Re-establishing credibility and legitimacy of scientific assessments in different policy arenas: the case of UN-ECE LRTAP and the EU CAFE process.

Berlin Conference HDGEC, 2-3 December 2005

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FIRST DRAFT. DO NOT CITE OR QUOTE WITHOUT PERMISSION OF THE AUTHOR

Abstract

The United Nations Economic Commission for Europe (UN-ECE) has been successful in generating, synthesising, and disseminating scientific knowledge. This is apparent in the initiation, negotiation and further development of the Convention on Long Range Transboundary Air Pollution (CLRTAP). CLRTAP provided a forum which simultaneously co-produced a scientific knowledge framework and a framework for policy making. Taking this co-production as a starting point this paper examines the question whether the scientific knowledge framework produced in the context of one policy arena can keep its credibility, legitimacy and relevance when used in a different policy arena. For example, the European Commission of the European Union (EU) is using knowledge produced in the context of CLRTAP to develop its own air quality strategies. This paper examines how the roles and division of tasks between scientists and policy makers differ among these two policy arenas and whether this influences the way credibility, legitimacy and relevance are established. To this end, the paper combines an analytical framework to approach effectiveness of scientific assessment in policy making with the notion of boundary work and co-production of science and policy. The results indicate that the process within the EU differs from CLRTAP in that it uses a more top-down approach, hires consultants and will result in binding targets. At the same time the work of the EC and of CLRTAP are very much intertwined and dependent on each other. The EC in the process rather focuses on building legitimacy, whereas it builds its credibility on the credibility established in the work of CLRTAP. Though the process of the EC is top-down, a very important feature in the process both for legitimacy and credibility is the use of bilateral consultations between countries and scientific consultants.

1. Introduction

Policy making in the field of Air Pollution on a European level takes place in two different arenas. Already since 1979 negotiations on reducing emissions of pollutants are going on in the context of the United Nations European Commission for Europe Convention on Long Range Transboundary Air Pollution (UN-ECE LRTAP). Of a later date, but evolving in a rapid manner is the development of European Union (EU) legislation on air pollution. In 2005 the European Commission launched an integrated Thematic Strategy on Air Pollution.

The two policy arena's UN-ECE LRTAP and the EU are linked in many different ways. Several authors have examined those policy linkages. Wettestad (2002) elaborates on the intensive interplay between the development of the so called CLRTAP multi-pollutant/multi-effect protocol signed in 1999 in Gothenburg and the development of the EU National Emission Ceilings directive at the same time, and adopted in 2001. Wettestad notes that policy development in the 1990s within the CLRTAP context has strengthened the position of EU policy entrepreneurs in the field of air pollution. Also he finds that CLRTAP experience and expertise had a major impact on the way of working and thinking within the Commission (Wettestad, 2002 p.157). Selin and VanDeveer (2003) discern a multitude of governance linkages and actor linkages between the two arena's. Governance linkages refer to e.g. similar policy objectives, harmonized activities and overlap concerning geographical area. With actor linkages Selin and VanDeveer point to the role of organisational actors, such as member organisations and non member organisations and individual actors in creating and utilising linkages. Furthermore Selin and VanDeveer note that CLRTAP and the EU share the same problem and solution frames in the use of terms like "critical loads", country based emission ceilings and the use of Best Available Techniques (BAT) and emissions limit values (ELV) standards on specific emission sources. Common rules include also specific emission reductions requirements.

In this paper we elaborate further on the differences and linkages between the two policy processes from a slightly different angle. We will elaborate on differences and linkages especially with regard to *the role of scientific advice and assessment in policy making.*

We focus on the division of roles and tasks between scientists and policy makers in integrated assessment processes in the context of UN-ECE LRTAP and in the EU Clean Air for Europe Programme (CAFE) respectively. The CAFE Programme was launched in 2001 as a programme of technical analysis and policy development and in 2005 has led to the formulation of the EU Thematic Strategy on Air Pollution. The CAFE programme partly builds on the scientific knowledge and the scientific knowledge framework and networks which have been developed within the context of UN-ECE LRTAP.
The scientific assessment process within CLRTAP is generally seen as having been successful in generating, synthesising, and disseminating scientific knowledge (Tuinstra et al., submitted). Within the context of CLRTAP there has been a successful division and co-ordination of work between science and policy. CLRTAP provided a forum which

simultaneously co-produced a scientific knowledge framework and a framework for policy making (Tuinstra et al., submitted).

