7.0 APPENDIX

1. Alberta: AESA Soil Quality Benchmark Program
Objectives

- provide baseline soil information
- evaluate landscape effects on soil quality
- provide a dataset to test and validate simulation models
- monitor changes in soil quality over time on a field landscape basis

Site Selection
Sites were to be distributed across the agricultural areas of Alberta and stratified according to major land use and landscape patterns. They were to occur only on cultivated land and were to be representative of soil-landscape patterns and land-use of the ecodistrict that each occurs in. The sites also need long-term security and cooperation from the land manager. The sites were not to be situated on headlands, pipeline right-of-ways, water courses, field corners or areas of weed infestations.

Soil Sampling Methods
Each sampling site consists of an upper, mid and lower slope transect. Each sampling position is recorded using high quality, real-time DGPS and is relocated each year using GPS. When each site was initially developed, profile descriptions and site characteristics were completed for each landform position to ensure that the site was representative of the ecodistrict in which it is located. At the time of the field inspection and description, topsoil depth, pedon descriptions and landscape descriptions were also taken. Soil samples of each principle horizon were collected and analyzed for particle size analysis, CEC, pH, EC, SAR (when pH>4.0), calcium carbonate, available NH_4, NO_3-N, P, K, SO4-S, total nitrogen and organic carbon. Bulk density samples were taken from 3 cm to 15 cm in the topsoil and 20 cm to 50 cm in the subsoil.

Soil samples are collected annually from each site. Samples are collected after harvest but before cultivation or fertilization and soil freeze-up. Five to ten soil cores are taken from 0-15 cm and 15-30 cm at each landform position and are bulked to provide one sample. The samples are collected using either a STAR SS soil sampler or Dutch auger. Samples are kept cool and are then air-dried and ground to pass a 2 mm diameter sieve. The soils are then analyzed for fertility, pH in water and $CaCl_2$, EC, SAR (if EC>4), mineralizable N and light fraction C. Excess soil is archived for future use. Bulk density samples are also taken from the 0-15 cm depth.

Monitoring Components
The program also collects information about weather conditions and annual land management practices, in addition to collecting and analyzing annual plant yield samples from each landform position.

Data Uses
Data is compiled in a database and has been shared with collaborating institutions to determine phosphorus sorption, verify a nitrogen mineralization model and to determine pesticide accumulations.

Data Trends
Monitoring has revealed significant differences in organic carbon between agricultural ecoregions, depending on soil horizon and slope position. Differences in nutrient levels were also found based on soil properties, slope position and agricultural ecoregion.

Data Dissemination
Annually, results are distributed to the land manager of each site. Fact sheets on results from analysis of organic matter and micronutrients have also been prepared for distribution.

2. Alberta: Long –Term Soil and Vegetation Plots Established in the Oil Sands Region
No additional information is available.

3. Canada: Soil Quality Benchmark Sites

Objectives

- provide baseline dataset for assessing soil quality change and yields of representative farming systems
- provide a way of testing and validating predictive models of soil degradation and evaluating sustainability of current and proposed agricultural land management
- provide a network of well-documented sites at which integrated multidisciplinary research programs can be developed
- provide means of evaluating agricultural sustainability of current production systems in major agricultural regions of Canada

Site Selection

Sampling sites were selected based on the following seven criteria, with priority given to the first three:

1. represent a major soil or climatic region and /or ecological region
2. represent a typical physiographic region (landscape) or broad textural grouping of soils
3. represent a major or potentially major farming system within a region
4. complement provincial priorities or opportunities
5. provide the potential of revaluation of the impact of a susceptible degradation process
6. occupy approximately five to ten hectares of land or a small watershed
7. be located on cultivated agricultural land and as part of an actual farming system

Soil Sampling Methods

On simple slopes, a grid design is used. This is a 25 m by 25 m grid and 80 to 100 points are contained within each grid. A transect design is used on hummocky to undulating terrain. Five or more transects placed perpendicular to the contour of the landscape are used. The transects stretch from the crest to the base of the hill and are spaced 10 m apart from each other. Sixty sample points are contained within the transect sampling design.

At each sample point, a loose sample of the Ap horizon is taken, while a loose sample of the subsurface horizons are taken randomly in the grid design and at 25 percent of the points at each different slope position using the transect design.

4. United States of America: Forest Health Monitoring Program / Forest Inventory and Analysis

Purpose

The Forest Health Monitoring Program was initially part of the Environmental Monitoring and Assessment Program (EMAP). It was designed to provide a basic understanding of conditions of forests through annual assessment and to address environmental concerns related to the impacts of air pollution, acid rain, global climate change and land management practices on forest ecosystem health. The program had four main components:

- detection-monitoring: permanent plot grid system and aerial and ground surveys
- evaluation monitoring
- intensive site ecosystem monitoring
- research on monitoring techniques

In 1999, the Forest Health Monitoring Program and the Forest Inventory and Analysis program were integrated in response to further information needs. The Forest Inventory and Analysis program is now mandated to provide annual state inventories, provide 5 year reports of forest health for the entire nation and each individual state, and provide national standards and definitions.

The purpose of the soil quality indicator is to provide baseline information about the status of forest soils so that changes in quality can be monitored over time.

Monitoring Component

The program monitors many ecosystem components including: biological diversity, productive capacity, ecosystem health and vitality, water resources, global carbon cycles and lastly, soil resources, which is divided into 3 separate categories. The three categories are soil erosion (% bare soil, forest floor thickness, slope and soil texture), soil compaction and soil chemistry (organic matter, nutrients and heavy metals).

Soil Sampling Methods
During the first visit to a plot, soil is collected from a point labeled "1" on transects which run at tangents to the annual subplots (58.9 ft radius). Each subsequent sampling takes place at 10 ft intervals on opposite sides of point "1" along the transects. The sampling plots are distributed on the basis of one plot per 158,00 acres of forested land in 27 states. The intent is to have the program implemented in all 50 states by 2003.

Samples are collected from the forest floor (litter and O horizon) and also from the mineral soil in 0-10 cm and 10-20 cm increments. A total of five samples (3 forest floor, 2 mineral soil) are collected from each plot. Collection takes place during the months of June to September.

5. Albania: Map of Soils of Albania
Country Description
Albania is a country of almost 29,000 km^2. Hills and mountains cover 80% of this area.

Soil Issues
Erosion is a problem due to deforestation for use as arable land and securing wood for heating purposes. The need to produce the nation's entire food supply without importing raw materials has forced agricultural production into areas not suitable for cultivation.

