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Subsidiary Body for Scientific and Technological Advice
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ACTIVITIES IMPLEMENTED JOINTLY UNDER THE PILOT PHASE

Views from Parties on a framework for reporting

Note by the secretariat

1. The Conference of the Parties, at its first session, by its decision 5/CP.1, paragraph 2, decided that a framework for reporting on activities implemented jointly under the pilot phase should be developed by the Subsidiary Body for Scientific and Technological Advice (SBSTA) in coordination with the Subsidiary Body for Implementation (SBI). The Bureau of the Conference of the Parties, at a meeting on 19 June 1995, considered that the contribution of views by Parties in writing would help to advance work on the establishment of such a framework.

2. Inputs from Parties are intended as contributions to substantive consideration of this subject at the second sessions of the SBSTA and the SBI.

3. The Executive Secretary, in his communication of 23 June 1995 to the permanent missions, advised Parties that the deadline for submission was set for 8 September 1995, although any contributions received by the secretariat before 4 August 1995 would be made available for information at the sessions of the subsidiary bodies that month.

4. The interim secretariat has received one submission from Norway and two from the Netherlands. These submissions are attached, and, in accordance with the procedure for miscellaneous documents, are reproduced in the language in which they were received and without formal editing. Any further submissions will be issued in an addendum to this note.

FCCC/SBSTA/1995/Misc.1

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RESPONSE STRATEGIES OF THE DUTCH ELECTRICITY GENERATING COMPANIES TOWARDS GLOBAL WARMING

1. Introduction

Under the UN Framework Convention on Climate Change Annex 1 Parties are committed to adopt national policies and take corresponding measures to mitigate climate change. In order to reduce emissions of greenhouse gases a combination of policies is applied. These include voluntary agreements, standards and regulations, fiscal and financial incentives, information, research and development. The policies lead to inter alia improved power production technology, industrial co-generation and district heating, energy saving, traffic measures and waste prevention. Annex I Parties are to report on the implementation of these policies and measures in their National Communications.

The Netherlands submitted its National Communication to the Conference of the Parties through the interim secretariat on 20 September 1994. In this communication the Netherlands emphasized the importance of a pilot phase for Joint Implementation (JI) on the basis of preliminary criteria to be established by CoP-1. Furthermore, it announced that it would subsequently develop a programme of pilot projects (PPP) in order to gain experience with JI.

At INC X Parties were invited to report on early experiences with respect to Joint Implementation. This communication is the Netherlands' Government's first report on early experiences, namely on the carbon sequestration activities of the Dutch Electricity Generating Board (Sep) through the Face foundation (Forests Absorbing Carbon dioxide Emission). The Face foundation was set up by the board in 1990 to encourage the planting of new forests to compensate CO_2 emission from a coal-fired power plant. The Face projects will be part of the Netherlands PPP.

In this report information is provided on Face projects in the Czech Republic and Ecuador. Submitting this report on these early experiences is supported by the Governments of these countries.

The Face projects are part of a broad approach by Sep to help mitigate climate change. It is shown that Sep invests at home in a wide range of measures specially focused on high efficiency combined cycle power generation, industrial cogeneration and district heating. Special attention is paid to the scope for integrating energy planning and spatial planning. This requires close cooperation with local authorities and energy distribution companies.

Face projects are established under several important criteria:

- supplementarity: the afforestation projects must lead to extra forest being planted in addition to the existing plans for afforestation;
- cost effectiveness: planting the forest, in the most efficient way in accordance with the foundation's quality standards;
- sustainability: preserving the forest systems for as long as possible; statutory provisions enabling Face to monitor implementation; the specific terms of a project must be settled in a contract between Face and the local contract partner; the Government of the host country has to endorse the project by means of a Memorandum of Understanding;
- the afforestation projects must be broadly accepted by society, i.e. fit in and/or be derived from national and regional policy, fulfil an economic function in the region and contribute to the socio-economic position of the local population.

The Face criteria are summarized in section 6 of this report. In the view of the Netherlands' Government these criteria provide a useful input for a CoP decision on criteria for a pilot phase.

In return for co-financing Face acquires the CO_2 sequestration capacity of the projects. This is laid down in a contract between Face and a local partner. In the view of the Netherlands' Government contractual arrangements are a requirement for JI-projects. Nevertheless, (fully in line with EU and the Netherlands' position at INC IX and X) it has been clearly stated that under the Convention these investments by the Face foundation will not be internationally credited against present Netherlands' commitments until 2000.
The Netherlands' Government is negotiating a voluntary agreement with the Sep with regard to CO_2 reduction measures for the period until 2010. The Face afforestation projects are included in these negotiations

2. Netherlands' Government policy for reducing CO_2 emissions

In the first National Environmental Policy Plan the Netherlands' Government formulated its strategy for environmental policy in the medium term (1990-1994) against the background of the need to pursue sustainable development. Much attention was paid to the theme of climate change. The Netherlands' Government pursues the international recognition of the greenhouse problem, the establishment of objectives for reducing CO_2 emissions, and preparation and stimulation of structural measures which may reduce CO_2 emissions. It has committed itself to achieve a 3%-5% of CO_2 reduction by 2000 compared to 1990. Further information on the Netherlands' climate change policy can be found in the National Communication of the Netherlands which was submitted to the interim INC secretariat on 20 September 1994.

3. Strategies of the Netherlands' electricity industry

Each sector is expected to help achieve the Netherlands' CO_2 target. The electricity production sector, presently responsible for roughly 20 % of the Netherlands' CO_2 emissions, has always taken a broader view of the problem of global warming. According to Sep, solutions should not be confined to the traditional domain of electricity supply and demand, but be extended to the energy infrastructure in general, including the industrial and residential heat market and the transportation sector. Sep is of the opinion that an integrated approach can realise higher energy savings and greater emission reductions at lower overall costs. As far as the demand side is concerned, Sep endorses the activities of the electricity distribution companies to reduce the electricity demand by increasing end-use efficiency. To this end Sep has initiated the establishment of a national database, known as NEEDIS to monitor the electricity end-use efficiency of a wide variety of appliances.

This section focuses on the response strategy of the Netherlands' Electricity Generating Board towards global warming. The various CO_2 emission reduction measures that are currently underway in the Netherlands' electricity production sector are described.

3.1. Improving power production technology

On the supply side the improvement of thermal power plant efficiency has been an ongoing activity of the electricity production sector for many decades. Changing the technology (e.g. from grid firing to pulverized coal firing), the capacity of the installations and the main steam conditions has essentially transformed the industry. Together with other measures, such as the reduction of excess air, flue gas temperature and condenser vacuum, this has improved conversion efficiency. In this way the average conversion efficiency was increased from 25% in the mid-1950s to 30% in 1960, 37% in 1970 and 40% in 1980.
In addition to conventional units with a topping gas turbine, STAG plants have been built. The latest STAG plants achieve a performance of about 52%. These figures show that gas turbine technology has improved considerably in a relatively short time. With further improvement of gas turbine technology, gas turbine exhaust temperatures will increase so that steam with high pressure and temperature can be generated and a three-pressure steam system can be applied with reheat. This is the core of the ambitious Eemsproject, in which 5 STAG units of 335 MWe each will be built, using gas turbines of the 200 MW class. The total efficiency of the combined cycle is expected to be 55%. Moreover a coal gasification combined cycle plant of 250 Mwe has been built to demonstrate the integration of coal gasification and electricity generation. This unit came into operation at the Buggenum power station in 1994. If its performance meets expectations, an Integrated Coal Gasification Combined Cycle-unit of 600 MW will be commissioned in the next century. Expected conversion efficiencies are 43% for the demonstration project and 48% for the commercial plant.

3.2 Industrial cogeneration and district heating

A more fundamental step on the supply side was taken in 1989 with the presentation of Sep's annual business report in which it announced that waste heat utilisation would be an integral part of future electricity expansion plans. This announcement was the result of a thorough reflection on the future role of the electricity sector in the energy infrastructure. A greater contribution to total emission reduction implied a fundamental change in the industry's activities. Sep would have to enter the industrial and residential heat markets. The challenge for the future is to find economically sound infrastructural solutions that serve power and heat requirements in a way that maximises both energy conservation and emission reduction.

The energy saving potential in the heat market is immense, not only in terms of thermodynamics, but also because primary energy use for space heating amounts to a quarter or a third of total energy use in industrialized countries. In the Netherlands about 50 % of annual primary energy consumption (some 1200 PJ) is used for the generation of process steam in the industry and warm water for space heating applications. In the process industry, high temperature steam is already partly generated in cogeneration plants but there is a substantial potential for additional cogeneration capacity. In the residential and commercial sector the gasfired boiler is still the predominant technology. Here district heating can play an important role in reducing emissions. This implies however that ingrained habits and practices with regard to space heating and regional planning will have to be replaced by new priorities.
Against this background Sep took the initiative to stimulate large-scale district heating in the Netherlands. In its 1990 expansion plan it was proposed that five new 250 Mwe combined cycle plants for district heating be commissioned by 1998. In the 1992 expansion plan decisions on five additional CHP plants were taken. These highly efficient plants (with electrical efficiencies of over 50% and an overall thermal efficiency of 85% in cogeneration) will be built on existing or new production sites which are good locations for medium-load power plants in the grid and close enough to process industries or other high heat density areas to keep the cost of transport and distribution within acceptable limits.

3.3. Integrating energy planning and spatial planning

A new infra-structural approach towards space heating based on proven technologies such as waste heat utilisation, CHP and heat pumps, offers excellent opportunities for reducing CO_2 emissions. However it requires careful planning and a coherent marketing strategy because of the financial risks associated with the necessary heat transport and distribution system. To explore the feasibility of integrated energy networks Sep and the Cooperating District Heating Companies have developed a heat demand database. The purpose of this project is to develop a planning instrument by means of which both numerical and geographical projections of future heat demand in the Netherlands can be made. This instrument will be used to find suitable locations for additional cogeneration plants.

By their nature cogeneration plants form a bridge between the national electricity supply system (the grid) and, typically local, heat supply systems. For this reason it is crucial that decisions on such plants and the associated infrastructure are supported by all the parties involved, not only the production and distribution companies but also provincial and municipal authorities responsible for regional and urban planning. The infrastructure associated with cogeneration and district heating requires that the pros and cons of different energy supply options be evaluated at an early stage of the planning process. Together with local authorities and delegates from the Ministry of Economic Affairs and the Ministry of Housing, Spatial Planning and Environment, Sep has launched a pilot project that aims to explore the scope for integrating energy planning and physical planning in the region around the cities of Arnhem and Nijmegen. The integral approach towards energy supply and demand that is currently being explored in this pilot project will ensure that long term costs are minimized and that ecological benefits are maximized and lasting.

3.4. Afforestation

While there are many technologies that can be applied to recover, utilize, store or dispose of CO_2, only nature can do so in an environmentally friendly way without any impact on energy conversion efficiency in technical installations. To explore this path, Sep set up the Face Foundation in november 1990. Face aims to encourage the planting of forests to sequester CO_2 from the atmosphere. The objective of Face is to absorb an amount of carbon dioxide equal to that emitted by a 600 MW modern coal-fired power station. This is estimated at 3 Mton yearly. Calculated on the basis of a 25 year life-cycle, the amount of forests needed was estimated at 150,000 ha.

