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**GREENHOUSE GAS INVENTORIES :  
NATIONAL REPORTING PROCESSES AND  
IMPLEMENTATION REVIEW MECHANISMS IN THE  
EU**

**SUMMARY FINAL REPORT**

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**RESEARCH TEAM**

**Coordinator :**

**John Lanchbery**

**Andrea Moran**

VERTIC:

Carrara House

20, Embarkment Place

UK - London WC2N 6NN

Tel.:+44-171 925 0867

Fax: +44-171 925 0861

E-mail: [vertic@gn.apc.org](mailto:vertic@gn.apc.org)

N.B. J. Lanchbery can now be contacted at RSPB

Tel.: +44-1767-692365

**Werner Katscher**

Ulrich Kotte, Stefan Comes

Forschungszentrum Jülich (KFA)

Postfach 1913

D - 52415 Jülich

Tel.: +49-24 6161 546

Fax: +49-24 6161 2496

E-mail: [u.kotte@kfa-juelich.de](mailto:u.kotte@kfa-juelich.de)

**Roberto Zubiaga**

Eloy Unzalu, Jorge Garcia and Christina Campos.

LABEIN

Cuesta de Olabeaga, 16

E - 48013 Bilbao

Tel.:+34-4 489 2400

Fax: +34-4 441 1749

**Owen Greene**

Julian Salt.

University of Bradford

Bradford

UK - West Yorkshire BD7 1DP

Tel.:+44-1274 733 466

Fax: +44-1274 385 240

E-mail: [owengreene@gn.apc.org](mailto:owengreene@gn.apc.org)

**Eastern European/ PECO Partner :**

Elena Nikitina and Vladimir Kotov.

Russian Academy of Sciences

Profsovnaya st. 23

Moscow - 117859

Russia

Fax: 7095 132 26 42

E-mail: [enikitina@glas.apc.org](mailto:enikitina@glas.apc.org)

## I. OBJECTIVES

Parties to the Framework Convention on Climate Change are obliged to compile and submit national communications on how they are implementing the Convention. The communications must include inventories of greenhouse gas emissions, reports on policies and measures which the Parties have adopted to try to stabilise or reduce emissions and, eventually, accounts of the extent to which emission abatement has been successful. Both the European Community and its Member States are Parties to the Climate Convention and are therefore obliged to report to it. It is also EU policy to try to limit greenhouse gas emissions and on 22 March 1993 the Council decided to establish a monitoring mechanism for carbon dioxide and other greenhouse gases. However, at the time that this project was proposed, in late 1993, it was unclear how the mechanism would work and, indeed, how the EU and its Member States would really go about compiling accurate and reliable inventories and reports.

This research project focused on how the EU and its Member States compile their inventories of greenhouse gases. It also examined how Russia, Poland and the Czech Republic do so. The project had two overall aims. The first was to study existing implementation review and verification systems in the EU, its Member States and the three neighbouring states with a view to enhancing knowledge of the accuracy and reliability of their reports. The second was to develop recommendations for how the EU and its Member States could compile more accurate and reliable reports and how the monitoring mechanism might also be made accurate and reliable. In a specific component of the project, recommendations were also made for Russia.

In pursuit of these aims, a set of more specific objectives was developed for the project and were as follows :

1. To identify existing greenhouse gas reporting and inventory compilation systems in the EU and selected neighbouring states, taking account of national differences in data acquisition and management - both formal and informal.
2. To establish the EU requirements for its own reporting and compliance procedures and the potential for developing procedures that would be more broadly applicable outside the EU.
3. To establish the relationship between EU reporting requirements and those of international institutions, such as the OECD and the Conference of the Parties to the Climate Change Convention.
4. To develop proposals for effective EU implementation review mechanisms. The proposals were to include recommendations for information management, supporting institutions and verification mechanisms which would allow the EU to review implementation of plans for emission reductions and to verify declarations of emission levels made in inventories.

