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COUNTRY CASE MATERIAL SUBMITTED BY THE NETHERLANDS*

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* The attached country case material is circulated in the language and form in which it was received.

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INTRODUCTION AND SUMMARY

An essential element of the work programm of UNCTAD's Working Group on the Interrelationship between Investment and Technology Transfer constitutes the emphasis placed by UNCTAD VIII on the need to take account of the diversity of country situations and experiences, with a view to sharing experiences, concerns and views.

The country case material in this report contains elements aimed at such an exchange, presenting briefly, first, an overview of the development of technology policy in the Netherlands from the beginning of the 1980s up to now, combining chronological and substantive aspects. In this context, it may be mentioned that the Netherlands was on of the first countries to initiate work on the development of a technology policy, e.g. in OECD. Secondly, a possible approach to technology diffusion in developing countries is outlined, based on some of the technology policy consideration and practical approaches referred to. This is followed by a succinct description of the work and functions of the Netherlands Foreign Investment Agency (CBIN). CBIN aims at attracting foreign direct investments, and takes the potential contribution to the Netherlands' "technological structure" into account. Finally the material also contains the essential features of MILIEV, a development assistance programme geared to making funds available for activities that have a positive environmental impact, that are not commercially viable, and entails a transaction with a company from the Netherlands. These activities can be expected to lead to transfer of embodied technology.

In addition to the present material, a number of general aspects related to the promotion of outward investment flows to developing countries are contained in the contribution of the Netherlands to the work of the Ad Hoc Working Group on Investment and Financial Flows.

TECHNOLOGY POLICY IN THE NETHERLANDS

1. HOW IT ALL STARTED .....

At the end of 1982 the coalition agreement of the first Lubbers Cabinet was concluded. This agreement marks the start of an explicit technology policy by the Dutch government. Prior to this, technological research and development were topics within either scientific policy (Ministry of Education and Science) or industrial policy (Ministry of Economic Affairs). This solution left us with two main problems: the civil servants within the Science Ministry were not close enough to the industrial sector to be familiar with the exact R&D wishes there. The other setback was the orientation of the civil servants involved in industry policy: at that time a defensive activity, aiming at saving weak industrial sectors as textile or shipbuilding.

Yet politicians and economists both were aware of a significant tendency in surrounding countries. This tendency had to do with spending more time and money on industry related R&D. It was clearly understood that furthering of this type of R&D led to new impulses for economic growth.

Other developments also played an important role. The 1980s provided the scenery for a dramatic change in the government's role. In its new role government focused on creating the right conditions for development and on encouraging R&D-organisation and firms to take on greater responsibility and financial commitment. It also stressed the importance of deregulation (restricting formal legislation) and privatisation (separation of policy-making and implementation). This created a perfect atmosphere for a new kind of policy in the Netherlands, characterized by constant interaction between industry, science, education and civil service. These partners participate in ad hoc advisory committees as the Zegveld Committee (1984) and the Dekker Committee (1987), but also in the permanent Advisory Council for Science and Technology Policy (installed in 1991) or the steering committees of the Innovation Oriented Research Programmes.

2 ..... AND HOW IT DEVELOPED

Working together with the target groups not only furthers the gearing of policy activities to the actual needs of these groups, it also ensures flexibility in policy making and implementation that enables us to go through a series of rapid growing phases !

Since the creation of the Technology Policy Directorate at

the Ministry of Economic Affairs in 1983 and the appointment of the Minister of Economic Affairs as the primarily responsible Minister for technology policy we can discern the following stages in the development of technology policy.

In the first few years the main emphasis was on the generation of R&D. This period saw the development and expansion of R&D-oriented instruments such as the Innovation Oriented Research Programmes, the Business-oriented Technology Promotion Programmes and the Technological Credit Scheme. Of great importance internationally was the start of the first framework programme of the European Community.