Thus Face, which is funded by its originator Sep, aims to finance the planting of this area of forests worldwide in the next 25 years, with tropical areas given priority. In seeking suitable sites for forests, Face in principle makes no distinction between countries. The sites chosen are such that ecological conditions are favourable and adequate space is available for large scale afforestation. An other criterion is the social acceptance of the projects at the sites as well as cost effectiveness. In stimulating and supporting afforestation, Face strives for maximum cost-efficiency and a good profitability for the owners of projects. In addition, in implementing its plans Face seeks association where possible with existing local afforestation projects or forestry organizations. Local residents will be involved as far as possible in planting and managing the forests.

Current plans foresee the realisation of 125,000 ha in the tropics, and 20,000 ha in Central Europe, where environmental problems are grave. Another 5,000 ha will be planted in the Netherlands. At present Face is co-financing projects in Malaysia, the Czech Republic, Ecuador, Uganda and the Netherlands. A project in Bhutan is under preparation. If all these projects are fully completed, the total area of newly-planted forests will amount to 186,000 ha.

In the following sections, the activities of the Face foundation will be described in more detail.

4. The Face Foundation

Green plants use CO_2 from the air and sequester this as carbon during their life-cycle. Because they are so big and long-lived, trees absorb relatively large amounts of CO_2 which they sequester for a long period. This is why Face aims to establish and preserve forests.

Given Sep's objectives, it is essential to take up as much CO_2 from the air as possible and to sequester it for as long as possible. The net CO_2 sequestration by preserving existing natural forest reserves is very small. Face endorses therefore the planting of new forests. Face's remit, as laid down in its statutes, is:

> ...to bring about afforestation in areas where this is desirable - wherever these may be - with appropriate forest and timber species, for the least possible costs and under socially acceptable conditions, to compensate wholly or partly for the

carbon dioxide emission from power stations in the Netherlands.

Three points of departure have been formulated for the selection of projects. They are:
- supplementarity
- cost effectiveness
- sustainability.

4.1. Supplementarity

To realize Sep's aim, the afforestation must be additional. Only then can CO_2 sequestration as a result of the project balance CO_2 emission. Face selects therefore only those projects which would not have taken place without Face funding. Face funding is intended to sequester CO_2 in new forests. The forest and its products - including the timber - are the property of the forest owner.

4.2. Cost effectiveness

Face partially funds the planting of forests and their maintenance for the first three years thereafter. It thereby pays for the CO_2 sequestration that the planted forest achieves during its long growing period. In terms of business economics, this means that the forest owner receives partial funding for the investment in the forest enterprise. In many cases it is impossible to make a profit without this co-funding, because it takes a long time for investment in a forest enterprise to yield returns, and often these do not balance the interest that has been paid.

The contribution of Face to the investment costs per hectare can be calculated as a price per ton of sequestered CO_2 at the end of the cycle. It goes without saying that Face aims for a price that is compatible with the Foundation's quality standards. This forces those responsible for planting the forest to work in the most efficient way possible. It is a market situation with common interests: the owner wants to switch to afforestation, thereby also serving Face's interests, but the agreement will only be reached if the agreed price is mutually beneficial.

The speed at which CO_2 is sequestered in a forest is a derived criterion associated with cost effectiveness. Face stipulates that during the cycle the planted forests must sequester a minimum of 5,500 Kg CO_2 per hectare per year.

4.3. Sustainability

Face is interested in preserving forests for as long as possible. In legal terms this is translated into a contract period of 99 years. Ecological, economic and socio-economic preconditions must be satisfied in order to guarantee that a forest will be preserved for such a long period.

4.3.1. Ecological preconditions

In general, Face stipulates that forest systems are to be developed that can be managed by methods based on the natural processes of development. This implies, for example, mainly using indigenous species for afforestation, and not artificially interfering with the growing site's original potential.

Face acknowledges that there are situations in which the ecological starting situation is such that only pioneer species can be used during the first afforestation. For reasons of business economics at least one cycle of non-indigenous tree species may then be unavoidable.

4.3.2. Economic preconditions

Face's interest in the preservation of forest will hardly ever be a sufficiently strong motive for the forest owner to pursue the same aim. Economic interest is a stronger motive and hence a better guarantee for preservation. Therefore, Face stipulates that the forest owner must have a clear economic interest in the long-term preservation of the forest. This economic interest may be macro-economic, or it may be related to business economics or social economics. Examples include: nature conservation or ensuring water supplies for an area, or both; guaranteeing the supply of raw materials to a large wood-processing factory; supplying fuel wood.

4.3.3. Socio-economic preconditions

The socio-economic context of an afforestation project in a region also determines the preservation of a forest. Face therefore also uses fairly strict criteria when identifying and approving projects. Important aspects of this are that the projects must form part of an operational national and primarily regional policy that is also focused on integrated regional development. The afforestation activities and the subsequent forest management must benefit local employment and boost the family income of the local population. It is very important that large-scale afforestation activities do not compete with existing small-scale types of land use practised by local people. If possible, any such future competition must be avoided, or be extremely unlikely (for example, because of a naturally infertile soil and/or poor accessibility).

5. The approach of Face

On the basis of its remit, Face has selected a limited number of project partners abroad who are able to plant at least 1,000 ha forest per year over a longer period and who are able and willing to maintain this forest for a period of 99 years (the duration of the Face contracts). In terms of cost effectiveness, not only do the costs of sequestering CO_2 in the tropics appear to be relatively low, but also large areas need to be afforested. A substantial part of the new forests (125,000 ha) will therefore be planted in these areas. In Central and Eastern Europe large-scale deforestation in the recent past and the dying of forests have had great social and ecological repercussions. In this region, Face will help fund a smaller forest area (20,000 ha), despite the higher price per ton of sequestered CO_2 and the fact that less CO_2 is sequestered per ha of forest. The smallest area to be afforested (5,000 ha) is in the Netherlands; here the costs are very high and the opportunities are very limited, partly because available land is scarce.

Face has decided that its projects should cover a range of rehabilitation methods, as well as a wide geographical range and a range of situations that differ ecologically, or socio-economically or both. As well as yielding a wealth of diverse data and experience this also reduces the risk of stagnation if an approach, forest type or region develops less successfully than anticipated.

The wide differences in culture and social development between South America and Asia lead to significant differences in the processes of deforestation. For these reasons the Face projects operate in diametrically different socio-economic structures. In South-East Asia the contract partners are more likely to be large, commercially operating concession-holders; in South America they are mostly individual land owners or communal organizations of local people. In Africa Face has opted for nature conservation by rehabilitation.

5.1. Selection and identification of projects

When starting activities, Face actively investigated the possibilities. In the first place, regions are chosen where the scope for reforestation is expected to correspond with Face's remit. On the other hand Face would like to have forests on different continents to gain more experience in reforestation under different social and economic conditions.
The survey was conducted in cooperation with forestry experts and consultants or organisations who had expertise in the region.
Existing forestry plans which fit the criteria of Face, but which have a financial deficit, are considered as potential projects for additional financing by Face. After a first general consideration of the objectives, a decision is taken on whether or not to conduct a further investigation.
At present Face is well known and there is a great demand for financial support for reafforestation activities. The initial objective will however already have been reached, so Face has to disappoint potential project partners.

5.2. Contracts

After the identification has resulted in a positive recommendation to the Board and the Board has agreed with the activity and the area to be developed, negotiations on the contract start. Face presents the "Contract Documents for CO_2 Offset" to the project organisation.
The contract documents consist in all cases of:
- A Form of Agreement for CO_2 offset;
- General Conditions of Contract for CO_2 offset;
- A Plan of Operation (covering the three-year implementation phase)

After the implementation phase of three years the management plan will become a contract document. The management plan includes detailed information regarding the management of the forest during the 99 years contract period, but can be revised every 10 years. If a local contract partner wishes to deviate from the General Conditions and such deviations are mutually agreed, they will be provided for in Special Conditions of Contract.

The contract covers a period of three years during which part of the area to be developed will be planted. The contract itself covers the obligations of both partners during a period of 99 years. In this way Face aims to sequester CO_2 for as long as possible. This means that under the management plan the forest owner may log trees but must replant within this period. After every three year period a new contract with new mutually agreed conditions on, for example, price, can be signed for a new part of the area. Payment to the contract partner will take place after implementation of the forestry activity. When concluding a contract with a forester, Face essentially buys CO_2 from that forester. In legal terms, Face buys from the forester the right to sequestration and offset of CO_2 by afforestation, reforestation or rehabilitation of forest. The volume of the CO_2 offset is determined per hectare of forest.

5.3. <u>MOU</u>

The Government of the host country is requested to endorse the projects by means of a Memorandum of Understanding (MOU).
In this Memorandum the Government stipulates that:

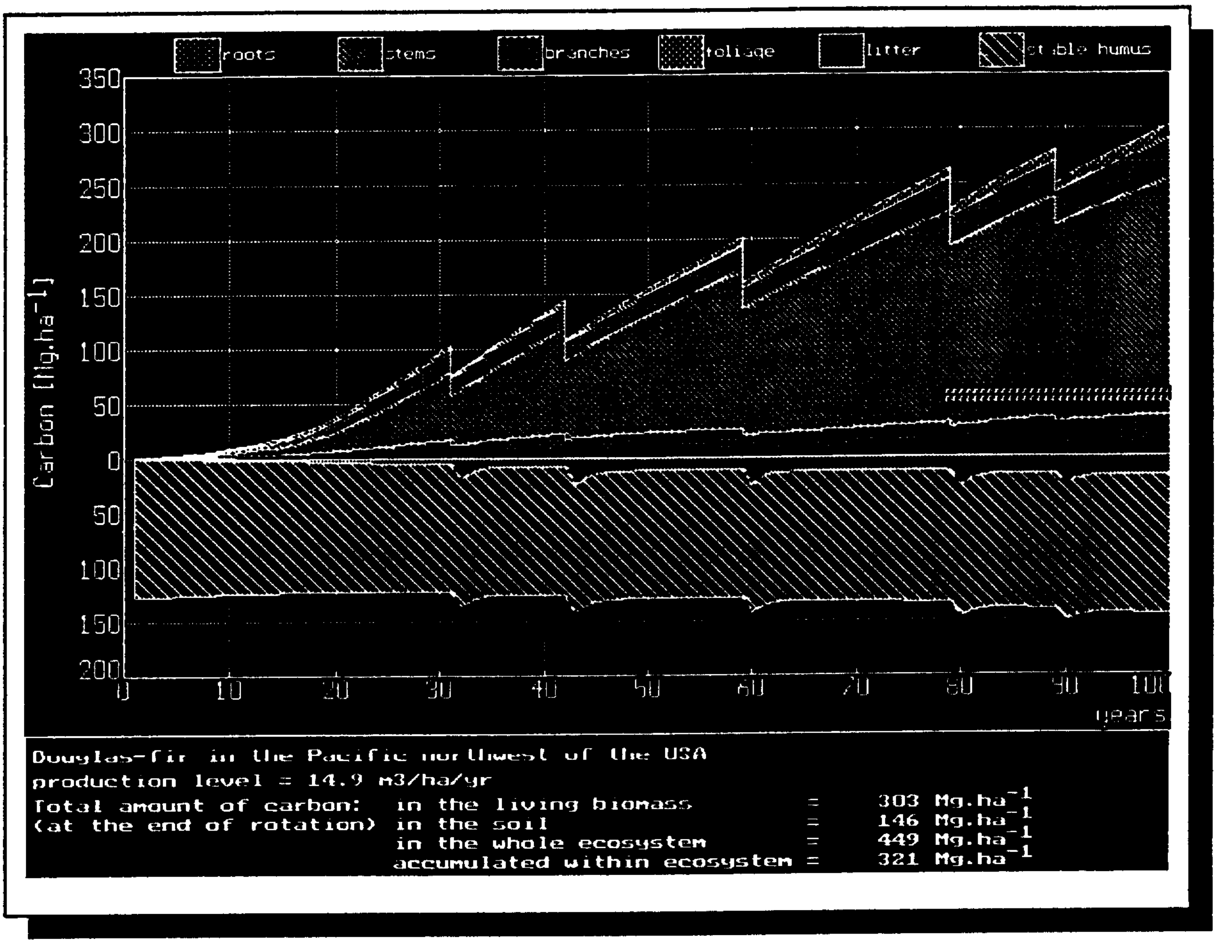
- if there is to be any crediting, the sequestration and offset of CO_2 under any part of the project will be exclusively for Face or its assignee.

