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Review of greenhouse gas emissions in SEA and EIA processes: Annex – SEA and EIA case studies

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1.1 Climate Fife – Sustainable Energy and Climate Action Plan (SECAP) (2020 – 2030) Environmental Report[1]

Introduction

The SECAP is a strategy that covers the entire Fife local authority area and will operate for a ten-year period from 2020 to 2030 to set the direction of carbon mitigation and climate adaptation strategy for Fife.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline refers to a wide range of GHG sources within Fife. Baseline information is spread across all relevant SEA topic areas, which supports the comprehensive range of GHG emissions sources identified (see **Table 1**).

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

Across the SEA topics there is a variety of both quantitative and qualitative data provided, which is illustrated in **Table 1** overleaf. The following main issues have been identified in relation to the coverage of GHG emissions sources in the environmental baseline:

- Under climatic factors the quantified environmental baseline includes GHG emissions by source and the Fife Council carbon footprint. Information is also provided on the locations for potential district heating.
- Qualitative information is provided on the existing renewable energy and electric vehicle charging network, when it is anticipated that this data would exist in a quantitative format.
- Across the other SEA topics, a wide range of other potential sources of GHG emissions are identified. In relation to soils and geology, the history of coal mining and areas of carbon rich soils are identified but not referred to in relation to GHG emissions.
- Detailed information is included in relation to air quality, reflecting some of the key sources within Fife, but the connection to GHG emissions is not clearly made.
- Baseline information on population and human health includes commuting patterns (unquantified), population growth (quantified) and the impact of visitors and GHG emissions and waste.
- Material assets includes coverage of waste arisings, waste treatment and transport but does not relate these directly to GHG emissions.
- Under the topic of land use, the existing forestry resource is referenced, but is unquantified, and potential future forest expansion is not included. The role of woodland and forestry in carbon sequestration is not explored in the baseline.
- Due to the content of the Plan, it might be expected that the cross-cutting nature of GHG emissions from different SEA topic areas from the information included could be explored further.

[1] https://climatechange.fife.scot/wp-content/uploads/sites/42/2019/10/Climate-Fife-%E2%80%93-Sustainable-Energy-and-Climate-Action-Plan-2020-2030-SEA-Environmental-Report-draft.pdf

Table 1: Fife SECAP summary of environmental baseline coverage of GHG sources

Fife SECAP				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Climate and energy				
	Fife wide carbon emissions by source (industrial/commercial, domestic, transport)			Provides total figures and percentage contribution by source, reflects on trends
	Fife Council carbon footprint			Provides the total footprint, and trends
	Locations for potential district heating			Identifies that a heat map has been produced showing locations where direct heat distribution is most likely to be beneficial and economical to local communities.
	Reference to renewable energy and electric vehicle charging network (unquantified)			Refers to range and expected general trends in renewable energy development.
Soils and geology				
	History of coal mining noted			Issue of methane emissions from disused coal mines not identified
	Areas of carbon rich soil			No reference to peat explicitly, or area of degraded or restored peat in Fife
Air				
	AQMA			Lists the AQMA and pollutants
	Air quality issues from industrial complexes			Recognises the point source pollution sources

Fife SECAP				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
	Hydrocarbon flaring			Refers to this alongside air quality.
	Identifies Mossmorran complex as the third largest single point source emitter of greenhouse gases within Scotland			Not identified in terms of its contribution to Fife's GHG emissions
	Short term emissions from development [of infrastructure] to change current energy and transportation modes			Identifies air quality emissions associated with changes, but does not identify GHG emissions.
Population and human health				
	Commuting patterns			Commuting patterns are referred to not quantified
	Projected population increase and their impact on carbon and waste			Quantification of population increase provided in material assets, 'waste'.
	Impact of visitors on carbon and waste			Recognises this as an issue
Material assets				
Minerals and waste	Types of waste management infrastructure			Describes the types of waste management infrastructure
	Notes legacy of historic landfill sites (unquantified)			No reference to GHG emissions from historic landfill
	Identifies quantities of waste subject to different treatment			Percentage and tonnage
	Identifies population increase and household growth (quantified) as a driver for waste arisings			Role of household and population growth on total waste arisings

Fife SECAP				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Transportation	Recognises key transport infrastructure, including freight port at Rosyth			Refers to the main transport infrastructure
	Identifies high level of commuting, level of bus service and car dependency in areas outwith main settlements			Refers to in general terms
	Identifies fuel consumption by private vehicle, freight and buses (quantified)			Provides percentage figures
	Notes Fife Airport and level of use			Brief description
Industry and economy	Identifies major industrial establishments			Lists these, but does not comment on their contribution to GHG emissions
	Refers to tourism			Refers to role of tourist economy, but not quantity of visitors
Landscape and land use				
	Existing forestry resource (unquantified)			No reference to future forest expansion.

How do the sources of GHG emissions identified relate to the scope of the PPS?

The scope of the SECAP is focused on GHG emissions and climate change adaptation and therefore the scope of GHG emissions covered in the environmental baseline is broad, and comprehensively covered across the SEA topics. There are some areas of information which are only presented qualitatively when it would be expected that this information would be available quantitatively to reflect the quantitative nature of GHG emissions reductions.

Carbon mitigation and sequestration is one of the key themes of SECAP. Peat is not referred to, nor is it explicitly referenced under 'biodiversity'. The biodiversity baseline lists designated sites but does not identify those of relevance to GHG emissions in terms of peat soils. There is reference to high carbon soils and their broad distribution, but there is no reference to how the quality of areas of high carbon soils or peat influence GHG emissions. The Scottish Soils map (2016)[2] which is not referenced would provide relevant data on this topic. However, it may be that this was not judged to be a significant issue within the context of the Strategy. Disused coal mines can also contribute to methane release. This may have been judged to have not been a

[2] https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/

significant issue as most methane is release immediately following closure[3] and Longannet was the last coal mine to close in Fife in 2002.

Overall, although the baseline provides coverage of a broad range of GHG emission sources, the extent to which the baseline is developed or quantified could have been developed further to provide more detailed information relevant to the assessment of the plan.

Review of consultation authority comments

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. SEPA made comments on the need for the scoring to recognise uncertain effects for some of the neutral effects identified, and the need for the assessment to reflect waste impacts from replacing infrastructure (e.g. lamps).

How is quantitative and qualitative information on GHG emissions reflected in the assessment?

The Fife SECAP provides an interesting case study example, because the focus of the plan itself is explicitly on climate change mitigation and adaptation. The plan sets out:

- A vision for where Fife Council wants to be, and the themes and programmes to show where actions are needed and how this will be supported;
- where Fife is now, with a Baseline Emission Inventory for Greenhouse Gas Emissions, and a Risk and Vulnerability Assessment to show the known and expected risks from unavoidable climate change; and
- action plans showing how Fife will get to where we want to be, working in partnership to deliver a robust response to climate change and identifying the first critical steps and plans to take.

Review of the plan content identifies that the majority of the plan actions are not quantified, for example supporting partnership working to achieve a specific aim or developing a specific strategy such as an adaption strategy or land strategy. The challenge to quantifying GHG emissions through the SEA process is that although the plan is working towards quantified emissions reductions, none of the actions are quantified through the plan. Most actions reflect the early stages of progress towards the vision, which focus on setting out partnership working and information gathering activities.

As set out in the Scottish Government Guidance on SEA (2013), the role of the SEA is to contribute to an evidence base by providing meaningful environmental information. It notes that practitioners have to try to secure relevant data and if not available, state this clearly in the Environmental Report.' Reflecting this, there is a need to acknowledge information gaps, the SECAP Environmental Report notes the following in relation to data gaps:

Data on the broad basket of greenhouse gases is not often available down to a local level. The assumption is that actions to reduce these gases will support mitigation of climate change, even where they cannot confidently be measured.

Energy technology and energy systems are evolving at a fast pace. This impacts potential estimates of energy savings and carbon reduction opportunities. Assumptions are made on the data to support the value of innovations will allow choices to be made to effectively reduce emissions, reduce energy demand, increase energy generation and optimise the movement and storage of energy.

[3] Department of Energy and Climate Change (2011) Update of Estimated Methane Emissions from UK Abandoned Coal Mines. Available at: https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1107080945_1775-ghg-improvement-project-wsp-report.pdf

As outlined previously, only some of the actions could theoretically be quantified. However, in order to quantify the assessment results through the SEA process, a significant level of additional detail would be required, which would need to be subject to a range of caveats around accuracy. The baseline includes a range of qualitative data, however some of which could have been quantified in terms of GHG emissions.

There is no quantification of effects in the assessment matrices. Only qualitative information is provided.

Alternatives

The approach to alternatives is described below and includes two different quantified alternatives. The Environmental Report describes the following three options.

1. Do nothing.
2. The minimum of addressing only the essential requirements of the SECAP, concentrating on Fife council only actions and strategy. Under this option the carbon reduction targets would meet the Carbon reduction targets as EU SECAP - 40% by 2030
3. Preferred option that stakeholders work in partnership across all sectors to develop an action plan that tackles the emissions and energy issues across the whole region. Targets set are above the EU SECAP requirements of carbon reduction targets - 40% by 2030, in line with revision to the Climate Change Act and Scottish Government declaration of a Climate Emergency, committing to net zero emission by 2045.

Alternatives 2 and 3 directly refer to the carbon reduction target of 40%. The third option is identified as exceeding the carbon reduction target but does not identify how much in excess of the target will be achieved. The approach to alternatives therefore is based on a quantified target.

What is the approach to the justification of significant effects?

The assessment was based on the use of assessment questions associated with each SEA topic. A review of the assessment questions identifies that these are based on direction of travel, and do not include specific links to the evidence base. The succinct justification text does not allow more detailed exploration of the assessment questions.

The review has identified the following in relation to the approach to assessment:

- The assessment questions are phrased to allow both quantified and qualitative responses.
- The assessment questions cover issues which are not fully reflected in the environmental baseline (e.g. restoration of peatlands). This may present an initial barrier to these issues being reflected in the assessment.
- The description of the significance criteria for major positive effects is defined as:

> *'a significant improvement, or series of long-term improvements…also likely to have cumulative and indirect beneficial effects'.*

This could be identified as either a quantified or qualified response.

- Although no major negative effects are identified in the assessment findings, the definition for a major negative effect potentially provides some scope for quantification through reference to environmental thresholds or capacities:

'likely to lead to a significant or severe damage or loss, or series of long-term negative effects, leading to large-scale and permanent negative effects

A scheme / measure which may also have significant cumulative and indirect detrimental effect and / or degrade conditions outside the specific scheme area, so will have negative transboundary effects.

An action which is likely to threaten environmental thresholds or capacities in areas already under threat.

The detrimental effects of an action which will be hard to reverse and are unlikely to be easily mitigated through policy or project intervention.

Any damage or detrimental effect in or to environmentally sensitive areas, issues or landscapes which are recognised and / or protected locally, regionally, nationally or internationally.

The following points have been identified in relation to the assessment results presented in Environmental Report:

- The presentation of the assessment findings combines the commentary for an objective or action across all SEA topic areas. There is a lack of clear read across from a significant positive score for one SEA topic to the justification text, because this covers the findings for all topics together
- The review has not identified the quantification of emissions in the assessment text. The assessment text takes a qualitative approach which reflects the scope of the plan content. The plan content is typically strategic and influences a broad direction of travel.
- The actions and aim/objectives included in the SECAP are typically broad in scope and unquantified. Where an aim/objective is potentially quantified e.g. EE01 replacement of all street lighting with energy efficient equipment, the anticipated carbon savings from this are not specified.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

Although the assessment is unquantified in relation to GHG emissions, the SEA monitoring indicators are quantitative. It is recognised that the monitoring framework will typically focus on existing data sources but may also propose new data collection.

The monitoring indicators which are relevant to GHG emissions are listed below, alongside commentary on how this indicator was reflected in the baseline:

- Reported condition of locally, nationally and internationally important wildlife sites – this review has identified that this could provide information on quality of peatland habitats, although this is not identified in the Environmental Report;
- GHG emissions from Council activities (including vehicles)- this is reflected quantitatively in the baseline;
- GHG emissions from Fife end user emissions inventory – baseline includes Fife Council carbon footprint;

- Total Waste Arising and Waste Landfilled – baseline includes quantities of waste subject to different treatment;
- Energy generated from Low Carbon Technologies – this review has identified that low carbon energy generation is only referred to qualitatively in the baseline but is also identified as a quantitative monitoring indicator. A link between the baseline data and the proposed monitoring data would be expected.

Benefits of the approach used

- The Environmental Report covers a range of potential greenhouse gas emission sources.
- The baseline information includes some key quantitative data sources, e.g. Fife wide carbon emissions by source
- The qualitative nature of the assessment is relevant to the qualitative nature of the majority of the plan content.

Apparent limitations of the approach used

- Some aspects of the baseline which it appears it would be possible to have quantified in terms of GHG emissions do not present this information.
- The Environmental Report noted the lack of data on greenhouse gas emissions.
- As outlined previously the SECAP SEA uses assessment questions and not SEA objectives. The assessment questions are focused on general trends and are not linked to specific quantitative information.
- Although separate to the SEA process, for this plan example the Public Bodies Climate Change Duties Annual reports may have had potential to support a more quantified assessment and relevant baseline information.

1.2 Perth and Kinross Council Renewable and Low Carbon Energy Supplementary Guidance (2019) Environmental Report[4]

Introduction

The Renewable and Low Carbon Energy Supplementary Guidance (SG) is provided by Perth and Kinross Council as an extension of the Policy 33 on Renewable and Low Carbon Energy Generation in the current Perth and Kinross Proposed Local Development Plan. The document guides how proposals for development can comply with the Development Plan and specifically with Policy 33. The Development Plan, and Supplementary Guidance cover the entire Perth and Kinross local authority area, and it sets out a vision for a ten-year period from 2017 to 2028.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline that covers GHG emissions includes five different SEA topics of biodiversity, air, soil, material assets/climatic factors and population and human health. **Table 2** presents a summary of GHG emissions sources referred to in the baseline.