The 1986 OECD Country Review on Technology Policy in the Netherlands and the growing significance of the EC framework programmes led to increasing attention for the diffusion of R&D. These international incentives supported the conclusions in the report of the Dekker Committee that the main problem was no longer the availability of knowledge, but the utilisation of that knowledge in developing profitable products. The issue of diffusion led to more attention for education and training and to the establishment of a network of Innovation Centres, of which there are currently 18 operating throughout the country. Other recommendations of this committee led to
the installation of the organisation SENTER (1988), which now implements a large number of support measures and thus embodies the separation of policy making and implementation.

In recent years, extra attention has been given to the integration of technological developments into society: furthering public information, developing technologies that are relevant to societal needs, improving the linkage between education and the labour market and focusing on the international context of technology policy.

The following sections will touch briefly on main instruments and programmes concerning industry, research infrastructure, education, innovation centres and integration of technology policy and society. Finally international cooperation will be discussed.

3 HOW TO PROMOTE R & D ....

Put before the initial question how to promote R&D, several instruments were brought to life to further R&D activities within industries and research organisations. Of these instruments **The Business-oriented Technology Promotion Programmes (PBTS)** are still going strong. This scheme offers a subsidy for the costs of feasibility studies, research projects or demonstration projects in the fields of biotechnology, information technology, materials technology and environmental technology. It is a very popular instrument for both larger and smaller firms. The 1993 budget is 108 million Dutch guilders.

Together with the **Innovation Oriented Research Programmes**

(IOPs) and the **Technical Development Credit (TOK)** these programmes cover the range from fundamental to applied research. **IOPs** were launched at 1980. Their objectives are to stimulate research on new technologies in research institutes. These technologies look promising and important to the industry, but research is still in the fundamental phase. This may inhibit industry to engage financially in the research projects. Therefore IOPs are jointly funded by government and research

institutes on a 50% basis. Selection of IOPs and steering of the research itself is a joint effort of research institutes, industry and government.

So industry is involved in a very early stage, but not financially steering it. At present 10 IOPs are running in varying areas as technical ceramics, polymers, the environment, industrial proteins and so on. Annual budget: ca. 35 million Dutch guilders. At the other end of the continuum there is applied research. This is the near to market research encouraged by **TOK**. The credits that are provided for by this scheme only need to be paid back (from the projects turnover) if the development activities have been a success. The 1993 budget is 134 million Dutch guilders.

However, promoting R&D activities involves more than just pumping in money. It also needs an environment that is beneficial to research. The most important environment in this respect is that of the universities and the large research institutes in the Netherlands. Besides the important educational task an university also has a research task. This task has been under discussion for some time. In order to strengthen this task it has been decided to establish so called **Research Schools**. The Dutch universities work with a two tier system. This consists of an initial phase of (in practice) 5 to 6 years and a second phase of 4 years for a limited number of students. This second phase leads to a dissertation. It is now being organised in the form of research schools, in order to improve the structured coaching and education of young research trainees. The funding of these schools is primarily the responsibility of the universities, which are subsidised by the Ministry of Education and Science. Industry pays for specific research projects for a limited percentage. The Ministry of Economic Affairs has a separate budget (44 million Dutch guilders in total) to stimulate the founding of research schools in areas of vital importance to the technological competitiveness of our industry. At present these are: telematics, biotechnology, process engineering, catalysis, turbulence and fluid dynamics.

The second important denominator of the research atmosphere is the **large technological research institute**. Of these the Netherlands Organisation for Applied Scientific Research (TNO) is perhaps best known. Other large institutes are institutes in the field of energy research (ECN), marine research (MARIN), space (NLR) and hydraulics (SWL). In addition to the many agricultural institutes these institutes constitute a

particularly important link between the basic research performed within universities and the market of knowledge-users. Evidence for this is found in the high percentage of contract research performed at these institutes. Almost 60 % of the annual turnover of 1000 million Dutch guilders of TNO and the large institutes is accounted for by contract research. In turn 60% of this type of research comprises contracts from firms, both domestic and foreign.Government funding of these institutes has changed in the past few years towards a system aimed at an increased market-orientation. Within the new structure, the institutes are themselves responsible for covering their running costs. They also have greater research freedom, as well as the right to obtain their own revenues through commissions from third parties. Strategic plans (missions) have been drawn up, which are partly used as a basis for coordination with the work being done by university research-institutes and other (semi) state-controlled institutes.