5.4. Determination of the CO_2 offset.

In 1991, when the Face Foundation was founded, there were no usable data or methods available against which the assignment could be reviewed despite the world wide interest in this mechanism of establishing new forests as a means of curbing the CO_2 level in the atmosphere. For this reason the Face Foundation commissioned the Institute for Forestry and Nature Research (IBN-DLO), of Wageningen, the Netherlands, to carry out a study into the fixation of carbon dioxide by forest ecosystems. The carbon storage of these forest ecosystems has been established with the help of a dynamic model (CO_2FIX), which describes the carbon cycle from annual growth and loss rates of the main biomass compartments of the forest ecosystem, in combination with accumulation and turnover of organic soil matter. The results of the study have been presented in the report "*Carbon fixation through forestation activities*". The report was peer reviewed by Professor Cannel of the Institute of Terrestrial Ecology in Edinburgh (UK).

5.5. Monitoring

An essential part of the contract concerns the maintenance of the forest during a 99-year period. To ensure that the forest really is in good condition, regular checks are necessary. Face has opted for a method whereby satellites images provide an insight into the condition of the forest. In 1995 Face will have an operational monitoring system (MONIS) integrated with a detailed database containing all the project data from the contracts, planting dates etc. The calculations of the carbon sequestration will also be integrated in the MONIS system as will Cost Comparison Models (CCM). CCM is a tool that enables to calculate the cost price of forestation activities and to monitor the price control in the future. Third countries interested in the monitoring method and/or the CO_2FIX-model can contact Face for more information.



Example of CO_2-sequestration in douglas fir forest (West Coast of the United States) during a rotation period of 100 years, calculated with the CO_2FIX model.

6. Summary of the criteria

1. The afforestation projects must result in extra forest being planted in addition to the existing plans for afforestation (supplementarity).

2. On average, the forest must sequestrate a minimum of 5,500 Kg CO_2 per hectare per year during the cycle.

3. The country where the afforestation is to take place must have:
   - forestry legislation and regulations for implementation,
   - a testable forestry policy, particularly in terms of sustainability,
   - a forestry organization (Government-run) able to perform large-scale afforestation,
   - statutory provisions allowing co-funding in accordance with the Face

construction,
- statutory provisions enabling Face to monitor implementation,
- agreed to the implementation of the project.

4. The preservation of the forest must be guaranteed. This implies:
   - that afforestation projects must have a broad support base in society, i.e. fit in and/or be derived from national and regional policy, fulfil a strong economic and/or regional function in the region, contribute to the socio-economic position of the local population;
   - that the planting and maintenance of the forest must be based on ecologically sound techniques and methods. This means, for example, making use of indigenous tree species, not using chemicals during forest maintenance and not artificially influencing the growing site other than a one-off fertilizer application;
   - that the preservation of the forest is feasible in terms of business economics.

5. The contract partner and national Government must have:
   - guaranteed long-term rights to the use of the land;
   - the expertise to plan large-scale forestry projects within the context of national and regional policy;
   - the expertise to implement large-scale forestry projects in a technically responsible and cost-effective manner;
   - the organizational structure and knowledge to guarantee the preservation of the forest as well as its planting;
   - sources of finance other than the Face Foundation which will enable the forest to be preserved.

7. Project descriptions

More information on the projects in the Czech Republic and Ecuador can be found in the following fact sheets.

7.1. Fact sheet Czech Republic

Project name: Krkonose, Czech Republic

General description:

The Giant Mountains (Krkonose) lie on the border between Poland and the Czech Republic, about 150 km northeast of Prague. This, the northernmost mountain range of Central Europe, has unique vegetation. In the last Ice Age the ice sheets did not reach this far, and so nature has been able to develop in this area undisturbed for thousands of years. Nowhere else in Europe are there forests of Norway spruce that have been able to adapt to the harsh montane climate in this way. In 1963 the 38,500 ha area on the Czech side was designated a National Park.

Increasing acidification led to the death of the higher forests. By 1992, 16, 000 ha of the 32,000 ha of forest existing in 1963 was dead or seriously damaged. In 1984 the IUCN (International Union for the Conservation of Nature and Natural Resources) placed Krkonose on the list of the ten most threatened national parks in the world.

Unfavorable conditions have also led to a lower or even the total loss of trees fertility and hence to the loss of the original genetic material that is specific to the vegetation of the Giant Mountains. Young trees in this montane climate begin to suffer from acidification about 25 years after they have been planted.

The sustainability of the forest can be guaranteed only if there is a real reduction in the emission of acidifying compounds in Central Europe. Measures must be taken by industry to ensure that the acidification will decline to an acceptable level in the coming decades. In this respect it is heartening that Sep's initiative to finance two flue gas desulphurization units in the Belchatow power station in Poland ultimately led to four such units being built. Czech and Polish power plants and heavy industries started the preparations and construction activities of installations which will reduce the acid emissions. Sep has provided financial support of about US$ 35 million for the design and construction of four desulphurization units at Belchatow Power Station, the world's largest lignite fired power plant.

1. General information:

Land/region: Czech Republic

Project partner: Administration Krkonose National Park

Area of the project: 16,000 ha

Starting date: 7 October 1992

Achievements as at 31-12-94: 1,600 ha

2. Benefits

The project area covers a National Park. The project directly employs about 140 people for 7 to 8 months a year. Indirect profits are expected from growing (eco)tourism. The project assists in restoring nature and the natural values of an area that has been accepted by UNESCO as one of the global biodiversity reserves.

3. Project costs

The financial support of Face during the period 1995 - 1997 amounts to US$ 2,000 per ha.
This amount more or less covers the planting costs. The other costs are covered by the Administration of the National Park. An amount of US$ 600,000 will probably be needed to complete the research started in the first project period (1992-1994).

4. Technology transfer

In this project research is being done on the mechanisms involved in growing conditions under acidic circumstances, so that optimal methods can be developed for planting and maintenance. The research is being done by Amsterdam University and the forestry research station in Opocno. Czech students are participating and can get a degree at the universities of Prague, Amsterdam or elsewhere.

6. Project organisation

The project partner is the Krkonose National Park, which is part of the Ministry of Environment. The project coordinator reports directly to the director of the National Park. There is close collaboration with the forestry service of the National Park for planting and maintenance activities.

The Memorandum of Understanding has been signed by the Minister of Environment.

A nature and environment educational programme is being carried out with the involvement of the primary and secondary schools in the region.

7. Sovereignty

The area has and will remain the status of nature conservation area.

8. Sustainability

The original tree species like Picea abies, Sorbus aucuparia and Fagus sylvatica are collected from local genetic resources and replanted. In the past reforestation was done by a monoculture of Picea abies. As a result of the research as mentioned at this moment the species to be planted are mixed in a natural like way.
Seed production in a degraded forest system is poor. Fortunately in 1992 there was a very good seed production for mainly Picea abies. For many years to come seeds of good genetic quality are in stock now.

7.2. Fact sheet Ecuador

Name of the project: Profafor, Ecuador

1. General description:

In Ecuador, as in most Third World countries, poverty is the most important cause of deforestation. People with a low income go into the forests, fell the trees and leave the land bare to the forces of nature.
Erosion and the reduced water-retaining capacity of the deforested Andean slopes are major problems.

The reforestation programme that was started in June 1993 with co-funding from Face is located in this mountain area, at an altitude of between 2,400 and 3,200 m. The farmland and villages lie below. The project area extends over a total distance of almost 1,000 km on the eastern and western foothills of the Andes. In this project Face cooperates with the local population. Unlike other Face projects, in Ecuador the initiative to reforest has come primarily from the owners of small plots of land. Planting trees above the cultivated plots and the villages protects the soil, regulates the water regime and gives the farmers a new source of income.

The project was set up on the basis of experience gained ten years ago in a similar project set up by the Ecuadorian Government but terminated because of the Government's financial problems. The project involves planting a maximum of 75,000 ha of forest on the mountain slopes. The Ecuadorian Forest Service, INEFAN, is the project partner. The projects are largely requested and implemented by farmers and village committees wishing to afforest part of their private or communal land. These people are largely of Indian origin and are among the most impoverished in Ecuador.

2. General information:

Country/region: Ecuador, Andes Mountains

Project partner: INEFAN

Project area: 75,000 ha

Starting date: 3 june 1993

Achievements as at 31-12-94: 2,800 ha

3. Benefits of the project

Economic:

Income generation for local farmers after 20 - 25 years. Creation of a structure of local nurseries.
Indirect income generation as a result of better watershed management and erosion

prevention.

Environment:

Protection of soil and water. Reintroduction of local tree species.

4. Project costs

Face's contribution is US$ 130 per ha. This covers about 75% of the cost of afforestation. The Ecuadorian Forestry Service INEFAN receives a payment of about 9 US$ per ha for their technical assistance. An amount of US$ 100,000 has been reserved for additional research.

5. Technology transfer

There is no technology transfer but research on growing conditions for trees in the Andes region is included. The site classification table based upon this research is available. Financial support is provided for research on the reintroduction and genetic improvement of the local (tree)species. This research is carried out by INEFAN in cooperation with the FAO.

6. Project organisation

The contract partner is INEFAN, the Ecuadorean Institute for Forestry, Natural Areas and Wildlife. The regional staff of INEFAN informs land owners about the reforestation programme. They assist with the submission of requests to Profafor (Programa Face de forestación), provide information on afforestation and supervise planting. Various NGOs are being consulted on the expansion of the nursery capacity.

Because the individual projects are relatively small (10 to 300 ha), Face has set up the Profafor field office in Quito. Profafor has a small staff of Ecuadorian nationals which handles the requests for projects. They are supported in this financially and organizationally by a representative from an internationally operating auditing firm. Final approval is given by Face.

Position of the Government:
The forestry plan is part of the national Reforestation Plan as formulated by INEFAN. The Ministry of Agriculture and Livestock signed a Cooperation agreement with Face. In this agreement is stated that Face shall make funds available for the sequestration and offset of CO_2 by means of afforestation and/or reforestation and sustainable management for the purpose of compensating CO_2 emission, in privately-owned land in the Republic of Ecuador, with the full support of INEFAN.

Report:
After the contract has been signed the required planting material is supplied and a letter of credit is issued, with the land as the security. Each land owner has the right to US$ 130 compensation per ha. The planting material is supplied on credit.

The planting is inspected after one and three years, after which Profafor pays the remaining sums due. Thereafter the farmers must manage their forests for a minimum of 22 years before harvesting timber. After felling, the land must be reforested. If they fell the trees within 25 years and do not reforest (at their own cost), the owners run the risk of having their land confiscated.

Involvement of NGOs or other local groups:
Local NGOs are consulted on their involvement in the start of nurseries for the production and supply of the proper trees and on cooperation in combined forestry plans.