[4]https://www.pkc.gov.uk/media/44763/Env-Report-Aug-2019/pdf/Env_Report_Aug_2019_updated.pdf?m=637018065941500000

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

The environmental baseline is strongly focused on quantitative data, as illustrated in **Table 2**. It is based on a State of the Environment Report for the Perth and Kinross Council area. Text-based information is provided within the body of the Environmental Report. A wide range of spatial data has also been complied to inform the assessment and is organised by eco-system services and is presented in Appendix 3 of the Environmental Report. Each map also provides a summary text based commentary. The spatial presentation of data reflects the spatial focus of the Supplementary Guidance and the approach to the assessment.

The following main issues have been identified in relation to the coverage of the environmental baseline:

- Although land cover maps illustrate broad habitat types, no acknowledgement is made of the relative carbon sequestration value of different habitat types.
- For air, information provided gives an estimate of the total CO_2 emissions from 2012. Data is quantified and provides percentage contribution by sector. Additionally, maps show the spatial distribution of CO_2 concentrations.
- The environmental baseline identifies carbon rich soils, deep peat and priority peatland habitat. This is shown in a spatially, alongside quantitative data on the area. Carbon sequestration is acknowledged, however not quantified.
- Information on existing renewable and low carbon energy technologies provides information on the number, location and capacity for different technologies.
- Quantified data is provided for natural gas consumption and electricity consumption.
- There is information provided on ancient and semi-natural woodland in the area. However, carbon sequestration of existing woodland is not discussed.
- It provides information on the current recreation and green infrastructure, Strategic Green Networks, Cycleways, Pathways and Recreation areas. However, the dataset does not include current travel and commuting patterns.
- Quantitative data on household and non-household waste are included, however potential methane emissions from landfills and waste facilities are not identified.

Table 2: Perth and Kinross Renewable and Low Carbon Energy Supplementary Guidance summary of environmental baseline coverage of GHG sources

Perth and Kinross Renewable and Low Carbon Energy Supplementary Guidance					
Ecosystem service	**SEA topic area**	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Provisioning	Biodiversity, fauna and flora				

		Land cover map broad habitat types			Mapping illustrates the location and extent of broad habitat types, and quantifies their contribution in percentage terms. No commentary is provided on the relative carbon sequestration value of different habitat types.
Regulating	Air				
		Total CO_2 emissions estimates 2012			Quantifies percentage contribution from different sectors and mapping shows spatial concentration of CO_2 emissions
		Land use and land use change			Identifies carbon take up by land use, land use change and forestry in Perth and Kinross is larger than at the Scottish level, but does not quantify.
	Soil	Carbon rich, deep peat and priority peatland habitat			Mapping illustrates spatial distribution of carbon rich, deep peat and priority peatland habitats. Identifies area (ha) of nationally important carbon rich soils, deep peat and priority peatland habitat. Carbon sequestration acknowledged, however not quantified in the Perth and Kinross context.
Provisioning	Material assets/Climatic factors				

		Energy – existing (approved) renewable and low carbon technologies and schemes			Provides data on the number, location and installed capacity for different technologies
		Energy – natural gas heat demand			Quantifies natural gas consumption across Perth and Kinross as mean domestic consumption and provides spatial distribution of demand
		Energy – domestic electricity demand			Quantifies mean annual domestic electricity consumption and shows spatial distribution
		Key GHG emissions sources			Land use, land use change and forestry recognized as one of the key emitters in the region, however not quantified in terms of their contribution
		Ancient and semi-natural woodland in the area.			Identifies area and spatial location of ancient and semi-natural woodland. Carbon sequestration capacity of existing woodland not discussed
Cultural	Population, human health and access				
		Recreation and Green Infrastructure Strategic Green Networks, Cycleways, Paths and Recreation areas			Identifies routes and recreational areas, and benefits of strategic green networks. Current travel and commuting patterns not identified

		Carbon dioxide emissions estimates per capita			Identifies the quantities and contributions by sector
		Household, non-household waste amounts, and rates of recycling			Potential methane emissions from landfills and waste facilities unacknowledged

How do the sources of GHG emissions identified relate to the scope of the PPS?

The sources of GHG identified clearly relate to the scope of the Supplementary Guidance document. However, there is a lack of baseline information on the role of some environmental features to sequester carbon. Baseline data on energy and electricity provides a clear picture of the current emissions and shows the potential for cutting emissions if renewable and low carbon energy is located in the right places.

Review of the consultation authority comments

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. Comments which are relevant to the general approach and consideration of GHG emissions include:

- SEPA raised concerns regarding environmental effects of the spatial strategy not being specifically identified and discussed in the main body of the ER and that some significant environmental effects may not have been identified as a result.
- The assessment of the spatial strategy is not presented by individual SEA topics, due to the presentation by ecosystem services.
- SEPA also noted that category 5 soil was not included in the peat maps
- SNH is concerned with the approach of ecosystem services to the spatial assessment due to its complexity, transparency and weightings and disagrees with some of the findings.
- SNH suggests that ER should acknowledge the limitations and confidence levels of the ER in predicting the significance of effects for the different renewable and low carbon technologies.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

The Environmental Assessment of the Renewable and Low Carbon Energy Supplementary Guidance is split into two assessment parts:

- A spatial, map-based assessment of Strategic Environmental Sensitivities that incorporates a range of environmental considerations for the technologies of wind, hydro and solar; and
- A technology-based assessment, based on a matrix methodology that identifies and assesses key environmental effects arising from the potential deployment of all technologies included in the guidance document (wind, solar, hydro, biomass, heat pumps, other renewables).

The overall assessment considered cumulative, secondary, synergistic and temporal effects, as well as the identification of options for mitigation and enhancement.

The assessment findings for wind, hydro and solar technologies are set out by catchment and the Environmental Report utilises a range of graphics to display the range of effects from each technology on the ecosystem services. These illustrate the prevalence and extent of key environmental sensitivities at a catchment and Council wide scale. However, because these sensitivities are presented in relation to ecosystem services, they focus on comparing the relative environmental sensitivities and are not directly related to the SEA topics.

The environmental report outlines the spatial location and distribution of areas with higher/lower environmental sensitivity to the development of wind, hydro and solar, providing a visual overview of the land area with lower sensitivity to each technology.

The assessment matrices use a list of 12 SEA objectives. The SEA objectives are strategic, and are supported by more detailed SEA criteria. The SEA objectives focus on avoiding adverse impacts, and promoting positive outcomes through protecting, conserving, increasing or supporting actions. This approach supports a qualitative assessment reflecting a broad direction of travel. The SEA criteria are qualitative and are supported by indicators, which are quantitative. The SEA objectives and indicators are described as intended for the assessment and future monitoring.

The approach to the assessment sets out a strong link between the quantified environmental baseline and the identified indicators for each SEA objective. However, the actual assessment matrices do not reflect the quantitative approach set out.

The SEA objectives are repeated as relevant against each SEA topic. For example, SEA objective 6 *Increase the potential of Perth and Kinross in contributing to Scotland's renewable energy resources*, appears under population and human health, climatic factors and material assets. The justification for each score is presented by SEA topic for each renewable energy technology. The justification is a short summary and there is no quantification of the contribution of each technology, and 'significant potential' is identified for all of the technologies for SEA objective 6.

Alternatives

The Supplementary Guidance provides a spatial framework for wind, solar, and hydro and policy context for heat pumps, biomass, anaerobic digestion and waste sources. No alternatives were considered as the supplementary guidance is considered the final tier of the policy hierarchy which accords with other strategic plans and policies.

What is the approach to the justification of significant effects?

The description of the significance criteria for major positive effects reflects a qualitative approach, and is defined as:

> *'A measure very likely to lead to an overall large improvement. Effects are widespread across the catchment and/or effects are likely to improve an ecosystem that is in less than good condition'.*

Through the sensitivity mapping, the spatial potential for wind, hydro and solar is clearly presented. This supports the identification of effects that are 'widespread across the catchment'. The definition of 'large improvement' is qualitative.

Although no major negative effects are identified in the assessment findings, the definition for a major negative effect potentially provides some scope for quantification through reference to environmental thresholds or capacities:

'A measure likely to lead to overall severe reduction, effects are widespread across the catchment and/or effects are likely to cause a significant adverse effect on an environmental issue'.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

There is a clear relationship between the identified monitoring indicators, the SEA assessment questions and the environmental baseline. The monitoring indicators relevant to climate change are related to soil, air (greenhouse gas emissions), climatic factors, landscape and land cover.

Benefits of the approach used

- Strongly quantified and spatial environmental baseline, providing quantitative data across a range of relevant data sources.
- Clear linkages between environmental baseline and proposed monitoring indicators.

Apparent limitations of the approach used

- There is a lack of detailed justification in assessment matrices for the scoring provided.
- The spatial assessment based on ecosystem services does not clearly relate to the SEA topic areas, although diagram is provided to show the relationship.
- The quantified environmental baseline and quantified indicators identified for each SEA objective are not reflected in the assessment findings.

1.3 Draft Climate Change and Energy Strategies: joint strategic environmental assessment (2017)[5]

Introduction

Draft Climate Change and Energy Strategies: joint strategic environmental assessment is delivered by the Scottish Government commitment of the Climate Change (Scotland) Act 2009 which requires Scottish Ministers to identify policies and proposals for meeting annual GHG emissions reduction targets. The draft Climate Change plan is the third report on policies and proposals published by the Scottish Government to reduce annual GHG emissions. The Scottish Energy Strategy draws together existing Scottish energy policies and new ambitions within a single overarching Strategy. It sets out a long-term vision for the Energy Strategy in Scotland and lays the foundation for a comprehensive 'whole system' approach. Both documents cover the whole of Scotland and set the direction for a period between 2017-2032 and beyond.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline covers a range of potential GHG emissions sources across all SEA topic areas including climatic factors, population and human health, air, soil, landscape and material assets. **Table 3** summarises the scope of the environmental baseline related to the potential sources of GHG emissions.

[5] https://www.gov.scot/publications/strategic-environmental-assessment-environmental-report-draft-climate-change-plan-draft/

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

The following main issues have been identified in relation to the coverage of the environmental baseline:

- There is a strong focus on quantitative data throughout the environmental baseline with clear links made to GHG emissions.
- There is comprehensive coverage of GHG emissions sources. Considering the climate change focus of the Plan, some information included in the environmental baseline could have included additional information to make it more relevant to climate change.
- Qualitative information includes data on GHG emissions by sector, land use and landscape change and information on land use changes associated with intensive land management.

Table 3: Draft Climate Change and Energy Strategies: Joint Strategic Environmental Assessment

Draft Climate Change and Energy Strategies: Joint Strategic Environmental Assessment				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Climatic factors				
	Total emissions, emissions by sector, and trends			Provides total of Scotland's emissions of the seven GHG as $MtCO_2e$, trends and contributions by sectors - energy supply sector (30%), transport (including international aviation and shipping) (28%), agriculture and related land uses (23%), business and industrial process (19%) and residential (13%)
	Emissions by GHG			Quantifies proportion of emissions as CO_2, and provides unquantified commentary on other GHG sources including methane from livestock, nitrous oxide from soil and methane from landfill
Population and human health				

Draft Climate Change and Energy Strategies: Joint Strategic Environmental Assessment				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
	Population, population change and proportion living in urban areas			Quantifies population in urban areas, small towns and towns but does not relate this to emissions associated with the distribution of population in these locations.
	Fuel poverty			Quantifies trends and levels of fuel poverty – and the connection between fuel poverty and energy efficiency
	Car traffic and active travel			Quantifies proportion car journeys of less than two miles and link to opportunities for active travel
Air				
	Air pollution sources (human activities: transport and industry, and natural sources)			Identifies main air pollutants and sources and quantifies trends Makes the link between air pollution and activities that contribute to climate change
Soil				
	Soil's role in storing carbon			Quantifies Scotland's soil carbon storage
	Peatland as carbon sinks			Identifies proportion of land area as peatland, but does not identify the proportion of good quality (net carbon sequestration) or degraded peatland
	Land use change			Identifies the role of land use change and land management practices as a pressure on soil, but does not relate this to GHG emissions

Draft Climate Change and Energy Strategies: Joint Strategic Environmental Assessment				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Biodiversity, fauna and flora				
	Scotland's protected areas (SAC, SPA, Ramsar)			Quantifies number of sites, but not condition, but does not identify the role of these sites in carbon storage
	Priority habitats and species			Quantifies number and condition of priority habitats and species, but does not identify the complementary role of biodiversity condition and carbon storage
Landscape				
	Landscape change			Identifies landscape change but does not identify the role of this on GHG emissions arising from land use change
Material Assets				
Energy	Electricity generation			
	Scotland's electricity generation and generation by source and consumption			Quantitative information on energy generation sources and trends Trends in energy consumption
	Heat demand			Trends in heat demand quantified by sector
Waste	Waste generated			Quantifies waste generated and waste type
	Amount of landfilled and recycled waste			Trends in landfill volumes, defines types of recycled waste No commentary on GHG emissions associated with different waste disposal routes

Draft Climate Change and Energy Strategies: Joint Strategic Environmental Assessment				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Transport	Total volume of Scotland's traffic			Quantifies volume and type of road traffic
	Total number of new motor vehicles registered			Quantifies new vehicle registrations and type (petrol, diesel and electric or hybrid electric)
	Movement of freight			Quantifies volume of freight and proportion moved by road
	Transport emissions			Quantifies transport emissions by sector but does not comment on levels of emissions associated with different sources except in relation to newly registered cars becoming more efficient.
Forestry	Woodland and forest cover			Quantifies area of woodland cover, new woodland creation, condition of native woodlands and role of Scotland as a net carbon sink
Agriculture	Agriculture holdings area coverage and agriculture total emissions			Quantifies area of agricultural land cover and identifies contribution of agriculture to total UK GHG emissions and the main gases
	Intensive land management			Provides qualitative information on land us changes associated with intensive land management, but not the GHG emissions associated with this change

How do the sources of GHG emissions identified relate to the scope of the PPS?

