Practical Guidance and Recommendations for Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EIA) Procedures

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FOREWORD

[To be added by DG Environment at their discretion]

Contents

Glossary

Term	Definition
Adaptation	The term used to describe responses to the effects of climate change. The IPCC defines adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." Adaptation can also be thought of as the ongoing process of managing changing climate risks.
Baseline	A description of the present and future state, in the absence of any project, taking into account changes resulting from natural events and from other human activities.
Biodiversity	The variability among living organisms and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems.
Climate	Usually defined as the 'average weather', or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time. These quantities are most often surface variables such as temperature, precipitation, and wind. The conventional period of time over which weather is averaged to calculate climate is 30 years, as defined by the World Meteorological Organization (WMO). (Modified from IPCC.)
Climate change	The IPCC defines this generally as "...any change in climate over time, whether due to natural variability or as a result of human activity." This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which defines 'climate change' specifically in relation to human influence as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.
Cumulative effect	Cumulative effects can be defined as incremental effects of an action when added to other past, present, and reasonably foreseeable future actions. These effects can result from individually minor but collectively significant actions taking place over a period of time.
Direct effect	An environmental effect caused directly by the preparation, construction or operation of a project in a particular location.
EIA Directive	Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC
Environmental assessment	A tool for integrating environmental considerations into decision-making by ensuring that significant environmental effects of the decision are taken into account.
Environmental Impact Assessment (EIA)	Generic term used internationally to describe environmental assessment as applied to projects.
Environmental Management Plan	The synthesis of all proposed mitigating and monitoring actions, set to a timeline with specific responsibility assigned and follow-up actions defined. The EMP is one of the most important outputs of the environmental assessment process. (World Bank)
Fauna	The animals of a particular region or habitat.
Flora	The plants of a particular region or habitat.
Indicator	A measure of variables over time, often used to measure achievement of objectives.
Direct effect	An environmental effect caused directly by the preparation, construction or operation of a project in a particular location.

Term	Definition
Indirect effect / impact	An impact that occurs away from the immediate area of the proposed action, e.g. quarrying of aggregates elsewhere in the country as a result of a new road proposal.
Mitigation (climate change)	An anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas emissions and enhancing greenhouse gas sinks.
Mitigation (EIA)	Measures to avoid, reduce or offset significant adverse effects.
Monitoring	A continuing assessment of conditions at and surrounding the action. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
Objective	A statement of what is intended, specifying the desired direction of change in trends.
Precautionary principle	State that if an action or policy has suspected risk of causing harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action.
Public	One or more natural or legal persons, and, in accordance with national legislation or practice, their associations, organizations or group.
Public concerned	The public affected or likely to be affected by, or having an interest in, the environmental decision-making.
Residual Effects	Effects that remain after mitigation has been applied.
Scoping	The process of determining the scope and level of detail of an EIA, including the environmental effects and alternatives which need to be considered, the assessment methods to be used, and the structure and contents of the Environmental Statement.
Screening	The process of deciding whether a project requires EIA.
SEA Directive:	Directive 2001/42/EC 'on the assessment of the effects of certain plans and programmes on the environment'.
Secondary effect	Effect that occur as a consequence of a primary effect or as a result of a complex pathway.
Short-term effects	Are typical of those that may occur during construction stage of a development, for example, the increased traffic going to and from the site during, say, a six months construction period.
Significant effect	Effects which are significant in the context of the project, a function of not just of magnitude, but of nature, sensitivity and scale of the receptor.
Strategic environmental assessment (SEA):	Generic term used internationally to describe environmental assessment as applied to policies, plans and programmes.
Synergistic effect	Effects that interact to produce a total effect greater (or less than) than the sum of the individual effects.
	[other terms may be added in final draft]

Acronyms and Abbreviations

BAP	Biodiversity Action Plans
BISE	Biodiversity Information System for Europe
CBD	Convention on Biological Diversity
CO_2	Carbon Dioxide
EEA	European Environment Agency
EIA	Environmental impact assessment
ETC/ACM	European Topic Centre for Air Pollution and Climate Change Mitigation
ETC/BC	European Topic Centre for Biological Diversity
ETS	Emission Trading Scheme
EU	European Union
EVDAB	European Database of Vulnerabilities for Urban Areas
GEO	Group on Earth Observatories
GHG	Greenhouse Gases
GIS	Geographical Information System
HFC	Hydro fluorocarbon
ICES	International Council for the Exploration of the Sea

IMS	Indicator Management System
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JRC	Joint Research Centre
LCA	Life Cycle Assessment
NGOs	non-governmental organisation
SAC	Special Areas of Conservation
SDI	Sustainable Development Indicator
SDS	Sustainable Development Strategy
SEA	Strategic Environmental assessment
SPA	Special Protection Areas
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
	[other abbreviations may be added in final draft]

EXECUTIVE SUMMARY

Climate change and biodiversity loss have been recognised internationally and within Europe as two of the most important environmental policy areas for the future. The reality of climate change and the need to take action has permeated European political agendas in recent years, resulting in important legislative actions (for example the EU climate-energy legislation of 2009) and policy commitments (the White Paper on adapting to climate change). Similarly, ambitious targets aimed at halting biodiversity loss and ecosystem degradation across Europe are contained within the European Commission's biodiversity strategy. Moreover, the complex links between the causes of and capacities to cope with climate change and the status of biodiversity and ecosystems have been widely recognised, and it is clear that objectives in these two areas are co-dependent.

Progress towards combating and adapting to climate change, and halting the loss of biodiversity and damage to ecosystems requires sound consideration of these issues in projects implemented across the EU

The *Practical guidance and recommendations for integrating climate change and biodiversity into Environmental Impact Assessment (EIA) procedures* serves as a tool to improve the inclusion and integration of climate change and biodiversity issues into EIA carried out across the EU Member States. This executive summary reviews the purpose of the guidance, and its key messages.

EIA at present offers the only formalised process for considering climate change and biodiversity concerns in proposed plans, programmes and projects across the EU. Required by EU law[1] for those public or private project interventions likely to have significant effects on the environment, environmental assessment has proven to be a critical tool for the implementation of EU environmental policy and the achievement of EU environmental objectives.

Yet experience and evidence has shown that EIAs carried out across the EU have so far struggled to effectively integrate climate change and biodiversity issues into practice, despite the recent prioritisation of these issues within the environmental policy agendas. Part of the reason for this is these issues - and climate change in particular - are not yet fully incorporated into either formal requirements or typical EIA procedures and available guidance. Moreover, both climate change and biodiversity – particularly when considered in terms of ecosystems – are complex and cross-cutting issues that do not lend themselves to simple or quick analysis. As legally required and specifically defined processes, both EIA and SEA represent an opportunity to integrate climate change and biodiversity into all future development directions in Europe; this is an opportunity that cannot be missed if Europe is to achieve its environment and as well as development objectives.

[1] The EIA Directive: *Council Directive on the assessment of the effects of certain public and private projects on the environment* (85/337/EEC), as amended in 1997, 2003 and 2009; and the SEA Directive: *on the assessment of the effects of certain plans and programmes on the environment* (2001/42/EC).

The guidance, which aims to facilitate the effective integration of climate change and biodiversity into EIA, is based upon a number of key messages which are important for policymakers, authorities and managers as well as EIA practitioners. These are summarised below.

Key messages for integrating climate change and biodiversity into EIA

Legal considerations. The EIA Directive recognises "climate" and "fauna and flora" in the list of factors to be assessed, meaning that these issues must be considered in order for assessments to be legally compliant. Moreover, the Directive sets out unambiguously to prevent environmental impacts and pollution rather than merely counteract their effect.

Policy drivers. The integration of climate change and biodiversity into EIA is not only required by the Directive, but it provides opportunities to ensure that projects are consistent with the requirements of national, regional and local targets, policies and strategies in these areas.

Project benefits. EIA offers the opportunity not only to avoid negative impacts in terms of GHG emissions and loss of biodiversity, but also to build in positive benefits for climate change mitigation and adaptation, and the enhancement and restoration of biodiversity, while at the same time creating greater resilience of projects to future environmental change.

Cost-effectiveness. EIAs should help bring to light the potential for cost-savings, and also positive economic and lifestyle opportunities to be gained from mitigation of climate change through energy efficiency and a shift away from fossil fuels.

Stakeholder engagement. Early and effective consideration of climate change and biodiversity in EIA will necessitate the involvement of a wide range of stakeholders, both for gathering information and consultations purposes. EIAs are important to help identify and bring together all the relevant stakeholders that need to be part of relevant decision-making.

The impact of a changing climate. EIAs need to consider not only the impact of the project on causes of climate change (e.g. greenhouse gas emissions), but also the projected impacts of the changing climate on the project itself. To do so will require a shift in thinking from the concept of impacts on the environment to one of impacts from the environment on the project. EIAs will need to how to build resilience - the capacity of systems to cope with environmental change and recover from disturbance – into proposed projects.

Ecosystems services. Through its broad approach to assessment and emphasis on cumulative impacts, EIA can encourage an "ecosystems approach" to planning recognising that biodiversity depends on the integrated management of ecosystems and processes, across administrative and other boundaries.

Impact on environmental limits. EIAs need to consider thresholds for sudden decline or collapse in biodiversity, even when unclear, based on the precautionary principle and "no regrets" solutions.

Long-term and cumulative nature of impacts. EIAs should consider the evolution of the environmental baseline, which will entail understanding recent trends and likely future trends in key issues.

Complexity. Climate change and biodiversity involved complex systems and interactions between the biophysical environment and the human environment. Efforts to mitigate one impact may adversely affect others.

Dealing with uncertainty. EIAs need to reflect the uncertainty inherent in climate change and help to develop climate resilient solutions based on "win-win" or "no regrets" approaches to project development. Scenarios, proxy indicators and risk management are all ways of dealing with uncertainty.

INTRODUCTION AND USER GUIDE

Objectives and purpose of the guidance

Climate change and biodiversity loss are among the most important environmental challenges the EU faces today. Both are complex and cross-cutting issues, which impact nearly all human activity. Progress towards combating and adapting to climate change, and halting the loss of biodiversity and damage to ecosystems requires sound consideration of these issues in plans, programmes and projects implemented across the EU. This in turn will require improved integration of these complex issues into the environmental assessment tools that exist to ensure the consideration of environmental impacts of decisions.

The *Practical guidance and recommendations for integrating climate change and biodiversity into Environmental Impact Assessment (EIA) procedures* serves as a tool to improve the inclusion and integration of climate change and biodiversity issues into EIA carried out across the EU Member States. By reinforcing general good practice principles and techniques for EIA, as well as introducing the range of benefits that integration of climate change and biodiversity can bring to projects, this guidance document aims to improve the efficiency and effectiveness of EIA overall.

Climate change and biodiversity loss have been recognised internationally and within Europe as two of the most important environmental policy areas for the future. The reality of climate change and the need to take action has permeated European political agendas in recent years, resulting in important legislative actions (for example the EU climate-energy legislation of 2009) and policy commitments (the White Paper on adapting to climate change). Similarly, ambitious targets aimed at halting biodiversity loss and ecosystem degradation across Europe are contained within the European Commission's biodiversity strategy. Moreover, the complex links between the causes of and capacities to cope with climate change and the status of biodiversity and ecosystems have been widely recognised, and it is clear that objectives in these two areas are co-dependent.

EIA at present offers the only formalised process for considering climate change and biodiversity concerns in proposed projects across the EU. Required by EU law[2] for those public or private project interventions likely to have significant effects

The purpose of the EIA Directive

The EIA Directive aims to protect the environment and the quality of life, through the assessment of the environmental effects of public and private projects. It is a key instrument of environmental integration covering a wide range of projects and making them environmentally sustainable.

[2] The EIA Directive: *Council Directive on the assessment of the effects of certain public and private projects on the environment* (85/337/EEC), as amended in 1997, 2003 and 2009.

on the environment, EIA has proven to be a critical tool for the implementation of EU environmental policy and the achievement of EU environmental objectives.

Yet experience and evidence has shown that EIAs carried out across the EU have so far struggled to effectively integrate climate change and biodiversity issues into practice, despite the recent prioritisation of these issues within the environmental policy agendas.[3] Part of the reason for this is these issues - and climate change in particular - are not yet fully incorporated into either formal requirements or typical EIA procedures and available guidance. Moreover, both climate change and biodiversity – particularly when considered in terms of ecosystems – are complex and cross-cutting issues that do not lend themselves to simple or quick analysis. Nevertheless, these complexities represent the reality of environmental issues facing Europe today. As a legally required and specifically defined process, both EIA represents an opportunity to integrate climate change and biodiversity into all future development directions in Europe; this is an opportunity that cannot be missed if Europe is to achieve its environment and as well as development objectives.

To address both climate change and biodiversity effectively means building them into the assessment process from the earliest stages

This guidance addresses the specific issues and challenges that climate change and biodiversity bring to EIA; complementary guidance is being prepared on improving the integration of climate change and biodiversity into SEA procedures and practice. It is designed to be used by project developers, authorities and practitioners across the EU Member States and candidate countries. By focusing on climate change and biodiversity this guidance does not seek to prioritise these topics, rather it seeks to facilitate the effective integration of these issues within EIA, alongside and in support of the other topics laid down in the Directive.

Nature of this guidance

This guidance addresses the specific issues and challenges that climate change and biodiversity bring to EIA. It is designed to be used by project developers, authorities and practitioners across the EU Member States and candidate countries. By focusing on climate change and biodiversity this guidance does not seek to prioritise these topics, rather it seeks to facilitate the effective integration of these issues within EIA, alongside and in support of the other topics laid down in the Directive.

[3] The *Study on the application and effectiveness of the SEA Directive (2001/42/EC) (*COWI for the EC, 2009) has cited the need for improved consideration of both climate change and biodiversity into SEAs based on dialogue with officials in MS; this has also been cited by the EEB in *EEB input into stakeholder consultation on climate change and adaptation* and *Biodiversity in Strategic Environmental Assessment, Quality of national transposition and application of the Strategic Environmental Assessment (SEA) Directive,* both 2005. It has also been noted with reference to SEA and climate change in the upcoming RSC project report on this issue, based on a survey of 11 EU regions.

This guidance is arranged in a thematic way that seeks to highlight what you need to know and to do to integrate climate change and biodiversity issues effectively into the EIA process. It deliberately does not simply follow the EIA process stages since there are many other factors to be considered in an EIA as well as climate change and biodiversity and this guidance is not intended to be comprehensive guidance on undertaking EIA. This guidance does not seek to identify or provide advice on all of the climate change and biodiversity impacts and issues you may encounter in EIA – this would be impossible for all situations and all sectors in a usable and reader friendly format.

To address both climate change and biodiversity effectively means building them into the assessment process from the earliest stages – in that way you are more likely to follow them through the whole EIA process. But it is important that the consideration of biodiversity and climate change issues is tailored to the specific context in which you are working; it is not simply a set of checklists of issues to tick off having been completed. The guidance is arranged in a way that will encourage you to think about how important climate change and biodiversity – as assessment issues – are likely to be for your EIA:

- What is it about climate change and biodiversity that poses a challenge to the assessment process?
- How does that affect the information needs the assessment will have – what type of information, what sources and what stakeholders will hold information and specific knowledge in these areas?
- What are the key aspects to cover in the detailed assessment and how important will those issues be in decision-making?

The guidance section will cover these three assessment issues that are most important for considering climate change and biodiversity in EIA. A series of annexes then provides specific information sources, tools, guiding questions or "entry points" for assessment, and a set of case studies illustrating actual practice. Details on how to navigate the guidance are in the user guide section below.

How to use this guidance

This guidance has a very broad target audience and has therefore been structured with a flexible approach. Users can review the entire document at once, or skip directly to sections that interest them.

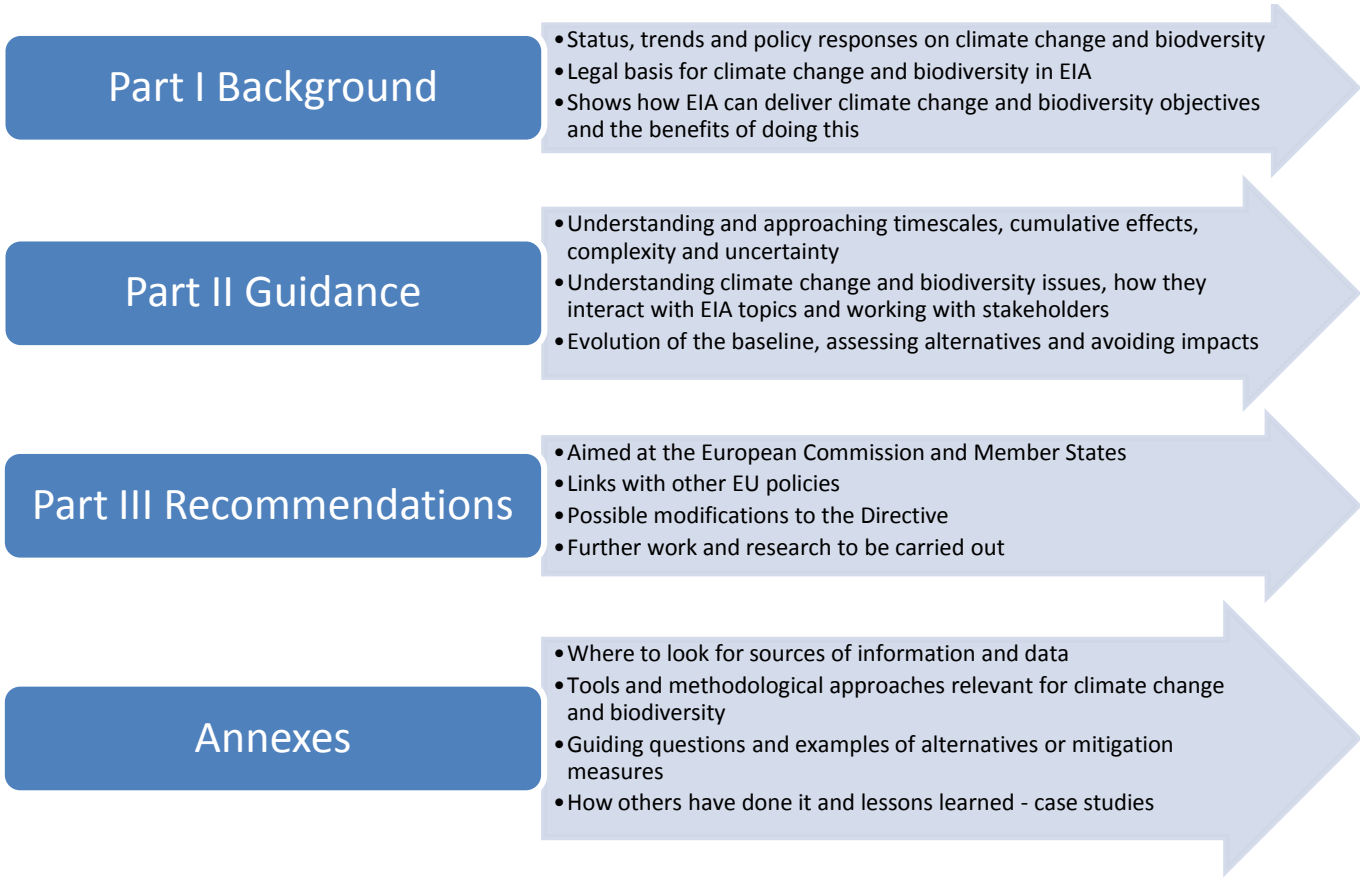
Part I Background provides background on the issues and their legal and practical relationship with EIA. It also points out the benefits of early consideration of climate change and biodiversity in EIA.

Part II Guidance covers the challenges, information needs and assessment approaches that are most important for consideration of climate change and biodiversity in EIA.

Part III Recommendations contains recommendations at the legal and policy levels, as well as ideas for further work and research projects that could support practitioners and stakeholders. It is aimed mainly at the European Commission and Member State levels.

It is possible that this section may be removed from the final guidance as the target audience is different.

Annexes contain more detailed information to assist in the actual practice of carrying out the EIA. This includes where to look for information and data, assessment tools and methodologies to assist in understanding and evaluating impacts and projections, and a breakdown of key questions to ask and examples of alternatives or mitigation measures to consider for some of the main climate change and biodiversity issues. Finally a set of case studies illustrates how EIAs have incorporated climate change and biodiversity from around the EU, as well as the consequences some have faced from failing to effectively consider these issues at an early stage.



The figure provides an overview of the guidance parts and sections and the contents of each section.

PART I: BACKGROUND

This part provides background information on the topics of climate change and biodiversity. It starts by introducing what is meant by the terms 'climate change' and 'biodiversity' and then provides an overview of the current status, trends and drivers relevant to them in the European context. It goes on to present the key policy context for climate change and biodiversity at the international and EU levels, and finally explores the key interactions between climate change and biodiversity.

The purpose of this part of the guidance is to highlight to those involved in EIA, whether as a project proponent, EIA practitioner, regulator or other stakeholder, the importance and complexity of climate change and biodiversity. It also provides an overview and starting point for some of the key information sources and issues, policy objectives and targets that need to be considered to best integrate climate change and biodiversity into EIA.

1. Background on Climate Change and Biodiversity

Introduction to climate change and biodiversity

Climate change has been described as humanity's biggest challenge and a threat to our civilisation. While there is truth to these statements, they also suggest that there is little that individual projects or environmental assessments can achieve. But this is not the case. In fact much of the potential for reducing the impacts of climate change lies in the actions of individuals and organisations and in particular our use and organisation of the natural and built environment. Environmental assessment is an important opportunity to influence these.

Climate change can be divided into two aspects:

- **Mitigation** - climate change mitigation is the process of reducing the emission of greenhouses gases (GHG) that are changing our climate. This may involve not releasing emission from a current carbon store such as a forest as well as reducing energy and material use as these are generally based on fossil fuel combustion. Scientists predict that to limit 'dangerous' climate change, global warming should be limited to 2^{o}C and that emissions need to peak in 2020 and reduce by around 50% by 2050.
- **Adaptation** - climate change adaptation is the process of responding to predicted and experienced climate change effects to moderate harm or exploit benefits.

These two aspects of climate change interact and have the potential for synergistic or conflicting relationship. This is an issue dealt with in Part II of the guidance.

Biological diversity - or biodiversity - is one of the key terms in conservation, encompassing the richness of life and the diverse patterns it forms. The Convention on Biological Diversity (CBD) defines biological diversity as '*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*' (Article 2).

Biodiversity is recognised as providing a wide range of services upon which the wellbeing of society and individuals is dependent. As such protecting biodiversity is more than an ethical issue; there are also clear socio-economic benefits to doing so.