Taking this co-production as a starting point the paper examines how the roles and division of tasks between scientists and policy makers differ among the UN-ECE and the EU air pollution policy processes and whether these differences influence the way credibility, legitimacy and relevance of the assessment are established. We will compare the science policy communication process in CAFE with the science policy communication process within CLRTAP and examine how the two are intertwined.

For this purpose we use a framework for the analysis of the role of boundary work in enhancing the credibility, legitimacy and relevance of scientific assessment in policy processes (Tuinstra et al., submitted).

In the next section we will present first the framework for analysis. In section 3 we shortly summarise conclusions of two analyses that elaborated on the science-policy interaction in CLRTAP and CAFE separately. Section 4 analyses differences and linkages between the two policy arenas. We conclude with a discussion in section 5.

2. Effective boundary work? A framework for analysis.

Tuinstra et al. (submitted) introduce a framework for the analysis of the role of boundary work in enhancing the credibility, legitimacy and relevance of scientific assessment in policy processes. This framework integrates two concepts. First, it uses the concept of effectiveness of assessment processes in terms of credibility, legitimacy and relevance as described by Farrell et al. (2001) and Farrell and Jäger (2005). Second, it uses a vocabulary to describe boundary work in terms of demarcation and co-ordination between science and policy as provided by Halffman (2003). This integrated framework will help us to focus on what happens at the science policy interface.

Starting point for the integrated framework are two observations. First, it is not easy to define effectiveness of assessment processes and factors that influence this effectiveness. Second, it is not easy to draw a sharp line between scientific and policy making activities in an assessment process. Neither can scientists' or policy makers' roles as actors in such processes always be precisely defined.

Effectiveness
With regard to the first observation, as mentioned above the framework builds upon the concept of effectiveness as described by Farrell et al. (2001) and Farrell and Jäger (2005). This concept considers effectiveness as an emerging property based on three qualities that participants and users attribute to an assessment: credibility, legitimacy and relevance. These qualities are co-determined by the characteristics of the assessment itself, the characteristics of the users of the assessment and the context in which the assessment takes place.

Boundary work

The second observation refers to an important aspect of science-policy communication in assessment processes, viz. the negotiation of the division of labour between science and policy. Negotiation takes place about the identity of practices (e.g. "science" and "policy") and actors (e.g. "scientists" and "policy makers") and their collaboration. This practice of maintaining and withdrawing boundaries between science and policy, shaping and reshaping the science-policy interface has been referred to as "boundary work" (cf. Jasanoff, 1990; Gieryn, 1995; Halffman, 2003).

Assessments are effective only if they are sufficiently relevant, credible and legitimate according to multiple audiences simultaneously (Cash et al., 2002). Relevance, credibility and legitimacy with multiple users, can be enhanced if context and user characteristics are taken into account in the *design* of the assessment. Assessment characteristics are the practical result of the design, taking into account the context and user characteristics (Tuinstra et al., submitted).

Important design elements are 1) Initiation and Goal; 2) Participation; 3) Treatment of uncertainty; 4) Treatment of Dissent and 5) Transparency. These design elements are very much determined by what happens in the science-policy interface: how science and policy demarcate and co-ordinate work. Halffman (2003) distinguishes three forms in which this *boundary work* can be embodied: Texts, Objects and People. Boundary Texts (or language or discourse) refer to the way actors in spoken and written text distinguish between science and policy and define respective roles. Boundary Objects refer to the tools that actors use, e.g. computer models, concepts or measuring standards, for knowledge production in a policy setting. Boundary People refer to networks of "scientists" and "policy" makers that are formed or individual people who through their position or actions mark a boundary between science and policy. Together, texts, objects and people form the boundary configuration between science and policy which is constructed throughout various stages of the communication process between science and policy within the context of a particular issue domain.