The identified potential GHG emissions sources provide high level (national) data which is relevant to the scope and level of the Draft Climate Change and Energy Strategies as

indicated in **Table 3**. The environmental baseline is very comprehensive, reflecting the wide scope of the two documents, and covers most of the potential GHG sources.

Review of the consultation authority comments

A review of the consultation authority comments for the joint Environmental Report of the Climate Change and Energy Strategies have been delivered separately. The comments regarding the Climate Change Strategy confirm that the authorities were generally satisfied with the assessment.

SEPA identified that the Climate Change Plan does not provide specific GHG consequences from its policies and proposals, rather identifies a whole sector GHG outcomes. It also suggested that the monitoring framework should be more comprehensive.

The comments regarding the Energy Strategy confirm that the consultation authorities were broadly satisfied with the Environmental Report.

HES noted that the assessment could be more robust to yield better results.

SEPA recommended that the assessment would benefit from the drawing out specific impacts and areas of uncertainty as a strategic level for: Carbon Capture and Storage (CCS), biomass, network management and infrastructure management.

SNH commented that the effects of new infrastructure can be significantly reduced by co-location (of district heating networks with digital and green infrastructures).

SNH noted that the report is based on an assumption that biofuels are produced sustainably, however there isn't any evidence to support this; scoring should be +/- not 0.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

Draft Climate Change and Energy Strategies provide interesting case studies, because their focus of is on climate change and low carbon energy respectively. In the assessment, the majority of policies set out qualitative objectives. The assessment findings include specific justification text for each SEA topic area, and provides qualitative text for the given score, which reflects the broad direction of change.

Approach to assessment

The assessment was undertaken utilising a combined approach:

- Assessing common elements of the draft Plan and draft Strategy;
- Consideration of previous SEA work;
- Three staged approach to assessment.
    - Individual assessment of policies and proposals within a sector
    - Summary of individual sector assessment
    - Key findings including cumulative assessment of all sector summaries
- Application of the TIMES model for identifying the effectiveness of carbon reductions measures in order to provide a consistent comparison of the costs of action across all sectors;
- Assessment questions aided the consideration of potential cumulative and in-combination effects likely to arise from both policies and proposals, and the wider policy context.

Individual assessment of policies and proposals within a sector

The individual assessment of policies and proposals within a sector is presented in an assessment matrix and provides a collated commentary across the SEA topics. Key to the assessment is the nature of the policies and proposals which are high level policy actions. Reflecting this, the assessment is qualitative. Equally, the assessment takes into consideration policies with clearly established objectives and policy milestones and actions to be carried out. Some of these, such as for example "Establish an agri-tech group" is aimed at knowledge exchange which as a result may lead to reduced emissions, however it does not directly set emissions reductions targets. Environmental baseline data is reflected in the assessment questions.

Summary of individual sector assessment

The individual sector assessment summarises the assessment findings for all of the policies and proposals for each sector. This focusses on identifying which different actions contribute to effects on each SEA topic area.

Key findings including cumulative assessment of ALL sector summaries

The key findings are presented in relation to each of the seven assessment questions, the first of which is 'How will the draft Plan and draft Strategy contribute to meeting Scotland's climate change commitments?'. This provides a qualitative summary of the assessment findings.

The findings of the assessment of alternatives for the Climate Change Plan compares some of the quantitative differences in actions such as hectares of trees planted or proportion of ultra-low emissions vehicles on urban roads. This is reflected as having further reductions in GHG emissions to those already identified.

Alternatives

For the Climate Change Plan, the assessment considered the Committee on Climate Change High Ambition Scenario for emissions reduction in Scotland as an alternative to the policies and proposals set out in the draft Plan. The High Ambition Scenario was felt by the Climate Change Committee to be what was required to make progress to meeting existing annual targets, but noted as still falling slightly short of meeting the annual targets required under the 2009 Act for a minimum 3% annual reduction in each annual target from 2020.

For the Draft Strategy the two alternatives considered were:

1. Development on a new, more ambitious target where by 2030, 50% of Scotland's energy needs would be met from renewable sources.
2. No new target – 'business as usual' where the existing renewable energy target of 30% of all energy by 2020 remains.

The alternatives considered are therefore based on quantitative variations, which are reflected in a qualitative assessment.

What is the approach to the justification of significant effects?

The matrices use a simple scoring scale of positive, mixed or negative effects. The judgement of significance is reflected in the sector summaries of the Plan and policy groupings of the Strategy. This reflects the strategic nature of the Plan and Strategy and the dependence on the level of uptake of the policies and proposals, type size and scale of development etc.

The SEA therefore both identifies significant effects, and also acknowledges the uncertainty around the significance of effects.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The monitoring section does not include a specific framework but identifies the proposed development of a monitoring framework through the proposals set out in the draft Plan and draft Strategy. Reference is made to existing environmental indicators for GHG emissions, including annual monitoring and reporting of Scotland's overall GHG emission abatement. The Environmental Report also notes that existing monitoring is likely to be complemented by monitoring for specific policies and proposals at the sectoral level, including:

- Scotland's energy mix and how energy is generated and consumed
- New woodland and forestry planting
- Waste management

These are all reflected in the environmental baseline, however there is a lack of detail included in the monitoring text to identify whether all of the environmental baseline is reflected in monitoring indicators.

Benefits of the approach used

- Strongly quantified and detailed environmental baseline fully reflecting the scope of the PPS.

Apparent limitations of the approach used

- Lack of clarity in significance of effects identified. This partly reflects the strategic content of the Plan and Strategy.
- Lack of clarity in how assessment of quantified alternatives is reflected in an unquantified assessment methodology.
- Lack of clear linkages between environmental baseline and monitoring (also noted by Consultation Authorities).

1.4 East Lothian Local Transport Strategy 2018 Environmental Report[6]

Introduction

The Local Transport Strategy covers East Lothian local authority and sets out priorities for transport maintenance and improvement between 2018 and 2023.The East Lothian Local Transport Strategy 2018 Environmental Report was prepared by PBA on behalf of East Lothian Council as a statutory SEA requirement to consider the evolution of the emerging Local Transport Strategy. The main objective of the environmental report is to identify mitigation and enhancement measures that can be incorporated in the final version of the East Lothian Local Transport Strategy.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline relevant to GHG emissions is very limited. Only the data provided for climatic factors mentions GHG emissions explicitly. **Table 4** provides a summary of the environmental baseline that relates to potential GHG emissions sources.

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

The majority of the provided data is quantitative.

[6] https://www2.gov.scot/seag/seagDocs/SEA-01300/20129.pdf

The following main issues have been identified in relation to the coverage of the environmental baseline:

- The data has provided quantitative information on the access to open space areas and recreation of the population of East Lothian and also an estimate of CO_2 emissions per capita, however, there is lack of information on active travel and commuting patterns.
- In terms of waste production and processing, data identifies levels of household and commercial waste and waste recycling rates. Information is not provided on the potential methane emissions from landfills and waste processing facilities. It is unclear how household waste is relevant to the scope of the SEA.

Table 4: East Lothian Transport Strategy Environmental Baseline

East Lothian Local Transport Strategy 2018 Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Population				
	Population growth			Describes current population and projected increase which will impact on travel demand
Human health				
	Open space area			Describes area ad provision of open space, but does not acknowledge active travel and travel patterns
Soil				
	Agricultural land areas (class 1 - 3)			
	Peat soil			Describes general locations of peat soil and potential impact of development and loss of stored carbon
Air quality				

East Lothian Local Transport Strategy 2018 Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
	Identifies particulate matter and nitrogen dioxide as pollutants of concern, and that road traffic is the main source			Refers to future traffic growth as a source of air pollution, but does not make the link to GHG. Does not refer to past trends.
Climatic factors				
	Per capita CO_2 emissions estimates			Does not refer to past trends or future change Lack of data on travel patterns
Material assets				
	Mineral deposits			
	Household and commercial waste and waste recycling rates			Waste and recycling rates in general do not appear relevant to the scope of a transport strategy. Waste is only relevant in terms of recycled material for travel route construction

How do the sources of GHG emissions identified relate to the scope of the PPS?

The scope of detail in the baseline provided appears to be quite limited. A number of additional information sources could have been included; these are identified as:

- modal choice;
- travel trends and commuting patterns, congestion levels, existing use of public transport, existing electric vehicle charging infrastructure;
- existing transport infrastructure e.g. communities served by train services, length of cycle routes;
- contribution of transport sector to East Lothian GHG emissions.

There is inclusion of data on household waste which does not appear relevant to the scope of the Local Transport Strategy, but there is no reference to waste minerals and aggregates as a construction source for travel routes.

A review of the consultation authority comments identified the following:

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. HES recommended clarifying whether or not the assigned scores in the assessment were before or after the successful delivery of the provided mitigation. SEPA recommended that Local Transport Strategy must recognise that it has a potential to adversely impact the air quality.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

The assessment of individual policy measures covers data which is not reflected in the environmental baseline (e.g. levels of walking and cycling) and therefore the assessment commentary cannot reflect on quantitative data. In line with the qualitative nature of the assessment questions the justification text identifies the direction of travel arising from a policy measure. However due to the lack of relevant baseline information, it is unclear to what extent this is significant in the East Lothian context. The assessment is therefore entirely qualitative in the approach.

Alternatives

No reasonable alternatives are identified for the purposes of this assessment.

Approach to assessment:

The following plan components have been subject to SEA:

- Vision and LTS objectives;
- Draft Policies; and
- Proposed Transport Infrastructure Interventions.

All components of the Local Transport Strategy were assessed in detail using matrices to identify likely significant effects on the SEA objectives.

The assessment uses SEA objectives and guide questions. The guide questions are detailed and cover issues which are not reflected in the environmental baseline, which may present issues for the assessment.

The assessment covers groups of policy measures under a broader policy, and provides individual scores by SEA topic area, and a collated justification of the scores.

What is the approach to the justification of significant effects?

The significance of effects is defined using a qualitative scoring system, and significant positive and negative effects are defined as:

- significant positive effect of a proposed option/policy contributes significantly to the achievement of the SEA objective,
- significant negative effect of a proposed option/policy detracts significantly from the achievement of the SEA objective and requires mitigation

Mitigation and enhancement recommendations from earlier drafts of the Environmental Report are incorporated into the current policies. The Environmental Report has also identified ‘core assumptions’ and ‘core uncertainties’ as relevant to the SEA objectives.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The Environmental Report identifies that the SEA Framework provides a starting point for developing monitoring indicators, and the LTS proposed monitoring framework is included in the Environmental Report. However, the Environmental Report does not take the next step to align the indicators to the SEA topic areas. The need to further develop the monitoring is recognised in the Environmental Report.

The LTS monitoring framework is quantitative and based on key statistics which are referred to in the draft LTS (but not included in the document). For example, this data includes percentage of people that walk regularly, household bicycle ownership and park and ride provision. This data is not reflected in the environmental baseline. There is no clear link between the quantitative data which is referred to but is not included in the published LTS, and the SEA baseline.

What are the benefits of the approach used?

- Detailed justification of scoring in SEA matrices (although poorly related to baseline data)
- Clear assumptions and uncertainties set out for each set of policy components and associated assessment.

What are the apparent limitations of the approach used?

- Lack of quantified environmental baseline
- Baseline data does not include coverage of some key environmental data relevant to the scope of the LTS
- Lack of a clear link between the quantitative monitoring framework and qualitative environmental baseline.

1.5 Cairngorm and Glenmore Strategy SEA Environmental Report[7]

Introduction

The Cairngorm and Glenmore Strategy sets out a long-term strategy that guides future management of Cairngorm and Glenmore for people and nature and provides a common sense of purpose and direction for the multiple organisations involved in managing the area.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline lists climatic factors as the first SEA topic in the baseline section and covers climate change across the National Park as a whole. The baseline is very comprehensive and includes area specific information where available.

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

The environmental baseline identifies GHG emission sources across the SEA topics including climatic factors, air, soil, material assets, biodiversity and population and human health. It is recognised that due to tourism being the key part of the economic vibrancy of the area establishing of a firm baseline has been difficult. Most of the data is quantitative with some more qualitative descriptive text. The environmental baseline is summarised in Table 5 below.

[7] https://cairngorms.co.uk/wp-content/uploads/2015/11/151123PDF00SEAEnvironmentalReportCairngormGlenmoreFinalReport.pdf

Table 5: Cairngorm and Glenmore Strategy summary of environmental baseline coverage of GHG sources

Cairngorm and Glenmore Strategy				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Climatic factors				
	Estimated CO2 emissions for the Cairngorms National Park	■		Quantitative and map based spatial illustration of CO_2 emissions
		■		CO_2 emissions by sector and trends over time, including per capita emissions Detailed caveats are provided on the scope of the data
Air				
	Traffic emissions (from tourism) and its impact on air quality	■	■	Quantitative and map based spatial illustration of PM_{10} and nitrogen oxides.
	Levels of use of private motorised vehicle use	■		Quantifies levels of use in Aberdeenshire and Highland
(material assets)	Household access to cars and vans	■		Refers to household levels
	Traffic emissions along key corridors within the park	■	■	Quantifies anticipated traffic growth on A9
Soil				
	Land capability classification mapping	■		Quantitative and map based spatial illustration of land

Cairngorm and Glenmore Strategy				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				capability for agriculture
	Soil organic matter (its importance in carbon storage)			Provides detailed description of pathways of CO_2 loss from soil
	Carbon richness of soil (mapping)			Quantitative and map based spatial illustration of soil carbon content and pie chart of carbon richness of soil by area
Material Assets				
	Roads			Number and mapped location of roads
	Rail			Annual passenger usage and trends at stations within Cairngorms National Park
	Proportion of households with access to car or van			Quantitative data on the household composition by car or van availability.
Biodiversity, fauna and flora				
	Woodland areas			Quantifies extent of woodland Carbon sequestration potential unacknowledged

Cairngorm and Glenmore Strategy				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
	Peatland areas			Carbon sequestration potential unacknowledged
Population and human health				
	Population			Population estimates and trends, and spatial distribution of trends
	Commuting patterns			Quantified description of mode of travel to work and distance travelled to work

How do the sources of GHG emissions identified relate to the scope of the PPS?

