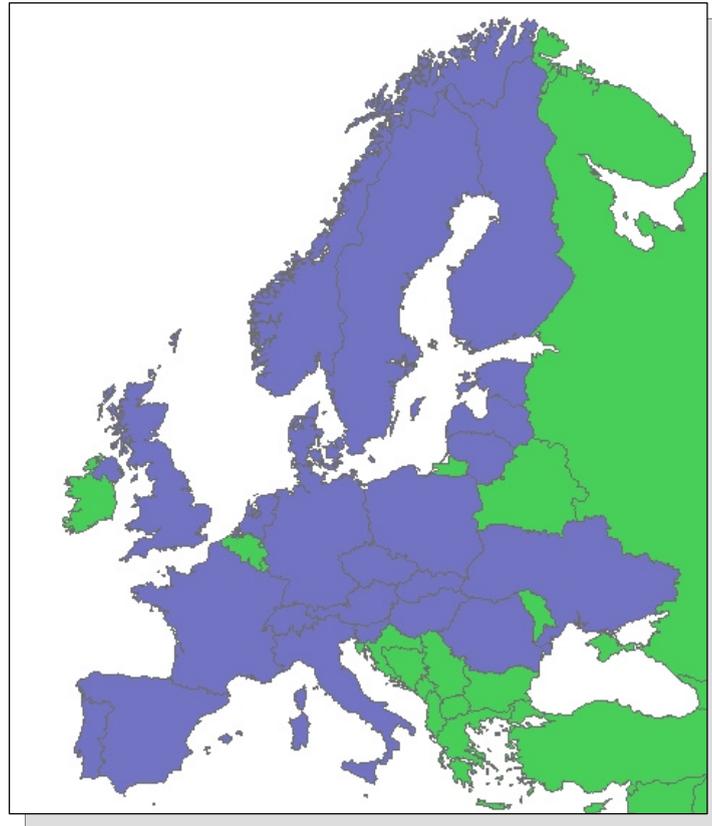


# WORKSHOP REPORT

## Workshop on European Networking of Long-Term Ecosystem Research (LTER) and Monitoring for Environment and Health

16th January 2003  
European Environment Agency, Copenhagen

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2<sup>nd</sup> revision

**Andrew Sier and Terry Parr**  
Centre for Ecology and Hydrology,  
Merlewood  
Windermere Road  
Grange-over-Sands  
Cumbria  
LA11 6JU

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# Workshop on European Networking of Long-Term Ecosystem Research (LTER) and Monitoring for Environment and Health

16th January 2003, European Environment Agency, Copenhagen

## Background to the meeting

The value of long-term environmental datasets for providing early-warning of environmental change and as a source of data for developing solutions to such problems is being increasingly recognized within policy circles. The recent EEA report on *Late Lessons from Early Warnings: the Precautionary Principle 1896-2000*<sup>1</sup> gave some good examples of this. However, previous experience has highlighted the difficulty of establishing and maintaining such long-term ecological research, because there have been few mechanisms for funding national or international programmes beyond a three to five year period. In order to generate and protect that funding, we need to improve the co-ordination of LTER activities at national and international levels across Europe and enhance its policy relevance.

This workshop was conceived to build on other initiatives in this area including those undertaken by the EC projects on NoLIMITS<sup>2</sup> (Networking and Long-term Integrated Monitoring in Terrestrial Systems), the EU-LTSERNET project (A European Long Term Socio-Environmental Research Network) and the experience of existing national and international LTER programmes such as that operating in the countries of Central and Eastern Europe.

The map on the front cover of this report shows the 23 countries who were represented at the meeting.

This report is a summary of the workshop presentations and discussions. Further information about LTER in Europe, including an online version of this report and the slides presented at the meeting can be found on the LTER-Europe web site, [www.lter-europe.ceh.ac.uk](http://www.lter-europe.ceh.ac.uk).

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<sup>1</sup> Harremoës, P., Gee, D, MacGarvin, M., Stirling, A., Keys, J., Wynne, B., Guedes Vaz, S. (2002). Late lessons from early warnings: the precautionary principle 1896-2000. Environmental issue report No 22. OPOCE. ISBN 92-9167-323-4

<sup>2</sup> <http://nolimits.nmw.ac.uk/>

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## 1 – Setting the Scene

*Chair: Gordon McInnes, European Environment Agency*

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### Aims of the meeting

The general aims of the meeting were to investigate the desirability and feasibility of establishing an International Long-Term Ecological Research and Monitoring Network (ILTER) in Europe. The workshop aimed to consider the issues that such a network should address, possible structures for a network and the steps needed for its establishment.

Specific objectives of the meeting were:

1. To exchange information on national initiatives on long-term ecological research and monitoring;
2. To identify and prioritise stakeholder requirements for ILTER related data and information in relation to the detection, early warning and management of environmental change and its impacts on society;
3. To develop links between environmental, economic and social science approaches to ILTER;
4. To identify the main barriers and opportunities related to the development of ILTER networks in Europe;
5. To identify possible structures for European ILTER network and the key actions required to deliver it, particularly in relation to opportunities in the EC's VI Framework Programme.

The full programme for the workshop is given in Annex A.

### Introduction

*Terry Parr*

*Environmental Change Network (ECN), UK*

We are approaching these aims from a position of strength. Several European countries have national LTER networks and there is also a regional ILTER network in Central and Eastern Europe. Additionally, some of the remaining countries possess data, gathered over considerable periods of time, for ecologically relevant sites. Furthermore, there are many thematic monitoring and/or research networks in Europe, such as ICP Forests. The challenge is to find ways to harmonise these different networks.

We do, however, have weaknesses. The links between different networks are, in general, quite poor, and there is a lack of harmonisation of networks. There are gaps, both in terms of geographic areas and the types of research and monitoring that are conducted. There are relatively few European-scale outputs, and there is a lack of a common research focus. Finally, there is no pan-European ILTER network.

The ecosystem approach is already established in EU political thinking, but the scientific community has yet to address it properly. In essence, as scientists we have failed to create an LTER brand, to define clearly what we mean by LTER.

The questions we must address in this workshop are, therefore:

- How can we start building a European LTER network?
- Is ILTER a basis for this?

## **The European Environment Agency and its interest in LTER**

*David Gee, Gordon McInnes & Ulla Pinborg  
European Environment Agency*

The European Environment Agency (EEA) helps to develop environmental policy by providing relevant information to its member countries in Europe<sup>3</sup>. It also provides support for the environmental reporting obligations of these countries. EEA collects and assesses environmental data, develops assessment criteria, and works to improve data quality. It also works to improve harmonisation and comparability of measurements. In addition, the EEA is active on the international stage, where it endeavours to promote the use of European data and expertise. EEA strives to avoid duplicating the work of other institutions and agencies, through working in cooperation with these organisations. EEA operates a number of European Topic Centres (ETC), which together address a range of environmental issues such as biodiversity loss, climate change and water-related issues.<sup>4</sup>

The environmental issues with which we must contend in Europe are many and varied. Some are relatively new issues; others have been present for a long time. When preparing the report *Late lessons from early warnings: the precautionary principle 1896-2000*, it became clear that long-term monitoring was critical in our handling of many cases of environmental damage, either because of its absence or its existence.

The EU has set a goal to halt all biodiversity loss in Europe by 2010. Whether or not this target can be achieved remains to be seen, but in order to assess success it is clear that we will need a mechanism to monitor and assess biodiversity for many decades. This is, therefore, one reason why the EEA is keen to support initiatives to develop a European LTER network. Such a network would, of course, need to be capable of addressing a range of environmental issues.