In short the integrated framework helps to provide insight in the way *how participants in the assessment process divide and co-ordinate work between science and policy; how this shapes design elements (initiation and goal, participation, treatment of uncertainty, treatment of dissent, transparency) of the assessment and how this enhances credibility, legitimacy and relevance with multiple audiences*

Figure 1 visualises the framework for analysis. See for a more elaborate description of the framework for analysis Tuinstra et al. (submitted)
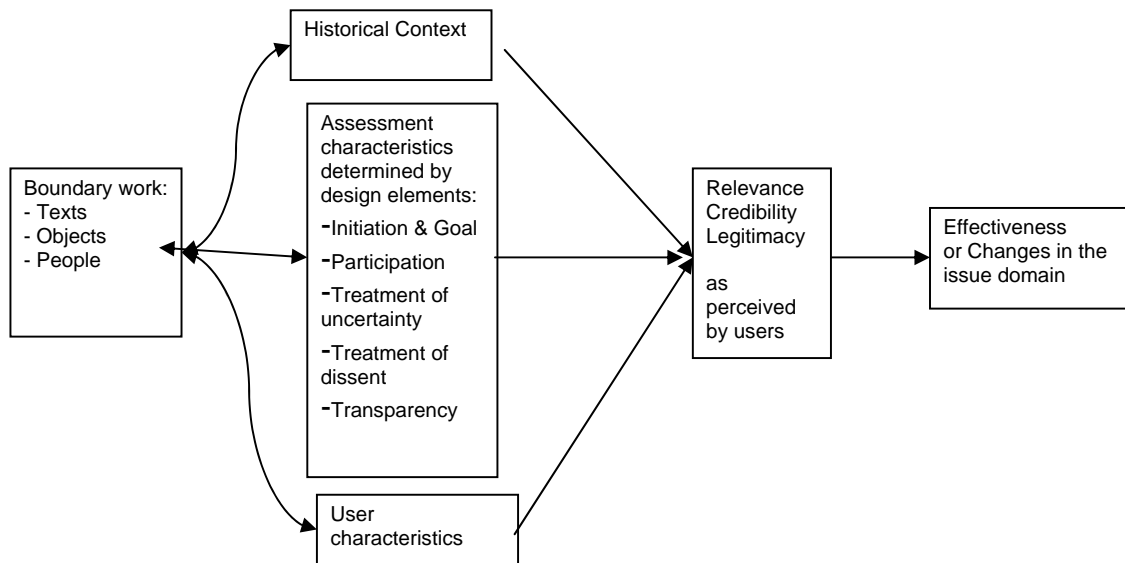
Figure 1: A framework to study co-production relating boundary work to the effectiveness of assessments

3. Boundary work in CLRTAP and CAFE

In two recent papers we have analysed the science-policy interaction in the two different arena's separately (Tuinstra et. al submitted; Tuinstra, in prep.). The conclusions of the two papers are summarised below in the Boxes 1 & 2.

Box 1: Summary of conclusions regarding boundary work in CLRTAP (Tuinstra, Hordijk and Kroeze, submitted)

Our analysis of *initiation and goal* of the CLRTAP and the *participation* in CLRTAP showed that what is considered to be credible, legitimate and relevant is established already in an early stage of the development of the assessment framework. It is therefore important for actors to be involved in boundary work in an early stage of the communication process.
 For example members of the RAINS team were very early participants in boundary work. The features of the RAINS model currently match quite well with what is considered relevant in the CLRTAP community. The knowledge frame of RAINS developed in parallel with policy development within CLRTAP and the set up of the data collection structure, and partly influenced the course of these developments. RAINS clearly participated in setting the scene and could therefore enhance its own relevance. An example of this is the development of the use of the concept of Critical Loads, which could not have been operationalised without IAMs such as RAINS and the other models used.
 With regard to dealing with *uncertainties* we also see that this requires careful boundary work balancing between credibility and legitimacy eventually leading to operational structures and effective assessment procedures. The example of the use of models and monitoring which could be managed and applied in all countries ("lowest common denominator standard") shows that this balance is of crucial importance for continuation of e.g. the monitoring programme without which this programme never could have been effective for policy making. The context determines what kind and degree of uncertainty is being accepted.
 With regard to dealing with *dissent* we see that the consensus structure of CLRTAP, which is inherent to the way of working of the UN-ECE, offers ample room for boundary work. We showed this in the example of the production of consensus reports but also in the creation of the "gap-

