CLIMATE CHANGE

Republic of Lebanon
Ministry of Environment

Empowered lives.
Resilient nations.

Guidelines on Integrating Climate Change into Environmental Impact Assessments

Ministry of Environment
September 2014

The issues and impacts related to climate change and relevant to a particular EIA should be defined by the specific context of each project and by the concerns of the authorities and stakeholders involved. Flexibility is therefore needed in handling the information published in this report. Tables, lists and other descriptions should be used only as a starting point for discussion and should not be considered exhaustive to any project and related EIA.

Contents

Overview of general steps

EIA process	**Key considerations**	**Key questions to integration climate change in the EIA**
Screening	• Would implementing the project be likely to have significant effects on, or be significantly affected by, **climate change**? • Is EIA required?	
Scoping	• What are the **key climate change issues** likely to be? • Who are the **key stakeholders** and **environmental authorities** with an interest in climate change and how will they be involved in the EIA? What do they think are the key issues? • What is the **current situation** relating to climate change and how is it likely to **change in the future**? • How will climate change interact with other environmental issues to be assessed in the EIA? • What is the climate change **policy context, what are the objectives and targets**?	
Data collection and assessment	• What methods, tools and approaches will be most helpful in understanding and assessing key climate change issues? How could climate change considerations be integrated into the project? • What alternatives are there to tackle key climate change issues? How would implementing them affect climate change objectives? • How can we avoid adverse effects on climate change? If we can't, how can they be reduced or offset? How can the positive effects be maximized? • Have the ways of identifying climate change issues, managing uncertainty, etc. been clearly explained?	• What do the environmental trends or scenarios (including extreme climate situations) look like without the project? • How likely are they? What is driving them? • Are they likely to reach a critical turning point or bottom line? • What are the cumulative effects on climate change, taking into account other • implemented/authorised/planned projects and the complexity of climate change issues, as well as other elements to be assessed in the EIA? • What are the assumptions and key uncertainties?
Decisions/ Recommendations	• How can climate change be **integrated** into development consent and the final project?	• Is the proposed development needed? At what scale? Where? What methods should be used? What is the timescale? • What alternatives would affect the climate less? Which ones would permit ecosystems to absorb shocks and

		disturbances? • What are the 'win-win', 'no-regret' or flexible options that would allow for future changes?

Types of projects

1. Energy
2. Transport/infrastructure (including energy infrastructure)
3. Agriculture/fishery
4. Industry
5. Leisure/tourism
6. Nature/forestry
7. Waste/wastewater
8. Raw materials/ quarries
9. Retail
10. Water supply
11. Residential development

Screening

Practitioners must first determine if climate change is likely to be a potential consideration in the EIA process by answering the following question: Would implementing the project be likely to have significant effects on, or be significantly affected by, climate change?

Factors influencing this decision include:

- The nature of the project and its setting;
- The lifetime of the project;
- Climate-related parameters likely to influence the project;
- Anticipated changes to those parameters over the lifetime of the project; and
- Applicable regulatory requirements, guidelines and expectations.

Scoping

Scoping must consider climate change in relation to:

- Design criteria;
- Ecology;
- Physical factors;

• Socio-economic issues, including human health and safety;

• Cumulative issues associated with climatic changes being considered for the lifetime of the project; and

• Uncertainty of predictions.

Therefore, at this stage the climate relevant factors and valued environmental components should be identified by answering the following question: what climate variables and elements of the project need to be assessed?

Scoping involves identification of environmental concerns based on public opinion, applicable legislation and regulation, and professional judgment. Scoping can range from a complex process involving public meetings to a simple internal review of project characteristics and regulations. In all cases, specific consideration of climate change should be added to the existing process.

Since scoping simply indicates whether or not there is concern (as opposed to determining the extent of an effect, or whether an effect actually occurs) the determination whether climate change is relevant, whether in relation to potential changes to the environment, or in consideration of the effects of the environment on the project is enough at the scoping phase.

Focus 1: climate change mitigation

What are the expected emissions of greenhouse gases resulting from the project and how can they be reduced?