In fact the EEA feels it should support both a European LTER network and a European health monitoring network, and it further feels these should be integrated in some form. The existing ILTER activities in Europe are impressive, but do not yet cover the whole of Europe. At EEA, therefore, there is a sense that we need more and better monitoring in Europe (and ideally globally). However, politicians, scientists and the public all need to be convinced that such monitoring is necessary. This meeting and report, and follow-up actions should aim to achieve this.

## ***Integrated Ecosystem Assessments: the need for LTER***

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### **What is LTER and why do we need it? An ecological perspective**

*Bill Heal*

*Scandinavian-North European Network of Terrestrial Field Bases (SCANNET)*

In the USA, where an LTER network has been running for 20 years, the benefits of this approach to ecological research and monitoring are clear. The US LTER network<sup>5,6</sup> has

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<sup>3</sup> The 29 current EEA members are the 15 European Union (EU) member states, 11 of the countries seeking to join the EU and Iceland, Norway and Liechtenstein. Poland and Turkey, who have applied to join the EU, should complete EEA membership formalities soon, and negotiations are underway with Switzerland. [Source: [http://org.eea.eu.int/documents/who\\_we\\_are](http://org.eea.eu.int/documents/who_we_are)].

<sup>4</sup> A complete list of ETCs is available at [http://www.eionet.eu.int/Topic\\_Areas](http://www.eionet.eu.int/Topic_Areas).

<sup>5</sup> *Bioscience* 53 (1) Jan 2003. AIBS. ISSN 0006-3568. Features a special section on the US LTER network. [See <http://www.aibs.org/biosciencelibrary/vol53/jan03.ldml>].

<sup>6</sup> <http://lternet.edu/>

played a major role in understanding complex ecological processes, and the impacts of different environmental pressures on systems. For example, LTER data have been used to show the relative impacts of a range of environmental drivers on biodiversity occurring in different regions and habitats. It is clear from this study that the different drivers impact biodiversity in varying degrees depending on the nature of the ecosystems. Such a conclusion could only have been reached by integrating long-term data from a range of sources.

The existence of an LTER network in the US has enabled long-term monitoring and experiments to be undertaken, which might otherwise have not been possible. The network has evolved to form a strong research base that is flexible and responsive enough to address a changing agenda. For instance, the US LTER network has evolved to embrace a holistic approach to environmental science, in which the human social dimension is a part.

Expansion of the LTER approach to a larger scale, through international cooperation is being addressed through the International Long-Term Ecological Research Network (ILTER; see later).

## **What is LTER and why do we need it? A socio-economic perspective**

*Sander van der Leeuw*

*Maison de l'Archéologie et de l'Ethnologie (MAE), France*

Humans are intimately bound up in environmental issues. We define what the environment is, what problems it faces and the solutions in response to these. Therefore, a socio-economic approach to understanding environmental issues and developing solutions is necessary.

It is often appropriate for such an approach to utilise long-term datasets. This can mean using historic data, such as archaeological data and archival resources, and carrying out long-term interdisciplinary research and monitoring. Such activities can enable us, for instance, to look at the co-adaptation and co-evolution of human and natural systems, as well as address contemporary issues such as rural-urban dynamics and urban ecology (which are presently poorly studied).

One example of an interdisciplinary approach can be found in France, where 10 spatially-defined zones have been identified. In each zone social and environmental scientists are working together on long-term studies to address pertinent issues. This is forcing scientists from all the disciplines involved to redefine the issues and actions needed to understand the problems in each zone, and find appropriate solutions.

Sander van der Leeuw is coordinating a three-year EC Concerted Action to develop a long-term socio-environmental research network in Europe (LTSER). An early activity will be to disseminate questionnaires to a wide range of people to find out what existing long-term approaches to socio-environmental research are being undertaken. Workshops are also planned in 2003 and 2004, and at least some of those present at the present workshop will be invited to participate in these. A number of reports are planned of relevance to LTER in Europe (for example on socio-environmental approaches, current status and data and information).

## **Structuring LTER**

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### **The International Long-Term Ecological Research Network (ILTER) as a framework for international networking**

*Jim Gosz*

*University of New Mexico, USA*

A primary role of the ecological sciences is to understand how to achieve sustainable management of earth's resources. LTER is important because, unlike much other research, it is long-term, it integrates many temporal and spatial scales, it considers complex assemblages of species and it is interdisciplinary. Importantly, it aims to produce accessible archives of data, rather than 'throw-away' datasets, and actively promotes the use of these data by policymakers. LTER combines both monitoring and research, and adds value to both activities.

Many countries have developed, or wish to develop, national LTER networks. ILTER was established to support these activities in a number of countries, and aims to:

- *Promote and enhance the understanding of long-term ecological phenomena across national and regional boundaries;*
- *Promote comparative analysis and synthesis across sites;*
- *Facilitate interaction among participating scientists across disciplines and sites;*
- *Promote comparability of observations and experiments, integration of research and monitoring, and encourage data exchange;*
- *Enhance training and education in comparative long-term ecological research and its relevant technologies;*
- *Contribute to the scientific basis for ecosystem management;*
- *Facilitate international collaboration among comprehensive, site-based, long-term ecological research programs; and*
- *Facilitate development of such programs where they currently do not exist.*

Although the environmental issues may vary from nation to nation, the underlying approach and philosophy to dealing with these issues is the same, which means ILTER can provide a structure for networking LTER approaches at a global level.

LTER sites can be viewed as 'research platforms', foci for research and monitoring activities at a national and international level. ILTER is a key provider of data and knowledge to the Global Terrestrial Observing System (GTOS).

ILTER is supported by the US National Science Federation (NSF), which also supports the US LTER programme. NSF is currently reviewing how best to manage this international programme, and is keen that it is not viewed as a solely US-led operation.

ILTER can provide a basis for developing a European ILTER network, as witnessed by the Central and Eastern European regional ILTER network (see below).

## ILTER Regional Network for Central and Eastern Europe

*Julius Oszlanyi*

*Institute of Landscape Ecology, Slovak Academy of Sciences*

The Central and Eastern European regional ILTER network is a network of LTER sites linked by the Carpathian mountain range but encompassing surrounding lowland areas. There are sites in the Czech Republic, Hungary, Poland (1998) and Ukraine, while in Romania and Slovakia the development of LTER networks is in progress. Data exist for some sites from 1967, though these are not continuous datasets.

The network is expanding, for example with the recent addition of new forest sites near the Danube that are affected by a dam development. Poland joined the network last year and has organised a conference on aquatic ecosystems.

Research varies from site-to-site and is aimed at addressing issues of local relevance. The main research themes are:

- in **aquatic** systems: hydrobiology (plankton, macrophytes, fish stock, microbial loop), water and sediment quality, nutrient loading from catchments, functioning and sustainable management of estuarine, wetland, fish pond and reservoir ecosystems, eutrophication and acidification impact and recovery;
- in **terrestrial** systems: biodiversity, primary and secondary productivity, nutrient cycling, responses of populations and communities to disturbances (pollution, grazing, climate change, acid rain, land use changes), ecosystem management and restoration; vegetation dynamics (succession, re-establishment); bird migration.

Partners in the network meet regularly, with financial support from the ILTER Central Office.

