# Guidance on consideration of climatic factors in Strategic Environmental Assessment

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Scotland's 4th National Planning Framework has recently been published. This document is therefore being reviewed and updated to reflect the new policies. You can still find useful and relevant information here but be aware that some parts may be out of date and our responses to planning applications may not match the information set out here.

## 1. Consideration of climatic factors in Strategic Environmental Assessment

1.1 The climate is affected by the release of greenhouse gas (GHG) emissions into the atmosphere. GHG emissions result from both natural processes and human activities. Human activities which result in GHG emissions include transport, energy generation and use, industrial activities, waste management, and agriculture; activities which can help to reduce or stabilise GHG emissions include forestry.

**Table 1: Greenhouse gases and their sources from human activity**

| **Greenhouse Gas** | **Sources from human activity** |
|---|---|
| Carbon dioxide $CO_2$ | Burning fossil fuels, burning biomass, land use changes, some industrial processes, transport |
| Methane $CH_4$ | Landfill sites, livestock |
| Nitrous oxide $N_2O$ | Fertiliser, some industrial processes |
| Hydrofluorocarbons HFCs | Refrigeration and air conditioning equipment (manufacture and end of life) |
| Perfluorocarbons PFCs | Refrigeration sector, aluminium production, fire extinguishing systems |
| Sulphur hexafluoride $SF_6$ | Electrical substations, magnesium smelters, production of consumer goods such as tennis balls and training shoes |
| Nitrogen trifluoride $NF_3$ | Used in the manufacture of flat-screen TVs and micro-electronics including touch sensitive screens and electronic processors. |

1.2 The Scottish Government reports annually on emissions of these gases and publishes information on contributions to GHG emissions from the following sectors:

- Energy supply.
- Business and industrial processes.
- Transport (including aviation and shipping).
- Public sector buildings.
- Residential.
- Agriculture and related land use.
- Development.
- Forestry.
- Waste management.

1.3 Plans, programmes and strategies (PPS) which influence activities such as these therefore have the potential to affect greenhouse gas emissions and therefore have the potential to result in significant effects on climatic factors.

1.4 For reporting purposes each gas is weighted by a Global Warming Potential in order that total greenhouse gas emissions are reported in a consistent way. The Global Warming Potential (GWP) for each gas is defined by its warming influence relative to that of carbon dioxide; greenhouse gas emissions are presented in carbon dioxide equivalent ($CO_{2e}$) units. Although the six other GHGs are produced in smaller quantities than carbon dioxide they are more powerful in their greenhouse effect per unit volume than carbon dioxide. For example methane has a GWP of 25 so one tonne of methane would be represented as 25 tonnes of carbon dioxide equivalent.

1.5 The effects of changes to the climate are complex and often interrelated. The UK Climate Change Risk Assessment (CCRA2) (January 2017) identified six key areas of inter-related risks resulting from climate change:

- Flooding and coastal change risks to communities, businesses and infrastructure.
- Risks to health, well-being and productivity from high temperatures.
- Risk of shortages in the public water supply, and for agriculture, energy generation and industry.
- Risks to natural capital, including terrestrial coastal, marine and freshwater ecosystems, soils and biodiversity.
- Risks to domestic and international food production and trade.
- New and emerging pests and diseases, and invasive non-native species, affecting people, plants and animals.

1.6 It is sometimes difficult to comprehend the significance of changes in local, often relatively small-scale GHG emissions to global climate change. However it is generally understood that the cumulative effects of the many different sources of GHG emissions from diverse activities around the world result in changes to the climate. These changes affect the world's population to differing degrees depending on their geographic, social and economic position.

1.7 At a local level we experience the climate in terms of its various attributes e.g. air and water temperatures; wind speed and direction; rainfall frequency, duration and intensity, and; intensity of solar radiation. On an individual level therefore changes to the climate impact on our ability to undertake everyday activities including work, education, travel, and leisure pursuits. On a global scale climatic factors impact on the fundamental ability of the world's population to feed, clothe, and house itself safely.

1.8 For SEA purposes a practical means of considering the effects of a PPS on climatic factors may be as high-level as questioning whether a particular course of action is likely to result in an increase, a decrease or have no effect on the GHG emissions generated in the PPS area. Due to the interrelated nature of effects, consideration of climatic factors may be integrated in to other SEA topics (for example air, soil or material assets) or it may be considered as a topic in its own right.

