MAKING THINGS LAST

CONSULTATION ON CREATING A MORE CIRCULAR ECONOMY IN SCOTLAND

Strategic Environmental Assessment

Environmental Report

August 2015

Report prepared by:

The Scottish Government
Riaghaltas na h-Alba

Table of Contents

Tables

Figures

Appendices

Abbreviations

BAU	Business as Usual
BSI	British Standards Institute
CAR	Controlled Activities Regulations
CCRA	UK Climate Change Risk Assessment
CO_2eq	Carbon dioxide equivalent
SIR	Scottish Institute for Remanufacture
DIY	Do-it-yourself
EC	European Commission
EMF	Ellen MacArthur Foundation
EIA	Environmental Impact Assessment
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HRA	Habitats Regulations Appraisal
ISO	International Standards Organisation
kg	Kilograms
Kt	Kilotonnes
Mt	Million tonnes
NPF3	National Planning Framework 3
PPS	Plan, Programme or Strategy
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RES	Resource Efficient Scotland programme
RoHS	Restriction of Hazardous Substances
RPP	Low Carbon Scotland: Meeting our Emissions Reduction Targets 2010 – 2022: Report on Proposals and Policies
RPP2	Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013 – 2027: The Second Report on Proposals and Policies
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SPP	Scottish Planning Policy
The 2005 Act	The Environmental Assessment (Scotland) Act 2005
t	Tonnes
UK	United Kingdom

WRAP	Waste and Resources Action Programme
WEEE	Waste Electrical and Electronic Equipment
ZWS	Zero Waste Scotland

1 Non-Technical Summary

What is a Circular Economy?

1.1.1 A circular economy is an alternative to a traditional linear economy model of 'make, use, dispose'. It is a means of reducing resource and energy use by extending the lifetime of products, components and materials. It aims to do this by keeping resources in use for as long as possible, extracting the maximum value from them whilst in use, then recovering or regenerating products and materials at the end of each service life.

1.1.2 Under this model, waste materials/products are seen as resources and the re-use, repair, refurbishment, remanufacture and recycling of existing products and components are planned for and enhanced through improved design. At its best, a circular economy incorporates these principles for the full lifetime of a product, and restores old products, parts and materials back to their original use in a way that uses the least resources to deliver the same function. The return of used products to the retailer/manufacturer is also seen as an important means of incentivising their retention within the economy.

What is the Consultation Document?

1.1.3 Scotland's Zero Waste Plan was published in 2010 and set out the vision of achieving a Zero Waste society and recognised that waste materials are actually valuable resources. The Safeguarding Scotland's Resources programme was published in 2013 and focused on preventing waste being created. It set out a range of actions to support resource efficiency, while also outlining initial steps to make the economy more 'circular'; notably, in its support for remanufacturing.

1.1.4 Making Things Last – Consultation on Creating a More Circular Economy in Scotland (the Consultation Document) is the next step in the process in moving Scotland further towards becoming a circular economy. It takes these ambitions forward by further recognising that a circular economy can both deliver Scotland's zero waste ambitions and also help to provide business with opportunities for further growth and innovation. It sets out new measures and actions that go beyond waste management and efficient use of resources, and recognise that moving towards a circular economy is a fundamental change in the way our economy works.

1.1.5 With the input of stakeholders and the public via this consultation process, the final suite of proposals will be prepared and these will be brought together with any continuing elements of the Zero Waste Plan and Safeguarding Scotland's Resources programme to create a finalised Circular Economy Strategy.

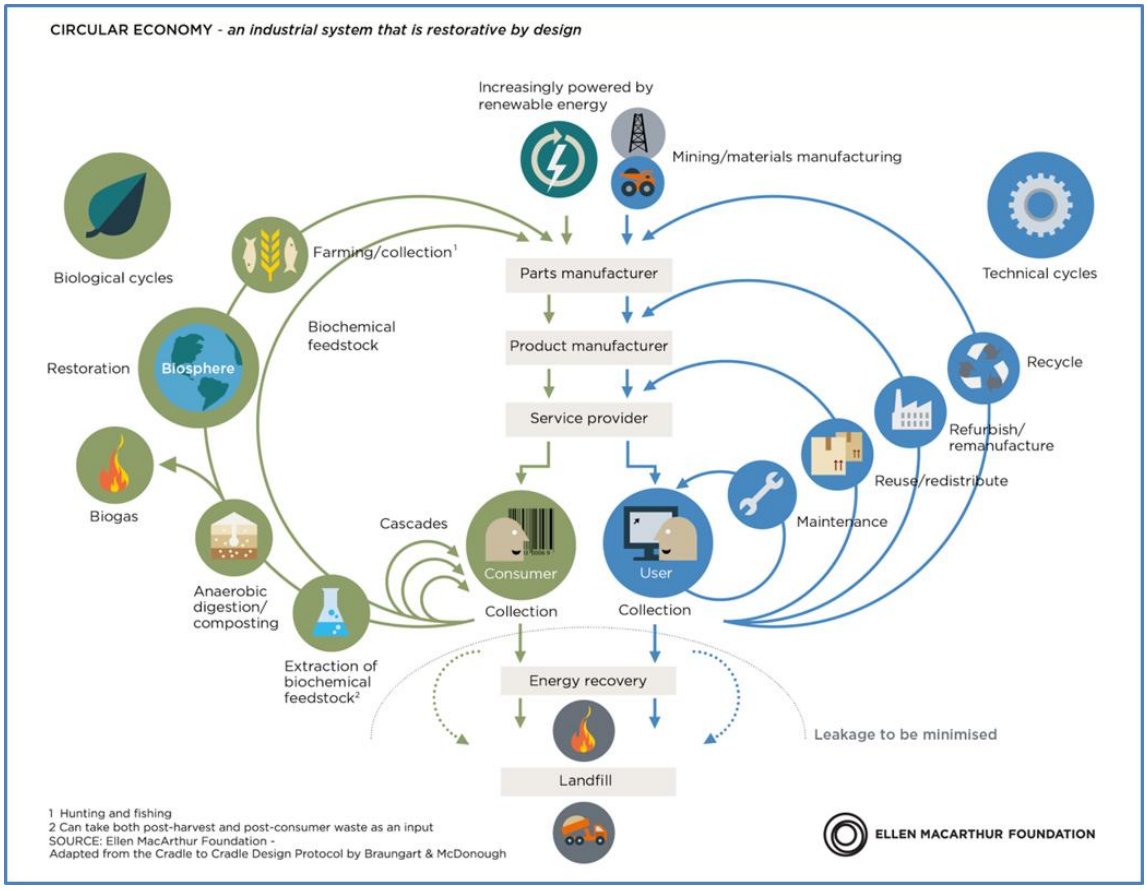

Figure 1.1 A Circular Economy[1]

What is a Strategic Environmental Assessment (SEA) and how was it undertaken?

1.1.6 A Strategic Environmental Assessment (SEA) is an assessment of the likely effects that a public plan, programme or strategy (PPS) will have on the environment if implemented. This SEA on the Consultation Document was undertaken in accordance with the Environmental Assessment (Scotland) Act 2005 (the 2005 Act) and the findings are set out in this Environmental Report.

1.1.7 The assessment reflects the strategic ambitions of the Consultation Document and has been undertaken in parallel with its development. This has enabled the SEA to assess how their adoption would impact on the environment, both positively and negatively. At the screening and scoping stages, the potential for significant effects on waste types and volumes and greenhouse gas (GHG) emissions were identified. At this stage, it was also noted that the likelihood of any effects is linked with society's acceptance, understanding, and perceptions of the reuse and remanufacture of goods

[1] Ellen MacArthur Foundation (2013) Circular Economy, Interactive System Diagram [online] Available at: http://www.ellenmacarthurfoundation.org/circular-economy/circular-economy/interactive-system-diagram (accessed 13/05/2015)

previously treated as 'waste'. As such, and in agreement with the Statutory Consultation Authorities[2], the environmental topics of Climatic Factors, Material Assets and Population were scoped into this assessment. This report sets out the findings the SEA.

What were the key environmental considerations identified?

POPULATION	• Our current level of consumption and production of resources is unsustainable. • While consumption behaviour is complex and involves many factors, there is no evidence that consumers are willing to pay a premium for a more circular product. However, the provision of environmental information does have an impact on their choice. • There is a significant opportunity to expand current practices such as re-use and remanufacture, and a key factor to enable this is increasing public confidence in good and suppliers. • Circular economy models and principles have been successfully applied in some sectors and industries. • Barriers slowing the uptake of remanufactured products can be separated into those affecting remanufacturers and those affecting consumers or producers. • Legislation and accreditation standards are beginning to be put into place, and this could help to influence design considerations and increase confidence in sectors such as re-use and remanufacturing.
CLIMATIC FACTORS	• Climate change has the potential to have significant impacts on many aspects of Scotland's environment, including the availability and quality of Scotland's natural resources. • There is the potential for associated effects on environmental receptors and likelihood of 'knock on' effects on communities, businesses and industry. • A tool has been developed that evaluates the greenhouse gas (GHG) impact of materials and waste rather than focusing on weight only. This is called the carbon metric. • Scotland's material consumption accounts for around three-quarters of its entire carbon footprint, and producing and consuming materials more efficiently through circular economy principles could lead to substantial carbon savings. • Opportunities and barriers to the uptake of the principles of a circular economy will directly impact on climatic factors, the ability of industry to improve their resilience and also our ability to adapt to climate change.
MATERIAL ASSETS	• While 1 in every 5 tonnes of material ended up as waste in 2012, decreasing trends in both generated waste and 'losses' to landfill have been observed in recent years. • Waste materials can be measured in several ways including weight, economic value and by carbon impact. • While the most significant material flows by weight are minerals (including fossil fuels), construction materials and food, the materials with 'higher carbon value' are food, minerals, ferrous and non-ferrous metals. • A range of barriers to greater 'access over ownership' business models, reuse and remanufacturing have been identified, and many of these barriers are linked to consumer and business behaviour (e.g. convenience, perception of value and quality compared to simply buying new products). • Extended producer responsibility regulations and regulations relevant to waste management, such as the Waste (Scotland) Regulations 2012, have a direct influence on the type and amount of waste going to landfill; this can drive change and innovation within business/industry. • Opportunities and successes in incorporating circular economy principles into business have been identified across a range of sectors including the automotive, aerospace, the marine and rail industries, and the catering and food industry

[2] Scottish Environment Protection Agency (SEPA) Scottish Natural Heritage (SNH) and Historic Environment Scotland (HES).

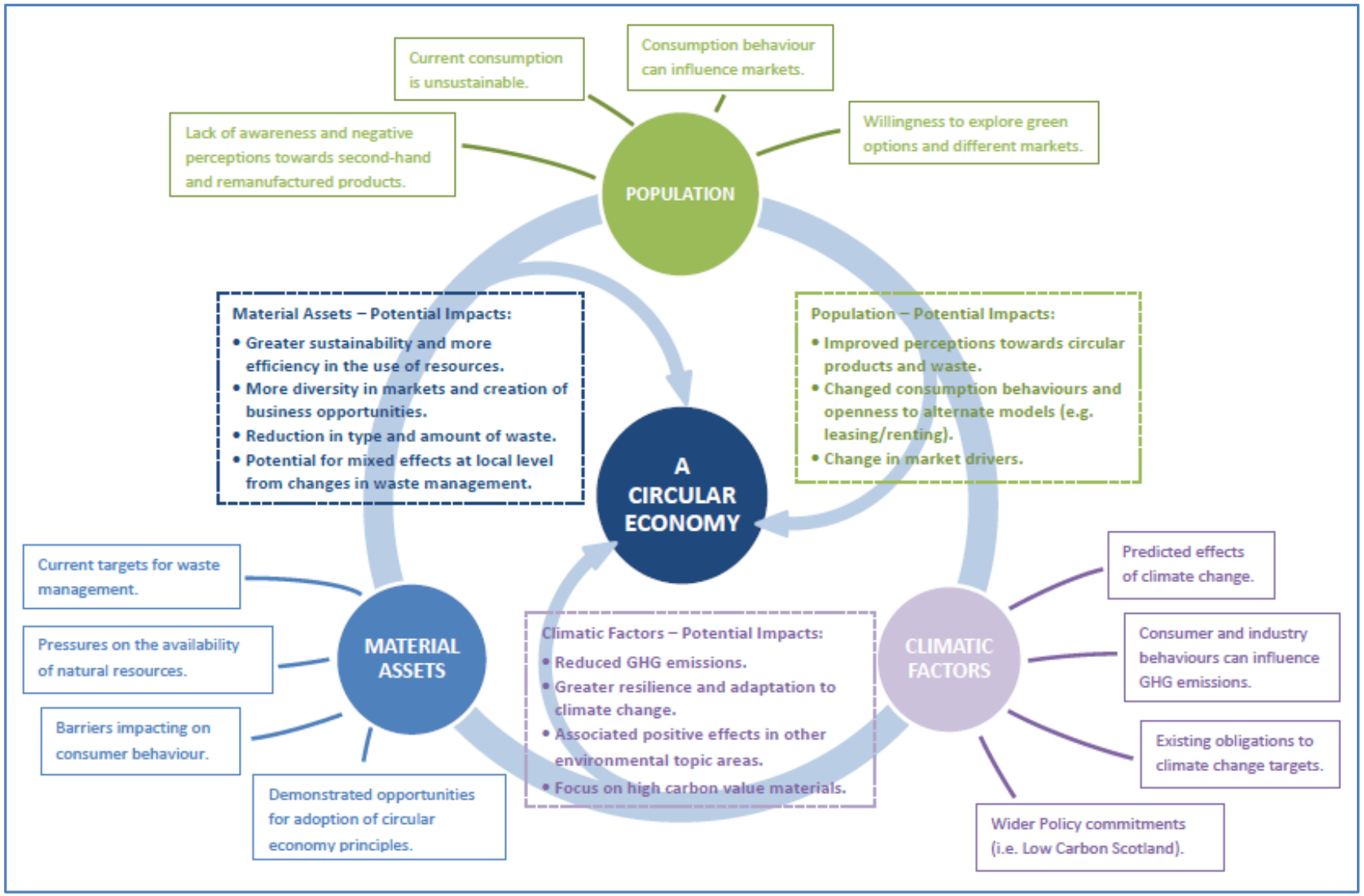

Figure 1.2 Overview of the findings of the SEA

What are the likely effects of proposals in the Consultation Document?

1.1.8 The proposals set out in the Consultation Document are likely to have an overall positive effect for the environment, particularly through working alongside and in combination with existing and wider Scottish policy.

1.1.9 As presented in Figure 1.2, the proposals have the potential to deliver positive effects primarily through reducing waste and improving how waste materials and products are utilised in Scotland, and by the inclusion of proposals aimed at incorporating circular principles into all stages of a product's lifespan. This has the potential to further reduce the volume and type of materials 'lost' to the system through disposal. This shift in focus from not only reducing the 'loss' of materials to targeting better use and retention of materials, particularly those likely to have a greater detrimental effect on the environment, is also likely to be significantly beneficial.

1.1.10 With the 'buy in' of business and industry, there is the potential for greater sustainability and efficiency in the management of our natural resources, and improved management of materials already in the system. The SEA found that the proposals would build upon and work in conjunction with current policy in reducing the volume of waste disposed of, and work to increase resilience and adaptation to the effects of climate change.

1.1.11 The potential for indirect or secondary effects on other aspects of the environment, such as helping to achieve further reductions in GHG emissions were also noted. However, the potential for mixed effects at the next stages of the delivery of some proposals has been identified but cannot be anticipated with any certainty at this policy level. Primarily, these were possible impacts associated with the likelihood of changes to the way that waste is managed in the future and our infrastructure requirements. It was noted that the potential for adverse environmental effects associated with any development associated with waste management in the future could be mitigated at the local and project levels through existing mechanisms.

What are the likely effects in the absence of proposals in the Consultation Document?

1.1.12 Whilst progress has been made in taking forward circular economy ambitions in Scotland within the existing policy context, this progress has been largely influenced by economic factors, and in some instances, a need for greater resource security. In the absence of the proposals, progress in many aspects of implementation of circular economy principles in business and industrial sectors is likely to continue, particularly in those reliant on the abstraction of natural resources and those affected by extreme price volatility and reduced access to resources. The progressive adoption of circular economy principles in business models is also likely to continue, particularly with further demonstration of success in business and industry. Further

changes in consumer and business perceptions could also occur as the use of previously considered waste materials becomes more prevalent in products and buying/leasing options.

1.1.13 However, this progress is likely to be at a progressively slower rate without the proposals set out in the Consultation Document. The SEA considered that the development of these proposals and the future publication of Making Things Last presents an opportunity to build upon the work already being done, and through promotion, engagement and inclusion of enabling opportunities set out in the proposals, could help to actively increase awareness and seek the involvement of consumers and industry alike. Without these proposals, the opportunity to steer and accelerate greater sustainability in our use of materials would likely be missed. Alongside this, an opportunity to promote environmental benefits through adopting more efficient and sustainable practices may also be missed, including an opportunity to further help in conserving our natural resources.

What opportunities for mitigation or enhancement have been identified?