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## 2 – Responding to the need: towards a European LTER

*Chair: Terry Parr, Environmental Change Network, UK*

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### **Status of national programmes**

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#### **Questionnaire responses**

*Terry Parr*

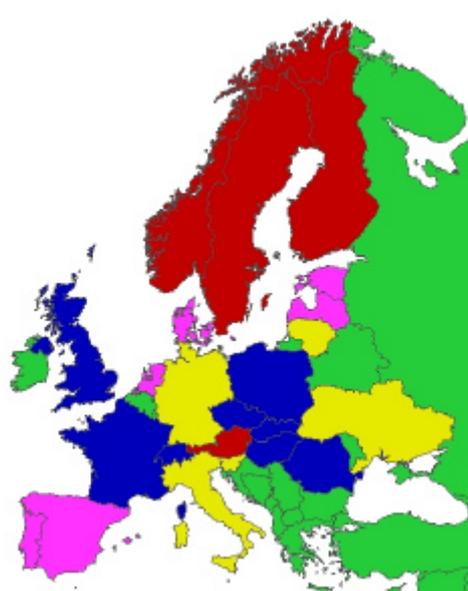
*Environmental Change Network (ECN), UK*

Prior to the meeting all participants were sent a questionnaire, which was designed to capture information about the current status of LTER programmes in Europe, and which could also be used to identify common objectives, themes or research questions for an ILTER network in Europe. A brief analysis of the questionnaire responses is given here.

#### Current status of LTER in Europe

Of the 23 countries that responded, eight have a formal national LTER network: Czech Republic, Switzerland, France, United Kingdom, Poland, Hungary, Slovakia and Romania. In addition, Norway, Sweden, Finland and Austria have national networks which are not part of ILTER.

Networks are under development in Ukraine, Lithuania, Germany, Italy and Slovenia, whilst Spain, Denmark, The Netherlands, Latvia, Estonia and Portugal reported being in the early stages of LTER network development.



#### **Status of national networks**

##### Key

- Blue: Formal national LTER network, member of ILTER
- Red: National network not part of ILTER
- Yellow: Network under development
- Pink: Country in early stages of network development
- Green: No contact or no questionnaire response

The sites that form these various national networks are very diverse in terms of habitat and extent, and include terrestrial, freshwater and, in some cases, marine sites. Some sites are catchments.

Funding for these networks comes from a diverse range of sources, including the EU, state governments, regional governments and some international funding for certain projects. The majority of the funding is from state governments.

Nine countries reported using standard measurement protocols at their sites. 14 countries stated that details of their networks were logged on the TEMS Database<sup>7</sup>. 5 countries reported having formal data and information management policies.

In addition to LTER programmes, there is a large number of shorter-term research and/or monitoring programmes operating in Europe. There is therefore, a strong base upon which to build a formal LTER network in Europe. However, it will require strengthening current and planned national programmes and linking together a large number of networks, organisations and funding bodies.

#### The function of LTER in Europe

In five countries (UK, Romania, Germany, Lithuania, Spain) the main objective of their networks were regarded to be coordination of activities, whereas 12 countries list scientific objectives for their networks.

A range of achievements of LTER activities was provided by respondents. They include:

- Addressing issues related to ecosystem health
- Detection of the effects of climate change and/or the development of climate change indicators
- Addressing transboundary pollution
- Addressing issues of ecosystem management – e.g. liming, catchments, wetlands
- Establishing links between biodiversity and productivity
- Contributing to our understanding of carbon budgets
- Providing unique research platforms
- Contributing to biodiversity strategies
- Contributing to environmental planning, land use and water quality

This is far from a complete list of achievements, and serves to demonstrate that LTER programmes can deliver tangible benefits. They are clearly addressing a range of issues, including pollution, impacts on biodiversity and climate, and operating at a range of scales, including addressing pan-European and global issues.

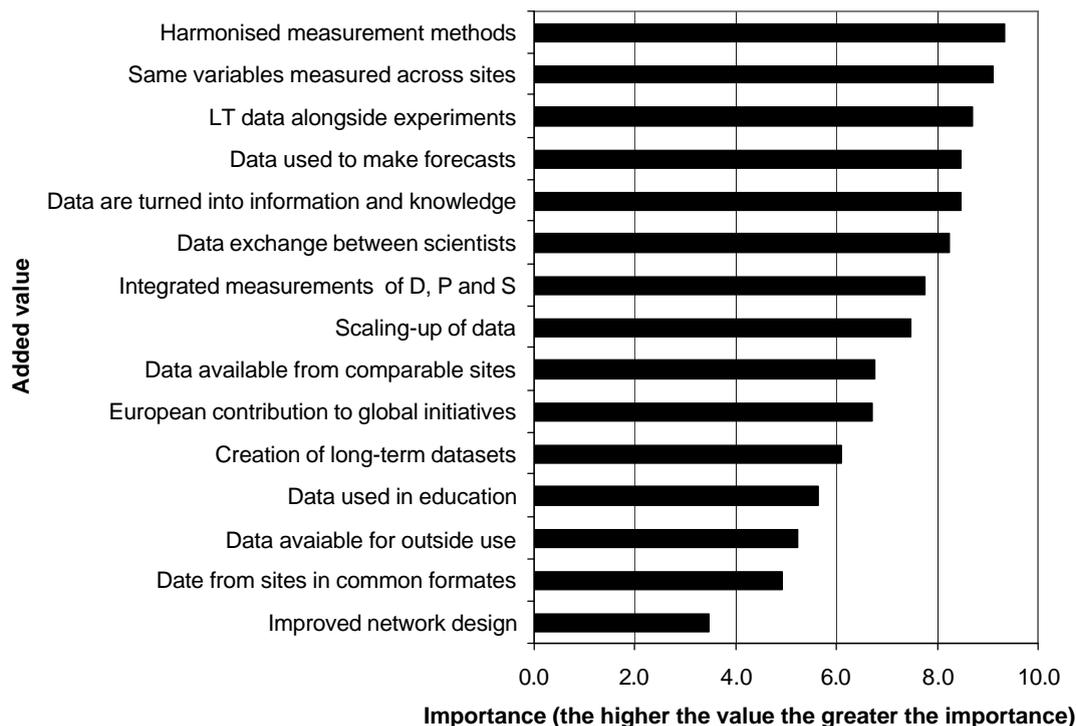
All respondents felt that a key future activity within their country was to develop the science activities of their national LTER operations. Four respondents also wanted to improve links and coordination with other networks or research programmes.

#### Added value of international networking in European LTER

Recipients of the questionnaire were asked to list in priority order the main perceived benefits, or added value, that would result from improved international networking. The results are shown below. The *higher* the score, the greater the importance of the benefit. The harmonisation of measurement methods and the common measurement variables at all sites, both of which can lead to datasets capable of integration and analysis as a larger dataset, were seen as the two most important benefits of international collaboration. Bringing together long-term monitoring and experimentation was also seen as a valuable benefit.

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<sup>7</sup> Global Terrestrial Observing System (GTOS) Terrestrial Ecosystem Monitoring Sites Database [see: <http://www.fao.org/gtos/tems/index.jsp>]



#### Objectives for a regional ILTER network in Europe

The questionnaire asked recipients to prioritise the current ILTER objectives in terms of which they felt were most important, from both a national perspective and a European perspective. The results are shown below.

National perspective		Score	European perspective		Score
1	Promote and enhance understanding of ecological phenomena	2.3	1	Promote and enhance understanding of ecological phenomena	2.4
2	Facilitate international collaboration	3.3	2	Promote comparative analysis	2.7
3	Promote comparative analysis	3.5	3	Contribute to scientific basis of ecosystem management	3.5
4	Facilitate development of new programmes	4.6	4	Promote comparability of observations	4.5
5	Promote comparability of observations	4.7	5	Facilitate interactions between scientists	5.0
6	Contribute to scientific basis of ecosystem management	5.2	6	Facilitate international collaboration	5.1
7	Facilitate interactions between scientists	5.6	7	Facilitate development of new programmes	6.4
8	Enhance training and education	6.8	8	Enhance training and education	6.4

Note: The *lower* the priority score the greater the importance.