Soil Sampling
In 1993, it was hoped to also include the following in the suite of analyses performed on the samples: hydraulic conductivity, pF, exchangeable Al, H, pH (CaCl2), EC, CEC, BS and matrix color.

Data Uses
The soil data has enabled the elaboration of drainage and irrigation projects, the determination of tillage and fertilization systems and erosion control. The information may serve monitoring relative to environmental protection although the pollution of soils and ground waters was still minor in 1993.

6. Austria: Forest Soil Monitoring System
Monitoring Components
The monitoring system measures tree growth, vegetation, crown damage, site descriptions, soil descriptions and chemical analysis of soil and foliar material.

Soil Sampling Methods
The site descriptions and soil analysis were carried out between 1987 and 1990. The soil samples were taken from 0-10 cm, 10-20 cm, 20-30 cm and 30-50 cm intervals. No repetition of soil sampling was planned before 2003.

Data Trends
The main results from the first sampling indicate moderate regional forest acidification, widespread heavy metal pollution, particularly lead and cadmium and the accumulation of nitrogen.

7. Bulgaria: Background Monitoring
Country Description
Arable land comprises 61 percent of the land area of Bulgaria. Thirty-three percent of the total land area is hilly or mountainous.

Soil Issues
The main areas of concern are heavy metal pollution, acidification, salinization, dehumidification, soil compaction, water logging and water and wind erosion.

Monitoring Components
Background monitoring involves monitoring many ecosystem components. Measured on a hourly basis are: ozone concentrations, relative humidity, air temperature, precipitation, sun radiation, and wind speed and direction. Sulphur and nitrogen dioxide are measured daily. Weekly measurements include dust, lead aerosols and the physical and chemical analysis of precipitation. Soil samples are collected annually, while phytomonitors are taken at the beginning and end of the growing season.

Soil Description
The soils at the background monitoring station in Rojen are high mountainous, light brown in color and are a sandy clay mix. They generally have good aeration, are slightly acidic and rich in humus.

8. Bulgaria: National Environment Monitoring System
Site Selection
The sample sites are organized by pollution source. Ninety-two sites are in industrial pollution areas, 80 sites are in areas affected by agricultural chemicals, 52 sites are situated in areas of irrigation and 79 sites are in zones polluted by automobiles.

9. Czech Republic: Basal Soil Monitoring Scheme
Objectives
- provide information on the main soil types and how their characteristics change with time
- assess the influence of anthropogenic activity on the soil resource
- provide information on strategic research
- act as a source of information for framing of legislation in the fields of soil protection and environmental impact assessment

Site Selection
Agricultural plots were selected for: soil type, proportion of land use type (arable pastures, vineyards, orchards, hop gardens), level of environmental contamination, even distribution of plots across counties, and the probability of agreement with the landowner.

Protected area plots were selected based on: the desire to cover all of the large scale protected areas in the Czech Republic, to cover all soil types, to reflect the aerial distribution of soil types in each individual monitoring area and to locate the plots in areas of least disturbance, mainly nature reserves.

Soil Sampling Methods
Each plot is divided into four equal subplots. Ten samples are taken from each genetic horizon in the subplots. Those samples are bulked to provide a 1 kg sample from each subplot, which equates to four samples from each genetic horizon over the whole plot. Soil cores are taken in triplicate for physical measurements. Soils are kept in a condition as close to field conditions as possible for measurement of biological parameters. The samples are air dried and ground to pass a 2 mm screen. Quality of analysis is assured by having various Institutes perform analysis of a reference soil that is provided by the Basal Soil Monitoring Scheme.

Monitoring Components
Atmospheric deposition is also monitored on 69 agricultural soil plots and 31 protected area plots.

10. Denmark: Heavy Metal Monitoring Programme
Country Description
Denmark is one of the smallest nations in Europe. As a result, it is densely populated and has well developed industrial and agricultural sectors. Agricultural activities use 62 percent of the land area and only four percent is used for municipal and industrial purposes.

Soil Issues
The largest environmental concern is food safety.

Site Selection
The sample sites were situated where detailed information on soil, land use and agricultural practices was available.

Monitoring Components
The program also monitors 20 agricultural fields with a known history of sewage sludge application.

Soil Sampling Methods
Each soil sample collected consists of a 2 kg sample composed of 17 subsamples. The subsamples are taken in a regular pattern within a 50 m^2 sample plot. A 3 cm cylindrical drill is used to obtain a sample to a 25 cm depth after removal of the organic layer. The soil is homogenized and sieved to 2 mm before analysis.

Data Trends
Two major trends have been found from the monitoring. The lowest concentration of heavy metals has been found in sandy soils and the use of phosphate fertilizers has increased the concentration of cadmium in arable soils. The low annual input of heavy metals in Denmark has prompted a 10 year waiting period before the sampling is repeated.

11. England and Wales: National Soil Inventory
The last re-sampling of the soils in England and Wales took place on arable and ley-arable soils in 1994.

Soil Sampling Methods
Soils are sampled by taking 25 soil cores to a depth of 15 cm These are taken at 4 m intervals within a 20 m by 20 m square plot centered on the 5 km by 5 km grid. The soil cores are bulked, air-dried and sieved to 2 mm prior to analysis.

Data Trends
The data collected to date indicates a decrease in organic matter and copper while indicating an increase in P and K in arable soils. The largest of the declines in organic matter are in grasslands ploughed up for arable use and on cultivated peaty or organic soils. No overall pattern of soil quality change can be detected but may indicate an actual change in chemistry or a change in agricultural practice over time.

12. England and Wales: Annual Representative Soil Sampling Scheme
This program, which began in 1969, measures 180 agricultural fields each year. The fields rotate each year, with one-third of the fields being sampled after a ten year interval, one-third being sampled after five years and one-third of the fields being sampled for the first time. Sampling at each site is discontinued after it has been in the sampling scheme for ten years.

13. Finland: National Forest Inventory
Country Description
Approximately eight percent of the total land area is used for cultivation.

Soil Issues
Finnish soils are thin with sandy till parent material. As a result, common soil phenomena are water surpluses, leaching and transport of substances into lower soil layers. Most of the soil degradation issues are confined to diffuse air pollution, in particular acidifying S and N deposition. Acidification by natural and anthropogenic processes is widespread, while salinization and wind erosion of arable land is not common. Climate changes, extensive forestry and regionally centralized agriculture have had the greatest impact on soil quality.

Program History
The National Forest Inventory has been performed for more than seventy years. The first inventory took place between 1921 and 1924. The ninth and most recent inventory was completed from 1996-2000.

Objectives
The traditional role has been to provide unbiased, reliable and large area forest resource information from the entire country. The information has been used in large area forest management planning, forest policy decisions and in strategic planning of forest inventories.

