European Commission

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Climate Change and Major Projects

Outline of the climate change related requirements and guidance for major projects in the 2014-2020 programming period

Ensuring resilience to the adverse impacts of climate change and reducing the emission of greenhouse gases

Climate Action

Introduction

Major projects are funded by the European Regional Development Fund (ERDF) and the Cohesion Fund and listed in the concerned operational programmes.

A major project has a total eligible cost exceeding € 50 million (and € 75 million for e.g. transport projects). More than 500 major projects are foreseen in the period 2014-2020.

Climate change adaptation and mitigation considerations are integrated in the preparation and approval of major projects.

Adaptation seeks to ensure adequate resilience of major projects to the adverse impacts of climate change, for example flooding. It is based on a vulnerability and risk assessment.

Mitigation seeks to reduce the emission of greenhouse gases, for example in the selection of low-carbon options. This is addressed through the quantification of greenhouse gas emissions and integration in the cost-benefit analysis.

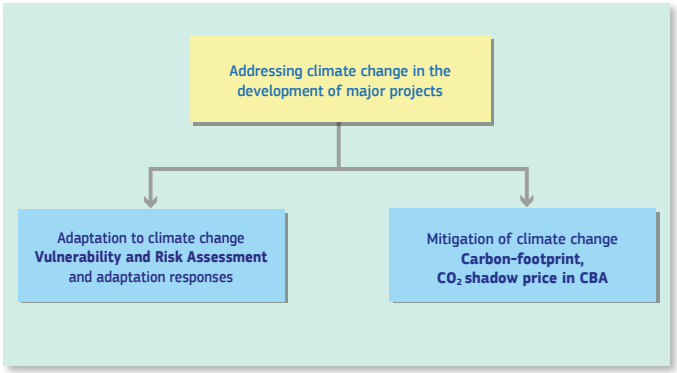


Figure 1. Addressing climate change in the development of major projects

Consideration of climate change requirements, both adaptation and mitigation should be initiated as early as possible in the development cycle. By doing so, the corresponding climate resilience measures and mitigation options can be optimally integrated in the project cycle. This is illustrated in Figure 2, which provides an overview of the main project development stages and an indication of how climate change adaptation and mitigation considerations should be included.

This fact sheet is first and foremost intended for those involved in the various development stages of major projects. However, the methodology presented is not limited to major projects. It has a broader scope and can be usefully applied for a wider range of projects.

Climate change

Europe will see a progressive and possibly very strong increase in the overall climate hazard. Key hotspots emerge particularly along coastlines and in floodplains. Climate hazard impacts to critical infrastructures and EU regional investments may strongly rise in Europe: damages could triple by the 2020s, multiply six-fold by mid-century, and amount to more than 10 times present damages by the end of the century[1].

Economic losses will be highest for the industry, transport and energy sectors. The strongest increase (more than fifteen-fold by the end of the century) in damage is projected for the energy and transport sectors. Losses from heat waves, droughts in southern Europe and coastal floods (including the effects of sea level rise) show the most dramatic rise, but the risks of inland flooding, windstorms and forest fires will also increase in Europe, with varying degrees of change across regions. Floods currently account for approximately half of the damages from climate hazards, but in the future droughts and heatwaves may grow faster and become the most damaging hazards.

The return period of climate hazards could be subject to a sharp drop. For example, a flood event that in average would occur once in a twenty year period (1:20) in the current climate may become more frequent and occur every one or two years (1:2) under future climate conditions. The same may happen to e.g. the current 1:100 year heatwave. The significant change in the return periods of multiple extreme weather events sends a strong signal to project developers, business owners and operators that the design and related standards should be amended in the concerned sectors.

Paris Climate Agreement

The UNFCCC adopted the Paris Climate Agreement[2] at COP21 on 12 December 2015. It is the first-ever universal, legally binding global climate deal, setting out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C. It also establishes the global goal on adaptation including strengthening resilience and reducing vulnerability to climate change. The aim of addressing climate change issues in major projects contributes to the implementation of these global goals on the local level.

Sendai Framework for Disaster Risk Reduction

Signed in 2015, the Sendai Framework commits every country at all levels to reduce disaster risks and build resilience. It includes a target to substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030. Ensuring climate resilient investments will contribute to meeting the target.