7. Sovereignty

Concurrence in land use:
At present the soils to be planted are bare. If these areas are not planted, they will be degraded by erosion and become useless within a few decades.

The 99 year claim is no problem, because the usufruct is based on a 25 year life cycle and the soil has no other function.

8. Sustainability

Selection of trees:
Pines (*Pinus patula* and *P. radiata*) are the main trees used. These species are not native to this part of the Andes. At present, little is known in Ecuador about the potential for using indigenous species. As a result, they are scarcely used or grown. Therefore part of the Face project also involves researching the usability of these indigenous trees and techniques for growing them.

The use of chemical fertilizers or pesticides is not allowed, except for the first plantation activities.

Usufruct:
The landowners must maintain their forests for at least 25 years before harvesting after which the area should be reforested. The contract covers a 99-year period. If they harvest within 99 years, the landowners have to replant at their own cost. In case they do not do so 30% of the income from the wood should be deposited in a revolving fund so that new forest can be planted.

Table 1. ***Data on number of hectares per project in relation to carbon dioxide fixation and costs***

Country*	rotation period (year)	ha	total ton CO_2	ton CO_2/ha/ year	ton CO_2/ha	US$/ ton CO_2
Netherlands	100	5,000	3,250,000	6.50	650	6
Czech-Republic	120	16,000	11,328,000	5.90	708	2.8
Ecuador	25	75,000	35,475,000	18.94	473	0.5

*) Projects in Bhutan and Belize are under preparation (about 30,000 ha)

The Netherlands (2)

Two Joint Implementation simulation studies of the Netherlands and Hungary

Interimreport no. 1

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Letter of Intent

A letter of Intent between the Netherlands' Ministry of Housing, Spatial planning and the Environment of the Netherlands and the Ministry for Environment and Regional Policy of Hungary was signed on March 9, 1995. In this letter it was agreed that the two countries would jointly undertake two joint implementation simulation studies in order to evaluate the potential consequences for the Hungarian and the Netherlands' side. These studies intend to monitor greenhouse gas emission reductions resulting from implementing two projects in the framework of the existing bilateral Netherlands-Hungarian Cooperation Programme. By linking a monitoring study to two on-going projects the concept of joint implementation will be tested.

Overview

At INC X Parties were invited to report on early experiences with respect to Joint Implementation. The first report of the Netherlands was submitted at INC XI, and focused on the carbon sequestration activities of the Dutch Electricity Generating Board (Sep) through the Face foundation (Forests Absorbing Carbon dioxide Emission) .

Enclosed is a follow up report on early experiences. The two projects in this report focus on energy conservation in local communities and the introduction of compressed natural gas engines in public transport. The monitoring studies will be finished at the end of 1997.

It was agreed to jointly report on its progress and final outcome to the Conference of the Parties (CoP) as a contribution to further decision making by the CoP on joint implementation. Furthermore Hungary and the Netherlands emphasized that implementation of the above mentioned two joint implementation simulation studies will not change present Netherlands and Hungarian commitments under the UN Framework Convention on Climate Change. It also was concluded that both simulation projects provide a good start to gain 'early experiences' in joint implementation and express that both projects will provide a sound basis for future cooperation between the Netherlands and Hungary in the effective implementation of international environmental conventions.

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Annexes

Annex 1: RABA/IKARUS Report

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LETTER OF INTENT

THE MINISTRY OF HOUSING, SPATIAL PLANNING AND THE ENVIRONMENT OF THE NETHERLANDS

AND

THE MINISTRY FOR ENVIRONMENT AND REGIONAL POLICY OF HUNGARY

aware that the 1992 Declaration of the United Nations Conference on Environment and Development states that "States and people shall cooperate in good faith and in a good spirit of partnership" (principle 27);

"acknowledging that the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions" (preamble United Nations Framework Convention on Climate Change);

"recognizing that steps required to understand and address climate change will be environmentally, socially and economically most effective if they are based on relevant scientific, technical and economic considerations and continually re-evaluated in the light of new findings in these areas" (preamble United Nations Framework Convention on Climate Change);

in the spirit of the principles of the Framework Convention on Climate Change which state inter alia that Parties should take into account that "policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost" and that "efforts to address climate change may be carried out cooperatively by interested Parties" (Article 3, paragraph 3 of the United Nations Framework Convention on Climate Change);

aware that Annex I Parties have committed themselves to "adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse sinks and reservoirs" (Article 4.2.a of the United Nations Framework Convention on Climate Change);

aware that "these Parties may implement such policies and measures jointly with other Parties" (Article 4.2.a of the United Nations Framework Convention on Climate Change);

aware that "the Conference of the Parties, at its first session, shall also take decisions regarding criteria for joint implementation" (Article 4.2.d of the United Nations Framework Convention on Climate Change);

referring to the exchange of views on joint implementation at INC X and in particular to the request of INC X to Parties to submit inter alia "early experiences with respect to joint implementation in the pilot phase" (A/AC.237/76, par. 62, 2 September 1994);

<u>express</u> the need to collect practical experiences in several ways to gain better insight in relevant aspects and criteria for joint implementation;

<u>agree</u> to jointly undertake two joint implementation simulation studies in order two evaluate the potential consequences for the Hungarian and the Netherlands' side. These studies intend to monitor greenhouse gas emission reductions resulting from implementing two projects in the framework of the existing bilateral Netherlands-Hungarian Cooperation Programme. By linking a monitoring study to two on-going projects the concept of joint implementation will be tested. These two projects focus on energy conservation in local communities and the introduction of compressed natural gas engines in public transport. The monitoring studies will be finished at the end of 1997;

agree that on the progress of both studies, with the involvement of representatives of key disciplines and organizations, regular consultation between both ministries will take place, *inter alia* via two workshops to be held in Hungary during the course of both studies. Interim and final results will be jointly published and distributed to those interested, like other national governments, business communities, non governmental environmental organizations and the scientific community;

agree furthermore to jointly report on its progress and final outcome to the Conference of the Parties (CoP) as a contribution to further decision making by the CoP on joint implementation;

agree that the Netherlands will provide assistance through the TNO Environmental Research Institute, DELTEC Fuel Systems, CAB Motor Car Consultancy and the NOVEM Energy Research Institute, as well as monitoring equipment and support for the technical and cooperating tasks of Hungarian experts;

agree that Hungary will provide for the required data and expertise and assistance through RABA Motor Works, IKARUS Bus Manufacturing Company, EGI Contracting and Engineering Co. Ltd., local communities and utilities;

emphasize that implementation of the above mentioned two joint implementation simulation studies will not change present Netherlands and Hungarian commitments under the UN Framework Convention on Climate Change;

emphasize furthermore, that these additional monitoring and analyzing tasks will also not modify the objectives and terms of agreement for the referred two on-going cooperation projects. To the contrary, these monitoring tasks may even endorse the value of those projects;

conclude that both simulation projects provide a good start to gain 'early experiences' in joint implementation and express that both projects will provide a sound basis for future cooperation between the Netherlands and Hungary in the effective implementation of international environmental conventions.

Done at date: March 9, 1995

On behalf of the Ministry of Housing, Spatial Planning and the Environment of the Netherlands,

Mr. G.J.R. Wolters, Deputy Director-General for Environmental Protection

On behalf of the Ministry of Environment and Regional Policy of Hungary,

Dr. Gábor LANYI, Director General, Ministry for Environmental and Regional Policy

JOINT IMPLEMENTATION SIMULATION STUDY RABA/IKARUS

INTERIM REPORT NO. 1

This report was drafted by:
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Delft/Budapest, March 1995

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Summary

In the RABA/IKARUS Compressed Natural Gas (CNG) Fuel Engine project Netherlands' technology will be transferred which aims at building in Hungarian industry the capacity to produce buses with CNG engines. The introduction of such buses in public transport has the potential of a significant improvement of air quality in cities and a modest reduction of CO_2-emissions.

In agreement with the Hungarian Government the Netherlands have selected this project for a *Joint Implementation Simulation*. Details of the simulation study are presented in this report.

From existing information on present public transport in Hungary an environmental *Baseline* has been derived which includes data on energy consumption, and on emissions of CO_2 and major air pollutants from bus transport in cities. In view of environmental and economical considerations a gradual substitution of present diesel powered buses by CNG driven buses has been assumed as a possible development. At the end of such a development the gain in emission reduction in bus exhaust gases in cities amounts to a factor 6 for carbon monoxide, a factor 2 for hydrocarbons, a factor 4 for nitrogen oxides and a factor 9 for particulate matter at an energy consumption which has increased by 11 per cent. The CO_2-emissions go down by 9 per cent. which is equivalent to an amount of 20 to 25 kton avoided emission per annum for Hungary.

Economic benefits of the project at short term have been calculated and estimates have been provided for the economic effects at longer term.

1. Introduction

In the Framework Convention on Climate Change (FCCC) an option has been included which allows developed countries to realize their emission targets in cooperation with other countries: Joint Implementation. In addition, the FCCC states that at the first Conference of the Parties (CoP) criteria are to be established for the application of Joint Implementation (JI). In order to provide material for testing these criteria and thus enhance the acceptance of JI in the international community, the Netherlands decided to start *Joint Implementation Simulation Studies*. In a Joint Implementation Simulation a project is selected which is monitored on its potential for Joint Implementation without having the actual CO_2-reductions credited to the donor country.

Hungary and the Netherlands, being both Party to the FCCC, signed a Letter of Intent for a cooperation aiming at enlarging the acceptance of JI. In order to achieve this, a jointly sponsored project which happened to start in January 1995, the RABA/IKARUS Compressed Natural Gas Fuel Engine project, was selected for consideration as a JI Simulation project. The aim of the present report is to provide details on this project and, in particular report on the baseline situation, viz. the situation which exists before any benefits of the project have materialized. In addition, a rough estimate of the potential benefits at short and medium term is presented. Updates of the report are to be prepared during 1996 and 1997, in order to refine the information on actual and projected benefits and to gain experience with the procedures for crediting of CO_2-emission reductions.

2. The RABA/IKARUS Compressed Natural Gas Engine Bus Project

In the RABA/IKARUS CNG-bus project technology will be transferred which will enable Hungarian industry to produce buses with Compressed Natural Gas (CNG) engines.
A gas engine is an attractive option for transport since its exhaust is considerably cleaner than that of diesel engines. Most relevant fuels for the gas engine are CNG and LPG (Liquid Propane Gas) of which CNG is a slightly better choice from the environmental viewpoint. However, the availability of LPG, which is by-product from oil refineries, is insufficient in most countries, including Hungary.
In the Netherlands the feasibility of CNG buses has been evaluated within the Rational Energy use in Traffic and Transport programme sponsored by the Netherlands' Ministry of Economic Affairs. The results of this evaluation were published in 1992 (1). It was concluded that, apart from the technical and environmental benefits, CNG driven buses are also economically feasible on the condition that CNG-buses will be included in the same road tax bracket as diesel buses. At present four Netherlands' local transport companies have a limited number of CNG or LPG powered buses in operation. Based on this experience and already existing experience in Hungary with a Dual Fuel (diesel + natural gas) Engine the RABA/IKARUS CNG Bus project may be qualified as a sound proposal.

The project involves the following partners:

-Deltec (Netherlands)
The firm of Deltec markets fuelling equipment for gas fuelled engines in heavy duty applications. The gaseous fuel can be either LPG (liquified petroleumgas) or CNG

(compressed natural gas). Deltec is responsible for the technology transfer to RABA, that will allow RABA to develop a CNG fuelled bus engine.