1.1.14 The development of the proposals set out in the Consultation Document, and the preparation of Making Things Last, are early steps in the process for implementing ambitions for a more circular economy. The collection of data, the provision of relevant and updated data, and getting greater benefit through the use of tools such as the Carbon Metric are important aspects of the Consultation Document and are likely to play a key role going forward.

1.1.15 The importance of monitoring is likely to be paramount in identifying the performance of the proposals, both individually and as a collective. This is also likely to aid in the identification of 'gaps' and further opportunities to take these ambitions forward in the future. The SEA recommended that Making Things Last should be able to be updated in order to take into account the success of the implementation of the proposals and any associated environmental impacts.

1.1.16 Together, monitoring of the various waste streams and industry should provide crucial feedback on the rate of progress in adopting circular economy principles. However, if the integration of these principles by business and industry continues to be slow or hampered by barriers as identified in the SEA, it may be that further exploration of additional, stronger and more direct measures may be required to deliver the long-term ambitions.

What happens next?

1.1.17 Following the conclusion of the consultation period, the responses received on both the Consultation Document and this Environmental Report will be analysed and reported. Key messages from respondents, including those of the various stakeholder groups, will be highlighted and the findings of the analysis will be taken into account in the preparation of Making Things Last anticipated for publication around the end of the year.

1.1.18 Upon adoption of Making Things Last, a Post-adoption SEA Statement will be prepared. This Statement will reflect on the findings of the SEA assessment and the views expressed in the consultation, and outline how the issues raised have been considered in the finalisation of Making Things Last.

2 The Circular Economy Consultation Document

2.1 What is a Circular Economy?

2.1.1 The 'linear' economy model based around the concept of 'take, make and dispose' relies on large quantities of easily accessible resources, and this model is becoming increasingly unfit for purpose[3]. Policy in many countries has been previously focused on improving efficiency, notably in improving the energy efficiency of industrial processes which provide materials and products. However, working towards improving resource and energy efficiencies in sectors such as manufacturing can only improve things so far[4].

2.1.2 The term 'circular economy' refers to an industrial system that is restorative and regenerative by intention and design. By its very nature, it is a means of reducing resource and energy use by extending the longevity of products, components and materials within the system. The aim of such a system is primarily to look beyond viewing waste as something to dispose of, and to see it as a resource and opportunity. In a circular economy, waste materials are seen as resources and the re-use, repair, refurbishment, recycling and remanufacture of existing products and components, are planned for and enhanced. The return of used products to the retailer/manufacturer is seen as an important aspect of a circular economy, and in providing incentive and opportunity for their reuse, repair, remanufacture, refurbishment, disassembly for spare parts, or recycling. At its best, a circular economy restores old products, parts and materials back to their original use in a way that uses the least resources to deliver the same function[5].

2.1.3 As illustrated in Figure 2.1, the circular economy system builds upon practices such as waste prevention, resource efficiency and recycling that we are already familiar with in Scotland. In this model, energy recovered from waste and landfill is referred to as 'leakage' with economic and embedded carbon value 'leaking' from the economy. These are options to be minimised or avoided where possible. Instead, processes within a circular economy aim to retain valuable materials and products in 'loops' or 'closed-loops' in the economy, avoiding loss of materials to energy recovery and landfill. The 'inner loops' of the system shown in Figure 2.1 are considered to represent greater value in the circular system. For example,

[3] Ellen MacArthur Foundation (2014) The circular model - an overview [online] Available at: http://www.ellenmacarthurfoundation.org/circular-economy/circular-economy/the-circular-model-an-overview (accessed 14/05/2015)

[4] Ellen MacArthur Foundation (2014) Rethinking the economy [online] Available at: http://www.ellenmacarthurfoundation.org/circular-economy/circular-economy/rethinking-the-economy (accessed 29/05/2015)

[5] Green Alliance (2015) Circular Economy Scotland [online] Available at: http://www.green-alliance.org.uk/circular-economy-scotland.php (accessed 23/06/2015)

maintaining or reusing an existing product is likely to require less energy and resource input than replacing it with a new product and recycling the old.

2.1.4 Although there are some elements of circularity such as recycling and composting, which are already present in linear economies, progress in improving these activities needs to be maintained. A circular economy goes beyond the pursuit of waste prevention and recycling to inspire technological, organisational and social innovation across and within value chains[6].

2.2 Context of the Consultation Document

2.2.1 Making Things Last will complement existing Scottish Government policy for progressing towards a zero waste and resource efficient economy and society. In particular it builds upon the targets, ambitions and foundation actions of Scotland's Zero Waste Plan and Safeguarding Scotland's Resources: Blueprint for a More Resource Efficient and Circular Economy.

2.2.2 The Scottish Government's circular economy ambitions are referenced in the Scottish Economic Strategy published earlier this year:

> "With our partners, such as Zero Waste Scotland and the Enterprise Agencies, we are creating conditions for a more circular economy that helps companies embrace new business models and manufacturing processes, and which transforms used products into assets that support industries like remanufacturing, reuse, product disassembly and reprocessing"[7].

2.2.3 Moving towards a circular economy is at the heart of the resource efficiency agenda established under the Europe 2020 Strategy for smart, sustainable and inclusive growth[8], and ideas on how to do more with less are being taken further in the EU's Environment Action Programme to 2020[9]. It is also expected that the European Commission will present an ambitious circular economy strategy later this year and that the work undertaken in

[6] European Commission (2014) Scoping study to identify potential circular economy actions, priority sectors, material flows and value chains August 2014 [online] Available at: http://www.ieep.eu/assets/1410/Circular_economy_scoping_study_-_Final_report.pdf (accessed 03/06/2015)

[7] The Scottish Government (2015) Scottish Economic Strategy (SES), pg. 46 [online] Available at: http://www.gov.scot/Publications/2015/03/5984 (accessed 06/07/2015)

[8] EC (2015) Moving towards a circular economy [online] Available at: http://ec.europa.eu/environment/circular-economy/ (accessed 13/05/2015)

[9] EC Environmental Action programme to 2020 [online] Available at: http://ec.europa.eu/environment/newprg/index.htm (accessed 13/05/2015)

preparing Making Things Last – Consultation on Creating a More Circular Economy in Scotland (the Consultation Document) has directly informed Scotland's contributions to this strategy.

2.2.4 Scotland's Zero Waste Plan set out the vision of achieving a zero waste society and recognised that waste materials are actually valuable resources. The Safeguarding Scotland's Resources programme focused on preventing waste being created and set out various actions to support resource efficiency, while also setting out some initial steps to make the economy more 'circular'; in its support for remanufacturing, for example.

2.2.5 As noted in Section 2.3, the Consultation Document is the next step in the process in consulting on and discussing these further ambitions and the conclusions from this process will be brought together with any elements of the Zero Waste Plan and Safeguarding Scotland's Resources programme that are still relevant to create Making Things Last. The Consultation Document will take these ambitions forward by further recognising that a circular economy can deliver Scotland's zero waste ambitions whilst also helping to provide business opportunities for growth and innovation. It will set out a suite of new policy measures and actions that go beyond waste management and resources efficiency issues, and recognise that moving more towards a circular economy is a fundamental paradigm shift in the way our economy works.

2.2.6 The Consultation Document also sits within context of a number of Scottish Government policies in place to meet our ambitious statutory targets for the reduction of greenhouse gas set out in the Climate Change (Scotland) Act 2009[10]. The Waste (Scotland) Regulations 2012[11] provide a statutory framework to maximise the quantity and quality of materials available for recycling, and to minimise the need for residual waste infrastructure in accordance with the objectives of the revised Waste Framework Directive (2008/98/EC)[12] and the Zero Waste Plan.

[10] A reduction of greenhouse gas emissions by at least 80% by 2050 and an interim target of at least 42% by 2020.

[11] The Waste (Scotland) Regulations 2012 [online[] Available at: http://www.legislation.gov.uk/sdsi/2012/9780111016657/contents (accessed 02/07/2015)

[12] Directive 2008/98/EC Waste Framework Directive [online] Available at: http://ec.europa.eu/environment/waste/framework/framework_directive.htm (accessed 02/07/2015)

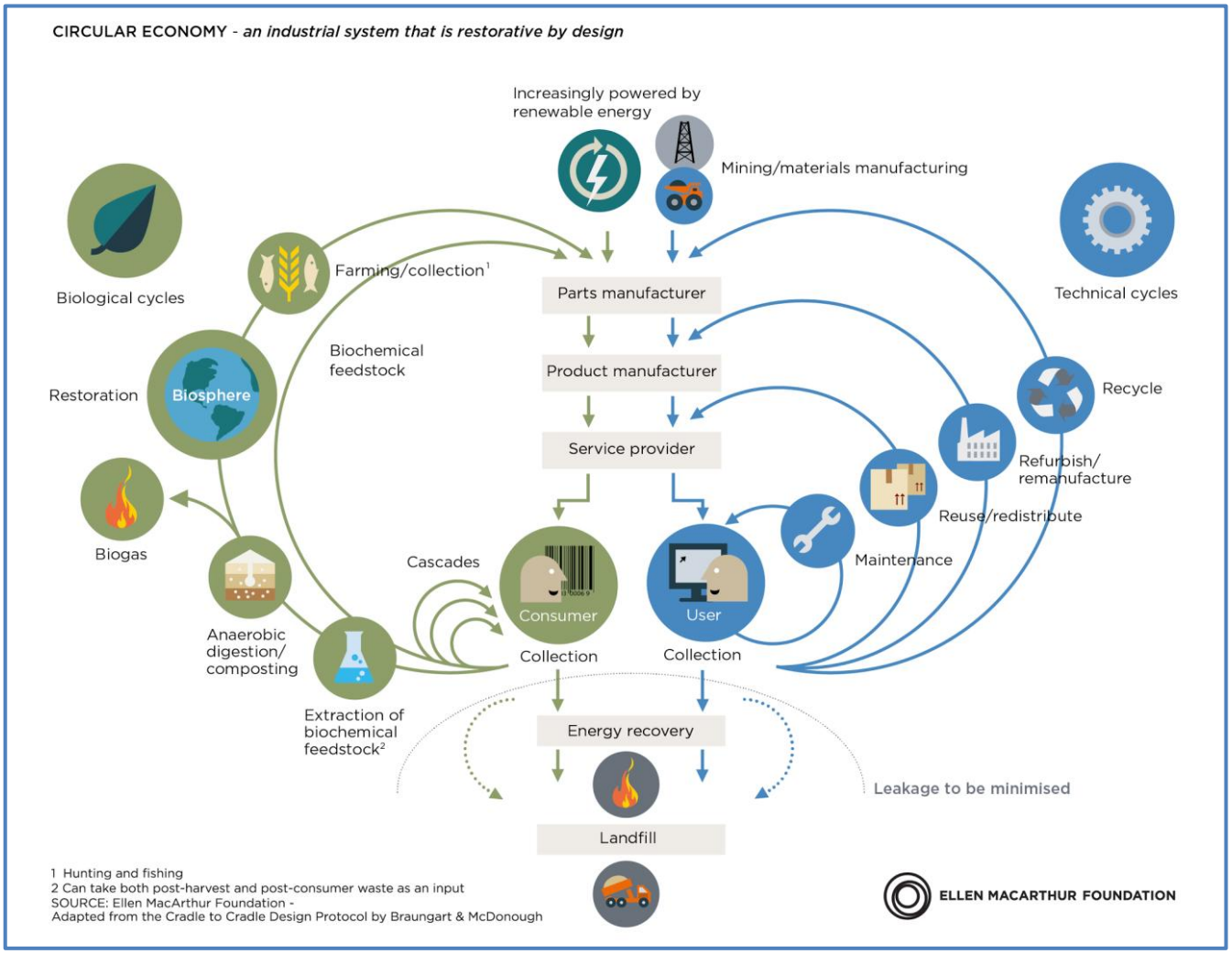

Figure 2.1 A Circular Economy[13]

[13] Ellen MacArthur Foundation (2013) Circular Economy, Interactive System Diagram [online] Available at: http://www.ellenmacarthurfoundation.org/circular-economy/circular-economy/interactive-system-diagram (accessed 13/05/2015)

2.2.7 The National Planning Framework[14] (NPF3) sets the context for development planning in Scotland and provides a framework for the spatial development of Scotland as a whole. It sets out a vision that our built environment is more energy efficient and produces less waste. Scottish Planning Policy[15] (SPP) was published alongside NPF3 and sets out how these visions will be delivered. The SPP has a key policy principle of reducing waste, facilitating its management and promoting resource recovery. The recently published Planning and Waste Management Advice[16] complements both these documents as well as the Zero Waste Plan. It provides step-by-step advice on development planning and development management for Planning Authorities within the context of the management of waste amidst circular economy and 'low carbon place' ambitions as set out in wider Scottish policy.

2.2.8 The Low Carbon Economic Strategy for Scotland: Scotland – A Low Carbon Society[17] is a key component of our broader approach to meeting Scotland's climate change targets to securing the transition to a low carbon economy in Scotland. It is closely linked to Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013 – 2027: The Second Report on Proposals and Policies (RPP2) and Conserve and Save: Energy Efficiency Action Plan[18]. Together, these documents set out a range of policies and actions to meet climate change targets and reduce energy consumption, and further set the framework within which the Making Things Last will sit.

[14] Scottish Government (2014) National Planning Framework 3: A Plan for Scotland: Ambition, Opportunity, Place and Scottish Planning Policy [online] Available at: http://www.scotland.gov.uk/Topics/Built-Environment/planning/NPF3-SPP-Review/NPF3 (accessed 25/05/2015)

[15] Scottish Government (2014) Scottish Planning Policy [online] Available at: http://www.scotland.gov.uk/Topics/Built-Environment/planning/Policy (accessed 28/05/2015)

[16] Scottish Government (2015) Planning and Waste Management Advice [online] Available at: http://www.gov.scot/Topics/Built-Environment/planning/Policy/Subject-Policies/low-carbon-place/ZeroWaste/Waste-advice (accessed 07/07/2015)

[17] SEPA, HIE, Scottish Enterprise, Scottish Government (2010) A Low Carbon Economic Strategy for Scotland: Scotland – A Low Carbon Society [online] Available at: http://www.gov.scot/resource/doc/331364/0107855.pdf (accessed 28/05/2015)

[18] Scottish Government (2010) Conserve and Save: Energy Efficiency Action Plan [online] Available at: http://www.scotland.gov.uk/Publications/2010/10/07142301/0 (accessed 25/05/2015)

2.3 What is the Consultation Document?

Overview

2.3.1 The Scottish Government is preparing the Consultation Document ahead of the anticipated publication of Making Things Last later in 2015. At this stage, the Consultation Document is not a strategy, but rather a set of proposals for consultation, discussion and debate. Together, the Document, the consultation process and the resulting publication of Making Things Last, will set the direction and pace of Scotland's journey on the path towards becoming a more circular economy.

2.3.2 These proposals have been developed to take forward existing Scottish Government policy focused on moving towards a zero waste and resource efficient economy and society. In particular, they will build upon the targets, ambitions and foundation actions of the Scotland's Zero Waste Plan[19] published in June 2010, and the Safeguarding Scotland's Resources programme[20] published in October 2013.

2.3.3 Together, the proposals have been developed to guide Scotland's transition and help to create an enabling policy framework for taking forward Scotland's circular economy ambitions for the short, medium and long-term. This framework has been developed to help unlock innovation and investment by business. Once implemented, it will be further supported through alignment in wider actions taken by the Scottish Government and its many partners including Zero Waste Scotland (ZWS), the Enterprise Networks, local authorities, further and higher education, Innovation Centres and the Scottish Environment Protection Agency (SEPA), amongst others.

Proposals for action

2.3.4 The proposals set out in the Consultation Document broadly include the following:

- **Design** – The proposals seek to take forward current work and bring together actions on enhancing circular design opportunities within Scotland's economy for product design, design of business models and systems design. A particular focus is given to supporting capacity for circular economy design and working with stakeholders to improve education and skill development in circular design. The proposals also include exploring the scope for a Scottish centre of expertise on circular design to operate in parallel to the existing Scottish Institute for Remanufacture (SIR), exploring scope for further actions and

[19] The Scottish Government (2010) Scotland's Zero Waste Plan [online] Available at: http://www.gov.scot/Publications/2010/06/08092645/0 (12/05/2015)

[20] The Scottish Government (2012) Safeguarding Scotland's Resources - Blueprint for a More Resource Efficient and Circular Economy [online] Available at: http://www.gov.scot/Resource/0043/00435308.pdf (accessed 17/07/2015)

opportunities to drive the manufacture of goods to last longer, and supporting further research in partnership with the industries such as the packaging industry, amongst others.