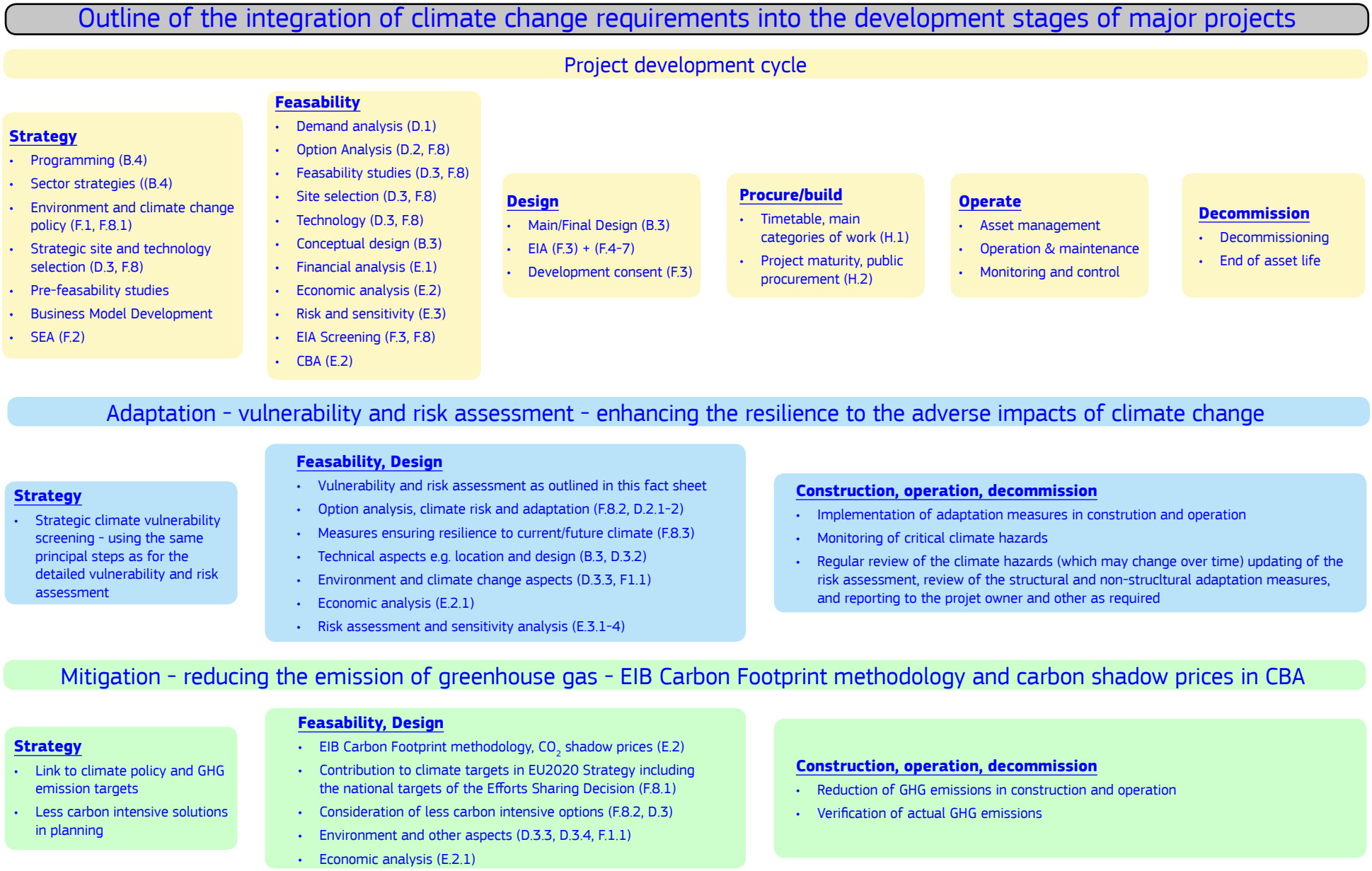
2030 Agenda for Sustainable Development

Addressing climate change issues in major projects can also contribute towards the goals of the 2030 Agenda for Sustainable Development, adopted by the General Assembly of the United Nations on 25 September 2015, and e.g. the Sustainable Development Goals 9 “Build resilient infrastructure” and 13 “Take urgent action to combat climate change and its impacts”.

EU Strategy on adaptation to climate change

The EU Strategy on adaptation to climate change[3], which was adopted by the European Commission on 16 April 2013, includes specific actions on enhancing the resilience of infrastructure and mainstreaming climate adaptation into the regional and cohesion policy. Climate resilient major projects will contribute to the objectives of the EU adaptation strategy.

Figure 2. Integrating climate change requirements in the development of major projects



The text in brackets, e.g. (B.4) refer to the corresponding senction in 'Format for submission of the information on a major project', Annex II, Commission Implementing Regulation (EU) 2015/207.
The diagram is indicative and entails some flexibility as to when certain activities should be undertaken in the project cycle.

Adaptation to Climate Change

Vulnerability and Risk Assessment

Introduction

The Climate Change Vulnerability and Risk Assessment is the process of managing climate adaptation issues for a project in order to improve the project's resilience to climate change. It involves identifying which climate hazards the project is vulnerable to, assessing the level of risk, and considering adaptation measures to reduce that risk to an acceptable level.

The consideration of climate change related risks is integrated in the legal basis for major projects (see references on p. 13).

It is highly recommended to integrate the vulnerability and risk assessment from the beginning of the project development[4], because this generally will provide the broadest range of possibilities for selecting the optimal adaptation options. For example, the project location, which is often determined at an early stage, can be decisive for the climate change vulnerability and risks assessment.

The guidance for project managers[5] on how to make vulnerable investments resilient to climate change, which was published with the EU Strategy on adaptation to climate change[3], provides a methodology for undertaking such a Vulnerability and Risk Assessment. It can be summarised into three steps:

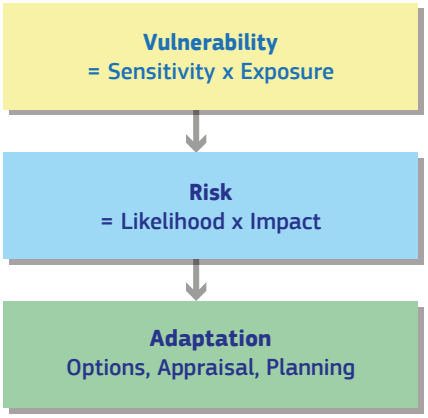


Figure 3. Main steps in the vulnerability and risk assessment

Preparing the vulnerability and risk assessment

As a prior step, before embarking on the vulnerability and risk assessment, it is essential to prepare and plan the process, assess and define the project context and project boundaries and interactions, define the methodology for how to do the assessment including key parameters for the vulnerability and risk assessment, identify who should be involved, ensure compliance with applicable rules and regulations including e.g. on structural engineering, etc

With regard to major projects in the programming period 2014-2020, it is recommended – unless available information and detailed analysis would show otherwise – to take the following into account:

First, as regards the scenario for greenhouse gas emissions and global warming reference can be made to the Paris Agreement[2]. On this background, as a pragmatic simplification[6], the vulnerability and risk assessment could be based on an increase in the global average temperature of indicatively 2°C above pre-industrial level by 2050 and remaining approximately constant thereafter. It should be noted, however, that locally the warming can be higher than the global average, for example over land, and this must be taken into account when assessing local impacts.