1.9 In any case it is important to remember that for SEA purposes it is the consideration of the effects of a PPS on climatic factors that is key i.e. whether the PPS will have an effect on GHG emissions. Changes in climate may affect the ability of a PPS to be implemented and so there will be a need for the plan-makers to build in resilience to the effects of climate change (e.g. dealing with increased flooding or storm events) but this is generally outwith the scope of SEA requirements.

## 2. Existing environmental problems and potential significant effects

2.1 The main environmental challenge associated with climatic factors is the emission of GHGs. An understanding of current sources of GHG emissions in the PPS area can help with understanding the effects of the PPS on emissions levels; for example if a PPS generates more demand for travel it may increase existing emissions from transport or if a PPS generates more demand for energy then emissions may increase in that sector. Consideration of climatic factors in this manner enables mitigation of negative effects to be put in place at a local level e.g. actions such as promotion low-carbon transport or renewable energy generation.

2.2 Table 2 below sets out some examples of current environmental problems in relation to climatic factors and their potential causes.

**Table 2: Existing problems related to climatic factors and their causes**

| **Existing problems related to climatic factors** | **Causes of existing problems** |
|---|---|
| *Air quality*<br>Changes in air quality result in risks to human health, water quality and biodiversity. | The underlying cause of problems related to climatic effects is the increase in GHG emissions.<br>GHG emissions influence air, water, and soil quality, for example:<br>• Air quality is influenced by climatic factors such as temperature, windspeed and direction, humidity, and extreme weather events.<br>• Soil quality is influenced by climatic factors such as rainfall (amount, intensity, frequency and duration), temperature, windspeed and direction, and extreme weather events (including flooding).<br>• Water quality and quantity, flooding and coastal erosion are influenced by climatic factors such as temperature, extreme weather events, flooding, rainfall (amount, intensity, frequency and duration). |
| *Soil quality*<br>Changes in climate can result in risks to soils from increased seasonal aridity and wetness, risks to natural carbon stores and carbon sequestration and changes in land suitability for a variety of purposes. | |
| *Water quality and quantity*<br>Changes in water quality can result in risks to human health, public water supplies, land management practices (e.g. agriculture), business and biodiversity from water scarcity and flooding. Changes in water temperature can also result in risks to freshwater species and ocean acidification from rising temperatures which have risks for marine species, fisheries and marine | |

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| heritage.<br>*Flooding and coastal erosion*<br>Flooding and coastal erosion can result in risks to human health, communities, buildings and businesses, habitats and heritage, loss of natural flood protection In addition there are a number of risks relating to infrastructure including risk of sewer flooding, risks to bridges and pipelines from high river flows / erosion, risks to viability of coastal communities from sea level rise, saltwater intrusion risks to aquifers, farmland and habitats. | |
| *Material assets*<br>Changes in ground stability e.g. as a result of flooding, desiccation, or severe storm events contribute to the risk of cascading infrastructure failures across interdependent networks. | The integrity of various types of infrastructure is susceptible to changes in the climate. |
| *Human health*<br>Changes in air quality, water quality and quantity, flood events, infrastructure resilience, soil stability and erosion all contribute to risks to human health. | Human health is a cross-cutting issue and is impacted on by many individual and interrelated environmental issues which may be exacerbated by climatic factors. |

2.3 The main issue with assessing the effects of a PPS on climatic factors is determining the scale on which significance should be considered. There is often a tendency to consider climatic factors as a global phenomenon and therefore changes in emissions at a local level are often considered to be negligible in this global context. However, given that climate change is the result of cumulative effects of varying magnitudes around the world a more useful approach may be to consider the scale of changes in GHG emissions at the local level as the measure of significance. This should enable the Responsible Authority to gauge the relative effects of alternative courses of action on GHG emissions in the PPS area.