- **Reuse** – The proposals largely build upon ambitions and measures set out in existing policy in helping the sale and use of second-hand products be seen as a mainstream good value option amongst consumers, and increasing the range of products available to them. They are focused on helping businesses and community organisations in this sector to thrive, particularly in facilitating sectoral growth and supporting local authorities and reuse organisations in improving re-use collection, storage, retail and communications relating to waste at Household Waste Recycling Centres. The proposals also include specific measures such as further expanding the availability of the Revolve branding to include a wider range of sellers (i.e. national charities, private shops), exploring the role of reuse as an aspect of relevant producer responsibility schemes, improving reuse data quality, updating Strategic Guidance for the Procurement Reform Act 2014, and exploring opportunities to improve regulatory and licensing frameworks and develop protocols and standards for the reuse of key components.
- **Repair** – The proposals largely seek to facilitate greater amounts of durable goods that can be repaired, primarily through increasing awareness of opportunities by working with manufacturers and retailers to increase the lifetime of use of products, and fostering greater skills in the sector. Also included are measures for exploring the market conditions and frameworks that could support greater repair of existing products and increased longevity of use (e.g. introduction of minimum warranty requirements and increased access to technical manuals under public procurement contracts). Other proposals seek to make repairers easier to access, work with the procurement community to build upon previous and existing programmes incorporating circular economy principles, and for the production of guidance for prolonging the life of goods.
- **Remanufacturing** – The proposals set out ambitions for promoting opportunities to increase take up of remanufacturing in Scotland, and to remove potential barriers to this. They principally seek to work with partners such as the EU, SIR and other bodies (e.g. British Standards Institute (BSI), International Standards Organisation (ISO) and Scottish Manufacturing Advisory Service) to support the promotion and recognition of remanufactured products alongside new products. This is aimed at ensuring that they are recognised and distinguished from lower value second hand or refurbished products. The proposals also include exploring the use of remanufactured products in relevant markets (e.g. via public procurement), developing efficient and cost

effective ways to return end of life products to remanufacturers, and exploring options to address potential legal issues that could impinge on growth of the remanufacturing sector.

- **Recycle** – A range of proposals are aimed at building upon previous work in the sector and providing support for improving recycling systems and infrastructure, expanding these activities across Scotland, and improving the quality of recyclate. For example, collaboration with the waste and packaging industry, disposal and collection authorities, and businesses (i.e. small food businesses, chemicals, construction, agriculture) is aimed at improving and expanding recycling activities. Other proposals also seek to enhance previous work in this area, including the development of a new household recycling charter, scope for early adopter councils to participate in the Ellen MacArthur Foundation's (EMF) Project Mainstream, exploring the potential for new regulations on recycled content of materials in public procurement, new funding mechanisms to support new re-processors, exploring issues raised in the call for evidence on a deposit return system for Scotland, and improving segregation of wastes through enhancing the regulatory measures applied by SEPA.
- **Producer responsibility for reuse and recycling** – The proposals seek to extend producer responsibility schemes to address materials and products such as tyres, furniture and bed mattresses, and examine the scope for further extensions.
- **Recovering value from biological resources** – The proposals seek to improve the management of biological resources through a combination of approaches that are largely centred on raising awareness of significant opportunities. These include improving data collection systems, assessing opportunities for regional hubs for bio-refining processes, exploring the scope for phasing out non-renewable biological materials and stimulating greater demand for renewable-based fertiliser products in the public sector. The proposals also seek to explore how to best support investment in research and development to address technical barriers for the use of these wastes, and investigate and pilot ways to help the economic and environmental footprint of anaerobic digestion.
- **Energy from waste** – The proposals carry across existing actions from ZWS and SEPA, and look to refine the methodology for the current infrastructure capacity requirements by seeking to improve the accuracy of information available for planning officials. For example, the Consultation Document includes a proposal to provide and update relevant information more frequently on the SEPA website, and production of an Economic Assessment Report to guide future infrastructure development of these waste streams.

- **Landfill** – The proposals seek to take forward steps in capturing landfill gas and support the existing fiscal measures, such as a Landfill Tax, to promote circular economy principles.

Cross Cutting Issues

2.3.5 The Consultation Document includes a wide range of cross cutting issues and actions that have clear links to many of the 'loops' of the circular economy. These include:

- **Climate change** – A range of measures throughout the consultation are aimed at improving awareness of reducing greenhouse gas emissions (GHG) and actively targeting the management of materials with high carbon impacts. For example, they include rolling out of food waste collection to all households, improved gathering and use of information through the use of the Carbon Metric tool, developing and publishing carbon metric statistics alongside waste statistics, and developing a programme to retrofit landfills with appropriate technology to capture methane gas.
- **Communications** – The proposals focus on encouraging behaviours that support a circular economy to be seen as norms in Scotland and broadening understanding of the true value in the products and materials people use. Also proposed is a new 'Scottish Circular Economy Network', a network of small and medium sized enterprises (SMEs) and other businesses to help achieve a more circular economy, through collaboration and business-led initiatives
- **Skills** – The proposals focus on promoting the development of skills through fostering and coordinating investment in training and growth of career opportunities in a more circular economy. They include supporting businesses in developing effective workforce skills and providing support for education providers in the creation of opportunities for both new entrants to the workforce and existing members (e.g. through creation of career development pathways and role models). Further, they include reviewing ways to incorporate circular economy training and skills development on a cross-sector basis and for mainstreaming these skills within wider skill development activity.
- **Measuring progress** - In parallel with discussions on the EU Circular Economy package, the Consultation Document states the intention of refreshing Scotland's suite of targets and indicators, and where possible, incorporating process measures to reflect more accurately the development of a more circular economy. The proposals also include the development of a long-term data strategy to support a more circular

economy, mandatory use of the electronic 'edoc'[21] system in Scotland and continuing to work with the UK Government and other devolved administrations to develop a system to consider inclusion of the trans frontier shipment of waste and hazardous wastes which are currently excluded from edoc.

[21] An online system designed to assist in the management of waste and transfer records [online] Available at: http://edoconline.co.uk/

3 Approach to the SEA

3.1 What is Strategic Environmental Assessment (SEA)?

3.1.1 A Strategic Environmental Assessment (SEA) is an assessment of the likely effects that a public plan, programme or strategy (PPS) will have on the environment if implemented. The SEA was undertaken in accordance with the Environmental Assessment (Scotland) Act 2005 (the 2005 Act) and reflects the strategic ambitions of proposals in the Consultation Document. It has been undertaken in parallel with the Consultation Paper to both inform its development and assess how the adoption of the proposals may impact on the environment, both positively and negatively.

3.1.2 The SEA process began with a joint Screening and Scoping document. The Consultation Document falls under Section 5(4) of the 2005 Act and the Scottish Government determined that a SEA would be required. This determination was formally advertised as required by the 2005 Act.

3.1.3 Alongside screening, scoping was also undertaken to establish the scope and level of detail proposed for the environmental assessment. The Scoping component of the report was subject to a five week statutory consultation, and comments were provided by the Statutory Consultation Authorities[22] on the Report. The views expressed were then taken into account in this environmental assessment.

3.2 Assessment Methodology

3.2.1 This Consultation Document builds on the existing waste policies as set out in the Zero Waste Plan and Safeguarding Scotland's Resources programme. These were both subject to their own SEAs and the approach taken to their assessment, and subsequent findings, have been used to inform and focus the scope of this assessment. Whilst the findings of these SEAs reported that there was likely to be significant positive effects, it was noted that in some instances due to the strategic nature of the content, many of the impacts would only likely be realised when subsequent plans and projects took forward the aims of the plans. Mitigation of impacts was therefore identified as likely to be implemented through existing mechanisms such as the planning system which would include requirements for assessments such as Environmental Impact Assessment (EIA) and Habitat Regulations Appraisal (HRA), where required.

3.2.2 The impacts of the Consultation Document and the findings of the assessment are discussed in this report. However, in initial consideration of the likely significant effects of the Consultation Document, a similar view was

[22] Scottish Environment Protection Agency (SEPA) Scottish Natural Heritage (SNH) and Historic Environment Scotland (HES).

reached to that of the previous waste plan SEAs. Namely that evidence suggests that whilst there are relevant strategic level environmental effects, some effects might only be identifiable as the proposals begin to be implemented through subsequent plans and projects. Therefore, whilst it was acknowledged that there will be possible impacts from proposals in the Consultation Document across all environmental topics, and that this would be touched upon within the narrative of the assessment findings, the assessment has focused solely on where these effects are likely to be significant.

3.2.3 Evidence presented at the scoping consultation phase demonstrated relevant primary significant effects on waste streams and volumes, considered under Material Assets, and greenhouse gas emissions, considered under Climatic Factors. However, the manifestation of these effects is likely to be indelibly linked with societal acceptance, understanding, and perceptions of reuse and remanufacture of goods traditionally treated as 'waste' as well as acceptance of changes to the way businesses and consumers access goods and services (i.e. from product purchase to provision of a service). Furthermore, this is also likely to be closely linked to the success of the proposals in keeping 'high value' products, components and materials, in terms of embedded energy and cost, in circulation for longer.

3.2.4 As such, and in agreement with the Statutory Consultation Authorities, the environmental topics of Climatic Factors, Material Assets and Population are considered in this assessment. Table 3.1 below sets out the scope of this assessment.

Table 3.1 Proposed Scoping In/Out of SEA Topics.

SEA Topic	Scoped in
Biodiversity, flora and fauna	No
Population	Yes
Human health	No
Soil	No
Water	No
Air	No
Climatic factors	Yes
Material assets	Yes
Cultural heritage and the historic environment	No
Landscape and visual impacts	No

3.3 Development of Assessment Questions

3.3.1 To maintain consistency in approach with the previous SEA work undertaken on the Zero Waste Plan and Safeguarding Scotland's Resources programme, the assessment findings have been set out in this environmental report in a narrative style under the SEA Topic headings. A suite of six assessment questions were developed (see Table 3.2) to explore the potential for environmental impacts from the implementation of the proposals in the Consultation Document on the three SEA Topics scoped into the SEA. These questions have also been developed to frame further discussion on the potential for environmental effects in the absence of these proposals.

3.3.2 The narrative approach has also allowed for the identification and discussion of interconnections between the environmental topics areas, including the likelihood of significant impacts, and if there is potential for indirect or secondary effects on other environmental topic areas from work following on from the adoption of the proposals set out in the Consultation Document. The assessment questions have also provided the basis for exploration of the potential for cumulative and in-combination effects which has been integrated into the assessment sections for each environmental topic.

Table 3.2 Proposed Assessment Questions

Assessment Questions
1. Will the Consultation Document contribute towards greater sustainability in the use of resources, through encouraging a shift in current patterns of consumption?
2. Will the Consultation Document contribute to the reduction of greenhouse gas (GHG) emissions and help in meeting Scotland's emissions reduction targets?
3. Will the Consultation Document assist in adaptation to the predicted effects of climate change?
4. Will the Consultation Document help in increasing the longevity of products, components and materials within in the economy?
5. Will the Consultation Document help to reduce the 'leakage' or 'loss' of products, components and materials from the economy (e.g. to landfill or energy recovery)?
6. Will the Consultation Document help to reduce current trends in the consumption of new products and components and in the use of raw materials?

3.4 Development of the Environmental Baseline

3.4.1 Schedule 3 of the Environmental Assessment (Scotland) Act 2005 requires that the following be identified:

- Relevant aspects of the current state of the environment and its likely evolution without the plan or programme.
- Environmental characteristics of areas likely to be affected.
- Relevant existing environmental problems.
- Relevant environmental protection objectives at the international, European or national level.

3.4.2 There are many objectives for environmental protection and improvement within existing legislation, policies, strategies that form the context for this SEA. A summary of these have been set out in the following sections of the report under the respective topic.

3.5 Consideration of Options

Requirement for consideration

3.5.1 The 2005 Act requires that the potential for significant environmental effects of the reasonable alternatives to the Consultation Document are assessed as part of the SEA process.

3.5.2 From the outset in the process of developing the Consultation Document, two broad options were identified. These considered how best progress could be achieved for moving ahead with Scotland's circular economy ambitions beyond the work previously undertaken through the existing policy framework set out in Scotland's Zero Waste Plan, Safeguarding Scotland's Resources programme and SPP, amongst others. These two options are set out below.

Business as usual (BAU) option

3.5.3 The first option involved not preparing a Consultation Document at this stage, but rather continuing with the current Zero Waste Plan and Safeguarding Scotland's Resources policy approach. It was considered that taking a 'business as usual' (BAU) approach would involve concentrating efforts on progressing the actions and ambitions already set out in these existing policies, particularly those aimed at continuing Scotland's shift from a 'linear economy' to a 'circular economy' approach. For example, this would involve continuing to support measures such as the on-going development of the SIR and the Resource Efficient Scotland (RES) programme to support businesses.

3.5.4 The environmental baseline detailed in this report inherently sets out the relevant environmental effects of this BAU alternative. It provides a snapshot of Scotland's current position in relation to waste management and resource use, whilst also providing an overview of current trends. The baseline sets the scene for changes in the future in the absence of further intervention, including current pressures and opportunities and potential changes associated with a wide range of environmental factors. This includes the predicted effects of climate change and impacts of resource availability and socio-economic factors such as population increase, continuation of consumption trends and a potential need for increased resource security. Consideration of growth in some sectors and industries, and emergence of new opportunities for businesses, is also included.

3.5.5 The assessment explores the implications of taking such an approach in the environmental context, and this is set out in subsequent sections in this report. This report also contains a strategic-level comparison of environmental effects that are likely to be associated with this alternative to the proposals set out in the Consultation Document.

The Consultation Document

3.5.6 The proposals set out in the Consultation document form the basis for an alternative approach; one that builds upon the work already underway as a consequence of current policy, and driven further by opportunities for market and sectoral development. In its initial stages, this second option encapsulated a broad spectrum of opportunities and ambitions centred upon a long-term ambition for Scotland to become a circular economy. Through a process of evidence gathering centred on the opportunities for key Scottish business sectors, and a six month Debate period involving engagement with key stakeholders, this broad spectrum of opportunities and ambitions has been shaped and prioritised into a package of measures and actions designed to progress the transition to a circular economy at an accelerated rate over that of the BAU option.

3.5.7 In the context of the current economic climate and given the importance that businesses, manufacturers and consumers together 'buy in' to these ambitions, it was considered that an approach that seeks to actively promote circular economy principles and foster its growth at the sectoral level through transitional steps would likely be the most effective and reasonable approach at the current time. As a consequence, this approach was considered to be the preferred alternative and formed the basis for the proposals set out in the Consultation Document.

3.5.8 The potential environmental effects arising as a result of the implementation of these proposals has been assessed in this SEA, and the findings are detailed in the following sections of this Environmental Report. However, it was acknowledged that the Consultation Document, and the subsequent finalisation of proposals in it, are steps in a longer journey in meeting

Scotland's circular economy ambitions. It is likely that the Consultation Document and the finalisation of Making Things Last, including its actions and ambitions, along with the forthcoming EU policy on the circular economy will form the basis for future iterations of Scotland's waste, energy environment, climate change and economic policies.

4 Population

4.1 Environmental Protection Objectives

4.1.1 Under the Population topic, the assessment focuses primarily on issues arising from the consumption of products and materials and the management of waste. A number of PPS exist that are relevant to waste management practices, including promoting and encouraging sustainable behaviour and giving consideration to the use of products at the end of life stage/post use.

4.1.2 The EU Waste Electrical and Electronic Equipment Directive (WEEE Directive 2012/19/EU); the Waste Framework Directive (2008/98/EC); the End of Life Vehicles Directive (2000/53/EC); the Sale of Goods Act 1979, the EU Registration, Evaluation, Authorisation and restriction of Chemicals Regulations (REACH Regulations as amended 2012); and the Restriction of Hazardous Substances Directive (RoHS Directive 2002/95/EC) set a framework to ensure products are fit for purpose and restrict the use of harmful or hazardous chemicals and/or materials in specified equipment. Other legislation exists that specifies standards for environmental labelling; for example, the Ecodesign Directive (2009/125/EC) amongst others.

4.2 Environmental Baseline

Overview

4.2.1 The population baseline focuses on the behaviours and attitudes of the population to the consumption of goods and materials. It explores the perceptions of consumers and businesses towards reused and remanufactured materials and products compared to new. Information has also been included on customer and business interest in new circular business models, such as leasing and take-back schemes, which promote closed loop practices.

4.2.2 Barriers and opportunities to behavioural change are also discussed which have links to the Material Assets topic area with secondary impacts on Climatic Factors. Much of this information is theoretical and sources include Peattie (2010)[23], Michaud and Llerena (2010)[24] and the Waste and

[23] Peattie K. (2010) Green Consumption: Behaviour and Norms [online] Available at: http://www.annualreviews.org/eprint/Ud7eHHJdqMqIuw9y88UU/full/10.1146/annurev-environ-032609-094328?utm_source=&utm_medium=environ&utm_campaign=eprint& (accessed 20/05/2015)

[24] Michaud C. and Llerena D.(2010) Green consumer behaviour: an experimental analysis of willingness to pay for remanufactured products (online) Available at: http://onlinelibrary.wiley.com/doi/10.1002/bse.703/abstract (accessed 20/05/2015)

Resources Action Programme (WRAP)[25], amongst others. Data has been included where possible, including on population growth and trends.

Barriers and opportunities

4.2.3 It is recognised that a transition towards a circular economy will require a change in the way products are produced and designed, and fundamentally, a shift will be required in consumption patterns to enable this transition. Transitioning to a circular economy also poses significant technical and logistical challenges. In addition, it also creates a considerable marketing challenge since innovative consumption models such as leasing and take-back schemes rely on the cooperation of consumers[26].

4.2.4 Peattie (2010) states that environmental technologies, production systems, economic policies and social initiatives will all play important roles in the pursuit of sustainability, however, their contribution will be undermined without changes in our consumption patterns and behaviours. The report further states that developing more environmentally sustainable consumption and production systems depend upon the willingness of both consumers and businesses to engage in "greener" consumption behaviours[27].