Table 1: Examples of key questions that could be asked when identifying key climate change mitigation concerns

Main concerns related to:	Key questions that could be asked at the screening and/or scoping stage of the EIA
Direct GHG emissions	• Will the proposed project emit carbon dioxide (CO_2), nitrous oxide (N_2O) or methane (CH_4) or any other greenhouse gases part of the UNFCCC? • Does the proposed project entail any land use, land-use change or forestry activities (e.g., deforestation) that may lead to increased emissions? Does it entail other activities (e.g., afforestation) that may act as emission sinks?
Indirect GHG emissions due to an increased energy demand	• Will the proposed project significantly influence demand for energy? • Is it possible to use renewable energy sources?
Indirect GHG caused by any supporting activities or infrastructure that is directly linked to the implementation of the proposed project (e.g., transportation)	• Will the proposed project significantly increase or decrease personal travel? Will the proposed project significantly increase or decrease freight transport?

Focus 2: climate change adaptation

How may the project be impacted by the consequences of climate change and how can the project be adapted to this?

Table 2: Examples of key questions that could be asked when identifying key climate change adaptation concerns

Main concerns related to:	Key questions that could be asked at the screening and/or scoping stage of the EIA
Heat waves	• Will the proposed project restrain air circulation or reduce open spaces? • Will it absorb or generate heat? • Will it emit VOCs and NO_x and contribute to tropospheric ozone formation during sunny and warm days? • Can it be affected by heat waves? • Will it increase energy and water demand for cooling? • Can the materials used during construction withstand higher temperatures (or will they experience, for example, material fatigue or surface degradation)?
Droughts due to long-term changes in precipitation patterns (also consider possible synergistic effects with flood management actions that enhance water retention capacity in the watershed)	• Will the proposed project increase water demand? • Will it adversely affect the aquifers? • Is the proposed project vulnerable to low river flows or higher water temperatures? • Will it worsen water pollution – especially during periods of droughts with reduced diffusion rates, increased temperatures and turbidity? • Will it change the vulnerability of landscapes or woodlands to wild fires? Is the proposed project located in an area vulnerable to wildfires? • Can the materials used during construction withstand higher temperatures?
Extreme rainfall, riverine flooding and flash floods	• Will the proposed project be at risk because it is located in a riverine flooding zone? • Will it change the capacity of existing flood plains for natural flood management? • Will it alter the water retention capacity in the watershed? • Are embankments stable enough to withstand flooding?
Storms and winds	• Will the proposed project be at risk because of storms and strong winds? • Can the project and its operation be affected by falling objects (e.g. trees) close to its location? • Is the project's connectivity to energy, water, transport and ICT networks ensured • During high storms?
Landslides	• Is the project located in an area that could be affected by extreme precipitation or landslides?
Rising sea levels	• Is the proposed project located in areas that may be affected by rising sea levels? • Can seawater surges caused by storms affect the project? • Is the proposed project located in an area at risk of coastal erosion? Will it reduce or enhance the risk of coastal erosion? • Is it located in areas that may be affected by saline intrusion? • Can seawater intrusion lead to leakage of polluting substances (e.g. waste)?
Cold spells and snow	• Can the proposed project be affected by short periods of unusually cold

	weather, blizzards or frost? • Can the materials used during construction withstand lower temperatures? • Can ice affect the functioning/operation of the project? Is the project's connectivity to energy, water, transport and ICT networks ensured during cold spells? • Can high snow loads have an impact on the construction's stability?
Freeze-thaw damage	• Is the proposed project at risk of freeze-thaw damage (e.g. key infrastructure projects)? • Can the project be affected by thawing permafrost?

Data collection and assessment

How does climate change alter the baseline for the assessments? And what does this mean for the assessment and possible measures?

Possible adverse effects of climate change on the project may include:

- Destruction of the project or components of the project;
- Negative impacts to the operation and productivity of the project;
- Increase to cost of project development;
- Revisions to project design;
- Increase maintenance frequency and costs, and
- Requirement for future project modifications.

Design criteria must be justified within the boundaries established by predictions of climate change over the lifespan of the project. When describing the uncertainty of predictions, both the knowledge base and the ability to predict likelihood accurately must be documented in relation to the suitability of key elements of project design. The source of climate predictions and their specific magnitude must be described along with the rationale for accepting the design criteria. Overall, any adverse impacts of extreme climate events on the project should be identified and the likelihood of their occurrence specified.

