Project Number 282910

ÉCLAIRE

Effects of Climate Change on Air Pollution Impacts and Response Strategies for European Ecosystems

Seventh Framework Programme

Theme: Environment

18.1 Report on Existing Applications of the ESA in Europe

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	Dissemination Level	
PU	Public	☐
PP	Restricted to other programme participants (including the Commission Services)	☒
RE	Restricted to a group specified by the consortium (including the Commission Services)	☐
CO	Confidential, only for members of the consortium (including the Commission Services)	☐

1. Executive Summary

The main objectives of the work reported here were to review available information on applications of the Ecosystem Services Approach (ESA) in Europe, and to prioritise ecosystem service / ecosystem combinations for valuation in the context of the ECLAIRE Project. The activity was informed through a series of workshops held in 2012 and 2013.

The prioritisation process took account of a number of criteria, including:
- Relevance to ECLAIRE
- Sensitivity to air pollution.
- Strength of evidence linking air pollution to ecosystem services
- Availability of valuation data

Following this, the following are considered priorities for valuation within ECLAIRE:
1. Impacts on biodiversity
2. Impacts of nitrogen and ozone on crop production
3. Impacts of nitrogen and ozone on timber production
4. Impacts of nitrogen and ozone on GHG emissions and sequestration

The literature review highlighted a range of methods being proposed for ecosystem assessment in air quality cost-benefit work. These will be further evaluated in subsequent deliverables under this work package, as each has its strengths and limitations.

2. Objectives:

1. Review existing applications of the Ecosystem Services Approach (ESA) in Europe, with particular reference to those likely to be influenced by the pollutants (nitrogen, ozone, GHGs) of main interest to the ECLAIRE Project.
2. Accounting for the likely outputs of other components of ECLAIRE and the availability of appropriate valuation literature and data, define priorities for valuation.

3. Activities:

The following activities were undertaken:
1. Review of available literature to identify what had and had not been quantified in Europe using the ESA, and the extent of policy applications.
2. Identification of ecosystem services and ways in which they may be influenced by the pollutants of interest to ECLAIRE.
3. Prioritisation of ecosystem services for consideration.

In order to prioritise ecosystem services, and the goods and benefits arising from them, a number of factors were considered:
- Relevance to the other ECLAIRE work packages
- Sensitivity to air pollution
- Strength of evidence linking air pollution to ecosystem services
- Availability of valuation data

These activities were informed also by a series of meetings held in 2012 and 2013 linked to both ECLAIRE and UNECE Task Force activities.

4. Results:

For the regulatory (GHG related) and provisioning (crops, timber) services, available results from other components of ECLAIRE indicate some degree of balance between the harmful effects of ozone and the beneficial effects of nitrogen deposition. Further to this, there are outstanding questions about the sustainability of beneficial impacts of nitrogen deposition, perhaps concerning the availability of non-N nutrients in the longer term and interactions with pests and pathogens. This is problematic for the subsequent analysis, as it raises questions about even the direction of overall impacts (whether the total cost will be positive or negative). However, it is essential that these issues receive proper debate, and so, even if final outcomes may be uncertain, they require consideration under ECLAIRE.

For ecosystems and biodiversity, however, the same does not apply, with N deposition and ozone exposure both demonstrated to have negative impacts. For this reason, together with the fact that quantification of effects on ecosystems is more challenging that for (e.g.) crops and forests, the main focus of this activity is on valuation of changes in biodiversity.

The following are considered priorities for valuation within ECLAIRE:
5. Impacts on biodiversity and subsequent amenity effects (to be valued using a variety of methods intended to reflect willingness to pay for ecosystem protection or avoidance of damage)
6. Impacts of nitrogen and ozone on crop production
7. Impacts of nitrogen and ozone on timber production
8. Impacts of nitrogen and ozone on GHG emissions and sequestration

It is noted that effects of ozone operate at different levels and geographic scales. For example, crops across Europe may be affected by a relatively low level effect of yield reduction, whilst in restricted areas farmers may lose entire crops, particularly salad and other leaf crops where appearance is a

significant determinant of value. Overall, the former effect appears likely to dominate, but the latter effect will tend to be limited to a small number of producers who could be severely affected. Consideration will thus need to be given to such distributional effects should data be available to account for them.

An important conclusion from the literature review is that the valuation process is subject to significant uncertainty, seemingly more so than for impacts to human health. In part this is down to the fact that the relevant literature for biodiversity is more limited. A consequence of this is that ecosystem services have received little attention in previous cost-benefit studies designed to inform European policy development on air quality. This contrasts with the effects work where a major output is the development of methods for mapping critical loads and critical levels for demonstrating the extent of risks to ecosystems. A variety of methods have been developed for valuation of ecosystems, for example in terms of restoration costs, 'regulatory revealed preference' and individual willingness to pay, and these will be reconsidered under ECLAIRE. One possibility is to use a number of methods and then to explore consistency in final outcomes.

5. Milestones achieved:

MS78 Agreed prioritisation of ecosystems and ecosystem services

6. Deviations and reasons:

This deliverable was delayed, in part to enable a better understanding of what results were likely to emerge from other components of ECLAIRE, and what those results might indicate. In particular, the extent to which the work should focus on biodiversity in contrast to regulatory and provisioning services, as discussed above (Sections 3 and 4). The delay does not have consequences for other components as the valuation stage is at the end of the analysis and discussions have been on-going with other ECLAIRE participants to ensure, to the extent possible, that their outputs are consistent with the needs of valuation. It ensures that effort can be most focused on areas where best progress can be made and means that ECLAIRE is able to account for the latest research materials, noting the pace of research in the ESA field.

7. Publications:

Rabl A., Spadaro, J.V. and Holland, M. (2014) How Much is Clean Air Worth? Calculating the Benefits of Pollution Control. Cambridge University Press (Chapter 5: Agriculture, Forests and Ecosystems)

8. Meetings:

- NEBEI (Network of Experts on Benefits and Economic Instruments) workshop, St Petersburg, February 2012
- TFIAM (Task Force on Integrated Assessment Modelling)/NEBEI workshop, Zagreb, October 2013
- Workshop at RIVM, Netherlands, December 18 2013

9. List of Documents/Annexes:

- Workshop reports: NEBEI, St Petersburg February 2012: TFIAM/NEBEI, Zagreb October 2013: RIVM, Netherlands, December 2013
- Overview of studies considered and priorities for valuation