4.2.5 Consumer behaviour and the factors which influence it is complex. It has been reported that 'green' consumption is strongly influenced by consumer values, norms and habits, yet is highly complex, diverse and context dependent[28]. Factors that influence consumer behaviour include accessibility, availability and affordability[29]. Behavioural economists have also repeatedly demonstrated the importance of emotion in guiding the decisions we make, and the limits of rationality in governing choices[30].

4.2.6 Research has shown that whilst consumers have a strong preference for buying and owning new products, there is a strong appetite for repair and rental services, for trade in options and purchasing second hand products when delivered by trusted major retailers such as Do-it-Yourself (DIY)

[25] WRAP (2015) At the forefront of the circular economy [online] Available at: http://www.wrap.org.uk/ (accessed 27/07/2015)

[26] Dragon Rouge (undated) Ellen MacArthur Foundation the Circular Economy 100, Understanding the consumer response to a circular economy [online] Available at: http://www.im-cms.co.uk/pdf/EMF/Insights/consumer/Understanding.pdf (accessed 18/06/2015)

[27] Peattie.K (2010) Green Consumption: Behaviour and Norms, Annual Review of Environment and Resources Vol 35 [online] Available at: http://www.annualreviews.org/eprint/Ud7eHHJdqMqIuw9y88UU/full/10.1146/annurev-environ-032609-094328?utm_source=&utm_medium=environ&utm_campaign=eprint (accessed 29/05/2015)

[28] Peattie.K (2010) Green Consumption: Behaviour and Norms, Annual Review of Environment and Resources Vol 35 [online] Available at: http://www.annualreviews.org/eprint/Ud7eHHJdqMqIuw9y88UU/full/10.1146/annurev-environ-032609-094328?utm_source=&utm_medium=environ&utm_campaign=eprint (accessed 29/05/2015)

[29] Bruyninckx, Hans et all (2014) European Environment Agency Well-being and the environment: building a resource-efficient economy in Europe (EEA Signals 2014) [online] Available at: https://www.google.co.uk/?gws_rd=ssl#safe=active&q=http:%2F%2Fwww.eea.europa.eu%2Fpublications%2Fsignals-2014%2Fat_download%2Ffile (accessed 03/06/2015)

[30] Dragon Rouge (undated) Ellen MacArthur Foundation the Circular Economy 100, Understanding the consumer response to a circular economy [online] Available at: http://www.im-cms.co.uk/pdf/EMF/Insights/consumer/Understanding.pdf (accessed 18/06/2015)

retailers, specialist electrical retailers and manufacturers[31]. However, research has also shown that there is also an element of scepticism and uncertainty, particularly regarding 'green' claims over products and services, with over half of those asked in one study stating they found it difficult to know what products are better for the environment[32].

4.2.7 There is a significant opportunity to expand on current practices such as re-use and a key factor to enable this has been identified as increasing public confidence in re-use businesses and goods[33]. For example, re-using products or remanufacturing components is an effective way of using existing materials and keeping products in circulation for longer. Changing public perceptions so that is understood that remanufactured goods are of the same or better quality as a new product is therefore vital and the current lack of awareness and negative perceptions are a barrier which limits their potential.

4.2.8 One of the most prevalent barriers to remanufacturing within a number of industries revolves around its definition[34]. Unlike recycling, and even with the development of BSI standards for remanufacturing[35], remanufacturing does not have a universally accepted or recognised definition[36]. This will also be discussed in greater depth under the topic of Material Assets, however, it should be noted in this section that a lack of a legal definition of remanufacturing is also linked to consumer perception that remanufactured products are "second best". This constrains demand and depresses the demand for products, thereby undermining the economics of remanufacture[37].

4.2.9 Michaud and Llerena (2010) looked into whether consumers are willing to pay for remanufactured products, especially when they are informed that these products are "green"[38]. The study found that consumers tend to value

[31] WRAP (2015) Resource Efficient Business Models: Consumer research [online] Available at: http://www.wrap.org.uk/content/resource-efficient-business-models-consumer-research (accessed 18/06/2015)

[32] Consumer Focus (2009) Green Expectations: Consumers' understanding of green claims in advertising [online] Available at: http://www.consumerfocus.org.uk/files/2011/01/Green-expectations-single-page.pdf (accessed 28/05/2015)

[33] Ellen MacArthur Foundation (2011) Revolve Reuse Quality standard [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/revolve-reuse-quality-standard (accessed 02/05/2015)

[34] APSRG (2014) Triple Win: the economic, social and environmental case for remanufacturing [online] Available at: http://www.policyconnect.org.uk/apsrg/sites/site_apsrg/files/report/535/fieldreportdownload/triplewin-thesocialeconomicandenvironmentalcaseforremanufacturing.pdf (accessed 03/06/2015)

[35] BS 8887-220:2010 Design for manufacture, assembly, disassembly and end-of-life processing (MADE), The process of remanufacture, Specification.

[36] The Scottish Government, Scottish Enterprise, SEPA, HIE, Zero Waste Scotland (2015) Circular Economy Evidence Building Programme: Remanufacturing Study Full Report March 2015 [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/Remanufacturing%20Study%20-%20Full%20Report%20-%20March%202015_0.pdf (accessed 02/06/2015)

[37] APSRG (2014) Triple Win: the economic, social and environmental case for remanufacturing [online] Available at: http://www.policyconnect.org.uk/apsrg/sites/site_apsrg/files/report/535/fieldreportdownload/triplewin-thesocialeconomicandenvironmentalcaseforremanufacturing.pdf (accessed 03/06/2015)

[38] Celine Michaud and Daniel Llerena (2010) Green consumer behaviour: an experimental analysis of willingness to pay for remanufactured products [online] Available at: http://onlinelibrary.wiley.com/doi/10.1002/bse.703/abstract (accessed 28/05/2015)

the remanufactured product less than the conventional one unless they are informed of their respective environmental impact. It also concluded that while there was no evidence that consumers are willing to pay a premium for a more circular product, providing environmental information to consumers has an impact on their choice, generally decreasing their willingness to pay for conventional (the most polluting) product[39].

4.2.10 The provision of environmental information can inform the consumer decision making process and instil customer confidence in green claims. The use of Ecolabelling is one means of achieving this. For example, one survey reported that over half of those questioned were of the view that Ecolabelling plays an important role in their purchasing behaviour. Of those questioned, the most important information on environmental labels was felt to be whether it is possible to recycle or reuse the product[40].

4.2.11 The reuse and recycling of products is also part of a circular economy model. For example, re-use does take place in different forms in today's mostly linear economy through long standing channels such as jumble sales, charity shops and the antiques trade, in addition to online marketplaces and auction sites. However research has shown that while 77% of the UK population want to shop second hand, only 27% actually do[41].

4.2.12 It is estimated that over 80% of all product related environmental impacts are determined during the design phase of a product[42]. However, design can act as both a barrier and driver to remanufacturing. Whilst it can act as a technical barrier, it is also acknowledged few products are designed with reuse in mind and that products need to be designed with the circular economy, and particularly remanufacturing in mind. As a consequence, it has been reported that the current lack of designing products for the future is limiting the growth of remanufacturing[43].

4.2.13 More recent studies have explored attitudes and behaviours to consumption, awareness of alternative consumption models and responses to new circular concepts. Whilst the results of one survey reported that there remains much to learn about consumers' appetite for circular models of consumption, there

[39] Celine Michaud and Daniel Llerena (2010) Green consumer behaviour: an experimental analysis of willingness to pay for remanufactured products [online] Available at: http://onlinelibrary.wiley.com/doi/10.1002/bse.703/abstract (accessed 28/05/2015)

[40] European Commission (2009) Europeans' attitudes towards the issue of sustainable consumption and production Analytical report [online] Available at: http://ec.europa.eu/public_opinion/flash/fl_256_en.pdf (accessed 28/05/2015)

[41] Ellen MacArthur Foundation (2011) Revolve Reuse Quality standard [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/revolve-reuse-quality-standard (accessed 02/06/2015)

[42] European Commission (2014) Joint Research Centre, Sustainable Product Policy [online] Available at: https://ec.europa.eu/jrc/en/research-topic/sustainable-product-policy (accessed 05/06/2015)

[43] APSRG (2014) Triple Win: the economic, social and environmental case for remanufacturing [online] Available at: http://www.policyconnect.org.uk/apsrg/sites/site_apsrg/files/report/535/fieldreportdownload/triplewin-thesocialeconomicandenvironmentalcaseforremanufacturing.pdf (accessed 03/06/2015)

are reasons to be optimistic[44]. This is mirrored by the findings of other research which reports that almost two thirds of customers said they would use repair and rental services etc. if they were delivered by trusted, major retailers[45].

4.2.14 This research explored business models for three areas: household appliances, consumer electronics and DIY and gardening products. WRAP statistics indicate consumers were particularly interested in consumer electronics (64%-74% of consumers said they would consider using a trade in service by a major retailer) and DIY and gardening products (75% of consumers said they would consider using a trade in service by a major retailer). With regard to a fixed price repair model for household appliances, 71% of consumers said they would be willing to use this service for washing machines, 76% for fridges and 56% for vacuum cleaners. Renting DIY and gardening products was also explored (70% said they would be most likely or very likely to rent a well-known brand). It was also reported that consumers want longer than standard warranties for electrical products, particularly "workhorse" appliances[46].

Existing context

4.2.15 Our planet has limited resources and we are extracting more resources than the planet can sustainably deliver. This is directly influenced by current consumption and production patterns. For example, it is thought that over 90% of the consumer products that are bought worldwide are usually disposed of as waste within six months[47]. It is also reported that if we keep consuming on current trends we will need to extract 75% more raw materials in the next 25 years[48]. Most of these materials are finite resources, and even those that can be renewed have limits on what can be used sustainably. Projections based on exiting trends[49] show the total population of Scotland rising from 5.31 million in 2012 to 5.78 million in 2037, and longer term projections show the population continuing to rise[50]. As the population increases, so too will current pressures on our resources.

[44] Dragon Rouge (undated) Ellen MacArthur Foundation the Circular Economy 100, Understanding the consumer response to a circular economy [online] Available at: http://www.im-cms.co.uk/pdf/EMF/Insights/consumer/Understanding.pdf (accessed 18/06/2015)

[45] WRAP (2015) Resource Efficient Business Models: Consumer research [online] Available at: http://www.wrap.org.uk/content/resource-efficient-business-models-consumer-research (accessed 18/06/2015)

[46] WRAP (2015) Resource Efficient Business Models: Consumer research [online] Available at: http://www.wrap.org.uk/content/resource-efficient-business-models-consumer-research (accessed 18/06/2015)

[47] Circle Economy (undated) The Circular Design Program [online] Available at: http://www.circle-economy.com/projects/sector/circular-design-program/ (accessed 02/06/2015)

[48] Scottish Government (2013) Safeguarding Scotland's Resources – Blueprint for a More Resource Efficient and Circular Economy [online] Available at: http://www.gov.scot/Publications/2013/10/6262/downloads#res435308 (accessed 28/05/2015)

[49] These make no allowances for future impact of government policies and other factors.

[50] National Registers Scotland (2015) High Level Summary of Statistics: Population and Migration [online] Available at: http://www.nrscotland.gov.uk/files/statistics/high-level-summary/j11198/j1119804.htm (accessed 28/05/2015)

4.2.16 Current legislation such as the European Ecolabel Regulations[51] established in 1992, identifies products and services that have a reduced environmental impact throughout their lifecycle. Recognised throughout Europe, the EU Ecolabel is a voluntary label promoting environmental excellence which can be trusted[52].

4.2.17 The Revolve Reuse Quality Standard[53] is an accreditation programme that aims to turn reuse activity into a key part of the economy through increasing trust and reputation of reuse retailers. Whilst its implementation since 2011 is limited to a number of stores, increased sales and a turnover of stock are reported. Programmes such as this are also thought to improve standards in the re-use sector from within; for example, by facilitating open discussion around perceptions, legislation and barriers to progress[54].

4.2.18 Current legislation such as the Ecodesign Directive aims to reduce the environmental impact of producers and energy consumption of products throughout their life cycle[55]. The Third Report of Session 2014 – 2015 of the UK House of Commons Environmental Audit Committee on Growing a Circular Economy recommended that a set of eco-design standards should be established across a range of products in the UK to make them easier to repair, upgrade or recycle. The report further recommended that such standards should phase out products made from materials that cannot be recycled and encourage companies to design goods that have a clear end of life recovery route, and are fabricated using easily separable and recyclable components[56].

4.2.19 There are a range of innovative and business models that extend product life, conserve resources and prevent materials from becoming waste[57]. Examples include product service systems, hire and leasing, and incentivised return and re-use programmes. ZWS is currently working to support new business opportunities in these. Internationally, the EMF's Circular Economy 100 is a global platform bringing together leading

[51] European Commission (2014) Joint Research Centre, Sustainable Product Policy [online] Available at: https://ec.europa.eu/jrc/en/research-topic/sustainable-product-policy (accessed 05/06/2015)

[52] European Commission (2015) The EU Ecolabel [online] Available at: http://ec.europa.eu/environment/ecolabel/index_en.htm (accessed 15/06/2015)

[53] Revolve (2015) Revolve Reuse Quality Standard [online] Available at: http://www.revolvereuse.com/ (accessed 15/06/2015)

[54] Ellen MacArthur Foundation (2011) Revolve Reuse Quality standard [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/revolve-reuse-quality-standard (accessed 02/05/2015)

[55] European Commission (2014) Joint Research Centre, Sustainable Product Policy [online] Available at: https://ec.europa.eu/jrc/en/research-topic/sustainable-product-policy (accessed 05/06/2015)

[56] House of commons Environmental Audit Committee (2014) Growing a circular economy: Ending the throwaway society: Third Report of Session 2014-2015 [online] Available at: http://www.publications.parliament.uk/pa/cm201415/cmselect/cmenvaud/214/214.pdf (accessed 02/06/2015)

[57] WRAP (undated) Innovative Business Models [online] Available at: http://www.wrap.org.uk/content/innovative-business-models-1 (accessed 19/06/2015)

companies, emerging innovators and governments/cities to accelerate the transition to a circular economy[58].

4.2.20 Evidence of the transition already taking place and the concept and principles of a circular economy having been put into place can be found within a range of companies who are actively participate in the Circular Economy 100. For example, H&M launched its first denim collection made from recycled cotton from collected garments in 2014. In addition, they state a vision that all recyclable clothes will be closed-loop recycled into new textile fibres[59]. Another retail example is Marks and Spencer who works to ensure no clothing goes to landfill by making it easier to return used items, and encouraging customers to donate unwanted clothing to Oxfam to be resold, reused or recycled[60]. After overcoming the existing barrier of customer perceptions and lack of awareness, Mazuma Mobile now receives up to 50,000 to 150,000 phones a month from customers. While previously, these products were either thrown away or placed in a drawer, the large majority of these are now either refurbished or recycled for materials[61].

Key considerations:

- Our current consumption and production of resources is unsustainable.
- Consumption behaviour is complex, involving many influencing factors.
- There is no evidence that consumers are willing to pay a premium for a more circular product, however, the quality, value, convenience and the provision of environmental information has an impact on their choice.
- There is significant opportunity to expand current practices such as re-use and remanufacture, and a key factor to enable this is increasing public confidence in goods and suppliers.
- Barriers slowing the uptake of remanufactured products can be separated into those affecting remanufacturers and those affecting consumers or producers.
- Supporting legislation and accreditation standards that can influence design considerations are beginning to be put into place, and this could help to increase confidence in sectors such as re-use and remanufacturing.
- A range of innovative business models have been developed that extend product life, conserve resources and prevent materials from becoming waste.
- Case studies indicate that circular economy models and principles have been successfully applied in some sectors and industries.

[58] Ellen MacArthur Foundation (undated) Circular Economy 100 [online] Available at: http://www.ellenmacarthurfoundation.org/business/ce100 (accessed 18/06/2015)

[59] Ellen MacArthur Foundation (undated) Circular Economy Network Map [online] Available at: http://www.ellenmacarthurfoundation.org/uploads/gkm/page_520.html (accessed 02/06/2015)

[60] Ellen MacArthur Foundation (2011) Revolve Reuse Quality standard [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/revolve-reuse-quality-standard (accessed 02/06/2015)

[61] Ellen MacArthur Foundation (2011) Case Studies Mazuma Mobile [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/mazuma-mobile (24/06/2015)

4.3 What are the likely effects of proposals in the Consultation Document?

Question: Will the Consultation Document contribute towards greater sustainability in the use of resources, through encouraging a shift in current patterns of consumption?

4.3.1 Of the barriers that have been identified as negatively impacting on consumer behaviour, the perceived inferior quality of second hand goods and the view that remanufactured goods are 'second best' are widely considered to be strongly influential. However, despite this, research has shown that whilst there is a strong consumer preference to buy new, there is also interest in buying environmentally 'green' products and a strong appetite for considering circular supply models such as leasing and hiring.