-TNO (Netherlands)
The research organization TNO possesses an extensive knowledge on the conversion of heavy duty diesel engines to the use of gaseous fuels. The Institute for Road Transport Vehicles of TNO will supply this expertise to RABA.

-RABA (Hungary)
RABA is a major representant of Hungarian heavy industry producing a variety of products, such as trucks, agricultural equipment, diesel engines and parts for this market; it is supplying almost all engines for the Hungarian buses for public transport. They also export engines to other countries in Eastern Europe as well as elsewhere in the world. With the aid of the technology transfer mentioned above, Raba will develop and market a CNG fuelled bus engine.

-IKARUS (Hungary)
The firm of IKARUS is a Hungarian bus manufacturer. The engines used for IKARUS buses are almost exclusively RABA engines. IKARUS will build a CNG fuelled bus on the basis of the RABA CNG bus engine.

In the Netherlands the RABA/IKARUS project has been committed by the Ministry of Economic Affairs through Senter as the contracting organization. The Ministry of Environment takes part in the accompaniment of the project.

The project fulfils major criteria for successful Joint Implementation:
It is expected that the transition from diesel buses to CNG fuelled buses will lead to some decrease in CO_2-emission by public transport in combination with a significant decrease in other atmospheric pollutants.
In addition, the project will provide economic benefits for Hungary and build capacity for producing advanced technology.

The RABA/IKARUS project can be characterized as a 'clean technology' project. It bears several potential effects for the environment and the economy of Hungary:

- avoided emissions of CO_2;
- avoided emissions of air pollutants, such as carbon monoxide, nitrogen oxides, VOC's, particles and absorbed micro-pollutants and of noise;
- direct economic benefits in the technology transfer stage;
- long term economic benefits as a result of new market perspectives based on the transferred technology;
- technology transfer and capacity building.

The respective elements will be discussed in the present report.

3. Public Transport by bus in Hungary

Public transport plays an important role in Hungary, as in most Central and East-European countries. Within the public transport sector buses have a significant share, especially in city transport. This chapter describes the situation in three Hungarian cities based on interviews with officials within the responsible authorities (2, 3, 4):

- Budapest
- Györ
- Debrecen

Budapest

In Budapest the public transport is operated by the Budapest Transportation Authority (BKV)

Budapest has several public transport systems:

- Underground
- Local railway
- Local Danubian shipping
- Bus, tram and trolleybus

The share of the last mentioned item (bus, tram and trolleybus) is 61% and the share of buses alone is 38%. BKV operates more than 1600 buses, of which 720 articulated buses (140 passengers) and some 90 small size 'midibuses' (46 passengers); the rest are normal size single buses (90 passengers). The midibuses are equipped with Perkins or VW engines. The fullsize buses are almost exclusively equipped with Raba engines, although recently 200 DAF engines were introduced, financed by the Netherlands' Government. The Raba engines are partly the older D2156 type and partly the more modern D10 type. At the moment the older types are being replaced by the modern type. Today some 250 buses have already been updated. Another 200-250 buses are going to be modernised in 1995/1996. Yearly about 100-110 new buses are planned for the coming years. Average annual kilometrage is 60.000-70.000 km.

Györ

Györ is typical for a middle sized Hungarian town, with 120.000 inhabitants.

Public transport in Györ is organised by Kisalföld Volan. They are typical for about 19 similar transport companies in Hungary. They operate only buses. The total number of city buses is 115, of which 51 are articulated. There are only 10 new buses, bought in 1995. The average age of the other ones is 9.3 years. The financial means will allow the purchase of about 10 new buses annually. There are plans to separate the city service and bring it under a local transport authority similar to BKV in Budapest. Kisalföld Volan would then only operate the interurban services. This restricts the willingness to invest in new city buses. The engines used are Raba D2156 and D10 (133 kW). The new buses are equipped with the even more modern D10-190 (190 kW). The annual kilometrage is 51.500 km.

Debrecen

The number of city buses in Debrecen is 140 (60 single and 80 articulated buses).

Debrecen operates dual-fuelled buses that run on diesel and CNG in mixed fuel mode. There are at the moment 49 of such buses. The fuel mix is 42% CNG/58% diesel, including the fact that buses sometimes run out of CNG during their daily operation and then carry on on diesel fuel. Annual kilometrage is 50.000 km. The total capacity of CNG is 450-500 litres per bus, carried in 6-9 containers. The filling takes 12-15 minutes. A maximum of 6 buses can be filled from a high pressure buffer container, with 30-40 minutes between groups of buses.

Of the diesel driven buses 25 have the more modern RABA D10 engine.

4. Some aspects of environmental policy in Hungary

Hungary has been recently developing its environmental policy in order to improve its own environment and to meet the requirements of the Conventions of the United Nations and, in particular the Economic Commission for Europe as well as those of the European Union as soon as possible.

Hungary is a party to the Framework Convention on Climate Change (5). It has signed and ratified the Vienna Convention and the Montreal Protocol and its amendments on the protection of the Ozone Layer. It is also a signatory to the ECE Convention on Long Range Transport of Air Pollutants.

On the national level Hungary is involved in a major transition in energy mix (6). The share of coal has been declining since the early sixties and has been subsequently supplemented with oil, gas and nuclear energy. The earlier trend of substitution of coal by oil in power generation has been followed by a further gasification which is still going on.

As a result, the emissions of sulphur dioxide, nitrogen oxides and particulate matter have decreased markedly since 1980 and in particular since 1988. Immission levels have consequently improved during that period (7).

Traffic policy is directed towards compliance with the standards of the European Union. Lead free petrol is available since 1991 and the EC guideline for emission limits of 1986 is applicable to new cars. Also, two-stroke engines are not allowed anymore for taxis and Government services.

New buses have to comply with the EURO-1 standards, which is valid in the EU as from 1992. Preparations are made to require compliance with EURO-2 standards (valid in the EU as from 1996) and will be followed by the requirement to comply with EURO-3 (required in the EU as from 1999) in the future [1].

It is obvious that CNG-driven buses are an excellent choice to meet these ambitious goals.

The Hungarian Ministry of Environment and Regional Policy, therefore, is in favour of the current project on the Compressed Natural Gas Fuel Engine. It has also obtained the support of the Hungarian Ministry of Transport (8).

[1] The EURO-3 standards have yet to be decided, but they are expected to require high technology engines from the diesel engine manufacturers. Diesel engines are expected to be capable to meet such standards, but at a price.

5. Environmental baseline of transport by bus: the case of Budapest

By way of an example the environmental effects of transport by bus is calculated for the case of Budapest. This is done for the full-size buses, since too little information is available for the midibuses. For the calculation the following data are used.

The so-called 13-mode emission figures[2] for the RABA and DAF engines were collected and are shown in Table 5.1. The fuel consumption figures were not available for the 13-mode test; only the minimum consumption figures are known. Table 5.1 also shows the estimated figures for the RABA CNG engine that are needed for the calculations of chapter 9.

Table 5.1 13-mode test data on emissions from specific engines for Hungarian buses

engine type	CO g/kWh	THC g/kWh	NOx g/kWh	PM g/kWh	consump. g/kWh
RABA D2156	6.10	1.80	14.30	0.60	226.00
RABA D2156T	3.20	1.33	10.40	0.70	217.00
RABA D10-150	0.38	0.49	11.20	0.25	206.00
DAF EURO 1	1.10	0.43	7.90	0.17	197.00
RABA CNG	0.60	0.60	3.00	0.05	187.00

By the use of a TNO conversion programme the 13-mode figures can be transformed into on-the-road emission figures for any specific bus. These are shown in Table 5.2. The consumption figures are corrected for the known consumption data of the Hungarian buses.

Table 5.2 Emission data for Hungarian buses on the road for different engines

bus type	engine type	CO g/km	THC g/km	NOx g/km	PM g/km	cons. g/km	cons. MJ/km	CO2 g/km
single	RABA D2156	10.25	3.24	24.02	1.01	342	14.59	1092
single	RABA D2156T	5.54	2.46	17.99	1.21	338	14.43	1079
single	DAF EURO 1	1.87	0.78	13.43	0.29	301	12.87	963
single	RABA CNG	1.05	1.12	5.25	0.09	340	16.44	941
articul	RABA D2156	14.64	4.62	34.32	1.44	488	23.63	1352
articul	RABA D2156T	7.68	3.42	24.96	1.68	469	22.69	1298
articul	RABA D10-150	0.91	1.26	26.88	0.60	445	19.00	1422
articul	DAF EURO 1	2.64	1.10	18.96	0.41	426	18.17	1360
articul	RABA CNG	1.44	1.54	7.20	0.12	466	22.55	1290

For the totalisation the numbers have been assumed that are shown in Table 5.3.

[2] The 13-mode test is the official certification test. The 13-mode emission figures are the official figures resulting from the type approval test on a static bench. They are engine specific and bear no immediate relation to the on-road emission factors.

Table 5.3 Numbers of bus types used for the calculations

BUS TYPE	ENGINE TYPE	NUMBER
single	RABA D2156 HM6U	570
single	RABA D2156 HM6UT	100
single	DAF EURO 1	140
articulated	RABA D2156 HM6U	220
articulated	RABA D2156 HM6UT	140
articulated	RABA D10-150	250
articulated	DAF EURO 1	110
TOTAL NUMBER		1530

The calculated amounts for the emissions and the energy consumption for an annual average of 65.000 km. per bus is shown in Table 5.4.

Table 5.4 Calculated total annual emissions and energy consumption for 1530 full-size buses in Budapest; these figures are derived from the data in tables 5.2 and 5.3.

Component	Emission/consumption	
Energy		
Fuel Consumption	39	kton/year
Energy Consumption	1734	TJ/year
Carbon dioxide		
CO_2	120	kton/year
Other pollutants		
CO	746	ton/year
THC	269	ton/year
NO_x	2420	ton/year
PM (particulate matter)	96	ton/year

The data presented in table 5.4 are to be considered as the baseline situation at the start of the RABA/IKARUS CNG Engine Bus project.

6. Economic aspects of the CNG technology for Hungary

Introduction of the CNG-driven bus requires decisions at the decentral level, viz. by transport companies and the municipal or provincial authorities of the towns or regions which are served by them. The feasibility of a transition to the CNG-driven bus depends on the economies of the infrastructure and of the exploitation prospect of the buses themselves.

6.1 Infrastructure

Hungary has, as a result of the exploitation of its own resources and the imports from Russia a nation-wide distribution network for natural gas. The pressure in the network is relatively low. For the use of natural gas for transport purposes compression stations are needed, in order to obtain acceptable filling times, which means that an investment has to be made in infrastructure. The investment to be made by a local transport company is lower than that to be made by a regional company or a company which operates over the whole country, since the number of compression stations needed will increase with the area to be served by the transport company. Local transport companies, therefore, are supposed to be the most probable buyers of CNG Engined buses.

In fact, the city of Debrecen, which has in operation 49 Dual Fuel type buses (diesel + natural gas), is presently the only city in Hungary where such filling infrastructure exists.

6.2 Economy of the Compressed Natural Gas Fuel Engine

Since the CNG Engine is not yet in production in Hungary it is not possible at the moment to provide a detailed estimate of its economic performance. However, a preliminary estimate has been made.
When compared with the present, most modern RABA diesel engine (D10 EURO-1 version), with which it has to compete, RABA expects that the price of the CNG Engine will be higher by 70-75% and that the extra costs related with operation on gas as a percentage of a new bus are approximately 20% (engine, catalytic converter, gas tanks and safety related equipment); these figures are to be corrected for the lifetime of the engine, which is estimated to be in favour of the CNG engine by 25% (8). Also, in the near future the comparison will have to be made with a D10 engine which meets EURO-2 standards; this will further reduce the difference.

