resource, with its own intrinsic value as well as a substitute for ever-dwindling natural resources (the substitution principle). The last option, under the Hierarchy, is the disposal of waste by landfill.

The EU Landfill Directive (1999/31/EC) aims to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, and contains targets for the reduction of biodegradable municipal waste going to landfills.

The European Commission is aiming to present a new, more ambitious circular economy strategy late in 2015, to transform Europe into a more competitive resource-efficient economy, addressing a range of economic sectors including waste.

An indicative Roadmap[9] for a Circular Economy Strategy was published by the European Commission in April 2015. The initiative is positioned as a direct contribution to the objectives pursued to give a new boost to jobs, growth and investment and placed within the wider context of the Commission's commitment towards sustainable development. Further, eco-industries and eco-innovation currently supply a third of the global market for green technologies, worth a trillion euro and expected to double by 2020, the initiative aims to reinforce this trend.

[8] **DOENI (2014):** The Waste Prevention Programme for Northern Ireland

[9] **European Commission (2015) Circular Economy Strategy:** http://ec.europa.eu/smartregulation/impact/planned_ia/docs/2015_env_065_env+_032_circular_economy_en.pdf

This approach explores synergies with policies relating to products or the development of well-functioning markets for secondary raw materials. It is advised that the ambition should be stepped up by looking more strategically at waste management on the one hand, and related key aspects of the value chain, which are essential in order to “close the loop” of the circular economy, on the other hand.

The new initiative aims to establish a framework to overcome shortcomings and create conditions for the development of a circular economy. What is needed is a clear and ambitious political vision combined with effective policy tools that can drive real change on the ground [10].

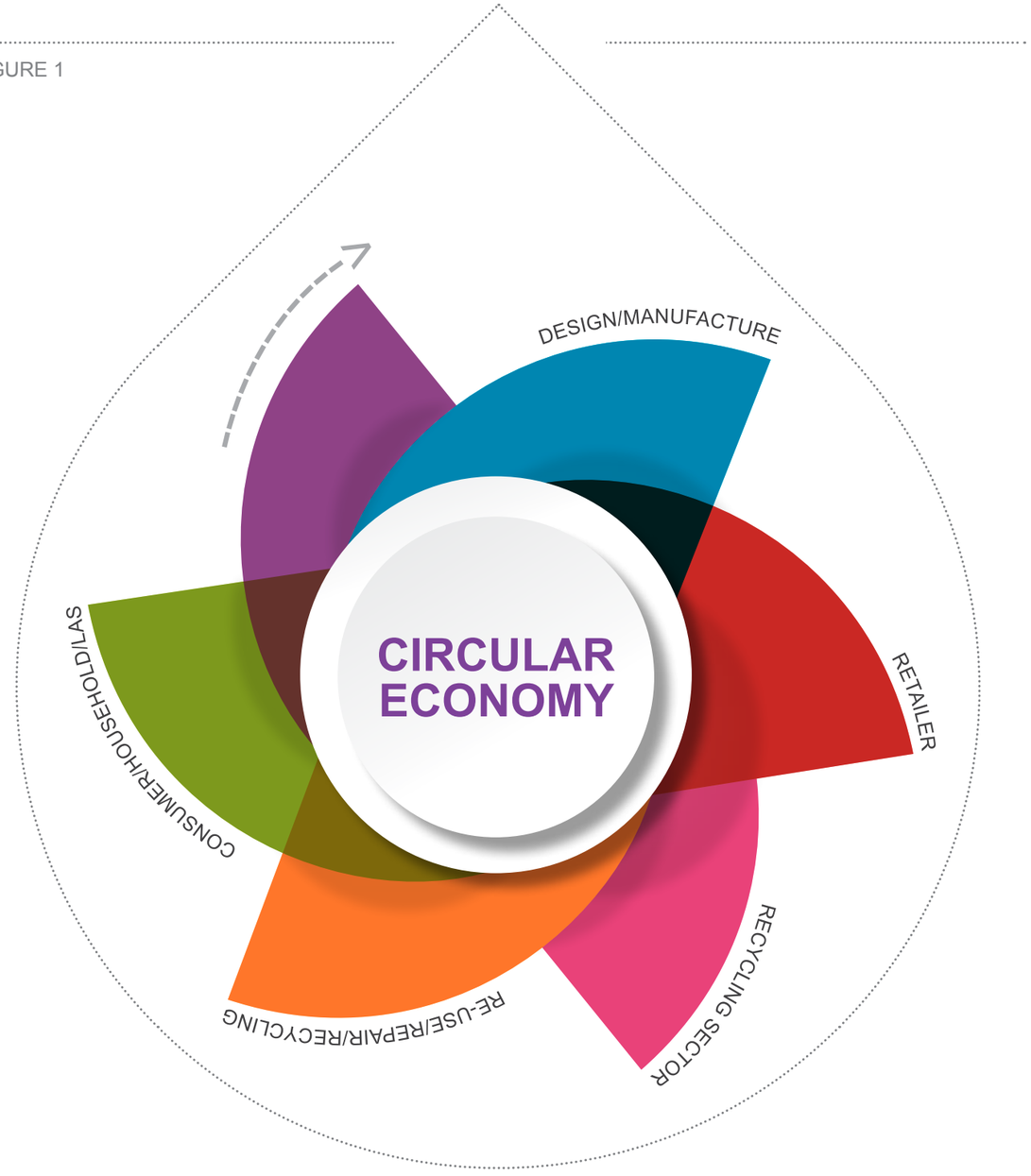
THE ECONOMIC CONTEXT

A circular economy means re-using, repairing, refurbishing and recycling existing materials and products. What used to be regarded as ‘waste’ can be turned into a resource. The aim is to look beyond waste and to close the loop of the circular economy. All resources need to be managed more efficiently throughout their life cycle.

A circular economy aims to maintain the value of materials and energy used in products in the value chain for the optimal duration, thus minimising waste and resource use. By preventing losses of value from material flows, it creates economic opportunities and competitive advantages on a sustainable basis [11].

Developing a circular economy has been identified as a route to improving resource efficiency [12]. A circular economy (figure 1) is defined as an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

FIGURE 1



[10] Ibid.

[11] **European Commission (2015) Public Consultation on the Circular Economy:** http://ec.europa.eu/environment/consultations/closing_the_loop_en.htm

[12] http://www.wrap.org.uk/content/wrap-and-circular-economy

Figure 1
It is widely accepted that waste is not only a key environmental and social issue, it is also an economic one. In 2012/13 local authorities collected over 900,000 tonnes of municipal waste from businesses and households in Northern Ireland [13].

The treatment and disposal not only incurs a considerable cost to businesses and householders, but places increasing stress on the use of raw materials, energy, water and food. Although in recent years Northern Ireland has seen a decline in the amount of waste generated, this does not allow for complacency.

Guidance [14] from the European Commission urges that stabilising waste generation is no longer enough, waste growth in Northern Ireland must now reverse.

The vision is of a European economy that, by 2050, has grown and developed in such a way that respects resource constraints and planetary boundaries, and thus contributes to a global economic transformation. A key milestone is not just to manage waste but to recognise it as a resource and thereby create a 'circular economy' with residual waste reduced as far as possible. This will require greater focus on waste prevention followed by increased recycling.

Also of relevance are:
- Changing refuse collections/bin sizes,
- Reducing contamination within recyclables (i.e. improving quality),
- Getting more householders to use services correctly
- Improved/enhanced communications,
- Reduced funding, and
- Structural alterations.

Moreover, the adoption of a circular economy is considered to offer significant economic benefits; Defra calculates that UK businesses could benefit by up to £23 billion per year through low cost or no cost improvements in the efficient use of resources, whilst McKinsey estimates that the global value of resource efficiency could eventually reach $3.7 trillion per year [15].

A keynote report [16] by the Ellen McArthur Foundation in 2014 stated that linear consumption is reaching its limits. The Report advised that a circular economy has benefits that are operational as well as strategic, on both a micro and macroeconomic level. The report further advised that this is a trillion dollar opportunity, with huge potential for innovation, job creation and economic growth.

13 **DOENI (2014):** The Waste Prevention Programme for Northern Ireland, The Road to Zero Waste.

14 **European Commission (2012):** Preparing a Waste Prevention Programme, Guidance Document.

15 http://www.wrap.org.uk/content/wraps-vision-uk-circular-economy-2020

16 **Ellen McArthur Foundation (2014):** Towards the Circular Economy, Accelerating the scale-up across global supply chains. https://emf-packs.s3-eu-west-1.amazonaws.com/Towards%20the%20Circular%20Economy%20vol%203/EMF_TCE3_24%20Jan%202014.pdf?AWSAccessKeyId=AKIAITAQSOURJ2COPP2A&Signature=2lBOcsFLfCTRr3L7nCzXWPKmkzo%3D&Expires=1490531890

In terms of the limits of linear consumption the report considered how recently, many companies are noticing that this linear system increases their exposure to risks - most notably higher resource prices and supply disruptions. The report discussed how the turn of the millennium marked the point when real prices of natural resources began to climb upwards, essentially erasing a century's worth of real price declines.

At the same time, the Report pointed out, price volatility levels for metals, food and non-food agricultural output in the first decade of the 21st century were higher than any single decade in the 20th century.

The Report urged that if no action is taken, high price volatility will likely to be here to stay if growth is robust, populations grow and urbanise, and resource extraction costs continue to rise.

The Report further advised that three billion new middle-class consumers are expected to enter the market by 2030 and that price signals may not be strong or extensive enough to turn the situation around fast enough to meet this growth requirement.

The Report discussed other trends which indicate that the power of the linear model is reaching its limits.

These include amongst others: [17]
- In modern manufacturing processes, opportunities to increase efficiency still exist, but the gains are largely incremental and insufficient to generate real competitive advantage or differentiation.
- Agricultural productivity is growing more slowly than ever before, and soil fertility and even the nutritional value of foods are declining.
- The risks to supply security and safety associated with long, elaborately optimised global supply chains appear to be increasing.