Second, it is important to note that the timescale for the vulnerability and risk assessment should correspond to the intended lifespan of the investment being financed under the project. The lifespan will often be (considerably) longer than the reference period used for the discounting of cash flow in the cost-benefit analysis.

Third, during the lifespan there could be significant changes in the frequency and intensity of extreme weather events[1] due to climate change, which should be taken into account. Due regard should also be given where relevant to e.g. sea level rise, which is projected to continue beyond this century even with a stabilisation of global warming below 2°C.

Vulnerability = Sensitivity x Exposure

The aim of the **vulnerability assessment**[7] is to identify the relevant climate hazards[8] for the given specific project type at the foreseen location.

This is done by combining the outcome of the analysis of sensitivity and exposure, respectively.

The aim of the **sensitivity analysis** is to identify the relevant climate hazards for the given specific type of project, irrespective of its location. For example, sea level rise is likely to be an important hazard for most sea port projects irrespective of the location.

The sensitivity analysis should consider the project in a comprehensive manner, looking at the various components of the project and also how the project operates within the wider network or system. The assessment may be undertaken separately for the various elements of the project, including e.g. on-site assets and processes, inputs such as water and energy, outputs such as products and services, as well as access and transport links, even if outside the direct control of the project.

In addition, the project design may critically depend on particular (engineering or other) parameters. For example, the design of a bridge could be critically dependent on the water level in the river it crosses, or the uninterrupted operation of a power plant could be critically dependent on sufficient cooling water and the minimum water level and maximum water temperature in the adjacent river. It may be relevant to include critical design parameters in the climate sensitivity analysis.

The aim of the **exposure analysis** is to identify the relevant hazards for the foreseen project location, irrespective of the project type. For example, flooding could be an important climate hazard for a location next to a river in a low-lying flood plain. The analysis can be split in two parts, i.e. exposure to the current climate and exposure to the future climate. Climate model outputs can be used to understand how exposure may change in the future. Particular attention should be given to changes in the frequency and intensity of extreme weather events[1].

Use robust and authoritative climate change information, e.g.:

- National / regional sources of climate change information
- National Risk Assessments[9] where relevant and available
- European Climate Adaptation Platform (Climate-ADAPT)[10]
- Copernicus[11]
- European Commission Joint Research Centre (JRC)[12]
- European Environment Agency (EEA)[13]
- IPCC Fifth Assessment Report[14] and Data Distribution Centre[15]
- World Bank climate knowledge portal[16]

Table 1 Examples of sources of information on climate change

Risk = Likelihood x Impact

The aim of the risk[7] assessment is to assess in a greater level of detail the likelihood and impact of the relevant climate hazards (as identified in the vulnerability assessment). The aim is to quantify the significance of the risks to the project in the current and future climate.

For a range of climate hazards it can be expected[14] that the likelihood and impacts will change during the lifespan of the major project – as global warming and climate change will unfold. The projected changes in likelihood and impacts should be integrated in the vulnerability and risk assessment. For this purpose it may be relevant to subdivide the lifespan into a sequence of shorter periods (e.g. 20 years). Particular attention should be given to weather extremes.

The risk assessment should respond to the requirements[17], for example as regards including risks related to climate change impacts and weather extremes in the option analysis. It will also contribute to the cost-benefit analysis' risk assessment with reference to chapter 2.9 of the Guide to Cost-Benefit Analysis of Investment Projects[18]. Reference can also be made to the latter guide as regard the definitions and scales used for likelihood and severity.

Adaptation options, appraisal and planning

Significant risks to the project deriving from the effects of climate change should be managed and reduced to an acceptable level.

For each significant risk identified, relevant adaptation measures should be considered and assessed. The preferred measures should then be integrated into the design and/or operation of the project to enhance the resilience of the project.

There is an increasing amount of literature and experience on adaptation options, appraisal and planning[19].

Adaptation will often involve a mix of structural and non-structural options. The former includes e.g. modifications to the design or specification of physical assets and infrastructure, or the adoption of alternative or improved solutions. The latter includes e.g. improved monitoring or emergency response programmes, staff training and skills transfer activities, development of strategic or corporate climate risk assessment frameworks, financial solutions such as insurance against supply chain failure or alternative services.

The expected benefits of recommended adaptation measures should be clearly explained and expressed in financial terms where possible and appropriate. The appraisal of adaptation options can be quantitative or qualitative depending on the availability of information and other factors. In some circumstances it may be sufficient with a rapid expert assessment. In other circumstances, in particular for options with significant economic impact, it may be relevant to use more comprehensive information, for example on the climate hazard's likelihood distribution and the economic value of the associated (avoided) damages as well as the residual risks.

The next step is to integrate the appraised adaptation options into the project, at the various development stages, including e.g. investment and finance planning, monitoring and response planning, defining roles and responsibilities, organisational arrangements, training, etc.

Example of a methodology for the vulnerability and risk assessment of major projects

This table illustrates the vulnerability and risk assessment method presented in the Guidance for project managers on making Infrastructure climate resilient[5]. It is one among several methods. Proper planning often includes an expert analysis and choice of the appropriate methodology.

SENSITIVITY ANALYSIS

Sensitivity table: *(example)*		Climate variables and hazards: Flood	Heat	...	Drought
Themes	On-site assets, ...	High	Low	...	Low
	Inputs (water, ...)	Medium	High	...	Medium
	Outputs (produts, ...)	High	Medium	...	Low
	Transport links	Medium	Low	...	Low
	Highest score 4 themes	High	High	...	Medium

The output of the sensitivity analysis may be summarised in a table with the sensitivity ranking of the relevant climate variables and hazards for a given project type, irrespective of the location, including critical parameters, and divided in e.g. the four themes.