> *"Healthy ecosystems are essential in any strategy for climate change adaptation. One can say that conservation of biodiversity is our life insurance for the future. The current threats of habitat loss and fragmentation and pollution need to be addressed."*
> Stavros Dimas, EU Environment Commissioner

Climate change mitigation - overview of current status, trends and policy responses

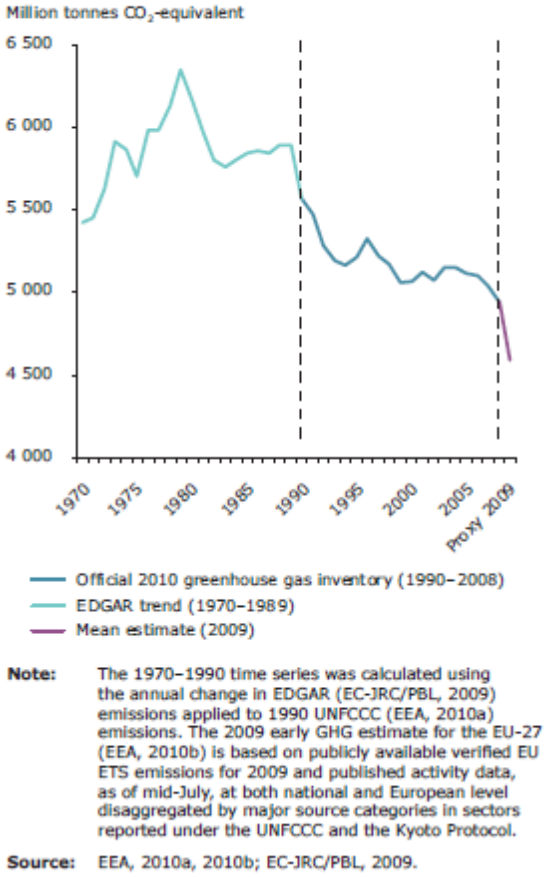
What are the current status, trends and key drivers?

The EU currently contributes around 12% of annual global direct GHG emissions. In recognition of this, the EU agreed in 2007 to an independent binding target to reduce its emissions by at least 20% by 2020 compared to 1990 levels. This commitment was to increase to 30% if major emitting countries outside Europe made similar challenging commitments under a global climate agreement. The historic trends of GHG emissions in the EU over the past 20 years are the result of two sets of opposing factors – those driving emissions upwards and those driving emissions downwards (see Table 1).[4]

Key GHG sources at the EU level are road transport (freight and passenger cars), international aviation and maritime transport - all of which have increased over the long term. Other GHG increases have been observed due to the consumption of halocarbons (HFCs) used in the production of cooling devices such as air conditioning systems and refrigerators – HFCs are powerful GHGs. For a more detailed analysis of the causes and drivers of GHG emission see the Key background documents on climate change mitigation presented in the box at the end of this sub-section.

Much of Europe's GHG emission reductions achieved in the last 20 years were achieved in the 1990s, largely as a result of the economic restructuring that occurred primarily in Eastern Europe. Beyond this reductions were achieved as a combined result of policies and measures implemented to reduce GHG emissions, such as the EU Emission Trading Scheme (EU ETS). Since 2008, the short-term effects of the global economic crisis have also contributed to emission reductions. Looking at sectors, CO_2 emissions from the residential and commercial sectors have fallen significantly since 1990. There have also been substantial reductions in GHG emissions from the waste sector due to improvements in recycling rates and the technical requirements of landfills.

Figure 1: Absolute GHG emissions in the EU-27, 1970–2009



Source: EEA (2010) Mitigating climate change - SOER 2010 thematic assessment

[4] Sources for this section are: EEA (2010) Mitigating climate change – SOER 2010 Thematic Assessment; EEA (2010) Understanding Climate Change SOER 2010 Thematic Assessment

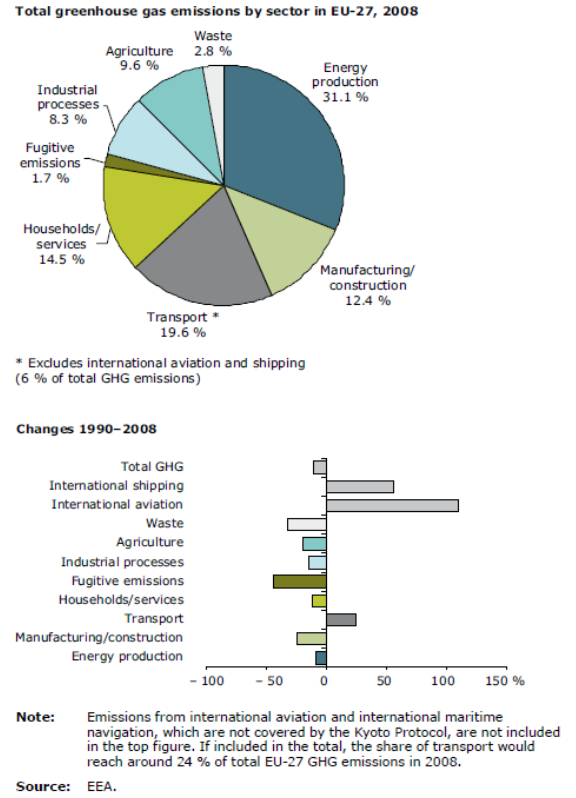
Table 1: Opposing factors driving historic trends of GHG emissions in the EU over the past 20 years

Factors driving emissions upwards	Factors driving emissions downwards
• increases in the production of electricity and heat by thermal plants, which has increased both in absolute terms and in comparison with other sources • economic growth in manufacturing industries • increasing transport demand for passengers and freight • increasing share of road transport compared with other transport modes • increasing number of households • demographic changes over the past decades	• improvements in energy efficiency, in particular by industrial end users and the energy industries • fuel efficiency improvements in vehicles • better waste management and improved landfill gas recovery (the waste sector achieved the highest relative reductions) • decreases in emissions from agriculture (by more than 20% since 1990) • a shift from coal to less polluting fuels, particularly gas and biomass, for the production of electricity and heat • partly due to the economic restructuring in Eastern Europe

Source: EEA (2010) Mitigating Climate Change – SOER Thematic Assessment

Overall, the EU is making progress towards its 2020 target with emissions of its 27 Member States 11.3% below 1990 levels in 2008 and, according to preliminary EEA estimates, 17% below 1990 levels in 2009 - see Figure 2. Despite the general reduction trend, achieving Europe's mitigation targets will require accelerated reductions over the medium to long term and much of the work required to achieve them needs to start now. Global emissions continue to increase, with many developing countries showing significant rates of increase. The per capita emissions of these nations however are still significantly below those of Europeans, meaning that the obligation is still on developed countries to de-carbonise.[5]

Figure 2: Greenhouse gas emissions in the EU-27 by sector in 2008, and changes between 1990 and 2008



Source: EEA (2010) The European environment - State and outlook 2010. Synthesis

[5] Sources for this section are: EEA (2010) Mitigating climate change – SOER 2010 Thematic Assessment

What's the policy response?

The global nature of climate change means that mitigating it requires a focus on delivering internationally binding emission reduction targets. The aim is to ensure that all nations operate within a level playing field and do not gain any benefits by not seeking to reduce GHGs.

- At the highest level the **United Nation Framework Convention on Climate Change (UNFCCC)** seeks to reduce international GHG emissions by setting national level targets based on the concept of 'equal but differentiated responsibility'. This means that nations which have emitted the majority of GHGs up to now, such as EU states, should seek to reduce GHGs at a greater rate.
- Under the **UNFCCC's Kyoto Protocol** European Commission are required to reduce their emissions relative to 1990 levels (Member State emission targets are differentiated under a burden-sharing EU accord). The Kyoto Protocol is still operational but ceases to be from 2012. Under the Kyoto Protocol, 15 Member States of the EU ('EU-15') are committed as a group to reduce their GHG emissions by 8 % compared to 1990 levels during the commitment period 2008–2012. The EU-15 is well on track to meeting its target; emissions in 2008 were 6.9 % lower than the base-year. Preliminary estimates of the EEA indicate that EU-15 emissions were further reduced in 2009 to 13 % below base-year levels. Of the EU-12 Member States, 10 have individual targets and are on track to meet these.
- The **EU's Climate and Energy Package** is a set of binding legislation that requires the 27 Member States to: 1) reduce their combined GHG emissions in 2020 by at least 20% compared to 1990 levels; 2) produce 20% of their combined energy from renewable sources; and 3) improve energy efficiency to reduce primary energy use by 20% compared with projected levels. The "effort sharing decision" establishes annual binding GHG emission targets for individual Member States for the period 2013-2020. This so called 20-20-20 target is supported by the long term (but as yet unlegislated) target of 80% reduction against 1990 levels by 2050.
- A **Roadmap for moving to a low-carbon economy in 2050** looks beyond these 2020 objectives and sets out a plan to meeting the long-term target of reducing EU emissions by 80-95% by 2050. The strategy takes a sectoral perspective, looking at the how heavy-emissions sectors such as power generation, transport, buildings and construction, industry and agriculture can make the transition to a low-carbon economy over the coming decades.
- Under the Europe 2020 Strategy, the **flagship initiative for a resource-efficient Europe** supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth. It provides a long-term framework for

*the **EU's Climate and Energy Package** requires the 27 Member States to reduce their combined GHG emissions in 2020 by at least 20% compared to 1990*

Key background documents on climate change mitigation

- European Environment Agency (2010) Mitigating Climate Change
- European Commission (2011) Roadmap for moving to a competitive low-carbon economy in 2050
- European Commission – European Climate Change Programme (ECCP)

actions to factor in resource efficiency in a balanced manner in many policy areas including climate change, energy, transport, industry, agriculture, biodiversity and regional development.

For the latest research and policy developments relevant to climate change and the European Union visit the relevant web pages on DG Climate Action's website: http://ec.europa.eu/climateaction/

Climate change adaptation - overview of current status, trends and policy responses

What are the current status, trends and key drivers?

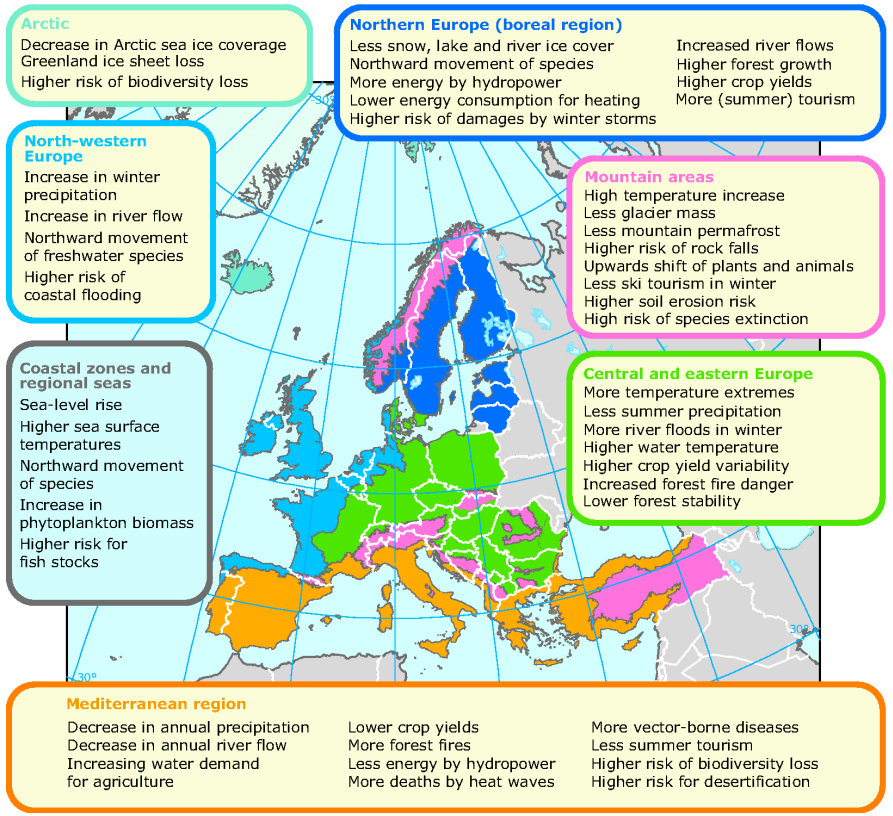
Regardless of the success of mitigation efforts, some degree of climate change is already 'locked in' and we are feeling the effects of our changing climate already. The majority of projected climate change impacts and vulnerabilities are, or are expected to be, negative, and these often need to be addressed proactively. The focus is therefore on identifying and countering the adverse effects of climate change through adaptation.

Adaptation does not seek to detract from mitigation; rather it is a commonsense approach to increasing the resilience of European society and natural environment in response to unavoidable changes in the climate.

Vulnerability to climate change varies significantly across regions and sectors in Europe; adaptation is therefore a context- and location-specific challenge. Regions of particular vulnerability include the Mediterranean basin, north-western and central-eastern Europe and the Arctic. Other general areas of vulnerability include many coastal zones (due to sea level rise) and areas prone to river floods, such as mountainous areas and cities. Low-lying coastal areas across Europe could face major impacts due to sea level rise and a possible increased frequency of severe storm surges, particularly in north-western Europe. More intense winter and spring river floods are expected in this region. General projected climate impacts include:[6]

[6] Sources for this section are taken from EA (2010) The European environment - State and outlook 2010. Adapting to Climate Change.

Figure 3: Key past and projected impacts of climate change and effects on sectors for the main bio-geographical regions of Europe



Source: EEA (2010) The European environment - State and outlook 2010. Adapting to Climate Change.

- A northward movement of species is expected due to higher sea surface temperatures. Plant and animal species face the risk of extinction due to barriers prohibiting them from moving upwards or northwards to more suitable habitats.
- Temperature increase particularly in mountain areas, leading to glacier mass decrease and resulting melt water, reduced snow cover, thawing of permafrost and changing precipitation patterns.
- Cities and urban areas (where much of Europe's population live) continue to be vulnerable to heat waves, flooding and droughts. These impacts are expected to have knock-on effects on infrastructure, public health and the economy of Member States.
- The Mediterranean basin has experienced decreased precipitation and increased temperature over past decades, and this trend is projected to worsen as the climate changes. The availability of water and hence crop yields could decrease while droughts, biodiversity loss, forest fires and heat waves may increase.
- The Arctic faces a continued accelerating decrease in summer sea ice cover. This trend is expected to continue.
- Temperature extremes are projected to increase and are considered likely to have significant impacts in Central and Eastern Europe. During summer, reduced precipitation, increased risk of droughts and higher energy demand are also anticipated. In winter and spring the intensity and frequency of river floods may increase as precipitation patterns change.
- Climate change may offer certain short- and medium-term opportunities in this region, such as increased forest growth in the northern regions as temperatures increase. However changing precipitation patterns and higher temperatures are projected to cause less snow and lake and river ice cover in northern Europe. At the same time, winter and spring river flows are expected to increase and the damage of winter storms is expected to increase.

the costs of adaptation are likely to be far less than the costs of inaction

It has been calculated that the costs of adaptation are potentially very large (possibly billions of euro per year in the medium- and long-term). Therefore current assessments suggest that timely and proportionate adaptation makes economic, social and environmental sense, simply put the costs of adaptation are likely to be far less than the costs of inaction. GHG emissions and climate change are the ultimate drivers of these projected impacts, but other factors relate specifically to the capacity to adapt. For example ensuring sufficient understanding of potential climate change impacts and the wide range of potential adaptation actions that can be taken represents a major barrier to effective adaptation. Adaptation actions that

are carried out without sufficient understanding of impacts and options are often unnecessary, ineffective, and can contribute to greater GHG emissions.

What's the policy response?

The concepts that define adaptation such as preparedness, resilience and vulnerability are not easily quantifiable, making it difficult to set hard and fast targets as in the case of climate change mitigation. In the EU, the focus is on integrating the need to adapt into all relevant policies and instruments and facilitating effective, consistent adaptation actions at Member State, regional and local levels.

- The European Commission adopted a **White Paper on Adaptation to Climate Change** in 2009 and plans to publish a Communication on Mainstreaming Adaptation and Mitigation in 2011. The White Paper recognises the importance of EIA in climate proofing - this guidance seeks to support the White Paper. The intention is to develop the knowledge base and options for mainstreaming climate change into key policy areas, and then to prepare a comprehensive EU adaptation strategy to be implementing in 2013-2020.
- Work has begun on an EU '**climate change impacts vulnerability and adaptation clearinghouse**', which will make it easier to find information on impacts and different adaptation approaches. The clearing house is to be operational by 2012. The clearinghouse will be maintained by the EEA and will collect and coordinate EU and national level data, vulnerability information and good practices in adaptation action. It will also provide simple and easy to use tools to orient users to the database and help them better understand vulnerability.
- **The last EU Budget Review** considered climate change and its policy to be considered amongst the tasks that require significant public spending, as part of the core objectives of the Europe 2020 Strategy. As such it is an active area of policy development where the EU is adopting a phased approach.

At a national level, many European countries, as well as a few regions and cities, have adopted adaptation strategies. The EEA keeps an overview of national adaptation strategies in its 32 member countries.[7]

For the latest research and policy developments relevant to climate change and the European Union visit the relevant web pages on DG Climate Action's website: http://ec.europa.eu/climateaction/

Key background documents on climate change adaptation

- European Commission (2009) White Paper on Adapting to Climate Change
- European Environment Agency (2010) Adapting to Climate Change
- European Environment Agency (2005) Vulnerability and Adaptation to Climate Change in Europe

[7] Available from: http://www.eea.europa.eu/themes/climate/national- adaptation-strategies

Biodiversity - overview of current status, trends and policy responses

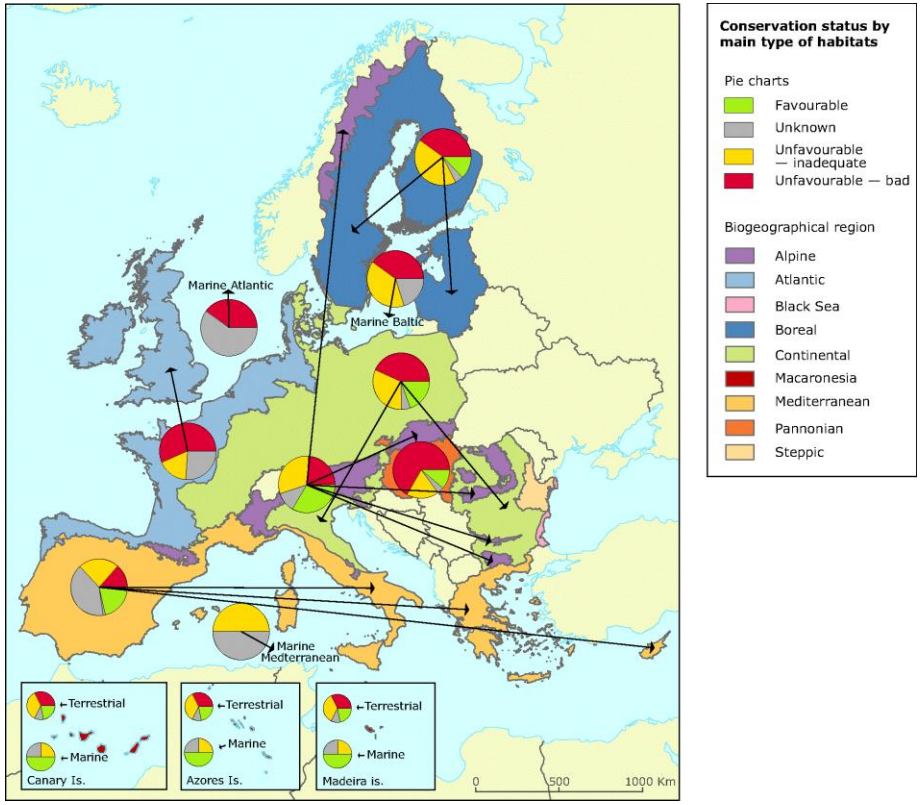
What are the current status, trends and key drivers?

Analyses have indicated that across the EU as a whole, despite some positive elements, the rate of biodiversity loss is still accelerating. This is illustrated in Figure 4 which shows the conservation status of habitats in the EU by biogeographical region. There are some positive elements within the Natura2000 network of designated sites, which has been credited with slowing the rate of biodiversity loss though protecting key species and habitats. However even many of these Natura2000 sites remain in an 'unfavourable' state and require improved management. It should also be noted that there is a great degree of uncertainty surrounding biodiversity and current trends, especially for individual populations of species within specific geographic areas, though there is no doubting the overall pattern is one of decline.

The main causes of biodiversity loss in Europe are:[8]

- **Habitat loss** – Europe experiences significant changes in land use but generally natural habitats are replaced by other systems such as intensive agricultural production systems and land abandonment and the construction of human developments and transport systems (causing fragmentation of habitats). These trends can be seen in Figure 5, where the continued loss of grassland and wetland habitats which are of particularly high biodiversity potential is of particular concern. Overall, it is considered that 70% of species are threatened by the loss of their habitat.
- **Overexploitation and unsustainable use of natural resources** - 30% of species are threatened by overexploitation. For instance: 88% of stocks are being fished beyond Maximum Sustainable Yields and 46% outside safe biological limits, which means that stocks may not replenish. Forestry as a sector is being managed more sustainably with general forest cover increasing, however its management is often focussed solely on yields, meaning many forests are increasingly homogenous and present few

Figure 4: Conservation status of assessed habitats in EU-25, by biogeographical region



Source: EEA (2010) Biodiversity Thematic Assessment

[8] The sources for this section are taken from: EEA (2010) Biodiversity Thematic Assessment; EEA (2010) Assessing Biodiversity in Europe; EEA (2010) Biodiversity: 10 Message for 2010; EEA (2010) Biodiversity Baseline Flyer

opportunities for species and biodiversity.

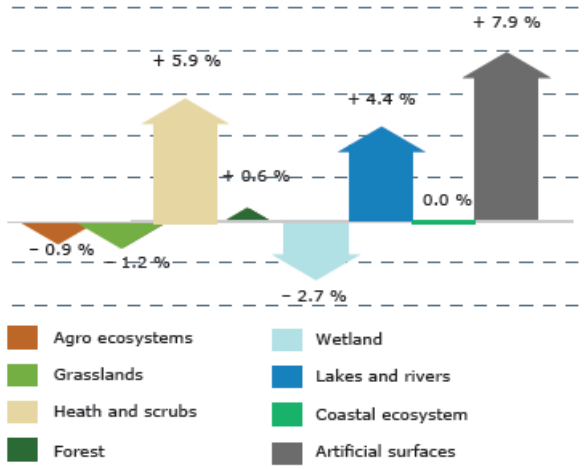
- **Pollution** - release of pollution and nutrient into the air, water and soil impacting on individual, population and ecosystem health. Despite some improvements in freshwater pollution (especially in rivers) there are still significant problems in coastal and lake environments, which are the final destinations for many of the pollutants we release. Moreover, 26% of species are threatened by pesticides, and fertilisers like nitrates and phosphates.
- **Invasive alien species** - this is an increasing phenomenon due in part to increased international trade and movement. More than 10,000 non-native species are now present in Europe – 10-15% of these are considered to have negative economic or ecological effects. It is considered that 22 % of species are threatened by invasive alien species.
- **Climate change** - shifts in habitats and species distribution are being observed as the climate changes, as are more severe climate impacts such as desertification (due to changing precipitation patterns). The impacts are predicted to be particularly severe in mountain environments. Climate change interacts and often exacerbates other threats to biodiversity (see below).

What's the policy response?