The scope of the environmental baseline is relevant to the scope of the PPS. The text acknowledges where there are limitations on including data specific to the Strategy area.

Review of the consultation authority comments

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. SNH suggested that monitoring framework can be developed further and lists examples for potential mitigation and monitoring.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

The assessment of individual policy measures covers data which is not reflected in the environmental baseline (e.g. levels of walking and cycling) and therefore the assessment commentary cannot reflect on quantitative data. In line with the qualitative nature of the assessment questions the justification text identifies the direction of travel arising from a policy measure. However due to the lack of relevant baseline information, it is unclear to what extent this is significant in the East Lothian context. The assessment is therefore entirely qualitative in the approach.

Approach to assessment

The assessment considers all strategy objectives against each SEA topic separately and includes detail on the nature of the effect, scale, permanence, timeframe and mitigation

and enhancement. SEA objectives and sub-objectives have been set out based on the environmental baseline and PPS. Radar graphs have been provided as a summary of the assessment for each objective and option.

Cumulative effects are presented and described using colour coded graphs, which provides a clear overview of effects by both strategy objectives and SEA topics.

The environmental baseline information relating to potential GHG emissions sources is reflected in the assessment objectives and questions set out (which are based on the environmental baseline). The assessment findings reflect key trends, such as most visitors accessing the area by motor vehicle but does not reflect the level of detail provided in the environmental baseline. Overall the assessment reflects a qualitative approach, and a high proportion of uncertain effects are identified.

Alternatives

The alternative to the Strategy was the 'Business as Usual Scenario'. Therefore, there was no quantification of effects relevant to the alternative.

The SEA was used to assess the four spatial options for the Glenmore Visitor Improvement Plan. The findings are displayed using radar graphs which provide a clear visual indication of the effects of each option.

What is the approach to the justification of significant effects?

The definition of significance is explored in the Environmental Report, and is described as:

- major positive effects would resolve an existing issue or maximise opportunities
- major adverse effects would create significant new problems or substantially exacerbate existing problems.

There is no quantification of significance.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

Although no significant adverse effects have been identified by the assessment a proposed set of indicators has been developed to monitor some of the key environmental impacts of the Cairngorm and Glenmore Strategy (see **Table 6**). The indicators within the Environmental Report are acknowledged as to be further developed through the post adoption statement. However, the extent of monitoring included in the environmental report does not reflect the detail included in the environmental baseline.

Table 6: Assessment questions and monitoring indicators

SEA topic	Assessment questions/objectives	Monitoring indicators
Climatic factors	Reduce greenhouse gas emissions Increase resilience to climate change	Number of vehicles at Inverdruie Number of vehicles at Cas Car Park Number of people at Glenmore Visitor Centre Ticket sales at Cairngorm Mountain Number of people using old logging way
Air	Protect and enhance air quality	

		Number of people using paths at Lochan na Freith Number of people at eight points on Cairngorm Estate

Benefits of the approach used:

- Area specific, comprehensive quantitative baseline.

Apparent limitations of the approach used:

- The level of detail included in the environmental baseline is greater than the level of detail and scope of the Cairngorm and Glenmore Strategy, and the approach to the assessment.
- Monitoring indicators are not closely related to the level of detail provided in the environmental baseline, or the SEA.

1.6 East Renfrewshire LDP2 SEA Environmental Report[8]

Introduction

East Renfrewshire Local Development Plan 2 sets out the spatial framework for East Renfrewshire up to 2029 and once adopted it will guide development and regeneration throughout the Authority area. The plan has five main parts:

- Proposed Local Development Plan 2 Vision and Objectives;
- Managing and Enabling Growth;
- Creating Sustainable Places and Communities;
- Promoting Sustainable and Inclusive Economic Growth;
- Promoting a Low Carbon Place.

Summary of GHG emissions coverage in environmental baseline

The Environmental Report summarises the headline issues from the State of the Environment Report which includes the full baseline. The environmental baseline is summarised in **Table 7** below.

The environmental baseline covers all SEA topic areas in the State of the Environment Report prepared to inform the SEA Environmental Report. Specific GHG emission sources identified in the environmental baseline are included in the SEA topics of air quality and climatic factors, biodiversity, fauna and flora, landscape, soil, transport, and waste.

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

All the data covering the potential GHG emissions sources is quantitative in nature and the majority is also presented spatially.

[8] https://www.eastrenfrewshire.gov.uk/CHttpHandler.ashx?id=25328&p=0

Table 7: East Renfrewshire LDP2 SEA Environmental Report summary of environmental baseline coverage of GHG sources

East Renfrewshire LDP2 SEA Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Air Quality/Climatic factors				
	Air Quality: NO_2 concentrations (annual mean concentrations of NO_2 at a selection of sites); PM_{10} particles concentrations; smoke control areas;			Identifies the concentrations of pollutants in the air (with a key focus on NO_2, PM_{10}, CO_2).
	CO_2 emissions for the regions (by sector)			Provides information on CO_2 emissions from each sector between 2010 and 2016.
	Number of wind turbines in the local authority;			No data on carbon savings calculations
	District heating opportunities			Mapping of potential District Heating Systems
Biodiversity, fauna and flora				
	National forest Inventory			Mapping of the Forest Inventory in the region, data available for 2012, 2014 and 2016 but the carbon sequestration potential is unacknowledged.
	Groundwater Dependent Terrestrial Ecosystems			Mapping of Groundwater Dependent Terrestrial Ecosystems (wetlands), indicates loss of wetland due to windfarms. Carbon sequestration potential was unacknowledged.

East Renfrewshire LDP2 SEA Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Landscape				
	Greenbelt mapping			Mapping of greenbelt area, the information indicates that its size has shrunk since 2011/ Additionally, data provides the number of planning applications put forward within the greenbelt area. Carbon sequestration potential is not acknowledged.
	Urban greenspace			Mapping of urban greenspaces, indicated a range of benefits but carbon sequestration potential is unacknowledged
	Greenfield/brownfield land for development			Mapping of greenfield and brownfield developments
Soil				
	Coalfields, mining and quarries			Mapping of coalfields, mining and quarries to indicate areas risky for developments. Methane emissions from disused coal mines unacknowledged.
	Carbon rich soils			Mapping of carbon rich soils that include carbon rich soils, deep peat and priority peatland habitats. No reference to carbon sequestration value of high carbon soils
Transport				
	Private vehicles ownership rate			Identifies the rate of private vehicles

East Renfrewshire LDP2 SEA Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				ownership and compares to Scottish average
	Commuting to work and study patterns			Identifies % of people commuting to work on daily basis using private vehicles, rail, bus, on foot and other.
Waste				
	Waste per household			Identifies the average waste per household.
	Household recycling rate			Identifies waste recycling rate, but methane emissions from landfills unacknowledged (or potential savings if waste reduced, recycling rates increased).
	Commercial waste			Identifies the overall scale of commercial waste in tonnes per year.

How do the sources of GHG emissions identified relate to the scope of PPS?

The scope of the datasets is appropriate to the scale of the Local Development Plan. It could be argued that on a few occasions the environmental baseline analysis does not acknowledge potential additional emissions of carbon sequestration opportunities that could be explored further.

Review of consultation authority comments:

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment and did issues raised relevant to the consideration of GHG include HES recommended a more detailed approach to reasonable alternatives and clearer presentation of the assessment matrices.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

The assessment findings include specific justification text for each SEA topic area, and provides qualitative text for the given score, which reflects the broad direction of change.

Approach to assessment

The SEA matrices score each policy against all SEA topics and objectives and provide a single collated commentary. This approach means that the justification for positive or negative scores in relation to the SEA topic of air quality/climatic factors are unclear. The SEA findings are also provided by plan section, and not by SEA topic area, which means that there is no overview of all plan impacts on air quality/climate. The section on cumulative, synergistic and secondary effects only acknowledges the complexity of this task but does not offer any commentary to summarise the effects. The text then refers to the mitigation embedded in the Proposed Plan.

There is no reference to any of the quantified baseline information within the assessment. The assessment is based on a qualitative approach and due to the assessment by policy, justification for the scores for each SEA objective are not clearly presented in the assessment matrix comments.

Alternatives

The approach to alternatives is not clearly set out, and it is unclear what alternatives have been considered.

What is the approach to the justification of significant effects?

The scoring of significance is based on the following categories:

- Positive
- Negative
- Mixed positive and negative
- Unknown or unclear

The approach to scoring is only based on the above categories, and therefore it is assumed a score is only provide for a significant effect.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The State of the Environment Report is updated every 2 years in order to assist in the identification of environmental trends. The State of the Environment Report includes key environmental objectives, data sources and summarises the overall status in relation to each environmental objective. The environmental objectives are therefore linked to qualitative monitoring data. The monitoring framework in the State of the Environment Report does not include explicit detail on the approach to monitoring. For example, in relation to the objective to protect and prevent impact on carbon rich soils (e.g. peat) the report does not define the area or condition of carbon rich soils, which would provide a baseline for future monitoring trends.

Benefits of the approach used:

- Broad ranging and comprehensive environmental baseline.

Apparent limitations of the approach used:

- Collated justification text for scores means that effects on GHG emissions are difficult to identify;
- Use of only positive or negative scores without significant positive or significant negative is unclear;
- Lack of summary of effects by SEA topic area means that impacts on climate are difficult to identify.

1.7 Falkirk Local Development Plan 2 Main Issues Report – Environmental Report (2017)[9]

Introduction

Falkirk Local Development Plan 2 Main Issues Report Environmental Report (2017) sets out the likely significant environmental effects of implementing the strategy for development that was set out in the Falkirk Local Development Plan 2 Main Issues Report, and also the likely significant environmental effects of alternative strategies for development as well as actions to prevent, reduce and offset any negative effects.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline covers all SEA topics. GHG emissions sources included in the baseline information are included for biodiversity, fauna and flora, population and health, soil, water, air, climatic factors, material assets, and landscape.

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

The environmental baseline is provided in an Environmental Baseline report provided as an appendix to the Environmental Report. The baseline information is strongly focused on quantitative data, as illustrated in **Table 8**, and provides comprehensive coverage of GHG emissions sources.

- In relation to biodiversity the baseline identifies the area in hectares covered by different habitats and the area of woodland both which could be used to identify the likely carbon sequestration value of the land cover, however this is not explored;
- Identifies quantified data in relation to waste;
- Quantifies legacy mining land but not any GHG emissions associated with this;
- Quantifies carbon rich soils but not the carbon storage of these;
- Quantifies traffic levels and trends, and use of sustainable transport modes;
- Quantifies the renewable energy capacity and the CO_2 emissions reduction;
- Identifies the Falkirk Council carbon footprint.

Table 8: Falkirk LDP2 Main Issues Report – Environmental Report summary of environmental baseline coverage of GHG sources

Falkirk LDP 2 Main Issues Report – Environmental Report (2017)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Biodiversity				
	Grassland habitat extent			Identifies the total area covered by grassland (171.2 km2).

[9] https://www.falkirk.gov.uk/services/planning-building/planning-policy/local-development-plan/plan-two/docs/sea/01%20Environmental%20Report.pdf?v=201906271131

Falkirk LDP 2 Main Issues Report – Environmental Report (2017)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
	Heath and bog habitat extent			Identifies the total area covered by heath and bog, and trends in area.
	Woodland area			Identifies the total area covered by woodland (33.6km2). Identifies the areas of ancient and long-established woodlands.
	Loss/damage to ecological sites			Identifies two designated sites that have been lost to development.
Population and human health				
	Level of recycling activity/waste arising			Identifies the rate for recycling of waste and waste growth rates.
	Active landfill capacity			Identifies the current and forecasted requirements for waste management processing capacity.
	Participation in outdoor activity			Indicates the % number of visits to the outdoors by the local population.
	Loss of open space			Indicates the total area of open

Falkirk LDP 2 Main Issues Report – Environmental Report (2017)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				space lost to other development.
Soil				
	Extent of abandoned mineral workings			Identifies the total area of abandoned mineral workings.
	Extent of land affected by legacy mining issues			Identifies the total number of recorded mine entries and coal mining related hazards that have been reported to the Coal Authority.
	Prime quality agricultural land allocated for development			Identifies the % rate of agricultural land of prime quality in the area.
	Carbon rich or rare soil allocated for development			Identifies the areas and the total scope of carbon rich and rare soils allocated for development that include basin peat, blanket bog, peat alluvium complex, peaty podzols, peaty gleys, podzols and humus iron podzols.
Air				
	Air quality monitoring data			Identifies the reasons for AQMAs being

Falkirk LDP 2 Main Issues Report – Environmental Report (2017)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				declared within the boundaries of the Local Authority.
	The number of AQMAs			Identifies the number and locations of AQMAs.
	Traffic levels			Identifies the total rate of traffic growth between 2005 and 2014 compared to the Scotland's average.
	Number of schools covered by school travel plans			Identifies the number of schools covered by school travel pans.
	Usage of sustainable transport modes			Identifies the total number of rail passengers.
	Modal share by Council residents for commuting and journeys to school and Falkirk Town Centre			Identifies the % of modal share for trips made by car, bus or train, other and working mainly from home.
Climatic factors				
	Renewable energy generation			Identifies the renewable energy generation capacity from wind energy. Identifies the annual CO2 emission reduction from

Falkirk LDP 2 Main Issues Report – Environmental Report (2017)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				wind energy development. Identifies the renewable energy power installations for photovoltaic, wind, hydro, and micro CHP.
	Falkirk Carbon footprint			Identifies the total CO2 emissions from Falkirk Council's operations, and the total emissions from the Falkirk Council area between 2005 and 2014.
Material Assets				
	Rate of traffic growth			Identifies the total traffic growth between 2005 and 2014 in comparison to Scotland's average.
	Car ownership			Identifies the rate of car ownership and trends.
	Type, location and consents of mineral working			Identifies the number of private car ownership and % change between 2001 and 2011.
Landscape				
	New housing brownfield/greenfield split			Identifies the % of new housing built

Falkirk LDP 2 Main Issues Report – Environmental Report (2017)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				on greenfield versus on brownfield land between 2001 and 2013.