EXPOSURE ANALYSIS

Exposure table: *(example)*	Climate variables and hazards: Flood	Heat	...	Drought
Current climate	Medium	Low	...	Low
Future climate	High	Low	...	Medium
Highest score, current + future	High	Low	...	Medium

The output of the exposure analysis may be summarised in a table with the exposure ranking of the relevant climate variables and hazards for the selected location, irrespective of the project type, and divided in current and future climate. For both the sensitivity and exposure analysis, the scoring system should be carefully defined and explained, and the given scores should be justified.

VULNERABILITY ANALYSIS

Vulnerability table: *(example)*		Exposure (current + future climate): Low	Medium	High
Sensitivity (highest, 4 themes)	Low			
	Medium		Drought	
	High	Heat		Flood

Legend:

Vulnerability level
Low
Medium
High

The vulnerability analysis may be summarised in a table for the given specific project type at the selected location. It combines the sensitivity and the exposure analysis. The most relevant climate variables and hazards are those with a high or medium vulnerability level, which are then taken forward to the risk assessment. The vulnerability levels should be carefully defined and explained, and the given scores justified.

LIKELIHOOD ANALYSIS

Scale for assessing the likelihood of a climate hazard (example):

Term	Qualitative	Quantitative (*)
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to occur as not	50%
Likely	Likely to occur	80%
Almost certain	Very likely to occur	95%

The output of the likelihood analysis may be summarised in a qualitative or quantitative estimation of the likelihood for each of the essential climate variables and hazards.
(*) Defining the scales requires careful analysis for various reasons including e.g. that the likelihood and impacts of the essential climate hazards may change significantly during the lifespan of the major project (due e.g. to global warming and climate change). Various scales are referred to in the literature

IMPACT ANALYSIS

Scale for assessing the potential impact of a climate hazard (example): Risk areas: / Impacts:	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational					
Safety and health					
Environment					
Social					
Financial					
Reputation					
Overall for the above-listed risk areas					

The impact analysis provides an expert assessment of the potential impact for each of the essential climate variables and hazards.

RISK ASSESSMENT

Risk table: Likelihood / Overall impact of the essential climate variables and hazards (example)	Insignificant	Minor	Moderate	Major	Catastrophic
Rare				Flood	
Unlikely			Drought		
Moderate			Heat		
Likely					
Almost certain					

Legend:

Risk level
Low
Medium
High
Extreme

The output of the risk analysis may be summarised in a table combining likelihood and impact of the essential climate variables and hazards. Detailed explanations are required to qualify and substantiate the assessment conclusions. The risk levels should be explained and justified.

IDENTIFYING ADAPTATION OPTIONS

Option identification process:
- Identify options responding to the risks (expert workshops, meeting, evaluation, ...)

Adaptation may involve a mix of responses:
- training, capacity building, monitoring, ...
- use of best practices, standards, ...
- engineering solutions, technical design, ...
- risk management, insurance, ...

APPRAISING ADAPTATION OPTIONS

The appraisal of adaptation options should give due regard to the specific circumstances and availability of data. In some cases a quick expert judgement may suffice whereas other cases may warrant a detailed cost-benefit analysis. It may be relevant to consider the robustness of various adaptation options vis-à-vis climate change uncertainties.

ADAPTATION PLANNING

Integrate relevant climate resilience measures into the technical project design and management options. Develop implementation plan, finance plan, plan for monitoring and response, and so on. The vulnerability and risk assessment and adaptation planning is aiming to reduce the remaining climate risks to an acceptable level.

Mitigation of climate change

Introduction

Mitigation of climate change is about reducing the emissions of greenhouse gases (GHG) and limiting global warming. Major projects (and many other projects and investments) can contribute in this regard, for example through the design and selection of low-carbon options.

A cost-benefit analysis is required[20] for all major projects including quantification[21] of the project's GHG emissions. This applies to all major projects, irrespective of the project category and the level of absolute and relative emissions.

Early and consistent attention to the emission of greenhouse gases in the various development stages of the major projects will help in applying better and more climate friendly solutions.

Carbon Footprint Methodology for major projects

The Guide to Cost-Benefit Analysis of Investment Projects[18] includes the evaluation of GHG emissions. The proposed approach to integrating climate change externalities into the economic appraisal is based, in part, on the EIB Carbon Footprint Methodology, which is published on EIB's website[22]. This methodology includes the default emissions calculation approach for e.g.:

- Waste water and sludge treatment
- Waste treatment management facilities
- Municipal solid waste landfill
- Road transport
- Rail transport
- Urban transport
- Building refurbishment

Steps in the carbon footprint assessment

The carbon footprint methodology includes the following main steps:

1. Define project boundary
2. Define the assessment period
3. Emission scopes to include
4. Quantify absolute project emissions (A_b)
5. Identify and quantify baseline emissions (B_e)
6. Calculate relative emissions ($R_e = A_b - B_e$)

The absolute (A_b) GHG emissions are the annual emissions estimated for an average year of operation for the project.

The baseline (B_e) GHG emissions are those emissions which would arise from the expected alternative scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would have occurred in the absence of the project.

The relative (R_e) GHG emissions represent the difference between the absolute project emissions and the baseline scenario emissions.

The absolute and relative emissions should be quantified for a typical year of operation. For certain projects, for example transport projects where the traffic is forecasted to increase over time, it is recommended to select the year with the highest level of emissions.

The carbon assessment should be included throughout the project development cycle including as a tool in the ranking and selection of options – with a view to promote low-carbon considerations and options.

The project boundary defines what is to be included in the calculation of the absolute, baseline and relative emissions.

The carbon footprint methodology uses the concept of "scope" as defined by the Greenhouse Gas Protocol[23].

Table 2 illustrates the three scopes that are part of the carbon footprint methodology and the particular consideration of indirect emissions for road, rail, and urban public transport infrastructure.