Biodiversity has been a core part of EU policy for over 20 years. Nevertheless, the overall trends are still negative and current policy considered to be ineffective – as shown by the EU's failure to achieve the target of halting biodiversity loss by 2010. In response to this, policy is increasingly seeking to expand upon the partial successes of site conservation and take a broader approach to biodiversity across the landscape including integrating the importance of the services we receive from biodiversity into decision making. There are a number of relevant legislative and policy tools:

- **The Habitat and Birds Directives** seek to protect sites of particular biodiversity importance – these sites form a network referred to as Natura 2000. Member States are required to designate and manage the Natura 2000 network sites on their territory. This includes ensuring that the status of the sites moves towards 'favourable' and reducing the impact of development. This is achieved in part through the use of Natura 2000 Assessments (see box).
- **The Convention on Biological Diversity (CBD)** is the major international agreement governing biodiversity policy. The EU and the Member States are all parties to this convention. Article 14(a) of the CBD requires the introduction

Figure 5: Changes in ecosystems between 1990 and 2006



Natural areas still being lost - the latest Corine Land Cover inventory (EEA, 2010) shows a continued expansion of artificial surfaces (e.g. urban sprawl, infrastructure) and abandoned land at the expense of agricultural land, grasslands and wetlands across Europe. Natural grasslands are still being turned into arable land and built-up areas. The loss of wetlands has slowed down (near 3 % lost in the last 16 years) but Europe had already lost more than half of its wetlands before 1990. Extensive agricultural land is being converted into forms of more intensive agriculture and is also being converted to into forests.

Source: EEA (2010) EU 2010 Biodiversity Baseline Flyer

Habitats and Birds Directive – Natura 2000 Assessments

Natura 2000 Assessment is required in accordance with Article 6(3) of the Habitats Directive. This form of assessment is a key process for assessing and regulating activities that may threaten habitats and species of Community interest within Natura 2000 sites.

of appropriate procedures requiring EIA of projects that are likely to have significant adverse effects on biodiversity (see Box).

- The main objective of the EU **Biodiversity Strategy 2020** '*Our life insurance, our natural capital: an EU biodiversity strategy to 2020*', is to '*halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss*'. There is also a target to protect, value and appropriately restore biodiversity and the ecosystem services it provides by 2050. Here the emphasis is on the essential contribution of biodiversity and ecosystem services to human wellbeing and economic prosperity, and avoiding catastrophic changes caused by the loss of biodiversity. The main targets include:
    - Full implementation of EU nature legislation to protect biodiversity
    - Better protection for ecosystems, and more use of green infrastructure
    - More sustainable agriculture and forestry
    - Better management of fish stocks
    - Tighter controls on invasive alien species
    - A bigger EU contribution to averting global biodiversity loss
- **Biodiversity Action Plans (BAPs)** detail how the Biodiversity Strategy is to be achieved. BAPs are present at the European level but also at the national and in some Member States local levels. These form the wider implementation framework for biodiversity beyond Natura 2000. BAPs at the Member State level include inventories of identified species and habitats, an assessment of the status of these species within the ecosystem, creation of targets for conservation and restoration and the establishment of budgets and timelines for achieving said targets.

For the latest research and policy developments relevant to biodiversity and the European Union visit the relevant web pages Environment's website: http://ec.europa.eu/environment/nature/biodiversity/policy/

Convention on Biological Diversity

Article 14(a) of the CBD states that *"Each Contracting Party, as far as possible and as appropriate, shall:*

*Introduce appropriate procedures requiring **environmental impact assessment** of its proposed **projects** that are likely to have significant adverse effects on **biological diversity** with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures".* (our emphasis)

Key background documents on biodiversity

- European Commission (2011) Our life insurance, our natural capital: an EU biodiversity strategy to 2020
- European Environment Agency (2010) Biodiversity
- European Environment Agency (2010) Assessing Biodiversity in Europe
- European Environment Agency (2010) EU 2010 Biodiversity Baseline

Interactions between climate change and biodiversity

The natural environment is intrinsically interlinked in ways that we are only starting to understand; these inter-relationships are particularly evident between climate change and biodiversity. This section does not attempt to fully describe the relationship between these two aspects, but there are a few key interactions that are directly relevant to EIA. To do this it is helpful to outline a basic framework within which these interactions operate– such as framework is provided by the concept of ecosystem services though other related concepts, such as resilience and environmental limits, are also relevant.

Ecosystem services as a framework for biodiversity – climate change interactions

The natural environment delivers a range of goods and services to society and individuals which directly contribute to our wellbeing by, for instance, cleaning our water, providing us with recreation and cultural spaces, protecting us from floods or other natural hazards. Biodiversity can be thought of as a central part of the system which provides these services that we are all dependent upon and it is essential to maintain the provision of these services. If this system is damaged or removed then the services we receive decrease and at some point will irreversibly stop. These thresholds or tipping points at which the damage becomes irreversible are generally poorly understood. This uncertainty around tipping points and the potential for harm to the public or the environment should they be exceeded is part of the reason why the precautionary principle is essential when considering biodiversity.

The value of biodiversity in terms of the services it provides to mankind is a human-centred argument for why we should care about biodiversity; an alternative argument is that animals and plants have an intrinsic right to exist. An ecosystem services approach is not inconsistent with this argument, but rather supports it by broadening the evidence base for why we need to maintain and enhance biodiversity.

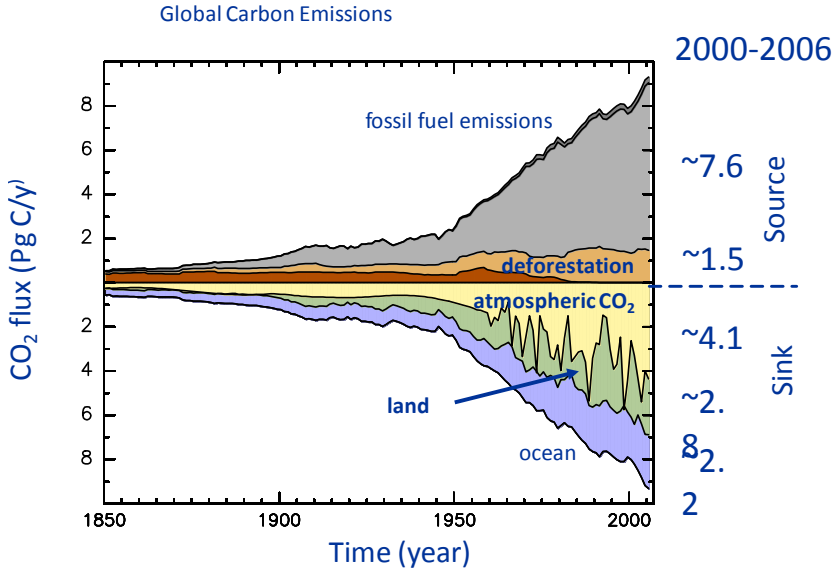
Two examples of the interactions between biodiversity and climate change are presented below:

- Supporting biodiversity delivers clear carbon benefits by enhancing the natural environment's ability to absorb and store carbon via soil and plant matter. Evidence suggests that healthy natural habitats such as soil, wetlands, and forests can sequester significant amount of carbon. Figure 6 shows the contribution that land as a resource makes

Ecosystem services

Ecosystems provide a number of basic functions that are essential for using the Earth's resources sustainably. The Economics of Ecosystem Services and Biodiversity (TEEB) study defines ecosystem services as: '*the benefits people receive from ecosystems*'. TEEB also sets out the basis of human dependence upon the natural environment. This European led study builds on the global Millennium Ecosystem Assessment.

Figure 6: Contribution of land to carbon sequestration



PgC/y = peta grams carbon per year

1 petagrams carbon = 1 gigatons carbon = 44/12 gigatons CO2 = 3.67 gigatons CO2

Source: DG Climate Action Synergies for Biodiversity and Climate Presentation

to carbon sequestration.[9] Damaging the biodiversity or physical environment of these areas can release this stored carbon, even indirectly, contributing to climate change as well as reducing biodiversity.

- Biodiversity and the natural environment also provide services which reduce the frequency and impact of extreme climatic events, which are predicted to increase in certain areas as a result of climate change. For example, well functioning green spaces can regulate storm water flow reducing the risk of flood events. Green spaces and vegetation also provide cooling within cities reducing the impact of heat waves and the urban heat Island effect and plants stabilise soils reducing the potential risks of landslides.

In addition to providing climate change specific services, biodiversity also provide a wide range of other services such as aesthetic, cultural and recreational spaces. Therefore, climate adaptation and mitigation and is based on biodiversity and ecosystems can have multifunctional benefits. Examples of this can be seen in Table 2.

Table 2: Examples of ecosystem-based approaches for climate change adaptation and mitigation

Climate impact	Ecosystem-based adaptation
Increased droughts	Use appropriate agricultural and forestry practices to increase the water retention capacity and mitigate droughts
Heat extremes	Increase green spaces in cities to improve the microclimate and air quality
River flooding	Maintain and restore wetlands and riverbeds which will act as natural buffers against floods
Increased fire risk	Cultivate diverse forests, which are more robust against pest attacks and present a lower fire risk

Source: European Commission (2009) Nature's Role in Climate Change

The relationship between biodiversity and climate change is not one way – the effects of a changing climate are already having an impact on biodiversity and ecosystem service provision. It is predicted that in the future climate change will be the single biggest driver to biodiversity loss next to land use change.[10] The impacts of climate change on biodiversity stem from the fact that species tend to evolve to a specific range of environmental factors such as temperature, moisture and. As these factors alter due to climate change, species need to migrate to stay in their optimum environment. Some species are more adaptive, such as those which are mobile and reproduce quite quickly. For others, this threatens their ability to survive and hence increases extinction rates and reduces biodiversity.

Environmental limits

The notion of environmental limits can be seen as defining the boundaries of sustainability. In effect the capacity of the environment. Two main types of environmental limit can be distinguished:

- **Threshold limits**: based on biophysical thresholds or breakpoints (mainly for environmental dimensions). For example pollutant levels may have small effects until a critical point is reached and results in significant acute impacts; and
- **Non-threshold limits**: established based on societal preferences. For example a landscape with manmade structures.

Source: SNIFFER, 2010

[9] The significant fluctuations are due to seasonal changes in photosynthesis rates, with more carbon being stored in the growing season of summer
[10] Millennium Ecosystem Assessment (2005) Synthesis Report

The ability of species to respond to this climate enforced migration is also limited by human activity – which has changed land uses and fragmented habitats. When roads, urban areas and agricultural land stand in their way, many species will find it almost impossible to migrate across the landscape. There is therefore a need to facilitate this natural adaptation process by, for example, creating migration corridors of natural habitats and reducing fragmentation, as well as reducing GHG emissions to reduce the overall likely impacts of climate change in the future.

Relationship between mitigation and adaptation

Climate change adaptation and mitigation are closely interrelated. While they are often considered as separate topics or policy fields, it is nevertheless critical to consider the interactions between them. Certain adaptation responses have clear mitigation benefits. An example is the creation of green spaces and planting trees in urban areas which not only sequester carbon but also reduce the urban heat-island effect - this delivers both GHG and adaptation benefits. Conversely, some actions can result in 'maladaptation' – actions that instead of reducing vulnerability to climate change actually increase it or reduce adaptive capacity. Examples of maladaptation include:

- Actions to cope with the effects of climate change that conflict with mitigation (for example energy intensive air conditioners if the required energy is provided by fossil fuels);
- Actions that use resources unsustainably (for example the over use of groundwater for irrigation in response to droughts); and,
- Actions that distribute the benefits of adaptation unequally across society (for example the prevention of climate change induced diseases only for affluent people).[11]

One of the roles of EIA is to manage these conflicts and potential synergies – this is considered in Part II.

***Maladaptation** is an action or process that increases vulnerability to climate change-related hazards. Maladaptive actions and processes often include planned development policies and measures that deliver short-term gains or economic benefits but lead to exacerbated vulnerability in the medium to long-term.*

[11] Taken from Guiding principles for adaptation to climate change in Europe ETC/ACC Technical Paper 2010/6

2. Why Address Climate Change and Biodiversity in EIA?

This section reviews some principles for EIA which are relevant throughout the Guidance, as they underpin the recommended approaches and techniques for integrating climate change and biodiversity into EIA. It is based upon the view that the "spirit" or intent of the EIA Directive is a preventive one, and that integration of climate change and biodiversity into EIA not only is integral to the requirements of the Directive, but also presents opportunities to enhance projects through greater resilience to the impacts of climate change. This section also outlines how EIA can help to deliver climate change and biodiversity objectives and how this in turn presents benefits for both the environment and project proponents.

The legal basis and "spirit" of the Directive

The EIA Directive contains a number of starting principles that provide a useful basis for considering climate change and biodiversity in EIA, even though the original Directive does not refer to either term explicitly. The Directive sets out unambiguously to prevent environmental impacts and pollution rather than merely counteract their effects, by undertaking EIA in order to assess likely significant effects of a project on the environment and take them into account as early as possible in all planning and decision-making processes. It is therefore the only formalised tool available to help integrate climate change and biodiversity into the planning process. The European Court of Justice has also consistently confirmed that the EIA Directive has *"a wide scope and a broad purpose"*[12] and therefore it needs to be interpreted in that light.

The Directive recognises "climate" by its inclusion in the topics to be assessed along with interactions between climate and other factors such as human beings, fauna, flora, soil, water, air, and the landscape (Article 3). The 1997 amended Directive subsequently added to these by including interactions with material assets and the cultural heritage. It also strengthened the need to avoid and prevent impacts through its specific reference to the precautionary principle, the need for preventive action and the polluter pays principle. Beyond this, the amended Directive also implemented the requirements of the UNECE Espoo Convention on EIA in a Transboundary Context, recognising the importance of consulting with the public in countries likely to be affected by development projects in another country. Climate change and contributing greenhouse gas emissions are, of course, inherently transboundary in nature. Importantly these issues are further emphasised in the latest amendment to the EIA Directive, in 2009, by Directive 2009/31/EC on the geological storage of carbon dioxide, including

[12] See Case C-72/95, *Kraaijeveld and others*, paragraph 31; Case C-227/01, *Commission v Spain*, paragraph 46.

Relationship between EIA and SEA

Strategic environmental assessment under the SEA Directive 2001/42/EC is carried out alongside certain plans and programmes that might have a significant effect on the environment and which set the framework for projects requiring EIA under the EIA Directive. There is therefore an explicit link between the two where SEA of plans/programmes should help ensure such documents provide a high level of environmental protection and support sustainable development. Environmental reports produced for SEAs should therefore provide very useful context on higher level policies and trends on climate change and biodiversity and therefore key issues, providing they have

projects not just for storage but also transport, and pipelines for transport, of carbon dioxide. Directive 2009/31/EC makes explicit reference also in its preamble to the UN framework convention on climate change and its aim to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, already established in the Sixth Environmental Action Programme.

Biodiversity is recognised in the EIA Directive initially through its reference to fauna and flora in the list of factors to be assessed. However, this too was made more explicit by the Amendment Directive 97/11/EC which made specific reference to the Birds and Habitats Directives 79/409/EEC and 92/43/EEC respectively, seen today as the bedrock of EU biodiversity policy. Annex III (screening criteria) of the Directive makes reference to the regenerative capacity of natural resources, of which biodiversity is an integral part. It also considers the absorption capacity of the natural environment, especially in relation to specific sensitive habitats which, if likely to be significantly affected, should be subject to EIA. Though not stated in those terms, these references to regenerative capacity and absorption capacity are fundamentally about using EIA to help ensure resilience of the natural environment to changes brought about by a project.

There is therefore no contradiction between the original EIA Directive and the need to consider climate change and biodiversity as integral factors in the assessment of significant effects. In fact, the Directive offers the opportunity not only to avoid negative impacts in terms of GHG emissions and loss of biodiversity, but also to build in positive benefits for climate change mitigation and adaptation, and the enhancement and restoration of biodiversity, while at the same time creating greater resilience of projects to future environmental change.

EIA as a means for delivering climate change and biodiversity objectives

EIA is a procedural and systematic tool that seeks to support the project planning and design process. For many types of projects, it is also the only legally required tool for the consideration of the environment at this early stage when alternatives are potentially still being considered and opportunities exist to avoid environmental effects and integrate environmental considerations into the project.

Certain characteristics of the EIA process mean it is particularly effective for the consideration of climate change and biodiversity. Not least, the requirements to engage and consult with key stakeholders as part of EIA process present an opportunity to consider a range of parameters which may not necessarily be included within the project design process. EIA

can therefore provide the mechanism to assess key issues effectively and transparently and bring opportunities to achieve wider objectives to light. For climate change this might include, for example:

- Understanding the potential GHG emissions from the project and potential alternatives to avoid or reduce these effects.
- Ways to improve the resilience of a project through considering possible implications of climatic changes on the project.
- Exploring the possible conflicts and synergies between climate change mitigation and adaptation and therefore avoiding maladaptation.

Benefits of considering climate change and biodiversity within EIA

EIA is not an end in itself; rather it is the appropriate approach for including environmental considerations within project planning and design. This guidance seeks to demonstrate that there are benefits to projects, project developers and society from incorporating climate change and biodiversity within project planning from the outset. Figure 7 shows a project's relationship with biodiversity and climate change as a cycle, which can be both positive and negative (positive elements are shown in green and negative in red).

Policy and other drivers

Clearly, as described previously the consideration of climate change and biodiversity within EIA will have the benefit of facilitating compliance with the Directive and relevant national laws on EIA. Moreover, climate change and biodiversity are the subjects of a large number of recent EU legislation, policies and strategies, including binding targets on Member States (see Section 1). EIA provides opportunities to ensure that projects are consistent with the requirements and the national, regional and local responsibilities they imply. Compliance with these objectives will support project planning and application for permissions.

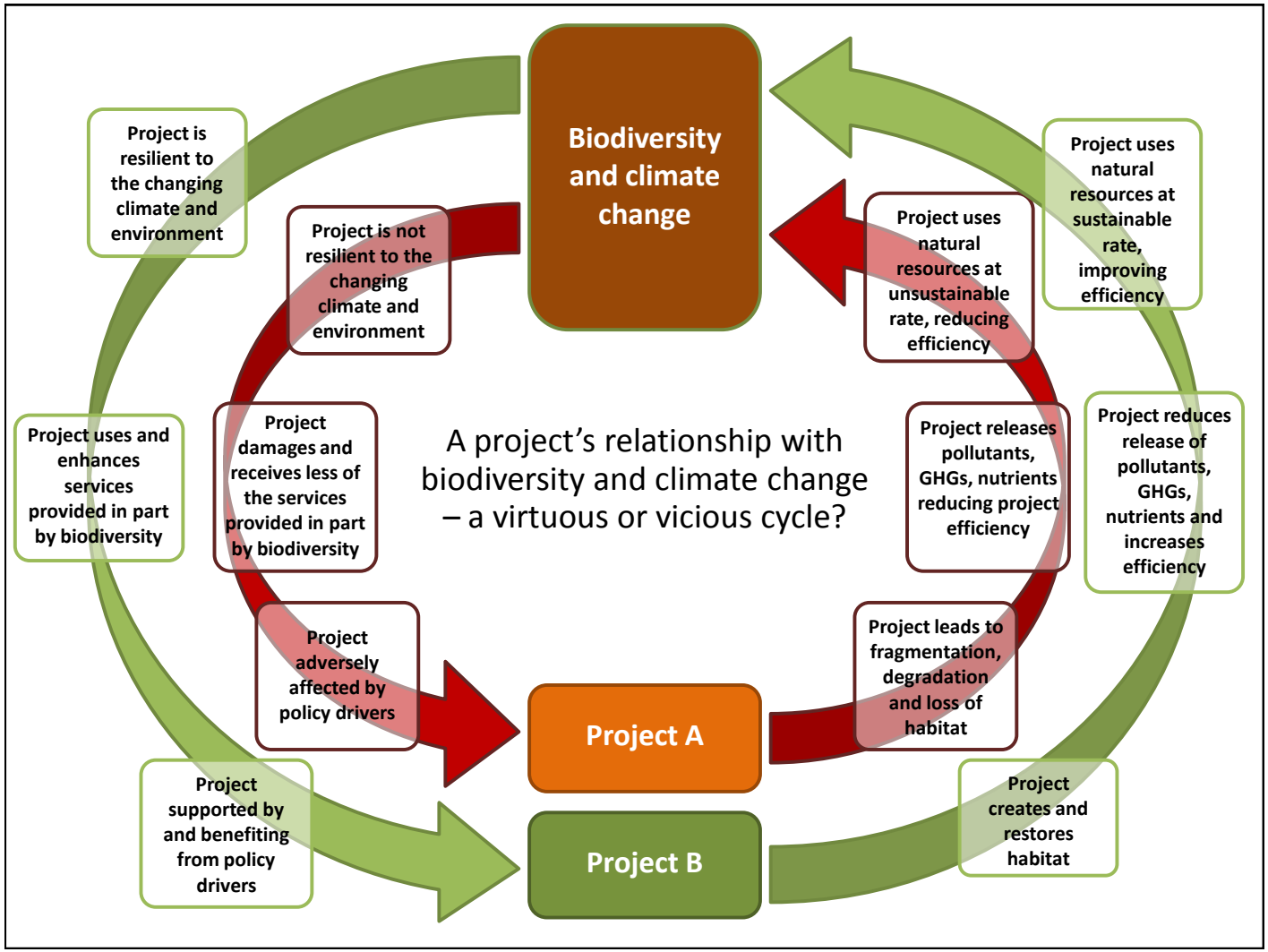
Beyond these public policy requirements, there is increasingly pressure from clients, local authorities and the general public to demonstrate that the project has minimal environmental effects if not positive environmental effects – as such there are reputational benefits. This is particularly true for GHG emissions, in part due to climate change concerns, but also because reducing GHG increases energy efficiency and tends to save costs.

Resilience of projects to a changing climate

A number of recent studies on the vulnerability of the EU and specific sectors and territories to the changing climate have shown that Europe's infrastructure needs to be more adapted to natural phenomena caused by the changing climate. This represents a shift in thinking from the traditional assessment of the impacts on the environment alone. Over the potentially long lifespan of a project the parameters of design at inception may not be valid as the climate changes. Insurance firms, for instance, are already recognising the value of this form of thinking and including it within their assessments of risks from natural hazards. EIA can allow projects to adapt to this through the concept of resilience.

Building resilience - the capacity of systems to cope with environmental change and recover from disturbance – is increasingly recognised as a key focus for adaptive management responses to climate change.[13] In the context of EIA this entails considering that a project operates within an evolving environmental baseline as such EIA needs to

Figure 7: Virtuous / vicious cycle – relationship between projects and climate change and biodiversity



[13] Resilience Alliance (2010) gives examples of environmental limits relevant to climate change and biodiversity

understand whether the project can operate within the changing baseline, how it will further affect it and how the project may respond. Adaptation should not be left until the end of project design – resilience needs to be built from the very beginning for projects that are likely to experience a significantly changing environment. More information as to how resilience can be built into EIA is considered further in Part II.

Ecosystem services received by the project

Ecosystem services provided by biodiversity also need to be considered as part of project design – for instance commercial and residential developments can also provide aesthetic, spiritual and cultural services offered by biodiversity through the incorporation of green spaces, water and other natural areas. The functionality and value (to the environment and project) of these areas can be improved by better recognising the role that biodiversity has in providing these benefits and making efforts to enhance biodiversity within such areas. However, the degree to which a project receives these services will depend largely upon the impact of a project on local and wider environmental limits.

Impact on environmental limits

Like climate change, biodiversity is a complex issue in part due to the importance of cumulative threats and pressures. A key part of this complexity within EIA is the fact that biodiversity and climate change often react in unpredictable ways to external pressures, and that the thresholds for sudden decline or collapse in biodiversity may be unclear. This requires environmental assessment processes to consider a wide range of related actions and impacts that may seem insignificant when considered individually. As with climate change, uncertainty presents the need to research and develop more resilient alternatives and "no regrets" solutions. There are three main potential pressures that a project may exert on environmental limits – the extent to which a project impact negatively on these will reduce the positive elements, described above, that a project receives.