4.3.2 The Revolve programme is one example of work that has had success in tackling this issue and changing perceptions. Proposals in the Consultation Document, including those to extend the remit of Revolve and develop further standards through collaborative working with BSI and ISO in the remanufacturing sector, are therefore likely to build on this success and further increase awareness and reputational confidence in these sectors.

4.3.3 These barriers can impact on the industry through suppressing customer markets and constrain industry uptake of innovative practices. For example, the lack of a legal definition of the term 'remanufactured' has been identified as a major barrier to both. The measures discussed above and those that aim to define or provide clarity over remanufactured products should not only increase customer confidence in this sector, but also have a beneficial impact on business and industry.

4.3.4 It is worth noting that the effect of this is potentially cyclical; affecting both market availability and consequently consumer demand. For example, as confidence in the remanufacturing sector increases, it is likely that more consumers will consider purchasing these products and components. Also as business and industry are supported through the measures proposed in the Consultation Document, such as defining remanufacturing and those that seek to provide a greater skills base for these sectors, this should encourage greater adoption of circular economy principles into current business operations. This in turn has the potential to impact on the range and type of products on offer and how they are supplied to the consumer; potentially changing the market and encouraging demand for these products.

4.3.5 Examples have shown that consumer behaviour can change. For example, practices once considered the norm, such as throwing a product away as waste once finished with it, can be replaced by behaviours involving trading a product in for a replacement or even leasing a product with regular upgrades included in the agreement. The success of businesses in the

mobile phone and telecommunications sector is one such example of this, with several companies now offering phone recycling and used phone sales services. Therefore, whilst changing consumer perceptions is undoubtedly one part of the process required to shift to a circular economy, business and industry can equally drive and change the market place with an attractive business model.

4.3.6 Another example of this is public procurement, a process by which public authorities (governmental bodies or local authorities) purchase work, goods and services from companies. The impact of public procurement on the transition to a circular economy has the potential to be significant. Using Denmark as an example, the public sector spend is around 19% of its GDP (€ 38 billion annually). With that level of investment, there is the potential for significant changes to the national marketplace[62]. It is therefore likely that the proposals set out in the Consultation Document in relation to procurement could have a similar influence, and potentially help to facilitate the transition to a circular economy.

4.3.7 Designing products with greater consideration of the end of life impacts is one example of where the environmental impact of a product impact can be greatly reduced prior to being made available for sale. Design can also impact on the take-up and success of reuse, repair and remanufacturing operations, particularly as many products are not designed with reuse in mind. While this is further discussed under the topic of Material Assets (Section 0), standardising products, materials and their components, and moving towards disassembly ready product design is likely to have an impact on the range of products available in the market place. As discussed above, this could consequently drive demand.

4.4 What are the likely effects in the absence of proposals in the Consultation Document?

4.4.1 The re-use and recycling of products are established practices that currently take place in many sectors of today's society demonstrating the progress made to date in integrating the principles of a circular economy amongst consumers. However, whilst increasing trends in these practices is evident, studies have also shown that the desire of consumers to take part in these practices, buying second hand for example, is significantly higher than that which occurs in practice. Therefore, even without implementation of these proposals, it is likely that the uptake of circular economy ambitions such as the recycling and re-use of products, components and materials will continue to increase but with room for further improvement.

4.4.2 In many instances, the use of reconditioned or remanufactured replacement parts in products such as washing machines and automotive vehicles would

[62] Ellen MacArthur (undated) Public procurement in Denmark [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/public-procurement-in-denmark (accessed 29/06/2015)

also likely continue to evolve, often without the realisation of consumers that these practices follow circular economy ambitions. Trends towards more options being made available for leasing, renting and sharing products are also likely to continue. Under the BAU option however, it is possible that any increase achieved may not be in line with current consumption rates and population increases. Without further intervention to help eradicate barriers and support business and industry through the transition required to adopt circular economy principles, this has the potential to lead to a status quo situation. That is, where any increase in established practices such as recycling and the take-up of new business models cannot match that of current consumption and production.

4.4.3 Therefore, in the absence of proposals in the Consultation Document, there could be a missed opportunity to progress new work and action, in addition to complementing this with further action targeting support for business and industry opportunities. For example, one barrier affecting both consumer choice and industry uptake of remanufacturing products and process is a lack of clarity of what remanufacturing actually means. Through addressing this barrier, the Consultation Document should provide a means to influence both of these important factors and consequently influence market demand and supply of these goods. If left unaddressed, it is likely that the market and industry alike may continue to be suppressed.

4.4.4 Further to this, a circular economy considers the value of products beyond the product as a whole, but also its constituent parts and components. As discussed earlier, at its best, a circular economy involves restoring old products, parts and materials back to their original use in a way that uses the least resources to deliver the same function. Fundamentally, this means retaining and protecting this value via circular economy 'loops' such as remanufacturing and consideration in design. In processes such as recycling, this value can be lost.

4.4.5 The longer products are kept in use and their value retained, the need for new resources will be reduced. In the absence of further measures that support and enable these processes to become embedded within society and industry and help shift our current trends in production and consumption, an opportunity to positively influence current behaviours and realise new opportunities may be missed. In the process, it is likely that much of the value of the associated products and materials will continue to be lost and subsequently there may be little change in our demand for new raw materials.

4.5 Assessment Findings

4.5.1 Our current rate of consumption and use of natural resources is widely considered to be unsustainable. With projections showing a continued increase in population growth, it is likely that a linear economy will potentially lead to increased consumption, use of raw materials and constraints on resources. In turn, this may lead to increased commodity price volatility. The proposals set out in the Consultation Document seek to build upon existing progress primarily by exploring ways to promote the economic and environmental opportunities that a circular economy can provide to businesses and manufacturers, and facilitating behavioural change amongst consumers. These are both critical aspects which will need to be addressed if the aims of the Consultation Document are to be met. Whilst it is possible to attain benefits from focusing on one aspect alone, such as customer behaviour, the links between market demand, consumer behaviour and industry are so intrinsic that greater benefit is likely to be achieved by addressing these in combination.

4.5.2 Overall, it is likely that measures in the Consultation Document will have a significant beneficial impact on these aspects in a number of ways. For example, increasing confidence and reputational value in the remanufacturing and reuse sectors, driving demand through procurement mechanisms and supporting industry to help them to embed circular economy principles in their operations can help to meet or create demand for leased, rented, second hand or remanufactured products.

4.5.3 Design is also acknowledged to be a critical element. Not only can effective design reduce the unsustainable use of raw natural resources in the first instance, it is also likely to be vital in helping to make it economically and technically feasible to keep valuable products, components and materials circulating in the economy for longer.

4.5.4 The environmental benefits resulting from the implementation of proposals within the Consultation Document cover a range of issues. Greater sustainability and efficiency in use of resources in the first instance through support for increased provision of and demand for remanufactured products, and in retaining the value of components and materials throughout the lifespan of the product. In addition, there is likely to be a positive effect on GHG emissions in two ways. Firstly, as a result of moving away from producing new products to meet demand and the subsequent reduction in energy requirements. Secondly, the proposed measures in the Consultation Document will likely change the type and amount of waste produced during manufacturing and maintenance processes by changing current consumption behaviours in businesses and households. Therefore, the SEA identified intrinsic links between business/consumer behaviour and industry practice to the Climate Change and Material Assets topics.

4.5.5 Market demand and the consumer decision making process are extremely complex subjects and are influenced by many factors. Additionally, changes will take time to be implemented, both within industry and in societal behaviour. Whilst it is anticipated that there is likely to be significant benefits, these may only be realised over time and contingent on the widespread 'buy in' of businesses and consumers alike.

4.5.6 The key findings are summarised below:

- Likely significant positive effects identified on a number of environmental issues. These include greater efficiency in the use of resources and a reduction in GHG emissions.
- Additional impacts on types and amounts of materials and components entering the waste stream have been identified.
- Any potential benefits are intrinsically linked to Climatic Factors and Material Assets.
- Identified benefits are likely to be dependent on having the 'buy in' of business and consumers.
- Instigating societal and industry changes will take time, as such, any identified benefits are likely be realised over the long term.

5 Climatic Factors

5.1 Environmental Protection Objectives

5.1.1 A number of current plans and policies seek to reduce the rate of climate change and its likely environmental effects. At the international level, targets and mechanisms for addressing climate change are set in the Kyoto Protocol. In Scotland, the Climate Change (Scotland) Act 2009 establishes a framework for reducing Scotland's GHG emissions, and the Low Carbon Scotland: Meeting our Emissions Reduction Targets reports for 2010 – 2022 and 2013 – 2027 (RPP and RPP2) detail a range of proposals and policies across of wide range of sectors for working towards these ambitions.

5.1.2 Important targets and key policies aim to reduce GHG emissions and set targets to create a shift towards a low carbon economy for Scotland. An updated framework for adaptation to climate change impacts has been published, alongside 12 sectoral work streams relating to the built environment, business and industry, energy and transport, amongst others. Scotland's Climate Change Adaptation Programme (2013 – 2017) is in place to address the predicted impacts for Scotland set out in the UK Climate Change Risk Assessment (CCRA).

5.2 Environmental Baseline

Introduction

5.2.1 Predictions of the effects of climate change have been well documented, and many studies, such as the Handbook of Climate Trends Across Scotland produced by Sniffer[63], show that these effects are already being felt in Scotland. While the extent of the effects of a changing climate is expected to vary by location, there is significant evidence to support the belief that significant changes in precipitation, snowfall, seasonality, cloud cover, humidity, wind speeds, soil moisture, rising sea levels and extreme weather may occur[64]. The UK CCRA predicts more frequent flooding arising from more frequent and intense rainfall and an increase in drought incidents during drier summers in the UK. Scotland is expected to see more extreme weather events such as more extended hot periods, increases in maximum temperatures nationwide, and fewer days of snow and frost. Longer periods of dry weather in the summer are expected and the wettest days of the year are likely to be considerably wetter than those at present[65].

[63] Sniffer (2006) A Handbook of Climate Trends Across Scotland. Available at: http://www.climatetrendshandbook.adaptationscotland.org.uk/ (accessed 13/8/2012)

[64] IPCC (2007) Fourth Assessment Report: Climate Change.

[65] DEFRA (2012) UK Climate Change Risk Assessment (CCRA) Available at: http://www.defra.gov.uk/environment/climate/government/risk-assessment/#report (accessed 3/8/2012)

5.2.2 Clear links between a changing climate and impacts on the natural environmental and natural resources have been identified and documented. For example, potential effects on biodiversity, flora and fauna, water, air and soil quality are often cited. Alongside this, there is the potential for indirect or secondary effects on other environmental receptors and on communities, businesses and industry. For example, the potential for impacts on water quality from increased flood potential, and the potential for increased pressures on biodiversity through predicted increases in temperature.

The Carbon Metric

5.2.3 The carbon metric is a tool developed to consider the environmental impact of materials and waste through an 'entire-life' approach rather than by focusing on its weight alone. It is a consumption based carbon accounting approach that considers the carbon impacts of a product or component over its entire life cycle regardless of its location of manufacture, use and disposal. This carbon based metric can also act as a proxy measure for a range of environmental impacts to enable the consideration of how Scotland's waste actually impacts on the environment at the global level rather than just in Scotland.

5.2.4 Using the carbon metric instead of considering weight alone gives a more complete picture of the carbon impacts of our waste. For example, using the carbon metric system, one tonne of plastic bottles equates to 3,199 kgCO2eq (carbon dioxide equivalent) of emissions which has a far higher environmental impact over their lifecycle than one tonne of rubble equating to 14 kgCO2eq. This tool can also enable the identification of opportunities and help to focus actions towards those of 'higher carbon value', and through improving the management and increasing the longevity of these materials within a circular economy, also has the potential to contribute towards maximising benefits. For example, if 'high carbon value' materials 'leak' from the economy rather than being retained and circulated in the economy for as long as possible, they will have a greater impact on the environment than others when discarded[66].

Barriers and opportunities

5.2.5 In terms of climatic factors, opportunities and barriers discussed under 'Population' and 'Material Assets' are likely to have an influence. For example, fundamental barriers to the uptake of reused, repaired, refurbished, remanufactured, or leased/rented goods include current perceptions of the quality of the product and the overall value and convenience. This in turn can impact on consumer demand and production rates.

[66] Zero Waste Scotland (2015) What is the carbon metric? [online] Available at: http://www.zerowastescotland.org.uk/content/what-carbon-metric (accessed 18/06/2015)

5.2.6 Conversely, if the opportunities of applying circular economy practices in current business systems are realised, this can lead to greater uptake of innovative products and services, acceptance of leased, reused or remanufactured products and influence consumer and business uptake. Both will have a direct influence on climate factors, either negatively or positively, which in turn can also impact on our resilience and ability to adapt to the impacts of a changing climate.

Existing context

5.2.7 In 2012, Scottish emissions of the basket of six GHG were estimated to be 52.9 million tonnes carbon dioxide equivalent ($MtCO_2eq$), equating to a 0.8% increase from the previous year (52.5 $MtCO_2eq$) and a 29.9% reduction between 1990 and 2012. Carbon dioxide (CO_2) accounted for over 75% of Scotland's GHG emissions in 2012. The main contributors to these emissions were the energy supply sector (32%), transport (20%), agriculture and related land uses (21%), business sector (15%) and the residential sector (14%) and the with relatively minor totals reported for the waste management sector (5%) and other sectors[67].

5.2.8 While Scotland currently produces just a small proportion of global GHG emissions[68] directly, when incorporating wider contributions to the production of global GHG emissions, our carbon footprint is wider reaching. Between 1998 and 2012, Scotland's carbon footprint (emissions from all GHG gases both directly and including imported products consumed with Scotland) fell by 6.3% from 1998 to 2012. This footprint rose steadily from 1998 to a peak in 2007 before falling again in the following years, coinciding with the recession, before increasing again by 5.3% in 2012. In total in 2012, GHG emissions embedded in imported goods and services from overseas accounted for around 44% of Scotland's carbon footprint, increasing by some 39% since 1998. In contrast, the GHG emissions embedded in UK-produced goods and services accounted for around 39% of the footprint in 2012; a reduction of around 45% since 1998[69].

5.2.9 Scotland's material consumption accounts for between 68–74% of its entire carbon footprint. Therefore, producing and consuming materials more efficiently through a more circular economy could provide Scotland with substantial carbon savings[70]. It has been estimated that under a circular

[67] Scottish Government (2014) Scottish Greenhouse Gas Emissions 2012 [online] Available at: http://www.gov.scot/Resource/0045/00452084.pdf (accessed 28/05/2015)

[68] Scotland's Environment (2012) Pressures Affecting Climate Change. Available at: http://www.environment.scotland.gov.uk/our_environment/air_and_climate/climate_change/pressures.aspx (accessed 13/8/2012)

[69] The Scottish Government (2013) Scotland's Carbon Footprint 1998 – 2012 [online] Available at: http://www.gov.scot/Resource/0047/00472991.pdf (accessed 29/05/2015)

[70] Zero Waste Scotland (2015) The Carbon Impacts of the Circular Economy Summary Report [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/CIoCE%20Summary%20Report%20-%20FINAL%20-%2015.06.15.pdf (accessed 18/06/2015)

economy scenario would produce an estimated saving of 51% in GHG emissions over that of the current 'business as usual' scenario[71] . It is also projected that circular economy strategies can have substantial global (consumption) savings without compromising economic growth through reductions in material consumption[72].

5.2.10 Including the aerospace sector (contributing around £ 670 million), remanufacturing activities currently contribute around £1.1 billion to the Scottish economy and support thousands of jobs. It is estimated that reuse and remanufacturing in the UK currently avoids CO_2 emissions in the region of 37,000 tonnes, predominantly in the aerospace sector (17,000 tCO_2eq), but has the potential to contribute greater savings in the future. With more support this could be increased, and it has been estimated that growth of an additional £620 million by 2020 could be achieved, with associated carbon savings, if barriers can be overcome in sectors such as medical equipment, mobile electronics, energy and the automotive sector[73].

5.2.11 In addition to carbon savings, there are links and opportunities between circular economy ambitions such as reuse and remanufacturing and other environmental topics; particularly through impacts on our natural resource consumption. One such example is the remanufacturing of a cylinder head compared to the process of producing new parts by engineering company Caterpillar. It is reported that in addition to reducing GHG emissions by 93%, this could require 86% less energy and 93% less water for the manufacturing and cooling processes involved[74].

5.2.12 While the disposal and treatment of waste can produce several types of GHG emissions, the most significant gas produced from waste is methane. This is released during the breakdown of biodegradable matter in landfills. The Waste (Scotland) Regulations 2012 contain a number of key actions relating to biodegradable waste streams. For example, a ban on municipal biodegradable waste going to landfill by 1 January 2021[75].

[71] Estimated based on calculations using consumption accounting. Consumption accounting is based on the concept of "consumer responsibility" and includes all the emissions resulting from consumption. Under consumption accounting, emissions required to produce imported products contribute to Scotland's carbon footprint, but the emissions from Scottish exports do not.