Scope	Road, rail and urban public transport infrastructure	All other projects
Scope 1 emissions direct emissions that occur from sources within the project boundary – burning of fossil fuels, industrial process	If applicable: Fuel combustion, process / activity, fugitive emissions	Yes: Fuel combustion, process / activity, fugitive emissions
Scope 2 emissions indirect emissions from purchased electricity	If applicable: Transport (mainly electric rail) infrastructure projects that are operated by the owner of the infrastructure	Yes: Electricity, heating, cooling
Scope 3 emissions other indirect emissions not under the control of the project	Yes: Indirect GHG emissions from vehicles using transport infrastructure including modal shift effects	If applicable: Direct and exclusive upstream or downstream scope 1 and 2 emissions

Table 2. Examples of scope 1, 2 and 3 emissions for selected project types

Baselines for the carbon footprint and the cost-benefit analysis

The baseline for the carbon footprint methodology is often referred to as the "likely alternative" to the project, and the baseline for the cost-benefit analysis as the "counterfactual baseline scenario". For certain projects there may be a difference between these baselines. In such cases it is important to ensure consistency between the quantification of GHG emissions and the cost-benefit analysis. This aspect should be adequately described in the cost-benefit analysis and summarised in the information on the Major Project.

CO_2 shadow prices in the Cost-Benefit Analysis

The Guide to Cost-Benefit Analysis of Investment Projects[18] includes the evaluation of GHG emissions and refers to the EIB unit cost of GHG emissions[24].

The application of carbon pricing to a project has the effect of penalising the economic performance of carbon-intensive projects.

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Chapter 4 of the EIB Guide to Economic Appraisal of Investment Projects[25] sets out the approach to include external costs, and the cost of carbon in particular. Drafted in early 2013, it presents estimates of the economic cost of carbon over the period 2010 to 2030 based on the recommendations of a study conducted by the Stockholm Environment Institute (SEI). Given the long asset life of some of the capital-intensive assets it is now necessary to extend the cost of carbon over a longer time period.

The estimated rise in real terms at an increasing rate over time as illustrated in Table 3 below, which complements table 2.10 in the Guide to Cost-Benefit Analysis of Investment Projects by covering the extended period until 2050.

Estimate	Value 2010 emission	Annual adders 2011 to 2030	Annual adders 2031-2040	Annual adders 2041-2050
High	40	2	4	8
Central	25	1	2	4
Low	10	0.5	1	2

Table 3. Shadow price of carbon, (EUR / t CO_2e), in 2006 prices, for the High, Central and Low Estimate

The central estimate for the economic cost of greenhouse gas emissions (carbon shadow price) in the period 2015-2050, in EUR per tonnes of CO_2-equivalent, in 2015-prices, is shown in the table below:

Year	EUR / tCO_2e	Year	EUR / tCO_2e	Year	EUR / tCO_2e	Year	EUR / tCO_2e
		2021	42	2031	54	2041	80
		2022	43	2032	57	2042	84
		2023	44	2033	59	2043	89
		2024	45	2034	61	2044	94
2015	35	2025	46	2035	64	2045	98
2016	36	2026	47	2036	66	2046	103
2017	37	2027	49	2037	68	2047	107
2018	38	2028	50	2038	70	2048	112
2019	39	2029	51	2039	73	2049	117
2020	40	2030	52	2040	75	2050	121

Table 4. Carbon shadow price, EUR/t CO2e, in 2015 prices, central estimate

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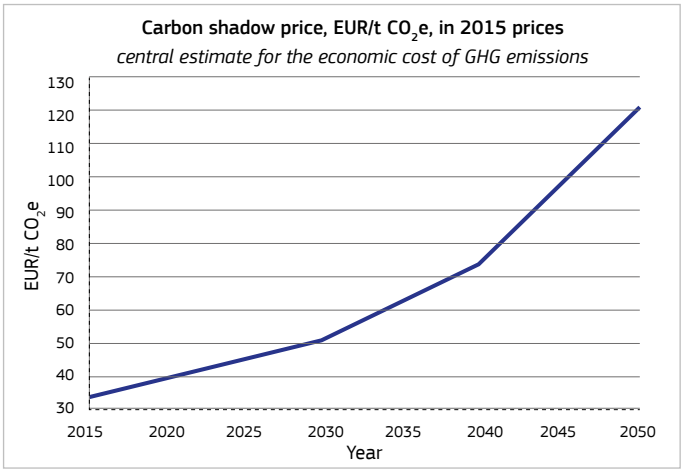

Figure 4. Carbon shadow price, EUR/t CO_2e, in 2015 prices, central estimate

Information on a major project

Introduction

The required information on a major project includes climate change aspects.

The Format for submission of information on a major project is defined in Commission Implementing Regulation (EU) 2015/207, Article 2 and Annex II.

Section F.8 'Climate change adaptation and mitigation, and disaster resilience' is the main climate related section in Annex II. It includes F.8.1, F.8.2 and F.8.3.

In addition, other sections in Annex II include climate change among the topics covered, e.g. sections D.2.1, D.2.2, D.3, D.3.2, D.3.3, D.3.4, E.2.1, E.3.1, E.3.3, E.3.4 and F.1.1.

The basic climate change information requirements for major projects are outlined below and 'further guidance' is provided (complementing the guidance in Annex II):

F.8.1 Contribution to climate change targets

Explain how the project contributes to climate change targets in accordance with the EU 2020 strategy, including information on climate change-related expenditure in line with Annex I to the Commission Implementing Regulation (EU) No 215/2014.