As a result, business leaders are looking for a better return and many are attracted to an industrial model that decouples revenues from material input: the circular economy [18].

17 Ibid.

18 Ibid.

Case Study 1

:METABOLON

:metabolon is Cologne University of Applied Science's teaching and research centre, and is located at the closed central landfill of the Bergischer Waste Management Association in North-Rhine Westphalia. :metabolon is reclaiming landfill for research and amenity.

North-west Europe is a highly urbanised and an industrially productive region that generates large volumes of waste. Current processes for waste treatment primarily focus on energy recovery rather than recovering and utilising valuable materials from the waste stream.

Innovation can be a drawn-out process, which prevents rapid transfer of new ideas to the marketplace [19].

The closed landfill site contains waste management, research and community amenity space. Social and community activities have been woven into the site while waste management activities such as sorting, segregation, baling, composting and anaerobic digestion take place around the central raised part of the landfill.

The raised part of the landfill includes various activities such as mountain biking courses, walking routes, and children's playground activities. The facilities include educational and informational displays on waste management and resource efficiency.

The visit to :metabolon, it is reported, ably demonstrated that waste management, research and community activities can co-exist within one site. This suggests a cultural change in public perception towards waste - from a perceived hazard to a mature understanding of opportunities [20].

[19] http://www.engineersjournal.ie/renew-waste-innovation-project-sees-closed-landfill-opening -minds/ cited in briefing paper WPB 22/14 presented at the Waste Programme Board Meeting of the 3 December 2014.

[20] Ibid.

Case Study 2

RICHMOND HILL

Set in the heart of the Irish Sea, the Isle of Man is recognised as a picturesque and independent semirural community - home to 80,000 people [21]. In the year 2000, the Isle of Man Government's Waste Plan identified a hierarchy for dealing with the island's waste - to minimise, recycle, and recover energy through energy-from-waste, minimising the amount of waste being sent to landfill.

To help achieve this, a contract was awarded to SITA Isle of Man to design, build, and operate an energy-from-waste facility to divert waste from the island's landfill sites.

The Richmond Hill energy-from-waste facility was designed with the capacity to handle the current levels of waste generated by the Isle of Man homes and businesses, guaranteeing the community's self-sufficiency in the medium term. Completed in 2004, the entire facility - plant, equipment, management and control systems - is designed for maximum efficiency as well as safety.

The facility has two incinerators. The primary incinerator uses a water-cooled grate allowing old tyres to be incinerated with the municipal waste stream. This line also includes a bulky waste shredder so that larger items of furniture can be incinerated.

The secondary incinerator was designed to process up to 5,000 tonnes of clinical, animal and oil waste.

Energy from the process is harnessed to produce renewable electricity for the island - providing 10 per cent of the island's electricity needs.

To save water the facility captures rainwater that falls on the site for use within the process and it recycles all the water used on the plant. This innovative approach reduces the demand for mains water by 40 per cent and negates the need for a water discharge from the facility.

Here you can view emissions information for the facility, see how much electricity is being generated and find out more about how the energy-from-waste process works.

[21] http://www.sita.co.uk/services-and-products/local-authority-customers/public-private-partnerships/isle-of-man

The Circular Economy at a local level

The concept of a circular economy is gaining momentum in Northern Ireland. Key players in the waste sector in Northern Ireland are becoming more aware of the opportunities of being more efficient in the way resources are used.

In April 2014, The Chartered Institution of Wastes Management (CIWM) commissioned research entitled "The Circular Economy: What does it mean for the waste and resource management sector?" [22] The stated intention of the research was to seek a deeper understanding of and preparedness for the circular economy from across a broad range of the waste resources industry, especially focussed on CIWM membership.

The CIWM president, arc21's Mr John Quinn, in his foreword to the report discussed CIWM's potential role in 'operationalising' the Circular Economy for the sector.

The landscape of waste, recycling and resource efficiency in NI has undergone change in recent years. In 2001, more than 90% of its household waste was sent to landfill; by 2012/13, nearly 40% was recycled or composted.

This progress has not been easy and it is apparent that despite the reduced costs, greater efficiencies and employment opportunities that a circular economy has to offer, there is still a long way to go.

Recent analysis from WRAP identified opportunities that could bring NI closer to the 50% recycling target and, along with work on reuse and waste prevention, move it towards a more circular economy.

These opportunities include amongst others: [23]

- Increased and more effective kerbside collections of food waste - separate and weekly collections are the best way to maximise the capture of food waste; the two types of food waste also have different treatment requirements. While recycling food waste is important, the focus should be on trying to prevent it in the first place. Recycling is necessary, but not sufficient to achieve a circular economy.
- Improve the performance of existing kerbside dry recycling collections by collecting all the key materials at the kerbside - paper, card, plastic packaging, cans and glass - and improve on existing capture rates.
- Increased household recycling centres (HWRCs) and bring-sites.

Innovation Requirements are identified as: adding new raw materials, introducing collection schemes, improving communications and optimising both the frequencies and the capabilities of recycling and residual waste collections.

Every step along the way to achieving the 50% recycling target is considered an aid to stimulate the country's circular economy: creating jobs, new business opportunities, reducing costs for local authorities, avoiding the use of virgin materials, cutting greenhouse gas emissions and helping to prevent waste crime [24].

22 **CIWM (2014):** The Circular Economy: what does it mean for the waste and resource management sector?

23 http://www.mrw.co.uk/opinion/time-to-look-further-than-the-obvious/8672546.article

24 Ibid.

SECTION 4

Waste Treatment Policies and Processes

THE WASTE HIERARCHY

The Waste Hierarchy (as defined in Article 3 of the revised (WFD) ranks waste management activities in terms of their environmental impact. Article 4 of the revised WFD sets out 5 steps in dealing with waste. The revised WFD requires the application of the revised hierarchy as a priority order in waste prevention.

The Waste Hierarchy is a scale of waste treatment options ranked from the most desirable to the least desirable in accordance with the impact they have upon the environment.

At the top of the Hierarchy is the most favourable alternative, namely prevention and minimisation of waste at source, followed by reuse, recycling and composting, incineration with energy recovery and finally landfill which is widely regarded as being the least favourable option.

The primary purpose of the Hierarchy is to minimise adverse environmental effects from waste and to increase resource efficiency in waste management and policy.

Like all Member States, the UK needs to apply this hierarchy as a priority order in waste prevention and management legislation and policy. The Waste Hierarchy is the cornerstone of EU waste policy and legislation, and is cited as a core principle of the revised 2013 'Delivering Resource Efficiency Strategy' [25].

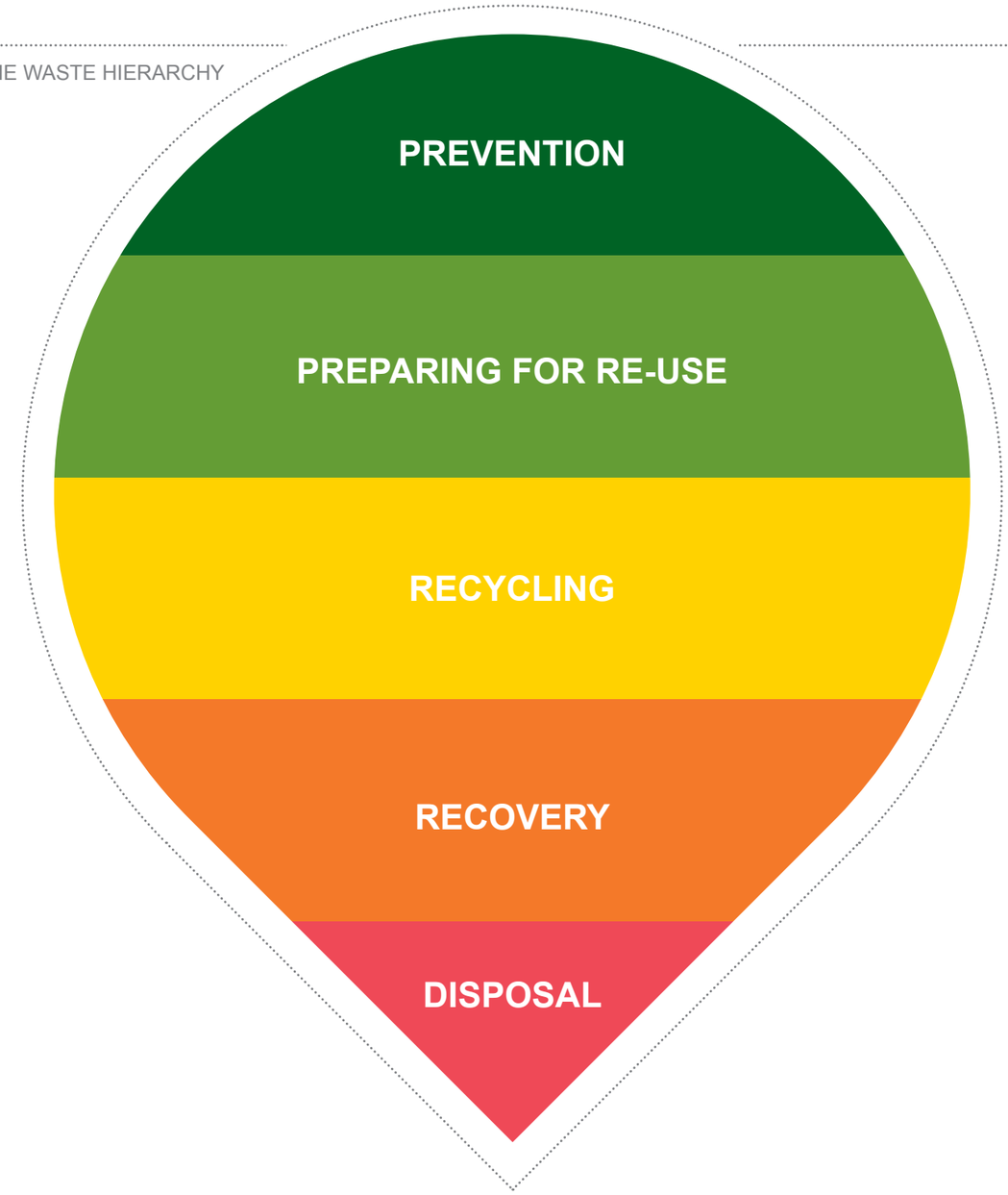
The Waste Hierarchy is a priority order for waste management to be applied as follows: [26]

- Prevention
- Preparing for re-use
- Recycling
- Other recovery, e.g. energy recovery; and
- Disposal.