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closure" concept which was inspired by the necessity to come to consensus in the policy debate. The concept served a boundary role by being relevant through its ample timing and in fitting both to the policy concerns and the framing of the scientific debate at that stage. In its context it was both politically legitimate because of its equity dimension, and scientifically credible because of its connection to effects, and therefore contributed to the effectiveness of the complete assessment process.

Box 2: Summary of conclusions regarding boundary work in CAFE (Tuinstra, in prep)

Especially in the beginning of the process (the preparatory meetings of the Air Quality Steering Group, the first meetings of the CAFE Steering Group) boundary work has been taking place in the sense that roles and identities of "experts" and "stakeholders" and the scope of certain groups have been negotiated. However, our analysis suggests that the boundary work was not completed in the sense that not all actors were satisfied with their roles and appointed identities. This can also have influenced the fact that not all participants were convinced that uncertainties were treated satisfactorily and that there was enough space available to discuss dissenting views. This could happen because conflicting views existed about what the right forum for the discussion of certain issues was and who were the ones entitled to give input in this discussion. This would also explain why certain groups could keep insisting that the process and inputs were not transparent, while in fact and in the eyes of most participants the Commission and the experts involved went out of their way in providing information and giving opportunity for comments. Especially for the Member States an important role in enhancing credibility, legitimacy and relevance were bilateral consultations between modelers and Member States, the review of the RAINS model and other models involved and, still, the transparency and documentation of the integrated assessment work e.g. on the internet.

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4. Exploring differences and linkages in science policy interaction in CLRTAP and CAFE

4.1 Introduction
In this section we will analyse differences and linkages in science policy interaction in CLRTAP and CAFE. Each sub-section addresses one of the design elements of the assessment process and will analyse how credibility, legitimacy and relevance have been enhanced in the assessment process.

The analysis of this chapter is based on interviews with participants in the process (consultants, country representatives, experts and other stakeholders); minutes and agenda's of CLRTAP and CAFE meetings and working groups; assessment reports; existing literature and participatory observation.

4.2 Initiation and goal: bottom up vs. top-down
An important feature of CLRTAP is that all initiatives and decisions are taken by the parties (countries) themselves. In contrast in the context of the EU, the European Commission (e.g. DG Environment) has the initiative. The process in CLRTAP is inherently bottom up while the CAFE process is top down. Related to this is the fact that

participation in e.g. monitoring or inventory efforts within LRTAP is on a voluntary basis and that e.g. compliance mechanisms are not very strong. Also decision procedures are quite slow. Funding of scientific work is coming from the parties themselves on a voluntary basis. Within CAFE all member states are supposed to participate and to deliver data. The EU has the possibility to enforce compliance. Because of the top down process decisions can be taken quicker and it is easier to provide funds if the CAFE secretariat decides that e.g. certain scientific analyses are needed.

A strong feature of a bottom up process is that it will enhance legitimacy of an assessment with many participants. A top down approach will enhance relevance of assessments for the process itself, because it can fine tune the assessment directly to the needs of the process.

4.3 Participation: broad scientific co-operation vs. contractors
CLRTAP has been setting up a data information structure to which all parties contribute.[1] Scientific work to underpin negotiations is carried out in collaboration with a broad network of scientists and national experts that contribute to the systematic collection, analysis and reporting of emission data, measurement data, critical loads and integrated assessment results. All countries can send experts to task force and working group meetings. Because all countries participate in the process, in principle there is the possibility for a common development of knowledge capacity. However, because of the voluntary nature some countries play a more active role than others.