[72] Zero Waste Scotland (2015) The Carbon Impacts of the Circular Economy Technical Report [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/CIoCE%20Technical%20Report%20-%20FINAL%20-%2015.06.15.pdf (accessed 18/06/2015)

[73] The Scottish Government, Scottish Enterprise, SEPA, Highlands and Islands Enterprise and Zero Waste Scotland (2015) Circular Economy Evidence Building Programme Remanufacturing Study: Full Report, March 2015 [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/Remanufacturing%20Study%20-%20Full%20Report%20-%20March%202015_0.pdf (accessed 16/07/2015)

[74] McGlone, Conor (2015) Can the UK manufacture its way to a green economy, the ENDS report No 481

[75] Zero Waste Scotland (2015) Waste (Scotland) Regulations [online] Available at: http://www.zerowastescotland.org.uk/content/waste-scotland-regulations (accessed 23/06/2015)

Key issues:

- Climate change has the potential to have significant impacts on a range of environmental topic areas, including the availability and quality of Scotland's natural resources.
- The potential for associated effects on environmental receptors as a result of changing climate is likely to have 'knock on' effects on communities, businesses and industry.
- The carbon metric considers the environmental impact of materials and waste rather than focusing on weight only, enabling action to be improved.
- Scotland's material consumption accounts for between 68 – 74% of its entire carbon footprint, and producing and consuming materials more efficiently through circular economy principles could lead to substantial carbon savings both within Scotland and globally.
- Opportunities and barriers to the uptake of circular economy principles will directly impact on climatic factors, the ability of industry to improve their resilience and also our ability to adapt to climate change.

5.3 What are the likely effects of the proposals in the Consultation Document?

Question: Will the Consultation Document contribute to the reduction of greenhouse gas (GHG) emissions and help in meeting Scotland's emissions reduction targets?

5.3.1 While the primary benefits of the proposals set out in the Consultation Document are likely to be economic in the context of businesses, the potential for overall positive effects in terms of climatic factors has also been identified; particularly in contributing to Scotland's GHG emissions reduction ambitions. The overarching ambitions of the circular economy set out in the Consultation Document promote the continued use of products, components and materials in a variety of business models whether through direct reuse (i.e. second-hand sale) or through refurbishment or remanufacturing in preference to newly manufactured items. This has the potential for significant positive effects.

5.3.2 Reductions in resource inputs (e.g. water and energy) in remanufacturing of existing products and components compared with manufacturing new ones, has been demonstrated in a wide range of industries (i.e. the automotive and shipping sectors). It is likely that proposals for further promoting the benefits and opportunities to business and industry has the potential to yield further reductions. For example, this could help in reducing emissions that would otherwise be associated with the sourcing of new raw materials and the creation of new products and components.

5.3.3 The focus given to improving the management of 'high carbon value' materials across a range of sectors also has the potential for delivering overall positive effects in this topic area. In particular, mapping bioresource waste streams across Scotland and the co-ordination of research and innovation in the management of bioresources in the circular economy context, were both identified. If implemented, these have the potential to improve the planning and management of these resources (e.g. understanding their composition, current disposal routes of these materials, improving our knowledge-base). These ambitions are likely to take forward previous work, such as the development of existing tools such as the Carbon Metric by ZWS, and could help to shift the focus from eliminating waste 'losses' and 'leakages' to maximising carbon savings by targeting actions on 'high carbon value' materials such as food and other biological wastes.

5.3.4 By promoting further opportunities to roll out household food waste collection across Scotland, directly engaging with sectors such as the food and drink supply industry, and the publication of carbon statistics alongside waste statistics, there is also an opportunity to raise awareness and educate consumers and industry alike on the 'carbon value' of their wastes and products. With their 'buy in', this has the potential to contribute to maximising the longevity of these materials within the economy. Providing relevant information and raising awareness could also help to promote industries in seeking future opportunities on how to better utilise these materials and eliminate their disposal in the future (i.e. working towards Scotland's existing zero waste ambitions).

5.3.5 Other specific proposals in the Consultation Document such as phasing out the use of peat in growing media also have the potential to deliver direct positive environmental effects. For example, there is the likelihood of positive effects in other environmental topic areas (e.g. benefits for biodiversity and water quality through conservation of these ecosystems) and an opportunity to contribute to Scotland's national emissions reduction targets (e.g. helping to retain the carbon sequestration properties of peatlands) and peatland conservation ambitions set out in wider policy (i.e. RPP2).

Question: Will the Consultation Document assist in adaptation to the predicted effects of climate change?

5.3.6 The case studies considered in preparing the Environmental Baseline for this SEA have demonstrated the potential for positive environmental effects, primarily through improving the management of resources and products, components and materials at all stages of their life span. In many instances, case studies such as that for the Maersk shipping company were developed, at least in part, to achieve greater certainty over the supply of essential resources (e.g. steel materials for ship building)[76].

5.3.7 Studies such as these show that changing design models from traditional linear economy approaches to incorporating end of life considerations, and changing business and procurement models can facilitate the reuse and remanufacturing of products and their components. In addition, they have the potential to provide an additional source of materials and increase the certainty of supply to businesses adopting these approaches. As one example, incorporating processes for the remanufacturing of automotive components has been demonstrated to have to the potential to significantly reduce material, energy and water consumption in comparison to the manufacture of new products or components.

5.3.8 There is therefore the potential for positive effects for businesses and industries in the future to improve their resilience to fluctuations in resource availability and supply. In particular, adopting a circular approach could help industries adapt to the likely effects of climate change (e.g. likely increases in periods of water scarcity, increased pressure on and competition for existing resources), the scarcity of resources, and the likelihood of any associated positive environmental effects. As a consequence, there is the potential for benefits for businesses with greater control over resource supply chain and opportunities for savings in consumption at the manufacturing stage.

5.3.9 There is also the likelihood of positive environmental effects associated with more efficient resource consumption from reduced pressure on the natural environment and its many resources; particularly relating to water availability and quality. As a consequence, there is the potential for associated positive effects for other environmental topic areas (i.e. biodiversity, flora and fauna; water; soil and geology), particularly if circular economy principles are incorporated into business models and adopted at an industry-wide or national scale.

5.3.10 The SEA identified that the ambitions set out in the Consultation Document complement those set out in existing policy relating to energy efficiency and

[76] Ellen MacArthur Foundation (2015) Maersk Line [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/maersk (accessed 16/07/2015)

shifting towards a low carbon economy (i.e. Energy Efficiency Action Plan, RPP/RPP2, NPF3 and SPP).

5.4 What are the likely effects in the absence of proposals in the Consultation Document?

5.4.1 The Environmental Baseline shows that many sectors and businesses have already taken forward circular economy ambitions. However, in many instances, this progress has been driven by economic factors and/or a need for greater resource security. Regardless, opportunities for positive environmental effects, particularly around improved efficiency, reduced resource input and a reduction in GHG emissions have also been observed.

5.4.2 Many of the proposals set out in the Consultation Document seek to build upon this progress and further communicate and promote the economic and environmental opportunities that a circular economy can provide to businesses and manufacturers across a range of sectors. While progress to date has been encouraging, and positive environmental effects would likely develop further within the current policy structure, the potential for delivery of additional benefits may be missed under a BAU scenario. Without the adoption of these proposals, sectoral progress towards incorporating circular economy ambitions into business practices would likely continue to develop as it has done previously within the current policy structure. For example, the expansion of reuse, remanufacturing and recycling processes in business models would likely still occur; although this may be largely driven by market forces in international supply chains, particularly for industries reliant on the extraction of natural resources and subject to fluctuations in supply and price. However, the opportunity that the development of Making Things Last could present in actively promoting the possibilities and benefits of such a shift to a wide range of businesses and sectors would likely be missed. Similarly, the potential for significant benefits for businesses in key sectors involved in the management of 'high carbon value' materials such as minerals and food wastes would also be missed.

5.4.3 While current policy measures are likely to deliver positive environmental effects, the opportunity to deliver further environmental benefits would likely be missed if the Consultation Document were not developed. In particular, the opportunity to help businesses to improve resilience to the predicted effects of climate change, and helping both businesses and local waste networks adapt to changing pressures such as evolving waste streams and expected population increases, would be unlikely to develop .

5.4.4 While GHG emissions reductions would also occur under the BAU scenario, particularly as more businesses incorporate circular economy ambitions in their business models, much of this work would likely be the responsibility of businesses themselves to identify and develop. Therefore, an opportunity to promote these ambitions to a wide range of industries, to maximise industry

contributions to meeting Scotland's GHG emission reduction targets, may be missed under this alternative.

5.5 Assessment Findings

5.5.1 With the 'buy in' of business, public sector, voluntary sector, industry and consumers, the proposals set out in the Consultation Document are likely to have a significant positive effect on the way that resources are used. In particular, it should help to promote opportunities for businesses to improve resilience to the predicted effects of a changing climate, and any associated increases in pressure and competition for resources. In general terms, improved management and greater efficiency in the use of resources in a circular economy is likely to have benefits for businesses and could help to improve their resilience to fluctuations in resource availability in the future (e.g. availability of water due to climate change, extreme price volatility and reduced access to resources).

5.5.2 The potential for the proposals to work towards helping to reduce Scotland's carbon footprint, particularly those associated with the reuse or remanufacturing of products, components and materials in preference to the importation of new products and components, was also identified as a key benefit. The SEA also identified intrinsic links between industry practices and the environment, particularly those aspects related to Climate Change. For example, positive effects such as the potential for businesses and consumers to further contribute to Scotland's adaptation to climate change is also likely through improving efficiency in the management of waste materials.

5.5.3 The incorporation of circular economy ambitions within business models, has the potential to help reduce resource consumption, reduce the generation of GHG emissions through the manufacturing process, and could help to contribute to meeting Scotland's established emissions reduction targets. There is the likelihood of a range of positive effects on other aspects of the environment, particularly associated with the potential for reducing pressure and increasing Scotland's environmental resilience in face of the predicted effects of climate change. In particular, the improved management and use of Scotland's water resources were identified amongst others. While the potential for associated benefits on other environmental topic areas was also noted, given the context of the proposals set out in the Consultation Document, these are not considered likely to be significant at the national level.

5.5.4 The key findings are summarised below:

- Likely significant positive effects through carbon savings and a reduction in GHG emissions.

- The potential for improved resilience of both business and the environment to the predicted effects of climate change is likely through more efficient use of resources.
- Intrinsic links were identified between this and the environmental topics of Population and Material Assets.
- The delivery of identified benefits is likely to be dependent on achieving the ‘buy in’ of industry; with particular opportunities noted if circular economy principles are incorporated into business models and adopted at an industry-wide or national scale.
- Instigating industry change will likely take time, and as such, any identified benefits are likely be realised over the medium to long term.

6 Material Assets

6.1 Environmental Protection Objectives

6.1.1 Under the 'Material Assets' heading, the assessment is focused primarily on issues arising from changes in approach within business and manufacturing sectors. This includes opportunities for changes to business models in how goods and services are provided to consumers; in changing current trends in the consumption of products and materials, including increasing the longevity of products, components and materials within the economy and reducing reliance on the extraction of raw materials; and the potential for changes to waste management practices and associated pressures on existing infrastructure (i.e. transport, waste treatment and disposal networks).

6.1.2 Existing PPS such as Scotland's Zero Waste Plan, Safeguarding Scotland's Resources programme and Scotland's Economic Strategy relate to these topics. They largely share common aims for contributing to core planning objectives of sustainability, to the low carbon economy and making best use of existing resources and infrastructure. Together with wider policy ambitions such as reducing GHG emissions and improving efficiencies in energy generation, they also set out shared ambitions for 'future proofing' at the national and sectoral levels, and for enhancing resilience and adaptation amongst businesses and manufacturers. In particular to changes in the availability of resources and the predicted effects of climate change.

6.2 Environmental Baseline

Overview

6.2.1 The following paragraphs focus on data trends and information in two ways. Firstly, the carbon impact of waste as measured by the Carbon Metric (discussed in Section 5.2). This is a fundamental consideration when assessing the potential impacts of the ambitions of the Consultation Document as a result of different materials having different 'carbon values'. Secondly, the amount of waste entering the waste stream is also discussed. This is also an important consideration as the proposals set out in the Consultation Document are likely to have the potential to influence how products, components and materials are managed over their lifespan, and how much waste and what type of waste, ends up in landfill or is disposed of by other methods.

6.2.2 Scotland's material consumption and disposal rate not only impacts on our carbon footprint but the quantity and availability of our natural resources. In 2012, Scotland consumed approximately 60.4 Mt of material, equivalent to around 11.4 tonnes of material per person. As such, nearly 1 tonne of material in every 5 ended up as waste. Over 11.7 Million tonnes (Mt) of

material was estimated to have been wasted, equivalent to around 2.2 tonnes per person[77].

6.2.3 By weight the most significant material flows are minerals (including fossil fuels), construction materials and food; however, based upon both consumption[78] and territorial[79] accounting methods, the materials with the greatest carbon impacts are believed to be food, minerals, ferrous and non-ferrous metals. For example, consumption-based figures (i.e. adapted from the carbon metric) identified food and plants (27 MtCO2eq) as having by far the highest carbon impacts, followed by other materials such as minerals (8.4 MtCO2eq), ferrous metals (4.8 MtCO2eq), non-ferrous metals (4.4 MtCO2eq) and textiles (4.0 MtCO2eq)[80].

6.2.4 Further to this, many of these wastes also differ in economic terms. Electronic waste is a good example of how looking at the volumes of weight generated does not reveal the true value embedded in consumer electronics. For example, while a mobile phone typically weighs less than 150 grams (g), it is a high value product that could be reused/repaired or used for parts, and when recycled, it contains valuable materials such as gold, silver and rare earth metals[81].

6.2.5 In 2012, an estimated 11.4 Mt of total controlled waste was generated and managed for Scotland continuing a declining trend observed over recent years[82]. A breakdown of this waste is presented in Figure 6.1.

[77] Zero Waste Scotland (2015) The Carbon Impacts of the Circular Economy Technical Report [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/CIoCE%20Technical%20Report%20-%20FINAL%20-%2015.06.15.pdf (accessed 19/06/2015)

[78] The consumption model included materials which were consumed by Scotland but excluded exports and non-Scottish waste managed in Scotland was excluded.

[79] The territorial model included all materials produced and wasted in Scotland whether those materials were consumed in Scotland or not. While emissions from production of goods for export and non-Scottish waste managed in Scotland were included, emissions generated from the production of imported materials and exported wastes were excluded.

[80] Zero Waste Scotland (2015) The Carbon Impacts of the Circular Economy Technical Report [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/CIoCE%20Technical%20Report%20-%20FINAL%20-%2015.06.15.pdf (accessed 19/06/2015)

[81] Ellen MacArthur (2012) Tool Kit Mobile Phones [online] Available at: http://www.ellenmacarthurfoundation.org/business/toolkit/in-depth-mobile-phones (accessed 25/06/2015)

[82] Scotland's Environment (2014) Waste: State [online] Available at: http://www.environment.scotland.gov.uk/get-informed/people-and-the-environment/waste/ (accessed 18/06/2015)

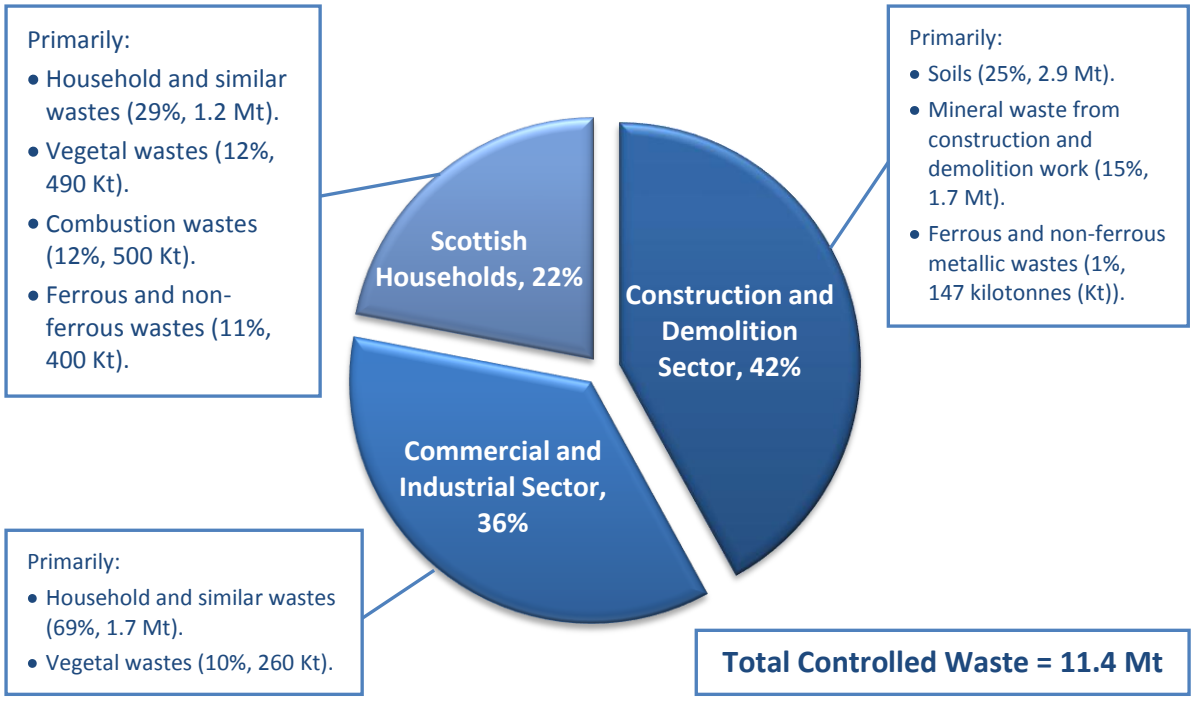

Figure 6.1 Controlled Waste Generated and Managed in Scotland (2012) [83]

6.2.6 In 2012, some 41% of waste (around 4.6 Mt) was placed in landfill or disposed of by incineration, equating to a reduction of around 4% from 2011 and reflecting longer term trends showing a reduction in 'leakages' or 'losses' of materials to landfill. Between 2005 and 2012, the volume of landfilled waste has reduced by some 39% with significant reductions in most waste types; particularly in animal and food wastes (69%), glass wastes (90%), soils (51%) and metallic wastes (77%) amongst others. In 2012, landfill wastes largely consisted of household and similar wastes (33%), soils (27%), sorting residues (19%) and combustion wastes (10%). A further 2% of waste was recovered by incineration, showing no little change from that observed in 2011[84] [85].