4 .... AND HOW TO SPREAD THE RESULTS

After the focus on the generation of know-how the policy makers turned to spreading the news: the topic of diffusion entered the scene. Two main types of activities played an important role in this area: education and transfer of know-how, especially to the small and medium sized enterprises (SMEs).

Of these, education is important to ensure a constant inflow of highly trained workers. Again with the help of a committee of experts from the main target groups (the Rauwenhoff Committee) activities were started to improve the linkage between education and the labour market.In 1991 the work of this Committee led to a covenant between government and the social partners (i.e. all employer and trade union umbrella organisations), stipulating their joint responsibility for a better linkage between education and the labour market. The Ministry of Economic Affairs has set aside 15 million Dutch guilders to support the following activities during the 1992 - 1994 period:

* **incentive programmes**: these programmes which will operate inside industrial sectors, aim at improving contacts between these sectors and (lower and intermediate) vocational education. Based on covenants between the ministry and the sector, the sector involved is responsible for conducting research on developments within it and ascertaining any subsequent need for education and training on the part of the workers. The educational authorities will then consider whether to update programmes, make any adjustments to coordination and obtain new equipment where needed. Funding is provided partly by current government programmes and partly by the sector. The first covenant has been signed with the hotel and catering industry.

* **free markets**: these are specific regional initiatives launched by partnerships between companies and third parties, such as employment offices, the regional Council

for Employment Policy, the Chamber of Commerce or local authorities. Possible actions include: the promotion of contacts between companies and schools, effective use of training facilities through cooperation and helping less skilled individuals by promoting measures to train them. The costs of these activities are largely paid for by the participants. Where necessary the Ministry of Economic Affairs will award a start-up subsidy. The first free markets are installed in the harbour of Rotterdam and the airport of Amsterdam.

* **interregional and intersectoral actions**: these actions include measures such as industrial sector evaluation (scanning sectors for relevant developments and their practical effects on jobs), technology foresight studies with an educative component, providing new equipment and teaching material, promoting the image of technical training and stimulating young people to complete their training to become skilled workers.

In almost all the above mentioned actions, the ministry is looking for implementation of projects based on a strategic alliance between interested parties, preferably in the form of a public-private-partnership (PPP).

The second topic within the range of diffusion oriented activities is the promotion of innovation, especially within the smaller firms. After a series of previous activities, policy now focuses on the so-called Innovation Centres. The first of the 18 centres was opened in 1988. The main task of these centres, which are modelled on earlier examples in Denmark and the German state of Baden-Würtemberg, is to direct technology-pulled SMEs to the right source of technological knowledge. They do not only play a passive role in answering questions, but also actively seek out SMEs and help them to formulate their problems (articulating demand) or to match specific problems with specific sources of knowledge (selection of supply). To achieve this, the centres offer enterprises two free consultancy days a year, and can also call on outside consultants.

The Innovation Centres have an annual budget of 40 million Dutch guilders, still entirely financed by government. Once the division between policy-making and implementation has been completed the network will become independent, probably in 1994.

5. DON'T FORGET THE SOCIETAL CONTEXT ....

Technology's success is determined by whether it is integrated into society. Such integration will only succeed if new knowledge and technology interlock with existing knowledge, customs, norms and values. Applicability, user-friendliness and desirability are thus the parameters dictating the success of new technological developments.

This implies that policy should also focus on:

- the use of technology (areas of application);
- the roles in which people are confronted with technology (as consumers, employees);
- specific problems of integration (education, public attitudes, institutional obstacles).

At present policy initiatives focus on:

* furthering public information: a national centre for science and technology will be built in Amsterdam. This is a joint project of the Ministries of Economic Affairs and Education and Science, the city of Amsterdam and some large enterprises.
* women and technology: women are under-represented in technical studies and jobs. Recently an interdepartmental group on Women and Technology has been appointed. The main task of this group is to prepare an activity plan to promote the participation of women in technical studies and occupations.

* technology at primary school: technology is taught at primary school in countries as the United States, the United Kingdom and Germany. The Ministry of Education and Science is preparing a white paper on the problems to be overcome (insufficient teaching material, the difficulty of the subject for young children, unprepared teachers, and so on).