Considering climate change and biodiversity within EIA should reduce the negative effects of the project upon these aspects of the environment, for instance by limiting fragmentation of habitat, emission of materials which harm biodiversity and GHGs, and the unsustainable exploitation of resources such as water and timber. Beyond reducing these negative impacts EIA has the potential to provide net gains in both biodiversity and by making project carbon neutral or negative can form a virtuous cycle where the project contribute to biodiversity improvement and GHG reduction and in return is more compliant, resilient and better provided with ecosystem services.

Biodiversity and Ecosystem Services Risks

- **Reputational risk**, especially concerning access to funding
- **Regulatory risk**, such as the expansion of protected areas or the strengthening of protected species legislation
- **Operational risk**, concerning the sustained provision of key inputs (e.g. clean water) or ecosystem services
- **Legal liability risk**, for example in the case of accidental damage to ecosystems or protected species
- **Systemic risk**, when a business or operation is overly dependent on a particular ecosystem service

Source: TEEB, 2010

PART II: GUIDANCE

This part provides an overview of the EIA process and an understanding of how climate change and biodiversity fit within the overall EIA process. It takes you through a sequence of key thematic questions:-

- *How to address the key challenges?*
- *What are the key climate change and biodiversity issues?*
- *How to assess the effects?*

The purpose of this part of the guidance is to provide advice on how to address the key challenges posed by climate change and biodiversity for EIA; how to identify the most relevant key issues in relation to a particular project, and how to assess the effects of a proposed project on climate change and biodiversity, and of climate change on a project.

3. The EIA process

Overview of the EIA process

This guidance does not seek to provide generic advice on undertaking EIA, rather it aims to illustrate key approaches, concepts, ways of thinking and tools which allows climate change and biodiversity to be better integrated into EIA. However, EIA is a procedural tool and there are certain generic steps that an EIA tends to go through. These are presented and briefly described here in Figure 8 to ensure consistency of approach for the users of this guidance. The generic EIA process shown here follows that outlined by the EIA Directive, but stages such as scoping and monitoring are either optional or not covered by the current EIA Directive, although they are recognised as important in best practice. This guidance is intended to support the EIA Directive while also encouraging best practice in considering climate change and biodiversity in EIA.

For more detail on these processes and for general guidance on implementing the EIA Directive see the further reading at the end of this document.

The Guidance is structured according to three key questions:

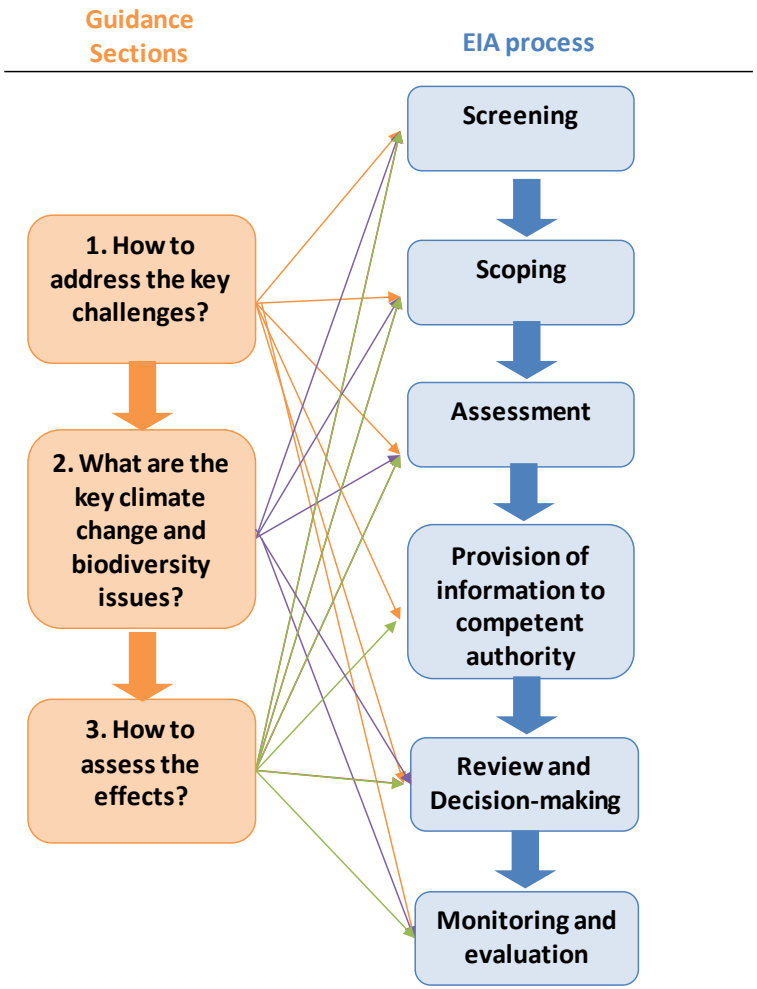
- How to address the key challenges?
- What are the key climate change and biodiversity issues?
- How to assess the effects?

Figure 8: The generic EIA process

EIA process	Description of stage
Screening	Determining if EIA is required at the initial stages of project inception based on an understanding of the potential significance of impacts drawing on the annexes of the Directive. (Annexes I, II and III)
Scoping	Optional but key stage to determine what biodiversity and climate change issues that need to be addressed within the assessment and collecting relevant data on the status of the environment. Platform for early engagement with stakeholders and experts.
Assessment	Predicting the likely changes to the environment as a result of developing the project and evaluating the significance of the potential effects, to include baseline trend analysis, alternatives, assessment and measures to reduce or remedy adverse impacts, or enhance positive effects.
Provision of information to competent authority	Provision of information to the competent authority (e.g. in an environmental impact statement) setting out the required information about the environmental impact of the proposed development, including information gathered during the earlier parts of the EIA process.
Review and Decision-making	Consultation with the public and other stakeholders. Examination of the results of the EIA by the competent authority (decision-maker) and other consultees including the public and NGOs. Results of review incorporated into decision making process and appropriate actions undertaken. And reasons given
Monitoring and evaluation	EIA follow-up, optional but important stage involving monitoring, auditing impacts of the projects and the implementation of mitigation measures and environmental management.

Figure 9 illustrates how each of the key thematic questions is relevant for most - if not all - of the key stages of EIA. However, some issues are likely to be more important for some stages than others and these are emphasised in the guidance below. In general it is better to consider climate change and biodiversity issues as early as possible in the EIA process, since that helps build these issues into the mind set of practitioners as a matter of course.

Figure 9: Topics of the guidance and the EIA process



4. How to Address the Key Challenges of Climate Change and Biodiversity in EIA?

A number of characteristics of climate change and biodiversity shape the way in which we need to look at them in the context of EIA:

- Long-term and cumulative nature
- Complexity
- Uncertainty

These characteristics influence how these topics are integrated into the EIA process, but are particularly relevant to the screening, scoping and assessment stages of the EIA itself, and for long-term follow-up through monitoring and evaluation. They are relevant also to report preparation and decision-making, but that should follow through if you have considered them at the earlier stages. Understanding the challenges climate change and biodiversity will pose to an assessment given their inherent characteristics, within the specific context of a particular project, will enable you to deal with them and communicate them more effectively through the EIA process. Table 3 below summarises how you might approach these three main challenges and each is discussed in more detail in the following sections.

Table 3: Recommended EIA approaches to meet the challenges of the characteristics of climate change and biodiversity

Key challenges to considering climate change and biodiversity in EIA	Recommendations for EIA approach
Long-term and cumulative nature of impacts	• Avoid 'snapshot' analyses and consider trends without and with the proposed project
Complexity	• Analyse impacts of development proposals on the key trends and their drivers • Work with worst-case and best case scenarios
Uncertainty	• Acknowledge assumptions and limitations of current knowledge • Base your recommendations on the precautionary principle • Prepare for adaptive management

Consider long-term trends without and with the proposed project

Climate change issues (mitigation and adaptation) are concerned with long term trends and often apparently imperceptible changes over normal EIA and planning horizons, except for the largest projects and infrastructure. The long –term nature of climate change makes it more difficult to consider within normal (short-medium) planning timeframes, but will be crucial to the long-term viability of projects. In particular it influences the baseline environment against which the project is being assessed. Major infrastructure projects in particular, given their long time span, are likely to become vulnerable to progressively more significant climate change impacts.

Biodiversity is also long-term in that biodiversity loss is recognised as a megatrend which in the EU we have failed to halt as intended by 2010 and now have a new target of 2020. Effects on biodiversity are cumulative over long time scales and once species or habitats are completely lost they cannot be replaced or recovered. This means that we need to avoid impacts wherever possible and make positive efforts to enhance and better manage existing biodiversity, not least because of the ecosystem services and benefits derived from biodiversity. What would no net loss of biodiversity mean for a specific project?

In light of the above facts, it is strongly suggested that EIA practitioners avoid 'snapshot' analyses (i.e. at a single point in time) and consider trends *without* and *with* the proposed project (and its alternatives). The cumulative aspects of climate change and biodiversity impacts are particularly important with regard to the evolving baseline. The current state of the environment will not necessarily be the future state of the environment, even if the proposed project does not go ahead. A snapshot of the baseline in current time is not therefore sufficient against which to evaluate a proposed project. An evolving baseline over time needs to be considered, which will entail understanding recent trends and likely future trends in key issues.

The current state of the environment will not necessarily be the future state of the environment, even if the proposed project does not go ahead.

Manage complexity by considering impacts of proposed developments on key trends and their drivers

Both climate change and biodiversity are complex issues because they involve complex systems and interactions between the biophysical environment and the human environment. The climatic system is still relatively poorly understood and the more we understand the more complex it can be seen to be. For example, forecast models of GHG emissions and climate change are still unable to account fully for feedback effects we understand, let alone those we do not yet know about. Since

Complexity

Impacts that may appear to have positive climate change mitigation benefits (such as renewable energy infrastructure) could impact on biodiversity, for instance via the effect of turbines on birds. Longer term negative effects might occur, for instance diverting water for hydro-electrical schemes could dry out and lead to the loss of carbon stored in wetlands as well as methane released from the reservoir.

we cannot fully understand some aspects of complex systems at the required decision point, we need to be able to work with what we have. At times this will require simplified models to give best estimates of emissions and impacts.

Both climate change and biodiversity operate at multiple scales, and this can cause specific challenges for EIA. The complexity of cause-effect relationships and impact interactions should not deter EIA practitioners from analyzing direct and indirect impacts of the proposed development on the trends in key issues. Conventional assessment approaches can be made more rigorous by asking two basic questions: Firstly, it is important to examine whether the proposed development is likely to have any significant direct impacts on the expected future state of the environment in the study area. Secondly, it is useful to know whether the proposed development can significantly alter drivers of trends in the key issues. Consideration of these direct and indirect effects of the proposed development should determine whether the relevant trends will reach any critical turning points or bottom-lines when major changes in the functioning of the ecosystem can be expected. In complex situation, EIA practitioners use best-case and worst-case scenarios to illustrate different futures states under various assumptions.

The judgment of impact magnitude and significance must be context-specific. For an individual project – a road scheme, for example – while its contribution to greenhouse gases may be insignificant at the global scale it may well be very significant at the local or regional scale in terms of its contribution to targets set at those levels for GHG reductions. Similarly, impacts on biodiversity will also depend on geographical and temporal scale of impacts and the sensitivity of the habitat or species concerned. For instance a project could have possible negative effects upon a relatively common species at the global level, but at the local level this could be the only viable population of that species. Both climate change and biodiversity therefore exemplify the importance of distinguishing between magnitude and significance as you should normally in EIA, but in these cases temporal and geographical scales may need to be much greater.

Acknowledge uncertainty and use precautionary principle for guiding project design and decision-making

Uncertainty exists within any decision making system but it increases with complexity and timescale. There may be uncertainty about what is already known (e.g. errors, or *known unknowns*), and there may be uncertainties due to what is not known at all (i.e. ignorance or *unknown unknowns*!). For EIA this becomes particularly relevant for large scale infrastructure that takes a long time in the planning and implementation and that is likely to be around over long time horizons - there is therefore a high degree of potential uncertainty. Uncertainties will exist regarding the impacts of the

Tips for dealing with uncertainty:

- ☐ Be comfortable with uncertainty; when seeking to anticipate the future you will never be able to be certain.
- ☐ You can gather more information which may be useful up to a point, but only if it is the appropriate information and it is feasible to fill an information gap. For more see Annex 1 on information needs.
- ☐ Scenarios are an effective way to deal with the uncertainty inherent within complex systems and imperfect data. They can present a range of possible outcomes or pathways. For more information on scenarios see Annex 2.
- ☐ Use proxy indicators if direct indicators are not available, e.g. trends in traffic levels if vehicle GHG emission data are not available.
- ☐ Think about risks when impacts are too uncertain.
- ☐ Monitor to improve adaptive capacity

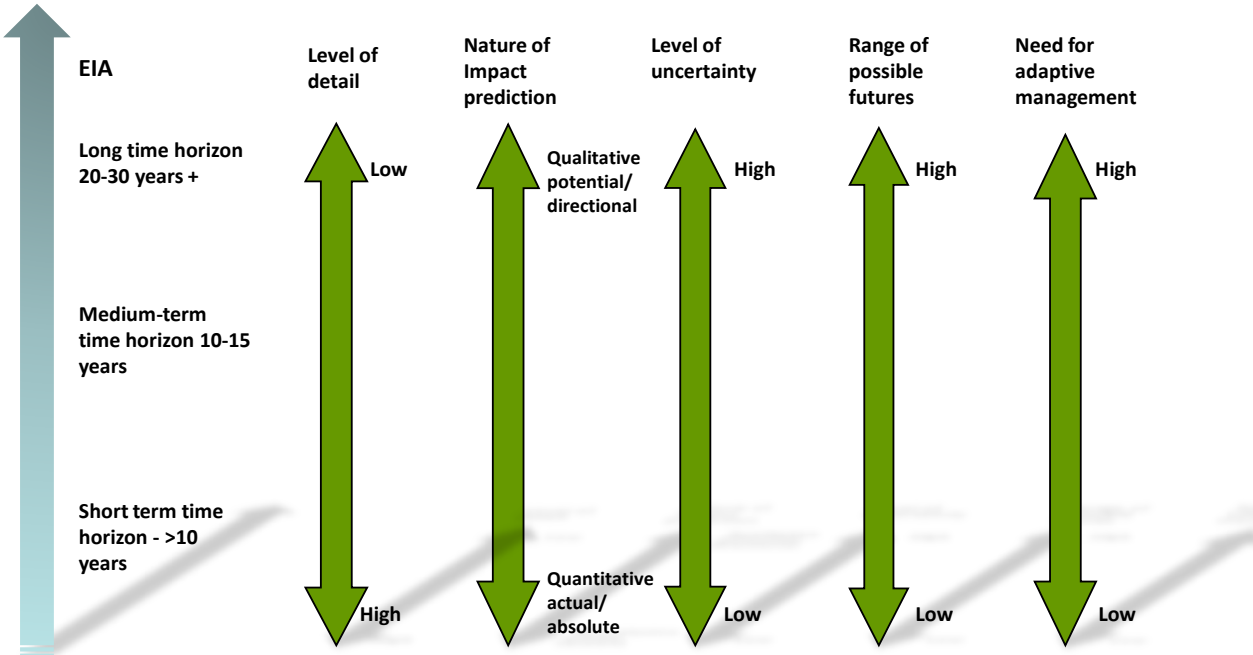
project upon biodiversity and climate change and also the impacts of changing biodiversity and climate on the project. Both sides of this coin need to be considered.

Many EIA practitioners - often with a natural or physical science background - will be used to working with quantitative data (from surveys, monitoring programmes, and modelling, for example), but feel less comfortable dealing with long-term uncertainty and therefore, by necessity a more qualitative approach (see Figure 10). However, being comfortable with uncertainty is essential when dealing with long-term climate change and biodiversity assessment, where we cannot *accurately* predict future impacts of a complex project in an uncertain world. We can however, consider possible future scenarios and their associated risks – to the environment and to the project.

There may be a high degree of uncertainty as to whether the significance of the impacts of the project, especially under Annex II of the Directive, is likely to be sufficient to require EIA (i.e. during screening). Does the project scale (e.g. design life and investment level) justify considering climate change risks and vulnerability? Could the project potentially be sensitive to climate change? If so what would that mean? This will require looking a long term trends, for example in biodiversity loss (species/habitat/genetic) to establish the sensitivity of receptors or habitats. Looking forward into the future will also help establish things like the increasing susceptibility of biodiversity to the impact of the project and the project to climate change (and potentially to changes in biodiversity caused by climate change, e.g. the increase in alien species).

Uncertainty therefore needs to be factored in to scoping – for example, temporal boundaries may need to be longer than normal; spatial boundaries may need to be greater for certain species. What climate variables and aspects of the project need to be assessed to address climate change and biodiversity? What expertise is

Figure 10: EIA – embracing uncertainty in long-term futures



needed on the project team to do so? What information is available or needed (see Annex 1)? In so doing you are likely to be thinking about and assessing risks, because impacts themselves may simply be too uncertain to have sufficient confidence in your predictions.

The assessment, therefore, should always acknowledge:

- The assumptions behind the assessment (i.e. under what circumstances can an impact occur);
- likelihood of the impact (i.e. probability that the impact will occur);
- uncertainties that constrain more precise assessment; and
- prepare for adaptive management (what measures can be put in place to respond to future changes)[14].

The choice of the project alternatives and mitigation measures should be guided by the precautionary principle. This includes thinking about the most appropriate kinds of alternatives and mitigation measures that can help build resilience into the project in the context of the evolving environmental baseline and preparing early warning systems and responses to potentially significant adverse effects. An ongoing environmental management plan (EMP) becomes more of a necessity rather than simply best practice, if you are to implement, monitor, evaluate and adjust effectively for resilient projects.

Summary

Climate change and biodiversity have certain characteristics that present a challenge within EIA – how this may be addressed and what stage of the assessment these might be relevant to are tackled further below. All these issues - long-term and cumulative nature, complexity, uncertainty, and adaptive management - may influence your choice of assessment tools and techniques, e.g. use of modelling, scenarios, risk assessment, public engagement processes etc.

Adaptive management

The EIA directive is quite explicit in Annex III about the need to consider the regenerative and absorption capacity of natural resources and the natural environment when considering whether a project is likely to have significant effects on the environment. This is consistent with a resilience approach to assessment. Having considered the resilience of different alternatives, build into the selected alternative adaptive capacity (flexibility and responsiveness) and adaptation measures (specific measures to moderate harm or exploit opportunities). Adaptive management is all about being responsive in the light of lessons learned.

(Further guidance on adaptive management can be found at http://www.for.gov.bc.ca/hfp/amhome/Admin/index.htm)

[14] See for example guidance on adaptive management produced by British Columbia's Ministry of Forests, Land and Natural Resource Operations at http://www.for.gov.bc.ca/hfp/amhome/Admin/index.htm

5. What are the Key Climate Change and Biodiversity Issues?

This section looks at the scope of climate change and biodiversity issues in EIA and how to identify which ones are appropriate for consideration in any particular context. It is structured around three key recommendations:-

- Use stakeholders early to help identify the key issues;
- Understand the key climate change issues, as well as how climate change interacts with the other topics to be assessed in EIA; and
- Understand the key biodiversity issues, as well as how biodiversity interacts with the other topics to be assessed in EIA.

Use stakeholders early to help identify the key issues

Identifying the key issues from a climate change and biodiversity perspective early in the EIA process is critical to ensuring those issues are assessed effectively throughout the rest of the EIA process. Early participation of targeted stakeholder groups and institutions as well as the wider public at an early stage is therefore essential to ensure you capture the most important and relevant issues. Somewhat uniquely perhaps, climate change and biodiversity have very vocal stakeholders with a high profile within the wider political context.

Early engagement is likely to help improve compliance with the Directive, but also make use of stakeholder knowledge and opinion to highlight potential areas of contention and areas of improvement in a timely and effective way. Engaging proactively with stakeholders can also help build climate change mitigation and adaptation measures and/or biodiversity enhancement schemes into the proposed project from the very beginning of planning.

The wide range of sectors and actors involved in climate change complicates the process of consulting the correct authorities and stakeholders when carrying out EIA. The EIA Directive requires consultation of authorities with "specific environmental responsibilities" covering the project in question. These are typically defined by the Member States as ministries or specialised agencies for environment, but climate change issues often require a different perspective, including authorities responsible for energy, transport, health and economic sectors. Again, here EIA can help project developers and experts to

Tips for determining which types of effects are relevant:

- ☐ When considering the potential effects on biodiversity (and on potential carbon sinks) draw out the considered sphere of influence of a project. This should include direct, indirect and cumulative effects and be informed by consideration of ecosystem chains.
- ☐ Consult with relevant stakeholders early to identify potential cumulative effects.

better define the range of authorities and stakeholders that need to be part of climate change-related decision-making, and to get them involved early in scoping out the key issues.

A series of key questions can be used to help identify which aspects might be most relevant. Annex 3 provides a set of questions and issues to help you think through those that might be most relevant in any situation.

Understand the key climate change issues to be assessed in EIA

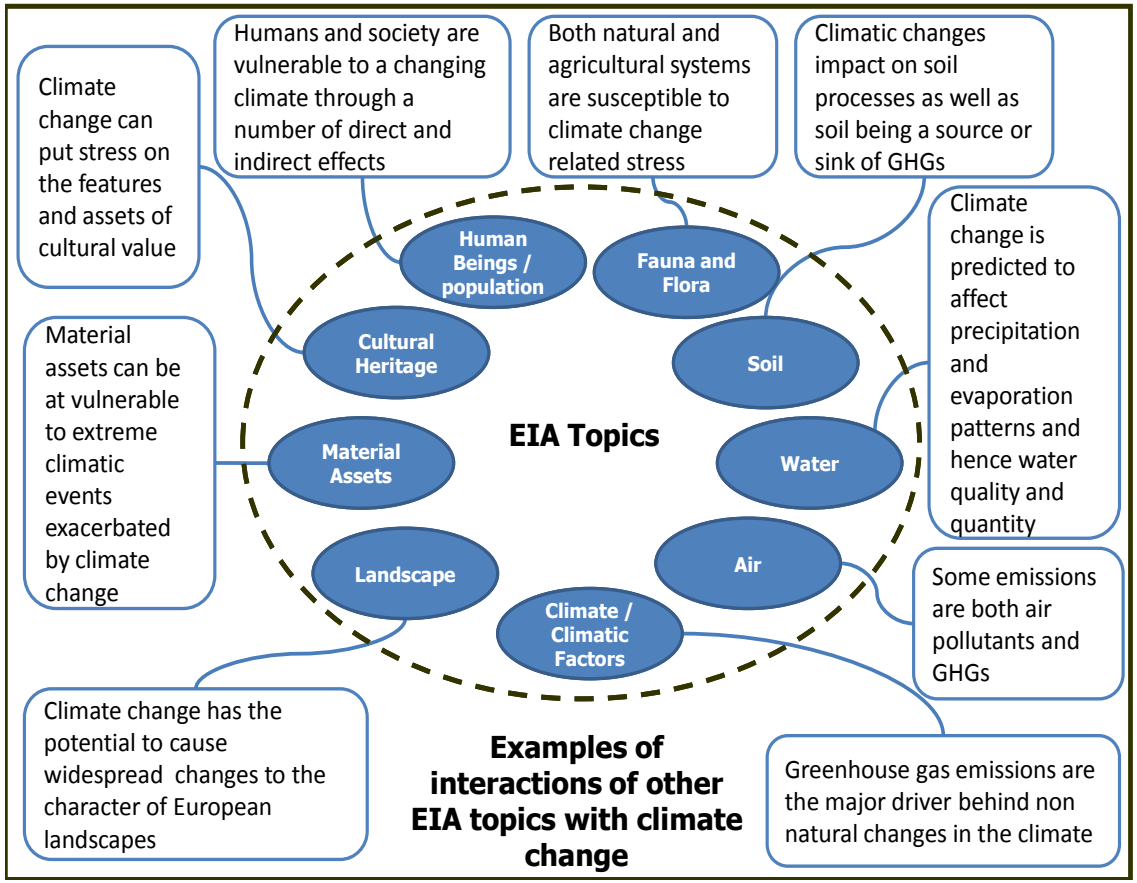
The starting point for considering **climate change** in relation to your EIA is likely to involve considering climate scenarios and what the implications of those might be for the project. Key issues of concern are likely to be around GHG emissions for mitigation, and adaptive measures needed to deal with anticipated extreme weather events and other impacts resulting from climate change. For climate in particular you need to consider not just the impacts of the project on climate and climate change, but also the impact of climate change on the project (see Annex 3 for key questions you might need to consider).