How do the sources of GHG emissions identified relate to the scope of the PPS?

As an LDP the development of land has key impacts on the loss of carbon, but there is no recognition of this. The environmental baseline covers modal share for transport but does not include coverage of access to services, which is a key issue for generating local trips, with associated GHG emissions. Apart from these two areas, the scope of the baseline data provided is relevant to the scale of the Local Development Plan.

Review of the consultation authority comments

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. SEPA indicated that there is more up-to-date baseline information available and points to relevant guidance documents. SNH disagrees with one of the mitigation measures suggested and provided a range of comments addressing SEA matrices on some individual scoring.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

Approach to the assessment

The approach to the assessment is based on the SEA objectives and associated assessment questions and supported by a detailed assessment matrix. The assessment findings include specific justification text for each SEA topic area, and provides qualitative text for the given score, which reflects the broad direction of change

Alternatives

Alternatives are considered in relation to each of the main issues. These are quantified in relation to Main Issue 3, Housing Targets and Requirements. This involves the provision of a more generous level of flexibility than the preferred option, and a need to identify a greater land requirement. This would have quantifiable implications for GHG emissions. Other alternatives relate to the location of land for housing and business which would have some quantifiable effects in terms of access to sustainable transport modes or existing services.

What is the approach to the justification of significant effects?

The approach to significant effects is justified relative to each SEA topic area. It is unquantified and is only defined in relation to significant increase/increase or decrease/significant decrease.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The monitoring section notes that there is already an established reporting procedure for monitoring the effects of the Development Plan and a SEA specific monitoring framework is not required. The monitoring indicators for climatic factors include housing developments within 1600m of local facilities. The proposed monitoring provides a comprehensive list of potential impacts which would have been relevant as SEA objectives. The relationship between the SEA objectives and the monitoring indicators is poorly related.

Benefits of the approach used

- Justification of significance is presented relative to each SEA topic area, although this is unquantified.

Apparent limitations of the approach used

Doesn't clearly show how environmental baseline has been used in the assessment.

- Large range of objectives and detailed assessment questions for each SEA topic area, providing a potentially complex approach to scoring and assessment.
- Lack of relationship between SEA objectives and proposed monitoring framework.

1.8 Loch Lomond and the Trossachs Trees and Woodland Strategy 2019 – 2039 SEA Environmental Report[10]

Introduction

The Loch Lomond and the Trossachs Trees and Woodland Strategy details the opportunities and constraints for woodland creation and management of individual trees and tree groups within the National Park. The document drives the delivery of woodland objectives and supports effective consultation between all partners on woodland creation and management proposals, helping the National Park realise its four statutory aims. The Strategy covers the full geographic area of the National Park.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline addresses all SEA topic areas, and in terms of potential GHG emissions sources includes relevant information for SEA topics of population and human health, geology, mineral and soils, air, forestry and woodlands (biodiversity), and landscape. The summary of the environmental baseline is provided in **Table 9** below.

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

The environmental baseline for the Environmental Report provides mainly quantitative information with one SEA topic being covered by qualitative information. Table 10 below summarises the scope and detail of the environmental baseline. The baseline lacks information on climatic factors that would for example include the current carbon footprint for the area. Quantitative information is included for topics such as population and human health, forests and woodlands, air, and landscape.

- Population and human health: include data on key transport mode used and the average private vehicle ownership per household within the boundaries of the park and the % rate of the key transport mode for the visitors of the park.

[10] https://www.lochlomond-trossachs.org/wp-content/uploads/2019/04/Trees-and-Woodland-Strategy-SEA-Environmental-Report-April-2019.pdf

- Forests and woodlands: include the scope of the area covered by woodlands, and the number of trees recorded on the Woodland Trust Ancient Trees Inventory.
- Landscape: includes the quantitative information on the registered agricultural land and presents a % rate of it, and mapping of the relative wilderness of the National Park.
- Air: provides information on the levels of CO_2 and SO_2 in the air. It is indicated that generally, the National Park has good quality of the air and hence not much other information is provided.

Qualitative baseline information is provided for geology, minerals and soils, and air:

- The baseline information on soils provides information on range of soil types by identifying the range of fertile and poor soil types for agriculture and forestry for the areas. It also includes information on carbon-rich soils, deep peat and priority peatland habitat. The information included does not identify the areas of degraded peat, nor existing forestry on peat soils.

Table 9: Loch Lomond and Trossachs Trees and Woodland Strategy 2019 – 2039 SEA Environmental Report summary of environmental baseline coverage of GHG sources

Loch Lomond and the Trossachs Trees and Woodland Strategy 2019 – 2039 SEA Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Population and human health				
	Key transport mode			Identifies the key transport mode and the average private vehicle ownership per household.
	Visitors key transport mode			Identifies % rate of key transport mode for the visitors.
Geology, minerals, and soils				
	Range of soil types			Identifies the rage of fertile and poor soil types for agriculture and forestry for the area.

Loch Lomond and the Trossachs Trees and Woodland Strategy 2019 – 2039 SEA Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
	Areas of carbon-rich soils, deep peat and priority peatland habitat			Identifies that areas of nationally important carbon-rich soils, deep peat and priority peatland. Does not identify the area of degraded peat. Potential carbon sequestration capacity is unacknowledged.
Air				
	Air quality			Identifies the levels of CO_2 and SO_2 in the air.
Climate				
	N/A			No information on the current carbon footprint of the area.
Forests and woodlands				
	Area covered by woodlands (forests and woodlands, native woodlands, ancient Caledonian pine woods)			Identifies the total area covered by forests, woodlands, native woodlands. Identifies the main priority habitat types.
	Number of trees recorded on the Woodland Trust Ancient Tree Inventory			Identifies the number of trees recorded on the Woodland Trust Ancient Tree

Loch Lomond and the Trossachs Trees and Woodland Strategy 2019 – 2039 SEA Environmental Report				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				Inventory for the area.
Landscape				
	Registered agricultural land area			Identifies the % rate of the registered agricultural area that is within the boundaries of the park.
	Wilderness mapping of National Park			Mapping of the relative wilderness of National Park.

How do the sources of GHG emissions identified relate to the scope of PPS?

The environmental baseline includes data on existing forestry and high carbon soils, which are the main areas relevant to GHG emissions from woodland and forestry. It does not include information on timber transport or timber processing, although these are referred to in the assessment findings.

Review of consultation authority comments

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. No further comments were made by any of the consultation authorities.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

The SEA objective for climate covers both mitigation and adaptation. The assessment questions for climate reflect the role of woodland and peatland in carbon sequestration. The assessment questions reflect the direction of travel and not the quantification of the effect.

Approach to the assessment

The assessment of climate change is through of the role of woodland expansion in carbon sequestration and the avoidance of woodland expansion on peatland. Although the extent of woodland expansion is quantified in hectares per year, there is no attempt to quantify the benefits of this in relation to climate. The air quality objective also includes an assessment question relevant to carbon sequestration. Only qualitative information is referred to in the commentary for the assessment in relation to climate.

Alternatives

The approach to alternatives is described below, as the approach described relates to three different options:

- **No strategy** – woodland creation/management proposals continue to be considered on case by case basis using relevant national policies and legislation.
- **High-level strategy** - A high-level, strategic strategy would be created for the National Park focusing on the key issues for woodland creation/management in the area (this strategy has been identified as preferred option).
- **Detailed strategy** - A detailed strategy would be created for the National Park which aimed to provide guidance on all local woodland creation/management issues at an individual landowner scale.

The approach to alternatives is not based on quantitative variations in the scope of the strategy, therefore it is not possible for the assessment to quantify the relevant effects of each alternative

What is the approach to the justification of significant effects?

The assessment considered the following in relation to the SEA assessment questions:

- The probability of effects;
- The frequency duration and reversibility of effects;
- The magnitude and spatial context; and
- the sensitivity of the environment.

The assessment of the environmental effects and their significance is based on the consideration of how the key elements of the Strategy are likely to affect the environmental baseline and whether any anticipated changes to the environmental baseline will help or hinder the SEA objectives being achieved. There is some lack of clarity in how significance is defined.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The monitoring will be via the existing National Park Partnership Plan indicators of success, and the text on monitoring identifies the connection between these indicators and the SEA topics. The monitoring indicators which are identified as relevant to climate include achievement of the target for new woodland expansion and a target for the area of peatland restoration by 2023. This relates well to the SEA assessment questions under 'climate'. However this does not relate to all potential GHG emissions such as visitor transport.

Benefits of the approach used

Focuses on main areas of GHG emissions relevant to forestry.

Apparent limitations of the approach used

Does not fully identify all relevant sources of GHG emissions in environmental baseline;

Does not quantify environmental baseline for key aspects relevant to the Strategy (area of peatland and area of degraded peatland).

1.9 Aberdeen Local Development Plan SEA Interim Environmental Report (2019)[11]

Introduction

Aberdeen Local Development Plan SEA Interim Report addresses the preferred and alternative policy and site options set out in the Main Issues Report for the Local Development Plan and explains how these effects can be addressed through mitigation.

The Main Issues Report forms the main focus for discussions on the options for sites that would be developed in Aberdeen and for the policies that will guide development.

Summary of GHG emissions coverage in environmental baseline

The environmental baseline addresses all SEA topic areas. GHG emission sources are covered in relation to the topics of climatic factors, air, soil, biodiversity and landscape. The summary of the environmental baseline is provided in **Table 10**.

What quantitative or qualitative information on GHG emissions is included in the baseline?

The environmental baseline is provided in the Appendix of the Environmental Report. The environmental baseline information relevant to GHG emissions is covered within the SEA topics of climatic factors, air, soil, biodiversity, fauna and flora, human health and landscape. The majority of the information provided in is quantitative format with an exception for the coverage of peat soils. All of the quantitative information of the GHG emissions sources is supported by mapping.

- For climatic factors, the environmental baseline includes the carbon footprint for Aberdeen city, per capita CO_2 emissions, domestic and commercial CO_2 emissions and emissions by sectors (from transport and land use).
- Air includes quantitative information on the annual mean concentration of NO_2, PM_{10}, $PM_{2.5}$. The assessment questions include AQMAs however the environmental baseline does not provide any information.
- The soil baseline is covered by quantitative information on prime agricultural land, rate of the municipal waste generated, rate of waste generated per capita, municipal waste recycled, household waste landfilled.
- Qualitative information is provided on carbon rich soils. It identifies the four types of peat soils (blanket peat, peaty podsols, peaty gleys, organic soils rich in peat), however it does not acknowledge the carbon sequestration potential of them.
- Landscape baseline includes quantitative information on the total area of different greenspace types.
- Biodiversity baseline includes percentage land cover by habitat types, including woodland, but no reference to the carbon sequestration value of these.

[11] https://www.aberdeencity.gov.uk/sites/default/files/2019-02/MIR%20SEA%20Interim%20Environmental%20Report%20PLA-19-151%20%28Full%20Report%29.pdf

Table 10: Aberdeen LDP SEA Interim Environmental Plan (2019) summary of environmental baseline coverage of GHG sources

Aberdeen Local Development Plan SEA Interim Environmental Report (2019)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Climatic factors				
	Aberdeen carbon footprint			Identifies the total Aberdeen City's annual carbon footprint and the total emissions by year.
	Per capita CO_2 emissions			Identifies the total CO_2emissions per capita between 2012 and 2016.
	Domestic CO_2 emissions			Identifies the total CO_2emissions from households between 2012 and 2016.
	Commercial CO_2 emissions			Identities the total emissions of CO_2 from industry and commercial sectors between 2012 and 2016.
	Summary of emissions from different sectors: transport, LULUCF			Identifies GHG emissions per year per sector including road transport, LULUCF[12].
Air				
	Annual mean concentration of NO_2, PM_{10}, $PM_{2.5}$			Identifies the annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ between 2013 and 2017. Assessment

[12] Land use, land use change, and forestry

Aberdeen Local Development Plan SEA Interim Environmental Report (2019)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				questions include AQMA, however baseline information does not include them
Soil				
	Prime agricultural land (class 1 to 3)			Identifies the total land area of prime agricultural land.
	Municipal waste generated			Identifies the total municipal waste generated between 2013 and 2016.
	Waste generated per capita rate			Identifies the rate of waste generated per capita between 2013 and 2016.
	Municipal waste recycled (tonnes)			Identifies the total municipal waste recycled between 2013 and 2016.
	Rate of municipal waste recycled (%)			Identifies the % rate of the municipal waste recycled between 2013 and 2016.
	Household waste landfilled (tonnes and % rate)			Identifies the total household waste landfilled between 2013 and 2016, but it does not acknowledge the methane emissions from landfills.
	Peat soils			Identifies four types of peat soils: blanket peat, peaty podsols, peaty gleys, organic soils rich in peat, but it

Aberdeen Local Development Plan SEA Interim Environmental Report (2019)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				does not acknowledge the potential capacity for carbon sequestration.
Biodiversity, flora and fauna				
	Land cover: woodland (broadleaf, coniferous); grassland, wetland; moorland;			Provides percentage land cover but no trends
Human health				
	N/A			No data on travel patterns or commuting
Landscape				
	Total area of greenspace types			Identifies the percentage of total areas of different greenspace types.

How do the sources of GHG emissions identified relate to the scope of PPS?

The environmental baseline does not cover modal share for transport neither does include coverage of access to services, which is a key issue for generating local trips, with associated GHG emissions.

As an LDP the development of land has key impacts on the loss of carbon and its impact on biodiversity. Loss of carbon through land use change is indirectly recognised, however the baseline does not provide this information.

Apart from these two areas, the scope of the baseline data provided is relevant to the scale of the Local Development Plan.

Review of the consultation authority comments:

A review of the consultation authority comments for the Environmental Report confirms that they were generally satisfied with the assessment. The only issue noted of relevance to this research was that SEPA indicated that the assessment should include whether the development promotes the efficient use of water (as well as energy). It also suggests that further work should be carried out with the Scottish Water to understand

their infrastructure proposals over the period of the plan to provide drinking water supplied to existing and new development.