[25] **DOENI (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

[26] Ibid.

THE WASTE HIERARCHY



PREVENTION
Avoidance, reduction and re-use; using less hazardous materials (1)

PREPARING FOR RE-USE
Checking, cleaning, refurbishing, repairing whole items or spare parts.

RECYCLING
Turning waste into a new substance or product. Includes composting if it meets quality protocols.

RECOVERY
Anaerobic digestion, incineration with energy recovery, gasification and pyrolysis which produce energy (fuels, heat and power) and materials from waste. Some backfilling operations.

DISPOSAL
Landfill and incineration without energy recovery (2)

The Waste Hierarchy ranks waste management options in terms of their environmental impact. “Waste prevention” is identified as the first tenet of the hierarchy and considered to represent the most efficient and sustainable use of resources. European Commission 2012 Guidance [27] (EC 2012 Guidance) describes re-use as an important part of this tenet, because it keeps the products in the consumption sphere for a longer period and thus avoids the creation of waste. Re-use, the Guidance states, implies that a product is used again for the same purpose for which it was originally conceived[28].

Next in the Hierarchy and explained by the EC 2012 Guidance is ‘preparing for re-use’, which contributes to the same purpose, but deals with products which have already been discarded by their last owner and are therefore formally waste according to the definition provided by Article 3(1) of the WFD [29].

This Hierarchy level was introduced to make waste operators aware of the potential to divert products from the waste stream, as their sorting, cleaning and repair allows them to be used by someone else. Preparing for re-use is therefore regarded by the EC 2012 Guidance as contributing to waste prevention in a wider sense and promotion of re-use has now been included in the present guidelines [30].

‘Prevention’ is not technically a waste management measure, as it occurs before a material or object becomes waste, the reduction of waste per capita, through re-use or other policy initiatives, is considered key to achieving the RE Roadmap milestone of turning potential waste into a resource [31].

The revised Waste Strategy advises that preparing for re-use has been introduced as a new concept and the revised WFD ranks it above recycling in line with the aim of improving resource efficiency [32]. The revised WFD hierarchy was introduced into NI Legislation through the Waste Regulations (NI) 2011 and the Department produced guidance on its application under regulation 17(5). In terms of departure from the Waste Hierarchy, this is permitted where justified by Lifecycle thinking.

Life Cycle Approach

European Commission 2012 guidance describes Lifecycle thinking as a fundamental change in product design wherein the consumption of resources and the environmental impact of products created during all phases of their production, distribution, use and disposal are considered from the outset.

Extended Producer Responsibility (EPR) is expressed as a strategy that encourages producers to consider the Lifecycle of its products at the design stage by widening their responsibility for the products they create to include their post- consumer end-of-life [33].

[27] Ibid.

[28] Ibid.

[29] Ibid.

[30] Ibid.

[31] **DOENI (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

[32] Ibid.

[33] **European Commission Directorate- General Environment (2012):** Preparing a Waste Prevention Programme, Guidance Document.

At each Lifecycle state there is a resource and energy consumption, and impacts created. Life cycle thinking aims to minimise the negative impacts while avoiding transferring the problem from one life cycle stage to another.

Polluter Pays Principle

The polluter pays principle, as explained in the revised Waste Strategy [34], is a guiding principle at EU level. The principle holds that the waste producer and the waste holder should manage the waste in a way that guarantees a high level of protection to the environment and human health.

Therefore the costs of waste management should be borne by the original waste producer, or by the current or previous waste holders. Thus the full cost of providing services to manage waste is passed on to the waste generator. The EU Landfill Directive reflects this principle in requiring that the price to be charged for disposal of waste should as far as possible cover the costs involved in the setting up, operation closure and aftercare.

Principles of Proximity and Self-sufficiency

The revised WFD, as discussed in the revised Waste Strategy, establishes principles of proximity and self-sufficiency within the context of the requirement for Member States to establish an integrated and adequate network of waste disposal installations and installations for the recovery of mixed municipal waste collected from households, including such waste collected from other producers, taking into account best available techniques.

The network is to be designed to enable the EU as a whole to become self-sufficient in waste disposal and recovery and each Member State to move towards this aim. The revised WFD requires that the network shall enable waste to be disposed of or, in the case of mixed municipal waste, recovered in one of the nearest appropriate installations by means of the most appropriate methods and technologies in order to ensure a high level of protection for the environment and public health.

However, it also makes clear that each Member State does not have to possess the full range of final recovery facilities.

Integration of Waste Streams

In the context of the revised Waste Strategy, integration of waste streams is defined as encouraging the development of waste management solutions that encompass all waste. The revised Waste Strategy advises that this ‘holistic’ approach reflects the broader definition of municipal waste and seeks to explore the potential benefits to be gained from co-treatment of different waste streams, including the sharing of waste infrastructure [35].

In agreement with the European Commission the way in which municipal waste is defined in NI has been broadened. Previously, the definition only included waste which was collected by Councils but this has been changed to include all waste from households and all wastes of a similar nature and composition to waste from households, whoever collects it. As a result, the definition now includes commercial waste which is similar in nature to household waste.

[34] **DOE (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

[35] Ibid.

WASTE PREVENTION

Waste Prevention is widely accepted as key to optimising resource efficiency across all waste streams and is therefore at the top of the Waste Hierarchy.

The revised WFD, as discussed in the 2013 NI Waste Strategy, defines prevention as 'measures taken before a substance or material or product has become waste that reduces: [36]

- The quantity of waste, including through the re-use of products or the extension of the life span of products;
- The adverse impacts of the generated waste on the environment and human health; or
- The content of harmful substances in materials and products.

In effect, this reflects the need to promote sustainable consumption and production through improved product design and consumer behavioural change. Moreover, waste prevention also has an important role in supporting measures to reduce the impact of climate change and in providing savings to householders and businesses.

The RE Roadmap urges a transformation in attitudes to natural resources through greater re-use and the decoupling of economic growth from resource use. While it does not set specific targets for waste reduction, it contains a milestone that waste generated per capita should be in absolute decline by 2020.

The revised WFD required Member States to create national waste prevention programmes by 12 December 2013. Waste prevention is the key driver for achieving a circular economy. The objective of these programmes is to present a co-ordinated national approach to waste prevention, delineating targets and policies with the aim of decoupling economic growth from the environmental impacts of waste generation [37].

Article 29 of the revised WFD requires Member States to: [38]

- Establish waste prevention programmes by December 2013,
- Assess existing national waste prevention measures,
- Define national waste prevention objectives,
- Evaluate the suitability of the strategies for inclusion in national waste prevention programmes,
- Take appropriate measures to promote re-use,
- Support the establishment and development of re-use and repair networks, as well as public procurement criteria and quantitative objectives for re-use,
- Determine qualitative or quantitative benchmarks for waste prevention measures,
- Adopt targets and indicators, if appropriate, to monitor and evaluate the success of waste prevention measures and progress towards objectives, and
- Review and revise waste prevention programmes at least every six years.

[36] **DOENI (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

[37] **DOENI (2014):** the Waste Prevention Programme for Northern Ireland - the Road to Zero Waste http://www.doeni.gov.uk/waste_prevention_programme_for_ni_2014-2.pdf

[38] Ibid.

The Waste Prevention Programme for Northern Ireland was published in September 2014. The Programme outlines that DOE NI is targeting prevention through 13 actions however it stops short of setting a headline target.

Actions are: [39]

Action 1 - Stakeholder Forum

- Hosting a stakeholder forum on waste prevention by December 2014, which will have a particular focus on establishing a repair and reuse network across Northern Ireland (this action slipped due to budgetary constraints and it is hoped that it will be actioned some time in 2015) ;

Action 2 - Rethink Waste Communications Campaign

- Developing a follow-up communications campaign to build on the initial Rethink Waste campaign, which includes waste prevention messaging to residents. As food waste is considered a 'priority' waste stream to tackle, the communications campaign will have a particular focus on preventing food waste (and will support Love Food Hate Waste campaign);

Action 3 - European Week of Waste Reduction

- Continuing to support an annual waste prevention week (http://resource.co/resource-use/article/european-weel-waste-reduction-launches) and promote waste prevention across local government, the public sector, the third sector, businesses, schools, and the public throughout Northern Ireland;

Action 4 - Eco-Home Programme

- Assessing the feasibility of expanding the Eco-Home Programme across Northern Ireland;

Action 5 - Eco-Schools Programme

- Continuing support for Eco-Schools Programme (http://resource/co/resource-use/article/northern-ireland-primary-reaches-zero-waste-milestone) including the waste topic relating to waste prevention and recycling;

Action 6 - Carrier bag Levy

- Extending the carrier bag levy (http://resource.co/resource-use/article/carrier-bag-use-northern-ireland-drops-718cent-following -levy 3256) to low-cost reusable bags from January 2015;

Action 7 - Support for Voluntary Agreements with Business

- Working with partners to ensure that voluntary agreements with business on waste and resource efficiency work well in Northern Ireland, and include a focus on preventing waste;

Action 8 - Zero Waste Projects

- Supporting zero waste projects through the Rethink Waste Fund (http://resource.co/sustainability/article/voluntary-sector-receives-recycling-funding-3257)

Action 9 - Voluntary Construction Sector Schemes

- Periodically reviewing the effectiveness of voluntary environmental schemes within the construction sector in determining whether to consider statutory instruments in the future;

[39] Ibid.