Baseline analysis

Considering that the design parameters identified at a project's inception may no longer be valid at the end of its potentially long lifespan represents a shift in thinking, from the traditional assessment of environmental impact to taking possible long-term risks into account. A project needs to be assessed against an evolving environmental baseline. EIA should show an understanding of how the changing baseline can affect a project and how the project may respond over time. The EIA process is particularly important since it can help set the context for projects; taking potential climate change impact (including disaster risks) into consideration in EIA can make projects more resilient.

A traditional EIA views the environment in its current state, usually based on a four season analysis of conditions. The existing status of each environmental component is analyzed in a detailed description of the existing environment. Project activities are then superimposed on the existing environment to determine impacts.

The essence of the EIA process does not change. Effects on environmental components with and without the project are still determined, and the existing definitions of significance should be used to evaluate the impacts of the project after climate change is considered.

Table 3: Criteria for Significance of Impacts from Project Activities

Key Terms	Criteria
Significance	• Magnitude • Geographic extent • Duration and frequency • Irreversibility, and • Ecological context
Likelihood	• Probability of occurrence, and • Scientific uncertainty

The baseline environment is a moving baseline. This is especially true for large-scale projects, which might only become fully operational after many years. During this time, the biodiversity in the project's area may change and the area may be subject to different climatic conditions, such as storms, increased flooding, etc. For long-term projects or those with long-lasting effects (timescales exceeding 20 years), climate scenarios based on climate model results should ideally be used. Such projects may need to be designed to withstand very different environmental conditions from current ones. For short-term projects, scenarios need to represent only 'near future' or 'present-day' climates.

Data sources

The next essential step is to determine the manner in which tangible values for appropriate climate-change parameters can be determined for use in the process. The following options may be available:

- Generally available climate change regional projections
- Country- or region-specific studies available from governments and other agencies;
- Project-specific climate-change modeling, recognizing that this approach is both complex and potentially costly, and
- Use of a risk-assessment-based approach to the consideration of climate change effects and the implications.

Detailed assessment of climate change will frequently need to consider specific parameters or species (especially rare or endangered species) or published guidelines or standards that might already be near the edge of their range. Issues such as temperature preferences or thresholds that vary by a few degrees can be extremely important in assessing the impacts of climate change.

Environmental outlooks and scenario studies that analyze trends and their likely future directions can provide useful information. If data are unavailable, it may be useful to use proxy indicators. For example, if air quality monitoring data are not readily available for an urban area, perhaps there are data outlining trends in traffic flow/volumes over time, or trends in emissions from stationary sources.

Spatially explicit data and assessments, potentially using Geographical Information Systems (GIS), are likely to be important for analyzing the evolving baseline trends and also to understand distributional effects.

Main issues to be considered at the data collection and assessment stage of the EIA

When looking at the evolving baseline, you should consider:

- **Trends in key indicators over time**, for example GHG emissions, indices of vulnerability, frequency of extreme weather events, disaster risk, key species such as farmland birds and the 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 their likely future direction?

- **Drivers of change** (both direct and indirect), which may cause a particular trend. Identifying drivers facilitates future projections, especially if some existing drivers are expected to change or new drivers are about to come into play and will significantly affect a given trend (e.g. already approved developments that have not been implemented yet; changes in economic incentives and market forces; changes in the regulatory or policy frameworks; etc.).

- **Thresholds/limits**, e.g. have thresholds already been breached or are limits expected to be reached? The EIA may determine whether the given trend is already approaching an established threshold or if it is coming close to certain tipping points that can trigger significant changes in the state or stability of the local ecosystem.

- **Key areas that may be particularly adversely affected by the worsening environmental trends** including, in particular, protected areas.

- **Critical interdependencies**, for example water supply and sewage treatment systems, flood defenses, energy/electricity supply, communication networks, etc.

- **Benefits and losses brought by these trends and their distribution** may determine who benefits and who doesn't. Beneficial and adverse impacts are often not proportionally distributed within society — changes in ecosystems affect some population groups and economic sectors more seriously than others.

- **Climate change vulnerability assessment needs to be built into any effective assessment of the evolution of the baseline environment, as well as of alternatives.** Major infrastructure projects, in particular, are likely to be vulnerable.