There is some commonality between the two perspectives, national and European, with enhanced understanding of ecological phenomena seen as the most important objective.

Recipients were asked to prioritise a list of scientific/policy issues in terms of which they felt were the most important for LTER to address. Again, they were asked to consider a national and a European perspective. The results are shown in the table overleaf.

National perspective		Score	European perspective		Score
1	Climate change - impacts	4.2	1	Climate change - impacts	4.6
2	Biodiversity loss	4.2	2	Biodiversity loss	4.3
3	Land use and quality	4.0	3	Climate change - mitigation	4.3
4	Freshwater quality and resource	3.9	4	Freshwater quality and resource	4.2
5	Air pollution (acidification)	3.9	5	Air pollution (acidification)	4.0
6	Climate change - mitigation	3.6	6	Land use and quality	3.8
7	Rural sustainability	3.5	7	Coastal zones	3.7
8	Soil quality	3.3	8	Soil quality	3.5
9	Coastal zones	3.1	9	Rural sustainability	3.3
10	Urban sustainability	2.6	10	Urban sustainability	3.1
11	Ozone depletion & UV-B	2.4	11	Desertification	2.9
12	Desertification	1.8	12	Ozone depletion & UV-B	2.8

Note: The *higher* the priority score the greater the importance.

Several issues, the impacts of climate change and loss of biodiversity, emerge as being important both nationally and from a European perspective. Land use and land quality and freshwater quality and resources were also felt to be important issues that an LTER network should address. Issues related to the urban environment and coastal zones scored lower. This suggests a largely terrestrial/freshwater network of sites, covering a range of ecosystems in Europe from near pristine to heavily modified rural areas. Air pollution (specifically related to acidification of water) was regarded as more important than ozone depletion or soil quality.

Finally recipients were asked to consider a list of research questions based upon a list produced at the NoLIMITS workshop that was held in 1999<sup>8</sup>. For each question they were asked to (a) indicate if they currently used LTER data to address the question, (b) to state whether LTER data collected in their country could be used to address the question and (c) to indicate what priority they would give the question for a European LTER network to address. The table overleaf shows only those questions that were regarded as priority issues for a European LTER

It is encouraging to find that LTER data are already being used quite frequently to address the issues in the above list. The list may be seen as the basis on which to develop a research and monitoring agenda for a future European LTER, though it would need to be mapped on to national and European policy and science needs.

<sup>8</sup> See <http://nolimits.nmw.ac.uk/workshop.html>

Question		Number using data to address issue	Priority issue for Euro LTER
<b>Generic</b>			
1	Are observed changes local, regional or global?	11	4.4
7	How do we predict direction, intensity and effects of change?	8	4.4
10	How do we develop indicators that can be measured at low cost for early warning?	11	4.6
12	How do we separate natural from anthropogenic change?	10	4.5
<b>Air polln</b>			
14	What are the effects of air pollution on forests and other terrestrial ecosystems?	11	4.5
15	How and where do we reduce emissions in Europe to maximise the benefits in terms of critical loads?	6	4.2
<b>Biodiv</b>			
18	What measures can we use to estimate loss of biodiversity?	10	4.5
19	What are the best indicators of biodiversity loss at the European level?	6	4.4
23	How can we ensure equivalent biodiversity data collection across Europe?	7	4.1
24	How do we separate permanent loss of biodiversity from year to year variations?	8	4.3
29	What are the driving forces behind past, present and future changes of biodiversity at different scales?	8	4.6
30	How does biodiversity respond to multiple stress factors?	7	4.2
35	What are the critical aspects of biodiversity and how are these affected by pressures?	5	4.2
<b>Climate</b>			
38	What are the effects of climate change on the ecosystems and landscapes of Europe?	10	4.8
39	What are the effects of climate change on biodiversity?	8	4.4
44	What are the adaptation possibilities with regards to climate change and ecosystem management?	6	4.6
<b>Land use</b>			
45	What are the consequences of recent land use changes and how do they influence ecosystem functions?	9	4.1
<b>Fwater</b>			
53	Are European environmental measures sufficient to improve landscape quality?	7	4.1
<b>X-cutting</b>			
56	How do climate change, land use changes and biodiversity loss affect ecosystem function?	6	4.7
62	How does land use affect water quality?	9	4.3
63	How can we get more precise predictions of local and regional climate patterns on ecosystems?	6	4.6

Note: The higher the priority score the higher the priority for a European LTER.

## Discussion of key points

Viera Straskrabova (Czech Republic) emphasised the importance of freshwater studies, and pointed out that catchments in effect integrate whole ecosystem studies. She also said that long-term sedimentary records are an important resource. Concerning biodiversity issues, she pointed out that patterns of migration may well change, as a result of climatic change, for instance, and this could lead to some countries or regions gaining species. Species loss is, therefore, not the only measure of impacts on biodiversity. In order to study such changes a collaborative approach with many countries working together is necessary. She reported on an EU-funded study of mountain lakes, which is a long-term project incorporating a socio-economic study.

Maciej Zalewski (Poland) stated that new sites had recently been added to the Polish LTER network, and that long-term databases generated from the network had recently been reviewed.

Miklos Kertesz (Hungary) said that Hungary was keen to improve its sites to ILTER standards, and felt it was important to encourage countries to adopt these standards. This would help countries to secure funding for developing sites and/or networks. Miklos also felt there was weakness in data and information management, despite NSF/ILTER efforts to organise training workshops. There are no resources to support data and information management in the longer-term, and Miklos felt that there needs to be a change of attitude of higher-level decision-makers to change this situation. Miklos stated that it is important that scientists from ecological and sociological disciplines work together to address issues and that conventional LTER sites needed to consider how they could be developed to achieve this.

Martin Forsius (Finland) felt there was a need for European-level support to develop national LTER networks. Unlike in the US, there is no single agency in Europe that is responsible for

this. In his view a European LTER office is needed to coordinate activities across Europe. He said that a strong top-down message needed to be sent (via the EC or EEA) to help support national initiatives to establish LTER networks.

Viesturs Melecis (Latvia) was concerned about some of the parameters that ILTER would require sites to monitor. He also felt that LTER monitoring and research does not deliver as many scientific papers as more conventional research activities, and that this would make it harder to fund. He felt there needs to be some central funding provided to establish monitoring and research programmes. He suggested that the EEA could help support applications for funding ILTER in Europe and in so doing this might influence national agencies to develop or establish LTER networks and join an ILTER-Europe network.

Terry Parr (UK) said that in the Environmental Change Network in the UK was now as productive as other research groups in terms of scientific papers. Jim Gosz (USA) agreed, and felt that LTER provides many opportunities for publishing papers, especially when there is a combination of short-term and long-term work going on. Collaboration with other research groups also creates opportunities for publishing work. Sander van der Leeuw (France) also agreed, though he pointed out there can be a lead-in time during which the publication rate may be low.

Bill Heal (UK) emphasised the fact that a long-term research/monitoring network can act as a rapid response system. When all the infrastructure and contacts are in place it is possible for the network to focus attention on key issues much more quickly than when a research facility has to be set up from scratch.

Rosa Paiva (Portugal) felt that the scientific community appeared largely to agree that an ILTER network in Europe was needed. The problem, however, will be in convincing funding agencies.