Action 10 - Voluntary Agreement for the Construction Sector

- Working with partners and stakeholders to develop a Northern Ireland-appropriate voluntary agreement as a follow-up to 'Halving Waste to Landfill';

Action 11 - Reuse and Repair Network

- Working with partners to develop a reuse and repair network throughout Northern Ireland, supporting reuse and preparing for reuse infrastructure;

Action 12 - Support to the Third Sector

- Reviewing the Rethink Waste Fund (http://resource.co/sustainability/article/voluntary-sector-receives-recycling-funding-3257) to provide appropriate support to the Third Sector to enable business growth and capacity to be expanded. This will seek to provide access to capital funding and to offer grants over one to three years to the third sector; and

Action 13 - Reuse Quality Assurance

- Working with Partners to: influence supply chains to promote reuse, develop business models to assist reuse businesses; and promote reuse assurance standards. Locally, the Department of the Environment will seek to work with and support stakeholders to increase the reuse of electronic and electrical equipment, and will assist the development of new business models with partners for reuse schemes and promote standards such as PAS1412.

The Department in the revised Waste Strategy commits to developing a Waste Prevention Programme to consider the scope for a common approach on Waste Prevention initiatives with Ireland. The Department further advises that Waste Prevention Programmes will be reviewed and revised every 6 years [40].

While it is accepted that 'Prevention' is not technically a waste management measure, as it occurs before a material or object becomes waste, the reduction of waste per capita, through re-use or other policy initiatives is key to achieving the Resource Efficient Roadmap milestone of turning potential waste into a resource.

Although many of the actions necessary to directly influence levels of waste production are beyond the direct powers of Local Authorities, councils can play a vital coordinating, facilitating and leadership role for the various waste producing sectors in their areas. This is likely to include long term education programmes and publicity campaigns. To be most effective, awareness and strategies should utilise a range of public awareness initiatives adapted to local circumstances.

They should also take into account location - whether rural or urban - and if there are any particular socio-demographic characteristics, which may affect the success of their campaign. Local Councils' procurement policies should also aim to ensure waste generation is minimised. Councils should procure goods and services manufactured with minimum waste and which will minimise the generation of waste throughout their lifecycles.

The following table provides a summary of advantages and disadvantages of waste prevention: [41]

ADVANTAGES OF WASTE PREVENTION	**DISADVANTAGES** OF WASTE PREVENTION
• Councils can lead by example, facilitating industry and other sectors • Environmental and other cost savings associated with production (including raw materials, energy, transport and processing) • Reduced disposal needs and costs • Reduction collection needs and costs • Reduced hazardousness of waste	• Investment required to bring about waste reduction in some manufacturing processes could have an unacceptably long payback period • Focussing on the minimisation of solid waste alone could result in an increase in other (aqueous or gaseous) wastes.

Top tip

[40] Ibid.

[41] **RPS Consulting (2006):** North West Region Waste Management Group Waste Management Plan.

RE-USE AND PREPARING FOR RE-USE

Preparing for re-use has been introduced as a new concept and the revised WFD ranks it above recycling in line with the aim of improving resource efficiency. The revised WFD draws a clear distinction between 're-use' and 'preparing for re-use'. The distinction, as discussed in Defra's 2012 guidance,[42] on the legal definition of waste and its application, is that the former is an activity which does not involve waste and the latter is an activity which does involve waste.

The revised WFD defines these terms as follows: [43]

- 're-use' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived; and
- 'Preparing for re-use' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing;

Examples of preparing products or components for re-use include: electrical equipment, furniture and carpets; bikes; paint and clothing. The revised Waste Strategy gives a commitment to encourage partnerships between Councils and the Third Sector in the development of schemes to promote preparing for re-use [44].

The revised WFD requires Member States to take measures to promote the re-use of products. The revised Waste Strategy advises that in line with this increasing emphasis on re-use, the European Commission has committed to, by 2016, examine the case for a mandatory 5% re-use target to be shown separately from the recycling target level in respect of Waste Electrical and Electronic Equipment [45].

The Environment Agency has produced a number of regulatory position statements relating to re-use.

There is a recognised need to support and encourage the establishment and continuation of re-use and repair networks throughout Northern Ireland and the potential for co-operation through these networks on an all-island basis.[46] The expansion of re-use and repair networks will promote the development of social enterprises at a community level and stimulate opportunities for green jobs [47].

The case for re-use is considered two-fold; as not only does it divert waste from landfill, it also contributes to significant carbon savings when compared with recycling. For the re-use market to grow there has to be social acceptance and confidence in the quality of goods being sold. DOENI had committed to supporting the development of a certificated re-use voluntary quality assurance scheme and to work with DECLG in assessing the feasibility of introducing a scheme on an all-island basis.

Re-use and Repair

A 2010 WRAP report, "Reuse of Bulky Waste in Northern Ireland: Opportunities for Growth" showed that there were significant opportunities to increase re-use activities. The report estimated the amount of bulky household waste arising in Northern Ireland at approximately 80,000 tonnes per year.

Further, estimations suggested that about 23,000 tonnes of this would realistically be reusable. In 2007/08 Furniture Reuse Organisations (FROs) diverted just over 1,000 tonnes of bulky items to reuse. Based on likely market demand for material, and increased local authority activity in cooperation with FROs, it was suggested that a further 3,100 tonnes could be diverted for re-use [48].

Case Study 3

BANBRIDGE COUNCIL

The council noted that there were large numbers of quality items disposed of at household waste recycling centres (HWRC). The Council decided that the HWRC's were the ideal place to set up a reuse and refurbishment scheme with environmental and social benefits for the local community. http://www.wrap.org.uk/sites/files/wrap/Case_study_1_-_Banbridge.pdf

[42] **Defra (2012):** Guidance on the legal definition of waste and its application.

[43] **European Commission (2008):** http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32008L0098&from=EN

[44] **DOE (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy. http://www.do eni.gov.uk/wms_2013.pdf

[45] **DOE (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

[46] Ibid.

[47] Ibid.

[48] **WRAP (2010):** Reuse of Bulky Waste in Northern Ireland, Opportunities for Growth.

Industrial Symbiosis

With the inclusion of “re-use”, as part of waste prevention, and “preparing for re-use” in the revised Waste Hierarchy, the revised Waste Strategy discuses how industrial symbiosis will play an increasingly relevant role in delivering targets and objectives with resource efficiency at its core [49].

Industrial symbiosis, as defined by WRAP, is an association between two or more industrial facilities or companies in which the wastes or by-products of one become the raw materials for another [50].

Industrial symbiosis can help companies:

- Reduce raw material and waste disposal costs
- Earn new revenue from residues and by-products
- Divert waste from landfill and reduce carbon emissions
- Open up new business opportunities

As in the natural world, this type of industrial synergy brings advantages to both parties, and is usually done for both commercial and environmental reasons.

The revised Waste Strategy considers Invest NI’s Sustainable Productivity Programme and how within this industrial symbiosis activity joins businesses and industries from all sectors to identify and maximise opportunities for the commercial exchange of commodities including for example water, waste and energy as well as logistics and expertise.

The revised Waste Strategy highlights that there will be increasing potential for such commercial opportunities to be grasped in the years ahead as businesses focus on cost savings, compliance with statutory obligations and achieving corporate goals.

A guide for businesses in Northern Ireland can be accessed at: http://www.international-synergiesni.com/wp-content/uploads/2014/10/204221-Industrial-Symbosis_WEB.pdf

Obtaining data on re-use activities

In terms of assessing progress towards the aim of waste prevention (including re-use) understanding and measuring re-use activities is important.

ADVANTAGES OF PREPARING FOR REUSE	DISADVANTAGES OF PREPARING FOR REUSE
• Environmental and other cost savings associated with production (including raw materials, energy, transport and processing) as many single trip products are replaced with reusable ones • Cost savings for business and the consumer as reusable products need less frequent replacement than single trip products • Reduced disposal needs and costs • Reduced collection needs and costs • New market opportunities produced e.g. refillable products	• The environmental costs associated with the infrastructure and transport needed for return/refilling systems could outweigh the environmental benefits of re-use • The costs and practical difficulties of collection, transport and cleansing • Reduced market opportunities for disposable products • Increased material use as re-usable products may need to be more robust than single trip products • Not possible for local authorities to control

Top tip

[49] **DOE (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

[50] http://www.wrap.org.uk/content/what-industrial-symbiosis

RECYCLING

After Waste prevention, including re-use, the next priority is to separate waste materials for recycling. This not only reduces the environmental impact of waste, but also reduces the demand on natural resources. Recycling is defined in the revised WFD as 'any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes'. It includes the reprocessing of organic material but does not include energy recovery and reprocessing materials that are to be used as fuels or for backfilling operations' [51].

The revised Waste Strategy aims to increase materials resource efficiency through the promotion of recycling of waste based on a life cycle approach which balances consumption and production. A strong emphasis, will be on ensuring that manufacturers, retailers and importers take responsibility for the costs of treatment and recycling of their products when they become waste in line with the 'polluter pays principle' [52].

The common idea behind recycling, as further discussed in EC 2012 Guidance [53], is that a waste material is processed in order to allow it to be used again for the same or other applications. Moreover, the explicit goal of the revised WFD is that the EU should become more of a 'recycling society', seeking to avoid waste generation and to use waste as a resource.

It is worth noting that WRAP launched a refreshed Recycle Now Campaign in June 2015. Local authorities can access a range of new free-to-use promotional materials aimed at encouraging householders to recycle.