Further guidance: The focus in this section is on the project's contribution to EU and national climate targets (e.g. the Effort Sharing Decision[26]). The following may be relevant:

- Information regarding the national climate change targets in support of the Europe 2020 Strategy and/or any other relevant climate change policies and objectives, and the contribution of the project towards them where relevant;
- Synergies with the European Semester and potential contribution to fulfilling the Country Specific Recommendations, and potential support to advancing the climate change dimensions of the Energy Union, where relevant;
- The EU contribution to the project costs, how much of the total project cost and the EU contribution is supporting climate change objectives (in EUR and as percentage) – based on the selected intervention field(s) and the corresponding climate change coefficients laid down in Commission Implementing Regulation (EU) No 215/2014;

F.8.2 Climate change risks, adaptation and mitigation

Explain how climate change related risks, adaptation and mitigation considerations, and disaster resilience have been taken into account.

As a guidance, please consider the following questions: How were the volume of the greenhouse gas (GHG) externality and the external cost of carbon assessed? What is the shadow cost of GHG and how has it been integrated into the economic analysis? Has a less carbon intense or based on renewable sources alternative been considered? Has a climate risk assessment or vulnerability screening been carried out during the preparation of the project? Have climate change issues been taken into account as part of Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) and have been checked by the relevant national authorities? How did the analysis and ranking of relevant options take into account climate issues? How does the project relate to the national and/or regional strategy for adaptation to climate change? Will the project in combination with climate change have any positive and/or negative impacts on the surroundings? Did climate change influence the location of the project?

Further guidance: The focus in this section is on how climate change has been taken into account in the development of the project including the underlying vulnerability and risk assessment and option analysis:

- Information regarding the national/regional adaptation strategy, and the contribution of the project towards it stated where relevant;
- The GHG externality (the carbon footprint) of the project calculated in accordance with a recognised methodology, and monetised in the cost benefit analysis (CBA);
- Information on when and how climate change was taken into account in the project preparation process, including:
    - Adaptation: An explanation of the climate change adaptation vulnerability and risk assessment process, which has been followed, including information on relevant climate change factors and climate projections, project vulnerability to those, resulting current and future risk, reference to climate forecasts and data sources, how all these aspects were documented and checked (within e.g. EIA, feasibility study, project design, etc.);
    - Mitigation and Adaptation: Selection and ranking of project options (e.g. technical, location) based on climate merits (e.g. for adaptation this may be 'merits regarding enhanced resilience');
    - In the case of dedicated adaptation projects: refer to and describe the project's contribution to the national / regional adaptation strategy;

F.8.3 Resilience to current and future climate

Explain what measures have been adopted to ensure resilience to current climate variability and future climate change within the project.

As a guidance, please consider the following questions: how was climate change taken into consideration when designing the project and its components, for example with regard to external forces (e.g. wind load, snow load, temperature differences) and impacts (e.g. heat waves, drainage, risk of flooding as well as prolonged dry periods affecting e.g. soil characteristics).

Further guidance: The focus of this section is on the selected project's adaptation to the current and future climate:

- Information on relevant measures to ensure, where significant risks were identified, the resilience of the project to the current and future climate. This includes both structural and non-structural measures, and can be divided in measures implemented (e.g. included in the design) and foreseen (e.g. as part of operation, maintenance, and monitoring);
- With regard to the resilience to the future climate and monitoring hereof reference can be made to e.g. Regulation 1303/2013, Article 110.1(d), Article 125.3(iii), and Annex I (section 5.2.1-2)

D.2.1 Options, risks (climate change impacts, weather extremes)

Please outline the alternative options considered in feasibility studies (max. 2-3 pages) in accordance with the approach as set out in Annex III (Methodology for carrying out the cost-benefit analysis) to this Regulation. At least the following information should be included:

(i.) The total investment cost and operating costs for options considered;

(ii.) Options for scale (against technical, operational, economic, environmental and social criteria) and options for location of the proposed infrastructure;

(iii.) Technological options – per component and per system;

(iv.) Risks involved for each alternative, including risks related to climate change impacts and weather extremes;

(v.) Economic indicators for options considered, if applicable;

(vi.) Summary table containing all pros and cons for all options considered.

In addition, in case of productive investments give details of capacity considerations (e.g. capacity of the firm before investment (in units per year), reference date, capacity after investment (in units per year), estimate the capacity utilisation rate).

Further guidance: Early and consistent attention to climate change adaptation and mitigation in the various development stages of the major projects, including the analysis of relevant options will result in better projects, which are more sustainable, low carbon and climate resilient. Include an outline of the options considered in the feasibility analysis study as regards risks related to climate change impacts and weather extremes.

D.2.2 Selection criteria, climate change vulnerability and risks

Specify the criteria considered in selecting the best solution, with ranking of their importance and method of their evaluation, reflecting the outcomes of the climate change vulnerability and risks appraisal and of the EIA/SEA procedures as appropriate ... and briefly present a justification for the option chosen in accordance with Annex III (Methodology for carrying out the cost-benefit analysis) to this Regulation.

Further guidance: The outcome of the climate change vulnerability and risk appraisal shall be reflected in the criteria considered in selecting the best solution.

D.3 Feasibility of the option selected (GHG Emissions, climate impacts and risks)

Provide a short summary of the feasibility of the option selected covering the following key dimensions: institutional, technical, environmental, and GHG emissions, climate change impacts and risks on the project (where applicable), and other aspects taking into account identified risks to prove feasibility of the project. Please complete the table by making reference to the relevant documents.

Further guidance: Climate change adaptation and mitigation are part of the key dimensions to be included in the summary of the feasibility of the selected option. Include a summary of the selected option as regards the emission of greenhouse gases and the adverse impacts of climate change and the related risks.

D.3.2 Technical aspects, climate risks assessment

Technical aspects including location, designed capacity of the main infrastructure, justification of the project scope and size in the context of the forecasted demand, justification of the choices made with regard to climate and natural disaster risks assessment (where relevant), investment and operating costs estimates.

Further guidance: Include a description of the various technical aspects and choices made with adequate justification as regards the climate risks assessment. For example, the project location, which is often determined at an early stage, can be decisive for the climate change vulnerability and risks assessment.