Tor Björn-Larsson (EEA) said that the EU works on the basis of 5 year funding for research programmes, and that we cannot easily change this. However, he felt it might be possible to link some monitoring and research to specific EU objectives.

## ***Links to other international programmes – problems and opportunities***

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### **European Network for Long-term Forest Ecosystem and Landscape Research (ENFORS)**

*Folke Andersson, Swedish University of Agricultural Sciences and ENFORS secretariat, ECOFOR, Paris*

The ENFORS<sup>9</sup> Cost Action aims to develop a European network of field research facilities including a number of existing long-term experiments. These facilities could be used as demonstration areas, related to sustainable forestry, and this could form the basis of increased collaboration between scientists, as well as providing opportunities to engage with stakeholders. ENFORS will run from 2001 to 2005, and is conducted in three phases:

1. Identification of existing research sites
2. Elaboration of the network, establishment of instrumentation at sites, development of a scientific programme, linking research and monitoring, links to other networks, and arrangements for management and funding of the network
3. Realisation of the European network.

There are many parallels between ENFORS and LTER, and in many cases future ENFORS sites will also be LTER sites. ENFORS sites will link research and monitoring, as with LTER sites. ENFORS sites will also have a landscape perspective, which includes interactions with adjacent ecosystems, and focuses on relevant issues such as water quality, biodiversity and socio-economic considerations.

### **UNECE Integrated Monitoring of Air Pollution Effects on Ecosystems**

*Lars Lundin, Swedish University of Agricultural Sciences*

Integrated Monitoring of Air Pollution Effects on Ecosystems<sup>10</sup> is one of the UNECE<sup>11</sup> International Cooperative Programmes (ICPs) on integrated monitoring. The objectives of the programme are: to monitor the state of natural and semi-natural ecosystems; to explain changes in terms of causative environmental factors; to develop and validate models for simulating ecosystem effects; to use models to estimate responses to pollution stress and to carry out biomonitoring for detecting changes and for assessing the effects of air pollutants and climatic change.

Integrated monitoring takes place at about 50 sites in 22 countries, and is operated at the catchment scale. A cause-effect approach is taken – driving and response variables are measured at the same or nearby locations. Common measurement protocols are used at all sites.

Expert institutes in the participating countries carry out the monitoring. National focal points assess the data and report aggregated data to the Programme Centre (based at the Finnish Environment Institute). This team collects, stores and processes these data, and is responsible providing researchers with access to the data (data are freely available on the internet). The

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<sup>9</sup> See <http://iffb.boku.ac.at/enfors>

<sup>10</sup> See [www.vyh.fi/eng/intcoop/projects/icp\\_im/im.htm](http://www.vyh.fi/eng/intcoop/projects/icp_im/im.htm)

<sup>11</sup> United Nations Economic Commission for Europe [See [www.unece.org](http://www.unece.org)]

ICP IM Task Forces is the steering body for the programme, and reports progress to the UNECE Working Group on Effects. ICP IM is under the leadership of Sweden.

The programme has links with several other networks and monitoring programmes, and is keen to develop further links.

## **German Environmental Specimen Bank**

*Christa Schroeter-Kermani, German Federal Environmental Agency*

The German environmental specimen bank (ESB)<sup>12</sup> was established in 1985 as a permanent institution for the systematic collection, processing, characterization and storage of environmental samples from marine, freshwater and terrestrial ecosystems as well as human samples. Responsibility and funding are within the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the administrative coordination of the Federal Environmental Agency. The ESB is part of the ecological observation programme in Germany and serves to recognize impending problems in ecosystems, to identify the type and extent of possible damage, to supply knowledge for priority setting of political measures, and to work out fundamental concepts for precautionary policy.

The ESB is both a means of monitoring the current state of the environment and a resource for addressing unpredictable questions that may arise in the future.

All work is done according to obligatory Standard Operating Procedures and all data are stored and managed in an information system.

## **ICP Forests**

*Martin Lorenz, Institute for World Forestry, Germany*

There are two levels of monitoring intensity in ICP Forests; level II is closest to ILTER. A range of parameters are studied including air pollution and deposition, vegetation composition and phenology. ICP Forests addresses a range of issues.

The similarities with LTER are obvious. Both programmes maintain sites in many countries, both analyse and store data, both seek to integrate science with policy and both integrate monitoring and research.

ILTER will need to formulate research programmes using data from existing programmes, and this will require collaboration with ICP Forests.

There are many benefits to cooperation. For example, ILTER could check forest monitoring methods against those used in ICP Forests, and could participate in the quality checks. Some sites could also be shared.

## **CarboEurope**

*Ivan Janssens, University of Antwerp*

CarboEurope<sup>13</sup> is a cluster of projects at different scales (in time, size and area) looking to quantify and understand the carbon balance of Europe. CarboEurope includes sites in many

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<sup>12</sup> See [www.umweltprobenbank.de](http://www.umweltprobenbank.de)

<sup>13</sup> See [www.bgc-jena.mpg.de/public/carboeur/index.html](http://www.bgc-jena.mpg.de/public/carboeur/index.html)

European countries, each using standardised protocols. Data are available for free on the Internet.

It is sensible for CarboEurope to cooperate with anILTER network in Europe. For example, CarboEurope needs more sites in Central and Eastern Europe, and these could be provided through closer collaboration with existing LTER networks.

## **Scandinavia-North European Network of Terrestrial Field Bases (SCANNET)**

*Bill Heal, SCANNET*

SCANNET<sup>14</sup> consists of nine sites in Northern Europe, including one in Greenland and one in Svalbard. Each site belongs to another, more local network (for example, the site in the Cairngorms, Scotland, is part of the UK's Environmental Change Network). SCANNET sites are not random – they were chosen to map onto a gradient of projected climate change temperature changes.

SCANNET is not relevant only to Scandinavian and Northern European issues. It addresses global and transboundary issues, for example migratory birds, many of which spend the summer in the Northern hemisphere but overwinter in more southerly regions.

In conclusion, representatives of all the organisations who gave presentation in this section were generally supportive of the need to establish strong links with the European LTER community, and could see obvious benefits in working together. Several people made the point that a new network must not duplicate the activities of existing networks.

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<sup>14</sup> See <http://www.envicat.com/scannet/Scannet>

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### **3 – Towards Proposals for anILTER Network in Europe**

*Chair: Terry Parr, Environmental Change Network, UK*

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#### ***Synthesis of workshop sessions***

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Participants divided into four groups and each group discussed the following questions:

**Question 1:** Why do we need a European Network for LTER and what should be its main objectives?

**Question 2:** What are the main unifying scientific/policy questions or issues?

**Question 3:** Structuring of LTER-Europe:

- How should an ILTER-Europe be structured?
- What are the key links/partnerships with other programmes/projects?

**Question 4:** Building LTER Networks in Europe:

- How should we support the development of national networks?

**Question 5:** What next? What are the priority actions and initial steps?

The following is a synthesis of the four group discussions.

#### **Question 1: Why do we need a European Network for LTER and what should be its main objectives?**

Not surprisingly there was strong consensus that a European LTER network was needed. Reasons given included:

- To provide data and information at different spatial scales
- Europe needs tools on which to base its policies, and multiple national research/monitoring programmes cannot always deliver what is required at the European level
- To provide much-needed scientific informing sustainable development policy in Europe
- Such a network would concentrate on sites rather than themes
- To provide a flexible capability, able to respond to new and unforeseen issues
- To ensure valid sampling of different environments/ecosystems
- To provide a means of sharing understanding, methods and technology, and for promoting increased harmonisation of approaches
- To provide added value to national programmes and networks

#### **Question 2: What are the main unifying scientific/policy questions or issues?**

Among the many objectives listed, the following were generally seen as the main issues that a European LTER network should address (Note: not listed in any order of priority):

- Biodiversity and biodiversity loss
- Diversity-function relationships
- Climate change impacts
- Carbon cycling
- Understanding impacts of pressures and interactions between multiple pressures

- Defining sustainable land-use policies
- Land use and quality
- Fragmentation effects
- Eutrophication
- Risk assessment and management

### **Question 3a: Structuring of LTER-Europe: How should an ILTER-Europe be structured?**

Participants discussed issues relating to both the selection and nature of sites and possible administrative structures for an ILTER-Europe.