The European Commission works in a different way. The main scientific work to support policy proposals is carried out by contractors who are hired by the commission. In the CAFE process in addition Member States are being consulted and invited to give comments to presentations made by the contractors. The main analyses however are carried out by the contractors on whom the commission relies heavily. Through a tendering process the Commission selects the best equipped scientific groups to do so. This means that in principle there are only a few scientific groups directly involved while other experts only can comment if they are a delegate for their own Member State. The possibility exists that development of knowledge capacity doesn't take place in all countries. However, because all Member states are obliged to participate in the consultation, all member states are at least involved in one way or another.

In practice the contractors in the CAFE process also are important players in CLRTAP. Furthermore the CAFE process currently builds on the knowledge development within CLRTAP. Thus indirectly input from various experts from various countries also can become included into the CAFE process. CLRTAP plays an important role to keep all countries involved in CAFE. Furthermore, funding of the contractors by CAFE is essential also for e.g. model development in CLRTAP.

4.4 Uncertainties: from statistical analysis to the detection of biases
Over the years the importance of the issue of uncertainties has increased within CLRTAP. Being first only an issue for the scientific community, in recent years, policy

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[1] See e.g. http://www.emep.int/index_facts.html, and http://www.unece.org/env/lrtap/welcome.html

interest in uncertainties also increased. This is partly an effect of the development of the air pollution issue. Because for certain pollutants targets and critical loads are close to be met, uncertainties become more significant. Though initially uncertainty management played a less important role, at the same time in the early 90s three integrated assessment models were available for scenario analysis in CLRTAP. The use of the three models was a form of uncertainty management and increased the credibility of the process. Later the RAINS model of IIASA became the central model.

In the preparations of the set up of the CAFE process the use of the term "sound science" was discussed (AQSG, 2001). Participants in the Air Quality Steering Group (AQSG, the predecessor of the CAFE Steering group) emphasised that uncertainty of science was inherent. It was suggested to use the concept "uncertainty management" instead. It was also stated that a discussion was needed on the "levels of evidence" needed for precautionary policy measures. In this context also the possibility of an external group to conduct peer-review was discussed. The commission stated in the AQSG meeting that "the starting point should be a clear identification of what kind of validation and peer review is needed to the scientific advice used by policy makers". (AQSG, 2001) This is an interesting remark, because it shows that in the view of the commission a specific kind of peer review and validation is needed for "scientific advice used by policy makers". In the second CAFE Steering Group meeting it was agreed that "publication of peer-review articles on technical work carried out for CAFE should be encouraged but should not be a prior requirement for the results to be used. Communication between modellers (e.g. through model inter comparison) was seen as important and it was emphasised that full advantage should be made of stakeholder experts." (CAFE Steering Group, 2001). Both the discussions on "sound science" and peer review are important for the final credibility and legitimacy of the analyses performed. These discussions help to make explicit what is accepted as being "credible" and "legitimate" within the CAFE process.

Though the use of various models is suggested in CAFE to enhance sensitivity and uncertainty analysis, in fact the only IA model used in the CAFE process is the RAINS model. Only in a note of 2001 to the SG (Amann et al., 2001) two other models are mentioned: ASAM and Merlin. They played no significant role in the rest of the process however.

In practice, currently the way the CLRTAP and CAFE processes deal with uncertainties is not fundamentally different, mainly because most CAFE work builds upon the work within CLRTAP. In the course of time both within CLRTAP and CAFE the focus of uncertainty analysis shifted from statistical analysis to the detection of biases and to sensitivity analysis. A peer review of the RAINS model performed in 2004 under contract of the commission to establish the credibility of the RAINS model (Grennfelt et al., 2004) also re-enforced the credibility of the RAINS model within CLRTAP. National experts and policymakers in both policy arenas have the opportunity to inform themselves or give input with regard to uncertainty management. The RAINS team has been publishing extensively about uncertainties in the model and data bases used. Also in 2002 there has

been a workshop on uncertainty analysis and RAINS at IIASA to which various participants in both the CAFE and CLRTAP processes were invited[2].
However, according to participants in the course of CAFE process itself uncertainty did not get a lot of explicit attention.