D.3.3 Climate change aspects (GHG emissions, adaptation)

Environmental and climate change mitigation (GHG emissions) and adaptation aspects (where applicable).

Further guidance: Include a description of climate change mitigation and adaptation aspects, for example: (1) as regards mitigation: quantification of greenhouse gas emissions in a typical year of operation and the weight it carried in the cost-benefit analysis and in the choice of the main options; and (2) as regards adaptation: refer to the vulnerability and risk assessment, and how it has influenced the project and the choice of the main options.

D.3.4 Reference table – Climate change adaptation and mitigation

In the required reference table, include 'Environmental, Climate change adaptation and mitigation and disaster resilience (where applicable)'.

Further guidance: Include climate change adaptation and mitigation in the reference table.

E.2.1 Economic analysis

Provide a short (max. 2-3 pages) description of methodology: description of compliance with the ... methodology for cost benefit analysis and exceptions to the application of the methodology, key assumptions made in valuing costs (including relevant cost components considered – investment costs, replacement costs, operating costs), economic benefits and externalities including those related to environment, climate change mitigation (including, where relevant, incremental greenhouse gas emissions in CO_2 equivalent) and climate change resilience and disaster resilience, and the main findings of the socio-economic analysis and explain the relationship with the Analysis of the Environmental Impact ... as appropriate.

Further guidance:

- Include climate change mitigation and adaptation in the description as appropriate;
- Include a description of the baseline(s) used for the quantification of greenhouse gas emissions vis-à-vis the counterfactual baseline scenario established for the major project in accordance with the Guide to Cost-Benefit Analysis of Investment Projects;
- Outline the underlying assumptions, scenario and time scale used in the vulnerability and risk assessment; and how it compares to the reference period used for the discounting of cash flow in the cost-benefit analysis;
- Outline the complexity encountered in performing the cost-benefit analysis for climate change adaptation and mitigation, respectively.

E.3.1 Risk assessment and sensitivity analysis

Provide a short description of the methodology and summary results including main risks identified.

Further guidance: Include a short outline of the climate change vulnerability and risk assessment, and how it has been integrated in the major project's risk assessment and sensitivity analysis.

E.3.3 Risk assessment

Present a short summary of the risk assessment including a list of risks to which the project is exposed, the risk matrix and interpretation and proposed risk mitigation strategy and the body responsible for mitigating the main risks such as cost overruns, time delays, demand shortfalls; special attention should be given to environmental risks, climate change related risks, and other natural disasters related risks.

Further guidance: Include climate change related risks – as identified in the climate change vulnerability and risk assessment.

E.3.4 Additional assessments carried out – climate risk analysis

If probability distributions for critical variables, quantitative risk analysis or options to assess climate risk and measures have been carried out, please provide details below.

Further guidance: Describe how likelihood distributions for main climate variables and hazards have been derived and used, with particular attention to weather extremes influencing the design, location and other options for the major project. Comment on how the frequency and intensity of weather extremes may change over time; describe the timescale used and how it has been taken into account.

F.1.1 Consistency of the project with environmental policy

Describe how the project contributes and takes into account the environmental policy objectives including climate change (as guidance, please consider the following: resource efficiency, preservation of biodiversity and ecosystem services, reduction of GHG emissions, resilience to climate change impacts etc.).

Further guidance: Describe how the project contributes to and takes into account the climate policy objectives including on the reduction of greenhouse gases emissions and ensuring adequate resilience to the adverse impacts of climate change such as weather extremes. The EIA Directive requires that the information on projects that are subject to an EIA will include their vulnerability to climate change, and their impact on the climate (e.g. in terms of GHG emissions).

Selected References

This section provides selected references to the legal basis and guidance for the integration of climate change considerations in the preparation and approval of major projects for the period 2014-2020.

Regulation (EU) No 1303/2013 of the European Parliament and the Council of 17 December 2013 laying down **common provisions** on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R1303

Commission Delegated Regulation (EU) No 480/2014 of 3 March 2014 supplementing Regulation (EU) No 1303/2013 of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.138.01.0005.01.ENG

Commission Implementing Regulation (EU) No 1011/2014 of 22 September 2014 laying down detailed rules for implementing Regulation (EU) No 1303/2013 of the European Parliament and of the Council as regards the models for submission of certain information to the Commission and the detailed rules concerning the exchanges of information between beneficiaries and managing authorities, certifying authorities, audit authorities and intermediate bodies. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R1011

Commission Implementing Regulation (EU) No 215/2014 of 7 March 2014 laying down rules for implementing Regulation (EU) No 1303/2013 of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund with regard to methodologies for climate change support, the determination of milestones and targets in the performance framework and the nomenclature of categories of intervention for the European Structural and Investment Funds. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.069.01.0065.01.ENG

Commission Implementing Regulation (EU) 2015/207 of 20 January 2015 laying down detailed rules implementing Regulation (EU) No 1303/2013 of the European Parliament and of the Council as regards the models for the progress report, submission of the information on a major project, the joint action plan, the implementation reports for the Investment for growth and jobs goal, the management declaration, the audit strategy, the audit opinion and the annual control report and the methodology for carrying out the cost-benefit analysis and pursuant to Regulation (EU) No 1299/2013 of the European Parliament and of the Council as regards the model for the implementation reports for the European territorial cooperation goal.http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32015R0207

Guide to Cost Benefit Analysis of Investment Projects for Cohesion Policy 2014-2020 http://ec.europa.eu/regional_policy/en/information/publications/guides/2014/guide-to-cost-benefit-analysis-of-investment-projects-for-cohesion-policy-2014-2020 and http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

Directive 2001/42/EC (**SEA Directive**) of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32001L0042

Directive 2011/92/EU (**EIA Directive**) of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32011L0092

Directive 2014/52/EU (**amended EIA Directive**) of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0052