2.4 The significance of the effects which a PPS may have on climatic factors is in relation to its influence on GHG emissions. It may be helpful to consider significance by setting out a scoring system ranging from a "significant positive" effect to a "significant negative" effect, for example:

- *Significant positive ++ Action very likely to lead to an overall large reduction in local GHG emissions*
- *Minor positive + Action very likely to lead to a moderate reduction in local GHG emissions*
- *Minor negative - Action very likely to lead to an overall moderate increase*

*in local GHG emissions.*

- *Significant negative - - Action very likely to lead to an overall large increase in local GHG emissions.*

2.5 The scoring system adopted for the assessment should be fully explained at the Scoping stage. This should include details of how terms such as "large" or "moderate" will be interpreted and applied consistently; for example this could be with reference to current local GHG emissions for individual sectors.

2.6 Neutral, mixed and uncertain effects of a PPS on climatic factors can be considered as follows:

- Neutral effects - an action which is unlikely to have any beneficial or negative effects on GHG emissions. Neutral scoring should only be used where it is very likely that the effect on the current baseline or trends will be neither positive nor negative. It is possible that a neutral effect may be enhanced through mitigation measures such as policy or project intervention.

- Mixed effects – an action which is likely to result in a combination of positive and negative effects, particularly where effects are considered on sub-issues, areas or criterion. Such mixed effects will be hard to predict, but could be significant in the long-term, or when taken with other effects e.g. cumulative or synergistic.

- Uncertain effects - the effect of an action on any existing GHG emissions is not known, or is too unpredictable to assign a conclusive score. Uncertainty may arise where an action covers a range of issues, or where the manner in which the action is implemented is a material factor in the nature of the effects it may have.

2.7 Where a PPS has the potential to have significant environmental effects on another EU Member State these effects are known as transboundary effects. Due to the global nature of climatic factors a PPS which influences GHG emissions in one Member State may result in significant environmental effects in many other Member States. Transboundary effects is a particular problem with regards GHG emissions as the effects on climatic factors can be experienced at distances far from the original emission source. Determining the significance of local changes in GHG emissions to the wider EU / global context will be an important consideration as to whether transboundary effects are likely to result from a PPS.

## 3. SEA objectives

3.1 SEA objectives can be used to develop a systematic, rigorous and consistent framework with which to assess environmental impacts. The level of detail appropriate for the SEA objectives will depend on the characteristics of the PPS being assessed and the potential significance of its environmental effects. For example objectives from a climate change or sustainable development strategy for the PPS area may be relevant for a local PPS or objectives derived from a national or UK strategy may be more appropriate for a regional or

national PPS. Where appropriate, "headline" SEA objectives can be broken down into sub-objectives or assessment criteria.

3.2 In order to address the areas associated with climatic factors which fall within SEPA's remit and depending on the content and purpose of the PPS being assessed consideration of effects on climatic factors may either be integrated with other SEA topics or considered as an independent topic. Table 3 below provides some examples of objectives which could be used where climatic factors is considered as an independent topic. Table 4 looks at integrating consideration of climatic factors into other SEA topics. In either case ensuring a proportionate approach will be a key consideration. For example, assessment questions for a local PPS should be framed in order to relate to what the PPS will influence at that level rather than trying to determine the significance of this influence at a national or global scale.

**Table 3 - Examples of SEA climatic factors objectives and assessment questions**

**Headline objective**

To reduce existing and avoid new GHG emissions

| **Sub-objectives** | **Example assessment questions** |
|---|---|
| To reduce existing and avoid new GHG emissions from energy generation and supply. | • Does the PPS support development of renewable energy technologies? |
| To reduce existing and avoid new GHG emissions from transport. | • Does the PPS seek to locate development to limit transport requirements?<br>• Does the PPS promote low carbon transport?<br>• Does the PPS support home working, broadband roll-out etc.? |
| To reduce existing and avoid new GHG emissions from resource use and waste management. | • Does the PPS contribute to waste minimisation?<br>• Does the PPS promote the efficient use of resources? |
| To reduce existing and avoid new GHG emissions from business and industry. | • Does the PPS support low carbon technologies? |
| To reduce existing and avoid new GHG emissions from land use and land use change including agriculture and forestry. | • Does the PPS promote restoration opportunities for peatlands?<br>• Does the PPS promote restoration opportunities for woodlands? |

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| To reduce existing and avoid new GHG emissions from buildings and services (residential and non-residential). | • Does the PPS support energy efficiency in the wider housing market?<br>• Does the PPS support energy efficiency in built development? |
| To reduce existing and avoid new GHG emissions from carbon rich soils. | • Does the PPS support use of carbon rich soils in GHG capture and storage?<br>• Does the PPS promote avoidance of disturbance of carbon rich soils? |

3.3 The process of developing SEA objectives for use in an assessment often highlights the complex interrelationships which exist between the individual SEA topics. Climatic factors act as "risk multipliers" in that they interact with other issues (e.g. water availability or air pollution) to create complex risks to the environment and human health. Depending on the PPS undergoing assessment it may be appropriate to develop a set of objectives which address climatic factors through other SEA topics rather than as a topic in its own right. Such an approach may also help to streamline the assessment.