Funding
The annual budget for 1997 was about 1.5 million ECU of which 0.6 million ECU was used for field measurements.

Personnel
The inventory team is composed of 1 project leader, 16 researchers, 6 crew leaders, 3 field data operators, 4 secretaries, 4 associates, 10 temporary crew leaders and 30 field assistants.

14. Finland: Soil Quality Monitoring Program
No additional information is available.

15. France: Soil Quality Observatory
Country Description
The land area of France is divided into 56 percent arable, 28 percent wooded and 8 percent natural areas.

Soil Issues
Land is being swallowed up for development purposes and is putting more pressure on soil quality.

Program Management
The Observatory is one component of the DINIOS organization, which is the National Inventory of Soil Observation. It is governed by the Ministry of the Environment, Ministry of Agriculture, French Environmental Institute and the National Institute of Agronomic Research.

Site Selection
The observatory is a network of sites approximately 1 ha wide which are distributed throughout France. They were chosen based on four criteria: soil type, land use, type and intensity of presumed changes in soil quality and the human context and land status. In 1999, eleven sites were operational and the goal of the program is to have 100 operational monitoring sites.

Monitoring Components
In 1993, it was planned to include the monitoring of biological properties, the assessment of pesticide effects, soil physical degradation, erosion and crop quality.

16. France: RENECOFOR
This is a long-term forest ecosystem monitoring system which is part of the Forest Health Network, a network of 863 plots in 34 European countries.

Site Description
Each sampling plot is two hectares in size and has one-half hectare fenced off in the middle.

Monitoring Components
This monitoring system evaluates many ecosystem components. Weather has been monitored weekly since 1992, through the use of automatic weather stations in 27 plots. Atmospheric deposition in open fields and under tree canopy is monitored in 27 plots and plant inventory is monitored on each plot by using 8 transects, each 100 m^2 in size. The program also measures foliar analysis on an annual basis and dendrometric inventories.

Soil Sampling Methods
Soil profile descriptions are made from two profiles per sampling plot. Soil samples are taken from 25 mini-trenches dug on each side of the one-half hectare paddock. Samples are obtained from three intervals: 0-10 cm, 10-20 cm, and 20-40 cm depths. Soil fertility is monitored every 10 years through intensive sampling of each plot. Soil solution is measured in 17 plots.

Funding
The monitoring system is funded by the European Union, French National Forest Office, Ministry of Agriculture and Fisheries, and the National Agency for Environment and Energy.

Personnel
The program is directed by the network coordination center which employees four staff members. Sampling is done by 188 monitors, 11 graduates and 17 diploma holding members. The laboratory analysis is contracted out.

17. Germany: Permanent Soil Monitoring Plots
Soil monitoring is aimed at the registration of long-term changes due to pollution and soil damage caused by erosion, compaction and other changes of physical properties. Monitoring is meant to obtain reliable information on the effects of environmental influence over longer periods. To obtain this reliable information, it is necessary to investigate representative areas according to specific criteria.

Objectives
The focus of this monitoring program is on the chemical status of soil and input and output estimates.

Data Trends
The data has shown that most changes occur in the organic layers of the soil. Two plots indicated increasing pH values and also had a decreasing content of humus. Al, Ca, K, Mg and Na increased significantly in the organic layer and topsoils in most plots.

18. Germany: Air Measuring Network
Objectives
The aim of this network is to investigate the current state and long-term changes of soil quality and the influence of air pollution on soil.

19. Great Britain: Country-Side Survey
Purpose
The aims of the survey across Great Britain include:

- estimate the extent and distribution of widespread habitats in Great Britain
- characterize widespread habitats in terms of land cover and botanical composition
- derive indicators of sustainable development for the wider countryside
- provide accessible databases containing information on the state of the British countryside
- provide ground reference data for the calibration and validation of "Land Cover Map 2000"

History
The survey has previously been carried out in 1978, 1984, 1990 and most recently 1998.

Monitoring Component
The survey measures ecosystem components other than soil. Vegetation is monitored on 16,718 plots, 405 freshwater biota samples are taken from 500 m stretches of water, bird populations, freshwater features, linear features, buildings, land use, and land cover are also monitored.

Soil Sampling Methods
A bulked topsoil sample is taken from five randomly selected squares within each one km^2 area. The sample squares are stratified by climate, topography and other stable attributes. More than 60 field surveyors working in teams of two to collect samples during the months of June to mid August.

Of the 1067 organic matter samples taken in 1998, 744 were from the same areas sampled during the 1978 survey. One thousand and seventy-one samples were taken for pH analysis of which 769 were from the same area as the 1978 survey.

Data Trends
The data indicate that there has been an increase in pH across Great Britain since 1978. Soil organic matter has increased slightly or has had no change over the last 20 years. A non-normal distribution of all heavy metal concentrations has also been noticed.

20, 21 and 22. Hungary: Information and Monitoring System of Soil Conservation (TIM)
Country Description
Agriculture is the main land use in Hungary. Eighty percent of the land area is cultivated while forests cover only 18 percent. Based on fertility, 90 percent of the total land area is suitable for agricultural use.

Soil Issues
Some of the factors affecting soil degradation in Hungary include soil acidification, erosion, salinization, marsh formation, desertification, soil infertility and toxicity.

Site Selection
TIM has three monitoring components: national basic monitoring system (program no. 20), forestry observation points (program no. 21), and special areas monitoring (program no. 22). The sites cover the entire country regardless of land use or ownership. The special areas component monitors "threatened areas" which refer to sensitive areas such as ameliorated soils, drinking water supply areas, watersheds of important water bodies, protected areas, pollution hotspots, military fields, surface mining areas and waste water disposal areas.

Monitoring Component
Along with the soil component, groundwater is also sampled and chemical composition is determined annually. The analyses include pH, electrical conductivity, CO^3, HCO^3, Cl, SO^4, NO^3, PO^4, Ca, Mg, Na, K, micronutrients and micropollutants.

Soil Sampling Methods
The sites are sampled from September 15 to October 5 each year.

23. Hungary: Soil Fertility Monitoring System
No additional information is available.

24. Hungary: Microelement Survey
No additional information is available.

25. Latvia: National Agricultural Land Monitoring Programme
Soil Issues
The major type of soil degradation is erosion due to the fact that the soils are sandy and landforms are mainly hilly moraines. Sixty-three percent of agricultural land has the potential for low pH values, while soil compaction and organic matter decline are also a concern.

Objective
The aim of the program is to make long term observations regarding anthropogenic impacts on agricultural land.