In addition to be above, cumulative effect should also be an important consideration in the integration of climate change into the EIA process. Climate change can either create direct impacts over time, or can modify other non-climate-change related impacts and thus compound the effects of a project. The analysis of cumulative effects is therefore inherent in the inclusion of climate change issues in the EIA process. Cumulative effect assessment should be carried out whenever climate change proves an important element in EIA, even when the regulatory regime does not specifically require it. Cumulative effects associated with climate change could include:

• Increased transport of physical or chemical constituents beyond the spatial boundaries under consideration, by factors such as increased storm intensity and frequency;

• An increase or decrease in habitat area for a species or species group that is already affected by the project, and

• Secondary effects related to climate-change modification to the environment or its effects on the project.

Framing/ Setting the boundaries

Table 4: Issues to be considered when establishing boundaries for each component which is likely to interact with, or be influenced by, the project

Boundary Types	Description	Potential Considerations for Climate Change Adaptation
Spatial Boundaries	Location where project activities are undertaken or facilities located. Includes any zones of influence (effluent or emission discharges) and the range of VECs.	Assess how the spatial boundaries of the project, including the individual VECs, may change in the context of potential climate issues.
Temporal Boundaries	The times that project activities overlap with the presence of VECs, including in the post-operation phase. This would include seasonal issues associated with the VECs such as migration or breeding periods.	Assess how the temporal boundaries of the project, including the individual VECs, may change in the context of potential climate change issues.
Ecological Boundaries	Consideration of the spatial and temporal scales of the natural systems.	Assess how the potential effects of climate change may influence ecological boundaries over and possibly beyond the lifespan of the project.
Administrative Boundaries	Boundaries imposed by political and regulatory frameworks concerning data collection for resource management.	Identify any new, or changes to, previously established administrative boundaries to address the management of climate change issues.
Technical Boundaries	Limitations imposed on the assessment by the measurability of effect, the availability of data, and the cost to gather and assess information	Evaluate these potential boundaries on the assessment in the context of climate change. If these boundaries are substantive, the previous described boundaries should be evaluated in that context.

Addressing uncertainties

The relevance and cost of obtaining climate predictions will vary between projects. It is conceivable that the cost of climate predictions could be large and time consuming in relation to project development. Therefore, a risk-assessment-based approach is recommended to achieve balance between uncertainty and affordability of regional or project specific climate projections given the potential impact implications.

Risk is defined as the probability or likelihood that a hazard (such as increased sea levels) will develop into a consequence. The estimation of risk for discrete and independent consequences is defined as risk assessment.

The following three types of risk assessment provide differing levels of precision, required detail in their inputs, and sophistication in analysis:

• Qualified risk assessment in which risks are assessed in terms of probability and severity of consequence based on descriptors such as "very likely" and "possible", often arranged in decreasing severity on a scale of 1 to 5.

• Qualified-quantified risk assessment, as above, except that each descriptor has a probability value assigned to it. These values are then combined using Boolean algebra.

• Semi-quantified risk assessment in which risks are calculated or estimated from statistics, modeling, or assignment based on descriptors. The probabilities are then combined using Boolean algebra.

Table 5: Decision matrix related to risk of impact and confidence in predictions when climate change interacts with a project

Level of confidence of project's interaction with a climate change paramter	High Risk of Impacts	Low Risk of Impacts
High Confidence	• Proceed with risk assessment outined in the guidance	• Proponent should be provided with all relevant climate change information • Report in EIA • No further action required
Low Confidence	• Proceed with risk assessment • Emphasize the uncertainty inherent in climate change data	No further action required Report in EIA

Decisions/ Recommendation

In order to formulate a set of recommendations based on the result of the assessment, key considerations include:

• \`No-regret' or \`low-regret\` options that yield benefits under different scenarios;

• \`Win-win-win\` options that have the desired impacts on climate change, biodiversity and ecosystem services, but also have other social, environmental or economic benefits;

• Favoring reversible and flexible options that can be modified if significant impacts start to occur;

• Adding 'safety margins' to new investments to ensure responses are resilient to a range of future climate impacts;

• Promoting soft adaptation strategies, which could include building adaptive capacity to ensure a project is better able to cope with a range of possible impacts (e.g. through more effective forward planning);

• Shortening project times;

• Delaying projects that are risky or likely to cause significant effects.