## II. METHODOLOGY

The general approach adopted was to perform work on the project roughly in the order outlined in the objectives. First, the team conducted studies of the EU and neighbouring states. Then they made "in depth" examinations of the four countries in which the teams were based: Germany, Russia, Spain and the UK. Next, they scrutinised the EU and international systems for inventory compilation and reporting. They then went on to analyse and compare the results of the studies and, finally, came up with conclusions on how EU systems for implementation review and verification could be improved.

It was decided at the outset of the project to hold regular, three monthly meetings of the partners in order to compare results and to decide exactly what to do during the following quarter. In order to make the findings of the work comparable, two detailed research protocols were drawn up, based on the conclusions of meetings of the partners. The first of these covered methodologies to be used during studies of individual countries and the second concerned exactly how, and by whom, the detailed analysis of the case studies should be conducted.

In outline, the first phase of the work on individual states was conducted as follows.

The research began with a review of the national reporting and inventory compilation systems in the then twelve Member States of the EU and, in addition, Sweden, Austria, Poland and the Czech Republic (the Russian study began rather later). The main aim of the review was to identify different types and characteristics of national reporting and inventory compilation procedures and to single out significant discrepancies between them. In essence, it was a review of current practices. It was based mainly upon published material, particularly on States communications to the Climate Convention, but also on the other relevant government publications, information from international bodies and, to a much lesser extent, on publications in the academic literature. (There are almost no such publications which are relevant.) In all cases, personal interviews were conducted with personnel responsible for compiling inventories. A minimum of two such interviews per countries was found to be necessary, and often many more, depending upon the particular circumstances prevailing in the country in question. In Belgium, for example, which is undergoing a process of "regionalisation", it was necessary to

interview officials from the Flanders and Wallonian Regions, two sets of government officials and the independent laboratory responsible for certain aspects of the inventory. In the more centralised system prevailing in France, on the other hand, it was only necessary to interview the responsible Environment Department official and the representative of the organisation which compiles the inventory in order to obtain a clear idea of the French system and how it operates. In all cases, reports on States were sent back to the officials questioned for verification prior to their being published.

The country studies were by far the most substantial, taking, with the in-depth studies mentioned next, some eighteen months of the two year project.

The next stage of the work was to conduct similar studies to those outlined above, but in even greater detail, on the countries in which the four partners are situated: Germany, Russia, Spain and the UK. These studies made more effort to trace exactly where the data that went into national inventories came from, by checking on sources cited in the reports. They also paid particular attention to the characteristics of reporting that were due to peculiarities in national cultures and styles, to an extent that was not always possible in the other studies.

Concurrently with the country studies, the existing international systems for inventory compilation were studied, in particular the IPCC/OECD system devised for reporting under the Climate Convention and the CORINAIR system devised for reporting for EU purposes. The related EMEP system, originally devised for the acid rain agreements, was also investigated but found to be largely merged with the CORINAIR system, following agreement between the two programmes.

At the conclusion of the country studies, a second research protocol was drawn up, in light of the findings thus far, and on the basis of this five further tasks were performed. Two of these consisted of more detailed studies of international inventory compilation systems: one concerning how the EU system works and the other being a comparison of exactly how states use the IPCC and CORINAIR systems and how the results given by the two systems differ. The other three tasks consisted of cross comparisons of the reported emissions and the emission factors used by the countries studied in the main sectors of the IPCC inventories prepared by them for submission to the Climate Convention. The sectors involved were those for agriculture, land use change and forestry, waste, energy consumption in industry and non-energy related industrial emissions.

Two “think pieces” were also written at this stage. One on how a centralised EU system for inventory compilation might work and another on how a decentralised system might work. Based on these pieces and all of the other findings of the project, a set of recommendations was developed during a one week meeting of all of the partners in the project.