* countering the sub-optimal use of technology in the public domain: activities are started in the field of technology for less developed countries, for the alleviation of problems like traffic congestion, the care for the elderly and so on. The central issue in these cases is to give special attention to technologies that meet societal needs.

6 .... AND TAKE A GOOD LOOK OUTSIDE AS WELL !

Just as there have been developments in technology policy at the national level, there have also been a number of influential developments in international cooperation on technology. During the start-up phase of technology policy more or less equal attention was given to both multilateral cooperation and bilateral activities. However in later years more and more attention was given to multilateral cooperation. This had to do with developments as the size, scope and effectiveness of multilateral programmes versus those of bilateral actions, but also with the growth of programmes as the EC-framework programmes and EUREKA. Furthermore the first signs of the increasing internationalisation and globalisation of technological and scientific developments helped to plan our activities.

By the early 1990s, the realisation that national policies cannot be planned or implemented in isolation from international developments or trends had taken a firm hold among policy-makers, including those responsible for technology policy. The above

mentioned considerations and the available manpower have therefore resulted in the following main lines within our international technology policy:

* promoting participation in multilateral programmes (EC/EUREKA/COST/ESA);

* undertaking and supporting of national efforts (EC Liaison bureau, monitoring groups) and flanking policy such as additional funding and supplementary actions in the area of norms and standards;

* furthering the diffusion of knowledge (for instance through the recent installed value relay centre and by making good use of the services of our technical and scientific attachés at our embassies);

* active participation in the deliberations within relevant OECD committees (such as the committee for scientific and technological policy, that recently launched a forum on international scientific cooperation in the field of megascience and that will soon start an expert group in the field of technology policy).

This concludes our short excursion in the field of technology policy in the Netherlands. For further information please contact the Ministry of Economic Affairs in the Netherlands (ms. B.J. Hoogheid, Directorate for Technology Policy, PO BOX 20101, 2500 EC The Hague).

DEVELOPING COUNTRIES AND TECHNOLOGY DIFFUSION

1. Introduction

Technology progress, more than any other single factor, has fueled economic advance. Access to these new technologies is important for developing countries. Developing countries should focus their technology policy on the diffusion of technology. Especially for developing countries with limited budgets, diffusion is more relevant than creation. Their main concern should be how to promote the use of new technologies among a large group of firms. This involves the establishment of relations between technology institutes and the private sector and it involves special mechanisms for technology transfer. The main elements of this policy are:

- a market oriented technology infrastructure (the system of education and training, the public R&D centres, the technical universities, technology transfer mechanism). This means a close connection between technology institutes/universities and the private sector.

- a business oriented technology policy focused on

cooperative R&D and technology transfer.

2. A market oriented technology infrastructure

The technology infrastructure is an essential supplier of knowledge and skilled labour. It also supplies training programmes which are getting increasingly important as rapid technological change requires continuously training of the labour force. The technological infrastructure is often seen as an area where the market mechanism will not function efficiently. However technical universities, public R&D-institutes and higher educational institutes should supply what the industry needs (knowledge, skilled labour, etc.). In principle it can be seen as a market where the public parties are the suppliers and the industry is the buyer. Market elements can be introduced as a mechanism to bring together public parties and the industry and to stimulate the diffusion of knowledge from the public to the private sector.Therefore governments should create conditions so public institutes can act as (rather autonomous) "market parties". This means that administrative and financial relationships between the government and the public institutions should be such that public institutes are in a position to get contract work from the private sector. It is essential that public institutes earn a large part of their budget from the private sector so the public R&D institutions will be "forced" to seek buyers for the results of their R&D work. Because of this, public parties will be responsive to the (changing) demand of the industry and will become more market driven.

Governments of developing countries also should stimulate cooperative research between the public sector and the industry. This improves the transfer (diffusion) of the results of R&D projects from the public R&D institutes to the industry and it stimulates public R&D institutes to focus more on development and applied research. It also increases the orientation of the public R&D institutes to the needs of the national industry. A way to stimulate close links between industry and public R&D institutes is to subsidise industrial R&D contracted out to public R&D institutes. A way to stimulate the diffusion of knowledge from universities to (small and medium sized) firms is to subsidise the wage costs of higher educated people.