[83] Scotland's Environment Web (2014) Waste Discover Data Tool [online] Available at: http://www.environment.scotland.gov.uk/get-interactive/data/waste-from-all-sources/ (accessed 27/05/2015)

[84] ibid

[85] Scotland's Environment (2014) Waste: State [online] Available at: http://www.environment.scotland.gov.uk/get-informed/people-and-the-environment/waste/ (accessed 18/06/2015)

Barriers and opportunities

6.2.7 A 2009 survey report by the Centre for Remanufacturing and Reuse (CRR), estimated that total value of remanufacturing and reuse activities in the UK at that time to be around £2.4 billion (excluding the aerospace industry), and that remanufacturing activities made up around half of this[86]. However, studies also show that whilst remanufacturing activity exists across almost all industrial sectors, the scale and nature of companies involved in these practices varies considerably both between sectors and within them. The Remanufacturing Study undertaken for the Circular Economy Evidence Building Programme in Scotland also identified areas likely to have the largest significance to the Scottish economy; specifically the automotive, aerospace, the marine and rail industries, and the catering and food industry (i.e. mainly re-use but also re-manufacturing in the context of wastes from whisky production) [87].

6.2.8 However, several barriers have been identified that affect these ambitions and opportunities within these industries. For example, a lack of clarity over what manufacturing entails, and a lack of guidance on the use of remanufactured products and issues over the effect of current legislation. Other barriers include a need for clarification on the definition of waste; competition from lower cost products; a lack of technically skilled engineers; and poor product or component design for remanufacturing[88]. Further to this insufficient investment in product design and production and in recycling and recovery infrastructure, innovation and technologies have also been identified as important barriers in a number of studies[89].

6.2.9 As noted in Section 4.2, one of the biggest barriers is considered to be a lack of legal definition of remanufacturing, with several studies having identified the potential for this to impact on other factors such as consumer perception of remanufactured products. As well as consolidating a lack of trust in remanufactured products, the lack of clear legal definition of remanufacturing has resulted in disparities between so called remanufactured products in most industries. In the remanufacturing of ink jet and toner cartridges for example, with a lack of legal definition surrounding these products, many producers brand their cartridges as remanufactured when they have simply been refilled. This can lead to the sale and consumption of lower quality

[86] Centre for Remanufacturing and Reuse (2009) Remanufacturing in the UK: A snapshot of the remanufacturing industry in the UK in 2009 [online] Available at: http://www.wrap.org.uk/sites/files/wrap/2009REman1.pdf (accessed 28/05/2015)

[87] The Scottish Government, Scottish Enterprise, SEPA, HIE, Zero Waste Scotland (2015) Circular Economy Evidence Building Programme: Remanufacturing Study Full Report March 2015 [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/Remanufacturing%20Study%20-%20Full%20Report%20-%20March%202015_0.pdf (accessed 02/06/2015)

[88] ibid

[89] European Commission (2014) Scoping study to identify potential circular economy actions, priority sectors, material flows and value chains August 2014 [online] Available at: http://www.ieep.eu/assets/1410/Circular_economy_scoping_study_-_Final_report.pdf (accessed 03/06/2015)

products which in turn can have a strong impact on the activities and perception of companies who do genuinely remanufacture[90].

6.2.10 A lack of awareness of remanufacturing, including a lack of understanding of processes and the quality of remanufacturing, or even its existence amongst many consumers and businesses, have also been identified as significant barriers[91]. Furthermore, a lack of awareness amongst manufacturers and producers on opportunities and the potential for economic and environmental benefits that a circular economy can provide has also been identified as another imposing barrier to progress. The EMF estimates that around 55% of manufacturers are unaware or have not considered the possibilities of remanufacturing in relation to their operations. This is particularly true among small and medium sized companies, who potentially have much to gain, but are far less likely to consider this business model[92].

6.2.11 The food industry is another example of where benefits of a circular economy can be realised[93]. Food supply chains are large in volume terms, and are also significant in economic and environmental terms whilst being central to the management of many biological materials. These chains currently generate significant amounts of waste[94]. Circular economy opportunities for the food sector include food redistribution and anaerobic digestion for energy and biorefining (e.g. improved fermentation to produce chemicals). For example, it is estimated that savings of £50 million from the redistribution of food waste, savings of £27 million in landfill fees, and gains of £27 million from energy generated via anaerobic digestion may be achievable[95].

6.2.12 The Circular Economy Scotland Report prepared by the Green Alliance noted that while redistribution and anaerobic digestion are the most common methods of recovering value from waste heat, biorefining is regarded as another important opportunity. Working across sectors, it suggested that the whiskey industry could continue to capture heat and electricity from the digestion of whisky wastes, but added that by biorefining these prior to

[90] APSRG (2014) Triple Win: the economic, social and environmental case for remanufacturing [online] Available at: http://www.policyconnect.org.uk/apsrg/sites/site_apsrg/files/report/535/fieldreportdownload/triplewin-thesocialeconomicandenvironmentalcaseforremanufacturing.pdf (accessed 03/06/2015)

[91] The Scottish Government, Scottish Enterprise, SEPA, Highlands and Islands Enterprise and Zero Waste Scotland (2015) Circular Economy Evidence Building Programme Remanufacturing Study: Full Report, March 2015 [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/Remanufacturing%20Study%20-%20Full%20Report%20-%20March%202015_0.pdf (accessed 16/07/2015)

[92] McGlone, Conor (2015) Can the UK manufacture its way to a green economy, the ENDS report No 481 March 2015

[93] The Scottish Government, Scottish Enterprise, SEPA, HIE, Zero Waste Scotland (2015) Circular Economy Evidence Building Programme: Remanufacturing Study Full Report March 2015 [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/Remanufacturing%20Study%20-%20Full%20Report%20-%20March%202015_0.pdf (accessed 02/06/2015)

[94] European Commission (2014) Scoping study to identify potential circular economy actions, priority sectors, material flows and value chains August 2014 [online] Available at: http://www.ieep.eu/assets/1410/Circular_economy_scoping_study_-_Final_report.pdf (accessed 03/06/2015)

[95] Green Alliance (2015) Circular Economy Scotland [online] Available at: http://www.green-alliance.org.uk/resources/Circular%20economy%20Scotland.pdf (accessed 23/06/2015)

anaerobic digestion, additional valuable products could be recovered. For example, protein meal for fish farming worth around £1,500 per tonne could be recovered and used to displace fish meal, compared to the £50 per tonne for pot ale syrup.

Existing context

6.2.13 Extended producer responsibility regulations[96] require companies in some markets, such as cars and electronics, to reclaim and deal with post use products[97]. Extended Producer Responsibility is "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle"[98]. In practice, extended producer responsibility implies that producers take over responsibility for collecting or taking back used goods and for sorting and treating for their eventual recycling. Extended producer responsibility is considered as a major instrument in support of the implementation of the European Waste Hierarchy.

6.2.14 Some sectors are already engaging with circular economy principles. The automotive industry is one example where remanufacturing is well established globally, and one where significant growth potential in Scotland has been identified[99]. Further, companies in the machinery manufacture and shipping sectors have also demonstrated the implementation of remanufacturing principles in their operations. These include:

- Renault's Choisy-le-Roi factory has been producing remanufactured automobile parts since 1949. The factory doesn't send any waste to landfill; instead 43% of the automotive carcasses are re-usable, 48% are recycled in the company's foundries to produce new parts and the remaining 9% is valorised in treatment centres meaning the process is waste free[100]

[96] The Producer Responsibility Obligations (Packaging Waste) (Amendment) Regulations 2012; The Waste Electrical and Electronic Equipment Regulations 2013

[97] Peattie.K (2010) Green Consumption: Behaviour and Norms, Annual Review of Environment and Resources Vol 35 [online] Available at:http://www.annualreviews.org/eprint/Ud7eHHJdqMqIuw9y88UU/full/10.1146/annurev-environ-032609-094328?utm_source=&utm_medium=environ&utm_campaign=eprint (accessed 01/05/2015)

[98] European Commission (2014) Development of Guidance on Extended Producer Responsibility (EPR) [online] Available at: http://ec.europa.eu/environment/waste/pdf/target_review/Guidance%20on%20EPR%20-%20Final%20Report.pdf (accessed 01/06/2015)

[99] The Scottish Government, Scottish Enterprise, SEPA, HIE, Zero Waste Scotland (2015) Circular Economy Evidence Building Programme: Remanufacturing Study Full Report March 2015 [online] Available at: http://www.zerowastescotland.org.uk/sites/files/zws/Remanufacturing%20Study%20-%20Full%20Report%20-%20March%202015_0.pdf (accessed 02/06/2015)

[100] Ellen MacArthur Foundation (2013) The circular economy applied to the automotive industry [online] Available at: http://www.ellenmacarthurfoundation.org/news/the-circular-economy-applied-to-the-automotive-industry-1 (accessed 01/06/2015)

- Nissan[101] and Toyota[102] are involved in trials to explore methods for the extraction of high value mechanical and increasingly, mechatronic (mechanical/electronic hybrid) parts. This includes the development of a single platform that could be used in multiple models to further reduce waste from manufacturing process.
- Heavy duty machine manufacturer Caterpillar has also been involved in remanufacturing for around 40 years. In 2013, they reportedly returned around 79,000 tonnes of end-of-life material back into its facilities across the globe[103].
- Shipping company Maersk are taking forward circular economy processes in relation to controlling material used and flexibility in managing the lifecycle of their ship fleet. Steel comprises roughly 98% of the volume of a Triple-E container ship, and Maersk developed a 'Cradle to Cradle Passport' system in parallel with the construction of 20 new ships. The aim of this work is to improve the flexibility and management of ship components and materials, whilst also helping to ensure a reliable supply of low-cost steel. The EMF consider that this is likely to be expanded upon further with the company exploring how to prepare ships for quality recycling from the design stage, and that such a system should also enable more useful disassembly and recycling information to be fed back to engineers at the planning and design phases[104].

6.2.15 In many instances, the environmental benefits of approaches such as these have become clear. For example, remanufacturing one automotive part can use around 80% less energy, 88% less water, 92% fewer chemical products whilst generating 70% less waste during production compared to that of manufacturing a new part[105].

6.2.16 The Waste (Scotland) Regulations 2012 contain a number of key actions relating to the disposal of food waste. For example, food businesses[106] producing over 50 kg of food waste per week must now present that waste for separate collection, amongst others[107].

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[101] Nissan Motor Corporation (2015) Environmental Activities, Activities in the End of Vehicle Life Stage [online] Available at: http://www.nissan-global.com/EN/ENVIRONMENT/CAR/RECYCLE/USED/index.html (accessed 01/06/2015)

[102] Toyota (2015) Sustainability vehicle recycling [online] Available at: http://www.toyota-global.com/sustainability/report/vehicle_recycling/ (accessed 01/06/2015)

[103] McGlone, Conor (2015) Can the UK manufacture its way to a green economy, the ENDS report No 481 March 2015

[104] Ellen MacArthur Foundation (2012) Case Studies Maersk Line [online] Available at: http://www.ellenmacarthurfoundation.org/case_studies/Maersk (accessed 18/06/2015)

[105] Ellen MacArthur Foundation (2013) The circular economy applied to the automotive industry [online] Available at: http://www.ellenmacarthurfoundation.org/news/the-circular-economy-applied-to-the-automotive-industry-1 (accessed 01/06/2015)

[106] Except those in rural areas.

[107] Zero Waste Scotland (2015) Waste (Scotland) Regulations [online] Available at: http://www.zerowastescotland.org.uk/content/waste-scotland-regulations (accessed 23/06/2015)

Key issues:

- Decreasing trends in both generated waste and 'losses' to landfill have been observed in Scotland in recent years. This is a positive trend however we need to put this into wider context, in 2012, 1 in every 5 tonnes of material still ended up as waste.
- Waste materials can be measured in several ways, including by weight, value and by carbon impact.
- While the most significant material flows by weight are minerals (including fossil fuels), construction materials and food, the materials of higher carbon value are food, minerals, ferrous and non-ferrous metals.
- Scotland's material consumption and disposal rates influence our carbon footprint and use and availability of natural resources.
- A range of barriers to greater "access over ownership" business models, reuse and remanufacturing have been identified, and many of these barriers are linked to consumer and business behaviour (e.g. convenience, perception of value and quality compared to simply buying new products).
- Regulations such as Waste (Scotland) regulations 2012 have a direct influence on type and amount of waste material and products going to landfill. In turn this can drive change and innovation within industry and business
- Opportunities and successes have been identified across a range of sectors, including the automotive, aerospace, the marine and rail industries, and the catering and food industry.

6.3 What are the likely effects of the proposals in the Consultation Document?

Question: Will the Consultation Document help in increasing the longevity of products, components and materials within the economy?

6.3.1 As discussed in Section 4.2, a range of barriers have been identified as standing in the way of changing consumer and business behaviours and increasing industry uptake of circular economy principles. Measures that address these barriers, such as those proposed in the Consultation Document, therefore have the potential to have a beneficial impact in overcoming these barriers, and could help to drive change in current market and industry practices.

6.3.2 Measures to improve the standard and confidence in industry such as reuse and remanufacturing through extending the remit of the Revolve programme and working with EU and other partners to support the recognition of

remanufactured products, have the potential to positively influence change. Other measures such as supporting a culture of repair, supporting industry through the provision of advice and guidance, and seeking to develop a more diverse and stronger skill base could also prove to be beneficial. Increasing awareness amongst industry and including circular economy considerations into business models, product and component design are likely to be critical in ensuring that it is economically and technically possible to retain the greatest value from these as possible.

6.3.3 The proposals to explore a centre for expertise on circular design, and support for skills training and use of educational materials, are likely to help embed the importance of designing for a circular economy whilst seeking to promote opportunities and innovation in current and future markets. The automotive and shipping industries are two examples where the benefits of designing for a circular economy can be seen, partially as a result of extended producer responsibility via the End of Life Vehicle Directive.

6.3.4 The introduction of Extended Producer Responsibility Regulations has been recognised as being a powerful instrument in support of the waste hierarchy. The inclusion of proposals to extend the breadth of sectors to which these regulations apply is likely to have a significant positive impact on current practices within these sectors. Furthermore, this illustrates where proposals have the potential to not only reduce the negative environmental impacts of waste, but also seek to drive innovation through a need for regulatory compliance.

6.3.5 Another driver of change may arise through the inclusion of proposals in the Consultation Document relating to procurement processes. Continuing to work with the professional procurement community and promoting circular economy principles are likely to build upon previous and current programmes of capability building (i.e. The Marrakech Approach to Sustainable Public Procurement[108]). Other measures related to procurement include the promotion of greater consideration of the recycled composition of procured goods, how easy these are to repair or remanufacture, and sharing good practice. Overall, this is likely to have beneficial impacts in two ways. Firstly by increasing the amount of goods and materials kept in use prior to disposal, therefore retaining their value in the economy for a longer. Secondly, this may also act as an incentive and help to drive sectors to become more competitive and adapt to meet an increased number of procurements contracts and tenders based on circular economy approaches.

6.3.6 Other proposals set out in the Consultation Document include the achievement of increased material/product recycling via a new Household Recycling Charter and support for local authorities in facilitating these activities, alongside improving standards and the reputation of reused and

[108] UN department of Economic and Social Affairs (2011) The Marrakech Process [online] Available at: http://esa.un.org/marrakechprocess/tfsuspubproc.shtml (accessed 29/06/2015)

remanufactured products. These actions, along with the development of ways to return end of life products to remanufacturers and working with sectors such as the chemical, construction and agriculture sectors, are all likely to have an overall positive impact in improving efficient use of resources and retaining their value and longevity in the economy. As a consequence, there is a likelihood of both economic and environmental benefits at the sectoral level.

Question: Will the Consultation Document help to reduce the 'leakage' or 'loss' of products, components and materials from the economy (e.g. to landfill or energy recovery)?