Program Design
This program has three levels of monitoring. Level 1 monitors soil at 12 research stations covering 20 soil types and texture groups. Level 2 is carried out on family farms which are representative of farming systems, soil and climatic conditions. The third level applies land use monitoring within 512 municipalities. It involves the observation of how land owners follow state and municipality rules and regulations regarding land use and conservation.

Data Trends
The program organizers have found that the producers don't properly fill out the agronomic data forms each year because they have no incentive to do so. It has also been difficult to compare the results from monitoring level 3 because there is no consistency in who performs the monitoring of land user activities at each location.

Funding
Agricultural soil monitoring has not received much support in Latvia due to the declining importance of agriculture in the Latvian economy. Meanwhile, the importance of environmental protection is increasing due to the European Union accession process.

26. Lithuania: National Environmental Monitoring Programme – Field Soil Monitoring
Country Description
Agricultural land covers 3.5 million hectares of Lithuania.

Objectives

- to register the positive and negative changes of soil cover and individual characteristics through a certain time
- to identify the regions and individual plots of agricultural land that are to reach negative nutrient balances due to poor management practices
- to establish the impact of various chemical means on the properties of soil
- to control the changes in soil acidity especially in areas where extensive mineral fertilization had been applied and in formerly acid but frequently limed lands
- to track the accumulation trends of pesticides and heavy metals

Soil Sampling Methods

Heavy metals and pesticides are sampled in 20 m by 20 m fixed plots. The accumulation of organic carbon humus and sulphur are analyzed from the humic layer of those fixed plots. The other soil parameters measured are taken from the cultivated layer of 3 to 3.5 ha plots.

Data Uses

The data collected illustrates the level of accumulation of the main agrochemical soil indicators, heavy metals and pesticides in the soil. There is national interest in the regularities of heavy metal distribution and changes over time, the detection of correlation between individual indicators and compilation of heavy metal distribution maps for the agricultural areas of Lithuania.

This program also provides information on the sensitivity of soil to anthropogenic loads, its migrational qualities and natural clean-up capacity and ultimately the possible impact of soil contamination on human health.

Funding

The main funding source for the National Environmental Monitoring Programme is the state budget. The soil monitoring budget for 1999 was 98,000 in Lithuanian currency, while the total ecosystem monitoring budget was 310,000 in Lithuanian currency. The funds are used for sampling, analysis of samples, calibration of testing equipment, systemization of collected data, and the assessment and preparation of reports and publications.

27. Lithuania: National Environmental Monitoring Programme – Forest Soil Monitoring

Objectives

- to track the amounts of heavy metals and biogenic substances in forest soil
- to register the positive and negative changes of soil cover and individual characteristics through a certain time
- to establish the relationship between the qualitative and quantitative changes in forest soils and air pollution

Soil Sampling Methods

Fieldwork for this monitoring program is carried out during the months of August and September.

A number of plots (74) from this portion of the National Environmental Monitoring Programme are used as part of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests.

Data Uses

Data collected is used for the identification of forest damage, to assess the background levels of heavy metal contamination, identify the pathways of heavy metal accumulation and migration, and assess the impact they have on forest ecosystems.

28. Lithuania: National Environmental Monitoring Programme- Integrated Monitoring of Agricultural Ecosystems

Objectives

- determine the balance of nutrients, accumulate data for hydrological, hydrochemical and biological models of agricultural ecosystems
- establish biological impact of changes in observed parameters on the agricultural ecosystem by combining observations of nutrient circulation with soil, vegetation and wildlife monitoring within the same basin

- assess the impact of agricultural activities on ecosystems by comparing the status of ecosystem components with that of relatively natural ecosystems to forecast the changes in ecosystem components

Soil Sampling Methods
Soil is sampled every two to three years, while heavy metals, pesticides and herbicides are sampled for every five years.

Data Uses
The data collected from this program is used for the establishment of nutrient balances and other environmental problems, such as the assessment of nutrient use by humans, the assessment of the impact of agricultural activities on the ecosystem and to forecast the changes in agroecosystem components.

29. Netherlands: National Soil Quality Monitoring Network
Country Description
The Netherlands has a land area of only 37,000 km^2. It is heavily industrialized, intensely cultivated and densely populated with over 400 people per square kilometer. As a result, anthropogenic management affects most land. The parent material is predominantly aeolian, fluvial and marine sediments and the topography is mostly flat.

Soil Issues
Approximately 64 percent of the land base is utilized by agriculture. Due to this fact, soil quality is a major concern. The focus of soil monitoring is on chemical pollution because salinization, erosion and other physical/chemical processes aren't a large concern in the Netherlands.

Objectives
A primary objective is to determine the actual quality and temporal trends of soil in the Netherlands and to gain insight into the relationship between deposition and transport to groundwater and its use in transport models. The main aim of the monitoring network is to relate the type of agricultural activity to eutrophication of the soil and determine which measures would be the best to reduce eutrophication and leaching of nitrates.

Site Selection
The network monitors both agricultural and forested sites. All sites chosen are on areas of known pollution loading. The agricultural sites range from dairy cattle farms in sandy regions, intensively managed cattle farms with high phosphate production, cattle farms on peaty soils and river clays to arable farms on sandy soils and sea clay. The cattle farm intensity is divided into intensive and extensive. The forested sites are deciduous, pine and mixed stands on sandy soil. Each sampling site has an area of approximately 400 m^2.

Soil Sampling Methods
The soil is sampled at two depths: 0-10 cm and 30-50 cm. Forty subsamples are taken at each depth and combined to create four composite samples from each site.

Data Trends
Monitoring has indicated that the heavy metal content of topsoils in both arable and cattle farms is below the target value. The heavy metal values in the second sampling depth are slightly lower than topsoil values. The target values for polycyclic aromatic hydrocarbons, organochlorine pesticides and atrazine were exceeded in both arable and cattle farming operations. An accumulation of heavy metals has been determined to continue in both farming practices.

30. Netherlands: Regional (Provincial) Soil Quality Monitoring Networks
Objectives
- to determine the trends in provincial soil quality in relation to the physical/geochemical characteristics (soil type and geohydrology) and land use
- to monitor soil quality in areas of special interest, such as nature reserves in order to recognize unwanted developments and take appropriate action

Site Selection
Sample sites were selected based on homogenous areas, represented by soil type, ground water tables and deposition of relevant elements. The representative areas could represent one contiguous area or small areas scattered all over the province. Sites were selected in agricultural and forested areas and other vulnerable or affected zones. The sample site size selected was approximately 10,000 m^2.