3.4 Table 4 below provides some examples of how consideration of climatic factors within SEPA's remit may be integrated into other SEA topics. It shows examples of objectives for other SEA topics and highlights how they may be interpreted to incorporate the effect of a PPS on climatic factors. Where SEA objectives cover a variety of topics it is useful to outline what these are in the methodology and ensure that the presentation of assessment findings clearly shows how these effects have been considered.

**Table 4 – Consideration of climatic factors in other SEA topics**

| **Topic** | **Example SEA objective** | **Example assessment questions and relationship with climatic factors** |
|---|---|---|
| Air | To reduce emissions of key pollutants to air. | Will the PPS contribute to reducing emissions of pollutants which contribute to GHG emissions?<br>Reducing GHG emissions will contribute to a reduction in changes to the climate which may affect air quality – for example changes in air temperature which can affect dispersal of pollutants. |
| Soil | To minimise disturbance to carbon rich soils, in particular peat. | Will the PPS avoid disturbance of carbon rich soils?<br>Disturbance of carbon rich soils (e.g. in the construction of energy or transport infrastructure) can result in GHG |

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| | | emissions. |
| Water | To protect and enhance the state of the water environment. | Will the PPS contribute to reducing GHG emissions?<br>Reducing GHG emissions will contribute to a reduction in changes to the climate which may affect the water environment – for example deterioration of water quality due to: increased run-off caused by storm events, increase in the magnitude or number of flood events, or low flows due to less rainfall. |
| Material assets | To promote the sustainable use and management of material assets. | Will the PPS promote waste minimisation and resource efficiency?<br>Waste minimisation and resource efficiency will contribute to a reduction in changes to the climate by reducing GHG emissions - for example: less energy and raw materials will be needed for manufacturing processes and products, low carbon energy sources and transport systems will reduce GHG emissions, minimising waste means that less treatment of waste (which contributes to GHG emissions) is required. |
| Human health | To protect and improve human health and wellbeing through improved environmental quality. | Will the PPS contribute to reducing GHG emissions?<br>A reduction in GHG emissions will contribute to a reduction in the changes to the climate which may affect human health – for examples changes in temperature and humidity, increases in storm events and increases in flooding can affect human health and wellbeing. |

## 4. Baseline information

4.1 Sufficient data about the current and likely future state of the environment should be collected to allow the Responsible Authority to predict and evaluate the potential effects of the PPS. However, where such information is not available, any data gaps and difficulties should be listed in the Environmental Report. The gathering of new data may be appropriate to include as recommendations in the Environmental Report, Post Adoption Statement or Monitoring proposals.

4.2 We would expect to see information on existing greenhouse gas emissions and their sources within the PPS area included at the Scoping or Environmental

Report stage. The type of information which will be relevant will depend on the environmental characteristics of the PPS area, typically it may include information on:

- Energy generation and supply.
- Transport routes and modes (road, rail, pedestrian).
- Waste quantities generated and / or managed.
- Industrial activity.
- Land use and land use change including forestry, agriculture and soils.
- Energy consumption (residential, public and business / commercial).

4.3 Statistics published by UK Government for local authority $CO_2$ emissions can be found here: www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics. The statistics aim to provide the most reliable and consistent breakdown of $CO_2$ emissions across the UK using nationally available data sets going back to 2005.

4.4 The National Atmospheric Emissions Inventory (NAEI) produce Local Authority $CO_2$ Interactive Maps showing $CO_2$ totals by local authority area for the UK. Individual local authority areas and / or emission sources (e.g. industry, energy, transport, land use change) can be selected for investigation. Time series charts which show 5 years of data allow comparison over time.