6.3.7 The transition towards a circular economy requires a shift away from the traditional linear model of 'take, make, dispose'. As discussed in previous sections, there are multiple benefits that are likely to occur from a transition to retaining the value of products, materials and components circulating in the economy. One aspect of this is a likely impact on the volume and type of waste products and materials currently considered to be waste, being disposed of in landfill. The proposals in the Consultation Document seek to facilitate this transition in a number of ways, targeting both current consumer behaviour and industry and business practice. In particular, those such as the inclusion of proposals for developing cost effective and efficient ways to return end of life products to remanufacturers have the potential to increase remanufacturing activity and reduce the 'loss' of these products. The implementation and success of these measures are therefore likely to have a significant impact on the amount of waste going to landfill or disposal via Energy from Waste (EfW) solutions.

6.3.8 In the concept of a circular economy, EfW and landfill is classed as 'leakage' or 'loss' and these measures have the potential to further facilitate a shift away from disposal or 'leakage' of waste, and with the 'buy in' of industry, could help to reduce the volume of biological and technical waste ending up in landfill. While EfW solutions do have a role, particularly in producing heat and electricity, this is limited to being an option when all other options to retain the waste material's value have been exhausted.

6.3.9 In addition, circular economy principles distinguish between separate technical and biological materials, keeping them at their highest value at all times. As such, there are proposals in the Consultation Document targeted specifically towards recovering value from biological resources. The proposals aim to build on current work such as increasing household food waste collections and the work that is being undertaken by the Industrial Biotechnology Centre and recent studies which have identified a strong growth potential in some sectors that support a more circular economy. Examples of this include the identification of opportunities within the beer, whisky and shellfish sectors.

6.3.10 Proposals that support cross-sector working through the development of a biological resources programme could help promote further innovation in this field and lead to identifying cross-sectoral opportunities to maximise the recovery of their value in other sectors. The benefits of this and other targeted actions could be significant given the high carbon value of many biological materials and their contribution to GHG emissions during their breakdown in landfills. As a result, there are direct links with regard the potential impacts of these targeted actions and the potential for benefits in other environmental topic areas such as Climatic Factors.

6.3.11 Whilst overall the potential for changes in the type and amount of waste entering the waste stream are likely to be beneficial, there is also the potential for knock on impacts to infrastructure requirements at local level. For example, a reduction in 'leakages' or disposal to landfill could help to reduce pressure on current landfill networks, and with the widespread support of business and consumer sectors, this could reduce the need for development of future landfills. Conversely, improved and more efficient management of products, components and materials, may also require the development of new or refurbishment of existing waste management facilities; to cater for increased volumes that would previously have been disposed of via landfill or to ensure the recovery of specific waste streams.

6.3.12 As a consequence, there is potential for both positive and negative effects on other environmental topic areas associated with the infrastructure requirements of facilitating these changes. This has the potential to have impacts at a local level on environmental receptors such as cultural heritage, landscape, biodiversity, soil, and air and water quality. However, these are not certain and would depend on the location of new infrastructure and that is beyond the scope of the proposals in the Consultation Document and this SEA. This SEA has assumed that subsequent planning processes provide sufficient opportunity to assess effects, and mitigate where required.

Question: Will the Consultation Document help reduce current trends in the consumption of new products and components, and in the use of raw materials?

6.3.13 The environmental benefits of retaining products, components and materials within the circular economy system are clear. Increasing the adoption of new circular business models plus reuse, refurbishment and remanufacturing processes on top of existing work to improve recycling schemes, are likely to reduce the need for new products and components, and consequently the requirement for raw materials. In addition to producing fewer negative by-products on the output side, these processes themselves require less energy and water resources than from 'starting from scratch'. This is therefore likely to have positive associated effects for other environmental topics such as biodiversity; soil, water and air quality; cultural heritage; landscape. However, the precise nature of any such effects is uncertain.

6.3.14 The assessment identified particular opportunities in sectors such as the offshore oil and gas industry where the future decommissioning of offshore infrastructure has the potential to create significant opportunities for reuse or remanufacturing (e.g. steel structural components, plant and equipment, electrical and computer systems). Similarly, the potential for building upon current successes in increasing the reuse of biological materials from households and sectors such as the food and drink industry have also been noted. For example, increased reuse of these materials in the agricultural and horticultural context could help to reduce demand for non-renewable fertilisers. This would also contribute to meeting wider policy ambitions such as phasing out the use of peat in growing media, the conservation of peatlands and soils, and improved carbon sequestration.

6.4 What are the likely effects in the absence of proposals in the Consultation Document?

6.4.1 The Zero Waste Plan and Safeguarding Scotland's Resources programme have been at the forefront in setting the ambition and direction for resource management in Scotland to date. These were the forerunning documents in driving the ambitious aspirations for a zero waste society, driving new levels of resource efficiency in our economy and recognising the opportunities provided by considering waste as a resource.

6.4.2 Progress to date is clear, and the Environmental Baseline shows that many sectors and businesses have already taken forward circular economy ambitions. Furthermore, there are many examples of the opportunities and potential benefits associated with pursuing the principles of the circular economy model in the business context. In particular, many in industries such as the automotive, shipping and rail sectors, have demonstrated significant progress and opportunities through incorporating these principles into their business models. However, while this work has occurred within the existing policy context and the ambitions of the Zero Waste Plan and Safeguarding Scotland's Resources programme, progress to date has been hampered by a number of identified barriers. Whilst progress in many aspects of circular economy loops is likely to continue, this may be at a progressively slower rate in the absence of the proposals in the Consultation Document.

6.4.3 As noted in Section 5.4, without the implementation of these proposals, sectoral progress in incorporating circular economy principles into business practices would continue to progressively evolve within the current policy structure. For example, the progressive inclusion of reuse, remanufacturing and recycling processes in business models would likely still be taken forward. However, this may occur more in industries reliant on the extraction of natural resources, and where resource security continues to be a key influence in sectors subject to availability and price volatility.

6.4.4 The proposals set out in the Consultation Document seek to build upon this progress by further promoting the economic and environmental opportunities that a circular economy can provide to businesses and manufacturers across a range of sectors. The proposals also target support for sectors managing or consuming 'high value wastes'.

6.4.5 It is also likely that greater adoption of these practices in Scotland is likely to occur with examples of success in the business world. As a consequence, the proposals set out in the Consultation Document are likely to present an opportunity to actively promote opportunities for business and industry alike, and help to foster further innovation and improved resilience to change amid increasingly competitive industries. Without the development of the Consultation Document, the opportunity to steer and accelerate the growth of circular economy ambitions in both small and large businesses and sectors in Scotland would likely be missed. Alongside this, an opportunity to promote associated environmental benefits and help to conserve natural resources both in Scotland and abroad may also be missed.

6.5 Assessment Findings

6.5.1 There is likely to be a number of significant positive effects arising from the implementation of the suite of proposals set out in the Consultation Document.

6.5.2 Primarily, significant benefits are likely to arise from increasing the longevity of products, materials and component circulating in the economy and maintaining them at their highest value at all times. In general terms, the longer products, components and materials are kept circulating in the economy, the greater their embedded value is retained in the economy. Furthermore, proposals seeking to drive the transition within industry and business towards a circular economy through the provision of support and guidance, altering market drivers, eliminating existing barriers, and requiring industry to change current practices in order to become compliant to legislative requirements or adapt in order to become more competitive, are likely to have positive effects in particular.

6.5.3 A range of positive environmental effects are also likely to be associated with the implementation of many of these proposals. Firstly, a reduction in the use and extraction of raw materials should occur with further movement towards a circular economy as demand for new products is displaced. Secondly, evidence and case studies have shown that there are significant savings to be made in terms of resource requirements for remanufacturing processes compared to that of producing new (e.g. water and energy use).

6.5.4 Design considerations are also likely to be an integral part in ensuring that the principles of a circular economy are both technically and economically feasible to apply. The inclusion of proposals in the Consultation Document seeking to embed such thought-processes into business and industry

models are likely to be of notable importance. In particular, there is the potential to not only reduce the requirements for raw materials at the start of the process, but also in facilitating that the parts, materials and components that make up a product are able to be maintained at their highest value throughout its lifespan. This is expected to be particularly pertinent as resources become increasingly finite, and as the predicted effects of a changing climate add another dimension to their abundance or use.

6.5.5 As noted previously, there has been progress to date in changing the amount and type of waste going to landfill and the adoption of common circular economy practices such as recycling and reuse in today's society. However, barriers that stifle the growth of those sectors and activities still remain, and these also inhibit opportunities to achieve further benefits from the application of circular economy principles. Together, the proposals in the Consultation Document seek to build on the success achieved to date, and if implemented, should help overcome existing barriers and help industry to identify opportunities in the future. In combination, the suite of proposals are likely to have overall positive effects.

6.5.6 The potential for significant changes in not only the amount of waste going to landfill, but also the type, through the inclusion of targeted action on some materials (e.g. food waste), has also been identified in this assessment. In turn, the potential for direct reductions in GHG emissions from waste disposal, and the potential for secondary impacts on other environmental topic areas, such as water and soil quality, have also been noted. However, the significance of any associated environmental effects cannot be established at this strategic level.

6.5.7 Whilst overall positive effects have been identified as a result of changes in waste management and disposal, there is also the potential of mixed effects at a local level; particularly through infrastructure changes that may be required to facilitate a transition to a circular economy. For example, there may be a requirement for the development of new or existing facilities for remanufacturing or refurbishment purposes. It is anticipated however that any potential impacts will be identified and mitigated at a local level through existing mechanisms, such as Town and Country Planning and Controlled Activities Regulations (CAR), amongst others. This will be discussed further in Section 0.

6.5.8 The key findings are summarised below:

- Likely significant benefits through increased sustainable use of resources have been identified. This is likely to become particularly pertinent as they become increasingly scarce.
- The proposals will likely help to increase resilience to the impacts of a changing climate through greater consideration and more efficient use of resources.

- A continued reduction in the amount of products, components and materials entering the waste stream is likely, including the amount and type being disposed of in landfill or through other disposal methods.
- Significant positive effects in reducing GHG emissions is likely through the proposals, including the targeted action on the management of biological by products and waste.
- There is the potential for both positive and negative impacts resulting from changes to infrastructure as a consequence of changes in waste management. However, the potential for any environmental effects is likely to be identified and mitigated through existing mechanisms at local and project levels.

7 Summary of Effects

7.1.1 When implemented, the combined proposals are likely to have significant positive environmental effects, particularly in terms of materials assets and climatic factors. There is clearly great potential for positive effects through reducing waste and improving how waste materials and products are utilised in Scotland as a result of implementing the proposals set out in the Consultation Document. The inclusion of proposals aimed at incorporating circular principles into all stages of a product's lifespan are designed to create benefits through more sustainable use of raw materials, some of which are finite. A reduced requirement on other resources, such as for the water and energy used in manufacturing processes are also likely. Further, positive impacts as a result of further reducing the amount and type of waste materials currently going to landfill or being disposed of via other methods were also identified. In addition, the potential for the proposals to aid in adaptation towards the predicted effects of climate change has also been identified though increased efficiency and sustainability in resource use.

7.1.2 The proposals seek to address a number of barriers and opportunities by building on existing progress towards the transition to a circular economy in a number of ways. For example, increasing confidence and reputational value in the remanufacturing and reuse sectors, driving demand through procurement mechanisms and supporting industry to help them to embed circular economy principles in their operations, can help to meet or create demand for second hand or remanufactured products.

7.1.3 Whilst individual actions are likely to maintain and support progress to date, it is in combination that these proposals are likely to have overall significant positive effects. In addition, in working together with other plans and policies such as the NPF3 and SPP, and the proposals and policies set out in RPP2, it is likely that if implemented, the proposals in the Consultation Document will not only play a key role in changing how our waste materials are managed and used, but also in contributing towards meeting wider environmental objectives. For example, they are likely to contribute to meeting Scotland's climate change targets and help adaptation to the predicted effects of climate change.

7.1.4 However, the success and delivery of benefits through the implementation of the proposals will largely depend on the 'buy in' of industry and consumers. Furthermore, while many benefits from individual proposals are likely to be realised in the short term, others such as changes in societal and industry behaviours are only likely to be realised over time.

7.1.5 The SEA also identified the potential for mixed environmental effects at the local level, associated principally with likely changes to waste management infrastructure including the development of new waste management facilities and the expansion of existing facilities. However, it is noted that there are currently existing mechanisms in place to identify and mitigate any potential

environmental impacts associated with these activities. For example, the Town and Country Planning system, CAR and any associated environmental assessment work (e.g. SEA, EIA and HRA) are required to be considered at the subsequent tiers of plan making and project implementation.

8 Recommendations for Mitigation, Enhancement and Monitoring

8.1.1 The development of the proposals in the Consultation Document, and the subsequent adoption of Making Things Last, are early steps in the process for implementing ambitions for a more circular economy. They are also likely to form the basis for future iterations of Scotland's waste, energy environment, climate change and economic policies. The collection of data, including the improved use of tools such as the Carbon Metric and provision of relevant and updated data, are important aspects of the Consultation Document and are likely to play a key role going forward.

8.1.2 The importance of monitoring is likely to be paramount in identifying the performance of the proposals, both individually and as a collective. This will play a key role in identifying 'gaps' and opportunities that could be pursued in future iterations. Together, monitoring of the various waste streams and industry should also provide crucial feedback on the rate of progress in adopting circular economy principles. For example, if the integration of these principles by business and industry continues to be hampered by barriers as identified in the SEA, it may be that further exploration of additional, stronger and more direct measures may be required to deliver the long-term ambitions. As a consequence, the SEA recommended that future iterations of waste planning take into account the success of the implementation of the proposals and any associated environmental impacts.

9 Next Steps

9.1 Consultation Timescales

9.1.1 Public views and comments are invited on both this Environmental Report and the Consultation Document to which it relates.

9.1.2 Comments should be made to the following address:

Zero Waste Delivery
Area 1-D (North)
Victoria Quay
Edinburgh
EH6 6QQ
Phone: 0131 244 0397
Email: EQ_CAT@scotland.gsi.gov.uk

9.2 Questions for Consultees

9.2.1 Consultees may find the following questions helpful to provide a focus for their responses on the Environmental Report.

9.2.2 Please note that responses do not need to be confined to these questions, and more general comments on the Environmental Report and the Consultation Document are also invited.

Table 9.1 Consultation Questions on the Environmental Report

Questions:

1. To what extent does the Environmental Report set out an accurate description of the current baseline and the business as usual scenario? (Please give details of additional relevant sources)
2. Do you agree with the predicted environmental effects as set out in the Environmental Report?
3. Do you agree with the recommendations and proposals for mitigation and enhancement of the environmental effects set out in the Environmental Report?
4. Are you aware of any further information that will help to inform the findings of the assessment? (Please give details of additional relevant sources)
5. Are you aware of other 'reasonable alternatives' to the proposed policies that should be considered as part of the Strategic Environmental Assessment (SEA) process conducted for the Consultation Document ?

9.3 Analysis and Use of Responses

9.3.1 Following the conclusion of the consultation period, the responses received on both the Consultation Document and this Environmental Report will be analysed and reported. Key messages from respondents, including those of the various stakeholder groups, will be highlighted and the findings of the analysis will be taken into account in the preparation of Making Things Last anticipated for publication around the end of the year.

9.3.2 Upon adoption of Making Things Last, a Post-adoption SEA Statement will be prepared. This Statement will reflect on the findings of the SEA assessment and the views expressed in the consultation, and outline how the issues raised have been considered in the finalisation of Making Things Last.

Appendix A:

Compliance checklist

Environmental Report Requirements	Section(s) of This Report
Relevant Sections of the Environmental Assessment Act	
14 (2) The report shall identify, describe and evaluate the likely significant effects on the environment of implementing—	
(a) the proposals in the plan or programme; and	Sections 4 – 7
(b) reasonable alternatives to the plan or programme.	Sections 3.5 and 4 – 7
14 (3) The report shall include such of the information specified in schedule 3 as may reasonably be required.	
Information referred to in schedule 3	
1. An outline of the contents and main objectives of the plan or programme, and of its relationship (if any) with other qualifying plans and programmes.	Sections 2 and 3
2. The relevant aspects of the current state of the environment … … and the likely evolution thereof without implementation of the plan or programme.	Sections 4 – 6
3. The environmental characteristics of areas likely to be significantly affected.	Section 4 – 6
4. Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (as last amended by Council Directive 97/62/EC).	Sections 4 – 6
5. The environmental protection objectives, established at international, Community or Member State level, which are relevant to the marine spatial plan or programme … … and the way those objectives and any environmental considerations have been taken into account during its preparation.	Sections 2 – 7
6. The likely significant effects on the environment, including— (a) on issues such as— (i) biodiversity and natural heritage;	Sections 4 – 7

Environmental Report Requirements	Section(s) of This Report
(ii) population; (iii) human health; (iv) fauna; (v) flora; (vi) soil; (vii) water; (viii) air; (ix) climatic factors; (x) material assets; (xi) cultural heritage and historic environment, including architectural and archaeological heritage; (xii) landscape; (xiii) the inter-relationship between the issues referred to in heads (i) to (xii). (b) short, medium and long-term effects. (c) permanent and temporary effects. (d) positive and negative effects. (e) secondary, cumulative and synergistic effects.	
7. The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the marine spatial plan or programme.	Section 8
8. An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of expertise) encountered in compiling the required information.	Section 3.5 and 7
9. A description of the measures envisaged concerning monitoring in accordance with section 19.	Section 8
10. A non-technical summary of the information provided under paragraphs 1 to 9.	Section 1