So how is climate affected by development? And how may development be affected by climate change?

Among other things development may lead to:

- GHG emissions;
- Demand for energy (and therefore GHG indirectly);
- Embedded GHG emissions (through energy used in materials, manufacturing and processing; transport etc.);
- Loss of habitats that provide carbon sequestration;
- Impacts on landscape and habitats that affect local microclimate (e.g. construction of major water bodies).

Figure 11: Examples of interactions between the other EIA topics and climate change



Some of the things that may affect development are:

- Increased flood risk, sea level rise, storm surges;
- Drought;
- Heat waves;
- Strong winds and storms.

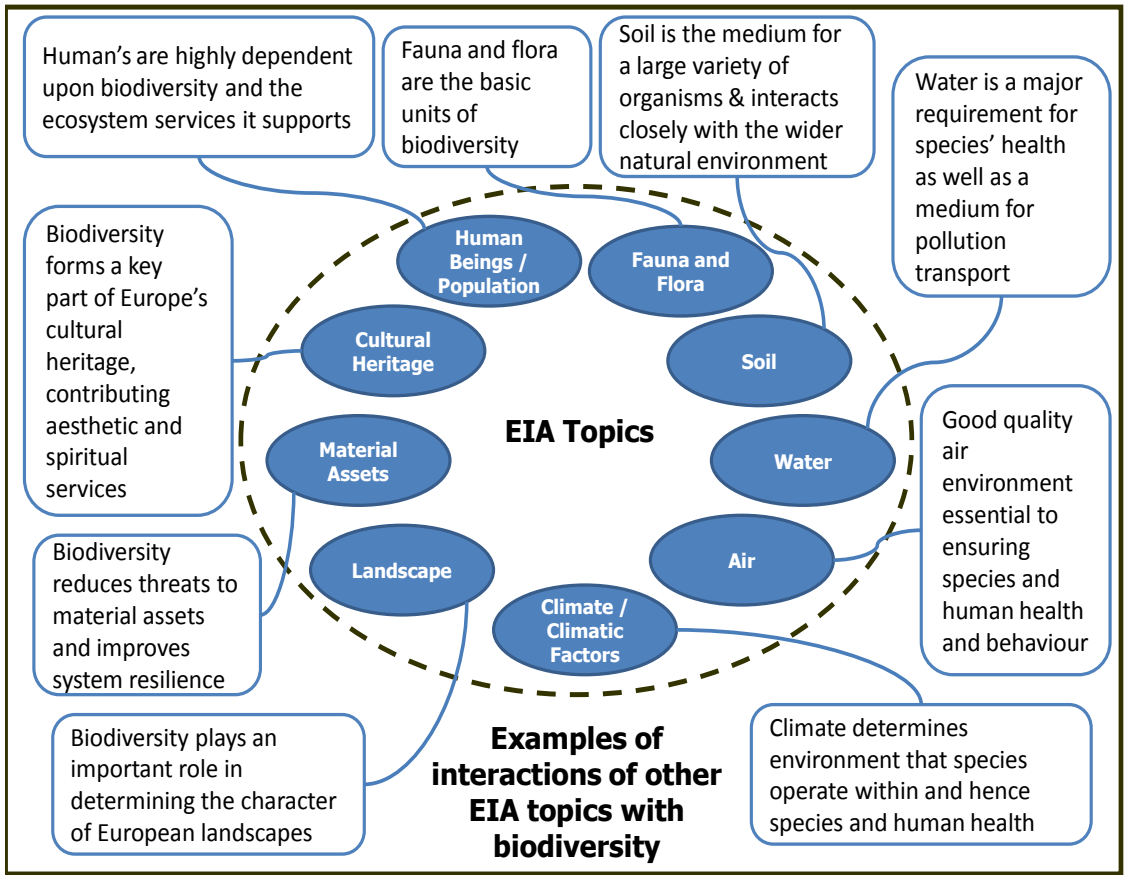
Figure 11 illustrates how climate change fits within the overall set of environmental topics to be considered in EIA.

Understand the key biodiversity issues to be assessed in EIA

How is biodiversity affected by development? Among other things development may lead to:

- Habitat loss and degradation, e.g. the destruction of wetlands, grasslands and forests for housing and industrial development;
- Habitat fragmentation - ecosystems and their species need a certain amount of interconnectivity for processes to continue. Breaking a natural area into smaller pieces, means that eventually species disappear and certain functions are lost;
- Loss of species, e.g. the plants and animals endemic to a particular habitat will not be able to survive if that habitat is destroyed or altered by development;
- Natural environmental processes, such as continued river flow, water purification, coastal sediment transport, and erosion control, are altered which can have a long term impact on habitat and species;

Figure 12: Examples of interactions between the other EIA topics and biodiversity



- Direct impacts, for example birds colliding with power lines, wind turbines;
- Alien invasive species that can transform natural habitats and disrupt native species;
- Pollution effects on ecosystems and species.

For biodiversity key concerns should centre on ensuring no net loss of biodiversity and how other EIA topics can support or enhance this aim (see Figure 12).

Impacts on biodiversity are best investigated by a specialist ecologist, botanist, zoologist etc., though at the early stages of EIA, such as scoping, ecologists who can take a broad look across the ecosystem can identify areas where more specific specialists need to be brought in for later detailed assessment work.[15]

IAIA's guiding principles[16] refer to the use of biodiversity 'triggers' for screening; using scoping as an opportunity to raise awareness of biodiversity concerns and discuss alternatives to avoid or minimize negative impacts on biodiversity; and the need to address biodiversity at all appropriate levels and allow for enough survey time to take seasonal features into account.

The *CBD Voluntary Guidelines on Biodiversity-inclusive EIA and SEA*[17] recommend the identification and mapping of valued ecosystem services so that these can help influence the type of alternatives and mitigation measures considered.

In scoping out the key issues for EIA it will be appropriate to consider any strategic environmental assessments (SEAs) that have been undertaken at higher decision-levels that might have an influence on the scope of the EIA and on climate change and biodiversity aspects of the evolving baseline (see box). Similarly, in relation to EIA where Natura 2000 sites might be affected, has there already been a Natura 2000 assessment undertaken under Article 6 (3) of the Habitats directive (see Box).

Relationship between EIA and SEA

Strategic environmental assessment under the SEA Directive 2001/42/EC is carried out alongside certain plans and programmes that might have a significant effect on the environment and which set the framework for projects requiring EIA under the EIA Directive. There is therefore an explicit link between the two where SEA of plans/programmes should help ensure such documents provide a high level of environmental protection and support sustainable development. Environmental reports produced for SEAs should therefore provide very useful context on higher level policies and trends on climate change and biodiversity and therefore key issues, providing they have

Relationship between EIA and Habitats Directive Article 6 assessment

Article 6 of the Habitats Directive requires a site- specific conservation assessment when a plan or project is likely to have an adverse effect on the conservation status of a Natura 2000 designated site. There is therefore a clear link to EIA, but EIA has a wider environmental remit. In some cases the assessments are combined, or data and information from the Article 6 assessment for the Natura 2000 site.

[15] www.ewt.org.za
[16] IAIA (2005), *Biodiversity in impact assessment*, Special Publication Series No. 3, July 2005.
[17] CBD/IAIA (2006), *Biodiversity in EIA and SEA - CBD Voluntary Guidelines on Biodiversity-inclusive EIA and SEA, Background document to CBD Decision VIII/2.*

6. How to Assess Effects Related to Climate Change and Biodiversity in EIA?

This section addresses specific tips, tools and methods for assessing effects related to climate change and biodiversity throughout the EIA process. It focuses on a number of key aspects of EIA where climate change and biodiversity are likely to have most resonance and where proper consideration can have most effect and the tools and techniques available for assessing climate change and biodiversity:

- Start with evolution of the baseline;
- Assess alternatives that make a difference in terms of climate change and biodiversity impacts;
- Assessing climate change and biodiversity cumulative effects; and
- Seek to avoid impacts.

The sections below look at the practical elements of EIA where climate change and biodiversity considerations are most relevant and examples of techniques that are most helpful. They draw on the overarching frameworks discussed in Part I – ecosystem services, resilience, and environmental limits. The techniques suggested can often be used at different stages of EIA so their appearance as illustrative examples of a particular stage does not limit their usefulness to that stage.

Start with evolution of the baseline

The evolution of the baseline – how the current state of the environment will change in the future - is critical to be able to understand how the proposed project might impact on that environment. Incorporating climate change and biodiversity at this stage also helps to ensure these issues are considered further throughout the assessment.

The baseline environment will be a moving baseline, in particular for large projects. It may take 20 years or more before a development is operational, and in that time biodiversity in the affected area may have changed, and the area may be subject to different climate impacts, such as storm events, increased flood risk, etc. So the project may need to be designed to withstand very different environmental conditions from the current ones.

Essential in looking at the evolving baseline is a consideration of:

Case study e.g. reservoir project

To be added

- **Trends in key indicators** over time, e.g. GHG emissions, indices of vulnerability, frequency of extreme weather events, key species such as farmland birds, status of habitats or protected areas. Are these trends continuing, changing, or levelling out? Are there environmental outlooks or scenario studies available that have looked at the likely future direction of these trends? If data is unavailable for certain indicators are proxy indicators available, e.g. if air quality monitoring data is not readily available for an urban area, are there data relating to trends in traffic flow/volumes over time?
- **Drivers of change**, e.g. major policy drivers at international, European, national, local level; global megatrends; socio-economic drivers such as the regional economy, usually broken down into:
    - Direct drivers – e.g. changes in land use and land cover; fragmentation and isolation; extraction, harvest or removal of species; external inputs such as emissions, effluents, chemicals; disturbance; introduction of invasive, alien or genetically modified species; restoration.
    - Indirect drivers – e.g. demographic, socio-political, economic, cultural, technological processes or interventions.
- **Thresholds/limits**, e.g. have thresholds already been breached (such as air quality thresholds in urban areas), or are limits expected to be reached? Are there tipping points to be avoided or catastrophic shifts?[18]

When developing the baseline against which the project is to be evaluated it is also important to acknowledge uncertainty (see Section 4 above) – depending on the timescale and spatial scale being considered some uncertainty is inevitable and this will increase over larger scales. A qualitative description of trends is perfectly valid in such situations. This can be done using terms such as 'strongly suspected' or 'suspected' – terms used by IPCC in their Fourth Assessment report (2007).

Vulnerability assessment is helpful when taking a resilience approach to climate change and needs to be built into any effective assessment of the evolution of the baseline environment, and of alternatives – how will the environment change without implementation of the project, and in relation to different alternatives?

Major infrastructure projects in particular will be vulnerable[19], for example:

- Increased flood risk to fossil fuel and nuclear power sites and electricity substations;

Illustration - adaptation

Possible climate impacts include hotter summers leading to melting of tarmac, or on railways – buckling of rails under heat. Cold winters lead to cracking and maintenance demands on roads, freezing of points, snow intake into train engines etc…. For possible information sources as to climate change impacts see Annex 1.

[18] Note: you can find examples of environmental limits relevant to climate change and biodiversity at http://www.resalliance.org/index.php/thresholds_database

[19] HM Government (UK) (2011), *Climate Resilient Infrastructure: Preparing for a Changing Climate* - Summary Document, at http://www.official-documents.gov.uk/document/cm80/8065/8065.pdf

- Reduced availability of cooling water for inland power stations;
- Reduced quality of wireless service from increased temperatures and intense rainfall;
- Increased floods risk to all transport sectors;
- Increased scour of bridges from intense rainfall/flooding;
- Reduced security of water supply from changing rainfall patterns;
- Increased flood risk to wastewater infrastructure.

Sewage treatment systems, for example, can be vulnerable to climate change, e.g. combined sewers subject under heavy rainfall conditions to overflowing and releasing sewage effluent and contaminated flood waters into river courses. Projects undertaking EIA that will place future demands on the sewerage system will need to take account of the capacity of the system to cope not just with the expected sewage effluent/disposal requirements of the project, but also its capacity in the long term and in the face of climate change. Biodiversity considerations may also be particularly relevant if, for example, river courses carrying sewage effluent discharge into estuaries designated as being of importance for biodiversity.

For biodiversity, the Institute of Ecology and Environment Management (IEEM)[20] in the UK recommend the following considerations when establishing the baseline from the point of view of biodiversity:-

Designated sites

- Are there any sites designated for nature conservation that fall within the zone of influence?
- Does the project affect any sites likely to be designated in the foreseeable future?
- Is there any policy presumption in favour of habitat protection/creation/restoration in the area?

General ecological considerations

- What ecological features at or above the defined threshold level of value may occur within the zone of influence?
- What are their distribution and status elsewhere for comparison>?
- What were their historical distributions, status and management compared with the present?

Case study: Climate and energy requirements in Austrian EIA procedures

In Austria, project developers are required by a 2009 regulation to provide information on how the proposed project has considered energy demand and flow, energy efficiency, GHG emissions and measures to reduce emissions and improve efficiency. The regulation is accompanied by a guidance document issued by the Austrian government to help project developers and EIA practitioners to better understand and comply with the regulation.

(see Annex 4 for further information)

[20] IEEM (2006), *Guidelines for Ecological Impact Assessment in the UK,* at http://www.ieem.net/ecia/.

- What are their scales of variation, vulnerability and likely exposure to the project?
- What are the key ecological processes or species activity periods; are there seasonal variations in distribution, abundance and activity?
- Are there any species, the disappearance of which would have significant consequences for others?
- Are there any other projects planned within the same area or time-frame that may contribute to cumulative effects?

Annex 2 suggests relevant tools and methodologies that can assist in consideration of the evolving baseline in EIAs.

Assess alternatives that make a difference in terms of climate change and biodiversity impacts

Alternatives in EIA are often considered to be at the heart of the EIA process, as they provide confidence that the proposed course of action is the best one available. While higher level decisions and/or processes may impose constraints on the types of alternatives that can be considered (e.g. site selection is pre-determined in a land-use plan or transport strategy), it is nevertheless useful to consider alternatives from project conception stage. In this sense, a hierarchical approach to assessing alternatives is helpful:

1. Is the project needed (could the objectives be achieved by some other means)?
2. If so, what mode or process?
3. Where should it go (alternative locations)?
4. How should it be implemented (timing, procedures etc)?

Climate change and biodiversity require a number of additional considerations if they are to be addressed effectively within EIA, particularly if consideration of long-term resilience – of the environment and of the project – is to be built into the EIA process.

The consideration of appropriate alternatives should be built into each step of the hierarchical approach above, so that for each question above (1-4) you should consider alternative approaches that:

- Result in no net loss to biodiversity and/or seek to restore biodiversity; and

Case study: Via Baltica

Lack of consideration of biodiversity issues up front in the scoping stage of an EIA for a road construction process resulted in failure to develop and assess suitable alternatives for the project, and a subsequent formal complaint and legal action against the project which eventually halted construction. Alternative routes were assessed and agreed upon later, but the process resulted in several years of delay and considerable added cost.

(see Annex 4 for further information)

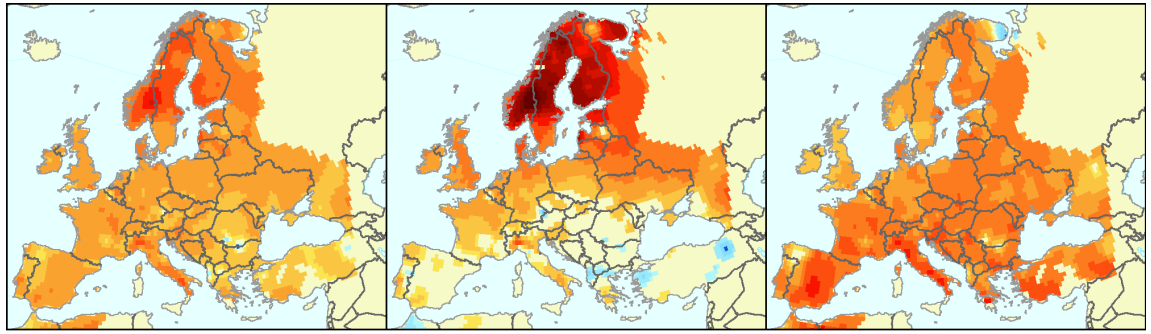
- Consider the context of different climate change scenarios and climate impacts, and possible alternative futures (see Annex 2, Scenarios)

Vulnerability assessment, as outlined under evolution of the baseline above, should also be used in evaluating alternatives in order to help identify and select the most resilient alternative(s). With respect to climate change mitigation this is likely to include considerations of energy demand and flow, energy efficiency, GHG emissions and perhaps the use of carbon calculators as one basis for comparing alternative options. Apply the precautionary principle when considering risks and adjust your proposal rather than seek to defend it against all future climate change impacts. This is fully consistent with the requirements of the Directive to *'avoid, reduce or remedy'* environmental effects.

Some examples of what to consider when assessing alternatives are provided in Annex 3.

Assessing climate change and biodiversity cumulative effects

Assessing cumulative effects is often seen as difficult enough already without having to factor in changes due to climate change over a long time scale. However, the key to the consideration of cumulative effects is to recognise their importance as early as possible in the EIA process. You should, for example, already be considering potential cumulative effects with respect to biodiversity, through the ecological assessment part of the EIA. Given the extent of ecological interconnectivity, biodiversity effects will inevitably involve cumulative effects. Different project components and processes will contribute to negative impacts on biodiversity, e.g. by breaching certain thresholds or environmental limits. Individual impacts may not be significant to tip populations/communities over the edge, but cumulative impacts may be. So the key here is to understand how individual seemingly insignificant effects may combine to result in a significant effect and that may best be achieved by talking to the right stakeholders as early as possible (see below).



The cumulative aspects of climate change and biodiversity impacts are particularly important with regard to the evolving baseline. The current state of the environment will not necessarily be the future state of the environment, even if the

proposed project does not go ahead. The climate and the species that make up the natural world are both in a constant state of flux driven by different mechanisms, but sharing a dynamic nature. Biodiversity and the organisms it constitutes are considered to be in a state of succession, i.e. a change in species composition in response to different environmental contexts. In part species alter the environmental conditions and in doing so change which species are favoured. For example, if grass species colonise an area of poor soil they serve to stabilise the soil, add organic matter through their death and over time improve the suitability of the soil for other species such as shrubs and ultimately trees. This is also partly a passive response to physical changes such as sea level rise or changing climate space (the space in which the climate is suitable for a particular species).

This is critical for EIA as over a longer time span the nature and type of the habitats will alter, meaning that what was for instance initially a poor quality brownfield site may become a wooded area or what was once high value grassland, because of changing management practices, becomes a degraded shrub area. In particular this needs to be considered within mitigation and monitoring measures to ensure appropriate management of high value habitats. This issue is exacerbated by climate change – which increases the rate of change in the environment. An adaptive management response to this may be to provide buffers in certain areas potentially threatened by sea level rise, or facilitating migration through corridors and ecological networks.

This evolving baseline has implications for projects as well; a changing climate may mean that the design and operational management of a project are meant for a certain climate scenario which will no longer be relevant in 20 years' time. For instance warmer summers may increase the susceptibility of materials to heat deformation or increase the risk of wildfires to a project. Considering potential impacts such as these are a unique challenge of climate change within EIA.

Causal chains/network analysis can be particularly helpful in trying to understand the interactions and associated cumulative effects between specific elements of the project and aspects of the environment. The point is not to be comprehensive, but to understand what might be the most significant cumulative effects. These may often be best identified through discussions with stakeholders who can help work through potential pathways in causal chains.

As in EIA generally it is important to distinguish between magnitude and significance – a large magnitude impact may not be significant if the species affected is common, widely distributed and readily able to recover, but a small magnitude impact may be very significant to a highly sensitive or rare species or habitat. The scale and nature of the impact and the sensitivity, abundance and distribution of the receptor all need to be considered in evaluating significance. Significance criteria should be developed from existing policy and guidance documents, such as biodiversity strategies; biodiversity action plans for habitats and species; international, national and local designations, legislation and/or using an ecosystems approach by

Case study: Ecosystem services approach in EIA M6 Heysham Link Road, UK

A 2007 study examined ways in which an ecosystem-based approach (EBA) could be applied to the EIA of a link road development project in North West England. The study recommended that the concept of ecosystem goods and services should replace the more fragmented, topic-based approach taken by the EIA for the project, in order for the project to be sustainable in the long-term. Well-planned stakeholder participation was also seen as crucial to identify the benefits arising from local ecosystem goods and services, assess their "value", and ensure that they are secured into the future. Furthermore, extending the scope of the EIA beyond the immediate siting of measures and infrastructure may be required to adequately map and quantify the supply and quality of ecosystem goods and services.

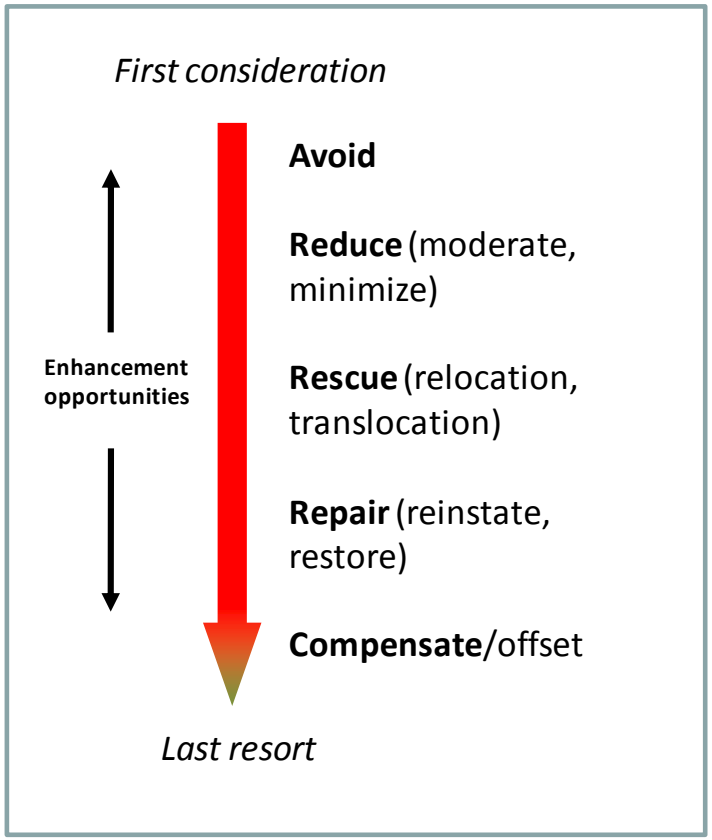
(See Annex 4 for further information)

identifying the valued ecosystem services and how those will be affected by drivers of change over time (see M6 case study, right).