Footnotes

1. Report "Resilience of large investments and critical infrastructures in Europe to climate change" prepared by the European Commission Joint Research Centre (JRC), 2015, for Directorate-General for Climate Action, https://ec.europa.eu/jrc/en/publication/resilience-large-investments-and-critical-infrastructures-europe-climate-change
2. Paris Agreement, UNFCCC, COP21: http://newsroom.unfccc.int/unfccc-newsroom/finale-cop21/, https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf
3. EU Strategy on adaptation to climate change: http://ec.europa.eu/clima/policies/adaptation/what/documentation_en.htm
4. See e.g. the EUFIWACC note "Integrating Climate Change Information and Adaptation in Project Development"
5. Guidance for project managers on making infrastructure climate resilient: http://ec.europa.eu/clima/policies/adaptation/what/docs/non_paper_guidelines_project_managers_en.pdf
6. The adequacy of this simplification presupposes further mitigation efforts compared to the current Intended Nationally Determined Contributions (INDCs), see e.g. UNFCCC 'Synthesis report on the aggregate effect of intended nationally determined contributions', 2 May 2016, http://unfccc.int/focus/indc_portal/items/9240.php
7. There are various definitions of vulnerability and risk, see e.g. IPCC AR4 (2007) on vulnerability and IPCC SREX (2012) and IPCC AR5 (2014) on risk (as a function of likelihood and the consequences of the hazard), http://ipcc.ch/
8. For a structured overview of climate change indicators and climate change impact indicators (hazards) see e.g. EEA Report 'Climate change, impacts and vulnerability in Europe 2012', http://www.eea.europa.eu/publications/climate-impacts-and-vulnerability-2012 (to be updated end 2016) and ETC CCA Technical Paper 'Extreme weather and climate in Europe' (2015 ´), http://cca.eionet.europa.eu/reports, and http://cca.eionet.europa.eu/docs/Extreme%20weather%20and%20climate%20in%20Europe, as well as http://www.eea.europa.eu/soer-2015/europe/climate-change-impacts-and-adaptation
9. Under Decision 1313/2013/EU on the Union Civil Protection Mechanism: http://ec.europa.eu/echo/what/civil-protection/mechanism_en and http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013D1313
10. Climate-ADAPT: http://climate-adapt.eea.europa.eu
11. Copernicus: http://climate.copernicus.eu
12. JRC: https://ec.europa.eu/jrc/en/research-topic/climate-change
13. EEA: http://www.eea.europa.eu
14. IPCC 5th Assessment Report, WG I, WG II: https://www.ipcc.ch/report/ar5/
15. IPCC Data Distribution Centre: www.ipcc-data.org/maps
16. World Bank portal: http://sdwebx.worldbank.org/climateportal
17. Commission Implementing Regulation (EU) 2015/207
18. European Commission Guide to Cost-Benefit Analysis of Investment Projects: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf
19. See e.g. Climate-ADAPT (http://climate-adapt.eea.europa.eu/) concerning adaptation:
    - options: http://climate-adapt.eea.europa.eu/adaptation-measures;
    - case study search tool: http://climate-adapt.eea.europa.eu/sat
    and e.g. EEA Report 8/2014 'Adaptation of transport to climate change in Europe', http://www.eea.europa.eu/publications/adaptation-of-transport-to-climate
20. Regulation (EU) No 1303/2013, Article 101(e)
21. Commission Implementing Regulation (EU) 2015/207, Article 3 and section 2.3.3 of Annex III
22. Methodologies for the Assessment of Project GHG Emissions and Emission Variations: http://www.eib.org/about/documents/footprint-methodologies.htm
23. The Greenhouse Gas Protocol 'A Corporate Accounting and Reporting Standard': www.ghgprotocol.org and http://www.ghgprotocol.org/standards/corporate-standard
24. EIB Carbon pricing, see annex 2, http://www.eib.org/attachments/strategies/eib_climate_strategy_en.pdf
25. EIB Economic Appraisal of Investment Projects: http://www.eib.org/infocentre/publications/all/economic-appraisal-of-investment-projects.htm
26. http://ec.europa.eu/clima/policies/effort/index_en.htm

Major projects represent a substantial share of EU spending and are frequently of strategic importance with respect to the achievement of the Europe 2020 strategy for smart, sustainable and inclusive growth.

Climate change adaptation and mitigation considerations are integrated in the preparation and approval of major projects through the legislative framework.

Adaptation seeks to ensure adequate resilience of major projects to the adverse impacts of climate change, for example flooding. It is based on a vulnerability and risk assessment.

Mitigation seeks to reduce the emission of greenhouse gases, for example in the selection of low-carbon options. This is addressed through the quantification of greenhouse gas emissions and integration in the cost-benefit analysis.

This fact sheet outlines and provides guidance on the climate change related requirements for major projects in the 2014-2020 programming period.

Major projects are funded by the European Regional Development Fund (ERDF) and the Cohesion Fund and listed in the concerned operational programmes.

A major project has a total eligible cost exceeding € 50 million (and € 75 million for e.g. transport projects). More than 500 major projects are foreseen in the period 2014-2020.

The climate change requirements for major projects are an integral part of the mainstreaming of climate action into EU policies and funds.

The approach to integrate climate change into major projects can be usefully adapted and applied to a wider range of infrastructure projects in different sectors.

This fact sheet is the initial version and intended to be updated and further developed based on evolving experience and emerging best practice.

Disclaimer: This publication aims to outline and provide guidance on the climate change requirements for major projects in the 2014-2020 programming period. It is for information purposes only and does not imply any interpretation of the concerned legal basis. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.

Useful resources:

European Commission Climate Action website and social media:

ec.europa.eu/clima

facebook.com/EUClimateAction

twitter.com/EUClimateAction

youtube.com/EUClimateAction

pinterest.com/EUClimateAction

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