### **III. MAIN RESULTS**

In order to understand the results outlined here it is first necessary to understand a little about the methodologies used for compiling inventories in the EU. There are two main, international inventory compilation systems. One is that developed by the IPCC and OECD for the Climate Convention which all Parties must use for reporting to the Convention. The IPCC system is thus THE international system. It is a fairly simple system because it was intended to be applicable to all countries and for the main emissions sector (that for energy related carbon dioxide emissions) it makes use of energy flow statistics of the type that most developed countries collect routinely. In this and in other respects it is largely what is known as a “top down” system.

The other international system is the CORINAIR system which was developed as an EU project (and remains a project coordinated by the European Environment Agency), originally for monitoring acid rain related emissions. It has therefore been strongly linked to the EMEP system of the Acid Rain Convention (LRTAP) and has now largely merged with it. CORINAIR is based largely on cataloguing large “point” sources of emissions and assessing diffuse ones and is thus essentially what is known as a “bottom up” system.

Both the CORINAIR and IPCC inventory compilation methodologies are used by the EU Member States. Also, some Member States have devised their own methodologies which they tend to use in preference to the two international systems, claiming them to be more reliable than the international ones, usually because they have been developed over long periods to meet specific national circumstances.

The only EU country which uses the IPCC system alone is Finland. Those wholly or largely using the CORINAIR system are Austria, Denmark, France, Ireland, Italy, Luxembourg, Portugal and Spain. The others use a mixture of the IPCC and their own methodologies. In practice, we find that the plethora of systems used by

the Member States should not give rise to too much concern because the systems are generally compatible and the inventory compilation experts are working on making them more compatible, as is described later. The national systems convert reasonably well into both the IPCC and CORINAIR formats, certainly for energy related emissions, and the CORINAIR system converts quite well to IPCC in this category. The opposite, however, is not the case and there must thus be some concern about states using predominantly the IPCC methodologies. Also, there are significant discrepancies between the CORINAIR inventories submitted by Member States and their IPCC inventories, particularly at subsectoral levels outside of the energy sector. To some extent this may be accounted for by difficulties in converting from CORINAIR to IPCC in some subsectors but this is not generally the case. Also responsibilities for reporting under the different Convention may vary within countries.

In general, we find that using more than one inventory compilation system has advantages, notably that it allows both top down/bottom up checks to be made which helps to validate the figures in them. In countries where such checks have been made a correspondence of about 5% is found for the energy sector (1% in the case of Wallonia in Belgium).

In emission sectors other than those relating to energy the research team found that the emission figures given in national inventories are often of poor quality. Not only are the IPCC and CORINAIR figures given for emissions frequently different but many are, at best, rough estimates. Indeed, in many subsectors, no estimates are made at all by some countries.

Here it should be noted that the European Environment Agency (EEA) has taken over practical responsibility for compiling the EU inventory and has essentially contracted the work out to Topic Centres, the Air Emissions Topic Centre (AETC) being led by the German Umweltbundesamt (UBA) and the database being at the Austrian UBA, an AETC partner. The AETC will develop a new, improved version of CORINAIR for the EEA called Air Emissions 94 (96, 98 etc.) for the EEA Members which are the members of the EU, Norway, Iceland and Liechtenstein. However, the EMEP membership is much broader encompassing the states of Eastern and Central Europe, and Canada and the USA too. Many of these countries currently use systems which are compatible with CORINAIR but it will be interesting to see how compatible the EMEP and CORINAIR successor systems remain if the non-EU members are to have no direct say in the development of the Air Emissions systems. But non-EU have continued to participate in CORINAIR. Particularly, if the Air Emissions system goes in the direction which it intends, which is that of developing a "multimedia" inventory which will serve the EU needs for reporting to not only the Climate and Acid Rain Agreements but also to the Baltic Sea and North Sea Agreements. EMEP and any systems it adopts must basically serve the acid rain regime of which EMEP is a part.