4.5 Dissent
By tradition CLRTAP works by consensus. This means discussions are geared towards reaching a compromise. Sometimes this takes a long time. Reports of meetings also play the role of "consensus documents" and constitute the collective memory of CLRTAP thereby ensuring credibility and legitimacy of the work (Tuinstra et al., submitted).

Within CAFE the commission takes the decisions, the final policy proposal is the responsibility of the commission. Member States and stakeholders are consulted during the process. Though the Commission takes the comments seriously, there is no need for consensus.

According to participants who are involved in both process those different principles of working also lead to a different starting point for countries. While in CLRTAP countries are more working together towards a common goal, within CAFE countries tend to protect their own stakes more

4.6 Transparency
Transparency means that interested observers can readily see into an assessment process and judge for themselves the data, methods, and decisions used in the process (Farrell and Jäger, 2005). In this sense the CLRTAP process up to the second half of the 90s has not been very much transparent. Though information within CLRTAP (on e.g data an models) was in principle open and reports were available and scientific meetings have been open as well, for just an "interested observer" it was not so easy to get to know how to access this information. According to participants however, everything always has been very transparent once you took part in the process. Still, according to participants who only recently joined the CLRTAP process it takes a while to be familiar with the procedures, though once you know them they are clear.
From the late 90s on transparency also to the outside world is improving rapidly. Reports and agenda's of meetings as well as data and documentation on models and methods used are accessible through internet.

The CAFE secretariat took great efforts to make the CAFE process transparent: all agendas, meeting notes, inputs and participants lists of all meetings from the beginning have been available on the internet. The same holds for reports of the modelling work and the documentation of scenarios. Through the IIASA website all databases are available and the RAINS model can be viewed and used online[3]. Thus all inputs are open for the users to make their own judgement, which is important for credibility and legitimacy.

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[2] See http://www.iiasa.ac.at/rains/meetings/Uncertainty-Jan2002/announcement.html

[3] See e.g. http://www.iiasa.ac.at/rains/Rains-online.html?sb=8

Also the RAINS team organises regularly workshops to inform country and stakeholder experts on the principles of the model[4]. At the other hand, according to some participants the information overload is difficult to handle.

According to participants, very important for the transparency of the modelling and scenario work have been the "bilateral consultations" organised by the RAINS team at IIASA. The bilateral consultations were held to enable country experts to review the inputs in RAINS (country data in the databases and scenario's) for their own country. It was mostly organised in such a way that one person from the environment ministry visited IIASA together with two experts from national Environment Protection Agencies. These bilateral consultations contributed to (1) credibility because they enabled country experts to verify the data and inspect the model structure, (2) legitimacy because all countries were involved to provide data: it was their own responsibility (3) relevance, because after review the data used would be more in line with data from the countries themselves. Through the bilateral consultations country experts could increase their own knowledge about the model and scenario work.

In practice the transparency of the assessment work in CAFE has re-enforced the transparency of the work in CLRTAP. Workshops, reviews, bilateral consultations organised in the context of CAFE also are also useful for CLRTAP.

According to participants, compared to CLRTAP less transparent in the CAFE process is at what moment and how policy decisions are taken. It is less clear in what part of the whole legislation and policy process the scientific knowledge will play a role. The CAFE Steering Group is a group on the level of civil servants of the ministries. The first real decisions are taken in the Commission itself. The next step is the procedure in the European Council and the European Parliament. It is not transparent what the role of the scientific knowledge and integrated assessment at what moment is in that part of the process. Though this might be clear on paper, it is not clear in practice.

5. Discussion: interdependency of CAFE and CLRTAP

The central question of this paper was how the roles and division of tasks between scientists and policy makers differ among the UN-ECE and the EU air pollution policy processes and whether these differences influence the way credibility, legitimacy and relevance of the assessment are established. Can a scientific knowledge framework produced in the context of one policy arena be as effective when applied in a different policy arena? What about the parallel development or co-production of knowledge and policy?