How is quantitative or qualitative information on GHG emissions reflected in the assessment?

The assessment findings include specific justification text for each SEA topic area, and provides qualitative text for the given score, which reflects the broad direction of change.

Approach to assessment

The approach to the assessment is based on assessment questions associated with each SEA topic. This includes reference to multiple SEA topics where applicable. For climatic factors relevant assessment questions relate to:

- Overall carbon emissions of a proposal using the SPACE tool
- Development on peatland
- Site aspect and use of solar gain
- Accessibility to facilities.

Although there is reference to the carbon emissions of a proposal using the SPACE tool, only general conclusions are drawn in the commentary text relating to the increased densification of the site.

The Environmental Report also sets out mitigation for each SEA topic. For climate only one aspect of GHG emissions is identified in relation to the operation and management of new buildings increasing resource use and energy consumption, with mitigation identified for all new buildings to install low and zero carbon generating technologies.

The main issues, policies and allocations considered under the Main Issues Report are assessed against the SEA topics. These effects are scored as negative, positive, uncertain, mixed or neutral.

Significance on the receptors is evaluated in relation to reversibility or irreversibility of effects, risks and duration (permanent, temporary, long-term, short-term and medium-term).

The justification of the scores for the main issues does not provide any significant detail, other than to reflect the score given. The assessment of the policies provides more detailed score justification but does not include reference to quantified environmental baseline.

The site assessment makes clear reference to access to facilities and public transport, although this is not referred to in the environmental baseline.

Alternatives

Alternatives were identified in relation to each of the Main Issues. Issue 6 of the MIR relates to low and zero carbon generating technologies and water efficiency. The preferred option relates to carbon reduction targets set out in current supplementary guidance, and the alternatives include increasing levels of expected carbon reduction and maintaining current GHG emissions reduction targets. Although these targets relate to different levels of reduction, this is not reflected in the assessment.

What is the approach to the justification of significant effects?

The approach to significance is based on the assessment questions for each SEA topic.

- Where ‘yes’ is answered to some or all of the questions, but the effect was not considered to be very significant, it is given a single minus in the score.

- Where 'yes' is answered to some or all of the questions, but the effect was considered to be very significant, we gave a double minus in the score.

The justification text outlined above does use the term significant positive effects.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The monitoring framework in the Environment Report is comprehensive and includes monitoring objectives and a range of supporting questions that help establish where such data will come from, whether there may be any gaps in this kind of information and how this could be resolved, in what instance a remedial action should be considered, who is responsible for undertaking such action and how often should the monitoring for each indicator take place.

Some of the indicators are not aligned with environmental objectives. For example, in relation to climatic factors, the baseline information includes total carbon emissions of Aberdeen city, whereas the monitoring framework only aims to track potential carbon footprint from new developments only. Car use and energy consumption in new developments are also identified for monitoring, but this does was not included within the environmental baseline. Similarly, the baseline for soil includes qualitative information on carbon-rich peat soils however the monitoring framework does not aim to observe any changes to such soils.

Benefits of the approach used

- Detailed quantitative baseline with clear presentation of trends.

Apparent limitations of the approach used

Lack of clear link between environmental baseline and the assessment.

- Some lack of relationship between SEA objectives and proposed monitoring framework.

1.10 Making Things Last: consultation on creating a more circular economy in Scotland SEA Environmental Report (2015)[13]

Introduction

Making Things Last: consultation on creating a more circular economy in Scotland complements existing Scottish Government policy for progressing towards a zero-waste and resource-efficient economy and society.

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.

Summary of GHG emissions coverage in environmental baseline

The Environmental Report assesses the likely environmental effects that this policy will have on the environment when implemented. The SEA scoped in only three of the SEA topics of population, climatic factors and material assets. Potential GHG emissions

[13] https://www2.gov.scot/seag/seagDocs/SEA-01070/17617.pdf

sources included in the environmental baseline are identified for both climatic factors and material assets. **Table 11** summarises the scope of the environmental baseline provided in the Environmental Report.

What quantitative and qualitative information on GHG emissions is recorded in the baseline?

Reflecting the circular economy topic, the environmental baseline is well related to GHG emissions sources.

- Quantitative information is focused on the Scottish emissions of GHG and contribution by sector. The baseline specifically refers to a tool that has been developed that evaluates the GHG impact of materials and waste called the carbon metric[14].
- Identifies the contribution of material consumption to Scotland's carbon footprint.
- The baseline for material assets focuses on waste and refers to the carbon value of different waste streams.
- Commentary is included on the role of waste in emitting GHG, but this is not quantified.

Table 11: Making things last: summary of environmental baseline coverage of GHG sources

Making Things Last: consultation on creating a more circular economy in Scotland SEA Environmental Report (2015)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
Climatic factors				
	Scotland's GHG emissions estimates			Identifies the total estimated CO_2 emissions for Scotland.
	Key emitting sectors and their cut			Identifies key sectors that contribute the most to the emissions (energy, transport and agriculture and land uses, business sector, residential and

[14] The Scottish Carbon Metric measures the whole-life carbon impacts of Scotland's waste, from resource extraction and manufacturing emissions, right through to waste management emissions, regardless of where in the world these impacts occur.

Making Things Last: consultation on creating a more circular economy in Scotland SEA Environmental Report (2015)				
SEA topic area	**Summary of baseline potential GHG sources identified**	**Quantitative**	**Qualitative**	**Commentary**
				waste management).
Material Assets				
	Level of consumed materials			Identifies the total amount of materials consumed, and per capita.
	Total generated waste			Identifies the total amount of waste generated in Scotland, but lack of data on recycling rates.

How do the sources of GHG emissions identified relate to the scope of the PPS?

The SEA has scoped the SEA topic areas to population, climatic factors and material assets. This reflects the main areas of impact from the plan.

Review of the consultation authority comments:

A review of the consultation authority comments for the Environmental Report did not identify any key issues for the assessment.

How is quantitative and qualitative information on GHG emissions reflected in the assessment?

The approach to the assessment is focused around each of the three SEA topics which have been scoped in. This presents the environmental protection objectives, environmental baseline, likely effects of each alternative and the assessment findings in a single topic chapter. This provides clear continuity between each element of the assessment, and clarity in relation to effects by SEA topic.

The assessment is based around six assessment questions which seek to identify the general direction of travel, including meeting Scotland's GHG emissions reduction targets.

The assessment methodology notes 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.

The assessment is based on a narrative approach, and does not include quantitative information, although the Strategy itself is based on meeting quantified waste reduction targets.

Alternatives

The approach to alternatives is described below and covers two different alternatives.

- Business as Usual option; and
- The Consultation Document which takes the targets and ambitions in the Zero Waste Plan and in Safeguarding Scotland's Resources and places them in the context of action for a more circular economy.

Therefore, the alternative of implementing the Strategy is based on meeting quantified waste reduction targets.

What is the approach to the justification of significant effects?

In line with the narrative approach to assessment, the Environmental Report does not define significance for the purposes of the assessment.

How closely are the monitoring indicators linked to the SEA objectives and baseline?

The Environmental Report does not include any specific monitoring framework. It includes general text on the collection of data, including the improved use of tools such as the Carbon Metric and provision of relevant and updated data. It refers to monitoring of the various waste streams and industry should to provide feedback on the rate of progress in adopting circular economy principles. Therefore, the monitoring is not clearly related to any quantified baseline information.

Benefits of the approach used

- Clear and coherent, easy to understand presentation of how the assessment has been carried out and how the sources of GHG emissions have been included.
- Quantified environmental baseline.

Apparent limitations of the approach used

- Significance is not defined for the purposes of the assessment.
- The quantified baseline information is not carried through into the assessment or monitoring.
- The quantified waste reduction targets within the scope of the plan are not reflected in the assessment.

2 Annex 2: EIA case studies

2.1 Benbrack Wind Farm Variation

The Benbrack Wind Farm was granted consent under section 36 of the 1989 Electricity Act from Scottish Ministers and deemed planning permission under section 57 of the Town and Country Planning (Scotland) Act 1997 in September 2017.

The consent was granted to construct and operate a wind farm with a generating capacity exceeding 50 megawatts (MW) with up to 18 turbines with a tip height of up to 130m, and associated infrastructure.

A variation of consent was submitted in February 2019, as a section 36c application, which sought to increase the rotor diameter and maximum tip height, seeking to increase the MW outage. The variation was granted consent in November 2019.

Benbrack Wind Farm S36c Variation			
	Quantitative	Qualitative	Commentary
Baseline			
			No definitive information on GHGs is detailed within the baseline.
Construction			
Direct			Set out in more detail below
Indirect			
Embodied			
Operational			
Direct			Set out in more detail below
Indirect			
Embodied			
Decommissioning			
Direct			The only quantified measurement of GHG emissions associated with the decommissioning phase of the scheme is linked to the carbon losses. This is considered in the same way as embodied emissions associated during the manufacture and construction of the turbines.
Indirect			
Embodied			

If a tool has been used, which tool was used?

In recognition of the fact that many Scottish wind farms are constructed in upland peatland and/or forested environments, which store terrestrial carbon, all wind farm applications determined under s.36 of the Electricity Act 1989 are required to be accompanied by a carbon balance calculation, undertaken in accordance with Scottish Government guidance. The tool is intended to determine both the carbon savings and losses associated with the wind farm, including the 'payback' time, which is the length of time (in years) required for the proposed Development to be considered a net avoider of emissions rather than a net emitter.

The carbon calculator assesses the 'savings of carbon emissions achieved by f the scheme, assuming that the wind farm will displace emissions associated with alternative sources of power generation (from coal fired capacity, a 'grid mix' or a 'fossil fuel' mix).

Carbon 'losses' include emissions released during the production, transportation, erection, operation and dismantling of the wind farm, backup power generation, the loss of carbon-fixing potential of peatland, the loss of carbon stored in peatland, carbon saving due to improvement of habitat and loss of carbon-fixing potential as a result of forestry clearance.

The carbon payback time associated with wind farms is calculated by comparing the net loss of carbon from the site due to wind farm development with the carbon savings achieved by the wind farm through the displacement of electricity generated from alternative sources of power generation.

How has impact significance been determined against the baseline and with reference to policy and guidance?

The chapter does not refer to the IEMA GHG in EIA Guidance document, considered to be a key document in assessing GHG emissions within EIA assessment. However, the chapter does refer to international, European, UK and Scottish legislation and policy (e.g. Scottish climate emission targets and UK carbon budgets).

The chapter avoids determining the impact significance and instead summarises the findings of the calculation of the carbon payback period and how carbon payback will be achieved in a short timeframe compared to the overall lifespan of the development.

Consultation responses

There were no specific consultee comments on net GHG emissions/savings. This is perhaps unsurprising given that a commonly accepted calculation methodology was followed.

In summary, what are the benefits of the approach used?

The Benbrack Wind Farm Variation ES uses an accepted approach, in accordance with Scottish Government guidance. It is project specific and provides quantified data on both carbon losses and savings, also presenting the findings as a readily comprehensible 'payback period'. It also accounts for the lifetime of the project and does not focus solely on the operational stage of the development.

In summary, what are the apparent limitations of the approach used?

There are two key limitations associated with the approach:

- The calculator does not capture all emissions which may relate to the scheme. For example, it does not include emissions from construction vehicles (including abnormal load/HGV vehicles and the movement of workers).

- The quality of the output is heavily reliant on the quality of the original environmental data and on any assumptions made to inform the calculation process, albeit application of the tool requires these to be stated transparently.

2.2 Cononish Gold Mine

The Cononish Gold Mine application for the development of an underground gold mine with process plant/ accommodation building and associated infrastructure was submitted to Loch Lomond and the Trossachs National Park Authority in August 2017 and approved in October 2018.

The application was supported by an Environmental Statement, prepared under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (predating the climate change related requirements introduced by the 2017 EIA Regulations).

Cononish Gold Mine			
	Quantitative	Qualitative	Commentary
Baseline			
			No baseline information on GHG emissions was included within the EIA
Construction			
Direct			The emissions associated with the construction are referenced in relation to the short-term disturbance of peat.
Indirect			
Embodied			
Operational			

Direct			This is assessed as GHG emissions associated with the energy linked to the extractive and processing operations as well as any carbon storage lost due to peat disturbance.
Indirect			
Embodied			
Decommissioning			
Direct			Emissions associated with decommissioning are not included.
Indirect			
Embodied			

If a tool has been used, which tool was used?

No tool has been used within the assessment.

How has impact significance been determined against the baseline and with reference to policy and guidance?

Whilst the ES was submitted in 2017, the document was prepared under the 2011 EIA Regulations. These regulations did not consider climate change as a standalone topic.

Based on the qualitative information set out within the assessment, the effect of the development on greenhouse gas emissions was considered to be insignificant with a more detailed carbon assessment scoped out.

No clear link was made back to established policy and guidance, accepting that the assessment may pre-date IEMA's GHG in EIA Guidance document which states that all GHG emissions arising from a project are arguably significant given that GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit.

Consultation responses

No comments were raised by consultees in relation to GHG emissions, accepting that consideration of GHG emissions was an emerging consideration at the time of their responses.

In summary, what are the benefits of the approach used?

The use of qualitative information can clearly and transparently highlight key areas where emissions are expected and enable appropriate mitigation measures to be identified.

For example, the EIAR includes mitigation measures such as the use of energy efficient plant to reduce energy use. Mitigation through design is also included with the EIAR stating that the reduction of the haul distance between the mine and processing plant will reduce transport related emissions.

In summary, what are the apparent limitations of the approach used?

Not all potential sources of GHG emissions associated with the development were captured, even qualitatively. The ES has also adopted a 'professional judgement' approach which could have been easily disputed.

Ultimately, the lack of quantifiable data does not provide sufficient information to assess the consequences of the development for meeting Scotland's GHG emissions reductions targets.