#### Site selection issues

Suggestions included:

- We should build upon existing facilities at a national and regional level
- We need to develop a basic set of criteria for the sites
- Different criteria will be needed for different scales (e.g. site scale to landscape scale)
- The network of sites should represent a range of influences and impacts
- Sites could be selected based on appropriate environmental gradients
- Sites should be representative of the different environments and systems across Europe
- Sites could be selected so as to have a range of biogeographical sensitivities
- We could aim to create multi-functional European ‘research platforms’, i.e. well-documented and instrumented sites that can be used to as a focal point for a range of research activities (similar in many ways to the telescope facilities that are shared resources for the global community of astronomers)
- Sites should form a structural hierarchy from the small scale to large scale
- Measurements should be made at a range of frequencies.

Some questions emerged. Should ‘normal’ sites or rare ecosystems be the focus of the network? Should we have patch sites or regional sites? Should specifically urban sites be included?

#### Administrative structure

It was generally agreed that the network should, wherever possible, be anchored in national funding bodies<sup>15</sup> (e.g. CNRS in France, NERC in the UK, NIVO in Norway), and should have national focal points. However, it was felt that a Europe-wide organisation, such as EEA or JRC, should play a coordinating role, and initial activities of such a group might be to evaluate the various current LTER monitoring and research activities in order to learn from the shared experience. This activity could be used to develop site-selection criteria.

Development of the network could be a voluntary, bottom-up approach, e.g. through an association of institutes with interests in developing the network, or a top-down, government-led approach. In part this would depend on funding (how much would come from the EU, for example). A long-term commitment is needed in either case.

National networks could supplement the activities undertaken as part of the Europe-wide initiative, with measurements or research aimed at addressing local issues.

The network needs to be capable of applying successfully for EC funding.

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<sup>15</sup> Note that such bodies do not exist, or are not effective, in some countries

### **Question 3b: Structuring of LTER-Europe: What are the key links/partnerships with other programmes/projects?**

A European LTER can feed back to national level networks and help strengthen them. It was felt that we need to link research with monitoring better than we do now. Linked programmes need to have complementary, rather than overlapping, objectives.

Specific organisations/groups to which strong links should be established include:

- Those organisations/networks represented at this meeting
- International Geosphere-Biosphere Programme (IGBP)
- Global Terrestrial Observing System (GTOS)
- Joint Research Council (JRC)
- Global Monitoring for Environment and Security (GMES)
- Other UN-ECE-ICP-sites not presented today (e.g. ICP Freshwaters)
- The European Ecological Federation and national or regional (scientific) ecological societies (e.g. British Ecological Society, OIKOS)

### **Question 4: Building LTER Networks in Europe: How should we support the development of national networks?**

Suggestions included the following:

- We should identify the key policy objectives for 2010 (this would help to identify criteria for sites and would help gain financial support)
- Develop funding streams, identify criteria and establish prototypes
- Water could be seen as a unifying policy theme, and could form the basis of an integrative project. Other themes are biodiversity and soil protection
- Establish a high-level core group to lead the development of the network, through promoting integrative projects/issues and developing the network to address these
- Build upon existing national and regional activities, but be prepared to adapt these to meet the requirement of a Europe-wide network
- Promote the value of existing national networks, through publicising the results and exchanges between countries
- Encourage the EU Commission to address national governments (e.g. Ministries of Environment, Agriculture, Science and/or Education) on this topic
- Use the US LTER as a model and demonstrator of what is possible
- Consider joining the ILTER network.

It was pointed out that building up the national networks towards a European network requires many things including expertise, support for lobbying, research cooperation and direct funding.

### **Question 5: What next? What are the priority actions and initial steps?**

Suggestions included:

- Produce a report of this meeting
- Develop the Framework VI Network of Excellence proposal
- Examine previous experiences
- Identify national focal points
- Support and foster national networks, through information-dissemination and further meetings

- Successfully operate the EU Concerted Action on developing a Long-Term Socio-Environmental Research network (LTSER)
- Produce more in-depth reports, including: a site inventory and map; an analysis of relevant scientific and policy issues
- Produce a paper setting out the arguments for a European-wide LTER, with details of what we want to do, examples of how it can be done and proposals for how it can be organised
- Some important issues to address in the short to medium term are: monitoring vs. research; sustainable development; protocols – do we need common ones; data sharing; involvement of the socio-economic sector.

## ***Discussion of key points***

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David Gee (EEA) felt that it would be important for us to identify what resources, in terms of time and money, we can each devote to developing a European network.

Fernando Valladares (Spain), Bill Heal (SCANNET) and Rosa Paiva (Portugal) all said they would be willing to devote time to this. Maciej Zalewski (Poland) said he could help, but that he would need some financial support. Julius Oszlanyi (Slovakia) said that the Central and Eastern European ILTER network would provide support. Bart Kruijt (The Netherlands) was not sure who should lead this activity in his country, but was willing to try and engage national support.

Martin Forsius (Finland) felt strongly that we need an organisation operating at the European level to support and develop the network. He felt the following reports would be needed: (i) an immediate workshop report, (ii) case studies and (iii) criteria for the sites, etc. These last two would require more time and investment. He asked if EEA could fund the production of a larger report.

David Gee (EEA) replied that EEA could probably support this. EEA wants to promote the concept of a European LTER and would like to contribute more than just the publication costs. He suggested that a theme for this could be burying the false distinction between research and monitoring. This theme could also be used to stimulate a small meeting with a few key people in DG Research and involving US partners. The European Science Foundation (ESF) could engage with funding bodies in member states, or this could be handled by a joint EEA/ESF approach.

It was repeatedly stated that the gap between monitoring and research is hampering the establishment of LTER, both nationally and internationally. As the differences between monitoring and research are quite unclear where long-term activities are concerned, this gap is regarded to be mostly artificial and in many cases a mere question of definition. Many funding agencies have a responsibility to fund either research or (environmental) monitoring, but by classifying LTER as either research or monitoring, agencies unwilling to fund LTER can put forward arguments not to support proposals.

Tor-Björn Larsson (EEA) said a meeting about a European biodiversity research strategy had taken place during the Danish presidency of the EU at which a paper on this topic by Gordon McInnes (EEA)<sup>16</sup> was presented. Similar meetings could provide fora for further discussions.

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<sup>16</sup> The need for comparable policy-relevant data and indicators on European Biodiversity: Connecting best science and policy-making. Talk given by Gordon McInnes (EEA) at the European Platform for Biodiversity Research Strategy (EPBRS) meeting, Silkeborg, Denmark, 4<sup>th</sup> October 2002. The notes for this talk are available from the EEA.

Folke Andersson (Sweden) wondered if we need to establish a small working group, of 5-6 people, to take forward the development of a European LTER network.

Michael Mirtl said the amount of effort required by people depends on the level of central activity.

Gordon McInnes (EEA) replied that the EEA cannot help with funding: that must be done through, for example, the Framework VI programme, and EEA cannot assist here. However, EEA can make statements to relevant policy and possibly also scientific communities.

