A simple methodological framework to incorporate climate change in impact assessment

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Future is my project
Future is multi-dimensional and dynamic
Climate Change → Direct Impacts → Consequences

- Temperature increase
  - Biodiversity
  - Hidrological cycle
- Reduction on precipitation
- Torrential rain
- Sea level rise
  - Coastal erosion
- Increase in water consumption
- Thermal stress
- Reduction of summer tourists
- Species migration: to North, altitude and depth
- Fishing
- New pathologies
- Reduction on water availability
- Agriculture production
- Wine production
- Problems in thermal powerplant cooling
- Wildfires
- Drainage (100 years → 50 years)
- Flooding protection buffer
- Coastal protection
HOW CAN WE ADD CLIMATE CHANGE INTO IMPACT ASSESSMENT?
2 x 3 Methodology

- Understand climate change
  1. Identify projected climatic changes
  2. Identify consequences of climate change
  3. Integrate this knowledge into impact assessment

- Environmental baseline chapter

- Adapt impact assessment
  4. Identify impacts of the project on climate change
  5. Identify impacts of climate change over the project
  6. Integrate this knowledge on the cumulative effects assessment

- Impact assessment chapter
Understand climate change – 1

1. Identify projected **climatic changes:**
   1. Collect information: IPCC (AR4 - 2007), national or local reports
   2. Climatic variables: temperature, precipitation, snow, sea level
   3. Temporal resolution: 2070-90 (...)
   4. Spacial resolution: sub-continental ➔ watershed
2080-99 versus 1980-99

1951 1980
1991 2020
2021-2050
2071-2100
Understand climate change- 2

2. Identify indirect **consequences** of climate change
   1. Collect information: IPCC (AR4-2007), European Environmental Agency
   2. Horizontal process
   3. Environmental systems:
      1. Water resources and management
      2. Ecossistems
      3. Food procustion and forests
      4. Coastal systems and low lands
      5. Industry, human settlement and society
      6. Health
Economic effects of climate change: tourism (EEA, 2008)

Map 7.6 Modelled conditions for summer tourism in Europe for 1961–1990 and 2071–2100

Simulated conditions for summer tourism in Europe for 1961–1990 (left) and 2071–2100 (right) according to a High Emissions Scenario (IPCC SRES A2)

Tourism Comfort Index (TCI)
- Unfavourable (TCI: 0–20)
- Favourable (TCI: 60–70)
- Excellent (TCI: 80–100)
- Acceptable (TCI: 40–60)
- Very good (TCI: 70–90)

Understand climate change - 3

3. Integrate knowledge into impact assessment
   1. Dynamic Future(s)
   2. **Evolution of baseline without project**
      1. Give more importance to this component
      2. Several scenarios
      3. Handle uncertainties
4. Identify impacts of the project **on climate change** (*Mitigation*)

1. Greenhouse gas inventory: CO$_2$, CH$_4$, N$_2$O, others
2. Land use: carbon offset, changes in albedo,…
3. Energy use, transport
5. Identify impacts of climate change over the project:
   1. Need of *Adaptation* measures
   2. Review of project dimensions and layout
   3. Review impact assessment

- Iterative process…
- Risk analysis?
6. Handle **cumulative effects**:

1. Cumulative effects (Canter and Ross, 2009)
   - Valued ecological components
   - Past, present and future actions
   - Identify link between actions and estimated cumulative effects

2. Uncertainty
Conclusions

- Impact assessment requires detailed information on projected climate change and its consequences
  - In time
  - In space
- A new life to traditionally “minor” EIA chapters:
  - Environmental baseline evolution without project
  - Cumulative effects
- EIA will be less deterministic and must identify uncertainties
- Climate change introduces methodological challenges to impact assessment
  - Project developers
  - Consulting firms
  - IA administration
  - Public
Additional remarks

- Methodologies for climate change coincide with biodiversity interests
  - More integration
- Correlate temporal scales of project and climate changes
- EIA shouldn’t be more complex or costly…
  - Use available information

- In the long term:
  - Climate change might disappear as an individual environmental factor in Impact Assessment
  - Incorporated in project engineering