2.3 Forth Replacement Crossing

The Forth Replacement Crossing was required as a result of the deteriorating condition of the existing Forth Road Crossing, constructed in 1964. The scheme comprises a new cable-stayed bridge across the Firth of Forth and associated new and improved roads infrastructure to both the north and south of the bridge.

The Environmental Statement, submitted in November 2009, was submitted under the Environmental Impact Assessment (Scotland) Regulations 1999, as amended.

The Forth Road Crossing Act received Royal Assent in January 2011.

Forth Replacement Crossing			
	Quantitative	Qualitative	Commentary
Baseline			
			CO_2 emissions in tonnes per annum are presented, derived from the Transport Model for Scotland using 2005 as the base year. However, this is the only quantified information on GHG set out within the baseline.
Construction			

Direct			CO_2 emissions have not been considered for the construction phase. The decision to include CO_2 emissions in the Air Quality chapter of the ES does not facilitate this as all construction related effects on air quality are considered to be temporary.
Indirect			
Embodied			
Operational			
Direct			The operational assessment only considers direct emissions associated with vehicle travel as a result of the operation of the scheme. The assessment covers emissions identified at both the regional and local level (see below).
Indirect			
Embodied			
Decommissioning			
Direct			There has been no assessment of the decommissioning phase of the development
Indirect			
Embodied			

If a tool has been used, which tool was used?

GHG emissions have been calculated using a tool associated with road traffic modelling (and presented in the air quality chapter (Chapter 15)). This involved spatial analysis using total vehicle kilometres travelled along each road link and available traffic data. Emission factors were derived using DMRB worksheets.

For each road link, total emissions per year were calculated. The emissions calculated for each link were then combined to generate the total mass of emissions for each assessed scenario.

Other calculations of GHG emissions have used Paramics / PHEM Modelling which calculates the rate of emissions based on a series of factors such as vehicle type, speed, loading and acceleration. In addition to the GHG emissions calculated through total vehicle kilometres (as set out above), the PHEM based result enabled a more informed view of the likely locally generated impact of 'stop-start' motoring conditions on

the congested routes to the Forth Road Bridge and the benefits associated with the implementation of mitigation measures to reduce surrounding traffic congestion associated with the scheme.

At the time of its use, this modelling tool had been developed by Transport Scotland; however, it was not fully approved for use in scheme appraisal.

How has impact significance been determined against the baseline and with reference to policy and guidance?

At the time the ES was prepared, there was no existing formal guidance on determining the significance of GHG emissions within EIA. The significance of the increase in CO_2 emissions was largely determined by testing whether the emissions released by the scheme could be offset by reducing emissions elsewhere.

However, the ES does refer to guidance set out by HM Treasury, which in turn refers to Defra guidance on the ways in which GHG emissions can be evaluated by determining the price of carbon based on its social and economic cost. This is not set out within the ES, however, and forms a separate document ("DMRB Stage 3 Scheme Assessment Report, Part C").

Whilst the assessment concludes that there will be increases in total emissions of CO_2, **the increase is considered to be insignificant in terms of direct impact on global warming. This does not appear to link back to the information set out in the baseline which assessed the GHG emissions at a regional level.**

The ES does acknowledge the Climate Change (Scotland) Act 2009 and the targets set out for the reduction of GHGs (42% by 2020 and 80% by 2050). Instead of determining whether this is significant at a national level, it is suggested that offsetting measures are put in place.

Consultation responses

No comments were raised by consultees in relation to GHG emissions.

In summary, what are the benefits of the approach used?

The approach does involve the quantification of CO_2 emissions generated by road traffic, at the operational stage, where they will most likely have the greatest impact.

In summary, what are the apparent limitations of the approach used?

Not all potential sources of GHG emissions associated with the development were captured. For example, there has been no assessment of the GHG emissions associated with the construction phase or of the embodied carbon contained within the raw materials required to construct the crossing. The later omission is reflected in the fact that GHG emissions are considered within a chapter addressing airborne emissions.

The ES states that the carbon cost of the scheme is detailed in the DMRB Scheme Assessment Report, Part C. If relevant information was used to inform the EIA, it may have provided more detailed quantified information on GHG emissions associated with the scheme.

Compared to more recent transport EIAs, the assessment is of a limited scope. However, when considering the age of the ES, the inclusion of GHG emissions should arguably be welcomed and has provided a starting point for more detailed assessments within recent EIAs for schemes of a similar nature.

2.4 Dell Wind Farm

Dell Wind Farm is located approximately 11km east of Fort Augustus in Inverness-shire. The scheme comprises 14 wind turbines and associated infrastructure, with approximately 42MW installed capacity.

An application was submitted to the Highland Council under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 in 2014. The scheme was refused consent in 2017 with permission subsequently granted on appeal in 2019.

Dell Wind Farm			
	Quantitative	Qualitative	Commentary
Baseline			
			The only quantified data for the baseline is in relation to estimated soil organic carbon stocks stored in peat located across the site under existing conditions.
Construction			
Direct			The Carbon Calculator has estimated GHG losses associated with the construction phase of the development.
Indirect			
Embodied			
Operational			
Direct			The Carbon Calculator has estimated GHG losses and savings associated with the operational phase of the development.
Indirect			
Embodied			
Decommissioning			
Direct			The Carbon Calculator has estimated GHG losses associated with the decommissioning phase of the development. The Carbon Calculator has also estimated the carbon gains arising from site restoration.
Indirect			
Embodied			

If a tool has been used, which tool was used?

Whilst not a formal requirement for wind farms (under 50MW) determined under town and country planning legislation, it is still considered good practice to apply the Scottish's Government Carbon Calculator. This approach has been adopted for the Dell Wind Farm GHG assessment which takes into account the following:

- carbon losses (activities resulting in emissions of carbon)
- carbon gains (activities relating to the uptake of carbon), and;
- savings from the avoidance of GHG emissions

The carbon losses are set out within a table in the ES, with GHG losses presented in tCO_2e (tonnes of carbon dioxide equivalent) for three different scenarios:

- expected;
- minimum, and;
- maximum.

Carbon gains, linked to the restoration of the site, are also presented, as well as carbon savings due to the displacement of grid electricity, which are presented in tCO_2.

In addition to the emissions covered by the Carbon Calculator, a spreadsheet which captures emissions not covered within the Carbon Calculator (additional construction materials, transport of materials, labour and plant to and from site, onsite plant use during construction and decommissioning) was also used. This spreadsheet is based on the principles of the GHG Protocol and uses UK Government conversion factors.

How has impact significance been determined against the baseline and with reference to policy and guidance?

Impact significance has been determined based on the payback period calculated for the development. However, the EIA Report states that "*there are no current guidelines about what payback periods constitute a significant impact*".

In the conclusions section of the chapter, the scheme is considered to have an overall positive effect, although no conclusive judgement on significance is reached. Instead, the estimated payback period is used to frame the scheme positively, stating that as the payback period is considered to be significantly shorter than the lifespan of the wind farm, an overall positive effect is expected on climate change mitigation.

Consultation responses

There are no direct references to the assessment of GHG emissions. However. Both SNH and SEPA, who are statutory consultees, outline measures to minimise the disturbance of peatland and carbon rich soils located on site.

In summary, what are the benefits of the approach used?

The ES has quantified emissions at every stage of the project and has included direct, indirect and embodied emissions, providing a comprehensive overview of estimated GHG emissions associated with the scheme.

In summary, what are the apparent limitations of the approach used?

Limitations largely relate to the fact that the quality of the output is heavily reliant on the quality of the original environmental data and on any assumptions made to inform the calculation process. However, it is notable that a number of scenarios for carbon losses are modelled and the ES notes the potential for both over and under estimations when using the Carbon Calculator.

2.5 Port of Cromarty Firth Phase 4 Development Invergordon Service Base

This EIA-R was undertaken to accompany the construction and dredging Marine Licence applications for Phase 4 of the development of the Port of Cromarty Firth Invergordon Service Base.

The proposed Phase 4 Development lies immediately adjacent to the previous development (Phase 3) and includes the following components:

- Land reclamation providing an additional 4.5ha of laydown space;
- 215m of berthing to create Berth 6, adjacent to Berth 5 providing a 369m long combined quay face; and
- Fendering (buffering) of Berths 5 and 6.

Marine licences for the construction of Phase 4 and associated capital dredging and disposal were being sought under the Marine (Scotland) Act 2010. An EIAR was required for the development under the Marine Works (Environmental Impact Assessment (EIA)(Scotland) Regulations 2017. The development was consented in May 2019.

As the project was scoped prior to the 16th of May 2017, the Phase 4 Development falls under the transitional arrangements documented in Section 40 of the 2017 Regulations. This means that consideration of climate change was not a formal requirement.

Port of Cromarty Firth Phase 4 Development Invergordon Service Base			
	Quantitative	Qualitative	Commentary
Baseline			
			The only quantified information on GHG emissions detailed in the baseline includes statistics on total Scottish GHG emissions for 2015 and 2015 CO_2e per capita emissions in Scotland.
Construction			
Direct			Detailed information is included within a table in the Air Quality Chapter which assesses GHG emissions associated with the construction phase of the development. This includes embodied carbon within the construction materials, direct emissions of the transport of aforementioned materials and GHG emissions associated with the fuels used to power construction plant.
Indirect			
Embodied			
Operational			
Direct			The details on GHG emissions associated with the operational
Indirect			

Embodied			phase of the development have been qualitatively assessed. The EIAR states that operational emissions are outwith the control of the project itself. However, the qualitative assessment provides analysis on how the development will address emissions arising from external activities associated with the operational phase (e.g. offshore renewables and cruise ships).
Decommissioning			
Direct			Decommissioning has not been assessed as part of the EIA so no details on GHG emissions have been detailed in relation to the decommissioning phase of the development
Indirect			
Embodied			

If a tool has been used, which tool was used?

Within the assessment, greenhouse gas emissions have been calculated using published CO_2e conversion factors based on the estimated raw material quantities set out in Chapter 18. These conversion factors have been sourced from a variety of publications including the UK Government, academic papers and presentations.

How has impact significance been determined against the baseline and with reference to policy and guidance?

To determine significance, the GHG emissions calculated were compared to the total Scottish GHG emissions for 2015 and 2015 CO_2e per capita emissions to assess the overall impact of the scheme. It was concluded that as the scheme's calculated GHG emissions equated to 0.03% of the annual CO_2e, these were determined to be low sensitivity and non-significant.

Whilst the assessment methodology section states that the methodology aligns with the IEMA guidance, no specific reference is made as to how this judgement aligns with the suggested approaches in the guidance for determining significance.

The qualitative assessment in relation to the operational phase of the scheme has determined effects to be beneficial, given the measures proposed to address emissions. However, no conclusion on significance is presented.

This does not link back to policy and guidance.

Consultation responses

There has been no reference made to the assessment of GHG emissions within the consultee responses.

In summary, what are the benefits of the approach used?

This approach provides a quantified estimate of the direct, indirect and embodied carbon anticipated at the construction stage of the development. While the assumptions made within the assessment could be interpreted as a limitation of the development, several plausible scenarios have been estimated in relation to the amount of travel miles and emissions associated with transport of materials from different areas around the UK. This could be interpreted as a sort of precautionary approach to estimating emissions.

In summary, what are the apparent limitations of the approach used?

A limitation associated with quantifying the GHG emissions at the construction phase is the assumptions made on the volume of raw materials set out in Chapter 18. It is stated that the exact quantities of raw materials and their sources will only be confirmed once a construction contractor has been appointed.

There may also be inconsistencies in the conversion factors used.

Whilst the construction GHG emissions have been detailed, the operational emissions have been presented qualitatively, at a high level, with no significance assigned to them.

2.6 Cambusmore Estate

A proposal for woodland creation and management was put forward by K R Greenland Farming in 2019 to seek consent for the planting of 1,258 hectares (ha) of native broadleaf, mixed conifer and shrubs of varying densities alongside ongoing management of land at Strath Carnaig, Cambusmore Estate in Sutherland, Scottish Highlands.

An application for consent under the Forestry (Environmental Impact Assessment) (Scotland) Regulations 2017 was submitted to Highland and Islands Conservancy with consent granted in March 2020.

<table>
<tr><td colspan="4">Cambusmore Estate</td></tr>
<tr><td></td><td>Quantitative</td><td>Qualitative</td><td>Commentary</td></tr>
<tr><td colspan="4">Baseline</td></tr>
<tr><td></td><td></td><td></td><td>No quantified or qualitative information on GHG emissions is included within the baseline assessment.</td></tr>
<tr><td colspan="4">Construction</td></tr>
<tr><td>Direct</td><td></td><td></td><td rowspan="3">No quantified or qualitative information on GHG emissions is included in relation to the construction phase</td></tr>
<tr><td>Indirect</td><td></td><td></td></tr>
<tr><td>Embodied</td><td></td><td></td></tr>
<tr><td colspan="4">Operational</td></tr>
</table>

Direct			The only quantified information within the EIA Report is in relation to the estimation of CO_2 sequestration as a result of the scheme.
Indirect			
Embodied			
Decommissioning			
Direct			No quantified or qualitative information on GHG emissions is included in relation to the decommissioning phase.
Indirect			
Embodied			

If a tool has been used, which tool was used?

No tool has been used for quantifying GHG emissions within the EIA-R.

References are made to the Scottish Government's Woodland Strategy 2019 – 2029 which is where the estimation of CO_2 sequestration per year figure has been estimated.

How has impact significance been determined against the baseline and with reference to policy and guidance?

No impact significance has been included within the EIA-R.

Consultation responses

No reference was made to the assessment of GHG emissions within the consultee responses.

In summary, what are the benefits of the approach used?

The EIA-R does provide a rough estimation of the expected carbon sequestration associated with the scheme.

In summary, what are the apparent limitations of the approach used?

Information on the impact of the project on GHG emissions is very limited. For example, there is no consideration of the generation of emissions during the planting and felling phases.

No justification has been provided for the exclusion of a quantitative or qualitative GHG assessment.