Further information on this can be accessed at: http://www.letsrecycle.com/news/latest-news/wrap-launches-refreshed-recycle-now-campaign/

Benefits of Recycling

Recycling some materials can have greater benefits than others and this also depends on the type of recycling undertaken. "Closed loop" recycling, the process by which recycled materials are used for the same purpose, is much better for the environment than open loop recycling, where the recycled material is 'downgraded'. Recycling materials which have the potential to reduce carbon impact the most, such as food, paper/card, dense plastics, textiles and non-ferrous metals are deemed to be the priority [54].

Recycling conserves natural resources and can save on waste disposal charges. It usually requires less energy than the use of virgin materials and reduces demand for landfill and thermal treatment plants, preventing the emission of many greenhouse gases and water pollutants. Recycling creates new opportunities for employment in the areas of collection, treatment and reprocessing of recyclable materials, particularly where new uses and applications for materials can be developed.

Markets for recycled products therefore need to be further developed and the demand for recycled products increased. Demand for products made of recyclable materials can be low due to the perception of poorer quality and in some cases more expensive final products [55].

The collection and sorting of recyclable materials also needs to be considered and there are a number of collection and processing systems to promote greater recovery and recycling of waste materials. The main dry recyclables for which markets can be developed are identified: paper, cardboard, glass, certain plastics, textiles and metals. Additionally, organic waste can be biologically treated to produce a compost or similar product [56].

In a number of ways recyclable materials can be separated and collected: [57]

Kerbside collections: recyclable materials are separated by the householder and collected at the kerbside. Kerbside collections can be carried out at the same time as normal refuse collection but recyclable materials are placed in a separate container. The term 'kerbside' tends to be used to cover a range of collection points, ranging from 'door to door collections to collections at the boundary of a property. Material collections normally encourage householders to deposit a mixture of dry recyclables into a dedicated wheelie bin or to deposit into a box. These systems generally collect the same materials but in the former, materials are sorted at a facility such as a Materials Recovery Facility (MRF) and in the latter, materials tend to be sorted at kerbside.

The revised WFD made provisions for Member States to set up separate collections of waste for at least paper, metal, plastic and glass by 2015.

Additionally, householders can take their recyclables to **bring banks** or drop-off facilities or to a **civic amenity** (CA) site or a **Household Waste Recycling Centre** (HWRC). Bring banks are usually unstaffed and located at points the public already travel to, such as shopping centres and petrol stations. CA/HWRC sites are dedicated (usually staffed) facilities where general household waste, garden waste, dry recyclables, bulky and hazardous household wastes can be deposited. In these cases the recycling is generally referred to as source segregated recycling.

The revised WFD requires Member States to 'take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors. Subject to Article 10(2), by 2015 separate collection shall be set up for at least the following: paper, metal, plastic and glass [58].'

The revised WFD also requires Member States to recycle 50% of waste from households by 2020 and to recover 70% of construction and demolition waste by 2020 [59].

51 **European Commission (2012):** Guidance on the Interpretation of key provisions of Directive 2008/98/EC on Waste.

52 **DOENI (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

53 Ibid.

54 **DOE (2013):** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy.

55 **Arc 21 (2014):** Waste Management Plan.

56 Ibid.

57 Ibid.

58 Waste Framework Directive 2008/98/EC, cited in Arc21 (2014) Waste Management Plan.

59 **Arc21 (2014):** Waste Management Plan.

Quality of Recyclates

The revised Waste Strategy also provides guidance on the quality of recyclates and discusses how promoting high quality recycling can facilitate increased 'closed loop' recycling which is more resource efficient.

Its importance is further considered in terms of how it can help support growth and the green economy by maximising the economic value of the waste material collected. It can also help increase public participation in recycling.

The Department gives a commitment to work with the waste management industry to produce transparent, robust and consistent information on quality to facilitate the proper functioning of the recyclate markets [60].

Duty of Care

Waste Management: the Duty of Care - A Code of Practice for Northern Ireland is issued by the Department of the Environment in accordance with Article 5(9) of the Waste and Contaminated Land (Northern Ireland) Order 1997 [61]. The Code is required by law under Article 5 of the 1997 Order. Breach of the Duty of Care is often an offence, which, ultimately, may result in prosecution which on summary conviction is liable to be a fine not exceeding the statutory maximum or, an unlimited fine if convicted on indictment.

In such cases, the Code is admissible as evidence in court and the court shall take it into account in determining any question to which it appears to be relevant.

The intention is that the Code will assist the courts, when hearing cases under Article 5 of the 1997 Order, in determining whether the persons subject to the Duty took reasonable measures to comply with it.

In July 2014 a revised Waste Management Duty of Care Code of Practice for Northern Ireland was published [62]. The purpose of the Code of Practice is to provide practical guidance for everyone subject to the Duty of Care. The 'Duty of Care' enshrines in law the requirement for all who import, produce, collect, carry, keep, treat, dispose of, broker in, deal in and process controlled waste to manage that waste correctly by storing it properly, transferring it only to the appropriate people and ensuring that when it is transferred it is sufficiently well described to enable its safe recovery or disposal without endangering human health or harming the environment [63].

The actions contained in the Code that are preceded by **'must'**, form the statutory sections of the code.

As well as setting out the general requirements of the Duty of Care, the Code is split into a series of sections covering: [64]

- waste producers,
- waste carriers,
- waste managers,
- waste brokers,
- waste dealers, and;
- householders

[60] **DOENI (2013):** Delivering Resource Efficiency, A Waste Management Strategy for Northern Ireland.

[61] **NIEA (2014):** Waste Management The Duty of Care - Code of Conduct.

[62] Ibid. http://www.doeni.gov.uk/duty_of_care_-_code_of_practice_2014.pdf

[63] Ibid. http://www.doeni.gov.uk/duty_of_care_-_code_of_practice_2014.pdf

[64] Ibid.

End of Waste and the development of Quality Protocols

The revised Waste Strategy sets challenging levels for recycling and composting LACMW, which is effectively a framework under which all possible segregated recycling and composting can be considered. Developments in recycling technologies, such as more advanced screening and sorting equipment, has meant that a wider range of municipal waste streams are now suitable for recycling.

The revised WFD sets out 'end of waste' conditions that must be met, and the European Commission has subsequently published end of waste criteria for iron, steel and aluminium scrap. Where end of waste criteria have not been set at EU level, Member States may develop their own. Accordingly, the NIEA have, since 2009, been participating in the development of a UK Quality Protocols programme. Quality Protocols set out how to fully recover waste from a particular stream and turn it into a quality product.

It defines the point at which waste ceases to be waste and can be used as a product without the requirement for waste management controls. By following quality controls producers can be confident that they are producing quality products from waste, providing confidence for end-users that the products are certified to relevant standards and do not fall under waste regulatory controls. Compliance with quality protocols is voluntary.

If producers do not comply with the quality protocol in full, the material will still be regarded as waste and the onward transfer and use of the waste will be subject to the requirements of the Waste Management Licensing Regulations (NI) 2003 as amended.

Processing of Organic Waste - Composting

Organic waste can be treated by either of two biological processes - aerobic and anaerobic. Aerobic processing, more commonly known as composting, is recycling of the organic fraction of waste in the presence of air, whilst anaerobic processing is a recovery process in the absence of air.

Key sources of organic wastes include: garden waste, kitchen waste, organic waste from food processing businesses, institutions or hotels, timber and agricultural waste, wastewater and low grade paper waste.

Composting typically takes 50-60 days and reduces the bulk of original materials by 40-50%. The ideal input material for a compost product is clean organic waste, such as arises from gardening.

Composting can be carried out at home or on a larger scale. Commercial operations may be windrow (garden waste only) or in-vessel (food and garden waste).

Some composting programs require source separation of organic compostables by participating residents and businesses, for example separation of garden from kitchen waste while others accept a mixed stream and separate non-compostables at a centralized facility. Educational programs are a critical aspect of source separated composting systems, since such programs depend on residents to accomplish much of the separation.

As discussed in DOENI 2011 Guidance on 'Applying the Waste Hierarchy: Evidence Summary',[65] the relative merits of composting, and energy recovery options other than anaerobic digestion, depend on the compost being used in place of fertiliser or peat. Research has found that composting green waste offers greenhouse gas savings which are on a par with energy recovery [66]. Energy recovery can avoid more air pollution, since burning food waste avoids using fossil fuels. However, composting avoids more water pollution where use of artificial fertilisers is avoided.

Separation of Food Waste - Current Debate

In September 2013, the DOENI consulted on proposals for restrictions for the Landfill of food waste and associated draft legislation. It has since been indicated that landfill and sewage bans and separate collection requirements for food waste in Northern Ireland will be introduced by 2017.

The Department has confirmed a series of measures that it intends to take to recover food waste.

They include: [67]

- A landfill ban on separately collected food waste from April 2015
- The segregation of food waste for large businesses (more than 50kg a week) from April 2016 and for smaller businesses (between 5kg and 50kg a week) from April 2017
- A ban on the discharge of food waste into sewage from April 2017
- The provision of food waste bins to households by councils from April 2017

Comingled collections will be allowed where they ensure the amount of food waste collected is not "significantly less" than would be if it had been collected separately.

At the time of writing the indication was that a TEEP argument will not be included in the legislation to allow potential exemptions to the separate collection requirements and bans.

Composting systems

A number of other composting systems exist. These are as follows:

- Turned aerobic windrow composting
- Static aerobic windrow composting
- Static pile

The traditional turned aerobic windrow method of composting is the predominant method of composting used within the United Kingdom. However, for the composting of non-green MSW and commercial waste, it is not necessarily the most appropriate method to use. The introduction of Animal By-Product Regulations (2003) demands all catering and food waste should treated to required specifications and temperatures in In-vessel (IVC) systems.

IVC allows collected food waste to be composted on a large scale. It can produce composts meeting quality standards [68] which can be used as an alternative to inorganic fertilisers and peat-based products.