<u>A Dutch example: knowledge-bearers in small and medium sized firms</u>

The Ministry of economic affairs in 1990 started a project entitled knowledge-bearers in small and medium sized firms. The aim of this project is to promote the transfer of knowledge from higher education to small and medium sized firms. The knowledge bearers, or those who have graduated from higher education colleges or universities, are placed in a business for a period of 1,5 to 2 years in order to bring about innovation. They are supervised by teachers from the educational institute. 10% of their time they follow a programme of education geared to the project. A maximum of two people from a higher education college

or university can be placed in each firm. 40% of their wage costs are subsidized and 50% of their supervision costs and course fees.

An important aspect very often ignored is the demand side. To connect demand and supply it is essential to have a picture of R&D, education and training needs of the industry. In principle it is the responsibility of the industry to articulate its needs. However, we see that this is a problem not easily solved by a market mechanism. It is mainly a problem for small and medium sized firms to formulate their technological needs and for the industry as a whole to formulate their needs to institutions of higher education. As both are crucial factors for innovation, a governmental intervention is needed. A government should create schemes to bring together industry and public institutes in order to improve articulation of needs.

A Dutch example: R & D needs survey

In the Netherlands industry and branch organisations carry out regular surveys to provide insight into the main developments in their field and their consequences for education and training.

Another important aspect of the technology infrastructure is transparency. Developing countries should put special attention on the technology transfer from the public to the private sector. Mainly small and medium sized firms have no complete knowledge about the (latest) state of the art in technology and do not know where to buy the knowledge. In other words small and medium sized firms are more dependent than large firms on external resources of technological information. The creation of a regional network of innovation centres is a good way to improve the transparency of the knowledge market.

A Dutch example: Innovation Centres

The Netherlands has a network of 18 regional Innovation Centres. The network forms a high quality structure of technological advice for small and medium sized firms. The network has about 130 consultants. It is their task to make technological knowledge accessible. They also help small and medium sized firms to put them into contact with universities and technical centres.

This transparency should not only be limited to the national base of knowledge. Developing countries should establish frameworks to enhance the access to technologies from Western Europe, the Far East and the United States of America (to facilitate import of technologies). One should take into account that imported technologies are often not adapted to local traditions, cultures and skills. Therefore the import of technologies requires training programmes and R&D to adapt it to local conditions.

A Dutch example: Science and Technology Attachés

The Netherlands established a network of technology attachés at some of their embassies to collect technical information abroad for national industries. Information is provided not only orally but also through the magazine "Technieuws" and through lending books and reports that are difficult to obtain in the Netherlands. The magazine "Technieuws" is published regulary and gives information about the state of the art of new technologies. Posts have been created at the Dutch embassies in Washington, Tokyo, Bonn, Paris and Rome.

3. A business oriented technology policy

First, a business oriented technology policy should improve the transfer of knowledge from firm to firm to develop economies of scale across an industry. This can be done by focussing R&D schemes on cooperative R&D.

A Dutch example: Collective research

The aim of the Subsidy Scheme for Business oriented Technological Research by Collectives in the Netherlands is twofold:

- to encourage research by cooperative ventures of a minimum of three firms;
- to disseminate the knowledge thus acquired.

The applications are classified by an external committee on the basis of quality, chance of succes and importance for the sector of industry. Allocations are made according to this classification until the available budget has been used.

Another way to transfer technologies from firm to firm is by organising demonstration projects. A government can encourage demonstration projects by promoting (foreign) firms to demonstrate their new technologies. Technology surveys also can be an important instrument to diffuse new technologies among the industry.

A Dutch example: Technology surveys

The Ministry of Economic Affairs in the Netherlands is carrying out technology surveys in order to identify potential applications of technologies. The surveys are being carried out by external agencies and supervised by experts from industry and the education and research world. The results of these surveys of individual technologies are discussed at strategic conferences, with experts from industry, government and educational and technical institutes.