Monitoring Components
The networks are explicitly developed to monitor diffuse pollution in rural areas, namely contaminant spread, eutrophication and acidification. Contaminant spread (heavy metals and PAH) are monitored in the topsoil of all regions in a province. Eutrophication, in vulnerable or affected areas, is monitored through annual phreatic groundwater analysis in combination with phosphate monitoring in the unsaturated zone of the soil. Acidification is monitored by analyzing the ammonia/potassium ratio and aluminum/calcium ratio in the soil moisture from forested areas on sandy soil.

Soil Sampling Methods
Over 1600 samples are obtained for analysis from across 7 provinces in the Netherlands. Sampling density is determined by the variability of concentrations of the elements being monitored in each province. Forty subsamples of topsoil are taken and combined to create four subsamples.

Data Trends
The data collected suggest that the influence of agricultural land use on soil quality is clearly visible. Zinc and copper are notably higher on agricultural land than in forested soils, while pH is higher in agricultural soil than in natural areas. High loads of zinc and copper result from spreading manure on farmlands. Elements not related to agriculture such as nickel, lead and chromium show little differentiation between land use on the same homogenous area sampled. Soil type also contributes to differences in zinc concentrations, as sandy soils had lower concentrations than did clay or peat rich soils.

31. Netherlands: Soil Quality and Shallow Ground Water Monitoring
No additional information is available.

32. Norway: Agricultural Environmental Monitoring Programme
Country Description
Norway is a rural and mountainous country with only three percent of its total land area being arable. The Norwegian system has acknowledged the need for information beyond that collected by the agricultural census. This is because of the growing awareness of the multiple roles of the agricultural industry. Ecosystem monitoring programs have been the result. The Agriculture Ministry is focusing its efforts on "quality" for all Norwegian food production, assuring high yielding, contamination free products, produced in an environmentally sustainable way.

Soil Issues
Arable land area is being consumed by urbanization, therefore soil health is becoming a priority. Air and soil contamination by agriculture are a minor concern in Norway. While soil degradation by heavy metals is increasing, the most significant agricultural environmental issue is surface water pollution resulting from soil erosion and increased loss of nutrients due to high stocking rates.

Objectives
- to give the public administration the basis for implementing a cost effective environmental policy
- to document the result of environmental efforts within agriculture as compared to the Ministerial Convention of the North Sea
- to inform the agricultural sector about the environmental impact of agricultural practices and the result of environmental efforts

The program registers and reports on the extent of erosion and nutrient losses from different agricultural systems under various agro-climatic conditions. The information is related to farming practices, natural resources and climatic conditions.

Site Selection
The program monitors small agricultural catchments representing major cropping systems under varying soil and climatic conditions.

Monitoring Component
In addition to monitoring soil parameters, the program also measures water discharge. In 1995-1996, the program included the monitoring of pesticides and heavy metals.

33. Poland: National Program of Environmental Monitoring
Soil Issues
There are two major causes of soil degradation in Poland. The first being soil acidification from industrial emissions of gases and dusts and the second is soil erosion. Thirty-nine percent of soil is threatened by water erosion and 28 percent has the potential to be eroded by wind.

Site Selection
The earth surface monitoring component includes 227 sites established on mineral and organic soils. The sample sites are located on arable land (210 sites), grasslands (40 sites) and forested areas (50 sites). Forty percent of the sites are positioned in heavily polluted zones, 40 percent in low pollution zones and the remaining sites are in medium intensity pollution areas. The sites are situated across the entire country and include all major soil units.

Monitoring Components
The Environmental Monitoring Program includes the monitoring of seven ecosystem components. These include air pollution, surface ground water, underground water, earth surface (soil and plant monitoring), forest monitoring, radioactivity and finally, food and health.

Soil Sampling Methods
At each sample site, the soil profile is exposed to 150 cm. A morphological description of each profile is made and four samples are collected from each genetic horizon or from the arable layer. For arable and forested sites, samples are taken from the 0-20 cm depth within a 100 m^2 area. The protocol for the grassland sites calls for a 0-10 cm sampling depth. The sampling is replicated every five years, with a ten year interval for the forested sites.

34. Poland: Arable Soils Monitoring Program
Site Selection
The sampling sites are located in a variety of areas, from high industrialization to rural land use areas.

35. Poland: Programme for Forest Monitoring
Site Selection
The permanent observation plots are located in Scots pine, spruce, fir, oak, beech and birch forest stands. A portion of the plots are part of the UN-ECE Forest Monitoring Program.

Monitoring Components
The Forest Monitoring Programme examines damage to stands, chemism of trees assimilatory apparatus, health of pine seeds, pollutant deposition, entomological monitoring and phytopathological monitoring.

36. Republic of Estonia: Estonian Environmental Monitoring Program – Agricultural Landscape Monitoring Sub-programme
Country Description
Thirty percent of the land area of Estonia is used for agriculture and 44 percent is covered by forests. Before independence, the country was heavily industrialized with 1/5 of the population employed in the agricultural industry. The major environmental problems at the time were atmospheric and water pollution resulting from emissions, mining and fertilization. By 1998, the agricultural labour force had been decreased to six percent. With the decrease in agricultural production also came a decrease in the use of pesticides and fertilizers. With a slight

improvement in the environmental situation, the new issue became land abandonment.

Objectives

- follow up and evaluate the environmental effects of land and agricultural reforms
- define changes in land use structure in the different types of agricultural landscapes (intensive, extensive and marginal land use)
- to study changes in land cover types, especially fallow land and semi-natural areas
- to explain the connection between landscape structure indicators and the characteristics of ecological status of the agricultural landscapes

The main reason to monitor the landscapes of Estonia is to provide a comprehensive and adequate overview of the consequences of agricultural and land reforms and the influence of a decrease in pesticide and fertilizer use on soil organisms.

Site Selection

Sites are selected on the following criteria:

- distribution according to Estonian landscape regions
- must be distributed across the country
- situated in intensive, extensive and marginal land use areas
- additional data is available from the site
- have a good relation to other environmental monitoring sites

Soil Sampling Methods

Earthworms are collected from a 0.1 m^3 block of soil collected during September and October when the earthworms are at their greatest density, activity and lowest variability.

Soil Parameters

There is a large focus on soil biological parameters. In particular, the diversity of earthworms and microorganisms, the maximum dominance in earthworm communities, hydrolytic acidity of soil microorganisms, the number of colony forming microorganisms per gram of dry soil, plate counts of heterotrophic aerobic bacteria and the functional diversity of soil microbes.

37. Romania: National Integrated Soil Monitoring System

Country Description

Half of the land area of Romania is used for agricultural production. Sixty-seven percent is cultivated annually while only 37 percent of the agricultural land is deemed suitable and efficient for agriculture.