4.5 Table 5 below lists some additional sources of information which may be useful in compiling an environmental baseline.

| **Table 5 – Sources of baseline information and trends** | |
|---|---|
| The **Scottish Pollutant Release Inventory** (SPRI) – the database and map of annual mass releases of specified pollutants to air, water and land from SEPA regulated industrial sites. | www.sepa.org.uk/environment/environmental-data/spri/ |
| **Waste Discover Data tools** present waste data interactively as a series of tables and charts which can be filtered as required. The data can also be downloaded to Excel. There are four tools:<br><br>(1) Household waste Discover Data tool which provides data for household waste generated and managed;<br><br>(2) Waste from all sources Discover Data tool which provides data for waste generated and managed from all sources (not just household waste);<br><br>(3) Scottish waste sites and capacity Discover Data tool which provides information on the numbers and types of licensed / permitted waste management facilities in Scotland, the tonnages of waste they handle in a given year and, where available, their licensed / permitted capacities, an | www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/ |

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| interactive map showing the location of these sites, and a summary of waste inputs to and outputs from individual waste facilities by EWC code and tonnage on a quarterly / annual basis.<br><br>(4) Scotland's material recovery facility Discover Data tool which reports sampling data provided by operators of certain Material Recovery Facilities (MRFs) in Scotland.<br><br>Other data available in Excel format are:<br>• Annual summaries of waste landfilled in Scotland<br>• Annual summaries of waste incinerated in Scotland<br>• Annual summaries of commercial and industrial (business waste) generated in Scotland. | |
| **Scottish Transport Statistics** include a variety of reports on emissions of air pollutants and GHG emissions at national and local levels by type of transport, $CO_2$ emissions per passenger km, number of cars registered by $CO_2$ emissions band and number of ultra-low emissions vehicles licenced.<br><br>It also includes statistics on traffic by road type (major, minor, trunk, motorway) and estimates of petrol and diesel consumption by local authority area. | https://www.transport.gov.scot/media/33814/sct01171871341.pdf |

## 5. Other plans, programmes and strategies

5.1 Links to other PPS relevant to the topic of climatic factors may be found by consulting the relevant local authority climate change or sustainability strategy. Given the strong connection between climatic factors and many other areas of activity it may also be worth consulting local strategies covering a wide range of issues including air quality, transport, energy and waste management. SEPA SEA topic guidance on air, soil, water, material assets and human health may also be useful in this respect. Table 6 below identifies some of the overarching national PPS which are of relevance to consideration of climatic factors.

**Table 6 – Key PPS and their associated provisions relevant to climatic factors**

| PPS title | Key provisions |
|---|---|
| Climate Change (Scotland) Act 2009 | Required Scottish Government to set a target for 2050, an interim target for 2020, and to provide for annual |

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| | targets, for the reduction of greenhouse gas emissions; gave power to Ministers to: impose climate change duties on public bodies; make further provision about mitigation of and adaptation; make provision about energy efficiency, reduction and recycling of waste; and for connected purposes. |
| Scottish Climate Change Adaptation Programme (SCCAP)<br><br>Progress Report 2018 | Aims to increase the resilience of Scotland's people, environment and economy to the impacts of a changing climate.<br><br>Annual progress reports are published. |
| The Climate Change (Duties of Public Bodies: Reporting Requirements (Scotland) Order 2015 | Requires all public bodies appearing on the Major Player list (which includes local authorities) to report annually to Scottish Ministers on their compliance with the climate change duties. |
| New Climate Change Bill | A new Climate Change Bill was introduced to the Scottish Parliament on 23 May 2018 which will amend the Climate Change (Scotland) Act 2009 and will immediately increase the 2050 target to 90% by 2050 which the UK Committee on Climate Change (CCC) states as currently “at the limit of feasibility”. |
| Clean Air for Scotland (2015) | Strategy sets out how the Scottish Government and its partner organisations propose to achieve further reductions in air pollution and fulfil their legal responsibilities. |
| Scottish Energy Strategy 2017 | Broadens the focus of the Scottish Government’s energy policy to include heat and transport alongside electricity and energy efficiency. |
| Scotland’s Energy Efficiency Programme (SEEP) | The Scottish Government’s coordinated programme of work to improve the energy efficiency of homes and buildings in commercial, public and industrial sectors across Scotland and decarbonising heat provision over the long term. |
| National Planning Framework 3 (2014) | Vision includes reference to achieving economic growth whilst reducing emissions.<br><br>Outcomes include making Scotland a low carbon place and reducing carbon emissions. Includes reference to role of energy and heat generation, industry, transport and peatland. |
| Scottish Planning Policy (2014) | Outcomes include reducing carbon emissions in the pursuit of establishing Scotland as a low carbon place. |