4. Conclusions

Promoting the diffusion of knowledge means creating a technology infrastructure in which market elements play a major

role. This implies autonomous public parties, cooperative R&D between public parties and firms, a good articulation of the needs of the industry and transparency of the public "knowledge" market. In addition a business oriented R&D policy, focused on cooperative R&D and the transfer of new technologies from firm to firm, will stimulate this diffusion.

The Netherlands Foreign Investment Agency: A Short Introduction

The Netherlands Foreign Investment Agency (NFIA), founded by the Dutch government as a division of the ministry of Economic Affairs, serves to promote The Netherlands as a basis for international activities and assists foreign companies which are contemplating setting up a new subsidiary or expanding an existing company in The Netherlands.

The NFIA can assist companies during each stage of the investment planning process.

Preliminary investigation. The NFIA has access to addresses, economic and financial information, and statistical and technical data. Furthermore, the NFIA can answer questions about government incentive policies.

Project evaluation. Next, the NFIA is able to establish contacts with the financial community (banks and venture capital companies for example); the service industry (accounting agencies, tax consultants, transportation companies, among others); the scientific world (universities and research centers); and government bodies (national, regional and local authorities, and customs personnel). During this stage the NFIA also assists in organizing fact-finding trips and site selection studies, and preparing investment, operational cost and cash-flow calculations. Project implementation. Finally, once a company has decided to establish, the NFIA is available for general consultation.

The NFIA identifies, via inter alia 'industry watches', foreign industrial sectors and companies that are ready for setting up a subsidiary or a branch in Europe. One important condition is that the sector or company already exports to Europe. The NFIA tries to find out what the advantages for these companies are when creating a physical place of business in Europe, and what the specific advantages are the Netherlands has to offer to these companies. The NFIA is inter alia targeting industrial sectors such as the (specialized) chemicals, biotechnology, medical technology, information technology/electronics and the food processing industry.

The NFIA, which services are free of charge and confidential, has offices in The Hague (The Netherlands), New York, Chicago, San Francisco, Tokyo and Seoul. In Taipei these services are available through The Netherlands Trade and Investment Office. In Europe contact may be made through local advisors in Austria, Finland, France, Germany, Norway, Sweden, Switzerland and the United Kingdom. The NFIA also operates

through the Netherlands Embassies, Consulates-General and Chambers of Commerce.

Industry and Environment Programme (MILIEV)

The MILIEV-Programme concerns grants, made available for partial payment of investment projects with positive environmental impact; these environmental actions will have an innovative character and act as a catalyst. Selected developing countries have access to this programme; a Dutch company has to be the supplier.

MILIEV-support is a kind of concessional funding, for which Dutch exporting companies can apply. According to OECD-regulations, activities will be eligible for government support only if they are not commercially viable. The Dutch content of the transaction to be supported has to be 60% minimum.

The transactions concern environmental improvement projects involving existing technology, end-of-pipe technology, clean production technology or technology suitable for use of renewable inputs.

MILIEV-support consist of a grant of 40% of the value of the transaction and 55% if the buyer is a corporation in a LLDC (in exceptional cases a higher percentage may be offered); the maximum grant in NLG 25 million. Adequate financing arrangements for the balance have to be demonstrated.

If the Netherlands Credit Insurance Company (NCM) accepts to insure a commercial loan to finance the balance, the premium for the credit insurance and the management - and commitment fee will be reimbursed over and above the grant. If the NCM does not accept insurance on a loan, the grant will be raised with 5% of the transaction value.

The grant will be charged to the Dutch government budget for development cooperation and internationally registrated as ODA. The grant and, if applicable, the commercial loan will be offerd by the Netherlands Investment Bank for Developing Countries (NIO).

Applications for MILIEV-support will be appraised in terms of environment impact and relevance for social and economic development, following a specific set of criteria. External experts will be assigned to contribute to these appraisals.

Apart from the Ministry of Foreign Affairs, the Ministries of Environment, Economic Affairs and Finance participate in policy development and appraisals of applications concerning the MILIEV-Programme. The annual budget for the MILIEV-Programe amounts to NLG 50 million. No Grants will be offered to a single country in excess of 40% of the programme budget.