Terry Parr (UK) said that a strong positive signal from EEA would be very helpful.

Bill Heal (UK) said that the EU was interested in strengthening connections between LTER activities in Europe and the US. He wondered how we could make best use of this.

Jim Gosz (USA) replied that he was willing to find out what the NSF's position on this is. He felt there is a mechanism here for greater collaboration, and he stated that a precedent was set when Europe-US collaboration on biotechnology research was strengthened recently.

### ***Next steps: list of actions***

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There was general agreement that we should continue to work towards the establishment of a European ILTER network based on national efforts. In the absence of any immediate funding for this, the following actions were agreed:

- A. Sier/T. Parr to produce and disseminate workshop report
- A. Sier to create a web site to act as a focus for information about a European LTER network
- All to contact T. Parr if they wish to be involved in an informal task force to develop a European LTER network
- All to send comments on this report, or thoughts and suggestions about developing a European LTER network to T. Parr
- All to develop opportunities for LTER in the EC Framework VI Programme as they arise
- J. Gosz to discuss, with NSF contacts, NSF's position with regard to strengthening connections between the US and Europe, and how this could be used to influence the development of ILTER
- S. van der Leeuw to circulate a questionnaire in relation to the Concerted Action on "European Networking of long-term Socio-Environmental Research"
- S. van der Leeuw to invite some LTER participants to workshops being organised within the Concerted Action
- T. Parr/EEA to develop plans for a strategic document outlining the role that LTER has to play in the protection and management of a sustainable European environment
- D. Gee/G. McInnes to consider ways in which the EEA could deliver a strong "top-down" signal about the need for a European LTER network
- All to consider examples of best practice and case studies that can be used to illustrate the value of LTER and the benefits of European LTER
- All to continue to develop national LTER networks
- All to note that another meeting of the European LTER group would take place in 2-3 years time.

## Annex A

### Final Programme

#### Session I– Setting The Scene (9.00 – 10.30)

*Chair: Gordon McInnes (European Environment Agency)*

##### 1. Introductions & aims of meeting

Terry Parr (UK Environmental Change Network) & Michael Mirtl (Federal Environment Agency, Austria)

##### 2. Integrated Ecosystem Assessments: the need for LTER

- a. EEA– environmental data and information  
David Gee (European Environment Agency)
- b. What is LTER and why do we need it? – An ecological perspective  
Bill Heal (University of Edinburgh/SCANNET)
- c. What is LTER and why do we need it? – A socio-economic Perspective  
Sander van der Leeuw (CNRS)

##### 3. Structuring LTER

- a. The International Long-term Ecological Research Network (ILTER) as a framework for international networking  
Jim Gosz (Chairman, ILTER)
- b. ILTER Regional Network for Central and Eastern Europe  
Julius Oszlanyi (Slovak Academy of Science)

#### Session II: Responding to the need: towards a European LTER (11.00 - 12.45)

*Chair: Terry Parr (UK Environmental Change Network)*

##### 4. Status of national programmes - Review of Current Activities (general discussion based on background papers produced for each country) with 5-minute assessments on key conclusions from these papers:

- i. Network Structures
  1. Status (established network, state of development)
  2. Organisation/funding
  3. Data and information policy
- ii. Network Functions:
  1. Objectives and scope
  2. Balance between monitoring and research
  3. Achievements – e.g. examples of successful applications particularly where LTER has fed into policy
  4. Benefits of LTER at national level
- iii. Future plans
  1. Future priorities
  2. Perceived benefits of international networking.

**5. Links to other International programmes – problems and opportunities**  
(5 minutes each, if necessary) followed by general discussion concerning links to some of the following:

- i. UN-ECE: International Cooperative Programmes (ICPs)
- ii. ICP-Integrated Monitoring of Air Pollution Effects on Ecosystems
- iii. ICP-Forests
- iv. COST E25 - ENFORs
- v. Natura 2000 Network
- vi. Biosphere Reserve Integrated Monitoring MAB/UNESCO
- vii. SCANNET (Arctic Monitoring Programme under FP5)
- viii. The Global Terrestrial Observing System
- ix. The marine experience

**Session III - Towards Proposals for an ILTER Network in Europe (14.00 – 16.00)**

**6. Workshop Sessions** (small sub-groups addressing the same questions):

**Question 1:** Why do we need a European Network for LTER and what should be its main objectives?

**Question 2:** What are the main unifying scientific/policy questions or issues?

**Question 3:** Structuring of ILTER-Europe:

- How should an ILTER-Europe be structured?
- What are the key links/partnerships with other programmes/projects?

**Question 4:** Building LTER Networks in Europe

- How should we support the development of national networks?

**Question 5:** What next what are the priority actions?  
Initial Steps?

**Session IV: (16.30-17.30)**

**6. Working Group Reports**

**7. Synthesis and Conclusions**

## Annex B

### List of delegates

**Folke Andersson**

Department of Ecology and Environmental Research  
Swedish University of Agricultural Sciences  
PO Box 7072  
SE-75007 Uppsala  
Sweden

Folke.Andersson@eom.slu.se  
tel: +46 (0)512 422 14  
fax: +46 (0)512 422 14

*and*

Secretariat COST E25 – ENFOR  
GIP ECOFOR  
19, avenue du Maine  
75732 Paris cedex 15  
France

marell@engref.fr  
tel: +33 1 4549 8802  
fax: +33 1 4549 8839

**Michael Bredemeier**

Forschungszentrum Waldökosysteme  
Forest Ecosystems Research Center  
Universität Göttingen  
Buesgenweg 1, D-37077 Göttingen, FRG  
Germany

mbredem@gwdg.de  
tel: +49-551-399840  
fax: +49-551-399762

**Eduardas Budrys**

Institute of Ecology  
Akademijos 2  
Vilnius LT-2600  
Lithuania

ebudrys@ekoi.lt  
tel: +37 05 2729264  
fax: +37 05 2729257

**Martin Forsius**

Finnish Environment Institute  
PO Box 140  
FIN-00251 Helsinki  
Finland

martin.forsius@vyh.fi  
tel: +35 8940 300 308  
fax: +35 8940 300 390

**Erik Framstad**

NINA - Norwegian Institute for Nature Research  
Dept. of Landscape Ecology  
PO Box 736 Sentrum  
N-0105 Oslo  
Norway

erik.framstad@nina.no  
tel: +47-2335 5110  
fax: +47-2335 5101

**David Gee**

Information Needs Analysis and Scientific Liaison  
European Environment Agency  
Kongens Nytorv 6  
1050 Copenhagen K  
Denmark

david.gee@eea.eu.int  
tel: +45 33 36 71 42  
fax: +45 33 36 71 28

**Jim Gosz**  
Biology Department  
University of New Mexico  
Albuquerque  
New Mexico 87131  
USA

jgosz@sevilleta.unm.edu  
tel: +1 505-277-2265  
fax: +1 505-277-5355

**Bill Heal**  
Easter Hackwood  
Dipton Mill Road  
Hexham NE46 1BP  
UK

o.w.heal@durham.ac.uk  
tel: +44 1434 606108

**Ivan Janssens**  
University of Antwerp, Department of Biology  
Research Group of Plant and Vegetation Ecology  
Universiteitsplein 1  
B-2610 Wilrijk  
Belgium

ijanssen@uia.ua.ac.be  
tel: +32 3 820 22 55  
fax: +32 3 820 22 71

**Miklos Kertesz**  
Institute of Ecology and Botany  
Hungarian Academy of Sciences  
H-2163 Vácrátót  
Alkotmány utca 2-4  
Budapest  
Hungary