Seek to avoid impacts wherever possible

The EIA Directive requires a description of measures envisaged to avoid, reduce or remedy significant effects on the environment. This establishes a clear hierarchy in the way in which impacts should be first avoided and then mitigated (reduced or remedied). In assessing biodiversity impacts there is a recognised hierarchy of mitigation (see Figure 13) which seeks to ensure residual impacts are reduced to zero while maximising opportunities for positive enhancement:-

Figure 13: Mitigation hierarchy



For climate change it is therefore preferable and consistent with a precautionary approach to avoid GHG emissions in the first place, rather than to have to deal with mitigating their effects after they have been released. Mitigation measures such as promised energy efficiency measures in buildings may contribute to climate change mitigation, but do not always mean that the project will have overall positive impacts in this regard. It may be less negative in terms of quantity of emissions, but still have negative impacts unless there is unequivocal zero carbon in terms of embedded carbon in the development, transport and use. Zero carbon is unlikely except in the highest performance buildings with renewable energy generation incorporated on site.

For climate change adaptation, the key is to treat the climate change events (flooding, droughts, fire) as natural ecological disturbances that test resilience of ecological and social systems. Do not excessively protect ecological and social systems from these phenomena – rather use

Biodiversity offsetting (banking)

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from development plans or projects after appropriate prevention and mitigation measures have been taken. They should:

1. Aim for no net loss;
2. Seek additional conservation outcomes;
3. Adhere to the mitigation hierarchy;
4. Recognise there are limits to what can be offset;
5. Be used in a landscape context;
6. Achieved through stakeholder participation;
7. Seek equity among stakeholders;
8. Be based on adaptive management and long-term outcomes;
9. Be transparent;
10. Informed by sound science.

Business and Biodiversity Offsets Program
http://bbop.forest-trends.org/index.php

EIA to facilitate adjustments of human activities and the proposed project to cope with extreme climate events.

For biodiversity key concerns should centre on ensuring no net loss of biodiversity. Mitigation measures for biodiversity can help mitigate and adapt to climate change. For example, the creation of new habitat, green space, green corridors, green and brown roofs (enhancement) can provide biodiversity benefits to maintain and enhance biodiversity, aid species in adapting to long-term climate change, and help provide essential ecosystem services such as flood storage capacity, rainfall interception, shade and heat regulation, and air quality regulation as part of adaptation to climate change. Bear in mind that your mitigation measures may themselves have significant environmental impacts that need so to be take into account (e.g. renewable energy generation or tree planting may have adverse impacts on biodiversity).

Further Reading

The documents, reports and datasets described below are presented as both documents referred to within this guidance but also as potentially useful sources of information within EIA practice. The table presented below provides a short title, hyperlink and short description as to the potential relevance of each of the documents.

Hyperlinks to be added for all sources/sites available!

Reference / further reading	Comments on relevance
Climate change	
UN Framework Convention on Climate Change (UNFCCC)	• Provides information regarding the last developments through the United Nations Conference of Parties (COP) process • Links detailing international requirements (such as Kyoto, Bali Action Plan, Copenhagen Accord and Cancun Agreement) including likely developments • Good source of supra-national GHG data
Understanding Climate Change, SOER thematic assessment. (European Environment Agency, 2010)	• Introduction to climate change, including scientific background, policy context, possible risks and impacts, policy actions and current targets and goals
Climate change - mitigation	
Mitigating climate change, SOER thematic assessment. (European Environment Agency, 2010)	• Considers global and European trends in GHG and associated challenges
EEA (2010) Climate change mitigation - SOER Thematic Assessment	• Summary of the European union's progress towards green house gas reduction targets
Wightman, J. (undated): Production and Mitigation of Greenhouse Gases in Agriculture	• Case study on the GHG emissions from agriculture, with a focus on dairy farming (NY, US)
Climate change - adaptation	
White paper - Adapting to climate change: towards a European framework for action. (European Commission, 2009)	• White paper setting out the EU's approach to adapting to climate change, based on the concept of mainstreaming • Refers to resilience of biodiversity and natural systems
Guiding principles for adaptation to climate change in Europe ETC/ACC Technical Paper 2010/6 (ETC, 2010)	• Technical consideration of the higher level principles for adapting to climate change, effect introduction to the concept and supporting principles.
Adapting to Climate Change, SOER thematic assessment. (European Environment Agency, 2010)	• Good source of European climate change impact analysis; description and analysis of current and possible future policy actions
Fabrizi, Lara (undated): Droughts and water shortage - The English case.	• Illustrates the disruptive effects of climate change on weather patterns, with a particular focus on droughts in South-East England

Biodiversity	
Biodiversity — SOER 2010 thematic assessment. (European Environment Agency, 2010)	• Provides comprehensive assessment of the state and trends of Europe's biodiversity
The Use of Environmental Limits in Regulating Environmental Systems - How Could the Concept Be Applied in Environmental Agencies? (SNIFFER 2010)	• Description of the concept of environmental limits and how it may usefully applied within environmental agencies
Assessing biodiversity in Europe — the 2010 report. (European Environment Agency, 2010)	• Provides good understanding of European biodiversity with a focus on designated areas and progress towards the EU's biodiversity loss targets
Biodiversity. 10 messages for 2010. (European Environment Agency, 2010)	• Provides a range of specific assessments based on Europe's bio-geographic regions and the interrelationship between climate change and biodiversity
Biodiversity Baseline Flyer (European Environment Agency 2010)	• Focussed summary of EEA's biodiversity assessments as part of the SOER 2010 reports.
The Economics of Ecosystems and Biodiversity (TEEB) (2010)	• Global assessment of the current provision of ecosystem services and the economic and decision support tools that can support its integration into policy and decision making.
Millennium Ecosystem Assessment (2005)	• Seminal report considering the status and trends of global biodiversity and the services it provides
Biodiversity Baseline (European Environment Agency, 2010)	• Detailed assessment of the status and trends of Europe's biodiversity
Biodiversity and climate change	
Climate change and biodiversity. 10 messages for 2010. (European Environment Agency, 2010)	• Exploration and description of the main issues surrounding climate change and biodiversity in Europe
Nature's Role in Climate Change(European Commission, 2009)	• Analysis of the potential role of nature and ecosystem services in mitigating and responding to climate change
Resilience Alliance (2010) examples of environmental limits relevant climate change and biodiversity	• Database of a wide range of examples and case studies of environmental limits research, experience and analysis
Adapting through natural interventions (Climate North West, 2011)	• Detailed description and analysis of environment based interventions that increase adaptive capacity with regard to climate change.
DG Climate Action Synergies for Biodiversity and Climate Presentation.	• Presentation given on behalf of DG Climate Action which considers the relationship between biodiversity and climate and how these can be combined to result in win – wins.
Jones Walters, L. and Nieto, A. (Eds.) (2007). *Climate change and biodiversity. The role of the European regions*. European Centre for Nature Conservation (ECNC).	• Discusses the role of the European regions in responding to climate change-related issues, from both an adaptation and a mitigation perspective
EIA	
Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment	• Lays down common principles to ensure that private and public projects likely to have significant effect on the environment are subject to systematic environmental assessment
Report on the application and effectiveness of the EIA Directive (COM (2009) 378 final)	• The report reviews the application and the effectiveness of the EIA Directive in the European

Reference / further reading	Comments on relevance
	Union. It gives a general overview on how Member States established the EIA regime and points out these regimes' potential shortcomings. The report also emphasises the overall benefits of the EIA Directive. Moreover, it gives an overview on the link between EIA and other legislation, with special regard to SEA, Habitats and Birds Directives and IPPC. The report devotes a section for the link between EIA, biodiversity and climate change
Environmental Impact Assessment of Projects. Rulings of the European Court of Justice	• Court judgements *inter alia* on the transposition of Article 3 of the EIA Directive into the national legislation (C-332/04, Commission vs. Spain), or on the notion of 'overall assessment of effects' (C-2/07, Abraham and Others)
Guidance on EIA – EIS Review. (European Commission, 2001)	• Background information regarding the legal aspects and effectiveness of EIA
Guidance on EIA – Scoping. (European Commission, 2001)	• Background information regarding the legal aspects and effectiveness of EIA
Guidance on EIA – Screening. (European Commission, 2001)	• Background information regarding the legal aspects and effectiveness of EIA
Interpretation of certain project categories on annex I and II of the EIA Directive. (European Commission, 2008)	• Background information regarding the legal aspects and effectiveness of EIA
EIA and SEA	
Opinion of the Committee of the Regions on improving the EIA and SEA Directives. (Committee of the Regions, 2010)	• Assessment of the EIA and SEA Directives and the potential for improvement • Recommends *inter alia* greater consideration of the Habitats Directive and Biodiversity Action Plan
The relationship between the EIA and SEA Directive. (ICON Consultants, 2005)	• Identifies areas of potential overlap between the Directives as well as potential loop holes.
EIA and biodiversity	
Guidelines for ecological impact assessment in the united Kingdom. (Institute of Ecology and Environmental Management, 2006)	• Good example of how biodiversity could be included into assessment methodologies (although not directly applicable to EIA)
Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment. (Convention on Biological Diversity)	• Assessment guidelines that seek to incorporate the requirements of the CBD into plans and programmes (via SEA) and projects (via EIA) • Considers higher level principles and provides relevant case studies
The Integration of Biodiversity into National Environmental Assessment Procedures, National Case Studies, United Kingdom. (UNEP 2001)	• Good number of possible data sources and a good example of possible approaches to including biodiversity into environmental assessment
Position paper on environmental assessment in the European Union. (Birdlife 2010)	• Incorporation of advocacy into guidance. Includes higher level principles supported by a process based approach that highlights common problems with each stage of assessment. • Sets out "dos and don'ts" for practitioners and reviewers. Also of use to support the rationale for inclusion of biodiversity into assessment as the document specifically addresses

Reference / further reading	Comments on relevance
	the role of impact assessment in achieving biodiversity policy objectives
Resolution X.17 - Environmental Impact Assessment and Strategic Environmental Assessment: updated scientific and technical guidance. (RAMSAR Convention 2010)	• Based on the CBD guidelines described above. Includes RAMSAR-specific additions that seek to include consideration of wetlands
Slootweg, R. And Kolhoff, A. (2003) A generic approach to integrate biodiversity considerations in screening and scoping for EIA. Environmental Impact Assessment Review, 23 p.657-681.	• Provides broader view of the issues surrounding screening and scoping as well as conceptual models for how to approach these stages
TEEB for local and regional policy makers. (TEEB 2010)	• Considers how EIA (and SEA) could seek to include ecosystem services
Bagri, A. and Vorhies, F. (1997) Biodiversity Impact Assessment - Convention on Biological Diversity, Discussion Paper.	• Proposes biodiversity impact assessment, includes consideration of the principles and processes this would require.
Brooke, C. (1998) Biodiversity in impact assessment - Convention on Biological Diversity Discussion Paper.	• Specific consideration of biodiversity, good approach to principles and structures that could incorporate biodiversity into impact assessment
Biodiversity, Ecology, and Ecosystem Services - Impact Assessment Considerations/Approaches. (International Association of Impact Assessment, 2006)	• Useful meta-study pulling together work and synthesising. Good range of overarching principles, supported by case studies and possible tools
Biodiversity in Impact Assessment (International Association on Impact Assessment, IAIA, 2005).	• Short special publication, user-friendly structure reviewing key strategic and operational issues concerning the integration of biodiversity-related considerations into impact assessment practices
Promoting biodiversity-inclusive EIA: best practice guide for publishing primary biodiversity data (Global Biodiversity Information Facility, 2011)	• Promotes standards and data publishing tools that can be employed in achieving discovery and publishing of primary biodiversity data via the Internet
EIA and climate change	
Guide to the Integration of Climate Change Adaptation into the Environmental Impact Assessment (EIA) Process. (CARICOM 2004)	• Adaptation. Very clear, well formatted guidance that provides hypothetical and real examples as well as case studies
Incorporating climate change impact and adaptation in environmental impact assessments opportunities and challenges. (OECD 2010)	• Multi-purpose document that assesses the current state of the inclusion of adaptation into EIA with examples of current approaches – Canada and CARICOM
Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003)	• Comprehensive document that sets principles, provides checklists and worked examples for the inclusion of climate change adaptation into EIA
Climate Change Mitigation & EIA. (IEMA Principles Series, 2010)	• Concise document setting out overarching, assessment and reporting and follow-up principles
Climate Change Adaptation & EIA. (IEMA Principles Series, 2010)	• Concise document setting out overarching, assessment and reporting and follow-up principles
Climate change and impact assessment symposium. (International Association of Impact Assessment, 2010)	• Provides links to a range of presentations on various aspects of climate change

PART III: RECOMMENDATIONS

7. Recommendations for Further Work or Action

The recommendations are aimed mainly at the European Commission and Member States. They have been placed in a separate Part of the guidance so that they could be removed before the Guidance is issued and disseminated widely for practical use by experts, practitioners and stakeholders.

The recommendations are in first draft form and will be further reviewed throughout the remaining course of the project.

Preparation of this *Practical guidance and recommendations for integration of climate change and biodiversity into EIA procedures* has been carried out based on targeted research and consultation activities. A comprehensive literature review of European and international studies, reports, articles and other guidance documents covering climate change, biodiversity and EIA has been carried out. A list of the most relevant documents consulted is included in the Further Reading section of this guidance document. The guidance team also carried out interviews with European Commission officials responsible for environmental assessment, climate change mitigation and adaptation, biodiversity and Natura 2000. In addition, ten expert stakeholders from within the Member States, including government officials, consultants, academics and NGOs have been consulted by email and telephone interview for their impressions on the state of integration of these issues into both EIA and SEA. Two senior expert advisors also contributed to the work as part of the project team. This guidance is based to a great extent on the key messages that were distilled from these preparation activities.

This work, along with the process of drafting the guidance, has led to a number of recommendations for further work or action that would support effective integration of climate change and biodiversity into EIA. These recommendations are summarised below.

Proposals for modifications to the EIA Directive

There are a number of ways in which the EIA Directive could be modified to render it more responsive to some of the specific challenges that climate change and biodiversity pose to the assessment process.

The definition of "project". Cumulative impacts and effects from other developments are very important for climate change and biodiversity, as these are such complex issues and are related to so many different factors. The definition of a "project"

in the EIA Directive could therefore be broadened to include associated projects or works. A principal project/accessory project test could put in place to test the relationship between projects and associated activities.[21]

The problem is particularly acute in the case of linear infrastructure projects, which are long-term in nature and for which climate change and biodiversity considerations are likely to be significant. Many linear schemes, e.g. road schemes, overhead power lines, railways may be promoted as single large projects, but in practice are consented as separate sections and/or through separate consent procedures e.g. railway stations and railway tracks, or power stations and power transmission lines. These separate consents result in separate EIAs being undertaken for individual sections, for example, often without an overall assessment being undertaken of the project as a whole and its associated works or sub-projects. An amendment along the lines could help to ensure climate change and biodiversity impacts are properly considered for the overall project. Unfortunately SEA does not solve this problem because often the schemes are for separate consent processes for which no strategic planning process (with SEA) exists.

Monitoring requirements. The guidance preparation process has indicated that there is a clear need for improved monitoring if projects are to become more resilient to climate change impacts. This need for better EIA follow-up and monitoring requirements is currently dependent upon the national requirements in the Member States – e.g. under spatial planning or licensing regulations – rather than consistently as part of EIA. One way to do this would be to include a requirement for an environmental management plan for certain high-impact project types, to facilitate implementation of mitigation measures and to provide a means of delivering responsiveness (adaptive management) to changing circumstances during construction and operation.

While it is likely that Member States would consider such a requirement as an additional burden on project developers and authorities, without such a legal provision, there is little likelihood that the monitoring necessary for climate change and biodiversity impacts will be put in place. Furthermore a monitoring requirement in EIA would bring the EIA Directive into line with the requirements of the SEA Directive.

Make scoping mandatory. Scoping in EIA is a critical step for the consideration of climate change and biodiversity. As these are complex issues with wide-ranging and many cumulative effects, establishing the relevance of impacts early on is important, and a clear scoping stage in the assessment process will help ensure that this is carried out. Scoping is also an opportunity to ensure that key issues are consulted with stakeholders and the public at an early stage, which is important

[21] As recommended in research conducted for the DG ENV in 2005 on the Relationship between the EIA and SEA Directives (Sheate et al, 2005).

given the expanded range of stakeholder to be included on these issues, as well as the potential for stakeholders to provide information. This approach is also more consistent with the requirements of the Aarhus Convention.

Factors to be assessed. There is currently some ambiguity about the scope of the legal requirement to assess climate change and biodiversity. While this guidance maintains in Section 2 that there is no contradiction between the EIA Directive and the need to consider climate change and biodiversity as integral factors in the assessment of significant effects, experience has shown that this is not always the interpretation taken in practice across the Member States. In fact, a more "literal" interpretation of the Directive is often taken. One result of this is that impacts on biodiversity are considered only with regard to species on designated protection lists, rather than in the wider sense of no net loss to biodiversity and the functioning of ecosystem services. An update of factors to be assessed should also include not impacts of the project on the environment, but also impacts of a changing environment on the project, with reference to climate change.

Promotion and awareness raising work

Targeted and detailed research on good practice case studies. Preparation of this guidance found that there are not many readily available, well-written and detailed case studies of good practice on integrating climate change and biodiversity into EIAs. Part of the reason for this is that there is limited experience, as these issues (particularly climate change) have only recently gained political and population recognition. Research has indicated that some experience and practice exists, but it has not been researched or written about in a manner that would facilitate easy transfer of experience to authorities, practitioners and other potential users. A targeted research project, which would involve interviews with a wide range of authorities and practitioners from around the EU to draw out and document the experience and lessons learned on a grand scale could have a very positive impact on the body of knowledge available in this rapidly evolving field.

Dissemination of this guidance. A targeted dissemination programme for this guidance will be needed if it is to reach the wide audience for which it is intended. Translation of the guidance from English into Member State languages will greatly facilitate this process as many authorities, practitioners and project developers will not have a strong enough command of English to find it useful in the original version. All key events related to environmental assessment, climate change, and biodiversity should be used as an opportunity to disseminate the guidance, along with targeted mailings to Member States, local and regional authorities, NGOs, academics and others who can further publicise and disseminate the document, both in print and online (.pdf) versions.

Training and capacity building. As experience is limited, so is capacity. For example, research for this guidance document found that many practitioners simply have not considered the concept of looking at the impacts of the environment or climate change on the project, as this is not traditionally part of the EIA approach. This and other factors dealt with in this guidance document, such as dealing with uncertainty and the increased importance of cumulative effects will undoubtedly also require improvements in the capacity of authorities, practitioners, project developers and others who play a role in EIA. This type of work could be carried out in many ways, mainly within the Member States, but could be encouraged by the European Commission.

Policy-level recommendations

Linkages with Cohesion Policy and other EU co-funded investments. EU Cohesion Policy co-finances many of the large infrastructure projects that will have major impacts on climate change and biodiversity issues and will themselves be especially vulnerable to the impacts of a changing climate. As regulations, and the specific investment terms with Member States are yet to be finalised for the 2014-2020 period, there is time to consider inserting a conditionality regarding the quality of EIAs for those projects that will have significant climate change and biodiversity impacts, and the extent to which they consider these impacts, in light of recent legislation and policies in these sectors.

Linkages with the EU Climate Change Adaptation Strategy process. The EU is in the process of preparing a strategy on adaptation to climate change, via the process outlined in the 2009 White Paper. A key aspect of this process is the mainstreaming of climate change adaptation issues into other policy areas and into investments, through a process of "climate-proofing". It will be important to link this work to EIA and SEA and to stress the use of these tools as the legal instruments and appropriate processes to make important contributions to delivering this mainstreaming.

Member State guidance and recommended procedures. As presented in the guidance, it is not possible to consider the wide range of specific climate change and biodiversity impacts that will affect users across the EU Member States, and the way in which these issues are considered for EIA will strongly depend on how the issues affect specific regions. In addition, approaches to environmental assessment vary considerably across the Member States, according to national legislation, political culture, working culture and other conditions. It is therefore important that Member States consider developing their own, place-specific guidance on integrating climate change and biodiversity into environmental assessment, which may be based upon the principles and resources given in this EU-level guidance.

ANNEXES

Annex 1: Sources of Information

This annex considers what information can be used to support an EIA. It outlines the different types and sources of information that may be available. Information needs are likely to be particularly relevant to the EIA screening, scoping and assessment stages, and then monitoring/follow-up.

Types of information

Examples of the types of quantitative datasets relevant to climate change and biodiversity include:

- Species distribution
- Trend data, e.g. loss of species/habitats
- Protected area status (SACs, SPAs etc, national designations etc.)
- GHG emission inventories etc
- Climate projections (IPCC etc)
- Future scenarios (climate and socio-economic).

These datasets may already exist, depending upon the location and scale required.

Sources of information

A starting point for sources of information on climate change and biodiversity will be other projects, plans and policies that provide the context in which a project must be considered. These may include, for example, municipal/local authority spatial plans and policies/strategies on biodiversity protection (e.g. biodiversity action plans for species and habitats) and climate change mitigation and adaptation plans, strategies or vulnerability assessment studies.

Other forms of assessment may also be relevant, such as Strategic Environmental Assessment (SEA) carried out for higher level plans and programmes, e.g. under the SEA Directive 2001/42/EC, or assessments carried out under the Habitats Directive 92/43/EC.

For biodiversity – potential specialist sources are likely to include:

- environmental authorities with responsibility for nature conservation
- environmental NGOs
- stakeholders dependent or influential on biodiversity derived ecosystem services, e.g. foresters, fisheries, water companies/authorities

For climate change – potential specialist sources are likely to include:

- environmental authorities with responsibility for climate change mitigation and adaptation

- local authorities/municipalities
- environmental NGOs
- health services
- social well-being organisations
- infrastructure providers, e.g. transport authorities, utilities

In some instances it may be necessary effectively to create new knowledge and understanding with regard to biodiversity and climate change, their interactions together and with the proposed project. Cooperation with stakeholders and the public can help to build understanding around the relevance and seriousness of climate change and biodiversity issues. At the scoping stage this fits well with the reviewing of other relevant policies, plans and projects, what the key issues are and defining the temporal and spatial scope, boundaries and parameters. So build climate change and biodiversity explicitly into your scoping process to ensure you access the most appropriate source of information and data as early as possible in the EIA.

Details on the EU climate change adaptation clearinghouse expected in 2012 should be added here for the final version as well as a box in Section 5.