Turned aerobic windrow composting, IVC and static piles may be considered conventional methods of composting. Static windrow composting is a newer idea still being tested that allows aerobic composting to take place without the need for turning. In-vessel and windrow composting can also feature in Mechanical Biological Treatment processes as a stabilising treatment for organic material , as explained below un the heading 'Mechanical Biological Treatment'.

Many types of food waste collected by district councils and private contractors are not suitable for windrow composting.

Although carbon to nitrogen ratios and moisture content must be considered for all freed material for composting, the composition of feed materials is less critical for in-vessel systems than it is for windrow or aerated static pile systems.

This flexibility allows for different mixes to be composted, based on the availability of feed materials. The compostable materials must be screened or handpicked for non-biodegradable materials and then chipped, ground, or shredded into uniform particles that will decompose quickly.

In addition to commercial composting, composting on a small to medium scale may be carried out by voluntary/community and environmental organisations and social enterprises, which collect and compost food and garden waste from local houses and businesses. Businesses can compost on site but even if they don't move food waste to or from the site, they must comply with the relevant legislation [69].

In most cases where food waste is being composted or aerobically digested on a site other than the premises of origin, the operation will also need to comply with relevant Animal By-Products Legislation [70].

ADVANTAGES OF CENTRALISED COMPOSTING	**DISADVANTAGES** OF CENTRALISED COMPOSTING
• Reduced Disposal needs • Removes organic waste from landfill, so reducing methane emissions and potential groundwater contamination • Reduces the use of natural resources such as peat and materials used to produce artificial fertiliser • Potential social/community benefits	• Generation of odours • Generation of spores and fungi • Generation of liquid effluent • Limited markets for compost based products, although these markets are developing • Variability of composting materials and products

65 **DOE NI (2011):** Applying the Waste Hierarchy: Evidence Summary.

66 Kranert, M., Gottschall, R., Burns, C. Hafner. (2010) Energy or compost from green waste? A CO2-based assessment. Waste Management.

67 http://www.mrw.co.uk/news/northern-ireland-presses-ahead-with-food-waste-rules/8665274.article

68 **BSI PAS 100: 2011** http://www.organics-recycling.org.uk

69 http://wwww.doeni.gov.uk/niea/waste-home/regulations-legs.htm

70 http://www.legislation.gov.uk/nisr/2011/124/contents/made

Processing of Organic Waste - Anaerobic Digestion

Anaerobic Digestion (AD) is the biodegradation of organic waste in the absence of oxygen. It is effectively a controlled and enclosed version of anaerobic breakdown of organic waste in landfill which releases methane.

Almost any organic material can be processed with AD, including:

- MSW
- Green/botanical wastes
- Sewage sludge
- Organic farm wastes
- Organic industrial and commercial wastes

Energy

AD produces a biogas made up of around 60 per cent methane and 40 per cent carbon dioxide. This can be burnt to generate heat or electricity or can be used as a vehicle fuel. If used to generate electricity the biogas needs to be cleaned. It can then power the AD process to be added to the national grid and provide heat for homes.

As well as biogas, AD produces a solid liquid called digestate which can be used as a soil conditioner to fertilise land. The amount of biogas and the quality of digestates obtained will vary according to the waste fed into the process. More gas will be produced if the waste is putrescible, which means it is more liable to decompose. Sewage and manure yield less biogas as the animal which produced it has already taken out some of the energy content.

Although AD can process garden wastes, too much garden waste in the mix reduces the yield of biogas, as a substance called lignin which is found in woody materials does not break down without oxygen. AD can also complement composting systems by treating biodegradable waste that can't be processed through windrow composting (e.g. cooked kitchen waste and animal by-products).

DOENI 2011 Guidance [71] states that the combination of digestate and biogas outputs means that AD is environmentally preferable to composting. The Guidance points out that this departs from the normal order of the waste hierarchy. The biogas from an AD plant can be burnt in a combined heat and power (CHP) plant, generating renewable-only heating. The process is deemed to be better than carbon neutral because it contains the methane gas from the natural degradation of organic materials to provide fossil fuel free renewable energy.

This would otherwise be released into the atmosphere to become a greenhouse gas and is some twenty one times worse than carbon dioxide. AD is considered a particularly fine example of a sustainable process because it represents a closed loop for plant nutrients as well as carbon dioxide [72]. As plants can be small and low rise so may be situated in towns, reducing haulage distances and associated traffic pollutants. They are likely to be more acceptable to local communities than larger waste management facilities. AD also produces less air and solid emissions than incineration, landfill and pyrolysis and gasification.

Like most treatment processes, there will be some emissions from AD. However, air emissions are low due to the enclosed nature of the process, though combustion of the biogas will produce some nitrogen oxides. However, emissions from AD-CHP are generally lower than other forms of waste disposal. The health risk from the solid and liquid residue from the AD plant should be low as long as source-separated waste is being used (i.e. no chemical contaminants are entering the system from other waste).

Government control standards such as Animal By-products Regulations will determine if residue can be spread on the land. The usefulness of AD as a stand-alone waste treatment method is questionable. However, AD can play a significant role as a stabilising treatment for organic wastes in Mechanical Biological Treatment processes, as explained under the heading 'Mechanical Biological Treatment'.

ADVANTAGES OF AD	**DISADVANTAGES** OF AD
• A well-managed AD system will aim to maximise methane production, but not release any gases into the atmosphere, thereby reducing overall emissions. • Provides a source of energy with no net increase in atmospheric carbon which contributes to climate change. • Feed stock for AD is a renewable source and therefore does not deplete finite fossil fuels. • Use of digestate decreases use of synthetic fuels in fertiliser manufacturing, which is an energy intensive process • Up to 80% reduction in waste odour • Converts residues into potentially marketable products - biogas, soil conditioner, liquid fertiliser • Suitable for many highly flammavble, volatile, toxic and infectious waste streams which should not be landfilled • Prevents putrescible waste from being landfilled and as result can help reduce the production of landfill gas and leachate. • Reduces demand for landfill, other waste management capacity.	• Significant capital and operational costs • Unlikely AD will be viable as an energy source alone • Cost of separation from unsustainable wastes • Requires careful screening to remove contaminants, particularly metals • Requires controlled conditions and careful management to optimise gas production • Produces residue that may require landfilling • Gas may require clean-up prior to use.

[71] **DOE NI (2011):** Applying the Waste Hierarchy: Evidence Summary.

[72] **Severn Wye):** Biogas Regions and introduction to Biogas and Anaerobic Digestion.

Mechanical Biological Treatment (MBT)/ Mechanical Heat Treatment (MHT)

Mechanical Biological Treatment is a residual waste treatment process that involves both mechanical and biological treatment processes. The aim of MBT as a waste management tool is to minimise the environmental impact associated with the end disposal of biodegradable wastes and to obtain additional value from the input waste by the recovery of recyclable materials, such as metal and glass, and in the form of 'compost' and in some cases, biogas and/or a waste-derived solid fuel.

In the initial stage, bulky materials and recyclables are removed and the remainder of the waste is homogenised and if necessary moistened. Biological treatment is then used to stabilise raw materials, and hence reduce the biodegradability, and obtain a mineralised produce through the biodegradation of organic constituents. The biological treatment may be either in the form of aerobic composting or anaerobic digestion [73].

The first MBT plants were developed with the aim of reducing the environmental impact of landfilling residual waste. MBT therefore complements, but does not replace, other waste management technologies such as recycling and composting as part of an integrated waste management system [74].

Recyclables derived from the various MBT processes are typically of a lower quality than those derived from a separate household recyclate collection system and therefore have a lower value.

The objective [75] of MHT is to separate a mixed waste stream into several component parts using mechanical and thermal (including steam) based technologies. This provides further options for recycling, recovery and in some instances biological treatment. The processes also sanitise waste, by destroying bacteria present, and reduce moisture content. Autoclaving is a form of MHT. Glass and metals derived from some MHT processes have the potential to be significantly cleaner than those from MBT processes due to the action of steam cleaning, which can remove glues and labels. Other recyclables such as plastics may also be extracted from some systems.

However, most plastic materials are deformed by the heat of the MHT process, some to a greater extent than others, potentially making them more difficult to recycle in some instances. Both MBT and MHT produce outputs often described as Compost Like Outputs (CLO), and they can produce Solid Recovery Fuel (SRF). SRF, depending on its characteristics, can be used in industrial combined heat and power production, cement kilns, purpose-built waste combustion plants, co-firing with other fuels (e.g. coal in power stations), and treatment in advanced thermal technologies, such as pyrolysis and gasification. SRF is classified as a waste and therefore any facility using the fuel is subject to requirements of the Waste Incineration Directive [76].

SRF can then be sent to a fuel user. Industrial and commercial users may prefer SRF to be untreated residual waste, either as a consequence of how untreated waste is perceived or because of practical, technical issues related to a refined fuel's energy efficiency and compatibility with storage and transportation conditions on industrial sites.

ADVANTAGES OF MBT	**DISADVANTAGES** OF MBT
• Even with a successful kerbside scheme in place there will be some recyclable material in the residual waste - these will be captured at the mechanical treatment stage. • It reduces the volume of residual waste and therefore the landfill space taken, thus reducing the cost to the local authority of disposal. • Potential hazardous waste contaminants of the waste stream, such as batteries, solvents, paints, fluorescent light bulbs etc, will not reach municipal landfill sites due to the sorting of the waste prior to treatment. • It reduces the biodegradability of the waste, thus helping local authorities complying with their landfilling Directives. • Stabilisation of the waste reduces side-effects at the landfill site such as odour, dust and windblown paper and plastics. • The plants tend to be modular. They are made up of small units which can be added or taken away as waste streams or volumes change. • Plants can be built on a small scale, which would not drag waste in from a large surrounding area. • Process produces an additional source of fuel, which could be used to service energy recovery facility or could be used in appropriate third party applications, such as a cement kiln, if available.	• Dry recyclables separated out during the process will be of poor quality compared to that collected by kerbside or bin-bank schemes. • Large scale plants draw in waste from a wide area, contradicting the proximity principle. • MBT plants with long term contracts may demand a fixed tonnage of waste that could undermine recycling and waste minimisation efforts in the area. • Although the biodegradability of the waste has been reduced via the MBT process, not all of the residue will be considered inert.