## 6. Mitigation and enhancement

6.1 Mitigation involves the identification of measures which are envisaged to prevent, reduce and as far as possible offset any adverse effects identified by the assessment. The best form of mitigation is avoidance; mitigation should therefore start with the avoidance of increasing GHG emissions as a first choice in the decision-making process.

6.2 Mitigation proposed to deal with negative effects on other SEA topics may also provide mitigation for effects on climatic factors. For example:

- Air – switching to renewable energy generating technologies or low carbon transport systems will help mitigate negative effects on air quality which may result from an increased demand for energy or travel. This mitigation would also help to reduce / minimise GHG emissions and consequent impacts on climatic factors.

- Soil – micro-siting of wind turbines to avoid carbon rich soils will minimise negative effects on peatlands and their biodiversity. It will also reduce / avoid GHG emissions which could result from peat disturbance in the absence of micro-siting.

6.3 Opportunities for enhancement should be explored for any neutral, uncertain and minimal effects identified. Such measures should aim to result in reductions in overall GHG emissions e.g. through changing to renewable energy generation technologies. In common with mitigation measures, opportunities for enhancement in relation to GHG emissions may also be identified under other SEA topics e.g. changing to low carbon transport modes may have positive effects on GHG emissions as well as improve air quality and human health.

## 7. Monitoring

7.1 The information gathered as a result of monitoring the effects of the PPS enables the Responsible Authority to track the effects of the PPS, gauge the effectiveness of any mitigation measures employed, identify unforeseen effects and manage any uncertainty encountered in the assessment process.

7.2 Table 7 below provides an example of indicators relevant to monitoring significant effects of a PPS on climatic factors. Other more contextual indicators should be identified by the Responsible Authority to monitor for unexpected effects and consider the effectiveness of mitigation and enhancement measures.

7.3 Where consideration of climatic factors is integrated into other SEA topics then monitoring indicators for these topics may provide a useful proxy indicator for climatic factors e.g. MW capacity of installed renewable energy systems, or number of properties supplied by low carbon heat technologies.

| **Table 7 – Examples of SEA indicators** | |
|---|---|
| **SEA climatic factors objective** | **Example of monitoring indicator** |
| To reduce existing and avoid new GHG emissions | % increase / decrease in overall GHG emissions. |
| | % increase / decrease in GHG emissions for relevant sectors e.g. energy, transport, residential buildings. |
| | % of housing stock which meets the Scottish Housing Quality Standard for energy efficiency or the Energy Efficiency Standard for Social Housing. |
| | % change in number / length of journeys made by public transport / walking / cycling. |
| | Amount of waste generated and disposed of annually (by disposal route e.g. % recycled, composted or landfilled). |
| | Energy generated by renewables (MWH). |

## 8. Cumulative effects

| **Table 8 – Cumulative effects** | |
|---|---|
| **Cumulative effect** | **Examples** |
| Time crowding - frequent and repetitive effects | Frequent and numerous occurrences of GHG emissions increase the rate at which climate change occurs. |
| Time lag - long delays between cause and effect | Historic GHG emissions contribute to climate change now and in the future. |
| Space crowding - high spatial density of effects | High concentration of GHG emissions in one area may contribute disproportionately to global climate change. |
| Cross-boundary - effects occur some distance away from the source | Local GHG emissions contribute to global climate change with effects being felt at locations far removed from the source. |
| Synergistic - effects resulting from multiple sources or combined effects different in nature from the individual effects | Climate change results from a combination of various individual emissions. |
| Indirect - secondary effects resulting from a | Generation of energy using renewable / low-carbon technologies results in a decrease in GHG emissions |

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| primary activity | but also an improvement in local air quality. |
| Nibbling - incremental effects | Frequent small additional GHG emissions result in irreversible climate change with resultant negative effects on human health and natural systems. |