Key European sources of data, including data repositories and online digital datasets:

Source	Description	Link
Climate change – mitigation and adaptation		
Climate Change Data Centre	Repository of a wide range of climate change relevant data and information. This includes all the latest climate change relevant developments within the EEA. Good meta-source of developments across European climate policy and reporting.	http://www.eea.europa.eu/themes/climate/dc
IPCC Fourth Assessment Report: Climate Change 2007	Latest release of global climate change science. Split into range of working groups and sectoral reports.	http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml
Climate change - mitigation		
Greenhouse Gas Emission Viewer	The EEA GHG viewer provides easy access and analysis of the data contained in the Annual European Union greenhouse gas inventory from 1990. The EEA GHG data viewer can show emission trends for the main sectors and allows for comparisons of emissions between different countries and activities.	http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011
European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM)	The ETC/ACM assists the European Environment Agency (EEA) in its support to EU policy in the field of air pollution and climate change mitigation. The ETC/ACM provides reports and databases relevant to climate change mitigation	http://acm.eionet.europa.eu/
Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007	Consideration of the climate change mitigation drivers and trends within a wide range of sectors.	http://www.ipcc.ch/publications_and_data/ar4/wg3/en/contents.html
Climate change - adaptation		
Vulnerability and adaptation to climate change	Technical report by the EEA that assesses European vulnerability to climate change impacts and adaptation measures being undertaken as of 2010.	http://www.eea.europa.eu/publications/technical_report_2005_1207_144937
Adapting to climate change	European Commission Green Paper presenting major risks to European society from climate change and possible policy responses.	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0354:EN:NOT
Mapping the impacts of natural hazards and technological accidents in Europe	The report assesses the occurrence and impacts of disasters and the underlying hazards such as storms, extreme temperature events, forest fires, water scarcity and droughts, floods, snow avalanches, landslides, earthquakes, volcanoes and technological accidents in Europe for the period 1998-2009. Useful for scoping potential vulnerability.	http://www.eea.europa.eu/publications/mapping-the-impacts-of-natural
EmDAT	International disaster database that seeks to inform preparedness and decision making to natural disasters. Useful for scoping vulnerability.	http://www.emdat.be/
NatCatSERVICE	Insurance based database analysing approximately 1,000 every year. The information collated can be used to document and perform risk and trend analyses on the extent and intensity of individual natural hazard events in various parts of the world.	http://www.munichre.com/en/reinsurance/business/non-life/georisks/natcatservice/default.aspx
Impacts of Europe's changing	The main part of this report summarises the relevance, past trends and future projections for about	http://www.eea.europa.eu/publications/eea

Source	Description	Link
climate — 2008 indicator-based assessment	40 indicators covering all aspects of climate change and impacted sectors. The report also addresses adaptation and the economics of climate change impacts and adaptation strategies and policies, and data availability and uncertainty as of 2008.	_report_2008_4
IPPC - Climate Change 2007: Working Group II: Impacts, Adaption and Vulnerability	IPPC Chapter on impacts of climate change across Europe. Considers key vulnerabilities and possible policy responses	http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch12.html
National Adaptation Strategies	Up to date database of EU Member States progress under the EU's Adaptation White Paper. Good source for country specific actions.	http://www.eea.europa.eu/themes/climate/national-adaptation-strategies
European Severe Weather Database	Database of severe weather events across Europe. Useful for indicating general vulnerability of projects.	http://www.essl.org/ESWD/
Green and Blue Space for Adaptation (GRaBS) Adaptation Risk and Vulnerability Toolkit	Online toolkit that presents spatially various aspects of climate change adaptation includes physical risk and aspects of social vulnerability.	http://www.ppgis.manchester.ac.uk/grabs/start.html
Climate Change Data Centre	Repository of a wide range of climate change relevant data and information. This includes all the latest climate change relevant developments within the EEA. Good meta-source of developments across European climate policy and reporting.	http://www.eea.europa.eu/themes/climate/dc
IPCC Fourth Assessment Report: Climate Change 2007	Latest release of global climate change science. Split into range of working groups and sectoral reports.	http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml
Vulnerability and adaptation to climate change	Technical report by the EEA that assesses European vulnerability to climate change impacts and adaptation measures being undertaken as of 2010.	http://www.eea.europa.eu/publications/technical_report_2005_1207_144937
Biodiversity		
Assessment of Biodiversity	EEA Report describing and analysing biodiversity trends compared to 2010 target.	http://www.eea.europa.eu/publications/assessing-biodiversity-in-europe-84/at_download/file
Biodiversity Baseline	Assessment of various habitat types across Europe as of 2010.	http://www.eea.europa.eu/publications/eu-2010-biodiversity-baseline/
Biodiversity	Thematic summary of the status of Europe's biodiversity as of 2010.	http://www.eea.europa.eu/soer/europe/biodiversity
Biodiversity Data Centre	Repository of a wide range of biodiversity relevant data and information. This includes all the latest biodiversity relevant developments within the EEA. Good meta-source of developments across European biodiversity policy and reporting.	http://www.eea.europa.eu/themes/biodiversity/dc
BISE (including European Clearing House Mechanism) Data	Database of all relevant European biodiversity data sources. Good source of indicators and maps collated from across European institutions.	http://biodiversity.europa.eu/data
European Topic Centre for Biological Diversity (ETC/BC)	The ETC/BD is an international consortium working with the EEA under a framework partnership agreement. The ETC/BD presents expert knowledge and reporting in a range of reports and databases.	http://bd.eionet.europa.eu/

Source	Description	Link
Global Biodiversity Information Service	Publicly accessible biodiversity data including species occurrence and taxonomic information. Very detailed species specific data source. Good indicator of potential species presence across Europe for use in scoping. Likely to require site investigation to confirm occurrences.	http://data.gbif.org/welcome.htm
Biodiversity Action Plan - European Commission	Inventory of European Biodiversity Action Plan and assessment of Member States.	http://ec.europa.eu/environment/nature/biodiversity/comm2006/bap_2010.htm
General		
Group on Earth Observatories (GEO)	Database of global data components on a range of environmental aspects, including climate change and biodiversity	http://geossregistries.info/holdings.htm
EUROSTAT	Database holding a huge range of environmental, economic and social data.	http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
EUROSTAT Sustainable development indicators	The Sustainable Development Indicators (SDIs) are used to monitor the EU Sustainable Development Strategy (EU SDS) in a report published by Eurostat every two years. They are presented in ten themes including climate change and natural resources down to Member State levels.	http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators
EUROSTAT Country profiles	Country specific data on a range of issues including climate change emissions and sectoral activity.	http://epp.eurostat.ec.europa.eu/guip/introAction.do
EEA Data and Maps	Access the EEA's maps, indicators, databases and graphs.	http://www.eea.europa.eu/data-and-maps
EEA IMS Indicators	Indicators and factsheets about Europe's environment.	http://www.eea.europa.eu/data-and-maps/indicators#c7=all&c5=&c0=10&b_start=0

Annex 2: Tools for Assessing Climate Change and Biodiversity within EIA

This annex provides an overview of some of the tools and approaches that are available to support the assessment of climate change and biodiversity within EIA. This is not an exhaustive list and many other tools may be relevant.[22] Some of the tools and approaches listed are used to support the assessment of specific aspects of climate change and biodiversity (e.g. GHG emission calculators and ecological surveys). Other tools and approaches can be more generally applicable across the different environmental topics but have been included here as they are particularly relevant to climate change and biodiversity.

The tools and approaches that will be relevant and useful for your EIA will depend upon the specific circumstances of the project (e.g. the type of project, its location and the characteristics of the receiving environment etc) and therefore its potential effects. These circumstances will define the type, level of detail and nature of analysis that is appropriate to a particular EIA and therefore which tools may be relevant. The decision about whether to use any of these tools for the EIA should be taken early in the process, most likely at the scoping stage.

Name	Description	Application Comments	Source of further Information
Biodiversity offsetting	Biodiversity offsetting is an approach which seeks to compensate for unavoidable loss of habitats and species due to development. Though not formalised in every Member State there are allowances for offsetting within the Environmental Liability Directive and Habitats Directive - Article 6.4.	This practice is developing across Europe and recent examples include the 2011 Biodiversity Strategy making reference to the Commission developing practice in line with previous studies (see sources of further information). It is likely that, within the context of European policy, Member States will develop this area as they see fit.	Business led offsetting programme: • http://bbop.forest-trends.org/index.php Commission feasibility study: • http://ec.europa.eu/environment/enveco/pdf/eftec_habitat_technical_report.pdf Online resource for overview of the sector: • http://www.ecosystemmarketplace.com/
Biodiversity screening map	Screening maps are a form of spatial analysis that requires the identification of the habitats sited around a particular project. Having done this these habitats should be assessed for their relative worth considering wider trends and likely impacts of the project. If there is considered to be some potentially significant effects this should inform the screening decision.	Useful for screening and scoping stages and to identify potential areas of higher value biodiversity that may be used within the consideration of the alternatives.	Can be supported by some of the information sources presented in Annex 1, but will more normally be based on expert judgement and the experience of other stakeholders.
Confidence levels	Confidence levels are an effective approach to communicating uncertainty; this may be useful when considering potential climate change impacts.	Increasingly climate change impacts are being presented in probabilistic scenarios which can be presented in terms of confidence levels.	The provision of confidence levels varies within different climate scenarios – e.g. the IPPC provides information as to specific confidence levels within different assessments.

[22] The IAIA wiki is a useful resource for more general tools and concepts for the practice of EIA: http://www.iaia.org/iaiawiki/

Name	Description	Application Comments	Source of further Information
Ecological Surveys	Undertaken by expert ecologists a site survey can identify and describe the ecosystems, habitats and species present on site. This allows the identification of protected species or habitats as well as informing project design to reduce avoidable damage to higher value areas of biodiversity and seek areas of potential enhancement.	The scale and type of expertise required will vary hugely between projects and should be defined based on local circumstances. An early ecological survey can save time and effort at later stages of the project by allowing the early identification of certain species and habitats that require particular protection or mitigation measures. There is also the need to consider Member State legal requirements based on the Birds and Habitat Directives.	There are a wide range of consultants available to undertake ecological surveys, ensuring competence and experience is essential.
Ecosystem services valuation	The economic valuation of ecosystem services has developed significantly as a potential tool within impact assessment. Recent analysis within the TEEB and various Member States indicate this approach has some potential for making clear the economic value of biodiversity, this in theory would allow a more informed understanding of the societal impact of a project. Valuation is a useful tool but the most efficient use of the concept of ecosystem services within impact assessment may be in demonstrating that the environment is important to us rather than in quantifying the cost equivalence of this importance.	The time and resource requirements for ecosystem valuation are significant and may undermine its potential to support impact assessment practice where resources are often limited. It is possible to relate existing valuation studies to a different project but this is difficult and the results are generally for illustrative purposes only due to the contextual nature of the environment of different projects. However certain ecosystem services (i.e. provisioning services) can be relatively simply valued and may add value to some assessments (see sources of further information).	• Chapter 6 of TEEB for Local and Regional Policy makers considers economic valuation as part of EIA (and SEA) practice: http://www.teebweb.org/ForLocalandRegionalPolicy/tabid/1020/Default.aspx • Guide to valuing ecosystem services: http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf
GHG emission calculators	Emission calculators seek to quantify the total green house gas (or often carbon alone) emissions from an activity or project as a whole. Emissions can be calculated for operation or the construction of a project. A range of calculators exist and are generally based on GHG equivalents for certain indicators such as energy consumption.	Depending on the scale of your project it may be appropriate to engage consultants to undertake this work, for smaller projects a range of online tools are available.	A number of consultancies operate GHG emissions calculators that can be undertaken for individual projects.
GIS and spatial analysis	Geographic Information Systems (GIS) and its use as a form of spatial analysis has proven value in communicating and identifying environmental impacts of projects. There is a huge spectrum of possible GIS methods and uses and these can be tailored depending on individual project scales and resources.	The nature of the GIS required will vary depending on the scale of the project and its intended purpose. GIS is a broad technique and can be used to undertake analysis of various morphological or technical factors or to support consultation exercises only.	GIS is largely dependent upon the available data, potentially useful sources of pan European information and data are presented in Annex 1.

Name	Description	Application Comments	Source of further Information
GRaBS Adaptation Risk and Vulnerability Toolkit	This is an online toolkit that presents spatially various aspects of climate change risk and vulnerability. It has relatively low data resolution but may be useful to understand broader regional vulnerabilities.	Useful tool for the scoping stage and for identifying regional trends for certain climate hazards.	http://www.ppgis.manchester.ac.uk/grabs/start.html
Industry (project) profiles of GHGs	EIAs should, where possible, make use of existing information – one potential source of useful information may be sectoral or technology profiles of the energy requirements of various elements of a project during operation and construction.	This information will be useful during the scoping and screening stages of the EIA.	Industry profiles may often be based on the experience of the project proponent and relating previous projects to current. In other Member States specific industry profiles may exist.
Life Cycle Assessment (LCA)	LCA is a technique that seeks to consider all the environmental impacts of particular actions - over their lifetime. This is particularly relevant to climate change as the greenhouse gas emissions are often released during the construction stage. LCA can include a full assessment of all impacts in detail or be a less quantitative and detailed consideration of the materials in use and their probable environmental impacts. For example responsibly sourced wood has a lower carbon footprint that steel and responsibly sourced (certified) wood has a generally lower impact on biodiversity than un-certified wood. LCAs can be undertaken by consultants or in-house.	Undertaking full LCA can be a very costly and timely process, however certain elements of a project may already be subject to LCA, there is therefore the potential for the EIA to use this information where available. It may also be possible to undertake a qualitative assessment of possible LCA impacts based on readily available information such as material types LCA is particularly useful during the impact assessment stage of the EIA and can inform the consideration of alternatives buy identify the most significant elements of a project in terms of biodiversity and climate change.	Online repository of LCA tools: http://www.dantes.info/Tools&Methods/Software/enviro_soft_SW.html
Network analysis	Network analysis is an effective way to consider complex systems by linking causes and impacts via a chain of causation. The concept is based on the idea that there are links and impact pathways between elements of a project and environmental outcomes, and that these can be identified. This enables the identification of actions that may achieve desired objectives, such as reduced impact or enhancement.	This approach can be used to ascertain the probable impacts and benefits on climate change and biodiversity of various elements of a project by identifying their outcomes via the development of a chain of causation. It is best undertaken during the scoping stage, but may be extended into the following stages of assessment.	Network analysis is generally dependent upon the use of expert knowledge and judgement and the accurate identification and linking of drivers and impacts.

Name	Description	Application Comments	Source of further Information
Risk management, vulnerability assessment	When considering climate change it is particularly useful to frame potential impacts in terms of the probability and magnitude of impacts. These two components make up risk. This can be achieved for example by considering the probability of impact (how likely is it that sea level rise will impact on a project) in relation to the magnitude of the impact (what would be the likely impact of sea level rise on a project). Understanding these two elements is essential to reducing vulnerability and increasing resilience.	Thinking in terms of probability and magnitude within an EIA can inform the project's stakeholders as to the vulnerability of a project and therefore the necessity of adaptation measures (what alternatives are available) and what monitoring is required.	• Vulnerability and climate change: http://www.metrovancouver.org/planning/ClimateChange/ClimateChangeDocs/Vulnerability_climate_change.pdf • IAIA's risk management advice: http://www.iaia.org/iaiawiki/ra.ashx
Robust Decision Making (RDM)	RDM is a decision making concept that seeks to consider the vulnerability and adaptability of a project rather that solely predicting the impact of that project. An example of RDM may be looking at a road system and considering what climate circumstances would cause the road to cease to operate (for instance floods, temperature changes etc), having identified the vulnerability, the project supported by EIA can then consider potential alternatives which may reduce this vulnerability, this will include a consideration of other elements such as cost and the potential impacts on other EIA topics, including biodiversity.	RDM is particularly useful when considering the impacts of climate change on a project and should be integrated into the alternative stage of project design and EIA. RDM approaches are commonly used within project design but EIA offers the potential to make this link to climate change more explicit and effective.	• RDM and climate change: http://rdcep.org// • Related publications: http://www.rand.org/international_programs/pardee/pubs/futures_method/exploratory.html
Scenarios	Scenarios relate to climate change scenarios (e.g. IPCC scenarios) and socio-economic/alternative futures scenarios for considering the resilience of projects and the environment into the long term future. The use of scenarios is a response to uncertainty.	Scenarios are effective ways of considering the evolution of the baseline – both in terms of the potential impacts of the climate on a project and the changes to wider socio-economic context that the project operates in. The scenarios can also support the consideration of alternatives.	Potential European resources include the information on the European Environment Agency's website: • http://www.eea.europa.eu/themes/scenarios/scenarios-and-forward-studies-eea-activities • http://scenarios.ew.eea.europa.eu/
Spheres of influence and Ecosystem chains	Spheres of influence are based on using spatial tools to assess the potential effects of a project beyond the specific project boundaries; as such these concepts use tools such as network analysis but apply them spatially. This entails looking at the indirect impact on downstream or related ecosystems, for instance how will changing water abstraction impact downstream systems, how will increased dust impact on the turbidity of downstream environments, how will removing one habitat type impact on neighbouring habitats?	This concept is particularly useful for the screening and scoping stages and for identifying indirect and secondary effects. Requires an understanding of possible impacts and causal chains, as such network analysis is a related tool. This may also be a useful tool when considering alternatives and their impacts.	Can be supported by some of the information sources presented in Annex 1, but will more normally be based on expert judgement and the experience of other stakeholders.

Annex 3: Key Climate Change and Biodiversity Issues and Impacts

This annex provides an overview of some of the key climate change and biodiversity issues and impacts to be considered as part of an EIA. It is important to note that this is only an indicative list and it is not comprehensive! The issues and impacts that will be relevant to any particular EIA will be dependent upon the specific circumstances of each project (e.g. the type of project, its location and the characteristics of the receiving environment etc) and therefore this annex should be used just as a starting point for considering what issues and impacts as well as alternatives and mitigation may be relevant.

The advice in this annex is divided into three tables covering:

- adaptation to climate change
- climate change mitigation
- biodiversity

This annex can be used during the scoping stage to help identify which climate change and biodiversity issues and impacts might be most relevant to an EIA of a particular project. Some key questions are provided to help you think through those that might be most relevant in your situation. It may be useful to explore these questions with key stakeholders with an interest or expertise in climate change or biodiversity.

For climate change in particular, it will be important to consider early in the EIA process not just the impacts of the project on climate and climate change, but also the impact of climate change on the project – the key questions therefore provide a guide on both of these dimensions:

- How may the climate be affected by the project?
- How may the project be affected by climate change?

Alternatives in EIA are often considered to be at the heart of the EIA process, as they provide confidence that the proposed course of action is the best one available. Some examples of what to consider during the assessment stage when assessing alternatives, as well as mitigation measures that may be relevant, are provided in the tables below. Use these as a guide to considering alternatives and mitigation in your EIA, but remember these are just examples and you will need to consider what else is relevant given the specific circumstances of the project concerned.

Basic questions regarding adaptation to climate change

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Examples of alternatives and/or mitigation measures (FOR ASSESSMENT STAGE)
Habitat protection	• Can the project directly or indirectly affect important habitats and migration corridors? • How seriously will this impact on the habitats and corridors be, considering the fact that they can be also adversely affected by changes in the climatic conditions?	• Protect key habitats and migration corridors from any further anthropogenic disturbances • Create and/or enhance key habitats and migration corridors as part of project design
Flood regimes	• Is the proposed development located in areas that may be inundated by floods, sea level rise or sea water surge during storms? • Will the proposed development reduce or enhance the capacity of existing ecosystems and flood plains for natural management of floods and flash floods? • Will the proposed development reduce or enhance risks of landslides, or bank erosion? • Will the proposed development increase the exposure of the vulnerable (e.g. the elderly, unwell or young people) or sensitive receptors (e.g. critical infrastructure) to floods?	• Avoid new development in areas at risk from flooding • Avoid new development in areas at risk from erosion • Ensure that any planned essential infrastructure (transport, energy, health and social facilities) and development which could increase the exposure of vulnerable people (e.g. schools, hospitals, care homes) avoids flood risk areas and is protected from future flood risk • In high risk areas, consider arrangements for supply of goods and services that may be disturbed by floods • Avoid loss of storage volumes in flood plains and plan to accommodate future storage needs • Protect and expand native woodland cover • Put in place / improve emergency planning, including flood warning systems and awareness, and recovery arrangements
Sea level rise, storms surge, saline intrusion	• Is the proposed development located in areas that may be affected by sea level rise or storm surges? • Will the proposed development reduce or enhance risks of coastal erosion? • Is the proposed development located in areas that may be affected by saline intrusion? • Will the proposed development increase the exposure of the vulnerable (e.g. the elderly, unwell or young people) or sensitive receptors (e.g. critical infrastructure) to sea level rise or storm surge?	• Avoid development in coastal areas at risk from sea level rise or storm surges • In high risk coastal areas, consider arrangements for supply of goods and services that may be disturbed during storms • Relocate water intakes and any economic activities that depend on supply of clean water or groundwater (e.g. agriculture) away from areas that will be affected by saline intrusion • Ensure that any planned essential infrastructure (transport, energy, health and social facilities) and development which could increase the exposure of vulnerable people (e.g. schools, hospitals, care homes) avoids areas at risk from sea level rise or sea water surge and is protected from sea level rise or sea water surge

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Examples of alternatives and/or mitigation measures (FOR ASSESSMENT STAGE)
		• Put in place / improve emergency planning, including warning systems and awareness, and recovery arrangements
Droughts	• Will the proposed development increase water demand? • Will it discharge any effluents into water bodies? • What will be the combined effect of water intake and effluent discharges on the likely expected future baseline trends for water quality, especially during droughts? • Can the project be adversely affected by increased water pollution (which may reduce pollution and nutrient dilution capacity in water bodies, reduce oxygen absorption, features algae blooms, saline intrusion, etc.) or reduced water availability during periods of prolonged droughts? • Will the proposed development increase or reduce the resilience of landscape/forests to wildlife fires? • Will the proposed development increase the exposure of the vulnerable (e.g. the elderly, unwell or young people) or sensitive receptors (e.g. critical infrastructure) to droughts or wild fires?	• Avoid proposed developments which a have a high water demand from areas at risk from droughts • Avoid proposed developments which discharge effluents into receiving water bodies that are at risk from droughts and not providing sufficient dilution • [23] Maintain and improve the resilience of watersheds and aquatic ecosystems by implementing practices that protect, maintain, and restore watershed processes and services • Encourage water efficiency measures • Maximise use of rainwater and reuse of grey water • Restrict excessive / non-essential use water use during droughts (depending on severity of the drought)[24] • Minimise low flow withdrawals • Restrict effluent discharges into water bodies during droughts • Maintain biological diversity - identify species, populations, and communities that are resilient to fire and develop conservation plans for them. • Increase landscape diversity - increase large-scale resilience, size of management • Plan for post-disturbance management • Put in place / improve emergency planning and recovery arrangements • Incorporate climate change into restoration - avoid trying to replicate historical conditions, but continue to learn lessons from historical variation

Heat waves	• Will the proposed development reduce or enhance urban heat island effect by:
	  ○ emitting heat and fine particular matters?
	  ○ reducing or expanding green areas and open water
		• Encourage design for environmental performance –reduce need for cooling
		• Encourage improvements in urban structure and reduced density - expansion of green areas, open water surfaces and wind paths

23 See http://www.fs.fed.us/ccrc/topics/wildland-fire.shtml

[24] See e.g. http://www.lenntech.com/water-shortage.htm#Water_restrictions_in_England

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Examples of alternatives and/or mitigation measures (FOR ASSESSMENT STAGE)
	surfaces in the urban areas? ○ reducing or expanding surfaces that absorb the heat or reduce evapotranspiration? • Will the proposed development increase the exposure of the vulnerable (e.g. the elderly, unwell or young people) or sensitive receptors (e.g. critical infrastructure) to heat waves?	(along rivers and waterfronts) in urban cities to reduce the possible heat island effect • Increase the suppression of thermal storage in buildings/roofs and roads (by use of different materials and colouring). Encourage the greater use of green roofs • Reduce man-made exhaust emissions during heat waves (industries, and car traffic) • Raise awareness of key risks associated with heat waves and opportunities for reducing them on individual level and in key industries – especially in agriculture (livestock) and energy sector (increased energy consumption, risks of breakdown of cooling systems of power plants etc.) • Put in place / improve heat wave early warning systems and response and recovery plans
Strong winds	• Will the proposed development be at risks because of storms and strong winds? • Will the proposed development reduce or enhance risks associated with storms and strong winds?	• Ensure new infrastructure considers increased high winds and storminess and is designed to avoid or minimise the future risks • In high risk areas, consider arrangements for supply of goods and services that may be disturbed by increased storm events

Basic questions regarding climate change mitigation

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Examples of alternatives or mitigation measures (FOR ASSESSMENT STAGE)
Direct greenhouse gas emissions	• Will the proposed development emit carbon dioxide (CO2), nitrous oxide (N2O) or methane (CH4)? • How can these emissions be expressed in carbon dioxide equivalent units (CO2e)[25]? • Whilst construction emissions are often small in proportion to operations emissions, will the proposed development involved construction that is particularly carbon-intensive (e.g. energy	• Consider different technologies, materials, supply modes etc to avoid or reduce emissions • Protect natural carbon sinks such as peat soils, woodlands, wetland areas

[25] Methane (CH4) = 23 CO2e; nitrous oxide (N2O) = 310 CO2e.