[73] **ADOENI (2011):** Applying the Waste Hierarchy: Evidence Summary.

[74] Ibid.

[75] Ibid.

[76] Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste.

Thermal Treatment, Energy from Waste - Gasification and Pyrolysis

Gasification and Pyrolysis are related technologies: [77]

- Gasification is the heating of organic materials, including mixed waste or biomass at high temperatures (above 700^{O}C) with a reduced amount of oxygen and/or steam.
- Pyrolysis is a similar high temperature decomposition process, but is carried out in the absence of oxygen. This process requires an external heat source to maintain the temperature required.

The outputs from both gasification and pyrolysis comprise a solid residue and a synthetic gas (syngas). The solid residue is a combination of non-combustible materials and carbon. The combustible part can then be burned to produce electricity. The gas can be burned independently in a boiler, engine or gas turbine to produce electricity. Pyrolysis also yields a char which could be used to replace coal in certain applications. Some pyrolysis processes produce gasses that can be condensed into a liquid fuel. There are other technologies such as plasma arc gasification, but the majority of these are still in their development stage for dealing with mixed waste.

Pyrolysis and gasification plants generally operate on a smaller scale that that which is demanded by a mass burn incinerator and therefore capital costs are smaller.

The plants tend to be modular in design, i.e. they are made up of small units which can be added to or taken away as waste streams or volume changes (e.g. increased recycling) and are, therefore, considered more flexible than mass-burn incinerators.

Where MBT(and by analogy, MHT) outputs are used as fuel (not replacing coal) or landfilled, the evidence comparing MBT and direct energy recovery, which suggests that unless the rate of energy recovery is low, MBT comes below incineration in the waste hierarchy [78]. Moreover, where MBT outputs are used to generate SRF to replace coal (e.g. in co-combustion or cement kilns), it is considered more advantageous [79].

The 2011 Guidance also points out how evidence on the relative merits is limited and cites that Eunomia (2006) and Papageorgiou et al (2009) suggest that MBT is preferable to combustion, whereas the Environment Agency Wales (2008) suggested that MBT is less preferable than energy recovery at this stage [80]. The use of Combined Heat and Power (CHP) technologies can improve efficiency of each of these treatment routes and may change this ranking, depending on the combinations being compared [81].

[77] **DOENI (2011):** Applying the Waste Hierarchy: Evidence Summary.

[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] Ibid.

In conclusion, residual waste may also be a suitable feedstock for the production of renewable transport biofuels, renewable heat, power and /or renewable chemicals through advanced biofuels and biorefinery technologies. There is some evidence that these can provide greenhouse gas savings relative to other technologies and reduce the demand for resources, but that further evidence is needed to compare other environmental impacts.

The revised Waste Strategy recognises that residual waste has value in terms of recovery and energy and as such states support for 'efficient energy recovery from residual waste in accordance with the waste hierarchy which can deliver environmental benefits, reduce carbon impacts and provide economic opportunities' [82].

ADVANTAGES OF GASIFICATION	**DISADVANTAGES** OF GASIFICATION
• Produces gas for energy production • Reduces demand for landfill and other waste management capacity • Uses low emission technology	• Not commercially proven for MSW/ household waste • May be considered similar to incineration and as a result of negative public perceptions this can lead to planning problems • Gas is often low in heating value • A high level of commitment to gasification may inhibit waste minimisation and recycling • A limited number of technology suppliers

ADVANTAGES OF PYROLYSIS	**DISADVANTAGES** OF PYROLYSIS
• Produces a gas/liquid for energy production • Reduces demand for landfill and other waste management capacity.	• Not commercially proven for MSW/ household waste • Can be difficult to transfer heat to feedstock • Unlikely to be suitable for the direct degradation of untreated municipal solid waste • Can be difficult to control product quality • A high level of commitment to gasification may inhibit waste minimisation and recycling

[82] **DOENI (2013):** Delivering Resource Efficiency, A Waste Management Strategy for Northern Ireland.

Incineration with Energy Recovery

Incineration is a waste treatment technology that involves the combustion of waste materials. Incineration and other high temperature waste treatment systems are also often also described as 'thermal treatment'. Incineration is the most well known thermal process.

During incineration the waste is burnt in the presence of oxygen at a high temperature - normally above 850^{O}C. The process produces steam which can be used to generate electricity and heat; wastes that are not incinerated remain a solid residue. Incineration of waste materials converts the waste into ash, flue gases, particulates and heat which can in turn be used to generate electricity. The flue gases are cleaned to remove pollutants before they are dispersed in the atmosphere.

The heat energy created is often referred to as energy from waste (EfW) [83]. The energy can also be used to heat water for heating systems in local businesses or houses and in these cases the facility can be referred to as Combined Heat and Power facilities (CHP).

Incineration with energy recovery is the application of sound, proven combustion engineering principles to a variety of technologies which reduces the volume and quantity, and sanitises the municipal waste fraction, after recycling and composting has taken place, in order to recover energy from the input waste material.

Typically during controlled combustion in the presence of oxygen, the organic component of the waste is oxidised to form CO2 and water, and the solid residues are mineralised into ash.

There are a variety of different technologies, (for example, moving grate and fluidised bed) which can produce energy from waste by burning mixed MSW material. Metals are extracted after combustion has taken place, and bottom ash produced can be used as an aggregate replacement. Air pollution control residues produced are deemed hazardous, and whilst some markets exist for their use, they are generally landfilled [84].

The capital costs of developing these facilities are fairly high and as such the development Energy from Waste (EfW) plant needs to be underpinned by long term contracts that guarantee continuous supply of waste [85].

EfW is therefore considered an attribute of an integrated waste management solution which can also provide an alternative to landfill without compromising recycling activities as long as EfW capacity requirements are determined taking account of current and likely achievements in waste reduction, recycling and composting.

[83] **Arc21 (2014):** Waste Management Plan.

[84] Ibid.

[85] http://archive.defra.gov.uk/environment/waste/localauth/partnerwork/documents/economies-scale.pdf cited in Arc 21 (2014) Waste Management Plan.

Although there has been some attention in relation to the emissions to the atmosphere and the potential for perceived risks to human health, studies have not proven any link between EfW and health, particularly incidences of cancer associated with dioxins.

The UK review of the health effects of Waste management (of solid wastes) [86] identified that the health risks of a modern EfW plant are small compared with other known human health risks, and that EfW remains an option for dealing with residual waste. Defra indicated there is sufficient confidence in current policies for local authorities to press ahead with the task of approving planning applications for new waste management facilities.

EfW plants are controlled operations subject to authorisation under IPPC, and all new plants have to meet the increased standards in the industrial Emissions Directive. Once a plant is operational, the Operator is required to monitor emissions using approved protocols and to an agreed schedule. The Regulatory Body (NIEA) has responsibility for checking monitoring data and for ensuring a plant operates within its authorisation [87].

DISPOSAL METHODS

Landfill

Landfill is currently the most common means of dealing with residual waste in the UK, and this continues to be the most unsustainable waste management option. Landfill can be simply defined as the disposal of solid municipal waste to land. This is usually carried out under anaerobic conditions and results in the generation of landfill gas and leachate. Government policy, as discussed in the DOENI 2011 Guidance, continues to promote measures to better manage methane capture at landfill sites and make better use of the gas in providing renewable heat and electricity [88].

In parallel, the Landfill Directive sets targets to reduce the quantity of biodegradable municipal waste sent to landfill, which in turn should lead to a reduction in methane emissions. However, the overall impact of landfill, it is explained, will continue to be negative as there is a range of additional environmental impacts, and not all methane emissions are captured.

The objective of government policy is therefore to reduce the volume of waste going to landfill however there will be some wastes for which landfill remains the least worst option [89].

The Landfill Directive (1999/31/EC) has placed specific engineering requirements on landfill developments to ensure that landfills offer the protection to the environment from the design stage to decommissioning and aftercare [90].

[86] **Environs for DEFRA (2004):** Review of Environmental and Health effects of Waste Management: Municipal Solid Waste and Similar Wastes, cited in Arc 21 (2014) Waste Management Plan.

[87] **Arc21 (2014):** Waste Management Plan.

[88] **DOENI (2011):** Applying the Waste Hierarchy :Evidence Summary.

[89] **DOENI (2011):** Applying the Waste Hierarchy :Evidence Summary.

[90] **Arc21 (2014):** Waste Management Plan.

APPENDIX 1

Legislation and Policy

This appendix provides a list of the key legislation and policy documents relevant to waste management practices in Northern Ireland. Key European Waste Directives, Regulations as well as key primary subordinate waste legislation in Northern Ireland are listed. It is intended for guidance only and this list is not exhaustive.