kmiki@botanika.hu  
tel: +36/-(28)-360-122  
fax: +36/-(28)-360-110

**Norbert Kraeuchi**  
Federal Research Institute  
Forest Ecosystems and Ecological Risks Division  
Zuercherstrasse 111  
CH-8903 Birmensdorf  
Switzerland

kraeuchi@wsl.ch  
tel: +41 1 739 25 95  
fax: +41 1 739 22 15

**Andrej Kranjc**  
Karst Research Institute  
Titov trg 2  
SI-6230 Postojna  
Slovenia

kranjc@zrc-sazu.si  
tel: +386 5 700 19 31  
fax: +386 5 700 19 99

**Bart Kruijt**  
Alterra  
PO Box 47  
6700 AA Wageningen  
The Netherlands

b.kruijt@alterra.wag-ur.nl  
tel: +31 317 474331  
fax: +31 317 419000

**Tor-Björn Larsson**  
European Environment Agency  
Kongens Nytorv 6  
1050 Copenhagen K  
Denmark

Tor-Bjorn.Larsson@eea.eu.int  
tel: +45 33 36 71 00  
fax: +45 33 36 71 28

**Sander van der Leeuw**  
MAE  
21 allée de l'Université 92023 Nanterre  
France

vanderle@mae.u-paris10.fr  
tel./fax: +33 1 46 69 24 35

**Martin Lorenz**  
Head of PCC of ICP Forests  
Institute for World Forestry  
Leuschnerstr.91  
21031 Hamburg  
Germany

Lorenz@holz.uni-hamburg.de  
tel: +49-40-73962-119  
fax: +49-40-73962-480

**Lars Lundin**  
Department of Environmental Assessment  
Swedish University of Agricultural Sciences  
PO Box 7050  
SE-750 07 Uppsala  
Sweden

Lars.Lundin@ma.slu.se  
tel: +46-18-673109  
fax: +46-18-673156

**Anders Mårell**  
Secretariat COST E25 – ENFORS  
GIP ECOFOR  
19, avenue du Maine  
75732 Paris cedex 15  
France

marell@engref.fr  
tel: +33 1 4549 8802  
fax: +33 1 4549 8839

**Gordon McInnes**  
European Environment Agency  
Kongens Nytorv 6  
1050 Copenhagen K  
Denmark

Gordon.mcinnnes@eea.eu.int  
tel: +45 33 36 71 00  
fax: +45 33 36 71 28

**Vladimir Medinets**  
Odessa State University  
2 Shamanskiy Str.  
Odessa 270058  
Ukraine

medinets@te.net.ua

**Viesturs Melecis**  
Institute of Biology  
University of Latvia  
Miera str. N 3  
Salaspils  
LV-2169

vmelecis@email.lubi.edu.lv  
tel: +371 7944988  
fax: +371 7944986

**Michael Mirtl**  
Austrian Federal Environment Agency  
Spittelauer Laende 5  
1090 Vienna  
Austria

mirtl@ubavie.gv.at  
tel: +43-1-31304-3410  
fax: +43-1-31304-3700

**Felix Mueller**  
Ecology Center  
University of Kiel  
Schauenburgerstrasse 112  
D - 24118 Kiel  
Germany

felix@ecology.uni-kiel.de  
tel: +49 431-880-3251  
fax: +49 431-880-4083

**Julius Oszlanyi**  
Inst. of Landscape Ecology, Slovak Ac. of Sciences  
Stefanikova 3, P.O. Box 254  
814 99 Bratislava  
Slovakia

Julius.oszlanyi@savba.sk  
tel: +42 1 25249 3882  
fax: +42 1 25249 4508

**Maria Rosa Paiva**  
GUECKO / DCEA, FCT  
Universidade Nova de Lisboa  
PT - 2825-516 Monte de Caparica  
Lisbon  
Portugal

mrp@mail.fct.unl.pt  
tel: +351 21 2948300  
fax: +351 21 2948554

**Terry Parr**  
UK Environmental Change Network  
Centre for Ecology and Hydrology – Merlewood  
Grange-over-Sands  
Cumbria LA11 6JU  
UK

twp@ceh.ac.uk  
tel: +44 (0) 15395 32264  
fax: +44 (0) 15395 34705

**Bruno Petriccione**  
CONECOFOR Service  
Ministry of Agriculture and Forestry Policy  
National Forest Service (divisione V)  
via Sallustiana 10  
00187 Roma  
Italy

conecofor@corpoforestale.it  
tel: +06 46656523/4  
fax: +06 483498

**Ulla Pinborg**  
European Environment Agency  
Kongens Nytorv 6  
1050 Copenhagen K  
Denmark

ulla.pinborg@eea.eu.int  
tel: +45 33 36 71 00  
fax: +45 33 36 71 28

**Christa Schroeter-Kermani**  
Umweltbundesamt  
Postfach 33 00 22  
14191 Berlin  
Germany

christa.schroeter-kermani@uba.de  
tel: +49 (0)30 8903-0  
fax: +49 (0)30 8903-2285

**Andrew Sier**  
UK Environmental Change Network  
Centre for Ecology and Hydrology – Merlewood  
Grange-over-Sands  
Cumbria LA11 6JU  
UK

arjs@ceh.ac.uk  
tel: +44 (0) 15395 32264  
fax: +44 (0) 15395 34705

**Brit-Lisa Skjelkvaale**  
Norwegian Institute for Water Research (NIVU)  
Brekkeveien 19, P.O Box 173  
N-0411 Kjelsaas, Oslo  
Norway

brit.skjelkvaale@niva.no  
tel: +47 6 389 8000  
fax: +47 6 389 8050

**Flemming Skov**  
Dept of Landscape Ecology, NERI  
PO Box 358  
Frederiksborgvej 399  
4000 Roskilde  
Denmark

fs@dmu.dk  
tel: +45 4630 1200  
fax: +45 4630 1114

**Viera Straskrabova**  
Department of Ecology, Hydrobiological Institute  
Faculty of Biological Sciences, Academy of Sciences  
University of South Bohemia  
Na sadkach 7, CZ 37005 C. Budejovice  
Czech Republic

verastr@hbu.cas.cz  
tel: +420 38 7775819  
fax: +420 38 5300248

**Tomasz Staszewski**  
Institute for Ecology of Industrial Areas  
Kossutha 6 st.  
40-833 Katowice  
Poland

stasz@ietu.katowice.pl  
tel: +32 254-60-31  
fax: +32 254-17-17

**Reet Talkop**  
Environment Information Centre  
Mustamae tee 33  
10616 Tallinn  
Estonia

Reet.Talkop@ic.envir.ee  
tel: +37 2 6737 578  
fax: +37 2 6564 071

**Angheluta Vadineanu**  
Faculty of Biology  
University of Bucharest  
Splaiul Independentei 91-95  
76201 Bucharest  
Romania

anvadi@bio.bio.unibuc.ro  
tel: +40 21 411 23 10  
fax: +40 21 411 23 10

**Fernando Valladares**  
Centro de Ciencias Medioambientales  
C.S.I.C.  
Serrano 115 dpdo.  
28006 Madrid  
Spain

valladares@ccma.csic.es  
tel: +34 91 7452500  
fax: +34 91 5640800

**Maciej Zalewski**  
Polish Academy of Sciences  
International Centre for Ecology  
Konopnickiej Str 1  
09-052 Lomianki, Warsaw  
Poland

mce-pan@mail.unicom.pl  
tel./fax: (022) 751-41-16