If, based on an assessment of specific risks and constraints, alternatives are considered impossible or too expensive; the project may have to be abandoned.

Bear in mind that some EIA decisions or recommendations that address climate change can themselves have significant environmental impact and may need to be taken into account (e.g. renewable energy generation or tree planting may have adverse impacts on biodiversity).

Focus 1: climate change mitigation

Table 6: Examples of alternatives and mitigation measures related to climate change mitigation concerns

Main concerns related to:	Examples of alternatives and mitigation measures
Direct GHG emissions	• Consider different technologies, materials, supply modes, etc. to avoid or reduce emissions; • Protect natural carbon sinks that could be endangered by the project, such as peat soils, woodlands, wetland areas, forests; • Plan possible carbon off-set measures, available through existing off-set schemes or incorporated into the project (e.g. planting trees).
GHG emissions related to energy	• Use recycled/reclaimed and low-carbon construction materials; • Build energy efficiency into the design of a project (e.g. include warmcel insulation, south facing windows for solar energy, passive ventilation and low-energy light bulbs); • Use energy-efficient machinery; • Make use of renewable energy sources.
GHG emissions related to transport	• Choose a site that is linked to a public transport system or put in place transport • arrangements; • Provide low-emission infrastructure for transport (e.g. electric charging bays, cycling facilities).

Focus 2: climate change adaptation

Table 7: Examples of alternatives related to climate change adaptation concerns

Main concerns related to:	Examples of alternatives and mitigation measures
Heat waves	• Ensure that the proposed project is protected from heat exhaustion; • Encourage design optimal for environmental performance and reduce the need for cooling; • Reduce thermal storage in a proposed project (e.g. by using different materials and coloring).
Droughts	• Ensure that the proposed project is protected from the effects of droughts (e.g. use water-efficient processes and materials that can withstand high temperatures); • Install livestock watering ponds within animal-rearing systems;

	• Introduce technologies and methods for capturing storm water; • Put in place state-of-the-art wastewater treatment systems that make reusing water possible.
Wildlife fires	• Use fire-resistant construction materials; • Create a fire-adapted space around the project (e.g. use fire-resistant plants).
Extreme rainfall, riverine flooding and flash floods	• Consider changes in construction design that allow for rising water levels and ground water levels (e.g. build on pillars, surround any flood-vulnerable or flood-critical infrastructure with flood barriers that use the lifting power of approaching floodwater to automatically rise, set up backwater valves in drainage-related systems to protect interiors from flooding caused by backflow of wastewater, etc.); • Improve the project's drainage.
Storms and winds	• Ensure a design that can withstand increased high winds and storms.
Landslides	• Protect surfaces and control surface erosion (e.g. by quickly establishing vegetation — hydroseeding, turfing, trees); • Put in place designs that control erosion (e.g. appropriate drainage channels and culverts).
Rising sea levels	• Consider changes in construction design to allow for rising sea levels (e.g. building on pillars, etc.).
Cold spells and snow	• Ensure that the project is protected from cold spells and snow (e.g. use construction materials that can withstand low temperatures and make sure the design can resist snow build-up).
Freeze-thaw damage	• Ensure that the project (e.g. key infrastructure) is able to resist winds and prevent moisture from entering the structure (e.g. by using different materials or engineering practices).

Challenges

Table 8: Tips on how to approach the challenges of integrating climate change into EIA

Key Challenges	Tips on how to approach them
Long-term and cumulative nature of effects	• Avoid "snapshot" analyses (i.e., at a single point in time) and consider trends, with and without the proposed project; • Work with the notion of absorption capacity/environmental limits.
Complexity of the issues and cause-effect relationships	• Analyze the impact of proposed projects on key climate change trends and their drivers; • Works with worst-case and best-case scenarios.
Uncertainty	• Acknowledge assumptions and the limitations of current knowledge; • Base recommendations on the precautionary principle; • Prepare for adaptive management.

References

Aecom. Environmental Impact Assessment and Climate Change - Australia

Climadapt, 2003. Guidelines for Incorporating Climate Change into the EIA Process

EU, 2013. Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment

IAIA13 Conference Proceedings, 2013. Climate change in EIA – Inspiration from practice

Justice and Environment, 2012. Climate change aspects in environmental impact assessment procedures