7. Market penetration of the CNG Engine

In order to make an estimate of the potential benefits an assumption has to be made of the penetration of CNG Engine driven buses on the market. This will be made with relevant detail for the Hungarian market and the export market, as far as projections can be made. For both markets RABA as the engine producer and IKARUS as the producer of buses are supposed to continue their long and tight cooperation.

7.1 Hungarian market

In view of the ambitious environmental policy and the support to the RABA/IKARUS CNG Fuel Engine project by the Hungarian Ministry of Environment and Regional Policy, it is quite possible that, in spite of the higher costs, the introduction of the CNG Engine will be made feasible in Hungary in the coming years. It has been considered, based on the Netherlands' study (1), that the economic feasibility may appear to be better than presently thought.
For an estimate of the size of the market it is noticed that the increasing mobility which accompanies the economic development will probably be absorbed by the increasing private motorization. The market for buses in Hungary will, therefore, largely depend on the substitution rate of the existing bus fleets. Existing bus fleets in the major cities amount to a number between 3000 and 4000; of this total number 1600 run in Budapest.
An ideal annual substitution rate would be 10 %; a rate of 7.5 % is probably realistic. This produces a maximal market between 200 and 250 buses per year in Hungary. It may take 3-5 years before this market is served to a major extent. Since the CNG Engine driven bus will be on the market from 1996 the full penetration could be complete in the year 2000 in the most favourable case. It would then take another 15 years to reach full substitution and obtain the maximal environmental benefits.

Since the investment budgets of transport companies are rather modest, economic factors may prevent full penetration. Environmental requirements, however, could further the penetration.
It is of interest to note that BKV in Budapest has committed a Technical and economical feasibility study on natural gas fueled city buses (9).
Full substitution in city transport could take a period of 15 years. Penetration of CNG buses on the market of intercity transport, which could become technically feasible as soon as the major cities have the infrastructure for filling installed, will have a low probability as compared with city transport, though it might contribute to some extent in the long run. It will be neglected in the estimate of the benefits of the project.

7.2 Export market

IKARUS has established a firm market position in such countries as:
- the member states of the former Soviet Union
- near East and North Africa
- East Asia
- the middle European countries
- the member states of former Yugoslavia

It is obvious that the availability of natural gas could rule out part of these countries as a market for the CNG powered bus, but it is expected that a majority of these countries are possible buyers.
IKARUS has proven to be able to compete on these markets on the basis of its price/quality ratio; this could be more difficult for industry from Western Europe. In addition, IKARUS will have unique technology when compared with its competitors in Central and Eastern Europe and Asia.

7.3 Total market

IKARUS has made an estimate for the market of the CNG Engine powered bus (10). It has estimated a possible sales evolution of CNG engine equipped vehicles; we have added a margin to both sides which we will relate to the calculation of the potential benefits:

Years	Sales volume	
1st	50	(25-100)
2^{d}	100	(50-200)
3^{d}	400	(200-500)

8. The potential benefits of the project: a preliminary estimate

8.1 Environmental benefits

8.1.1 Introduction

The calculation of the energy consumption and the emissions of carbon dioxide and other pollutants is made in the same way as the calculation of these figures was made in chapter 6 (Environmental effects of transport by bus). The calculation is again made for the example of Budapest. The scenarios which have been used are summarized in Table 8.1.

Table 8.1 Numbers of bus types in the scenarios for calculation of energy consumption and emission reductions

bustype		scenario				
		basis	minimum	average	optimum	maximum
RABA D2156	single	570	0	0	0	0
RABA D2156T	single	100	0	0	0	0
DAF EURO 1	single	140	140	140	140	0
RABA CNG	single	0	670	670	670	810
RABA D2156	articulated	220	220	0	0	0
RABA D2156T	articulated	140	140	0	0	0
RABA D10-150	articulated	250	250	250	0	0
DAF EURO 1	articulated	110	110	110	110	0
RABA CNG	articulated	0	0	360	610	720

The scenarios may be characterized as follows:
-Basis:
This is the situation as calculated in chapter 5
-Minimum:
All RABA D1256 engines in single buses are replaced by RABA/CNG engines
-Average:
All RABA D1256 engines are replaced by RABA/CNG engines
-Optimum:
All RABA diesel engines are replaced by RABA CNG engines (that is: including D10 engines)
-Maximum:
All diesel engines are replaced by CNG engines
(that is: including the DAF engines)

The results of the calculations are discussed in the following sections.

8.1.2 Energy consumption and CO_2-emissions

In table 8.2 the CO_2-emissions for the different scenarios, together with the energy consumption from which they were calculated, are presented.

Table 8.2 Calculated emissions and energy consumption for Budapest, according to the different scenarios

scenario	buses	fuel cons. kton/y	energy cons. TJ/y	CO_2 kton/y
basis	1530	39.1	1734	120.2
minimum	1530	39.1	1816	113.7
average	1530	38.7	1799	112.8
optimum	1530	39.0	1857	110.6
maximum	1530	39.7	1921	109.9
basis		100%	100%	100%
minimum		100%	105%	95%
average		99%	104%	94%
optimum		100%	107%	92%
maximum		101%	111%	91%

The fuel consumption increases with an increasing share of CNG buses, since the efficiency of spark ignition engines is inherently inferior to that of diesel engines. In general an energy use increase of 25-30% is normal. Due to the fact that in the scenarios older, less efficient diesel engines are replaced by modern CNG engines, the increase in energy use is limited to 11% in de *maximum* scenario. The fuel consumption by mass does not increase, due to the higher heat content of CNG.

The CO_2 emission shows a gradual decrease over the scenarios. This is obtained notwithstanding the increase in energy consumption, due to the lower CO_2-production of CNG relative to diesel fuel.

8.1.3 Emissions of other pollutants

As can be seen from table 8.3 already the *minimum* scenario gives a large reduction of CO and a good reduction of total HC which both further improve with the *average* scenario. The emission of NO_x shows a good reduction for the *minimum* scenario and a large reduction for the *average* scenario. Beyond the *average* scenario the gain is lower. The particulate matter keeps improving with every next scenario due to the very low particulate emission of CNG engines.

Table 8.3 Calculated emissions of pollutants for Budapest, according to the different scenarios

scenario	buses	CO ton/y	THC ton/y	NO_x ton/y	PM ton/y
basis	1530	746	269	2420	96.4
minimum	1530	376	182	1641	55.0
average	1530	130	120	1092	21.9
optimum	1530	139	125	772	14.1
maximum	1530	123	131	613	10.1
basis		100%	100%	100%	100%
minimum		50%	68%	68%	57%
average		17%	45%	45%	23%
optimum		19%	47%	32%	15%
maximum		16%	49%	25%	11%

8.1.4 Implications for Hungary

In view of the estimates of the total number of buses involved in city transport the figures of tables 8.2 and 8.3, which are valid for Budapest, have to be multiplied by a factor between 2 and 2.4 to obtain the corresponding figures for Hungary. In the *maximum* scenario a reduction 20 to 25 kton CO_2 per year results. Data on present CO_2-emissions in Hungary, which could put this figure in perspective, have been summarized in Annex 1.

It can be concluded that the project has the potential of a major improvement in local air quality; the modest reduction in CO_2-reduction rather is to be regarded as an additional benefit.

An additional benefit is expected from the noise reduction. In the Netherlands' evaluation study on CNG buses this aspect was highly valued as a benefit from CNG engines in buses when compared with diesel engines.

8.2 Economic benefits

8.2.1 Short term benefits

The RABA/IKARUS CNG Bus project has been budgeted for a total of 203 Million HUF (about 2,000,000.- US$). Of this amount 132 Million HUF is contributed by the Hungarian partners, of which 86 Million HUF come from Hungarian Governmental R&D support and central environmental funds. The Netherlands' contribution amounts to dfl 750,000.- (US$ 500,000.-). The Joint Implementation Simulation study has been budgeted at Dfl 180,000.- to be financed by the Netherlands' Government.
A significant part of the Netherlands' contribution is to be spent in Hungary.

At RABA the project will yield the capacity to produce the CNG Engine in a production line. In addition, a test bench construction will be built, together with the necessary safety and hygienic provisions.

At IKARUS the project will stimulate the development of production facilities for CNG tanks and related technology and the design of buses in which the new engine and connected equipment can be accommodated.

8.2.2 Long term benefits

Based on the presently available projection it is assumed that RABA will produce the CNG engine solely for IKARUS buses. This seems a reasonable assumption for the medium term.
A second assumption is that, at an unchanged profit margin, the higher costs of respectively the CNG engine and the CNG-driven buses will result in a proportionally higher profit.
The actual profits will depend on the size of the production series to which the investments have to be attributed so the benefits are presented as relative results.

The estimates for market penetration have been worked out for an IKARUS CNG-bus with an assumed cost price of 15 Million HUF (US$ 150,000.-) and are based on the projected production figures mentioned in section 7.3.

Table 8.4 Relative results at IKARUS for three scenarios

	Increase in turnover at IKARUS in 1000 US$		
	low	middle	high
1st year	750	1,500	3,000
2d year	1,500	3,000	6,000
3d year	6,000	12,000	15,000

The contribution to the net result will be dependent on the profit margin for the bus.

9. References

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10. Informal information from IKARUS

Annex 1

CO_2 EMISSIONS (kton) BY SOURCE AND SINK CATEGORIES IN HUNGARY (6)

Source and sink categories	1990 (reference year)
FUEL COMBUSTION	68105
Energy transformation	29746
Industry	7893
Transport	8208
Commercial and trade	3290
Residential	15125
Agriculture and forestry	2462
Other	1381
INDUSTRIAL PROCESSES	3568
LAND USE AND FORESTRY	- 4467
TOTAL	71673

ENERGY-EFFICIENCY IMPROVEMENT BY HUNGARIAN MUNICIPALITIES AND UTILITIES

INTERIM REPORT NO. 1

The Netherlands Agency for Energy and the Environment (Novem bv)/
EGI/GEA Contracting/Engineering

Utrecht/Budapest, March 1995

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1. Introduction

In the 1992 UN Framework Convention on Climate Change, the possibility was created for developed countries to meet their reduction commitments by joint measures with other parties. This instrument has become known as Joint Implementation or with its abbreviation as JI.
The Netherlands Government stated in its second National Environmental Policy Plan (NEPP-2), that it valued Joint Implementation as part of an international effort to cut back on global CO2 emissions. Therefore the NEPP-2 mentioned the Netherlands Governments' wish, to gain experience with JI soon. For this reason not only new projects will be initiated, but also JI simulation studies will be attached to ongoing projects.

The main objective of these simulation studies is to gain experience how countries can cooperate in preparing, implementing, simulating the sharing of crediting and evaluating JI projects. These results will be presented to the Conference of Parties (COP) of the Climate Convention and will furthermore be widely disseminated.