In the case of CLRTAP and CAFE we have seen that though it are different policy arenas, user characteristics and the historical context are to a certain extent similar. Participants in the two processes overlap partly and the two processes tackle to a certain extent the same policy problem. To a certain extent because UN-ECE includes more

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[4] See e.g. http://www.iiasa.ac.at/rains/meetings/methodology/announcement.html

countries then only EU countries (e.g Russian Federation and USA as well) and while the focus of CLRTAP is naturally on "long range transboundary air pollution" the EU is also concerned with urban air pollution. While within UN-ECE the policy process is one of international negotiation, within in the EU it is a matter of legislation and binding targets. And as we have seen in the preceding sections, there are differences in the design of the assessment processes in terms of e.g. initiation, participation and treatment of dissent.

With regard to the issue of co-production, VanDeveer (2004) notes that the centre of air pollution politics in Europe moved from CLRTAP to the EU. "LRTAP's knowledge producing bodies are now increasingly interwoven with EU-policy processes. […] The focus of scientific and technical research and advice has changed. Researchers and modellers at IIASA, whose RAINS model has been used by LRTAP negotiators for years, now design their models in response to feedback from staff at the EU Commission in Brussel. Air Pollution knowledge is being reframed consistent with European integration and EU policy" (VanDeveer, 2004, p. 203). Thus also on the EU level co-production of knowledge and policy takes place, and in such a way that it influences developments in CLRTAP as well.

We conclude that despite the differences between the two different policy arena's the use in CAFE of the knowledge framework as developed within CLRTAP can be effective and maintain credibility, legitimacy and relevance. However this can only be effective under certain conditions. One of those conditions is the effective functioning of CLRTAP as the CAFE assessment process is highly dependent on the CLRTAP process. We elaborate this further below.

In essence the top-down approach of the Commission cannot function without the bottom up approach of CLRTAP. First, the data collection and mapping efforts in the context of CLRTAP form also the basis for the analyses within CAFE. Second, within CLRTAP the equal role and participation of each country is very important, both for the legitimacy of the process and for the capacity building within the countries. An own scientific basis in a country is needed for parallel development of scientific and policy understanding in that country. With regard to both points there are risks involved. First, when the EU policy process would become dominant over the CLRTAP process, countries could shift their attention to the requirements of the EU. Then there is a risk that there are no funds or capacity available anymore in the countries to maintain the data collection infrastructure for CLRTAP. This would at a certain moment backfire on the EU process as well. Second, if only a few scientific groups under contract would perform analyses for the EU and no broadly embedded scientific basis would exist as now provided and facilitated by CLRTAP, there is the risk that other countries cannot follow or relate to the analyses anymore which would undermine credibility, legitimacy and relevance of the assessment process in the EU.

In turn, for CLRTAP it is important to stay alert on the "reframing of air pollution knowledge consistent with European integration and EU policy", as the UN-ECE encompasses more than the EU only. Also non-EU countries have to remain able to follow the process and the analyses as well as to subscribe to them. Also there has to

remain room for negotiations and consensus. If the process for the EU countries within the UN-ECE develops isolated from the other countries, little room for manoeuvre remains and there is the risk that other countries within UN-ECE don't feel involved anymore. A broad basis for consensus still is needed within CLRTAP and therefore both knowledge and policy development in CLRTAP should ideally develop in parallel with the developments in the EU.

Remaining alert and encouraging parallel development in the two policy arenas offers lots of opportunities to enhance effectiveness as we have seen in our analysis. CAFE has build on the credibility of the CLRTAP knowledge framework and in turn re-enforced credibility and legitimacy of CLRTAP work e.g. through the RAINS review and bilateral consultations. Furthermore funds for CAFE work also favour developments in CLRTAP. And because of the stronger compliances mechanism CAFE plays a very important role in attaining environmental targets both set by the EU and the UN-ECE.

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