To date, the EU Greenhouse Gas inventory has been compiled basically by summing the Member States inventories. The Commission, (namely DG XI), with help from EEA compiled the EU's "National Communication", including the inventory and submitted it, in draft form to the Climate Convention Secretariat. As far as we could discern, there was no involvement by the EU in the States inventory compilation processes at the State level, except through meetings in bodies such as the EMEP Task Force on Emission Inventories. Certainly there was no formal involvement by EU officials and not much informal involvement in most cases, but EEA, an EU body, published joint EMEP/CORINAIR Guidebook to help countries prepare inventories for EMEP and FCCC and provided additional support via EMEP Task Force and AETC.

At the EU level, the greenhouse gas inventory compilation process was closed and non-transparent, although individual officials were helpful when approached on behalf of this Commission research project. The same was not generally true of States processes. In some states informal meetings had been held with NGOs, particularly industry, although none had made any systematic attempts to involve organisations outside government. Deliberations on the workings of the EU monitoring mechanism, which has still not been decided in detail, are not so much non-transparent and closed, as secret. Some States have reported the Commission attitude as being "unhelpful" with respect to national communications in general. We believe that the main problem with the Commission providing information on this and other related issues is that the unit in question has been chronically understaffed and underfunded.

At the conclusion of this section on the main results of the project, a few further observations are made about how inventories are compiled and which although apparently comparatively minor may have important implications.

The first observation is that many Member States subcontract out all or some of their inventory compilation work to commercial companies. The project team found this worrying for two main reasons. The first is that many such companies tend to be secretive, thereby further obscuring an already obscure process. The second is that inventory compilation contracts are typically small and intermittent. There is thus a very significant chance that expertise in particular inventories will be lost, either through one or two people leaving the companies concerned or by the companies no longer finding such contracts lucrative. The project team would suggest that an area of such importance should not be left to a free market mechanism. In this area continuity of personnel is essential.

It was notable that in all countries the groups of people compiling inventories were small. This fact, coupled with the fact that they are working in a very specialised field (so that few others understand their topic) leads them to liaise extensively with other similar people in other countries, not only at scientific meetings but also routinely by mail. This has at least two beneficial outcomes. The first is that the groups tend to compete to make their inventories the best in terms of accuracy and reliability. The second is that they get to know how each others inventories are put together and the possibility of cheating during the inventory compilation process is thus minimal. Any significant changes in an inventory will be picked up and scrutinised by the experts in other countries. This applies not only within the EU but also, via the EMEP Acid Rain regime links, to all other UNECE members, including the USA and Eastern European countries. Here, it should be stressed that the project found no indications of EU States having tried to change their inventories for overtly political reasons.

A potentially less desirable effect of having so few inventory compilation experts is that the people who compile the inventories also review them, not only at technical meetings such as those of CORINAIR and the EMEP Task Force but also in the Subsidiary Bodies to the Climate Convention. (Those responsible for inventory compilation in the EU states commonly appear on delegations to the meetings of the Convention.) The international process for reporting and review of information concerning greenhouse gas emissions is thus very inbred. If an error or inaccuracy is tolerated at a fairly low, informal, technical level it will certainly pass further scrutiny at the EU or international levels. It is difficult to see how to avoid this potential problem although it should, again, be stressed that there is no evidence of political interference in the technical processes of compilation, reporting or review.

In summary, the research found that neither the Greenhouse gas inventories of the Member States nor that of the EU are accurate or reliable outside of the energy sector. This is not surprising given the rapid development of the climate issue and the requirement for reliable inventories. Nevertheless, much more work needs to be done in this area, soon. Likewise, the team found that the system for compiling the EU Greenhouse gas inventory is inadequate. In particular, it is not transparent and does not involve third parties to the extent that it should if it is to be credible. Specific recommendations on these topics are made in the following section on "implications".