The Netherlands-Hungarian cooperation project "On-site auditing and advising for local communities in Hungary" (conducted within the framework of the bilateral Netherlands Cooperation Programme PSO 1992 served a large need among Hungarian municipalities. It showed in twentyfour municipalities, that with low cost measures already 10% to 30 % of energy savings could be realized and it listed furthermore cost-effective investment projects for each local authority.
On request of the Hungarian Government this program will be continued (PSO 1994) with ten more Hungarian municipalities and with two local demonstration programs: a small scale Combined Heat and Power (CHP) project in a district heating system and a Demand Side Management (DSM) project with a Hungarian utility. In both projects cooperation will be created between a Netherlands and a Hungarian utility.

In the framework of the simulation studies an additional monitoring component will be added to both of these energy-efficiency projects (PSO programs 1992 and 1994).

In this report the preliminary findings of these programmes will be described the approach will be outlined for the JI simulation study as well as the structure for reporting and dissemination of the findings. On request of the Netherlands Ministry of Housing, Spatial Planning and the Environment (VROM) and the Hungarian Ministry of the Environment and Regional Planning, this JI simulation study will be conducted by: the Netherlands Agency for Energy and Environment/Novem (The Netherlands) and EGI/GEA Contracting & Engineering (Hungary). The Novem/EGI consortium was also responsible for the development and implementation of both advising and demonstration programs for the Hungarian local communities and utilities.

2. Netherlands' Bilateral assistance programme for Hungary in the energy field

2.1 Introduction

The Netherlands have been offering assistance to Hungary in the energy efficiency field for a couple of years. These programmes resulted in the improvement of energy efficiency in certain Hungarian sectors, provided information on investment opportunities for Netherlands entrepreneurs, and contributed in general to the improvement of relationship between the two nations.

In the first years of the programme selected industrial sectors, such as the dairy, meat processing, milling, and brewing industries were involved. Later a national CHP study was prepared to assess the potential for small-scale cogeneration in Hungary.

Since 1993 the main focus of the programme is the local communities, based on the recognition that while the share of the communities in the country's energy consumption continuously increases, the capabilities for addressing the challenges are not sufficient.

For that reason two programmes address the local communities in Hungary. The community advice programme (2.2.) is concluded and will be reviewed for its JI potential and for relevant lessons. A new programme "Energy efficiency improvement and demonstration programme for Hungarian municipalities and local utilities" will be described (2.3.), because it will provide the joint implementation study projects.

2.2 Concluded community advice programme

2.2.1 Background and general considerations

In 1993 and 1994 the Netherlands and Hungarian Government co-financed an on-site auditing and advising programme for Hungarian communities. All Hungarian municipalities could apply for this programme (free of charge) and could select for themselves from a so-called assistance menu what kind of assistance they preferred. The programme was implemented by the Novem/EGI consortium, was supervised by a ministerial steering committee and was assisted by an expert body and an advisory board. The main objective of the Netherlands-Hungarian Community Advice Programme has been to provide assistance for selected communities in the field of energy management. An additional objective has been to identify general findings and disseminate these in a wide circle in Hungary (regional and national) and to other Central and Eastern European (CEE) countries.

The Novem/EGI consortium had to learn that in many communities, at the time of the audits and site-visits, there was no energy management at all. Neither energy usage nor costs were monitored in a correct way by the local authorities.

In more and more communities the individual institutions (municipal buildings, schools etc.) are given some independence. A certain budget is provided for them each year. The breakdown of the budget is the institute's own responsibility. In this way the local governments do not have an insight into the operational costs, including energy costs, of their institutions.

In district heating systems typically lump-sum contracts are used. It means that energy usage is monitored only in the central plant.

In the field of public lighting energy consumption and costs are quite precisely metered.

For the above reasons it is rather difficult to establish a baseline energy consumption for the communities which participated in the (PSO 1992) advice programme during 1993 and 1994.

It has also to be considered that according to the actual needs of the communities the programme has been so far rather an educational one (targeting at the development of awareness and behavioural measures (with a short pay-back time), and not a technical one (targeting at preset performance improvement).

Energy has been saved inevitably, but verification may be difficult.

2.2.2 Review of implementation of proposals

In the framework of the programme 24 communities were audited and advised. More than a hundred proposals were worked out[1]. A significant part of the proposals related to educational and awareness development changes, or to the introduction of more efficient energy management. The results of these proposals cannot be quantified.

Altogether 78 quantifiable proposals were presented to the local governments. If 100 % of them is implemented, an estimated energy saving of 191409 GJ/year can be achieved, at an investment cost of 370,000,000 HUF (equivalent to ca. 7 million NLG). This could result in an energy cost-saving of roughly 5.5 million NLG. This energy saving furthermore could reduce Hungarian CO_2 emission by 12,810 tonne/year.

2.2.3 Status of implementation

The status of implementation is being reviewed by EGI the Hungarian consultant. The following preliminary observations can be made:

A. The communities have implemented 10-90 % of the proposals so far.
B. Due to the practice of yearly planning some projects can be implemented only in 1995 and 1996.
C. Some communities underestimate the importance of energy efficiency and the potential for costsaving. This is why they neglect implementation of EE projects.
D. Other communities have realised the importance of energy efficiency and do their best to have an achievement in this field.
E. The legal and economic environment still does not encourage energy efficiency efforts.

[1] A detailed description of the programme can be found in the Final Report of the "On-site energy advice for communities in Hungary" (Novem/EGI, March 1995)

2.2.4 Conclusions and preliminary findings

The most important lessons learned during the community advice programme can be summarised as follows:

* With respect to the situation in Hungary (scarcity of capital and awareness) the programme focused on low-cost measures, mainly on education and better housekeeping. The proposals worked out by the experts initiated positive changes, but it is difficult to quantify these changes in terms of fuel conservation or emission reduction.
* Although the community advice programme was not designed for JI, important lessons were learned, which can be effectively utilised in the design of a real JI programme.
* There is a significant potential for energy saving in Hungarian communities. A part of this potential can probably be channelled through JI.
* Educational and behavioural projects cannot be directly used as JI projects, as the verification of savings and attribution of results is not unambiguous.
* Investment-type projects, such as cogeneration or boilerhouse refurbishment, seem to suit best the JI concept.
* If more complicated measures are considered for JI (e.g. the introduction of energy management), a reliable monitoring system has to be established prior to the implementation of the JI project.

2.3 New programme: Energy efficiency improvement and demonstration programmes for Hungarian municipalities and local utilities.

2.3.1 Background of the project

As has been experienced during the PSO (1992) project 'On-site energy advice for local communities' in Hungary, there is in general a large potential for energy saving by local energy companies. However, there is insufficient knowledge of energy production and distribution costs, of saving opportunities and of management aspects needed to efficiently produce and distribute energy locally. Netherlands experience gained by many years of local energy saving promotion could, as was learned from the above mentioned project, effectively assist local energy managers to gain more insight in ways to save energy and actually advice on concrete follow-up measures, as was done in some twenty Hungarian communities.

As the Hungarian policy directs towards privatisation of energy distribution companies, it becomes more and more attractive for Hungarian and Netherlands energy companies to cooperate in commercial energy supply activities. Demonstration projects developed and implemented in a cooperation relation between a Netherlands and Hungarian company, assisted by a local energy saving programme in the line of the earlier programme, would both support and demonstrate to local energy companies energy saving and energy management, and support the bilateral trade relation between Hungary and the Netherlands.

Consequently, the Hungarian Ministry of Industry and Trade, as the responsible state body for energy issues, requested support from the Netherlands for a continuation and extension of the earlier 'On-site energy advice for local communities' project, which was regarded highly successful by this Ministry. The intended programme comprises of three main elements, namely:

A. Extension of the general energy efficiency improvement programme for Hungarian local energy communities with at least 10 and preferably 20 more local energy authorities, with a strong emphasis on involvement of local energy companies, and follow-up of the earlier activities in the field of introducing a 'monitoring and targeting approach' in at least 10 communities of the pool;
B. Development and implementation of a project demonstrating small scale combined heat and power generation (CHP);
C. Development and implementation of a demonstration project regarding 'demandside management'.

The new projects A, B and C will be developed in such a way that they can serve as JI simulation study objects.

2.3.2 Description of new projects

A. Continuation and extension of the 'on-site energy advice for communities in Hungary' project
The earlier PSO project "On site energy advice for communities in Hungary" demonstrated that energy efficiency can be significantly improved on the local level by advising, introduction of up-to date energymanagement, development of energy efficiency projects and information and education. The following findings were identified:

* In Hungary the energy consumption of the residential and communal sectors is continuously increasing. Similarly to the Western practice the importance of the local level is growing in politics, too. The local governments are, however, often unable to cope with the new tasks assigned to them in the energy field, as they have neither trained people nor experience.
* In spite of the dramatic growth of energy costs not much happens to improve the situation. Lack of awareness (public and political), lack of capabilities (managerial and to a lesser degree technical), lack of (access to) investment funds, and various myths hinder sound action. Most of the local governments are convinced that nothing can be done; a general passivity in the local energy field prevails .
* Western experience with energy efficiency can be beneficially utilized in Hungary. Netherlands energy management knowledge can be easily adopted to the conditions of Hungary. Netherlands energy efficiency products, like condensing boilers, lighting devices, controls, and instruments can contribute to the improvement of the situation. Getting acquainted with the circumstances of the Hungarian Energy field can lead to the development of business ties between the Netherlands and Hungary.

B. Developing and implementing a small scale CHP demoproject
As in the Netherlands it is accepted in Hungary too, that Combined Heat and Power (CHP) is one of the most effective means of energy conservation (that means, when used to replace old heat and/or power production capacity). Still, the share of cogenerated power is rather low compared to that in industrialized countries and it is mainly performed by bigger power stations. According to Western experience, gas engines and gas turbines can provide up-to-date solutions for smaller scale cogeneration. It has also been proven that under certain circumstances (such as world market prices for energy) these technologies can be feasible at low unit capacities too (that is from a couple of hundred of kilowatts). In the Netherlands, for example, hundreds of small CHP plants generate power and heat economically for communities, industries, hospitals and greenhouses.

Up to now, the present time small gas turbine technology has not been demonstrated in Hungary yet and gas engine technology in general has been demonstrated only in two projects. No demonstration has been carried out in the district heating field yet, although this field could theoretically provide the best opportunities for small scale CHP.

District heating (DH) is rather widespread in Hungary. As much as 140 systems serve 104 settlements. Some 640.000 homes are connected to DH and roughly a quarter of the population lives in such homes. Besides some big ones, the majority of the systems fall in the 20-50 MW capacity range. As revealed by several studies (a.o. a Nehem, ECN and EGI study financed by PSO), small scale cogeneration is feasible in these district heating systems, if the capacity of the plants is dimensioned according to the summer domestic hot water demand. The magnitude of the CHP capacity that can be installed in the Hungarian DH systems is between 200 and 300 MW.
DH systems are owned in Hungary by the local governments. Earlier significant state subsidies have been eliminated.

Today the owners work on the implementation of a transition that can make district heating compatible with the market economy. Once they succeed in stabilizing the conditions, DH systems can be privatized. Privately owned heat and power supply will then provide good opportunities for independent power production.

Studies pointed out that the penetration of CHP is hindered in Hungary by subsidized electricity prices and by the lack of a proper legal background. On the microeconomic level CHP is not feasible. In the meantime a new Electrical Act was accepted by the parliament, which allows independent power production and provides that realistic market prices will be introduced by the end of 1996. It means that, if the policy is carried out according to the plans, within two years true market conditions will prevail in the energy field of Hungary.

Demonstrating CHP in district heating at this moment therefore prepares the energy companies in Hungary for further implementation once the market conditions improve (and thus support the implementation of the energy efficiency policy), but also provides Netherlands companies with the opportunity to exhibit the Netherlands capacities in this field and to establish some business contacts.