Soil Issues

Erosion is the largest problem facing arable land in Romania. Other soil degradation issues include acidification, water logging, salinization, compaction, pesticide and heavy metal pollution and low humus content. Soil quality degradation is mostly due to industrial emissions and animal waste.

System Design

The monitoring system is organized into two subsystems (agricultural and forest soils) and into three detailed levels. Level 1 plots are designed to identify problem areas and are located in a 16 km^2 grid. Level 2 is designed to identify the cause of the problems and Level 3 identifies the possible remedial actions.

38. Slovakia: Environmental Monitoring System

Country Description

In the year 2000, half of the land area of Slovakia was used by the agricultural industry. Forests covered 41 percent of the remaining area.

Soil Issues

Anthropogenic activity has intensified the effects of pollution over the past decades. This has threatened and destroyed many sensitive biological ecosystem components and has negatively impacted human health.

Objectives
Slovakia has attempted to gather objective and comparable ecological information through the Environment Monitoring System. It will contribute to more effective decision-making, environmental improvement and the preservation of sustainable growth.

The aim of the soil portion of the monitoring system is to monitor soil contamination and soil properties which are important to soil fertility and other environmental functions. The essential activity of soil monitoring is to monitor changes in the most important soil properties and monitor their stability.

Site Selection
Agricultural, forested and highland areas are monitored, while urbanized areas are avoided.
Twenty-one key sites are monitored yearly in addition to 19,257 agricultural plots which are part of a survey to measure the total area of soil contamination.

Monitoring Components
The Environmental Monitoring System monitors various ecosystem components including: air, water, soil, biota, forests, geological factors, radiation, waste, settlement, land use, allochtonous substances in foodstuffs and fodder, population load, meteorology and climatology.

Soil Sampling Methods
Forest soils are sampled from 0-10 cm, 20-30 cm, 35-45 cm and the soil parent material. Agricultural soils are only sampled from 10-30 cm and one to five subsamples are mixed together to form the sample from each plot.

Data Trends
Observations were made based on the 2000 sampling period. Only 1.4 percent of the monitored soil is contaminated and 0.4 percent is heavily contaminated. The heavily contaminated soil was located mainly in mountainous areas with the occurrence of geochemical anomalies. No changes were found in heavy metal content since the 1993 sampling. Heavy metal values don't exceed the limits of natural spatial heterogeneity and the content of agricultural lands is significantly below the valid sanitary limits. The content of polycyclic aromatic carbohydrates (PAU) in agricultural soils is below background limits. A significant amount of agricultural soils (457,000 ha) are potentially endangered by compaction while 191,000 ha are already compacted. Water erosion presents a problem, while wind erosion isn't a concern; the lowest intensity of erosion is under permanent grasslands.

39. Slovakia: Soil Monitoring System
Data Trends
Results have shown that the lowest amount of soil organic carbon was found in luvisols, planosols and regosols. A medium content of humus was detected in chernozems and phaeozems.

40. Sweden: National Swedish Environmental Monitoring Programme- Integrated Monitoring
Objectives
- describe the state of the environment
- assess the possible threats to the environment
- provide a basis for analysis of the national and international environmental impact of various pollution sources
- provide the basis for actions
- follow up measures that have already been implemented

Environmental monitoring activities are to focus on following national environmental quality objectives, provide state of the environment information and trace the effects of situations, which are of significance for ecologically sustainable development. Sweden has monitoring on both a national and regional basis, which is designed to meet the needs of society to carry out effective, measure oriented environmental protection work.

Site Selection
Sites were selected based on the following criteria:

- area not affected by local environmental disturbances or direct human influence
- vegetation in the drainage area should have reached the late stage of succession
- geographical and geological factors characterizing the drainage areas should be representative of those in the surrounding watershed
- sites should not be located in brooks or lakes in order to increase the range of environmental factors accessible for monitoring

The watersheds selected for the program were located in National parks or nature reserves to increase the protection of the site

By 1987, most of the sites became part of the UN-ECE Integrated Monitoring Programme. In 1993, the 15 remaining sites were reduced to 4, with 3 of those being new sites.

Monitoring Components
There are ten individual ecosystems monitored by the Swedish Environmental Monitoring Programme. These are: air, coast and sea, fresh water, wetlands, toxic substances coordination, mountain areas, forest, agricultural land, health related environmental monitoring and landscape.

Budget
The total budget in 2001 was 109 million SEK. Of that total, 73.5 million was allocated for national monitoring, 17.9 million for regional monitoring and 1.5 million for international monitoring.

Within the Swedish Environmental Protection Agency there is an environmental monitoring council consisting of 10 members and a chairperson. This council decides on the focus of national environmental monitoring and allocates funds to national and regional monitoring activities.

41. Sweden: National Swedish Environmental Monitoring Programme - National Survey of Forest Soils and Vegetation
This survey is part of the National Swedish Environmental Monitoring Programme – Forest Programme area. The survey began in 1983 and the second re-sampling period was between 1993 and 2002, with one tenth of the sites being sampled each year.

Monitoring Components
The vegetation-monitoring component focuses on timber production but also monitors vegetation understory and includes an inventory of pendulous lichens and algal growth on spruce needles.

Sampling Design
The survey uses circular plots seven to 10 m in radius which are arranged in a square tract having sides from 300 to 1800 m long. The tracts are systematically distributed across the entire country and the size of the tract varies between different parts of the country.

Personnel
The survey employs 50 field workers during the period of May to October. Field crews consist of two to three people, one whom is trained in the collection of data for the National Survey of Forest Soils and Vegetation. When sampling is complete, approximately 20 employees are responsible for preparatory work, finishing work and presentation of the collected data.

Information Dissemination
Some of the collected data is presented in an annual publication called Skogsdata. A new system called Markinfo is being developed which will be a system for presenting the results from this survey.

42. Sweden: National Swedish Environmental Monitoring Programme – Agricultural Land Programme Area

Objective

The aim of the survey of agricultural land is to quantify concentrations of transported nutrients and pesticides in surface and groundwater whose catchment areas are dominated by agriculture.

43. Switzerland: Swiss Soil Monitoring Network

Soil Issues

The soil in Switzerland is slowly being degraded. A large contributor is anthropogenic soil contamination stemming from industry. Permanent monitoring of soil contamination is therefore necessary for political decision making to prevent further degradation.

Objectives

The mandate of the Swiss Soil Monitoring Network is to collect data on contamination in space and time and to evaluate it in relation to monitoring the success of soil conservation measures.