#### **IV. SCIENTIFIC INTEREST AND POLICY RELEVANCE**

##### **i) Policy relevance**

It is crucial that inventories of greenhouse gas emissions are accurate, reliable and comprehensive. Otherwise, it is not possible to determine what States emissions are, where they originate and how they are changing. Without these data neither the EU nor its Member States can devise credible emission limitation or abatement measures. Nor can the effects of any such measures be monitored at the State, EU or international level. The success of the Climate Convention and of any EU burden sharing arrangements under the Convention depend almost entirely on the accuracy and comprehensiveness of the data supplied in national and EU inventories.

The findings are that although the inventories of the EU and its Member States are amongst the best in the world, they are not yet adequate for the purpose for which they are intended. Generally, they are neither accurate nor reliable outside of the energy sector. The EU and its Member States thus need to undertake far more work to achieve greater accuracy and comprehensiveness in these areas. Some such work is already under way. The Commission has, for example, funded several projects to better quantify emissions from agricultural sources. More research of this type is, however, needed, particularly at the national level where it is essential that data is collected on the peculiarities of emissions at a local level, which are many. Also, more work is needed which is specifically directed towards obtaining information for inventories, rather than purely for scientific information.

The groups of inventory compilation experts at both the national and EU levels are small and work on compilation is often fragmentary and issued in the form of subcontracts. This is an unsatisfactory situation. To ensure the reliability and continuity of inventories at least some expert, government employed officials are needed in each State, and especially at the EU level. Also, a far greater number of non-government experts from industry, academia and other institutions should be involved in the compilation process. This would not only

increase the reliability of the inventories but would also increase the transparency of the compilation process which is opaque at present, particularly within the EU

Significant and probably adequate attention is being given to the development of inventory compilation methodologies by international bodies, including the European Environmental Agency. Being constitutionally independent of the Commission should help the EEA to develop inventory compilation methodologies largely free of political pressures. However, the small numbers of full-time staff employed by the Agency and their consequent policy of contracting out much of their work is a potential cause for concern. On balance, it is probably best for the EU to continue to have two inventory compilation processes so as to facilitate cross checking.

In the EU, the reporting and review processes for national communications to the Climate Convention are inadequate in at least two ways.

1) In most States there is too little involvement by third parties in the compilation process and far too little by the EU in the form of either the Commission or the EEA. Also, most national processes are not transparent. The project team recommended that these deficiencies should be rectified by having at least one meeting/workshop on each national inventory, before its publication, with expert third parties and with representatives of the Commission and EEA present. This again implies higher staffing levels within the Commission and EEA.

2) Within the EU the inventory compilation process is not transparent and, again, involves too few experts. The research team therefore recommended that the Commission set up a technical assessment body to aid in the compilation of the EU inventory. The body would comprise Commission and EEA representatives, States representatives and non-government experts. It would review the national inventories and advise on where these might be changed prior to their inclusion in the EU inventory. Because the technical assessment body would be quite large it might be efficient for it to form a small expert subgroup, or subgroups on particular matters.

#### **ii) Scientific interest and novelty**

There is almost no work being done in this area, and certainly not on the scale of this project. To the best knowledge of the research team, nobody has tried to examine the processes by which climate related inventories and reports are compiled in any country. Although a considerable amount of work has been done on inventory compilation methodologies, almost none has been done on processes. Perhaps surprisingly, neither has much research been done by way of comparative studies of policies making processes concerning climate. Much has, of course been done on policies but little on comparisons between processes.

There has been a considerable amount of interest in this research, but almost entirely from practitioners: inventory and report compilers, and reviewers. Nearly all of the people interviewed in the States investigated in this project have been keenly interested in its outcome and have requested copies of reports (on countries other than their own). Likewise, representatives of states as far away as Taiwan have requested copies and the Climate Convention Secretariat has made extensive use of the country studies in their "in-depth country studies" of developing countries.

Thus far, purely academic interest in the project has been comparatively slight, but then the results have yet to be written in a political science/international affairs format.

In summary, the work is novel and the practical, policy relevance of it is well established, but the scientific interest is less so. This is probably because practitioners first were targeted.