2.7 A90/A96 Haudagain Improvement Project

The Haudagain Roundabout is located in the north-west of Aberdeen. The roundabout serves both the A90 and A96 trunk roads which enable access into and around Aberdeen from the north and north-west. The junction has significant queues, especially during peak periods, with delays on all approach arms.

The A90/A96 Haudagain Improvement project comprises approximately 500m of new dual carriageway link road, three new signal-controlled junctions to connect existing roads to the new link road, a detention basin to store and treat surface water run-off, new footpaths and shared footway/cycleways.

Draft Road Orders and an accompanying EIAR was submitted to Scottish Ministers in June 2015. The EIAR was prepared as a requirement of the Roads (Scotland) Act 1984 and the Environmental Impact Assessment (Scotland) Regulations 2011. The decision to proceed with the project was made in February 2017.

A90/ A96 Haudagain Improvement Project			
	Quantitative	Qualitative	Commentary
Baseline			
			No baseline information on GHGs is presented within the EIA-R.
Construction			
Direct			The Materials Chapter of the EIA-R details the estimated carbon footprint of the scheme's materials, the transport of materials, waste and energy usage arising from construction plant.
Indirect			
Embodied			
Operational			
Direct			An annual regional assessment of CO_2 emissions linked to road traffic has been set out in the Air Quality Chapter. This also includes GHG emissions associated with maintenance, operational energy usage and the carbon footprint of any required replacement materials which is set out in the Materials chapter.
Indirect			
Embodied			
Decommissioning			

Direct			
Indirect			
Embodied			The GHG emissions relate to the generation and disposal of waste arising from demolition activities.

If a tool has been used, which tool was used?

The assessment of CO_2 emissions in the Air Quality Chapter was undertaken using the road traffic Emissions Factor Toolkit (EFT). The EFT is published by Defra and the Devolved Administrations to assist local authorities in meeting their legal review and assessment responsibilities in relation to local air quality. In addition to allowing users to calculate road vehicle pollutant emission rates for oxides of nitrogen (NOx) and particulate matter (PM - PM10 and PM2.5), for a specified year, road type, vehicle speed and vehicle fleet composition, CO_2 emission rates can also be calculated for petrol, diesel and alternative fuelled vehicles.

The Materials Chapter used Transport Scotland's Carbon Management System 2014 (CMS), developed to measure carbon emissions associated with construction and maintenance activities of road and rail schemes.

How has impact significance been determined against the baseline and with reference to policy and guidance?

No impact significance for CO_2 has been identified within the Air Quality Chapter due to the lack of relevant significance criteria. However, the chapter does note that CO_2 emissions are likely to increase for the Aberdeen City Council area by 0.1% during the opening year but to reduce by 0.3% by 2033 due to the scheme reducing congestion and encouraging the re-routing of traffic.

The Materials Chapter concludes that the carbon footprint of the development is negligible due to mitigation measures such as the production of a Construction Environmental Management Plan and the use of a 'just in time' delivery system to minimise the double handling of materials. Mitigation measures set out for the operational phase included the use of the local sourcing of materials and inclusion of recycled contents.

Consultation responses

No reference was made to the assessment of GHG emissions within the consultee responses.

In summary, what are the benefits of the approach used?

GHG emissions have been quantified for the construction, operational and decommissioning phases, using recognised assessment tools.

In summary, what are the apparent limitations of the approach used?

As always, there is a degree of uncertainty regarding outputs when using modelling tools.

There is no discussion of baseline GHG emissions, which links with the absence of any defined criteria for evaluating the significance of the predicted change in GHG emissions as a consequence of the project.

2.8 Leven Road Gasworks (mixed use)

Due to the limited examples of EIAs for mixed-use developments located within Scotland, the Leven Road Gasworks development has been included. The application, supported by an Environmental Statement prepared under the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, was submitted to the London Borough of Tower Hamlets in 2018. The scheme was subsequently approved in October 2019.

The scheme forms a comprehensive mixed-use development, with a maximum of floor space of 195,000 sq m floor space for the following uses:

- residential (Class C3);
- business uses including office and flexible workspace (Class B1);
- retail, financial and professional services, food and drink uses (Class A1, A2, A3 & A4);
- community, education and cultural uses (Class D1);
- a secondary school (Class D1) (not included within the above sqm figure);
- assembly and leisure use (Class D2);
- public open space including riverside park and riverside walk;
- storage, car and cycle parking; and
- formation of new pedestrian and vehicular access and means of access.

Leven Road Gasworks			
	Quantitative	Qualitative	Commentary
Baseline			
			No baseline GHG emission are assumed as the site is currently undeveloped.
Construction			

Direct			The quantified construction emissions cover embodied carbon within materials and waste as well as direct emissions from construction traffic. Indirect emissions arising from onsite fuel use and worker transport are also included.
Indirect			
Embodied			
Operational			
Direct			
Indirect			The only quantified emissions presented for the operational phase are the energy and fuel usage associated with the development.
Embodied			
Decommissioning			
Direct			The GHG emissions associated with the decommissioning phase have not been assessed on the grounds that as the design life of the scheme is 100 years, emissions cannot be realistically estimated.
Indirect			
Embodied			

If a tool has been used, which tool was used?

For all relevant processes and activities, GHG emissions have been calculated from activity data multiplied by the relevant emissions factor. For construction traffic, emissions were calculated using Defra's Emissions Factors Toolkit. Other emissions factors have been taken from Defra 2017 Emissions Factors, with the exception of construction fuel usage, which was taken from the UK Industry Performance Report 2017.

How has impact significance been determined against the baseline and with reference to policy and guidance?

GHG emissions associated with the development during its proposed design life have been compared against relevant UK carbon budgets. In the absence of defined guidance on categories for describing the magnitude of impacts, categories have not been used to describe impacts.

Ultimately, the impact significance of GHG emissions associated with the scheme has been determined in line with the IEMA GHG in EIA guidance, aligning with the suggested approach that all GHG emissions are considered significant and adverse.

Consultation responses

As part of the scoping exercise, the London Borough of Tower Hamlets requested that a GHG assessment was included within the EIA. This was taken on board and included within the ES.

In summary, what are the benefits of the approach used?

GHG emissions have been quantified for direct, indirect and embodied carbon emissions at the construction phase while indirect emissions have been considered at the operational phase. Due to the nature of the development, the quantification of the emissions at the operational phase could have been easily excluded.

The ES has taken on board comments from consultees in relation to the inclusion of a GHG assessment.

In summary, what are the apparent limitations of the approach used?

The Energy Statement and Sustainability Assessment which also accompany the application contain further information on quantified GHG emissions associated with the scheme. Whilst arguably unnecessary duplication, this information could have been drawn upon to strengthen the assessment of GHG emissions within the ES.

The Emissions Calculations are split across appendices within the ES. These appendices include slightly more detailed information on the emissions (e.g. the specific emissions factors used and the estimated quantity of materials/ predicted energy usage)

The supporting text for the emissions calculations within the main text is basic and provides a high-level summary of the anticipated emissions. While assumptions are detailed, other case studies assessed as part of this research have included more detailed information.

2.9 A9 Berriedale Braes Improvement Works

The A9 at Berriedale Braes located in Caithness, north of Helmsdale and south of Dunbeath was identified by Transport Scotland as requiring improvement. The objective of the works was to ensure that all vehicles were able to travel on the A9 through the study area without having to stop or give way to vehicles travelling in the opposite direction. This involved the replacement of the hairpin bend on the road and the improvement of the alignment.

In April 2014, it was determined that an EIA under the Environmental Impact Assessment (Scotland) Regulations 2011 was not required.

As a statutory EIA was not required by legislation, a non –statutory Environmental Report was prepared to accompany the Stage 3 Scheme Assessment Report. This did include consideration of greenhouse gas emissions.

Consent for the scheme was granted in December 2016 and the improvement works are currently ongoing.

A9 Berriedale Braes Improvement Works			
	Quantitative	Qualitative	Commentary

Baseline			No information on GHG emissions has been presented in any relevant baseline assessments.
Construction			
Direct			The GHG emissions set out in the construction assessment cover the embodied carbon within the construction materials, the emissions associated with the transport of construction material and waste arisings.
Indirect			
Embodied			
Operational			
Direct			There has been no inclusion or assessment of GHG emissions at the operational stage of the development.
Indirect			
Embodied			
Decommissioning			
Direct			There has been no inclusion or assessment of GHG emissions at the decommissioning stage of the development.
Indirect			
Embodied			

If a tool has been used, which tool was used?

Transport Scotland used their purpose-built Carbon Management System (CMS) Project Tool which can be used to estimate greenhouse gas (GHG) emissions associated with major road projects.

This tool was used to quantify emissions associated materials and waste associated with the scheme, which was considered appropriate given the level of information available for the project at the time.

Emissions were determined using potential sourcing distances, which range from 900km from the scheme to on-site, and were dependent upon the type of material required.

How has impact significance been determined against the baseline and with reference to policy and guidance?

The magnitude of impact for materials associated with the scheme was ranked according to scale, in line with the scale set out in DMRB Draft Guidance HD 212/11.

The scale, set out in the table below, assigns a scale of magnitude according to the total CO_2e of materials in tonnes.

Scale of impact magnitude	Total CO_2e of materials (tonnes)
No change	<1,000
Negligible	1,000 – 5,000
Minor	5,000 – 20,000
Moderate	20,000 – 40,000
Major	>40,000

The embodied carbon emissions and transport associated emissions were combined for each material (e.g. the total carbon emissions associated with fencing). The overall associated carbon required to construct the scheme is estimated to be 1,573.95 (tCO_2e). In line with the impact significance criteria set out, the impact is judged to be either negligible or even no change.

Consultation responses

The summary of consultation responses was set out within the Environment Report. No comments were raised by consultees in relation to GHG emissions.

In summary, what are the benefits of the approach used?

Whilst it was determined that an EIA was not required as part of the scheme, the Environmental Report presents a comprehensive overview of the embodied and direct GHG emissions associated with the construction of the scheme. Impact significance criteria have also been adopted.

The use of the CMS tool uses data gathered from operational, construction and maintenance activities from Transport Scotland ensuring there is consistency in regard to the measurement of carbon emissions and that the existing database is relevant to the project.

In summary, what are the apparent limitations of the approach used?

No GHG emissions associated with the operational phase have been calculated. However, there was opportunity to do so using the CMS tool, developed by Transport Scotland, to at least estimate carbon emissions associated with maintenance operations. This was not quantified and instead a qualitative assumption was made. This approach could result in either under or overestimations of the GHG emissions associated with any required maintenance.

2.10 Madison Square Gardens London

The Madison Square Garden's London ('MSG London') is a large-scale multi-use entertainment and leisure development located within the London Borough of Newham. The plans involve the construction and operation of an illuminated external display and external podium and terraces with landscaping as well as the construction of new pedestrian and vehicular bridges, highway and access works, servicing, open space, hard and soft landscaping, demolition of existing structures, associated infrastructure, plant and utilities.

This application for the scheme was accompanied by an Environmental Statement (ES) submitted under the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, to the London Legacy Development Corporation. The application is still pending consideration.

The ES, originally submitted in February 2019, was replaced entirely by a new ES in November 2019 after several amendments had been made to the scheme to address design changes and comments following consultation. This was also prepared in response to a request for further environmental information made by the London Legacy Development Corporation.

It should be noted that the assessment of GHG emissions is not included within the ES Volume 1: Main report but is set out in ES Volume 3: Technical Appendices of the EIAR.

Madison Square Gardens London			
	Quantitative	Qualitative	Commentary
Baseline			
			No baseline GHG emissions are assumed as the site is currently undeveloped.
Construction			
Direct			
Indirect			
Embodied			
Operational			
Direct			
Indirect			
Embodied			
Decommissioning			
Direct			
Indirect			
Embodied			

If a tool has been used, which tool was used?

It is stated that no universal database is available for the quantification of GHG emissions. As such, several tools have been used throughout the assessment for different stages of the development. For example, the construction phase has utilised on-site energy consumption benchmarks included within the RICS Whole Life Carbon Assessment for the built environment, published in 2017, whilst waste streams have been calculated using the UK Government (2018) GHG Conversion Factors.

Other emissions factors derived from the RICS Methodology to Calculate Embodied Carbon (2014) have also been included to assess the embodied carbon at the product stage.

Information included within the Energy Statement, which is entirely separate from the ES, has been used to calculate CO_2 emissions by multiplying predicted carbon emissions by the Reference Study Period, which forms part of industry guidance and is included within the 2017 RICS publication.

How has impact significance been determined against the baseline and with reference to policy and guidance?

As there is no baseline information include, impact significance has not been determined against the baseline.

A comparison of the estimated GHG emissions arising from the scheme against the UK National Carbon Budgets has been made. As the scheme does not account for more than 1% of the UK carbon budget, the impact of the scheme on national emission reduction targets, set out in the Climate Change Act (2008), is deemed to be low.

However, the assessment takes cognisance of the IEMA Assessing Greenhouse Gas Emissions and Evaluating their Significance guidance and concludes that the GHG emissions of the scheme are nevertheless considered to be significant.

Consultation responses

As part of the scoping report, a GHG assessment was proposed and approved within the Scoping Opinion issued by LLDC. No further comment was raised on the methodology or scope.

In summary, what are the benefits of the approach used?

The standalone GHG assessment provides a detailed quantitative assessment which covers every aspect of the development from the pre-construction phase to the end of life phase.

The assessment takes a pragmatic approach to the consideration of impact significance, providing a quantitative judgement on this whilst also acknowledging the importance of any level of emissions, resulting in the inclusion of a greenhouse gas management hierarchy as part of the mitigation strategy.

In summary, what are the apparent limitations of the approach used?

Whilst the assessment of GHGs is in depth, it is located within Volume 3 of the EIA. Arguably, this should have been included within the main volume of the report as the scheme has, ultimately, been assessed as having a significant adverse impact.

In a similar vein to other examples reviewed, the assessments can only be based on assumptions and indicative information on the scheme. Additionally, it is also challenging to provide a meaningful calculation of transport emissions or the embodied carbon associated with materials as a greater understanding of where these goods originate from and their quantities is required.

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