Site Selection

The sites were chosen to reflect typical vegetation, land use, land management, air quality and soil conditions.

Soil Sampling Methods

Samples are taken using a steel gauge auger with an inside diameter of 3 cm. In the sampling of 2000, soil physical and biological parameters were added to the list of properties measured.

44. New Zealand: 500 Soils Project

Country Description

Two-thirds of the land area of New Zealand is hilly or mountainous terrain. The rock is geologically young and is easily eroded.

Soil Issues

Most of the soils in New Zealand are thin and of low nutrient status in their natural state. Generally, they are in good biological and physical condition and are suitable for native vegetation adapted to low nutrient conditions.

Soil quality issues include structural decline, nutrient issues, soil organic matter depletion, biological activity concerns and soil acidification.

Objectives

The project provided a national baseline of soil data, which environmental staff can now use to measure soil quality trends in the future.

Site Selection

In total, 511 sites under various land uses such as indigenous forest, plantation forest, tussock, pasture, scrub, horticulture/crop and urban areas were measured for soil quality parameters. The sites selected for the project represented the prominent land uses in each region of the country.

Soil Sampling Methods

A transect method was used to sample soil at each site. At 2 m intervals along a 50 m transect, soil cores of 2.5 cm diameter were taken to a depth of 10 cm. This resulted in 25 samples, which were bulked prior to chemical and biochemical analysis.

Three undisturbed samples were taken from each plot, along the transect at 15, 30 and 45 m positions. These were collected by pressing 75 cm^3 steel liners into the topsoil. Sub samples of the resulting cores were used for particle size analysis, bulk density measurement and moisture release. Samples for aggregate stability determination were taken from the same positions as the cores. A 1000 cm^3 block of soil was cut away and bagged for analysis. The samples were then stored at 5 °C.

45. United Nations Economic Commission for Europe (UN-ECE): International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems (ICP-IM)

Integrated monitoring of ecosystems involves measuring physical, chemical and biological properties of various ecosystem compartments at the same location over time.

Program History

This was a pilot program from 1989 to 1991 and became a permanent monitoring program in 1993. It is part of the effects monitoring strategy under the Long-Range Transboundary Air Pollution Convention of the UN-ECE. The international ICP-IM Programme Centre is located in the Finnish Environment Institute. The program center collects, stores, processes and analyses the data and is responsible for the cooperation among the ICP's and other related programs. Each "national focal point" or national agency overseeing the data collection, is responsible for the quality of data reported to the ICP-IM Programme Centre.

Program Participants

Presently, there are 20 countries participating in the program. The countries are: Austria, Belarus, Canada, Czech Republic, Denmark, Estonia, Finland, Germany, Iceland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, and the United Kingdom.

Objectives

The main objective of the program is to observe and predict the state of and possible medium and long-term changes in natural ecosystems caused by transboundary air pollution. Other objectives include:

- to monitor the biological, physical and chemical status of ecosystems over time to explain changes
- to develop and validate models simulating ecosystem response
- to carry out bio-monitoring to assess the effects of pollutants and climate change. Emphasis is placed on the fluxes and effects on ecosystems of acidifying sulphur and nitrogen compounds and also ozone and heavy metals

The main aim of the program is to establish a consistent time series for environmental variables rather than establishing representative surveys across the UN-ECE region.

These objectives are met by:

- monitoring both biogeochemical trends and biological responses in small (10 -1000 ha) and clearly defined areas
- seeking to separate noise of natural variation, including succession from the signal of anthropogenic disturbance, by monitoring natural and semi-natural ecosystems
- developing and applying tools for regional assessment and prediction of long-term effects

Site Selection

The ICP-IM sites are located in catchments/plots within natural or semi-natural areas. The ideal site is between ten and 1000 ha in size and has no ongoing management activities. It should be typical of the region and the closest significant pollution source should be 50 km away.

Components Monitored

Various ecosystem components are monitored within this program. These sub-programs include:

- inventory of birds and small rodents: 3-5 years
- inventory of plants: 5-20 years
- climate: daily
- meteorology
- air chemistry: daily/weekly
- precipitation chemistry: weekly/monthly
- moss chemistry: 5 years
- throughfall: weekly/monthly
- stemflow: weekly/monthly
- soil chemistry: 5 years
- soil water chemistry: monthly
- ground water chemistry: 2-6 months

- lake water chemistry: 2-6 months
- runoff water chemistry: daily/weekly/monthly
- foliage chemistry: 1 year
- litterfall chemistry: 1 year
- microbial decomposition and soil respiration: 1 year
- forest damage: 1 year
- vegetation subprograms: 1-5 years
- hydrobiology of streams and lakes: 6 months
- trunk epiphytes: 1-5 years
- aerial green algae: 1-5 years
- forest stand inventory: 5 years
- plant cover inventory: 5 years

Soil Sampling Methods
The sampling procedure at each plot should be systematic, cover the whole soil plot and include an adequate number of subsamples to give sufficient precision so changes over time can be detected. A manual describing the protocols for each parameter is applied throughout the program and was revised in 1999. The following soil chemistry sub-program protocols are outlined in the manual. In order to minimize soil disturbance, a soil auger is used to take the samples. A set of undisturbed soil samples used for bulk density determination are taken from a soil pit dug outside of the plot. The humus layer is sampled separately and only includes the Of and Oh organic layers and not the green and Ol material. The mineral soil is sampled from fixed depths of 0-5 cm, 5-10 cm, 10-20 cm, 20-40 cm and 40-80 cm. Peat soil samples are sampled from 0-5 cm, 5-20 cm and 20-40 cm depths. The sub samples taken from a plot are mixed into one composite sample. They are kept at 4°C in dark conditions until they are pretreated by drying at 40°C and then sieved through a 2 mm mesh. The soil component is sampled every five years during the months of August and September.

46 AND 47. UN-ECE International Cooperative Programme on the Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests): Level I and II
Program History
The program was established by the United Nations Economic Commission for Europe (UN-ECE) under its Convention on Long-range Transboundary Air Pollution (CLRTAP).

Participants
There are 38 countries participating including: Albania, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, Canada, Austria, Belarus, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Ukraine, United Kingdom, Cyprus, Liechtenstein, Luxembourg, Republic of Moldova, Russian Federation, Switzerland, Turkey and Yugoslavia.

Objectives
- provide periodic overview on the spatial and temporal variation in forest condition, in relation to anthropogenic and rural stress factors on a European and national, large scale systematic network
- contribute to a better understanding of the relationships between the condition of forest ecosystems and anthropogenic and natural stress factors, through intensive monitoring on a number of selected permanent observation plots spread over Europe
- provide a deeper insight into interactions between various forest ecosystem components
- provide policy makers and general public with relevant information

Program Structure
ICP Forests is divided into two levels. The first level monitors forest condition on a representative, systematic grid net throughout Europe. Level II involves intensive ecosystem monitoring on permanent plots.