European Waste Directives

- 2008/98/EC Waste Framework Directive
- 1999/31/EC Directive on the Landfill of Waste
- 2004/12/EC Directive on Packaging and Packaging Waste
- 2012/19/EC Directive on Waste Electrical and Electronic Equipment
- 2000/53/EC Directive on the End-of Life Vehicles (ELVs)
- 2006/66/EC Directive on Batteries and Accumulators
- 2010/75/EC Industrial Emissions Directive
- 2001/42/EC Strategic Environmental Assessment Directive
- 2001/689/EEC Directive on Hazardous Waste
- 97/11/EC Environmental Impact Assessment Directive
- 2004/35/EC Environmental Liability Directive
- 1986/28/EC Sewage Sludge Directive
- 2006/21/EC Mining Waste Directive

European Union Waste Communication

- Thematic Strategy on the Sustainable Use of Natural Resource
- Thematic Strategy for Soil Protection
- Thematic Strategy on the Prevention and Recycling of Waste

National Legislation and Regulations

Primary Legislation

- Waste and Contaminated Land (Northern Ireland) Order 1997 SI 2778 (including Amendments)
- Waste and Emissions Trading Act, 2003
- Environment (Northern Ireland) Order, 2002, SI 3153 (including Amendments)
- Producer Responsibility Obligations (Northern Ireland) Order 1998 SI 1762 (including Amendments)
- Litter (Northern Ireland) Order, 1994
- Waste (Amendment) (Northern Ireland) Order, 200 SI 611
- Clean Neighbourhoods and Environment (Northern Ireland) Act 2011

European Waste Communication

- Thematic Strategy on the Sustainable of Natural Resources
- Thematic Strategy for Soil Protection
- Thematic Strategy on the Prevention and Recycling of Waste

National Legislation and Regulations

Primary Legislation

- Waste and Contaminated Land (Northern Ireland) order, 1997 SI 28 (including Amendments)
- Waste and Emissions Trading Act, 2003
- Environment (Northern Ireland) Order, 2002 SI 3153 (including Amendments)
- Producer Responsibility Obligations (Northern Ireland) Order, 1998 SI 162 (including Amendments)
- Litter (Northern Ireland) Order 1994
- Clean Neighbourhoods and Environment (Northern Ireland) Act 2011

Secondary Legislation

- The Waste Regulations (Northern Ireland) 2011 SR 127
- The Landfill Allowances Scheme (Amendment) Regulations (Northern Ireland) 2011
- The Landfill (Northern Ireland) Regulations, 2003 SR 29 (as amended)
- The Landfill (Amendment) Regulations (Northern Ireland) 2011 SR 101

APPENDIX 2

Northern Ireland Waste Management 2000 - 2015

The EU Waste Framework directive (2008/98/EC) requires Member States to have in place waste management (i.e. waste strategy, implementation plans and supporting documents) and to revise these every sixth year).

The first Waste Management Strategy for Northern Ireland was published in April 2000 and was revised in March 2006 under the title “Towards Resource Management”. The Northern Ireland Waste Management Strategy, Towards Resource Management (2006), set the policy context for tackling the waste agenda in Northern Ireland.

This Strategy, together with the three-sub regional Waste Management Plans, provided the framework for establishing and integrated network of waste management facilities for Northern Ireland, as required by the EU Waste Framework Directive.

During 2011 the Department of the Environment carried out a scoping exercise and it was agreed that the 2006 Strategy should be revised to cover all relevant EU Directive requirements and provide a coherent approach to the waste policy framework for Northern Ireland. A revised Strategy was published in October 2013.

The revised Waste Strategy moved the emphasis of waste management from resource management to resource efficiency, with a new focus on waste prevention and recycling in accordance with the EU Waste Framework Directive Waste Hierarchy.

The revised Waste Strategy follows the priority order for waste treatment set out in the Waste Hierarchy, a cornerstone of EU waste policy and legislation, with Part 2 divided into seven sections containing policy measures that build on core principles of the 2006 Strategy [91].

[82] **DOE:** Delivering Resource Efficiency, Northern Ireland Waste Management Strategy (October 2013).

The revised Waste Strategy, places a renewed focus on waste prevention (including re-use), preparing for re-use recycling, and moves the emphasis of waste management in Northern Ireland from resource management to resource efficiency i.e. using resources in the most efficient way while minimising the impact of their use on the environment.

Governance arrangements to implement the Waste Strategy in Northern Ireland, like the Strategy itself have experienced revision.

The Waste Programme Board combines the remit of the former Strategic Waste Board and Waste Programme Steering Group and fulfils the role of Programme Board.

The Board continues to operate post-reform, with local government membership under review.

Membership of the Board up to 31st March 2015 was:

- Minister of the Environment (Chair);
- Permanent Secretary (DOE);
- Deputy Secretary, Environment and Marine Group (DOE)
- An elected representative of NILGA;
- Two elected representatives from each of the three WMGs; and
- Six representatives drawn from the construction, business and NGO sectors.

There have also been a number of forums dealing with operational waste and resources issues specific to central and local government.

These include the Waste Infrastructure Programme Board (WIPB), established in 2007; the Northern Ireland Landfill Allowance Scheme Implementation Steering Group (NILAS ISG), established in 2005 and the Waste Management Strategy/Waste Management Plans Liaison Group.

In March of 2015, a further forum - the Waste Co-ordination Group - was set up, in response to identified need for a forum where representatives from central and local government could explore issues in partnership and within the framework of their respective statutory responsibilities for waste management.

The Northern Ireland Waste Management Strategy sets the policy context for tackling the waste agenda in Northern Ireland.

Since the introduction of the Northern Ireland Waste Management Strategy in 2000, district councils have been at the forefront of the drive to reduce, reuse and recycle household waste produced in Northern Ireland.

Local Government is responsible in its turn for the preparation and implementation of Waste Management Plans setting out the councils’ arrangements for the collection and disposal of waste.

Work is now underway to contemporise arrangements, to best suit the needs of the 11 post-reform councils.

This Strategy, together with the three sub-regional Waste Management Plans, provided the framework for establishing an integrated network of waste management facilities for Northern Ireland, as required by the EU Waste Framework Directive.

The 26 local authorities in Northern Ireland, using powers conferred in the Local Government Act (NI) 1972, formed into three sub-regional waste management groups for the delivery and development of waste management plans and infrastructure, for benchmarking and sharing best practice.

They were:

- ARC21
- North West Region Waste management Group (NWRWMG)
- Southern Waste Management Partnership (SWaMP2008)

The constituent councils of arc21 and SWaMP2008 used this process to establish two waste management joint committees with body corporate status, giving them legislative authority to enter into contract in their own rights.

The North West Region Waste Management Group operated an unincorporated joint committee. The three waste management groups in Northern Ireland each prepared waste management plans for their respective region.

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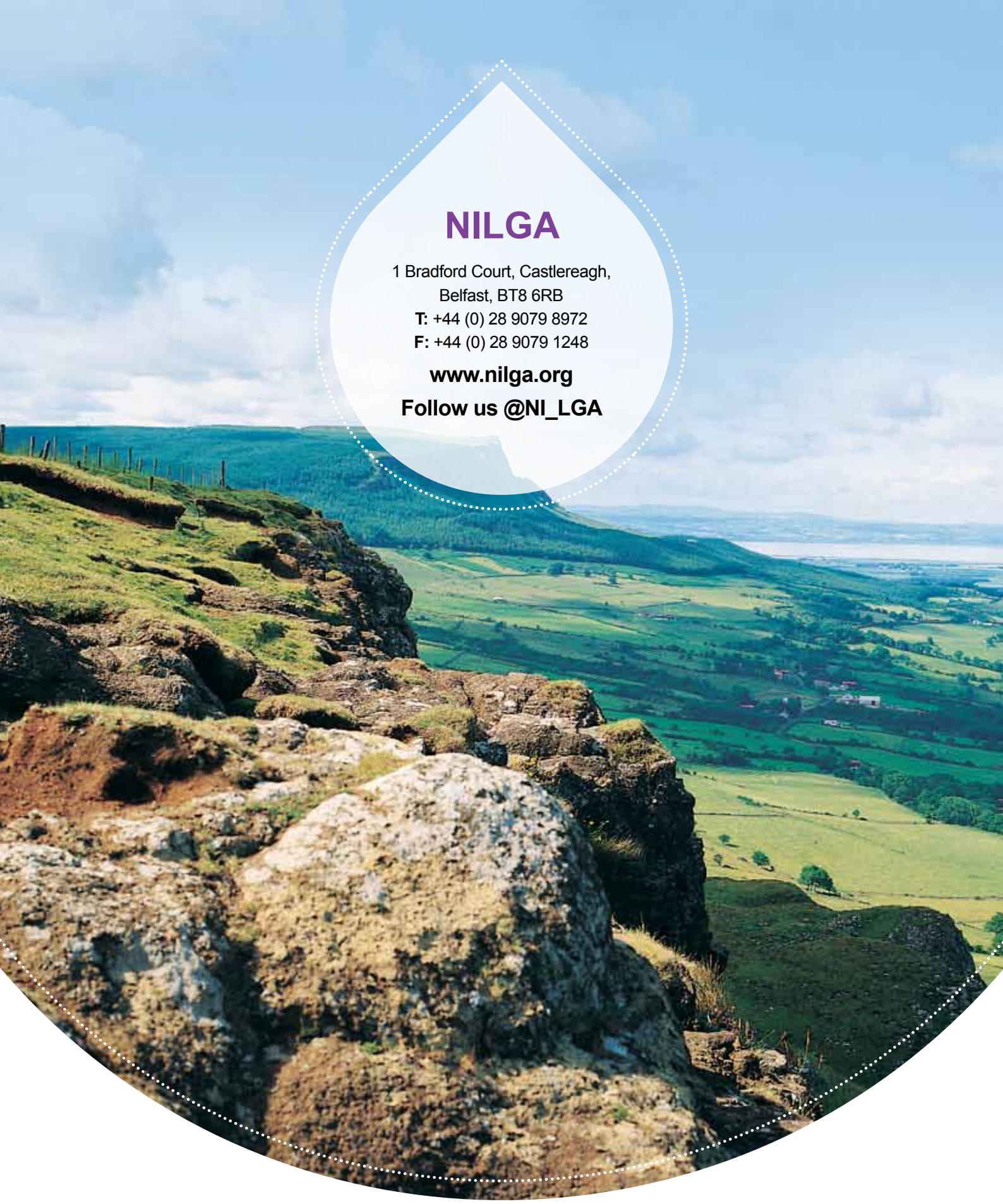

NILGA

1 Bradford Court, Castlereagh,
Belfast, BT8 6RB
T: +44 (0) 28 9079 8972
F: +44 (0) 28 9079 1248

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