C. Introduction of Demand Side Management in end use sectors
Netherlands experience shows that utilities are in a favourable position to promote Demand Side Management (DSM) among their customers. In The Netherlands they have developed and implemented several energy efficiency programmes in different sectors (residential, commercial, industrial) that achieved high participation rates and high energy savings and that were costeffective to the utility and the society. This success is due to several reasons: they have insight in the consumption patterns of their customers, they have the technical know-how, they are in close and regular contact with their customers and they are developing more and more into providers of energy-services.
Among Hungarian energy specialists, both in energy companies as in government, there is an interest to develop DSM projects in Hungary as well. Energy saving programmes driven by the energy producers will be of interest to them if this will lead to smaller investment costs for capacity increases or renewal. However, there is no experience in this respect, and little know-how for starting up such an initiative. A demonstration demand side management project aiming at reducing electricity consumption would provide Hungarian electricity companies and district heating companies with experience of this

approach leading to costreduction at both the production and the consumption side.

Project location
The projects will take place in several communities, with several energy companies, in Hungary. The Hungarian counterparts, and thus the project locations, will be selected in the first phase of the project by an open process and supervised by a steering committee with representatives from three Hungarian ministries.
For the execution of the demonstration projects, a substantial contribution is expected from the involved energy companies.
Altogether 12 JI simulation sites will be selected: one CHP project, one DSM project and ten implementation projects (selected from the 34 audited municipalities from the concluded community advice programme (24 communities) and from its new extension (ten communities).

3. The JI approach attached to the programme

3.1 JI simulation integrated in the different projects.

A "JI approach" will be attached to the 1995 part of the Netherlands-Hungarian energy efficiency programme. The following provisions will be made:

In the community programme an additional element will be added to the selection criteria. This criterion is the probable availability of a baseline energy scenario.
Monitoring activities will start at the very beginning of each community project, so that the changes induced by the programme can be followed. If necessary, energy meters will be installed and the mentoring and targeting approach will be introduced.
The concept of JI will be discussed with many actors of the energy field, including Government officials, companies, local governments, and NGO's.
In the CHP project instruments will be installed to precisely monitor the input and output energy flows.
In the DSM project the participating utilities will be requested to assess the savings achieved by the DSM actions.

3.2 Expected outputs

It is expected that the findings gained in 1995 and 1996 will largely contribute to the development and check of the JI concept. Answers for the following questions will be sought:

1. What kind of projects are eligible for JI?
2. Which emission reductions of greenhouse gases result from the project?
3. Which local benefits does the project entail?
4. What are the costs per tonne of CO_2 reduced?
5. How can and should the emission reductions be attributed to the participants?
6. What transfer of technology and contribution to local capacity building have taken place?
7. How has the monitoring, reporting and possibly verification of claimed results been arranged?
8. What organisational structure has been established?

4. Structure of the JI simulation study

4.1 Introduction: similarities between JI and performance contracting

Energy performance contracting (EPC) for energy efficiency and environmental control is a technique successfully applied in some countries. Vendors, called "energy service companies" or "ESCO"-s invest in the energy systems of the clients. They provide expertise, technology, and capital. Their efforts are rewarded by a part of the savings generated by the interventions of the ESCO. The savings are metered or calculated in a pre-agreed way. All the responsibilities and rights of the parties are put down in a contract. This ESCO concept is already applied in several Central and Eastern European (CEE) countries.

There are apparent similarities between JI and EPC. Both approaches ensure that:

- the capabilities of "well-prepared" parties is utilised for the benefits of both parties
- the achievements are shared by the parties
- the achievements are quantified in an agreed manner
- the synergy effect is utilised.

The authors believe that the adaptation of experience with EPC, an energy conservation instrument with "business approach", for JI can be worthwhile.
Many other similarities between JI and Energy Performance Contracting (EPC) can be identified, the most important of them being the monitoring and verification of savings.

A lesson, ESCO's have early learned is that only clearly accountable projects can be implemented under a performance contract.
Experienced ESCO's avoid projects where:

* the baseline is not unambiguous
* the performance can not be exactly monitored
* arguing about the attribution of the savings may occur
* savings fail to be generated for reasons beyond the ESCO's control

It is mainly the investment type projects which qualify for EPC.
One can suspect that essentially the same applies to JI.
In the selection and set-up of the JI simulation study-sites the ESCO experience will be utilised, since the Hungarian partner EGI already is experienced in this field.

4.2 Selection of the new projects

Tasks:

1. Description of the Hungarian setting (this report);
2. Selection of the projects (one DSM, one CHP and ten implementation projects at Hungarian communities.

4.3 Establishment of baseline for the new projects

Tasks:
1. Identify areas by a 'walk-through' audit at the communities where proposals will be probably made
2. Check if installed energy meters (main meters) are available and operational
3. Where main meters are missing, specify, procure, and install new ones
4. Establish a baseline monitoring procedure, including regular reading of the meters, data collection, and evaluation

This part includes study activities and procurement of hardware.
The phase can be started only, when the Hungarian Steering Committee for the PSO 1994 program has made de decision about the selection of new communities (estimated time: March, 1995). If proposals are likely to be developed in the space heating field, the data collection period shall include the 1995/96 heating season. In that case the proposals should be implemented in the summer of 1996. Implementation of the proposals is possible in the summer of 1995 at sites which already have their main meters.

Hardware cost requirement:

As a rough estimate it can be assumed that the average community needs 1 heat meter, 1 cold water, and 1 hot water meter. The average cost for 1 community is 5,000 NLG (the beneficiary community will make the installation). The total cost for 10 communities is 50,000 NLG. Novem and EGI shall do their best to identify communities which are able to finance at least a part of this investment. Furthermore part of these costs will be covered by a PSO project (15.000 NLG).
So the remaining investment for this JI simulation study is approximately 35.000 NLG.

4.4 Data and information collection

Tasks:
1. Collect and process data
2. Provide the answers to the questions listed in 4.2.

Methodological matters

The monitoring component of the Energy Advice project will provide the expected outputs (see 4.2.), which are relevant for Joint Implementation :

4.5 Reporting

During the three year period three preliminary reports will be prepared and one final report.
Furthermore the Netherlands contractor (NOVEM) and the Hungarian subcontractor EGI/GEA will have regular contacts with their counterparts at the Netherlands and Hungarian ministries of Environment.

This first interim report is handed over to the Ministry of VROM by March 1995. The main function of this report is the elaborate description of the findings from part 1 (review of the background and review of the applicability of earlier activities). A second interim report is prelimarily planned for December 1995. It will provide a solid base line description and as far as possible a first inventory of emissions reductions with respect to the aforementioned baseline. The third interim report which will give an update of emission reduction information will be ready by October 1996. The fourth and final report will be completed by September 1997. It will provide all answers to the questions of chapter 4.2.

4.6 Diffusion of information on results

For improving the quality of the study, getting input from other Hungarian, Netherlands and international experts (on environment, energy-efficiency or JI) during the course of the project two workshops will be organized in Hungary.

Diffusion of Information on Results.

The information generated by the reports will be spread in a number of ways:

* following the second interim report (spring 1996) there will be a small scale workshop in Hungary for all Netherlands and Hungarian project workers involved, as well as for policy-makers and scientists in both countries and a few selected international JI experts; the workshop report will be made by the consultant and be part of the entire monitoring study;
* a second workshop will be organised in Hungary in October 1997 on the basis of a concept of the final report; the consultant will make a workshop report and take account of the results in completing the final report;
* the Netherlands Government and the Hungarian Government will regularly report to the conference of the Parties under the Climate Convention (and/or relevant subsidiary bodies) on the results of its pilot project programme, thus including the present project;
* the Netherlands and Hungarian Governments can use preliminary and final results in its policy documents on JI and in relevant publications in national or international magazines.

Norway

Oslo, 04.08.95 (revised)

SUBMISSION BY THE GOVERNMENT OF NORWAY RELATED TO THE ESTABLISHMENT OF A FRAMEWORK FOR REPORTING ON ACTIVITIES IMPLEMENTED JOINTLY (AIJ).

1. According to Decision 5\CP. 1, Art. 2 adopted at the first Conference of the Parties, "The SBSTA will, in coordination with the SBI, establish a framework for reporting, in a transparent, well-defined and credible fashion, on the possible global benefits and the national economic, social and environmental impacts as well as any practical experience gained or technical difficulties encountered in AIJ under the pilot phase. The Parties involved are encouraged to report to the COP through the Secretariat, using the framework thus established. This reporting should be distinct from the national communications of Parties. The SBSTA and SBI, with the assistance of the Secretariat, are requested to prepare a synthesis report for consideration by the COP."

2. **The SBSTA and the SBI** thus have a shared responsibility in creating a framework for reporting on AIJ. This reporting will represent the inputs for the synthesis report to be prepared by the two Subsidiary Bodies, with the assistance of the Secretariat, to be considered by the COP at its annual sessions. The information, as assessed by the two Subsidiary Bodies, contained in the synthesis reports will constitute an important factual basis for the conclusive decision on the pilot phase and progression beyond it, as constituted in article 3 (b) of Decision 5\CP.1. Hence, it is imperative to establish a clear division of labour and responsibilities between the two Subsidiary Bodies and avoid unnecessary duplication of work. The following assignment of tasks between the two bodies may thus be envisaged:

***The SBSTA**. On a broad basis the SBSTA should be responsible for the analytical work during the pilot phase. The SBSTA should be responsible for the assessment of tecnical, economic and methodological questions arising, especially those pertaining to subparagraphs b) and d) under article 1 of Decision 5\CP.1. For this purpose an ad-hoc working group could be established under the SBSTA, or one could choose to instruct one of the two established intergovernmental technical panels to organize this work. This body should draw upon the work of relevant international organisations with expertise in AIJ, including private sector interests. In order to facilitate the conclusive decision to be taken by the COP on the pilot phase and progression beyond that, this body's main task would be to advise the SBSTA on all relevant technical aspects of building an AIJ-regime within the FCCC, including methodology for measuring and verifying emission reductions/sequestrations.

***The SBI**. The SBI should be responsible for the development of guidelines on policies, eligibility criteria and programme priorities related to building an AIJ-framework. The SBI should ensure that the framework for reporting secures that all relevant elements in Decision 5\CP.1 are included and assessed by the Parties in their reports. The SBI should furthermore, in coordination with the SBSTA, assess the relevance of AIJ in obtaining the overall objectives of the FCCC and make recommendations to the COP on all aspects of the pilot phase, including a final assessment and recommendation at the end of the pilot phase.

3. **The Secretariat** should compile and organize the reports from the Parties on AIJ and submit these to the SBSTA and SBI with the view to facilitate their work. In respons to article 2(c) of Decision 5\CP.1, the Secretariat will, based on the findings of SBSTA and SBI, prepare a synthesis report for consideration by the COP. Proper modalities to facilitate endorsement by the two Subsidiary Bodies before submission to the COP would need to be established. Although AIJ-reporting should be distinct from the national communications, the assistance of the Secretariat may be sought in order to ensure that the reporting methodology and format for AIJ are consistent with the requirements established for the national communications.

4. All **Parties** that so choose are entitled to report within the established framework, all projects that are considered eligible as AIJ according to Decision 5\CP. 1. Parties are also free to report on activities related to building the framework of AIJ, such as analytical work related to establishing baselines and other vital elements of an AIJ-regime, whether these are developed by Governments themselves, research institutions or other entities with expertise in AIJ.