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Examples of alternatives or mitigation measures (FOR ASSESSMENT STAGE)
	intensive and/or extensive use of resources like concrete and structural steel)?	
Indirect greenhouse gas emissions through increased demand for energy	• Will the proposed development directly or indirectly increase or decrease demand for energy? • How can these changes in energy demand be expressed in the carbon dioxide equivalent units (CO2e) given the GHG emissions from the local energy supply mix?	• Reduce demand for energy (electricity or fuel) in the industry • Branding of Energy Efficiency • Targeted support to businesses engaged in eco-innovations, low carbon business and low carbon technologies
Greenhouse gas emissions from transport	• Will the proposed development significantly increase or decrease personal travel – i.e. the number and length of journeys made and the mode of travel? • Will the proposed development significantly increase or decrease freight transport - the volume of transported goods, length of journeys and the mode of travel? • How can the resulting changes in the fuel consumption and NOx emissions be expressed in carbon dioxide equivalent units (CO2e)?	• Promote development patterns that reduce need to travel • Support car free developments • Encourage walking and cycling • Encourage public transport • Provide an effective and integrated public transport system (provide transport choices to encourage modal shift) • Provide low emission infrastructure (e.g. electric charging bays or low emission fuelling points, car clubs, bike/e-bike rental schemes) • Transport demand management, driver behaviour and traffic management schemes • On-site parking standards • Encourage car sharing • Emission based differential tolling (e.g. tunnels and bridges) • Prioritise the high density urban developments (smaller housing at higher density) and reuse of brown-field land • Avoid development's which contribute to 'urban sprawl'
Greenhouse gas emissions from agriculture and horticulture	• Will the proposed development release nitrous oxide (N2O) or methane (CH4) from fertilizers and horticulture? • How can these emissions be expressed in carbon dioxide equivalent units (CO2e)? • Will the proposed development disturb carbon rich soils?	• Reduce the use of nitrogen in fertilizing practices • Manage methane (enteric and manure) • protect natural carbon sinks such as peat soils

Basic questions regarding biodiversity

The following sources are recommended to help determine which key biodiversity issues and impacts that it might be relevant to consider as part of an EIA, and how to approach alternatives and mitigation measures (the advice in the table below is based on these sources):

- The Convention on Biological Diversity's Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment http://69.90.183.227/decision/cop/?id=11042#_Toc124570466
- The IAIA's Biodiversity in Impact Assessment http://www.iaia.org/publicdocuments/special-publications/SP3.pdf

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Approach to alternatives or mitigation measures (FOR ASSESSMENT STAGE)
Ecosystems (including the extent or quality of the habitat and habitat fragmentation or isolation)	• Will the proposed development, either directly or indirectly, lead to serious damage or total loss of ecosystem, or land-use type thus leading to a loss of ecosystem services of scientific/ecological value, or of cultural value? • Will the proposed development affect the exploitation of ecosystems or land-use type in such manner that the exploitation becomes destructive or non-sustainable? • Will the proposed development change the amount, quality or spatial organization of habitat? • Will the proposed development damage ecosystem processes and services, particularly those on which local communities rely? • Will the proposed development disturb connectivity between habitat of the same or different ecosystems, particularly those habitats which are important for interaction between species populations and breeding? • Will the proposed development result in emissions, effluents, and/or other means of chemical, radiation, thermal or noise emissions in areas providing key ecosystem services? • Will the proposed development lead to changes in ecosystem composition, ecosystem structure or key processes / responsible for the maintenance of ecosystems and ecosystem services in areas providing key ecosystem services? • If habitats will be lost or altered, is there alternative habitat available to support associated species populations?	General guidance on the approach to alternatives: • Evaluate impacts of alternatives with reference to the baseline situation, and how it might evolve in the future without the project. • Compare against legal standards, thresholds, targets and/or objectives for biodiversity. • Use national biodiversity strategies and action plans and other relevant documents for information and objectives. • The vision, objectives and targets for the conservation and sustainable use of biodiversity contained in local plans, policies and strategies, as well as levels of public concern about, dependence on, or interest in, biodiversity provide useful indicators of acceptable change. General guidance on the approach to mitigation / enhancement: • The purpose of mitigation in EIA is to look for ways to achieve the project objectives while avoiding negative impacts or reducing them to acceptable levels. The purpose of enhancement is to look for ways of optimizing environmental benefits. Both mitigation and enhancement of impacts should strive to ensure that the public or individuals do not bear costs, which are greater than the benefits that accrue to them. • Remedial action can take several forms, i.e. avoidance (or prevention), mitigation (by considering changes to the scale, design, location, siting, process, sequencing, phasing, management and/or

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Approach to alternatives or mitigation measures (FOR ASSESSMENT STAGE)
	• Are there opportunities to consolidate or connect habitats? • Will the proposed development affect plans to enhance habitat availability or quality? • Will the proposed development adversely affect: protected areas; threatened ecosystems outside protected areas; ecological corridors identified as being important for ecological or evolutionary processes; areas known to provide important ecosystem services; and areas known to be habitat for threatened species? • Will the proposed development involve the creation of linear infrastructure that leads to fragmentation of habitats or in areas providing key and other relevant ecosystem services? Processes which are important for the creation and / or maintenance of ecosystems: • Will the proposed development change the foodweb structure and interactions that shape the flow of energy and the distribution of biomass within the relevant ecosystem? • Would the proposed development result in significant changes to water level, water quantity or water quality? • Would the proposed development result in significant changes to air quantity or pollution?	monitoring of the proposed activity, as well as restoration or rehabilitation of sites), and compensation (often associated with residual impacts after prevention and mitigation). A 'positive planning approach' should be used, where avoidance has priority and compensation is used as a last resort measure. One should acknowledge that compensation will not always be possible: there are cases where it is appropriate to reject a development proposal on grounds of irreversible damage to, or irreplaceable loss of, biodiversity. • Practical evidence with respect to mitigation suggests that: ○ Timely and ample attention to mitigation and compensation, as well as the interaction with society, will largely reduce the risk of negative publicity, public opposition and delays, including associated costs. ○ Mitigation requires a joint effort of the proponent, planners, engineers, ecologists and other specialists, to arrive at the best practicable environmental option; ○ Potential mitigation or compensation measures have to be included in an impact study in order to assess their feasibility; consequently they are best identified during the scoping stage; ○ In project planning, it has to be kept in mind that it may take time for effects to become apparent. Summary of key messages in promoting no net loss of biodiversity: 1. Avoid irreversible losses of biodiversity, for example by the spatial arrangement of a project. 2. Seek alternative solutions that minimize biodiversity losses, in particular consider and prioritise maintaining habitats which are experiencing long term decline 3. Use mitigation to restore biodiversity resources where their loss is unavoidable. 4. Compensate for unavoidable loss by providing substitutes of at
Species diversity	• Will the proposed development cause a direct or indirect loss of a population of a species in the area, especially those identified as priorities in NBSAPs and/or subnational biodiversity plans? • Will the proposed development alter the species-richness or species-composition of habitats in the study area? • Will the proposed development affect sustainable use of a population of a species? • Will the proposed development surpass the maximum sustainable yield, the carrying capacity of a habitat/ecosystem or the maximum allowable disturbance level of populations, or ecosystem? • Would the proposed development increase the risk of invasion by alien species?	

Concerns related to:	Key guiding questions that could be asked within the assessment (FOR SCOPING STAGE)	Approach to alternatives or mitigation measures (FOR ASSESSMENT STAGE)
Genetic biodiversity	• Will the proposed development result in extinction of a population of particularly rare species, declining species and those with identified as priorities in National Biodiversity Strategies and Action Plans (NBSAPs) and/or subnational biodiversity plans? • Will the proposed development cause a local loss of varieties of cultivated plants and/or domesticated animals and their relatives, genes or genomes of scientific, ecological, or cultural value? • Will the proposed development result in the fragmentation of an existing population leading to (genetic) isolation?	least similar biodiversity value. 5. Seek opportunities for enhancement, for example by facilitating the connectivity of fragmented environments, creating beneficial high biodiversity habitats.

Annex 4: Case Studies

Case study 1: Via Baltica – biodiversity and EIA lessons learned

Country / location:

Poland.

Key Message

Lack of consideration of biodiversity issues up front the scoping stage of an EIA for a road construction process resulted in failure to develop and assess suitable alternatives for the project, and a subsequent formal complaint against the project which eventually halted construction. Alternative routes were assessed and agreed upon later, but the process resulted in several years of delay and considerable added cost.

Type and description of project:

Via Baltica was an extensive road project that was planned to run from Warsaw (Poland) to Helsinki (Finland) via Estonia, Latvia and Lithuania as part of a Central / Eastern Europe transport network. An SEA process was undertaken for the route as a whole and a number of separate EIAs were conducted for different parts of the road. This case study is only focussed on the Via Baltica section within Poland, and in particular the section routed through the internationally important Augustow Forest which is part of the protected Natura2000 Network.

The Polish Government had claimed that the assessment of potential damage, consideration of alternatives and compensatory measures undertaken was compliant with the EIA and Natura2000 Network Directives. This has subsequently found to not be the case through the investigations of a number of NGOs – lead, primarily by Birdlife International, in particular the assessment of alternatives was found to be inadequate. The NGOs lobbied the Government to find alternative routes to avoid irreparable damage to these internationally important habitats and species. This advice was ignored and the initially proposed route was still preferred by the Government, this resulted in a formal complaint with the European Commission was lodged by the NGOs against the Government. This was not acted upon and construction started – the Commission subsequently referred the case to the European Court of Justice and asked for an urgent order to stop the project – this was subsequently given (April 2007) and construction was forcibly halted.

Particular fault was found with the consideration of alternatives as per the EIA Directive; in particular the lack of consideration of alternative routes undermined the Government's stated case regarding overriding public interest as per the Habitats Directive.

In 2009 a number of roundtables were conducted with the Government, nature NGOs and other stakeholders to determine possible alternative routes avoiding the protected sites. This was supported ultimately by an SEA process which identified possible alternative routes, see figure. In October 2009 the Government agreed to follow the recommendations and adopted an alternative route; bypassing the majority of the protected sites.

Elements of good practice / key lessons from the EIA:

This is not an example of good practice; rather it serves as an example of the implications of not properly incorporating biodiversity within screening, scoping and the consideration of

Case study 1: Via Baltica – biodiversity and EIA lessons learned

alternatives. This can be ultimately attributed to a lack of early and effective engagement.

- Interrelationship between EIA, SEA and the Natura2000 network and assessment. In particularly consideration of alternatives in EIA is a key stage in avoiding potential impacts to protected Natura2000 sites.
- Ineffective scoping meant that the presence of protected species such as the Greater Spotted Eagle, Corncrake and Aquatic Warbler was not identified as significant and integrated into the development of alternatives. This was symptomatic of a lack of proper investigation of biodiversity concerns resulting in a failure to generate sufficient alternatives. Preliminary screening exercises should have identified these (and other) protected species and the potentially significant consequences of the project and supported the development of alternatives.
- The effects of the project would be beyond the direct footprint of the road, the changes in migration, morphology; water flow and noise are all likely to have negative effects on the immediate environment and due to the importance of these particular habitat species movements and fitness internationally. Only by considering these cumulatively can the true potential impact of the project be accurately considered.
- This example makes clear the status and importance of biodiversity stakeholders and therefore the need for effective early engagement to highlight their concerns and respond in a timely manner. In this instance a lack of early engagement with biodiversity stakeholders (who would have identified these issues) leading to a series of actions which ultimately cost to project and proponents a significant amount of resources. Ultimately by working together the key stakeholders have produced a negotiated solution.

Source of further information:

- **Construction of the 'Via Baltica' Motorway (2003) – Report presented by NGOs to Council of Europe:** https://wcd.coe.int/wcd/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=1326730&SecMode=1&DocId=1440682&Usage=2
- **Follow–up of Recommendation No. 108 (2003) Construction of the 'Via Baltica' Expressway in Poland (2004) – presented by NGOs to Council of Europe:** **https://wcd.coe.int/wcd/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=1326964&SecMode=1&DocId=1450596&Usage=2**
- **Poland's Government spares threatened wildlife from road development:** http://www.rspb.org.uk/news/details.asp?id=tcm:9-232944
- **Delight as Polish court gives road development a 'red light':** http://www.rspb.org.uk/news/details.asp?id=tcm:9-178409
- **Via Baltica - Poland's nature under threat:** http://www.birdlife.org/eu/EU_policy/Birds_Habitats_Directives/casework_via_baltica.html
- **Audio – visual presentation of the case study to honour Goldman Prize for Environment 2010:** http://www.youtube.com/watch?v=Hgd93rxQyfY&feature=player_embedded

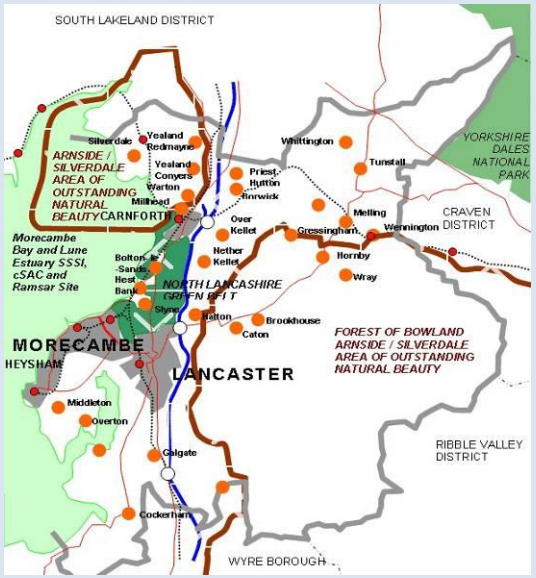
Case study 2: The Heysham M6 link road – biodiversity and EIA, lessons learned

Country/location:

Lancaster, Northwest United Kingdom

Key Message

A 2007 study examined ways in which an ecosystem-based approach (EBA) could be applied to the EIA of a link road development project. This study recommended that the concept of ecosystem goods and services should replace the more fragmented, topic-based approach taken by the EIA for the project, for the project to be sustainable in the long-term. Well-planned stakeholder participation is also crucial to identify the benefits arising from local ecosystem goods and services, assess their "value", and ensure that they are secured into the future. Furthermore, extending the scope of the EIA beyond the immediate siting of measures and infrastructure may be required to adequately map and quantify the supply and quality of ecosystem goods and services.



Type and description of project

In 2007, the UK's Department for Environment, Food and Rural Affairs (Defra) commissioned a study on the application of the ecosystem-based approach (EBA) in the EIA of an important infrastructure development project, the Heysham M6 link road in Lancashire, England.

The planning application upon which the EIA was conducted proposed a trunk road to improve connectivity between the Heysham port, Morecambe and the M6 motorway. This design, which was first proposed in the 1940s, has traditionally been controversial due to environmental concern and divided public opinion among local communities. On the one hand, the area is of undisputable environmental value (SSSI, Special Protection Area, Special Area Conservation and Ramsar sites, fishing resources, etc.) and thus potentially vulnerable to any major infrastructure developments. On the other hand, economic regeneration in the area significantly depends on industrial development, which would in turn benefit from better connections with the Heysham port.

This study was part of a series of research project commissioned by Defra with a view to efficiently incorporating the EBA into future policy and implementation measures. This follows the rationale that the EBA can provide a more robust framework for decisions requiring stronger integration and assessment of social, economic and environmental issues. The two main questions that the study sought to answer are the following:

1. "How well does the procedure that has been followed for the proposed Heysham M6 link deliver the EBA?"
2. "To what extent can the information collected to assess the impact of the Heysham M6 link, together with other information already available, be used to successfully use the EBA?"

To do so, the study checked the EIA against the twelve tasks set out in the guidelines published by the Convention on Biological Diversity (CBD): *The Ecosystems Approach Advanced User Guide (*http://www.cbd.int/ecosystem/sourcebook/advanced-guide/)

Benefits of incorporating the EBA into EIA processes

The study presented a retrospective discussion of the potential benefits that the adoption of an EBA throughout the planning process might have yielded.

First, it would have favoured a stronger consensus at local level as well as greater ownership of the adopted decisions. This would make the process more inclusive and participatory, which appears to be a key issue given the recurrent delays and opposition that affected the Heysham M6 link project in the past.

Case study 2: The Heysham M6 link road – biodiversity and EIA, lessons learned

Second, adopting the EBA would have warranted "a solution that optimises local benefits whilst meeting regional, national and international priorities".

Third, it would have resulted in a more holistic mitigation strategy focusing on ecosystem functions and limits, thus helping ensure the sustainability of project-related outcomes.

Fourth, it would have resulted in a stronger framework for ongoing management and monitoring of the mitigation strategy.

Adopting an EBA for EIAs: lessons learned

The overarching conclusion of the ADAS study was that the EBA, i.e. "having a clear strategy for and commitment to the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way", should form the basic framework for the planning process rather than serve as a mere tool or set of techniques. Furthermore, the study concluded that, while many of the tools and methods used in the EIA process were to some extent compatible with the EBA, "there are significant tensions and incompatibilities that need overcoming in the current planning system, which still remains adversarial in nature". In other words, the EBA must inform both policy delivery planning and the culture of the organisation/expert in charge of carrying out the EIA.

At a more concrete level, the study issued a number of recommendations to favour the adoption of EBA in EIAs. What follows is a summary of the most relevant ones.

1. Work with communities and local authorities to introduce a new "quality of life" language into the planning system context for EIA, so that 'defining the problem' is a more integrated, holistic process. The study points out that EIAs, especially those for road schemes, tend to focus solely on the impact of the proposed route and neglect more sustainable options (e.g. non-road and alternative routes).

2. Work with relevant agencies and partners to find meaningful and accurate ways of mapping and quantifying the supply and quality of ecosystem goods and services. This requires a flexible mapping tool to develop scenarios for different land use combinations based on inherent soil fertility, ecological functions and nutrient cycling abilities for successfully adapting to environmental change, e.g. climate change impacts and pressures from farming and forestry.

3. Account for the costs of changing natural resource systems (and their supplies of ecosystem goods and services) resulting from each option considered in the EIA. This may require extending the scope of the EIA beyond the immediate siting of measures and infrastructure.

4. Develop economic valuation of aspects of the natural environment that people relate to and use on a daily basis. This would help people understand the benefits and losses they may incur from a project, thus contributing to a more informed consensus around decision making.

5. Retrieve and take into account local knowledge, concerns and aspirations for the area under study. This would lead to both more robust and sustainable decisionmaking, and better design and mitigation strategies for approved schemes.

Sources of further information

- **Case study to develop tools and methodologies to deliver an ecosystems approach – Heysham to M6 link Defra research project nr0110, December 2007:** http://randd.defra.gov.uk/Document.aspx?Document=NR0110_7329_FRA.pdf
- **Convention on Biological Diversity (CBD), Ecosystems Approach portal (also available in French and Spanish):** http://www.cbd.int/ecosystem/
- **Lancashire County Council, Heysham to M6 Link portal:** http://www.lancashire.gov.uk/corporate/web/?siteid=6092&pageid=35076&e=e

Case study 3: The climate and energy concept in Austrian EIA procedures

Country/location:

Austria

Key Message

In Austria, project developers are required by a 2009 regulation to provide information on how the proposed project has considered energy demand and flow, energy efficiency, GHG emissions and measures to reduce emissions and improve efficiency. The regulation is accompanied by a guidance document issued by the Austrian government to help project developers and EIA practitioners to better understand and comply with the regulation.

Description

In 2009, the Austrian government passed a regulation which made consideration of the "climate and energy concept" mandatory in EIA procedures. The regulation was passed in recognition of the global and EU targets on GHG emissions reductions and energy efficiency, in an effort to improve the opportunities for EIA to contribute to these goals. The regulation requires project developers to provide the following information within the environmental impact statement for all projects requiring EIA:

- energy consumption, broken down by plants, machinery and devices as well as by energy sources
- available energy indicators
- description of energy flows
- description of the climate-relevant greenhouse gases (GHG) arising from the project
- Measures to reduce GHG emissions and energy efficiency measures

To assist with compliance with these rules, the Austrian government has issued guidance on the climate and energy concept in EIA procedures. The guidance points out that projects with a reasonable threshold of energy demand – a total of 50 Terajoule per year (5 for major project parts) are particularly relevant. These include mainly power stations (operated with fossil fuels); industrial installations with a high energy demand (e.g. cement production, iron and steel, paper and pulp, chemical industry); infrastructure projects strongly dependent on customers' traffic (e.g. shopping centres); and urban development projects which require large heating and air conditioning systems (e.g. large housing estates).

The guidance also recommends the following important sources for up-to-date information on energy efficiency and GHG reduction methods: European Best Available Technology (BAT) reference documents, European legislation and standards, comparison with similar projects, and available benchmarks. The guidance stresses that the planning phase for large-scale developments is crucial, and provides opportunities for the following measures:

- Optimisation of industrial production processes (reducing the energy demand by recovery of excess heat, process control measures)
- Use of cogeneration in large combustions plants and waste incineration plants
- Use of renewable energy sources
- Use of energy efficient auxiliary systems (heating, cooling, pumps, motors, lighting etc.), avoid oversized systems
- Implementation of an energy efficiency management system

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- Proper insulation of buildings, low energy buildings
- Construction phase: logistics, short transport routes, use of energy efficient trucks and machinery
- Traffic: options for public transport

The regulation is also aimed at raising awareness about climate change mitigation in Austria.

Source: The Climate and Energy Concept in Austrian EIA Procedures

http://live.unece.org/env/eia/meetings/wg_eia_14.html

For further information: tbd