Monitoring Components

Level I

Level I involves large-scale forest condition monitoring. Crown condition is monitored annually, while foliar condition and soil chemistry have only been monitored once since the program inception.

Level II

Level II is an intensive monitoring scheme in which more than 860 permanent plots are used to investigate key factors and processes at the ecosystem scale. Ecosystem components measured include: crown condition (annually), soil (10 years), soil solution (continuous), foliage (2 years), deposition (continuous), ambient air quality (continuous), meteorology (continuous), forest growth (5 years), ground vegetation (5 years), phenology (many times per year) and remote sensing (initial).

Soil Sampling Methods

Soil sampling is completed in the same manner for both levels of the program. Before sampling begins, the litter layer of the sample site is removed and the O horizon is sampled separately from the mineral horizons. The samples are taken either by fixed depth or from each genetic horizon. When the horizon method is used, one composite sample is taken per horizon. Macroscopic roots and stony material (>2 mm) in size must be removed. The sample is dried at temperatures lower than 40 °C and is ground immediately before analysis.

48. United Kingdom: Environmental Change Network (ECN)

The ECN gathers information about the pressures on and responses to environmental change in physical, chemical and biological systems. The soil monitoring component of the network has the main objective to characterize and quantify physical, chemical and mineralogical properties of soils and identify and quantify any changes.

Objectives

- provide a network of sites from which to obtain comparable long-term datasets
- integrate and analyze the data in order to define possible environmental change and improve the understanding of such change
- use the data for modeling and prediction of future change
- provide a range of sites with good instrumentation and reliable information for research purposes

Site Distribution

The ECN has sites located across the United Kingdom. There are 7 sites situated in England, 3 sites in Scotland, and 1 site in each of Wales and Northern Ireland.

Monitoring Components

Along with soil sampling, the network also monitors vegetation, vertebrates (birds, bats and rabbits), invertebrates (moths, butterflies, spittle bugs, beetles), surface water, atmospheric chemistry and precipitation chemistry.

Soil Sampling Methods

Each sample site in the ECN is 8 ha in area. Within each site, the central 1 ha is used for soil sampling. The sampling is done on two grid sizes, 50 m and 25 m within the 1 ha area. Within the 25 m grid, the actual sampling is performed in 6 of the blocks; four samples taken from the edges and two from the center. Different blocks within the grid are sampled for the five and 20 year sampling periods and each block is sampled only once.

Soil samples are taken by horizon and fixed depth. One set of samples is obtained from 0-5 cm, 5-10 cm, 10-20 cm, and 20-30 cm, totaling 16 samples, which are then bulked. A second set of samples are taken from each horizon up to a 30 cm depth, for a total of 16 samples which are bulked to form one sample. Samples are kept at 4-6 °C and in the dark prior to processing. The samples are then air dried and sieved to 2 mm and once the analyses are performed, each sample is archived.

49. Terrestrial Ecosystem Monitoring Sites (TEMS)

TEMS is a database, which registers terrestrial sites, and relevant networks that carry out long-term terrestrial monitoring and research. Currently the network measures 114 variables and includes sites from approximately 120 countries.

Purpose
The purposes for development of TEMS are:

- to develop modeling, assessment and research programs
- to assess the gaps in geographic coverage of key variables
- to link ground and satellite observations
- to evaluate the quality of data and measurement methods
- to identify terrestrial sites that need upgrading

Site Criteria
There are several criteria that sites must meet to be included in the TEMS database. First, the sites must be relevant to one of the five key priorities set out by the Global Terrestrial Observation Sites. These five criteria are:

- changes in land quality
- availability of fresh water resources
- loss of biodiversity
- climate change
- impacts of pollution and toxicity

Secondly, the sites must be actively gathering data, demonstrate international interest in collaboration and lastly, have a reasonable history of observation and security of long-term funding.

50. International Long-Term Ecological Research Network (ILTER)
ILTER is an international network of long-term ecological research programs. As of January, 2003, 25 countries had established formal, national, long-term ecological research programs.
Member countries include: Australia, Brazil, Canada, China, China-Taipei, Costa Rica, Columbia, Czech Republic, France, Hungary, Israel, Korea, Mexico, Mongolia, Namibia, Poland, Slovakia, South Africa, Switzerland, Ukraine, United Kingdom, United States, Uruguay, Venezuela and Zambia.

51. Pan-European: Networking of Long-Term Integrated Monitoring in Terrestrial Ecosystems (NOLIMITS)
No additional information is available.

52. Europe: Proposed European Soil monitoring Network (EUROSoilNet)
Soil Issues
The major soil issues concerning Europe are climate change, pollution, urban development, desertification, erosion, salinization and acidification.

The proposed European soil monitoring network will be based on a nested sampling design with three levels:
Level 1
Level 1 is based on a 16 km by 16 km grid system. It will target decline in organic matter, diffuse soil contamination and loss of soil biodiversity. It will be managed by the member states who will have a degree of flexibility to meet their national interests and international commitments with respect to soil monitoring.

Level 2
These will be benchmark sites selected from the Level 1 sites. The national institutions overseeing Level 1 and the European coordinating organization will select these. Soil sampling will be performed by the member states while the soil analyses and sample archiving will be performed at the central European level.

Level 2 sites will gather information on soil physical degradation such as compaction, soil structure, aggregate stability, slaking, infiltration, soil salinization and local soil contamination. Monitoring at these benchmark sites will include all parameters monitored at Level 1 sites and additional parameters, which indicate physical degradation, salinization and soil contamination. Soil pollution parameters monitored will specifically include monitoring of nonyl-phenol and nonylphenol-ethoxylates, which are nonionic surfactants commonly found in sewage sludge and linear alkylbenzene sulfonates which is an anionic surfactant. A measure of microbial activity will include respiration rate monitoring.

Level 3

These will be specialized sites, which monitor for soil erosion, urban and rural soil sealing and hydrogeological risks. The sites monitoring soil erosion and hydrogeological risks will be situated in small catchments representative of climatic and landscape conditions, jointly selected by the two organization levels.

EuroSoilNet will impose mandatory use of GPS, aerial photography and site specific reference points to ensure accurate repeated sampling. The network will also allow existing National soil monitoring systems to be fully integrated and reporting will be done at the lowest possible level (municipal) in order to ensure a strong involvement by local communities which may result in a strong local commitment to soil protection.